City of Colleyville

Infrastructure Construction Provisions and Details

Revised July 2014

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Table of Contents

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IV. INFRASTRUCTURE CONSTRUCTION PROVISIONS, STANDARDS AND DETAILS

PART A – GENERAL PROVISIONS

SECTION A 1 GENERAL

A 1.1 Purpose

The project shall be in accordance with the *Standard Specifications for Public Works Construction* as issued by the North Central Texas Council of Governments (NCTCOG), as it may be amended from time to time, hereinafter referred to as the Standard Specifications.

These Provisions are included for the purpose of adapting the Standard Specifications to the particular project which is subject to this agreement and of adding thereto such further provisions as may be necessary to state the contract in its entirety.

The work shall conform to the requirements of these Provisions and the details as shown on the drawings. These contract documents are intended to be complementary. Requirements of any of the contract documents are as binding as if called for by all. In the event of conflict between the drawings and the Provisions, the interpretation of the drawings shall have priority. Where any discrepancies occur between the Provisions and the Standard Specifications, the Provisions shall govern.

References made to TxDOT Items in this contract shall mean items in the *Standard Specifications for Construction and Maintenance of Highways, Streets, and Bridges* as published by the Texas Department of Transportation in 2004. Metric projects will refer to the 1993 edition. Further technical requirements contained in other publications are referenced in sections where they apply and are hereby incorporated.

A 1.2 Definitions

The following words and expressions, or pronouns used in their stead, shall wherever they appear in this Contract, be construed as follows, unless a different meaning is clear from the context:

Addendum: A supplement to the Contract Documents issued in writing prior to the receipt of bids.

Agreement: See Contract.

Advertisement: All of the legal publications pertaining to the work contemplated or under contract. Also called Notice to Bidders.

Bid: The offer of proposal of the Bidder submitted on the prescribed form setting forth the prices for the Work to be performed. Also called Proposal.

Bidder: Any person, firm, or corporation submitting a Bid for the Work.

Bonds: Bid, performance, payment, maintenance bonds and other instruments of security, furnished by Contractor and his surety in accordance with the Contract Documents.

Calendar Day: A calendar day is any day of the week or month, no days being excepted.

Change Order: A written order to the Contractor authorizing and directing an addition, deletion or revision in the work within the general scope of the Contract Documents, or authorizing an adjustment in the contract price or the contract time. The change order must be approved prior to the construction taking place. Any work done by the Contractor prior to the approval of the change order will be done at the Contractor's risk.

City: The City of Colleyville, Texas, a municipal corporation, authorized and chartered under the Texas State Statutes, acting by and through its governing body or its City Manager or his/her duly authorized representatives. The terms City and Owner are synonymous.

Completion Time or Contract Time: The time set forth in the Contract for the performance of the Work contracted. The time may be expressed as calendar days, working days or as a specific date of completion.

Contract or Contract Documents: The written contracts covering the performance of the work. The Contract or Contract Documents include the advertisement, instructions to bidders, provisions, standard specifications and details, proposal, drawings, any supplemental changes or agreements pertaining to the work or materials therefore, and bonds, as well as additional documents incorporated by reference in the above.

Contract Drawings: The Contract Drawings are the drawings or reproductions therefrom showing in detail the location, dimension and position of the various elements of the project, including such profiles, typical cross sections, layout diagrams, working drawings, preliminary drawings and such supplemental drawings as the City may issue to clarify other drawings or for the purpose of showing changes in the work hereinafter authorized by the City. The plans are usually bound separately from other parts of the Contract Documents, but they are a part of the Contract Documents just as though they were bound therein.

Contractor: The individual, partnership, firm, corporation, association or organization, or any combination thereof identified as such in the Contract, acting directly or through agents, employees, or authorized representatives who are liable and responsible for the acceptable performance of the work and for the payment of all legal debts pertaining to the work.

Contract Price: The total monies payable to the Contractor under the terms and conditions of the Contract Documents. When used in such context, it may also mean the unit price of an item of work under the contract terms.

Contract Work: Everything expressly or implicitly required to be furnished and done by the Contractor by any one or more parts of the Contract Documents, except "extra work" as hereinafter

defined; it being understood that, in case of any inconsistency between any part or parts of this Contract, the Owner shall determine which shall prevail in accordance with Section A 3.

Directed, Required, Approved, and Words of Like Import: Whenever they apply to the work or its performance, the words "directed," "required," "permitted," "ordered," "designated," "established," "prescribed," and words of like import used in the contract, specifications, or upon the drawings, shall imply the direction, requirement, permission, order, designation, or prescription of the City; and "approved," "acceptable," and words of like import shall mean approved by or acceptable to the City.

Director of Public Works: The Director of the City of Colleyville Public Works Department or duly authorized assistants, agents, engineers, inspectors, or superintendents, acting within the scope of the particular duties entrusted to them.

Engineer: The term Engineer means the Engineer or a duly authorized representative. The Engineer shall be understood to be the Water Utilities Engineer, and nothing contained in the Contract Documents shall create any contractual or agency relationship between the Engineer and the Contractor.

Equal or Approved Equal: Materials, articles, or methods which are of equal or higher quality than those specified or shown on the drawings, subject to approval by the City and as otherwise defined under *A 3.8 Materials and Workmanship*.

Extra Work: Work other than that which is expressly or implicitly required by the Contract Documents at the time of the execution of the Contract.

Final Acceptance: Acceptance by the City of Colleyville of the work completed upon the expiration of the maintenance bond period and after the correction of any deficiencies.

Final Inspection: Inspection of all work under the contract as soon as practicable after the work is completed.

Flow Line: The flow line of a pipe shall be the lowest interior portion of the pipe in which flow will occur.

Initial Acceptance: Approval of the suitability of the work completed for the City of Colleyville. For water and sewer systems, as indicated by tests for leakage and effectiveness of disinfection and compliance with the specifications as required and approved by the Public Works Inspector, Water Utilities Engineer and Field Operations Representative. This initial acceptance does not constitute final acceptance which is subject to the correction of deficiencies prior to the conclusion of the two (2) year maintenance bond period. Initial acceptance shall include all adjustments required and the effectiveness of disinfection shall be verified prior to approval. The two (2) year maintenance period will begin upon completion of the final inspection or payment of the final estimate whichever is later.

Inspector: Any representative of the Owner designated to inspect the Work.

Notice: Written notice effective the date of the postmark thereon, or if hand delivered, effective the date of hand delivery.

Notice of Award: A written notice by City to the apparent successful Bidder stating that upon compliance with the conditions precedent to be fulfilled by him/her within the time specified, City will execute and deliver the Agreement to him/her.

Notice to Proceed: A written notice given the Contractor fixing the date on which the Contract Time will commence to run and on which the Contractor shall start to perform his obligations under the Contract Documents.

Other Contractors: Any Contractor, other than the Contractor or his/her subcontractors, who has a direct contract with the City for work on or adjacent to the site of the Work.

Owner: The City of Colleyville. See City.

Owner's Representative: The Engineer or other duly authorized assistant, agent, engineer, inspector, or superintendent acting within the scope of their particular instructed duties.

Plans: See Contract Drawings.

Product Data: Illustrations, standard schedules, performance charts, instructions, brochures, diagrams, and other information furnished by the Contractor to illustrate a material, product, or system for some portion of the work.

Proposal: See Bid.

Proposal Guaranty: A cashier's check on any State or National bank or acceptable bidder's bond in the amount of not less than five (5%) percent of the total amount of the bid to the City of Colleyville by the Contractor. See Section A 2.5.

Samples: Physical examples which illustrate materials, equipment, or workmanship and establish standards by which the Work will be judged.

Shop Drawings: All drawings, diagrams, illustrations, brochures, schedules and other data which are prepared by Contractor, a Subcontractor, manufacturer, supplier or distributor and which illustrate the equipment, material or some portion of the Work.

Site: The area upon or in which the Contractor's operations are carried on, and such other areas adjacent thereto as may be designated as such by the City.

Special provisions: The special clauses setting forth conditions or requirements peculiar to the specified project involved, supplementing the Standard Specifications, and taking precedence over any conditions or requirements of the Standard Specifications with which they are in conflict.

Specifications: The Specifications is that section or part of the Contract Documents which sets forth in detail the requirements which must be met by all materials, construction, workmanship, equipment and services in order to render a completed and useful project and includes these Special Provisions. Whenever reference is made to Standard Specifications, regulations, requirements, statutes, etc., such referred to documents shall become a part of the Contract Documents just as though they were embodied therein.

Subcontractor: Any persons, firm, or corporation, other than employees of the Contractor, who or which contracts with the Contractor to furnish, or actually furnished, labor, or labor and materials, or labor and equipment, at or about the site.

Sureties: The corporate bodies which are bound by such bonds as are required. Said sureties engaged to be responsible for the entire and satisfactory fulfillment of the Contract, and for any and all requirements as set out in the Specifications, Contract or Plans.

The Work: All labor and services including the furnishing of materials, tools, equipment and construction supplies required by the Contract Documents to be performed by the Contractor to produce the necessary construction, and that part of the construction which has been performed.

A 1.3 Abbreviations

Wherever the abbreviations defined herein appear in the contract documents, the intent and meaning shall be as follows:

AASHTO	American Association of State Highway and Transportation Officials
ACI	American Concrete Institute
ANSI	American National Standards Institute
API	American Petroleum Institute
APWA	American Public Works Association
ASA	American Standards Association
ASCE	American Society of Civil Engineers
ASTM	American Society for Testing Materials
AWS	American Welding Society
AWWA	American Water Works Association
Ave.	Avenue
Blvd.	Boulevard
C.	Centigrade
cfs	Cubic Foot per Second
CI	Cast Iron
CO	Cleanout

Conc.	Concrete
Corr.	Corrugated
CTB	Cement Treated Base
CTS	Cement Treated Sand
C.Y.	Cubic Yard
Cu.	Cubic
DI	Ductile Iron
Ea.	Each
Elev.	Elevation
F.	Fahrenheit
Ft. or '	Foot
Gal.	Gallon
g.p.m.	Gallons per Minute
HMAC	Hot-Mix Asphaltic Concrete
HTH	Calcium Hypochlorite
I.D.	Inside Diameter
In. or "	Inches
Lin.	Linear
L.F.	Linear Foot
Lb.	Pound
mg/l	Milligrams per liter
mgd	Million Gallons Per Day
MH	Manhole
Max.	Maximum
Min.	Minimum
NGVD	National Geodetic Vertical Datum
NSF	National Sanitation Foundation
No.	Number
O.D.	Outside Diameter
O.S.H.A.	Occupational Safety and Health Act
P.I.	Plasticity Index
ppm	Parts per Million
psi	Pounds per Square Inch
PVC	Polyvinyl Chloride
R.	Radius
Reinf.	Reinforced
ROW	Right-of-Way
S.Y.	Square Yard
Sq.	Square
Std.	Standard
TCEQ	Texas Commission on Environmental Quality
TNRCC	Texas Natural Resources Conservation Commission
TU	Texas Utilities
TxDOT	Texas Department of Transportation

Vol.	Volume
V/mil.	Volts/mil thickness
Yd.	Yard

SECTION A 2 PROPOSAL REQUIREMENTS AND CONDITIONS AND AWARDS

A 2.1 Proposal Form

The City will furnish bidders with proposal forms, which will state the general location and description of the contemplated work and which will contain an itemized list of the items of work to be performed or materials to be furnished and for which bid prices are asked. The proposal form will provide for entering the amount of proposal guaranty as described in Section A 2.5.

A 2.2 Quantities in Proposal Form

The quantities of the work and materials set forth in the proposal form or on the plans approximately represent the work to be performed and the materials to be furnished and are for the purpose of comparing the bids on a uniform basis. Payment will be made to the Contractor only for the actual quantities of work performed or materials furnished in accordance with the plans and specifications, and it is understood that the quantities may be increased or decreased as hereinafter provided, without in any way invalidating the bid prices.

A 2.3 Examination of Plans, Specifications and Site of the Work

Bidders are advised that the plans, specifications, and other documents on file as stated in the advertisement shall constitute all the information which the City will furnish. Bidders are required, prior to submitting any proposal, to read the specifications, the proposal, the contract and bond forms carefully; to visit the site of the work; to examine carefully local conditions; to inform themselves by their independent research, tests, and investigations of the difficulties to be encountered and judge for themselves the accessibility of the work and all attending circumstances affecting the cost of doing the work or time required for its completion; and obtain all information required to make an intelligent proposal. No information given by the City, it's Engineer, or any official thereof, other than that shown on the plans and contained in the specifications, proposals and other documents, shall be binding upon the City. Bidders shall rely exclusively upon their own estimates, investigations, tests and other data which are necessary for full and complete information upon which the proposal may be based. By filing their bid all bidders represent and warrant that they have prepared their bid in accordance with the specifications, with full knowledge and understanding of the terms and provisions thereof; that they have reviewed, studied and examined the bid prior to the signing and filing of same; and that they were cognizant of the terms of their proposal, verified their calculations, found them to be correct, and agree to be bound thereby.

A 2.4 Preparation of the Proposal

The bidder shall submit his proposal on the forms furnished, and it shall be submitted bound with the remainder of the Contract Documents. All blank spaces in the form shall be correctly filled- in, and the bidder shall state the prices both in words and numerals for which they propose to do the work contemplated or furnish the material required. Such prices shall be written in ink distinctly and legibly. If the proposal is submitted by an individual, his/her name must be signed by the individual or their duly authorized agent. If the proposal is submitted by a firm, association or partnership, the name and address of each member must be given and the proposal signed by a member of the firm, association, or partnership, or person duly authorized. If the proposal is submitted by a company or corporation, the company or corporate name and business must be given, and the proposal signed by an official or duly authorized agent. Powers of Attorney authorizing agents or others to sign proposals must be properly certified and must be in writing and submitted with the proposal. The proposal shall be executed in ink. It is understood and agreed that the proposal may not be withdrawn once the bids have been opened.

A 2.5 Proposal Guaranty

No proposal will be considered unless it is accompanied by a Cashier's check on any State or National Bank, or acceptable Bidder's Bond, payable unconditionally to the City of Colleyville. The Cashier's check or Bidder's Bond shall be in the amount of not less than five (5%) percent of the total amount of the bid. The proposal guaranty is required by the City as evidence of good faith and as a guarantee that if awarded the contract, the bidder will execute the contract and furnish the required bonds within twelve (12) working days after official notice of acceptance of proposal or pay the damages as set forth hereinafter. The said Bidder's Bond shall be conditioned that if the proposal is withdrawn after the bids have been opened or the Contractor refuses to execute the contract in accordance with his proposal, the Contractor and the surety shall become liable to the City for the amount of the Bidder's Bond. If a Bidder's Bond is used, the surety thereon shall designate an agent acceptable to the City to whom requisite notices may be delivered and upon whom service of process may be had.

In the event a Cashier's check is submitted along with the proposal of the bidder and the Contractor does not execute the contract within twelve (12) days after award of said contract or withdraws his/her bid after bids have been opened, the City shall be entitled to the proceeds of such check.

A 2.6 Filing of Proposals

No proposal will be considered unless it is filed at the place and within the time limit for receiving proposals as stated in the advertisement. Each proposal shall be in a sealed envelope, plainly marked with the word "Proposal," and the name or description of the project as designated in the "Advertisement." Proposals shall be submitted bound with the remainder of the Contract Documents.

A 2.7 Withdrawing Proposals

Proposals filed with the City can be withdrawn or withdrawn, modified, and re-deposited up to ten (10) minutes prior to the time set for opening proposals. Request for non-consideration of proposals must be

made in writing addressed to the City prior to the time set for opening proposals. After other proposals are opened and publicly read, the proposal for which non-consideration is properly requested may be returned unopened. The proposal may not be withdrawn after the bids have been opened, and the bidder, in submitting the same, warrants and guarantees that his/her bid has been carefully reviewed and checked and that it is in all things true and accurate and free of mistakes and that such bid will not and cannot be withdrawn because of any mistake committed by the bidder.

A 2.8 Opening Proposals

The proposals filed with the City will be opened at the time stated in the advertisement and publicly read aloud and shall thereafter remain on file until the award of the contract. Any proposal received after the advertised time of the bid opening will be returned to the bidder unopened.

A 2.9 Irregular Proposals

Proposals will be considered irregular if they show any omissions, alterations of form, additions, conditions not called for, unauthorized alternate bids or irregularities of any kind. However, the City reserves the right to waive any irregularities and to make the award in the best interests of the City.

The bidder or Contractor shall not take advantage of any error in the bidding or Contract Documents including but not limited to anything mentioned in the Specifications and not shown on the Drawings, or shown on the Drawings and not mentioned in both. In case of any apparent difference between the Drawings and Specifications or any other apparent error which the bidder or Contractor may discover, he/she shall refer the matter at once to the City as to which, in accordance with the intent of the Contract Documents, shall govern. The City shall have the right to correct any error discovered.

A 2.10 Rejection of Proposals

The City reserves the right to reject any or all proposals, and all proposals submitted are subject to this reservation. Reasons proposals may be rejected include, but are not limited to:

A. Proposal received after the time limit for receiving proposals as stated in the advertisement.

B. Proposal containing any irregularities.

C. Unbalanced value of any items.

A 2.11 Disqualification of Bidders

Bidders may be disqualified and their proposals not considered for any of the following specific reasons before or after the bid opening:

A. Reason for believing collusion exists among the bidders.

B. Reasonable grounds for believing that any bidder is involved or interested in more than one proposal for the work contemplated.

C. The bidder being involved or interested in any claim or litigation against or involving the City.

D. The bidder's Surety being involved or interested in any litigation or claim against or involving the City.

E. The bidder being in arrears on any existing contract or having defaulted on a previous contract.

F. The bidder's Surety being in arrears on any existing contract.

G. Lack of competency as revealed by the financial statement, experience and equipment, questionnaires, unsatisfactory work on previous projects, etc., of bidder or bidder's Surety.

H. Incomplete work which in the judgment of the City will prevent or hinder the prompt completion of additional work if awarded.

I. Failure by bidder to comply with equipment specifications in their entirety or submission by bidder of an unsatisfactory "letter of exception."

J. Lack of responsiveness or responsibility of the bidder.

K. Lack of responsiveness or responsibility of the bidder's Surety.

L. Proposals which are obviously unbalanced.

M. Unbalanced value of any bid items.

N. More than one proposal from an individual, a firm or partnership or an association of the same or different name or any combination of the foregoing will not be considered.

O. Failure to execute a previous contract awarded to the bidder or the required bonds.

A 2.12 Consideration of Contract

After proposals are opened, the proposals will be tabulated for comparison on the basis of the bid prices and quantities shown in the proposal. Until final award of the contract, the City reserves the right to reject any or all proposals, to waive technicalities, and to re-advertise for new proposals, or proceed to do the work otherwise in the best interests of the City.

A 2.13 Award of Contract

The award, if made, will be within 60 working days after the opening of bids, but in no case will the award be made until after investigations are made as to the responsibilities of the bidder to whom it is proposed to award the contract. The City shall give a work order (Notice to Proceed) to the Contractor, advising that the contract has been accepted and that the Contractor shall begin work within twelve (12) working days from date of work order. The work order may be dated as of the date on which the award is made by the City.

A 2.14 Return of Proposal Guaranty

The City will return the proposal guaranties accompanying all proposals within twelve (12) working days after opening except for the two apparent low proposals. The two apparent low proposal guaranties will be retained by the City until the required contract and bonds have been executed, after which they will be returned.

A 2.15 Surety Bonds

With the execution and delivery of the contract the Contractor shall furnish and file with the City in the amounts set forth in Section A 3 of these Specifications and the provisions the required surety bonds. Such surety bonds shall be in accordance with the provisions of Chapter 2253 of V.T.C.A. Government Code as amended.

A 2.16 Execution of Contract

The person or persons, partnership, company, firm, association, or corporation to whom a contract is awarded shall, within twelve (12) working days after receipt of the Notice of Award, sign and return the necessary Contract Documents to the City.

A 2.17 Failure to Execute Contract

The failure of bidder to execute the contract or the required statutory bonds shall constitute a breach of the proposal, and the City may annul the award and collect on the Proposal Guaranty. In the event the City should re-advertise for bids, the defaulting Contractor shall not be eligible to bid.

SECTION A 3 GENERAL CONDITIONS

A 3.1 Correlation and Intent of Documents

A. General: The Contract Documents are complementary and what is called for by any one shall be as binding as if called for by all. The intent of the documents, unless otherwise specifically provided, is to produce complete and finished work. No verbal conversation, understanding, or agreement with any officer or employee or agent of the City, either before or after the execution of the

Contract, shall affect or modify any of the terms, conditions, or obligations contained in the Contract Documents.

B. Contract Drawings and Specifications: The City will furnish the Contractor, without charge, such copies of the Contract and any Supplemental Drawings and Specifications reasonably necessary for the proper execution of the work. At least one copy of all Drawings and Specifications shall be accessible at all times to the City. The Plans, these Specifications, the Proposal, the provisions and all supplementary documents are intended to describe a complete work and are essential parts of the Contract. A requirement occurring in any of them is binding. In cases of discrepancies, figures and dimensions shall govern over scaled dimensions; Plans shall govern over Specifications; Provisions shall govern over both general and standard specifications and plans.

C. Priority of Contract Documents: In case of conflict between Contract Documents, priority of interpretation shall be in the following order: Signed agreement (or contract), performance and payment bonds, provisions (or conditions), advertisement for bids (or invitation to bidders, or request for proposals), project (or contract) drawings, these Standard Specifications, standard drawings, referenced specifications, and proposal.

D. Supplemental Drawings and Specifications: In order to carry out the intent of the Contract Documents and to assist the Contractor in performing his work, the City, after the execution of the Contract, may by Supplemental Drawings, Specifications, or otherwise, furnish additional instructions, enlarged scales, additional, or revised details, as may be necessary for construction purposes. All such Supplemental Drawings, Specifications, or instructions are intended to be consistent with the Contract Documents, true developments thereof, and reasonably inferable therefrom. Therefore, no extra costs will be allowed by the City on a claim that particular Supplemental Drawings, Specifications, or instructions differ from the requirements of the Contract Documents, incurring extra costs, unless the Contractor has first brought the matter, in writing, to the City's attention for proper adjustment, and the City has approved such adjustments and cost, before proceeding with the work covered by such. If the City shall decide that there is no departure from the requirements of the Contract Documents, the Contractor shall then proceed with the work as shown, specified, or directed. If the City shall decide that extra work is involved, the City will so modify the Supplemental Drawings, Specifications, or instructions to eliminate the extra work, or cause a City written change order to be issued.

E. Errors and Corrections in Drawings and Specifications: The Contractor shall not be allowed to take advantage of any manifest errors, omissions, or discrepancies in the Drawings or Specifications, as full instruction will be issued by the City for correction in accordance with the original intent of the Contract Documents. In case of any errors, omissions, or discrepancies in the Drawings or Specifications, the Contractor shall promptly submit the matter to the City who, in turn, shall promptly make a determination and issue the necessary instructions in writing. Any adjustment by the Contractor without this determination and instructions shall be at the Contractor's own risk and expense. The work is to be made complete as intended by the Contract Documents.

F. Existing Structures: The Plans show the approximate locations of surface and subsurface structures. However, the locations of many gas mains or lines, water mains or lines, conduits, sewers, underground electric, cable television, etc., are unknown, and the City assumes no responsibility for failure to show any or all these structures on the Plans or to show them in their exact location. It is mutually agreed such failure will not be considered sufficient basis for claims for additional compensation for extra work or for increasing the pay quantities in any manner whatsoever, unless the obstruction encountered is such as to necessitate changes in the lines or grades, or requires the building of special work, provisions for which are not made in the Plans and Proposal, in which case the provisions in these Specifications for extra work shall apply.

A 3.2 Contractor's Warranties and Understanding

A. General: In consideration of, and to induce the award of this Contract, the Contractor represents and warrants:

1. That the Contractor is financially solvent and sufficiently experienced and competent to perform the work;

2. That the facts stated in the Proposal and the information given by the Contractor pursuant to the Contract are true and correct in all respects;

3. That the Contractor has read, understands, and complied with all the requirements set forth in the Contract;

4. That the Contractor is familiar with and understands all laws and regulations applicable to the work;

5. Unless otherwise specifically provided for in the Contract Documents, the Contractor shall do all the work and shall furnish all the tools, equipment, machinery, materials, labor and appliances except as herein otherwise specified, necessary or proper for performing and completing the work required by this Contract, in the manner and within the time herein prescribed; and

6. By executing the Contract, the Contractor represents that the Contractor has visited the site of work, is fully familiar with the local and on-site conditions under which the work is to be performed and has correlated the observation with the requirements of the Contract Documents. In addition, the Contractor represents that the Contractor is satisfied as to sub-surface conditions at the site of the work. Information, data, and representations contained in the Contract Documents pertaining to the conditions at the site, including sub-surface conditions, are for information only and are not warranted or represented in any manner to accurately show the conditions at the site of the work. The Contractor agrees that the Contractor will make no claims for damages, additional compensation, or extension of time against the City because of encountering actual conditions in the course of the work which vary or differ from conditions in information contained in the Contract Documents.

B. Surety Bonds: With the execution and delivery of the Contract, the Contractor shall furnish and file with the City in the amounts herein required, the following surety bonds; such surety bonds shall be in accordance with the provisions of Chapter 2253 V.T.C.A. Government Code as amended.

1. Performance Bond: A good and sufficient bond in an amount equal to 100 percent of the approximate total amount of the Contract, as evidenced by the Proposal, guaranteeing the full and faithful execution of the work and performance of the Contract for the protection of the City in accordance with the Contract Documents.

2. Payment Bond: A good and sufficient bond in an amount equal to 100 percent of the approximate total amount of the Contract, as evidenced by the Proposal, guaranteeing the full and proper protection as provided by law of all those claimants supplying labor and material in the prosecution of the work provided for in said Contract.

3. Maintenance Bond: A good and sufficient bond in an amount equal to 100 percent of the approximate total amount of the Contract, as evidenced by the Proposal or otherwise guaranteeing the full and proper maintenance of the work for a period of two (2) years from the date of initial acceptance by the City or up to five (5) years if specifically set forth in the Contract Documents.

4. Sureties: No sureties will be accepted by the City who are now in default or delinquent on any bonds or who are interested in any litigation or claim against or involving the City. All bonds shall be made on forms furnished and shall be executed by not less than one (1) corporate surety authorized to do business in the State of Texas and acceptable to the City. Each bond shall be executed by the Contractor and the surety.

5. Bankruptcy of Surety: If the surety on any bond furnished by the Contractor is declared bankrupt or becomes insolvent or its right to do business is terminated in any state where any part of the project is located, or if such bond is revoked by the surety, the Contractor shall within five (5) days thereafter substitute another bond and surety, both of which shall be acceptable to the Owner.

A 3.3 Contractor's Responsibilities

A. Performance of the Work: In addition to those matters elsewhere expressly made, the Contractor shall have the full and direct responsibility for the performance of the work under this Contract and for any act or neglect of the Contractor, their agents or employees. The Contractor shall bear all losses, if any, resulting on account of the amount and character of the work, or because the conditions under which the work must be done are different from what were estimated or anticipated by the Contractor, or because of weather, floods, elements, or other causes.

B. Indemnification: The Contractor shall and does agree and contract to indemnify, defend and hold harmless the City of Colleyville (Owner) from any and all damages, loss or liability of any kind

whatsoever, by reason of injury to property or third persons occasioned by any error, omission or negligent act of the Contractor, its officers, agents, employees, invitees, or other persons for whom it is legally liable with regard to the performance of this agreement, and the Contractor will, at his cost and expense, defend and protect the City of Colleyville (Owner) against any and all such claims and demands. The Contractor does hereby agree and contract to waive all claims, release, indemnify, defend and hold harmless the City of Colleyville (Owner) and all of its officials, officers, agents, and employees, from and against any and all claims, losses, damages, suits, demands or causes of action, and liability of every kind including all expenses of litigation and/or settlement, court costs and attorney's fees for injury or death of any person or for loss of, damages to, or loss of use of any property, arising out of or in connection with the performance of this contract. Such indemnity shall apply whether the claims, losses, damages, suits, demands or causes of action arise in whole or in part from the negligence of the City of Colleyville (Owner), their officers, officials, agents or employees. It is the express intention of the parties hereto that the indemnity provided for in this paragraph is indemnity by the Contractor to indemnify and protect the City of Colleyville (Owner) from the consequences of the City of Colleyville (Owner) own negligence, whether that negligence is a sole or concurring cause of the injury, death or damage.

C. Contractor's Liability: The mention of any specific responsibility or liability of the Contractor in this Section A 3.3 or in any part of the Contract Documents shall not be construed as a limitation or restriction upon the general responsibility or liability imposed on the Contractor by the Contract Documents. The Contractor shall carefully study and compare the Contract Documents and shall at once report to the City any error, inconsistency, or omission discovered. The Contractor shall perform no portion of the work at any time without Contract Documents, or, where required, approved shop drawings, product data, or samples for such portion of the work.

D. Supervision and Construction Procedures: The Contractor shall supervise and direct the work, using his best skill and attention. The Contractor shall be solely responsible for all construction means, methods, techniques, sequences, and procedures and for coordinating all portions of the work under the Contract. The Contractor's competent person shall not be a "working foreman." The foreman will be allowed to operate equipment or do manual labor in the event of sickness or absence until replacements can be added to the work force for a maximum of 20% of the contract time. The Contractor shall be responsible to the City for the acts and omissions of employees, subcontractors and their agents, and employees, and other persons performing any of the work under a contract with the Contractor. The Contractor shall not be relieved from any obligations to perform the work in accordance with the Contract Documents either by the activities or duties of the City in its administration of the Contract, or by inspections, tests or approvals required or performed by persons other than the Contractor.

E. Labor and Materials: Unless otherwise provided in the Contract Documents, the Contractor shall provide and pay for all labor, materials, equipment, tools, construction equipment and machinery, water, heat, utilities, transportation, and other facilities and services necessary for the proper execution and completion of the work, whether temporary or permanent and whether or not incorporated or to be incorporated in the work. The Contractor shall, at all times, enforce strict discipline and good order among employees and shall not employ on the work any unfit person or

anyone not skilled in the task assigned. The Contractor shall provide and maintain equipment in good working condition at all times. Any equipment having defects which cause unnecessary damage to the job site and/or the surrounding areas shall be repaired or removed from the site within 24 hours of the notification of the deficiency by the Engineer. Equipment used for disposal of surplus materials beyond the limits of the work shall avoid spilling or wasting of materials along the line of haul. The Contractor shall immediately clean up all materials spilled or wasted along the haul route.

F. Progress Schedule: The Contractor, immediately after being awarded the Contract, shall prepare and submit for the City's information an estimated progress schedule for the work. The progress schedule shall be related to the entire project to the extent required by the Contract Documents and shall provide for expeditious and practicable execution of the work. The progress schedule shall be updated upon request by the Owner.

G. Prosecution of the Work: The Contractor shall begin the work to be performed under this Contract not later than the date specified in the work order and shall conduct the work in such a manner and with sufficient equipment, material and labor as is necessary to insure its completion within the time limit. It is the intent of this Specification to provide a continuous construction operation without delay except as occasioned by unforeseeable causes beyond the control and without the fault or negligence of the Contractor, and it will be the Contractor's responsibility to execute the work in the most expeditious manner. Work shall be done only during the regular and commonly accepted and prescribed working hours. No work shall be done nights, Sundays, or regular holidays, unless permission is given by the City. The rate of progress shall be such that the whole work will be performed and the premises cleaned in accordance with the Contract within the time limit established in the Contract, unless an extension of time is made in the manner hereinafter specified.

H. Record Drawings: The Contractor shall keep one (1) record copy of all specifications, drawings, addenda, modifications, and shop drawings at the site in good order and annotated to show all changes made during the construction process. These drawings shall be available to the Engineer and the City and shall be delivered to the City upon completion of the project.

A 3.4 Compliance with Laws

The Contractor shall fully comply with all local, state, and federal laws, ordinances, and regulations applicable to this Contract and the work to be done hereunder. The Contractor shall secure and pay for all permits and licenses necessary for the execution of the work and shall fully comply with all their terms and conditions. It is the intent that all work required under this Contract comply with all requirements of law, regulation, permit or license. If the Contractor finds that there is a variance, it shall be immediately reported to the City for resolution.

A 3.5 Protection of Work and of Persons and Property

A. Protection of Work: During performance and to the date of final acceptance, the Contractor shall be

under absolute obligation to protect the finished and unfinished work against any damage, loss, or injury. In event of such damage, loss, or injury, the Contractor shall promptly replace or repair such work, whichever the City shall determine to be preferable. The obligation to deliver finished work in strict accordance with the Contract prior to final acceptance shall be absolute and shall not be affected by the City's approval of or failure to prohibit means and methods of construction used by the Contractor.

B. Protection of Persons and Property: The Contractor shall have the responsibility to provide and maintain all warning devices and take all precautionary measures required by law to protect persons and property while said persons or property are approaching, leaving, or within the work site or any area adjacent to said work site. No compensation will be paid to the Contractor for the installation or maintenance of any warning devises, barricades, lights, signs, or any other precautionary measures required by law for the protection of persons or property. The Contractor shall assume all duties owned by the City to the general public in connection with the general public's immediate approach to and travel through the work site and the area adjacent to said work site. Where the work is carried on in or adjacent to any street, alley, sidewalk, public right-of-way, or public place, Contractor's shall at their own cost and expense provide such flaggers and watchpersons and furnish, erect, and maintain such warning devices, barricades, lights, signs, and other precautionary measures for the protection of persons or property as are required by law. The Contractor's responsibility of providing and maintaining flaggers, watchpersons, warning devices, barricades, signs and lights, and other precautionary measures shall not cease until the project shall have been accepted by the City. If the City discovers that the Contractor has failed to comply with the applicable federal and state or local law (by failing to furnish the necessary flaggers, warning devices, barricades, lights, signs, or other precautionary measures for the protection of persons or property), the City may order the Contractor to take such additional precautionary measures as required by law to be taken to protect persons and property. In addition, the Contractor will be held responsible for all damages to the work and other public or private property due to the failure of warning devices, barricades, signs, lights, or other precautionary measures in protecting such property. Whenever evidence is found of such damage, the City may order the damaged portion immediately removed and replaced by and at the cost and expense of the Contractor. All barricades and warning signs and warning devices shall be as set forth in the MUTCD Manual, as amended.

A 3.6 Protection for Labor and Materials and Third Parties

The Contractor shall pay all indebtedness of the Contractor or any subcontractor which may become due to any person, firm, or corporation having furnished labor, materials, or both in the performance of this Contract. It shall be the responsibility of each person, firm, or corporation claiming to have furnished labor, materials, or both, in connection with this Contract, to protect the individual or its interests in the manner prescribed by applicable laws of the State of Texas. The City may increase retainages or withhold retainages when the City finds lawful claims for damage to person or property of Third Parties are pending against the Contractor, and the Contractor is not in good faith negotiating to resolve such claims.

A 3.7 Insurance

The Contractor shall purchase and maintain such insurance as will protect the Contractor from claims set forth below and which may arise out of or result from the Contractor's operations under the Contract, whether such operations be by the Contractor or by any subcontractor or by anyone directly or indirectly employed by any of them, or by anyone for whose acts any of them may be liable:

A. Claims under workers' or workmen's compensation, disability benefit, and other similar employee benefit acts;

B. Claims for damages because of bodily injury, occupational sickness or disease, or death of employees;

C. Claims for damages because of bodily injury, sickness or disease, or death of any person other than the Contractor's employees;

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

E. Claims for damages, other than to the work itself, because of injury to or destruction of tangible property, including loss of use resulting therefrom; and

F. Claims for damages because of bodily injury or death of any person or property damage arising out of the ownership, maintenance, or use of any motor vehicle.

The insurance required shall be written for not less than any limits of liability specified in the General provisions, or required by law, whichever is greater.

The insurance required shall include contractual liability insurance applicable to the Contractor's obligations under Section A 3.3.

Certificates of Insurance acceptable to the City and on the Accord form shall be filed with the City prior to commencement of the work. These certificates shall contain a provision that coverage afforded under the policies will not be suspended, voided, canceled or reduced in coverage until at least thirty days' prior written notice has been given to the Director of Utilities of the City. The Certificate of Insurance shall also show that the City has been named as an additional insured on all applicable policies.

Additional insurance coverage and amounts may be required by the General provisions. The insurance company must also be duly authorized to transact that class of insurance in the State of Texas.

Workers' Compensation and Employers' Liability Coverage: The insurer shall agree to waive all rights of subrogation against the City, its officials, employees and volunteers for losses arising from the activities under the Contract.

A 3.8 Materials and Workmanship

A. General: Unless otherwise expressly provided in the Contract Drawings or Specifications, the work shall be performed in accordance with the best modern practice with materials and workmanship of the highest quality for the particular purpose. The City shall judge and determine the Contractor's compliance with these requirements.

B. Materials: Where materials, equipment, or articles are specified by a particular brand, or name of a proprietary product, or "approved equal," the City shall decide the question of equality of other materials, equipment, or articles specified by reference to the number of a specific standard, except as limited to type, class, or grade, or modified in such reference. The standards referred to, except as modified in the Specifications, shall have full force and effect as though printed in full therein.

The Contractor shall be free to secure the approved materials, equipment, and articles from sources selected by the Contractor; however, Contractor agrees to use diligent efforts to purchase all goods and services from Colleyville businesses whenever such goods and services are comparable in availability, quality, and price. However, if the City determines that the work will be delayed or adversely affected in any way because a selected source of supply cannot furnish a uniform product in sufficient quantity and at the time required and a suitable source does exist, or the product is not suitable for the work, the City shall have the right to require the original source of supply changed by the Contractor. The Contractor shall have no claim for extra cost or damage because of this requirement.

The Contractor warrants to the City that all materials and equipment furnished under this Contract will be new unless otherwise specified, and that work will be good quality, free from faults and defects, and in conformance with the Contract Documents. All work not conforming to these requirements, including substitutions not properly approved and authorized, may be considered defective. If required by the City, the Contractor shall furnish satisfactory evidence as to the kind and quality of materials and equipment. This warranty is not limited by the provisions of the following paragraphs.

C. Workmanship: The Contractor shall promptly correct all work rejected by the City as defective or as failing to conform to the Contract Documents whether observed before or after substantial completion and whether or not fabricated, installed, or completed. The Contractor shall bear all costs of correcting such rejected work including compensation for additional services made necessary thereby.

If, after the approval of final payment and prior to the expiration of two (2) years thereafter, or such longer period of time as may be prescribed by law or by the terms of any applicable special guarantee required by the Contract Documents, any work that is found to be defective shall be repaired by the Contractor at the Contractor's own expense within five (5) days after written notice has been given by the Owner. Should the Contractor fail to make the repairs within five (5) days thereafter, the Owner may make the necessary repairs and charge the cost of same to the Contractor

without giving any notice to the Contractor. In the case of an emergency, brought about by defective work of the Contractor, the Owner may proceed immediately to make the necessary repairs and charge the cost of same to the Contractor without giving any notice to the Contractor. The Contractor shall furnish a maintenance bond to be effective for two (2) years or longer after the approval of final payment or such other period of time as specified by the Contract Documents as part of this guarantee.

The Contractor shall remove from the site all portions of the work which are defective or non-conforming and which have not been corrected unless removal is waived by the City.

A 3.9 Shop Drawings, Product Date, and Samples

Shop Drawings are drawings, diagrams, schedules and other data specifically prepared for the Work by the Contractor or any Subcontractor, Manufacturer, Supplier or Distributor to illustrate some portion of the Work.

Product Data are illustrations, standard schedules, performance charts, instructions, brochures, diagrams, and other information furnished by the Contractor to illustrate a material, product, or system for some portion of the work.

Samples are physical examples which illustrate materials, equipment, or workmanship and establish standards by which the Work will be judged.

The Contractor shall review, approve, and submit, with reasonable promptness and in such sequence as to cause no delay in the Work or in the Work of the City or any separate Contractor, all Shop Drawings, Product Data, and Samples required by the Contract Documents.

By approving and submitting Shop Drawings, Product Data, and Samples, the Contractor represents that the Contractor has determined and verified all materials, field measurements, and field construction criteria related thereto, or will do so, and that the Contractor has checked and coordinated the information contained within such submittals with the requirements of the Work and of the Contract Documents.

The Contractor shall not be relieved of responsibility for any deviation from the requirements of the Contract Documents by the Engineer's approval of Shop Drawings, Product Data, or Samples unless the Contractor has specifically informed the Engineer in writing of such deviation at the time of submission, and the Engineer has given written approval to the specific deviation. The Contractor shall not be relieved from responsibility for errors or omissions in the Shop Drawings, Product Data, or Samples by the Engineer's approval thereof.

The Contractor shall direct specific attention, in writing or on resubmitted Shop Drawings, Product Data, or Samples, to revisions other than those requested by the Engineer on previous submittals.

No portion of the Work requiring submission of a Shop Drawing, Product Data, or Sample shall be commenced until the submittal has been approved by the Engineer. All such portions of the Work shall be in accordance with approved submittals.

A 3.10 Means and Methods of Construction

A. Unless otherwise expressly provided in the Contract Drawings or Specifications, the means and methods of construction shall be such as the Contractor may choose; subject, however, to the Owner's right to prohibit means and methods proposed by the Contractor which in the City's judgment:

1. Will constitute a hazard to the work, or to persons or property, or will violate express requirements of applicable laws or ordinances;

2. Will cause unnecessary or unreasonable inconvenience to the public;

3. Will not produce finished work in accordance with the requirements of the Contract Documents; or

4. Will not assure the work to be completed within the time allowed by the Contract.

The City's approval of the Contractor's means or methods of construction, or the City's failure to exercise their right to prohibit such means or methods, shall not relieve the Contractor's obligation to accomplish the result intended by the Contract; nor shall the exercise of such right to prohibit create a cause of action for damages.

Where the Contract Drawings or Specifications do not require the use of specific means or methods of construction, the Contractor shall submit the proposed plan of procedure to the City sufficiently in advance to permit a reasonable time for determining the adequacy and safety of the proposed plan.

Failure to submit the proposed plan within a reasonable time agreed to by the City and the Contractor shall not create a cause of action for damages for the resulting delay in the work or be a cause for extension of time by the City for completion of the work.

B. Sanitary Provision: The Contractor shall establish and enforce among employees such regulations in regard to cleanliness and disposal of garbage and waste as will tend to prevent the inception and spread of infections or contagious diseases and to prevent effectively the creation of a nuisance about the work on any property either public or private, and such regulations as are required by the City shall be put into immediate force and affect by the Contractor. The necessary sanitary conveniences, including, but not limited to, portable restrooms for the use of laborers on the work, properly secluded from public observation, shall be constructed and maintained by the Contractor in such a manner and at such points as will be approved by the City, and their use shall be strictly

enforced by the Contractor. All sanitary laws and regulations of the State of Texas and the City of Colleyville shall be strictly complied with.

C. Public Convenience and Safety: Materials stored about the work site shall be so placed, and the work shall at all times be so conducted, as to cause no greater obstruction to the traveling public than is considered necessary by the City. The Contractor shall make provisions by bridges or otherwise at all cross streets, highways, sidewalks, and private driveways for the free passage of pedestrians and vehicles, provided that where bridging is impracticable or unnecessary in the opinion of the City, the Contractor may make arrangements satisfactory to the City for the diversion of traffic and shall, at the Contractor's own expense, provide all material and perform all work necessary for the construction and maintenance of roadways and bridges for the diversion of traffic. Sidewalks must not be obstructed except by special permission. The materials excavated, and the construction materials or plant used in the construction of the work, shall be placed so as not to endanger the work or prevent free access to all fire hydrants, water valves, gas valves, manholes for the telephone, telegraph signals or electric conduits, sanitary sewers, and cable television conduit.

The City reserves the right to remedy any neglect on the part of the Contractor relative to the public convenience and safety which may come to its attention, after twenty-four hours' notice in writing to the Contractor, save in cases of emergency, when it shall have the right to remedy any neglect without notice; and in either case, the cost of such work done by the City shall be deducted from monies due or to become due the Contractor. The Contractor shall notify the City when any street is to be closed or obstructed. The Contractor shall, when directed by the City, keep any street or streets in condition for unobstructed use by emergency services. Where the Contractor is required to construct temporary bridges or make other arrangements for crossing over ditches or streams, Contractors' responsibility for accidents shall include the roadway approaches as well as the structures of such crossings.

Where the work passes over or through private property, the City will provide such right-of- way. The Contractor shall notify the proper representatives of any public utility, corporation, or any company or individual, not less than forty-eight hours in advance of any work which might interfere with the operation of their property along or adjacent to the Work. The Contractor shall be responsible for all damage or injury to property of any character by reason of any negligent act or omission on the part of the Contractor, or agents, or at any time due to defective works or materials, or due to the failure to reasonably or properly prosecute the work or as otherwise provided by Contract, and said responsibility shall not be released until the work shall have been completed or accepted. When and where any such damage or injury is done to public or private property on the part of the Contractor, the Contractor shall restore or have restored at the Contractor's own cost and expense such property to a condition similar or equal to that existing before such damage was done, by repairing, rebuilding, or otherwise restoring as may be directed, or the Contractor shall make good such damage or injury in a manner acceptable to the property Owner or the Engineer. In case of failure on the part of the Contractor to restore such property or make good such damage or injury, the City may, upon forty-eight hours written notice, under ordinary circumstances, and without notice when a nuisance or hazardous condition results, proceed to repair, rebuild, or

otherwise restore such property as may be determined necessary, and the cost thereof will be deducted from any monies due or to become due the Contractor under the Contract.

A 3.11 Superintendence by Contractor

The work under this Contract shall be under the direct charge and superintendence of the Contractor. Except where the Contractor is an individual and gives personal superintendence to the work, the Contractor shall provide a competent superintendent or general foreman on the work at all times during progress with full authority to act. The Contractor shall also provide an adequate staff for the coordination and expediting of the work.

The superintendent and staff shall be satisfactory to the City. The superintendent or general foreman shall not be changed during the Contract except with the written consent of the City or unless the superintendent or general foreman proves unsatisfactory to the Contractor and ceases to be employed by the Contractor.

If the superintendent should be or become unsatisfactory to the City, the superintendent shall be removed by the Contractor upon written direction of the City.

A 3.12 Employees

The Contractor shall employ only competent, efficient workers and shall not use on the work any unfit person or one not skilled in the work assigned. The Contractor shall at all times maintain good order among employees. Whenever the City shall inform the Contractor in writing, that, in its opinion, any employee is unfit, unskilled, disobedient, or is disrupting the orderly progress of the work, such employees shall be removed from the work and shall not again be employed on it. Under urgent circumstances, the City may orally require immediate removal of an employee for cause, to be followed by written confirmation.

A 3.13 Working Area

A. General: The Contractor shall confine equipment, storage of materials, and construction operations to the area shown on the Contract Drawings or stated in the Specifications, prescribed by ordinance, laws, or permits or as may be directed by the City, and shall not unreasonably encumber the site or public right-of-way with construction equipment, plant, or materials.

Such area shall not be deemed for the exclusive use of the Contractor. Other Contractors of the City may enter upon and use such portions of the area and for such times as determined by the City that are necessary for all purposes required by their contracts. The Contractor shall give to such other Contractors all reasonable facilities and assistance to the end that the work on this and the other contracts will not be unduly or unreasonably delayed. Any additional grounds desired by the Contractor for personal use shall be provided at the Contractor's own cost and expense.

Upon completion of the work and before initial acceptance and final payment will be made, the Contractor shall clean and remove from the site of the work surplus and discarded materials, temporary structures, and debris of every kind. The Contractor shall leave the site of the work in a neat and orderly condition equal to that which originally existed. Surplus and waste materials removed from the site of the work shall be disposed of at proper, safe and legal locations.

B. Construction Stakes: All construction staking for capital improvement projects, subdivisions, private projects, etc., shall not be the responsibility of the City but shall be the responsibility of the Developer, the Design Engineer, or the Contractor.

The full responsibility for holding to alignment and grade shall rest upon the Contractor.

Where construction operations require the removal of construction stakes, the Contractor shall reference such points in an approved manner. If the points cannot be referenced, the Contractor must obtain authorization for their removal. In the case of their unauthorized destruction or removal, they will be replaced at the Contractor's expense.

The Contractor shall safeguard all points, stakes, grade marks, etc., re-establishing same if disturbed, and shall assume the entire expense of rectifying work improperly constructed due to failure to maintain and protect such established points, stakes, and marks.

A 3.14 Other Contractors

The City may award other contracts for additional work on this project, or contiguous thereto, and the Contractor shall fully cooperate with such other Contractors and shall coordinate and fit the work to be done hereunder to such additional work as may be directed by the City. At the time of bidding, prospective bidders will be advised of other planned contract work which is expected to affect the work area. The Contractor shall not commit or permit any act which will interfere with the performance of work by any other Contractor.

Upon receiving written notice from the Contractor that another Contractor is failing to coordinate their work with the work under this Contract as directed by the City, the City will promptly investigate the charges and take such necessary action as the situation may require. However, the City shall not be liable to the Contractor for damages suffered through failure of another Contractor to carry out the directions of the City.

A 3.15 Owner's Right to Suspend Work

Reasons for Suspension: The City shall have the right by written order to require the Contractor to suspend the whole or part of the work whenever, in the judgment of the City, such suspension is required:

A. In the interest of the City generally (for convenience);

B. Due to Government controls or orders which make performance of the Contract temporarily impossible or illegal;

C. To coordinate the work of the various Contractors engaged on this project;

D. To expedite the completion of the entire project even though the completion of this particular Contract may be thereby delayed;

E. Because of weather conditions unsuitable for prosecution of the work;

F. Because the Contractor is proceeding contrary to Contract provisions;

G. Because health and safety issues are not properly addressed.

The written order of the City to the Contractor shall state the reasons for suspending the work and the anticipated periods for such suspension. Upon receipt of the City's written order, the Contractor shall suspend the work covered by the order and shall take such means and precautions as may be necessary to properly protect the finished and partially finished work, the unused materials, and the uninstalled equipment. Work shall not again be resumed on that part of the work ordered suspended until ordered by the City in writing to do so, and then shall be resumed promptly.

A 3.16 Use of Completed Portions of Work

The City may, after written notice to the Contractor, take over and use any completed portion of the work prior to the final completion and initial acceptance of the entire work included in the Contract, and notwithstanding that the time allowed for final completion has not expired. The Contractor shall not object to, nor interfere in any way with, such occupancy or use after receipt of the City's written notice. Immediately prior to such occupancy and use, the City will inspect such portion of the work to be taken over and will furnish the Contractor a written statement of the work, if any, still to be done on such part. The Contractor shall promptly thereafter complete such unfinished work to permit occupancy and use on the date specified in the City's written order, unless the City shall permit specific items of work to be finished after the occupancy and use by the City.

A 3.17 Delays and Extensions of Time

A. General: The Contractor shall be entitled to an extension of time as provided herein only when claim for such extension is submitted to the City in writing by the Contractor within seven days from and after the time when any alleged cause of delay shall occur, and then only when such time is approved by the City. In adjusting the Contract time for the completion of the project, unforeseeable causes beyond the control and without the fault or negligence of the Contractor, including but not restricted to inability to obtain supplies and materials, acts of God, acts of the public enemy, acts of the City, fires, floods, epidemics, quarantine restrictions, strikes, freight embargoes, unusually severe weather conditions, or delays of subcontractors due to such causes may be taken into consideration. If the satisfactory execution and completion of the Contract should

require work and materials in greater amounts or quantities than those set forth in the Contract; and/or more time for completion than the anticipated time, work, and/or materials of this work, then the Contract time shall automatically be increased in the same proportion as the cost of the additional work bears to the cost of the original work contracted for. No allowances will be made for delays or suspension of the prosecution of the work due to the fault of the Contractor.

B. Failure to Complete on Time: Time is of the essence in this Contract. Since time is of the essence, the City has established the time required to complete this project. For each calendar day that any work shall remain uncompleted after the time specified in the Contract, or the increased time granted by the City, ordered after the Contract is signed, the sum per day given in the Contract provisions entitled Time for Completion and Liquidated Damages, will be deducted from the monies due the Contractor. The sum of money thus deducted for such delay, failure, or non-completion is not to be considered as a penalty, but shall be deemed, taken and treated as reasonable liquidated damages, since it would be impracticable and extremely difficult to fix the actual damages resulting from additional engineering, inspection services, and other additional work caused by such delay.

A 3.18 Change or Modification of Contract

A. Increased or Decreased Quantities of Work: The City reserves the right to make changes in the quantities of the work as may be considered necessary or desirable, and such changes shall not be considered as waiving or invalidating any conditions or provisions of the Contract or Bond. The Contractor shall perform the work as altered, whether increased or decreased, and no allowances will be made for anticipated profits.

The City reserves the right to decrease the work under this contract.

Payment to the Contractor for the Contract items will be made for the actual quantities of work performed and material furnished at the unit prices set forth in the Contract, except as provided hereinafter.

When the quantity of work to be done or of materials to be furnished under any item of the Contract is more than 125 percent of the quantity stated in the Contract and greater than five percent of the total Contract cost, then either party to the Contract, upon demand, shall be entitled to negotiate for revised consideration on that portion of work above 125 percent of the quantity stated in the Contract.

Any revised consideration will be paid for as is hereinafter provided. The foregoing notwithstanding, the total original contract amount shall not be increased more than 25 percent unless allowed by law.

B. Alteration of Plans and Specifications: The City reserves the right to make such changes in the Plans and Specifications and in the character of the work as may be necessary or desirable to insure completion in the most satisfactory manner, provided such changes do not materially alter the

original Plans and Specifications or change the general nature of the work as a whole. Such changes shall not be considered as waiving or invalidating any condition or provision of the Contract and Bond.

C. Extra Work: When any work is necessary for the proper completion of the project and for which no prices are provided in the Proposal and Contract, the Contractor shall do such work, but only when and as ordered in writing by the City or its Engineer. Payment for extra work will be made as hereinafter provided.

A 3.19 Methods for Determining Adjustments in Contract Price

Changes, if any, in the Contract price, either additive or subtractive, by reason of a change or modification in the Contract ordered in writing by the City, shall be limited to the amount stated in the written order. Changes in price shall be determined by one or more of the following methods, the City having the right to select the method or methods used:

A. By mutual acceptance of a lump sum properly itemized and supported by sufficient substantiating data to permit evaluation;

B. By unit prices stated in the Contract Documents or subsequently agreed upon;

C. By cost to be determined in a manner agreed upon by the parties and a mutually acceptable fixed or percentage fee; or

D. By the methods provided below:

If none of the methods set forth in A., B., or C. above is agreed upon, the Contractor, provided he/she receives a written order signed by the City, shall promptly proceed with the work involved. The cost of such work shall then be determined by the City on the basis of the reasonable expenditures and savings of those performing the work attributable to the change. In such case, above, the Contractor shall keep and present, in such form as the City may prescribe, an itemized accounting together with appropriate supporting data for inclusion in a Change Order. Unless otherwise provided in the Contract Documents, cost shall be limited to the following: cost of materials, including cost of delivery; cost of labor, including social security, old age and unemployment insurance, and fringe benefits required by agreement or custom; workers' compensation insurance; bond premiums; rental value of equipment and machinery; and the additional costs of supervision and field office personnel directly attributable to the change. The amount of credit to be allowed by the Contractor to the City for any deletion or change which results in a net decrease in the Contract sum will be the amount of the actual net cost. When both additions and credits covering related work or substitutions are involved in any one change, the allowance for overhead and profit shall be figured on the basis of the net increase, if any, with respect to that change.

A 3.20 Disputed Work, Determination, or Order

If the Contractor is of the opinion that (a) the work necessary or required to accomplish the result intended by this Contract, or (b) any work ordered to be done as Contract work by the City, is extra work or additional work and not Contract work, or (c) any determination or order of the City violates the terms and provisions of this Contract, the Contractor shall promptly, either before proceeding with such work or complying with such order or determination, notify the City in writing of their contentions with respect thereto and request a final determination thereof.

Such determination of the City shall be given in writing to the Contractor. If the City determines that the work in question is extra work and not Contract work, or the determination or order complained of required performance by the Contractor beyond that required by the Contract or violates the terms and provisions of the Contract, thereupon the City shall cause either (a) the issuance of a written order covering the extra work as provided for in Section A 3.18 hereof, or (b) the determination or order complained of be rescinded or so modified so as to not require performance beyond that required, by or so as not to be in violation of the terms and provisions of the Contract.

If the City determines that the work in question is Contract work and not extra work, or that the determination or order complained of does not require performance by the Contractor beyond that required by the Contract or violate the terms and provisions of the Contract, the City will direct the Contractor to proceed, and the Contractor must promptly comply. However, in order to reserve the Contractor's right to claim compensation for such work or damages resulting from such compliance, the Contractor must, within twenty (20) calendar days after receiving the City's determination and direction, notify the City in writing that the work is being performed or that the determination and direction is being complied with under protest.

If the Contractor fails to so appeal to the City for a determination or, having so appealed, should the Contractor thus fail to notify the City in writing of the protest, the Contractor shall be deemed to have waived any claim for extra compensation of damages therefore. No oral appeals or oral protests, no matter to whom made, shall be deemed even substantial compliance with the provisions of the Section.

A delay of the Contractor due to the City's failure to secure right-of-way at the time required or because of a conflict of a utility with the work will not be a cause for damages sustained by the Contractor but may be a cause for extension of Contract time. If the Contractor shall claim to be sustaining damages by reason of any acts or omissions of the City, its officers, or employees, the Contractor shall within ten (10) calendar days after such acts or omissions occur, notify the City in writing, except that if claim is not given within ten (10) calendar days of its commencement, the claim will be considered only for a period commencing five (5) calendar days prior to the receipt by the City of the notice thereof. Within ten (10) calendar days after the date of notification or within such additional time as may be granted in writing by the City upon the Contractor's written request therefore, the Contractor shall submit to the City verified detailed statements of the damages sustained together with documentary evidence of such damages. On failure of the Contractor to fully comply with the foregoing provisions, such claims shall be deemed waived and no right to recover on such claims shall exist.

In addition to the foregoing statements, the Contractor shall, upon notice from the City, produce for examination at the Contractor's office, by the representatives of the City, all books of record, showing all acts and transactions in connection with or relating to or arising by reason of the matter in dispute. At such examination, a duly authorized representative of the Contractor may be present.

Unless the aforesaid statements shall be made and filed within the time aforesaid and the aforesaid records submitted for examination, the City shall be released from all claims arising under, relating to, or by reason of this Contract, except for the sums to be due under the provisions of this Contract. It is further stipulated and agreed that no person has power to waive any of the foregoing provisions and that in any action against the City to recover any sum in excess of the sums to be due under or by reason of this Contract, the Contractor must allege in a written complaint and prove, at the trial, compliance with the provisions of this section.

In connection with the examination provided for herein, the City upon demand therefore, will also produce for inspection by the Contractor such records as the City may have with respect to such disputed work or work performed under protest pursuant to order of the City except those records and reports which may have been prepared for the purpose of determining the accuracy and validity of the Contractor's claim, or which are confidential by law.

A 3.21 Performance of Extra or Disputed Work

While the Contractor or subcontractor is performing extra work in accordance with the Owner's written order, the cost of which is to be determined by method set forth in Section A 3.19d. hereof, or is performing disputed work or complying with a determination or order under protest in accordance with Section A 3.20 hereof, then in each case the Contractor shall daily furnish the City's representative at the site with three copies of verified statements showing:

A. The name and number of each worker employed on such work or engaged in complying with such determination or order, the character of work each is doing and the wages paid, including the rate and amount of payroll taxes and contributions for unemployment insurance and federal social security; and

B. The nature and quantity of any materials, plant, or construction equipment furnished or used in connection with the performance of such work or in complying with such determination or order; and from whom purchased or rented.

A copy of such statements will be signed by the City's representative, noting thereon any items in question, and will be returned to the Contractor within two (2) working days after submission. This signature shall not be construed as the City's agreement and acceptance of items not questioned since all items are subject to subsequent review and audit by City representatives.

The Contractor and subcontractors, when required by the City, must also produce for inspection and audit by designated City representatives, any and all books, vouchers, records, daily job diaries and reports, canceled checks, etc., showing the nature and quantity of labor, materials, and equipment actually used in

the performance of the work, and the amounts expended therefore, and the costs incurred for insurance premiums and other items of expense directly chargeable to such work. The Contractor must permit the City's representatives to make extracts therefrom or copies thereof as may be desired. Failure of the Contractor to comply strictly with these requirements shall constitute a waiver of all or part of any claim for extra compensation on account of the performance of such work.

A 3.22 The City's Representative

A. General. The work under this Contract shall be under the general direction of the City's Representatives and shall be subject to the representative's determination, direction, and approval, except where the determination, direction, or approval of someone other than the City's Representative is expressly called for herein.

Without implying any limitation upon the power of the City's Representative and in addition to those matters elsewhere delegated to the City's Representative and expressly made subject to the representative's determination, direction, or approval, the City's Representative shall have the authority and power:

1. To determine the amount, kind, quality, and acceptability of the work to be paid for hereunder, and to reject such work which does not conform to the Contract requirements;

2. To determine all questions in relation to the work, to interpret the Contract Drawings, Specifications, and Bulletins, and to resolve all patent inconsistencies or ambiguities therein;

3. To amplify the Contract Drawings and Specifications, add explanatory information, and furnish supplemental drawings and specifications consistent with the intent of these Contract Documents;

4. To make changes in the work as deemed necessary provided that the general character of the work as a whole is not materially affected thereby; such changes shall be made in writing;

5. To determine the adequacy of the Contractor's construction methods, plant, and facilities;

6. To require the application of the Contractor's forces to any portion of the work without extra compensation, or the work temporarily stopped without extra compensation when, in his/her judgment, such may be necessary to assure proper performance of the Contract;

7. To determine how the work of this Contract shall be coordinated with the work of other Contractors engaged simultaneously on the project of which this Contract is a part, including the power to temporarily stop the work; and

8. The rights reserved to the City in this section are for the protection of the City and to insure full performance by the Contractor, subcontractors, employees and agents of the duties imposed upon the Contractor by the provisions of this Contract and shall not excuse or relieve

the Contractor from any of the duties, responsibilities and obligations under the Contract including, but not limited to, the absolute obligation to safely perform the work and to indemnify and save harmless the City.

B. City's Representatives. Where the Contract Documents provide that the determinations, directions, or approvals shall be made by the City or "City's Representatives," this shall mean acting directly or through duly authorized representatives acting within the limit of authority delegated to them. Any determination, direction, or approval of such authorized representatives shall be subject to review by the City's Representative.

C. City's Representative Final Determinations. The City's Representative's determinations shall be final, relative to the proper performance of the work and the materials used, and the Contractor is bound thereby.

It is hereby covenanted and agreed between the two parties of the Contract that the City's Representative shall review and determine all disputes, controversies, or claims of either party in relation to the Contract or its performance. Such determination shall be made in writing by the City's Representative within a reasonable time and shall be final and conclusive upon both the Contractor and the City. It is further covenanted and agreed between the two parties to the Contract that the determination by the City's Representative shall be a condition precedent to the right of any legal action at law or in equity that either party may have against the other.

A 3.23 Inspection and Tests

A. General. The Contractor shall furnish the City with every reasonable facility for determining whether or not the work performed was in accordance with the requirements and intent of the Plans and Specifications. Any work done (except excavation) or materials used without suitable supervision or inspection by the City may be ordered removed and replaced at the Contractor's expense.

B. Removal of Defective and Unauthorized Work. All work which has been rejected or condemned shall be repaired, or if it cannot be repaired satisfactorily, it shall be removed and replaced at the Contractor's expense. Defective materials shall be immediately removed from the site of work. Work done without line and grade having been given, work done beyond the lines or not in conformity with the grades shown on the Plans or as given, save as herein provided, work done without proper inspection, or any extra or other work done without written authority and prior agreement in writing as to prices, shall be done at the Contractor's risk. Such work will be considered unauthorized and, at the option of the City, may not be measured and paid for, and may be ordered removed at the Contractor's expense. Upon failure of the Contractor to repair satisfactorily or to remove and replace, if so directed, rejected, unauthorized, or condemned work or materials immediately after receiving notice from the City, the City will, after giving written notice to the Contractor, have the authority to cause defective work to be remedied or removed and replaced, or to cause unauthorized work to be removed and to deduct the cost thereof from any monies due or to become due the Contractor, or to change the Contractor therefor.

C. Final Inspection for Initial Acceptance. The City will make inspection of all work included in the contract as soon as practicable after the work is completed and ready for initial acceptance. If the work is not acceptable to the City at the time of such inspection, the City will inform the Contractor as to the particular defects to be remedied before initial acceptance will be made.

D. Samples and Tests of Materials. Initial testing of all materials, construction items, or products incorporated in the work will be performed at the direction and expense of the City, including initial compaction and density tests deemed necessary, unless otherwise provided in Contract.

In the event a material, construction item or product incorporated in the work fails to satisfy the minimum requirements of the initial test, appropriate testing will be made as directed by the City to determine the extent of the failure and to verify that the corrective measures have brought the item to Specification requirements. The cost of all testing necessary to determine the extent of the failure and the adequacy of the corrective measures will be the responsibility of the Contractor.

The failure of the City to make any tests of materials shall in no way relieve the Contractor of the responsibility of furnishing materials conforming to the Specifications.

The Contractor shall provide such facilities as the City may require for collecting and forwarding samples and shall not use the materials represented by the samples until tests have been made. The Contractor shall furnish adequate samples without charge.

The inspections and tests made by the City, its inspectors or its agents, will ordinarily be made without cost to the Contractor unless otherwise expressly specified in the Contract Documents. The Contractor shall furnish without additional cost to the City such materials for testing as may be reasonably necessary. Retesting after failure to pass tests will be at the expense of the Contractor. Should, however, the preparation or manufacture of the materials or equipment be at far distant or inaccessible points, or should it be separated into unreasonably small quantities, or widely distributed to an unreasonable extent, or should the percentage of rejected material or equipment be unreasonably large, the additional cost of such inspection and tests resulting therefrom shall be borne by the Contractor. The City shall judge what an extra inspection is and shall determine the additional cost incurred thereby.

A 3.24 No Estoppel

The City, or any officer, or agent thereof, shall not be precluded at any time, either before or after final completion and final acceptance of the work and payment therefor, from:

A. Showing the true and correct amount, classifications, quality, and character of the work done and materials furnished by the Contractor or any other person under this Contract, or from showing at any time that any determination, return, decision, approval, order, letter, payment, or certificate is untrue and incorrect, or improperly made in any particular specific or quantity, or that the work or the materials or any parts thereof, do not in fact conform to the Contract requirements; and

B. Demanding the recovery from the Contractor of any over-payments made, and interest or such damages as the City may sustain by reason of the Contractor's failure to perform each and every part of this Contract in strict accordance with its terms; or both.

A 3.25 City's Right to Declare Contractor in Default

The work or any portion of the work under Contract shall be suspended immediately on written order of the City declaring the Contractor to be in default. Notice shall be given to the Contractor and shall be deemed Notice to Contractor's Surety whether actually sent or received by Contractor's Surety. The Contract may be terminated by the City for cause or causes, including but not limited to the following:

A. Failure of the Contractor to start the work within twelve (12) working days from date of written notice by the City to begin the work;

B. Substantial evidence that the progress of the work being made by the Contractor is insufficient to complete the work within the specified time;

C. Failure of the Contractor to provide sufficient and proper equipment or construction forces for properly executing the work;

D. Substantial evidence that the Contractor has abandoned the work;

E. Substantial evidence that the Contractor has become insolvent, bankrupt, or otherwise financially unable to carry on the work;

F. Deliberate failure on the part of the Contractor to observe any requirements of these Specifications or to comply with any orders given by the Engineer as provided for in these specifications;

G. Failure of the Contractor to promptly make good any defects in materials or workmanship or any defects of any nature, the correction of which has been directed in writing by the City; and

H. Substantial evidence of collusion for the purpose of illegally procuring a contract or perpetrating fraud on the City in the construction of work under Contract.

When the work is suspended for any of the causes itemized above or for any other cause or causes, the Contractor shall discontinue the work or such part thereof as the City shall designate, whereupon the sureties may at their option assume the Contract or that portion thereof which the City has ordered the Contractor to discontinue and may perform the same or may, with the written consent of the City, subcontract the same provided, however, that the sureties shall exercise their option, if at all, within two weeks after the written notice to discontinue the work has been served upon the Contractor and upon the sureties or their authorized agents. In case the sureties do not, within the hereinabove specified time, exercise their right and option to assume the Contract or that portion thereof which the City has ordered the Contractor to discontinue, then the City shall have the power to complete by contract or otherwise, as it may determine, the work herein described or such part thereof as it may deem necessary.

At the time work is suspended, the Contractor shall provide an accounting to the City of the work performed and the equipment, materials, supplies and other property on site. The Contractor shall not remove any materials, equipment, supplies or any other properly from the site. The Contractor hereto agrees that the City shall have the right to take possession of or use any or all of the materials, plant, tools, equipment, supplies, and property of every kind provided by the Contractor for the purpose of the work and to procure other tools, equipment, and materials for the completion of the same and to charge to the account of the Contractor the expense of said contract or labor, materials, tools, equipment, and expenses incident thereto. The expense so charged shall be deducted by the City out of such monies as may be due or may at any time thereafter become due the Contractor under and by virtue of the Contract or any part thereof or to charge the Contractor for such amounts. The City shall not be required to obtain the lowest bid for the work of completing the Contract, but the expenses to be deducted shall be the actual cost of such work. In case such expense is less than the sum which would have been payable under the Contract if the same had been completed by the Contractor, then in such case the City may pay to the Contractor the difference in the cost, provided that the Contractor shall not be entitled to any claim for damages or for loss of anticipated profits. In case such expense shall exceed the amount which would have been payable under the Contract if the same had been completed by the Contractor, then the Contractor and sureties shall pay the amount of the excess to the City on notice from the City for excess due including any costs incurred by the City, such as inspection, legal fees, and liquidated damages. When any particular part of the work is being carried on by the City by Contract or otherwise under the provisions of this section, the Contractor shall continue the remainder of the work in conformity with the terms of the Contract and in such manner as not to hinder or interfere with the performance of workers employed as above provided by the City.

A 3.26 Suspension by Court Order

The Contractor shall suspend such part or parts of the work ordered by the Court and will not be entitled to additional compensation by virtue of such court order.

A 3.27 Subcontracts

The Contractor shall not make any subcontract for performing any portion of the work included in the contract without notice to the Owner. This contract having been made pursuant to the bid submitted by the Contractor and in reliance with the Contractor's personal qualifications and responsibility, the Owner reserves the right to withhold approval of any subcontractor which the Owner deems would not be in the Owner's best interest.

The Contractor shall, as soon as practicable after signing the contract, submit a separate written notice to the Owner identifying each proposed subcontractor. Upon request of the Owner, the Contractor shall promptly furnish additional information tending to establish that any proposed subcontractor has the necessary facilities, skill, integrity, past experience and financial resources to perform the work in accordance with the terms and conditions of this contract. If the City determines that any proposed subcontractor is unacceptable, the City shall so notify the Contractor, who may thereupon submit another

proposed subcontractor unless the Contractor decides to do the work. Disapproval by the City of any proposed subcontractor shall not provide a basis for any claim by the Contractor.

If an approved subcontractor fails to properly perform the work undertaken, the subcontractor shall be removed from the job upon request of the City, following notification to the Contractor in writing of the request for removal and the reasons therefor.

Each subcontract entered into shall provide that the provisions of the Contract shall apply to such subcontractor and their officers and employees in all respects as if the subcontractor and they were employees of the Contractor. The City's decision not to disapprove of any subcontract shall not relieve the Contractor of any of the responsibilities, duties and liabilities hereunder. The Contractor shall be solely responsible for the acts, omissions, negligence or defaults of subcontractors and of such subcontractor's officers, agents and employees, each of whom shall, for this purpose, be deemed to be the agent or employee of the Contractor to the extent of his subcontract.

The Contractor agrees to bind each subcontractor, and each subcontractor agrees to be bound by the terms of the Contract Documents insofar as applicable to the work. The Contractor and each subcontractor jointly and severally agree that nothing in the Contract Documents or otherwise shall create or be deemed to create any rights in favor of a subcontractor against the City; nor shall be deemed or construed to impose upon the City any obligation, liability or duty to a subcontractor; or to create any contractual relation whatsoever between a subcontractor and the City.

As a matter of policy with respect to City of Colleyville projects and procurements, City of Colleyville also encourages the use, if applicable, of qualified contractors, subcontractors and suppliers where at least 51percent of the ownership of such contractor, subcontractor or supplier is vested in racial or ethnic minorities or women. In the selection of subcontractors, suppliers or other persons in organizations proposed for work on this contract, the contractor agrees to consider this policy and to use its reasonable and best efforts to select and employ such company and persons for work on this contract.

The provisions contained herein shall likewise apply to any sub-subcontracts.

A 3.28 Assignments

The Contractor shall not assign, transfer, convey, or otherwise dispose of this Contract, or the right to execute it, or the right, title, or interest in it or any part thereof without the written approval of the City. The City will ordinarily not favorably consider an assignment, transfer, or conveyance of the Contract unless an exigency occurs which was not known or could not have been foreseen by the Contractor at the time of bidding.

The Contractor shall not assign, either legally or equitably, by power of attorney or otherwise, any of the monies due or to become due under this Contract or the Contractor's claim thereto without the prior written approval of the City.

The approval by the City of a particular assignment, transfer, or conveyance shall not dispense with such approval to any further or other assignments.

The approval of the City of any assignment, transfer, or conveyance shall not operate to release the Contractor or Surety hereunder from any of the Contract obligations, unless otherwise agreed by the parties with City's consent.

A 3.29 Claims against City and Action Thereon

No claim against the City for damages for breach of contract or compensation for extra work shall be made or asserted in any action or proceedings at law or in equity, unless the Contractor shall have strictly complied with all requirements relating to the giving of notice and information with respect to such claims all as hereinbefore provided.

A 3.30 City's Officers, Employees, or Agents

No claim whatsoever shall be made by the Contractor against any officer, employee, or agent of the City for, or on account of, anything done or omitted to be done in connection with this Contract.

A 3.31 Patents

The Contractor shall pay all royalties and license fees and shall hold and save the City and its officers, employees, and agents harmless from all liability of any nature or kind, including cost and expenses for, or account of, any patented or unpatented invention, process, article, or appliance manufactured or used in the performance of the Contract, including its use by the City, unless otherwise specifically stipulated in the Contract Documents. In this respect the Contractor shall defend all suits or claims for infringement of any patent or license right. In the event that any claims, suit, or action at law or in equity of any kind, whatsoever, is brought against the City, or its officers, employees, or agents, involving any such patents or license rights, then the City shall have the right to, and may, retain from any money due or to become due to the Contractor, such sufficient sum as is considered necessary to protect said City, or its officers, employees, or agents against loss, and such sum may be retained by the City until such claim or suit shall have been settled and satisfactory evidence to that effect shall have been furnished the City.

A 3.32 Final Payments

The percent retained by the City will be ten (10%) percent of contracts whose contract price estimate is less than $400,000, and five (5%) percent on all contracts whose contract price is $400,000 or greater unless otherwise provided by the Contract Documents or Law.

See Section A 4.14 for Monthly estimates and A 4.15 for Final Quantities.

A 3.33 Payment Withheld

In addition to express provisions elsewhere contained in the contract, the Owner may withhold from any payment otherwise due the Contractor such amount as determined necessary to protect the Owner's interest, or, if it so elects, may withhold or retain all or a portion of any payment on account of:

A. unsatisfactory progress of the work not caused by conditions beyond the Contractor's control;

B. defective work not corrected;

C. Contractor's failure to carry out instructions or orders of the City or the City's representative;

D. a reasonable doubt that the contract can be completed for the balance then unpaid;

E. work or execution thereof not in accordance with the Contract Documents;

F. claim filed by or against the Contractor or reasonable evidence indicating probable filing of claims;

G. failure of the Contractor to make payments to subcontractor or for material or labor;

H. damage to another Contractor;

I. unsafe working conditions allowed to persist by the Contractor;

J. failure of the Contractor to provide work schedules as required by the Owner;

K. use of unqualified subcontractors; or

L. failure of the Contractor to keep current as-built record drawings at the job site, or to turn same over in completed form to the Owner.

When the above grounds are removed, payment shall be made for amount withheld because of them, and Owner shall never be liable for interest on any delayed or late payment.

A 3.34 Service of Notices

The Contractor's address in the Contract Documents will be the place where all notices, directions, or other communication may be delivered, or to which they may be mailed.

Notices, directions, or other communications to the Surety or Sureties on Contract Bonds shall be directed or delivered to the home office or to the agent or agents who executed the bonds on behalf of the Surety or Sureties.

Actual delivery of any such notice, direction, or communication to the aforesaid places or depositing it in a postpaid wrapper addressed thereto in any post office box regularly maintained by the United States Post Office Department shall be conclusively deemed to be sufficient service thereof upon the above persons as of the date of such delivery or deposit.

The above addresses may be changed at any time by an instrument in writing executed and acknowledged by the party changing the address and delivered to the other party or parties.

Nothing herein contained shall, however, be deemed to preclude or tender inoperative the service of any notice, direction, or communication upon the above parties personally, or, if the Contractor be a corporation, upon any officer or director thereof.

A 3.35 Unlawful Provisions Deemed Stricken

If this Contract contains any unlawful provisions not an essential part of the Contract and which shall not appear to have been a controlling or material inducement to the making thereof, such unlawful provisions shall be of no effect. Upon the application of either party, the unlawful part shall be considered stricken from the Contract without affecting the remainder of the Contract.

A 3.36 All Legal Provisions Included

It is the intent and agreement of the parties to this Contract that all legal provisions of law required to be inserted herein, shall be and are inserted herein. However, if through mistake or oversight, any such provision is not herein inserted or is not inserted in proper form, then upon application of either party, the Contract shall be amended so as to strictly comply with the law and without prejudice to the rights of either party hereunder.

A 3.37 Equal Employment Opportunity

The Contractor shall not discriminate against any employee or applicant for employment because of race, age, color, religion, sex, ancestry, and national origin, place of birth or disability. The Contractor shall take action to ensure that applicants are employed and treated without regard to their race, age, color, religion, sex, ancestry, and national origin, place of birth or disability. This action shall include but not be limited to the following; employment, upgrading, demotion or transfer, recruitment or advertising; layoff or termination; rates of pay or other forms of compensation; and selection of training, including apprenticeship.

A 3.38 Independent Contractor

CONTRACTOR covenants and agrees that he or she is an independent Contractor and not an officer, agent, servant or employee of the CITY; that CONTRACTOR shall have exclusive control of and exclusive right to control the details of the work performed hereunder and all persons performing same, and shall be responsible for the acts and omissions of its officers, agents, employees, Contractors, subcontractors and consultants; that the doctrine of respondent superior shall not apply as between CITY

and CONTRACTOR, its officers, agents, employees, Contractors, subcontractors and consultants, and nothing herein shall be construed as creating a partnership or joint enterprise between CITY and CONTRACTOR.

A 3.39 Headings

The headings of these specifications are for the convenience of reference only and shall not affect in any manner any of the terms and conditions hereof.

A 3.40 Governing Law

The Contract Documents shall be governed by the laws of the State of Texas and, if legal action is necessary to enforce the Contract documents, exclusive venue shall lie in Tarrant County, Texas.

SECTION A-4 PROJECT ADMINISTRATION

A 4.1 Contract Term

This contract shall be for a period of nine (9) months or 270 calendar days beginning on the date specified in the Notice to Proceed. City and Contractor may, upon mutual written consent, extend the contract for three (3) additional one-month periods after the initial term. Contractor shall present a written request no later than ninety (90) days prior to the expiration of the contract indicating interest in extending the contract for an additional term. Contractor may request a price increase in the written request at a rate not to exceed the effective percentage change in the consumer price index (CPI-U) for the previous twelve (12) months. At the City's discretion, the effective change rate shall be based on either the local or national index average rate for all items. The City will accept price reductions at any time during the contract period.

If agreement cannot be reached or the City does not desire to extend the contract for an additional term, the contract will be terminated at the end of the current contract period.

A 4.2 Scope of Work

This is a requirements contract. While locations have been included for the work anticipated, the City has the authority to add, reduce, cancel and/or postpone work at any time. Changes may be made based upon need, prevailing weather conditions and available funding. Quantities included in the proposal reflect the estimate of the City for the contract period; the City is under no obligation to pay for quantities beyond those actually performed and/or installed, therefore, the award of the contract does not guarantee any minimum quantity of work. City reserves the right to rearrange the schedule at any time, while being sensitive to the mobilization cost associated with such changes. Contractor is required to have a work crew dedicated to this project to keep work progressing at all times.

The work governed by these specifications is located in the city of Colleyville, Texas and consists of improvements to paving, trails, drainage, and utilities, City of Colleyville Project No. ST14-006, including all necessary appurtenances.

The intent of the contract documents, including the Standard Specifications, Provisions, and other instruments, documents, drawings and maps comprising the Plans and Specifications, is to describe the completed work to be performed by the Contractor under the contract as an independent Contractor.

Any provision of the agreement vesting in the City or the engineer the right of inspection is understood by all the parties to be for the purpose of ensuring that the plans and specifications are complied with and that the completed work is obtained and described, and no such provision shall be interpreted as vesting the City of Colleyville or engineer the right to control the details of work.

Critical sections of curb and gutter will be staked by contractor and approved by the City. The areas requiring staking will be communicated to the Contractor by the Inspector. For these critical locations, Contractor shall not remove any concrete until the City inspections has obtained all the necessary data. Contractor shall follow directions provided by the City.

The Contractor shall provide, at his own expense, all construction staking required to perform the work as described in the plans and specifications. The Contractor shall set excavation and fill stakes on or near the right-of-way, all stakes necessary for utility relocation and storm drain placement, four-foot (4') off-set back of curb stakes for subgrade stabilization and paving, and intermediate grade stakes (i.e. blue topping, fill, or cut stakes) on the centerline. All staking shall be subject to inspection by the City. While the City shall have the right to inspect, it shall have no duty to inspect. The Contractor will be responsible for any discrepancies from the plan alignment and/or grade.

Calendar days will not be adjusted due to the lack of available crews or due to the negligence of the Contractor or vandalism that causes the replacement of stakes.

The Contractor shall provide a superintendent authorized to receive and fulfill instructions from the Inspector at all times on the job site. Superintendent must:

- Serve as the Contractor's primary point of contact.
- Be a permanent staff employee.
- Be knowledgeable of the specifications herein, and inspect the performance of the crew(s).
- Be responsible for the day to day operations in accordance to the service requirements throughout the term of the contract.
- Make decisions and receive, follow, give, and understand written and verbal instructions in English, and inspect the work site with the Inspector and/or City Engineer upon request.
- Provide a hard copy of the Contractor's Work Record Summary to the Inspector on a monthly basis.

The City recognizes that events beyond the control of the Contractor such as death, physical, or mental incapacity, long-term illness, or the voluntary termination of employment of the on-site supervisor will require the Contractor to propose a replacement. In the event that such replacement is necessary, the

Contractor agrees that no personnel shall begin work on the project without written approval from the City.

The Contractor shall employ only competent, efficient workmen and shall not use on the work any unfit person or one not skilled in the work assigned to him; and shall at all times maintain good order among his employees.

Whenever the City of Colleyville shall inform the Contractor in writing that, in his opinion, any employee is unfit, unskilled, disobedient, or is disrupting the orderly progress of the work, such employee shall be removed from the work and shall not again be employed on it.

Under urgent circumstances, the City of Colleyville may orally require immediate removal of an employee for cause, to be followed by written confirmation.

Work shall be accomplished between the hours of 7 a.m. to 6 p.m., Monday through Friday unless otherwise approved by the Engineer. For Saturday and inspections, see Section A 4.12.

Contractor is responsible to stay informed of all major events within the City of Colleyville. Contractor shall not work in the in these areas unless approved by the Field Operations Manager or designee. Upon approval to proceed with construction, the contractor must complete work and remove all traffic control devices two days prior to the next event, or as directed by the Field Operations Manager or designee. It will be the responsibility of the Prime Contractor to see that Subcontractor is in compliance with requirement.

A 4.3 Minority and/or Women Business Enterprise

The Contractor is encouraged to use, if applicable, qualified subcontractors, suppliers, and firms where at least 51 percent of the ownership of such subcontractor, supplier or firm is vested in racial or ethnic minorities or women. In the selection of subcontractors, suppliers or other persons in organizations proposed for work on this contract, the Contractor agrees to consider this policy and to use reasonable and best effort to select and employ such company and persons for work on this contract. Contractor will be required to submit information related to minority and/or woman owned businesses. The information submitted shall include the Contractors and any other subcontractors performing work as part of this contract. See following Prime and Subs Report form for information required. Contractor will be required to submit this form with anticipated dollar amounts (if applicable) at time contract is awarded and to resubmit the same form with actual cost spent prior to final payment for this project.

Prime and Subs Report

Project Name:	Project No:
Name of Prime:	Date:

Legend: * Answer with "YES" or "NO"
** To be filled in at end of project.

#1 – Minority Owned
#2 – Women Owned
#3 – Registered with the State of Texas historically Underutilized Business Program
#4 – Registered with the North Central Texas Regional Certification Agency
#5 – Meet qualifications, but not certified with the programs mentioned above

PLEASE INCLUDE PRIME AND ALL SUBS:

	*	If MWBE,							
				Use legend above and check all that apply					
Name of Firm	MWBE	Anticipated Amount	**Actual Amount	#1	#2	#3	#4	#5	*Submitted Certification
				☐	☐	☐	☐	☐	
				☐	☐	☐	☐	☐	
				☐	☐	☐	☐	☐	
				☐	☐	☐	☐	☐	
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Please complete this form (with the exception of Actual Amounts) and return with executed contracts. If applicable, complete the Actual Amounts and resubmit this form prior to final payment for this project.

A 4.4 Prevailing Wage Rates

The Contractor shall comply with V.T.C.A., Government Code, Chapter 2258, in performing this project. In accordance with V.T.C.A., Government Code, Chapter 2258, the prevailing wage rates as set forth in Section V of the contract documents shall be paid on this project. For overtime work and legal holidays, the hourly rate shall be one and one-half times the basic hourly rate set forth in Section 2. The City will require an affidavit stating that the Contractor has complied with the prevailing wage rate provision of the contract documents, prior to acceptance of the project. The City reserves the right to conduct interviews with the Contractor's employees to insure compliance with Section 2 of the contract documents in accordance with applicable State and Federal Laws.

Upon written request by the City, the general contractor shall be responsible for submitting payroll information to the City of Colleyville for all employees performing work on the project, whether employed by the general contractor or a subcontractor to the general contractor. Each submittal shall be certified by the general contractor as to completeness and accuracy.

A Contractor or subcontractor in violation of V.T.C.A., Government Code, Chapter 2258 is liable for a penalty. That Contractor or subcontractor shall pay to the City $60.00 for each laborer, workman, or mechanic employed for each calendar day, or portion thereof, such laborer, workman, or mechanic is paid less than the said stipulated rates for work done under the contract.

The Contractor or subcontractor violating a requirement of this provision may be determined ineligible to bid on or receive any additional work during the calendar year following the year in which the violation of this provision occurred.

A 4.5 Sales Tax Exemption

The Contractor is responsible for understanding Texas law regarding tax exemption for City projects and bidding accordingly. Latest information can be obtained from the State Comptroller's Office and/or other appropriate entities.

A 4.6 Bonds, Insurance and Affidavits

The following bonds and proof of insurance shall be filed with the City of Colleyville as a condition of the contract, together with appropriate powers of attorney.

Performance, Payment, and Maintenance Bonds

Performance, payment and maintenance bonds in the amount of not less than 100 percent of the contract price conditioned upon the faithful performance of the contract, and upon payment of all persons supplying labor or furnishing materials, will be required upon the forms which are a part of the Contract Documents. Bonds shall be executed by a surety company authorized to do business in the State of Texas and acceptable to and approved by the City of Colleyville. The period of the Maintenance Bond

shall be two years from the date of acceptance of all work done under the contract, to cover the guarantee as set forth in the Special Conditions.

Performance Bonds and Payment Bonds In Excess Of $100,000

In addition to all other requirements set forth with regard to performance bonds and payment bonds, any performance bond or payment bond in an amount exceeding $100,000 must be issued by a surety that is qualified as a surety on obligations permitted or required under federal law as indicated by publication of the surety's name in the current U.S. Treasury Department Circular 570. In the alternative, an otherwise acceptable surety company that is authorized and admitted to write surety bonds in Texas must obtain reinsurance on any amounts in excess of $100,000 from a reinsurer authorized and admitted as a reinsurer in Texas who qualifies as a surety or reinsurer on obligations permitted or required under federal law as indicated by publication of the surety's or reinsurer's name in the current U.S. Treasury Department Circular 570.

Insurance

Contractor shall, at his own expense, purchase, maintain and keep in force during the term of this contract such insurance as set forth below. Contractor shall not commence work under this contract until he has obtained all the insurance required under the contract and such insurance has been approved by the City, nor shall the Contractor allow any subcontractor to commence work on his subcontract until all similar insurance of the subcontractor has been obtained and approved. All insurance policies provided under this contract shall be written on an "occurrence" basis. The policy limits stated below are at a minimum.

NOTE: Coverage limits (highlighted amount) needs to be adjusted if the estimated cost of project exceeds coverage limits. Amount to increase will be determined by the City.

Liability Insurance Liability Insurance Commercial General Liability (No standard coverage's are to be excluded by endorsement. XCU and contractual liability are not to be excluded)	$1,000,000 Per Occurrence
Automobile Liability Insurance Commercial Auto Liability Policy (Any Auto, including hired, and non-owned autos)	$ 1,000,000 Combined Single Limit
Umbrella Liability (Following Form and Drop Down Provisions Included)	$2,000,000 Each Occurrence
Compensation Insurance Workers' Compensation Employer's Liability	Statutory Limit $1,000,000 Each Occurrence $1,000,000 Disease - Each Employee $1,000,000 Disease – Policy Limit

It is agreed by all parties to this contract that the insurance policies required under this contract shall be endorsed to provide:

- The City of Colleyville as an additional insured on all applicable policies;
- Provide for thirty (30) days' notice of cancellation to the City, for nonpayment of premium, material change, or any other cause;
- Be written through companies duly authorized to transact that class of insurance in the State of Texas with an A.M. Best rating of A:VII or better; and,
- Waive subrogation rights for loss or damage so that insurers have no right to recovery or subrogation against the City of Colleyville, it being the intention that the required insurance policies shall protect all parties to the contract and be primary coverage for all losses covered by the policies.
- Provide one copy of a Certificate of Insurance on an Accord form or other State- approved form evidencing the required coverage to:

City of Colleyville
Public Works Department
Attention: Jeremy Hutt, City Engineer
City of Colleyville
100 Main St
Colleyville, TX 76034

Neither final payment nor any remaining retained percentage shall become due until the Contractor submits to the engineer (1) an affidavit that payrolls, bills for materials and equipment, and other indebtedness connected with the work for which the City of Colleyville or the City of Colleyville's property might be responsible or encumbered (less amounts withheld by City of Colleyville) have been paid or otherwise satisfied, (2) a certificate evidencing that insurance required by the contract documents to remain in force after final payment is currently in effect and will not be canceled or allowed to expire until at least 30 days prior written notice has been given to the City of Colleyville, a written statement that the Contractor knows of no substantial reason that the insurance will not be renewable to cover the period required by the contract documents, consent of Surety, if any, to final payment and (5) if required by the City of Colleyville, other data establishing payment or satisfaction of obligations, such as receipts, releases and waivers of liens, claims, security interests or encumbrances arising out of the contract, to the extent and in such form as may be designated by the City of Colleyville. If a subcontractor refuses to furnish a release or waiver required by the City of Colleyville, the Contractor may furnish a bond satisfactory to the City of Colleyville to indemnify the City of Colleyville against such lien. If such lien remains unsatisfied after payments are made, the Contractor shall refund to the City of Colleyville all money that the City of Colleyville may be compelled to pay in discharging such lien, including all costs and reasonable attorneys' fees.

In addition to the requirements contained above, the Contractor shall comply with the following in its provision of workers' compensation insurance.

Definitions:

Certificate of coverage ("certificate") - A copy of a certificate of insurance, a certificate of authority to self-insure issued by the commission, or a coverage agreement (TWCC-81, TWCC-82, TWCC-83, or

TWCC-84), showing statutory workers' compensation insurance coverage for the person's or entity's employees providing services on a project, for the duration of the project.

Duration of the project - includes the time from the beginning of the work on the project until the Contractor's/person's work on the project has been completed and accepted by the governmental entity.

Persons providing services on the project ("subcontractor" in §406.096) - includes all persons or entities performing all or part of the services the Contractor has undertaken to perform on the project, regardless of whether that person contracted directly with the Contractor and regardless of whether that person has employees. This includes, without limitation, independent Contractors, subcontractors, leasing companies, motor carriers, owner-operators, employees of any such entity, or employees of any entity which furnishes persons to provide services on the project. "Services" include, without limitation, providing, hauling, or delivering equipment or materials, or providing labor, transportation or other service related to a project. "Services" does not include activities unrelated to the project, such as food/beverage vendors, office supply deliveries and delivery of portable toilets.

The Contractor shall provide coverage, based on proper reporting of classification codes and payroll amounts and filing of any coverage agreements, which meets the statutory requirements of Texas Labor Code, Section 401.015(44) for all employees of the Contractor providing services on the project, for the duration of the project.

The Contractor must provide a certificate of coverage to the governmental entity prior to being awarded the contract.

If the coverage period shown on the Contractor's current certificate of coverage ends during the duration of the project, the Contractor must, prior to the end of the coverage period, file a new certificate of coverage with the governmental entity showing that coverage has been extended.

The Contractor shall obtain from each person providing services on a project, and provide to the governmental entity:

A. certificate of coverage, prior to that person beginning work on the project, so the governmental entity will have on file certificates of coverage showing coverage for all persons providing services on the project; and
B. no later than seven (7) days after receipt by the Contractor, a new certificate of coverage showing extension of coverage, if the coverage period shown on the current certificate of coverage ends during the duration of the project.

The Contractor shall retain all required certificates of coverage for the duration of the project and for two year thereafter.

The Contractor shall notify the governmental entity in writing by certified mail or personal delivery, within ten days after the Contractor knew or should have known, of any change that materially affects the provision of coverage of any person providing services on the project.

The Contractor shall post on each project site a notice, in the text, form and manner prescribed by the Texas Workers' Compensation Commission, informing all persons providing services on the project that they are required to be covered, and stating how a person may verify coverage and report lack of coverage.

The Contractor shall contractually require each person with whom it contracts to provide services on a project, to:

- provide coverage, based on proper reporting of classification codes and payroll amounts and filing of any coverage agreements, which meets the statutory requirements of Texas Labor Code, Section 401.015(44) for all of its employees providing services on the project, for the duration of the project;
- provide to the Contractor, prior to that person beginning work on the project, a certificate of coverage showing that coverage is being provided for all employees of the person providing services on the project, for the duration of the project;
- provide the Contractor, prior to the end of the coverage period, a new certificate of coverage showing extension of coverage, if the coverage period shown on the current certificate of coverage ends during the duration of the project;
- obtain from each other person with whom it contracts, and provide to the Contractor:
- a certificate of coverage, prior to the other person beginning work on the project; and
- a new certificate of coverage showing extension of coverage, prior to the end of the coverage period, if the coverage period shown on the current certificate of coverage ends during the duration of the project;
- retain all required certificates of coverage on file for the duration of the project and for one year thereafter;
- notify the governmental entity in writing by certified mail or personal delivery, within ten days after the person knew or should have known, of any change that materially affects the provision of coverage of any person providing services on the project; and
- contractually require each person with whom it contracts, to perform as required by paragraphs 1 – 7 above, with the certificates of coverage to be provided to the person for whom they are providing services.

By signing this contract or providing or causing to be provided a certificate of coverage, the Contractor is representing to the governmental entity that all employees of the Contractor who will provide services on the project will be covered by workers' compensation coverage for the duration of the project, that the coverage will be based on proper reporting of classification codes and payroll amounts, and that all coverage agreements will be filed with the appropriate insurance carrier or, in the case of a self-insured, with the commission's Division of Self-Insurance Regulation. Providing false or misleading information may subject the Contractor to administrative penalties, criminal penalties, civil penalties, or other civil actions.

The Contractor's failure to comply with any of these provisions is a breach of contract by the Contractor which entitles the governmental entity to declare the contract void if the Contractor does not remedy the breach within ten days after receipt of notice of breach from the governmental entity.

A 4.7 Indemnification

CONTRACTOR DOES HEREBY AGREE TO WAIVE ALL CLAIMS, RELEASE, INDEMNIFY, DEFEND AND HOLD HARMLESS THE CITY OF COLLEYVILLE AND ALL OF ITS OFFICIALS, OFFICERS, AGENTS, EMPLOYEES, IN BOTH THEIR PUBLIC AND PRIVATE CAPACITIES, FROM AND AGAINST ANY AND ALL LIABILITY, CLAIMS, LOSSES, DAMAGES, SUITS, DEMANDS OR CAUSES OF ACTION INCLUDING ALL EXPENSES OF LITIGATION AND/OR SETTLEMENT, COURT COSTS AND ATTORNEY FEES WHICH MAY ARISE BY REASON OF INJURY TO OR DEATH OF ANY PERSON OR FOR LOSS OF, DAMAGE TO, OR LOSS OF USE OF PROPERTY OCCASIONED BY ERROR, OMISSION, OR NEGLIGENT ACT OF CONTRACTOR, HIS OFFICERS, AGENTS, EMPLOYEES, SUBCONTRACTORS, INVITEES OR ANY OTHER PERSONS, ARISING OUT OF OR IN CONNECTION WITH THE PERFORMANCE OF THIS CONTRACT, AND CONTRACTOR WILL AT HIS OR HER OWN COST AND EXPENSE DEFEND AND PROTECT CITY OF COLLEYVILLE FROM ANY AND ALL SUCH CLAIMS AND DEMANDS. CONTRACTOR DOES HEREBY AGREE TO WAIVE ALL CLAIMS, RELEASE, INDEMNIFY, DEFEND AND HOLD HARMLESS CITY OF COLLEYVILLE AND ALL ITS OFFICIALS, OFFICERS, AGENTS, AND EMPLOYEES, FROM AND AGAINST ANY AND ALL CLAIMS, LOSSES, DAMAGES, SUITS, DEMANDS OR CAUSES OR ACTION, AND LIABILITY OF EVERY KIND INCLUDING ALL EXPENSES OF LITIGATION AND/OR SETTLEMENT, COURT COSTS AND ATTORNEY'S FEES FOR INJURY OR DEATH OF ANY PERSON OR FOR LOSS OF, DAMAGE TO, OR LOSS OF USE OF ANY PROPERTY, ARISING OUT OF OR IN CONNECTION WITH THE PERFORMANCE OF THIS CONTRACT. SUCH INDEMNITY SHALL APPLY WHETHER THE CLAIMS, LOSSES, DAMAGES, SUITS, DEMANDS OR CAUSES OF ACTION ARISE IN WHOLE OR IN PART FROM THE NEGLIGENCE OF THE CITY OF COLLEYVILLE, HIS OFFICERS, OFFICIALS, AGENTS OR EMPLOYEES. IT IS THE EXPRESS INTENTION OF ALL THE PARTIES THAT THE INDEMNITY PROVIDED FOR IN THIS PARAGRAPH IS INDEMNITY BY CONTRACTOR TO INDEMNIFY AND PROTECT CITY OF COLLEYVILLE FROM THE CONSEQUENCES OF CITY OF COLLEYVILLE'S OWN NEGLIGENCE, WHETHER THAT NEGLIGENCE IS A SOLE OR CONCURRING CAUSE OF THE INJURY, DEATH OR DAMAGE AND WHETHER SAID NEGLIGENCE IS CHARACTERIZED AS SOLE, CONTRACTUAL COMPARATIVE, CONCURRENT, JOINT, GROSS, ACTIVE, PASSIVE, OR ANY OTHER FORM OF NEGLIGENCE.

IN ANY AND ALL CLAIMS AGAINST ANY PARTY INDEMNIFIED HEREUNDER BY ANY EMPLOYEE OF THE CONTRACTOR, ANY SUBCONTRACTOR, ANYONE DIRECTLY OR INDIRECTLY EMPLOYED BY ANY OF THEM OR ANYONE FOR WHOSE ACTS ANY OF THEM MAY BE LIABLE, THIS INDEMNIFICATION OBLIGATION SHALL NOT BE LIMITED IN ANY WAY BY ANY LIMITATION ON THE AMOUNT OR TYPE OF DAMAGES, COMPENSATION OR BENEFITS PAYABLE BY OR FOR THE CONTRACTOR OR ANY SUB-CONTRACTOR UNDER WORKMEN'S COMPENSATION ACTS OR OTHER EMPLOYEE BENEFIT ACTS.

A 4.8 Time for Completion and Liquidated Damages

Since time is of the essence, the City has seen fit to establish the time required to complete this project. The time, as set out in Section A 4.1 of this contract, will be the maximum number of calendar days allowed to substantially complete this project. Substantially complete is defined as having completed all bid items included in the contract to allow the facilities to function as designed. Failure of the Contractor to complete the work within this time will result in damages being sustained by the City of Colleyville. Such damages are, and will continue to be, impracticable and extremely difficult to determine. The Contractor will pay the City of Colleyville five hundred dollars ($500) for each calendar day of delay (including Sundays and holidays) in finishing the work in excess of time specified for completion, plus any authorized time extensions. Execution of the contract under these specifications shall constitute agreement by the City of Colleyville and Contractor that five hundred dollars ($500) is the minimum value of the costs and actual damage caused by failure of the Contractor to complete the work within the allotted time, that such sum is liquidated damages and shall not be construed as a penalty, and that such sum may be deducted from payments due the Contractor if such delay occurs.

A 4.9 Computation of Contract Time for Completion

The engineer will furnish the Contractor a monthly statement on forms furnished by the City, showing number of calendar days during the month, the number of calendar days allowed in the contract and the calendar days remaining under the contract. If the satisfactory completion of the contract shall require unforeseen work or work and materials in greater amounts than those set forth in the contract, then additional calendar days will be considered, equal to the time which, in the opinion of the engineer, the work as a whole is delayed. However, the completion time can only be changed by the execution of a supplemental agreement.

Time will be charged for all calendar days regardless of weather conditions, material supplies, or other conditions not under the control of the Contractor, which could impede the prosecution of the work. Time will also be charged for Sundays and holidays.

Prior to beginning construction operations, the Contractor shall submit to the engineer a critical path method (CPM) chart progress schedule showing the manner of prosecution of the work that he intends to follow in order to complete the contract within the allotted time. The purpose for this schedule is to assure adequate planning and execution of the work. The progress schedule must present a reasonable approach to completing the work within the allotted time.

Payment of partial monthly estimates shall not be commenced until the CPM chart progress schedule has been approved by the engineer.

The Contractor shall be entirely responsible for maintaining the progress of the work in accordance with the approved schedule. Should it become evident, in the opinion of the engineer, any time during the construction that the progress of the work has not been maintained in accordance with the approved schedule, the Contractor shall, upon written request of the engineer, promptly submit a revised schedule. This revised schedule shall set out operations, methods, equipment, added labor, and additional work

shifts by which time lost shall be made up. At the end of each estimate period, the engineer will determine whether the Contractor is in compliance with the approved schedule, or the approved revised schedule. In the event the Contractor is determined not to be in compliance, he will be notified immediately in writing. If the Contractor does not correct the work progress to comply with the approved revised schedule by the end of the month of notification, payment for work performed during the period of non- compliance will be reduced according to the following:

1st Month - Reduction = 30% X work performed (Month Only)
2nd Month - Reduction = 40% X work performed (Month Only)
3rd Month - Reduction = 50% X work performed (Month Only)
Subsequent Month - Reduction = 50% work performed (Month Only)

The first month (the month of notification) is that month in which notification is made. Each month's reduction will be assessed only for that work performed during that specific month. The reduction will be cumulative for the entire period of non-compliance; i.e., 30% payment reduction for the work performed during the first month, plus 40% payment reduction for work performed during the second month, plus 50% payment reduction for work performed during the third month, and plus 50% payment reduction for work performed in each succeeding month of non-compliance thereafter. When the work progress becomes in compliance with the approved schedule, or the approved revised schedule, all withheld monies will be paid to the Contractor with the next regular estimate.

The Contractor shall anticipate possible delays and shall be prepared to supplement and revise his construction methods accordingly.

Prior to any construction activities, the Contractor shall install erosion control measures. The Contractor shall then begin the work to be performed under the contract within ten (10) days after the date of the authorization to begin work and shall continuously prosecute same with such diligence as will enable him to complete the work within the time limit specified. He shall not open up work to the detriment of work already begun. The Contractor shall conduct his operations so as to impose a minimum interference to traffic.

A 4.10 Delays

The Contractor assumes the risk of all suspensions of or delays in performance of the contract, regardless of length thereof, arising from all causes whatsoever, whether or not relating to this contract, including wrongful acts or omissions of City of Colleyville or its Contractors or subcontractors except only to the extent, if any, that compensation or an extension of time may be due as expressly provided for elsewhere in this contract for such suspension or delays, and, subject only to such exception, the Contractor shall bear the burden of all costs, expenses and liabilities which he may incur in connection with such suspensions or delays, and all such suspensions, delays, costs, expenses and liabilities of any nature whatsoever, whether or not provided for in this contract, shall conclusively be deemed to have been within the contemplation of the parties.

Notwithstanding any provisions of this contract, whether relating to time of performance or otherwise, City of Colleyville makes no representation or guarantee as to when the construction site or any part thereof will be available for the performance of the contract, or as to whether conditions at the construction site will be such as to permit the contract to be performed thereon without interruption or by any particular sequence or method or as to whether the performance of the contract can be completed by the time required under this contract or by any other time.

Wherever in connection with this contract it is required, expressly or otherwise, that City of Colleyville shall perform any act relating to the contract, including making available or furnishing any real property, materials or other things, no guarantee is made by the City of Colleyville as to the time of such performance and the delay of City of Colleyville in fulfilling such requirement shall not result in liability of any kind on the part of City of Colleyville except only to the extent, if any, that an extension of time or compensation may be due as expressly provided for in this contract.

An extension of time will only be considered when a claim for such extension is submitted to the City in writing by the Contractor within fourteen (14) calendar days from the time when alleged cause of delay occurs.

A 4.11 Inspection

Contractor shall provide the City 48 hours' notice prior to any construction. Any time that work is being performed on bid items, work that supports bid items, or work that requires lane closures, an Inspector must be present. Work performed without the proper inspection shall be performed at the Contractor's risk. This work will be consider unauthorized, and at the option of the Construction Services Manager may not be measured and paid for and may require removal at the Contractor's expense. If the Contractor fails to satisfactorily repair, replace or remove the unauthorized work or materials immediately upon receipt of written notice, the City will have authority to cause such remediation to be performed and to deduct the cost thereof from any monies due or to become due to the Contractor. If there is ever any question as to what requires inspection, please check with the assigned Inspector, Inspector Supervisor, or Construction Manager. General clean-up and similar items of work that have no direct pay can be performed without the benefit of inspection.

A 4.12 Saturday Inspection

Contractor delivers $200.00 non-refundable deposit to the Department of Public Works (via the Engineering Division) before 1:00 p.m. the Thursday prior to the Saturday that is to be worked. If a deposit is not delivered by 1:00 p.m. Thursday prior to the Saturday to be worked, the contractor will not be able to work on that Saturday.

Following the performance of inspection services, an invoice will be prepared and mailed to the Contractor via the U.S. Postal Service. The $200.00 deposit will be deducted from the total invoice amount. All invoices must be paid in order for the Contractor to receive the retained funds at the termination of a project, and/or to receive a final project acceptance.

Nighttime tie-ins are exempt from these rules when they are done in an effort to reduce the impact of water outages to customers.

Engineering Services management will determine the appropriate number of Inspectors necessary and which Inspectors will work on each Saturday.

Summary of Process

Contractor delivers $200.00 non-refundable deposit to the Department of Public Works (via the Engineering Department) before 1:00 p.m. the Thursday prior to the Saturday that is to be worked. If a deposit is not delivered by 1:00 p.m. prior to the Saturday that is to be worked, the contractor will not be able to work on that Saturday.

Contractor works desired number of hours and is invoiced at $50.00 per hour for the number of hours worked by the Inspector minus the previously remitted $200.00 deposit.

Contractor pays invoice that he receives in the mail.

Nighttime tie-ins are exempt from these rules when they are done in an effort to reduce the impact of water outages to customers.

Holiday Schedule

These City holidays will be observed and **no work will be permitted** except in the most extreme circumstances and with prior approval from the Construction Services Manager.

- New Year's Day (January 1)
- Memorial Day (Last Monday in May)
- Independence Day (July 4)
- Labor Day (First Monday in September)
- Thanksgiving Day (Fourth Thursday in November)
- Thanksgiving Friday (Friday after Thanksgiving Day)
- Christmas Eve (December 24)
- Christmas Day (December 25)

In addition to the above, any holidays falling on Saturday will be observed on the preceding Friday. Any holidays that fall on Sunday will be observed on the following Monday.

A 4.13 Meetings

Preconstruction Meeting: This will be coordinated by the Construction Manager prior to project start, with Engineer, Inspector, prime and any subcontractors, prior to Public Meeting

Public Meeting: Prior to start of a capital improvement construction project, a public meeting will be held for this project. The purpose of the meeting will be to explain the project to affected citizens and answer questions. A representative of the Contractor, knowledgeable of the project, shall attend the public meeting. The representative will be introduced and will be called on as necessary to assist in answering questions.

Progress Meetings: Once construction begins, project construction meetings may be held for this project. A representative of the Contractor, knowledgeable of the project, shall attend the construction meetings. The engineer will schedule the time and location, and determine the frequency of these meetings.

A 4.14 Monthly Estimates

Monthly pay estimates will be processed at the beginning of each month for work performed during the prior month. Assuming there are no issues encountered during the standard process, payment will be processed within 30 days from the end of the prior month.

Where multiple locations are included in the contract, City may require measurements to be performed on a daily basis. Invoices shall be submitted for the actual work performed.

Right to Audit

Contractor agrees that City shall, until the expiration of three years after final payment under this contract, have access to and the right to examine any directly pertinent books, documents, papers and records of Contractor involving transactions relating to this contract. Contractor agrees that City shall have access during normal working hours to all necessary Contractor facilities and shall be provided adequate and appropriate work space in order to conduct audits in compliance with the provisions of this section. City shall give contractor reasonable advance notice of intended audits.

A 4.15 Final Quantities

The Contractor is required to be present when final quantities are measured by the inspector. The inspector will coordinate with the Contractor to schedule a mutually agreeable date and time (including Saturdays) to perform the final measuring. If the Contractor chooses not to be present when final quantities are measured by the inspector, the Contractor agrees to accept the inspector's measurements or reimburse the City for time the inspector spends remeasuring any portion of the project.

A 4.16 GPS Monuments

Contractor shall Furnish and Install two (2) Berntsen Top Security Rod Monuments or two (2) Berntsen C35D - 3 1/2" Aluminum concrete markers or any combination of both (at the City Engineers discretion) complete and in place. Location of said Monuments/Markers shall be marked by the City Engineer. Contractor shall notify the City Engineer two weeks before planned installation date. Contractor shall have a Registered Professional Land Engineer survey the Berntsen Monuments/Markers, publish and certify GPS data sheets that meet and/or exceed Second Order Specifications using the Global Positioning

System (GPS). Data Sheet horizontal coordinates shall be NAD 83(86) or NAD 83(93) only, but must specify which conversion. Data Sheet vertical datum for the Berntsen Monuments/Markers shall be based on NAVD88 and meet and/or exceed Third Order Specifications. Contractor shall notify City Engineer beforehand of exact date of installation of Berntsen Monuments/Markers so City Engineer can inspect procedures of the installation of Berntsen Monuments/Markers. Payment shall be at the unit price bid for each installed monument complete and in place including all labor and materials.

A 4.17 GPS Asset Information

A bid item has been designated in the Proposal to have the Contractor provide the owner with GPS data on infrastructure attributes installed with this project. Installation includes, but not limited to, construction of new and adjustment or relocation of existing stormwater attributes. Examples of stormwater attributes include: Culverts, Fittings, Inlets, Junction Boxes, Manholes, Open Channels, Bends, Outfalls and Pipes elevations of flowlines within inlets, manholes and at headwalls. Horizontal accuracy will be up to a sub-centimeter. The data will need to be formatted to the following base datum:

Note: Coordinates must be attained in Grid Coordinates not Surface Coordinates.

Projected Coordinate System:	NAD_1983_StatePlane_Texas_North_Central_FIPS_4202_Feet
Projection:	Lambert_Conformal_Conic
False_Easting:	968500.00000000
False_Northing :	6561666.66666667
Central_Meridian:	98.50000000
Standard_Parallel_1:	32.13333333
Standard_Parallel_2:	33.96666667
Latitude_Of_Origin:	31.66666667
Linear Unit:	Foot_US
Geographic Coordinate System:	GCS_North_American_1983
Datum:	D_North_American_1983
Prime Meridian:	Greenwich
Angular Unit:	Degree

Data shall be in ESRI version 10 geodatabase format with the above NAD_1983_StatePlane_Texas_North_Central_FIPS_4202_Feet. The data will need to be verified by City staff before payment can be made on this item.

In addition to GPS data, the following attribute information should be included by asset type:

Traffic Signs
Street Number
Street Name
Sign Text
MUTCD Code

Dimension – Width
Dimension – Height
Sign Mounting Height
Support Type/Material
Sign Backing
Image
Install Date

Inlets
Materials (RCP, Concrete
Description (e.g., 10 foot curb inlet)
Drainage Basin (Big Bear Creek, Little Bear Creek)

Outfalls
Description (Headwall or Flume) Dimensional measurements
Priority Status (High, Medium, Low)
Drainage Basin (Little Bear Creek, Big Bear Creek)
Diameter inches
Height inches
Width inches
Material (Concrete, Corrugated Metal, PBC, Rip Rap, Earthen, Other)
Shape (Circular, Rectangular, Trapezoidal, Natural, Other)
Flow Condition
Structural Condition
Vegetation Present
Debris Present
Observed Flow (Yes or No)
Testing- Color, odor, Floatables

Sidewalks
GPS location only; segmented by intersections

Handicap Ramps
GPS location only

Curbs and Gutters
GPS location only; segmented by intersections

Streets
GPS location only; segmented by intersections

Fire Hydrants
Brand

Model
Control Valve

Water Valves
Size
Depth
Type (Gate, Butterfly)
Marked on Curb (Y/N)

Water Lines
GPS location segmented by Water Points
Size
Material (PVC, Cast Iron, AC)
Length between Valves
Depth

Blow Offs and Flush Valves
Size
Valve Type
Material (Copper, PVC, Poly)
Control Valve
Marked on Curb(Y/N)

Cleanouts
Line Size
Plug
Marked on Curb(Y/N)

Sewer Manholes
Depth to Flowline
Material
Type (Precast, PIP, Brick)
Direction of Flow
Line Size
Rainstopper Installed (Y/N)
Marked on Curb (Y/N)

Sewer Lines
GPS location segmented by Manholes
Size
Material
Length between Manholes
Depth

A 4.18 Construction Contingency Allowance

A construction contingency allowance, in the amount designated in the Proposal, is provided to allow for expeditious handling of unforeseen conditions that may arise during the course of the Project, and may only be used with the concurrence of the City Engineer. Before contingency work is performed, the Contractor shall submit a proposed price for the work to the City Engineer and shall obtain written approval before proceeding with the additional work. Any balance of funds remaining in the construction contingency allowance at the close of the project belongs to and shall remain with the City of Colleyville.

A 4.19 Mobilization and Bonds

A lump sum bid item has been included for compensation for mobilization and bonds. This item is a one-time pay item per project and will not be paid per location. Upon presentation of a paid invoice for the required bonds, the Contractor will be paid that amount from the amount stated in the proposal. However, a monthly pay estimate will not be processed solely for paying these items. Work on other pay items must be initiated prior to processing the first monthly pay estimate. The remaining amount of the lump sum will be paid when ten (10) percent of the amount for the original construction items is earned.

A 4.20 Construction Water

Construction water necessary for the normal construction of this project will not be provided free to the Contractor. All construction water will be metered by City owned meters and only these meters. The Contractor is responsible for paying the current rate for the meter at the Utility Billing Office, City Hall, 100 Main Street, City of Colleyville, prior to picking up the meter. There will be a fee and deposit for furnishing the meter. These meters will be furnished by the City of Colleyville and will be picked up at the City of Colleyville Public Works Operations Building at 1601 Hall-Johnson Road. The meter will be read and billed each month in accordance with the current Customer Services Policy. Any damage that occurs to the meter during this time will be repaired by the City of Colleyville at the expense of the Contractor. The cost of the repairs will be deducted from the deposit and the remaining deposit returned to the Contractor. This procedure will be followed wherever construction water is needed. No exceptions to the rule will be sanctioned. If the meter is set on a fire hydrant, the meter assembly shall be provided with an approved backflow prevention device, provided by the contractor in accordance with the standard detail. Where water is necessary only to settle dust on the street at the request of the property owners, the engineer or inspector will notify the Contractor. The necessary application of water for dust shall be considered subsidiary to the other bid items listed in this contract. The City's Backflow ordinance must be followed.

A 4.21 Consecutive Street Construction

The rate of progress shall be such that at no time shall more than three (3) streets be under construction at the same time without prior approval by the project engineer or inspector.

A 4.22 Protection of the Public

The Contractor shall at all times conduct the work in such manner as to ensure the least possible obstruction to public traffic and protect the safety of the public. Any provisions necessary for the work being performed to provide public safety and convenience shall be the direct responsibility of the Contractor and shall be performed at his entire expense. Materials placed on the site, materials excavated and construction materials or equipment shall be located so as to cause as little obstruction to the public as possible

The City of Colleyville reserves the right to remedy any neglect on the part of the Contractor in regard to public convenience and safety which may come to its attention. The cost of such work done or material furnished by the City of Colleyville shall be deducted from monies due or to become due to the Contractor. For protection and convenience of the public and emergencies, the Contractor shall furnish the City with a telephone number at which the Contractor can be contacted 24 hours a day during the entire construction period of this project. This telephone number shall be furnished to the City in writing prior to the beginning of construction.

A 4.23 Protection of Adjacent Property

The Contractor shall be responsible for the protection of all fences, trees, curb and gutter, and other improvements on the property adjoining the construction sites from damage by the Contractor's equipment and personnel. The Contractor shall be responsible for notifying the property owners in advance of any trimming to be done on trees. The Contractor will notify the City of any trees, shrubs, or bushes that must be removed by the construction. No trees will be removed by the Contractor until permission is granted by the engineer or his designated representative. The Contractor will not be allowed to place excess material, forms, equipment, or any other material outside the street right-of-way without written permission of the property owner and approval of the Engineer. No dumping will be allowed in floodplains or below the 100-year flood elevation of drainage ways.

For documentation purposes, Contractor will be responsible to video the job site prior to commencing work and to provide the Inspector with a date stamped copy of the video. Contractor will be responsible for any damages caused by the Contractor or his subcontractors. Damages shall be repaired or resolved promptly upon notification by the Inspector. Damages to irrigation by negligence of the contractor shall be repaired by a licensed irrigator within 48 hours of being damaged. Contractor will be responsible for any cost incurred if City forces or City contractor repairs the damages due to lack of response from the Contractor. Such cost shall be deducted from the monthly pay estimates.

A 4.24 Use of Private Property

The Contractor shall not at any time use private property to park or turn around construction vehicles or store equipment and/or materials without the written permission of the property owner involved. The Contractor shall not at any time use water metered by meters set for the property owner’s use without written permission of the property owner. Contractor is responsible for any and all damages to private property used for construction purposes.

A 4.25 Location and Protection of Existing Structures and Utilities

In the preparation of plans and specifications, the engineer has endeavored to indicate the location of existing underground utility lines which are known to the engineer. No attempt has been made to show minor lines or service lines however, and it is not guaranteed that all major lines or structures have been shown on the plans. Prior to the start of construction, the Contractor shall communicate with the local representative of all utility companies and advise said representatives of the route of the proposed construction in order to obtain the assistance of the utility companies in the location of and in the avoidance of the conflicts with utility lines. It is the Contractor's responsibility to uncover and determine the elevation and location of all potential conflicts well ahead of the excavation.

A 4.26 Use of City Parks

The Contractor shall obtain written permission from the Parks and Recreation Department prior to the use of City park property for access or for the storage of machinery, equipment, materials, and/or supplies. Any damage incurred to City park property, by unauthorized use by the Contractor, will be the responsibility of the Contractor to repair in an equal or better condition. Payment to the Contractor may be withheld until the damage is repaired and/or payment for the damages has been made.

A 4.27 Protection of Adjacent Landscaping Improvements

The Contractor shall be responsible for the protection of any existing landscaping improvements in the medians and parkways adjacent to the project including but not limited to trees, shrubs and irrigation from damage by Contractor's equipment or personnel. If the Contractor damages any of the landscaping improvements, the Contractor shall be responsible for replacing and/or repairing the improvements prior to processing the final pay estimate for the project. If the Contractor feels any of the landscaping improvements are in conflict with the project and must be removed or have prior damage, the Contractor shall coordinate this with the project inspector prior to removal of any landscaping improvements.

A 4.28 Existing Utilities

The Contractor shall make every effort to protect existing utilities and other lines or structures. The Contractor shall not adjust, remove, or operate existing utilities unless specifically requested to do so in these specifications or authorized to do so by the engineer or his representative. Any utility damaged by the Contractor during the construction shall be suitably replaced at the Contractor's expense.

The Contractor should not assume the City has Surface Utility Engineering (SUE) maps for any of the proposed locations. Contractor will be responsible for calling for ALL locates (1-800-DIGTESS or 8-1-1) in a timely manner so that all utility issues may be addressed and resolved within the allotted contract time. For City's water, sewer and signal locates, call (817) 503-1360.

The Contractor shall contact the proper utility representative for questions or coordination of construction related to existing utilities.

Duty of an Excavator Relating to Excavation Operations That May Damage Underground Facilities

A person who intends to excavate shall notify a one call notification center not earlier than the 14th day before the date the excavation is to begin or later than the 48th hour before the time the excavation is to begin, excluding Saturdays, Sundays, and legal holidays. If an excavator makes a Saturday notification, the excavator may begin the excavation the following Tuesday at 15:59 p.m. unless the intervening Monday is a holiday. If the intervening Monday is a holiday, the excavator may begin the excavation the following Wednesday at 15:59 p.m.

The notice required under this section shall include:

- the name of the person serving the notice;
- the location of the proposed area of excavation, including:
- the street address, if available, and the location of the excavation at the street address; or
- if there is no street address, an accurate description of the excavation area using any available designations such as the closest street, road, or intersection;
- the name, address, and telephone number of the excavator or the excavator's company;
- the excavator's field telephone number, if one is available;
- the starting date and time, and the anticipated completion date of excavation; and
- a statement as to whether explosives will be used.

To have a representative present during the excavation, the utility owner shall contact the excavator and advise the excavator of the utility owner's intent to be present during excavation and confirm the start time of the excavation. If the excavator wants to change the start time, the excavator shall notify the operator to set a mutually agreed-to time to begin the excavation.

A 4.29 Protection and Cleaning of Existing Sewers

If the Contractor, through carelessness or negligence, obstructs the flow of any existing sanitary sewer or deposits any materials in the sanitary sewer within the limits of the project, the Contractor shall provide the necessary equipment and labor (or hire a subcontractor approved by City of Colleyville Public Works Operations) to clean and televise the affected sewers. The limits of the sewer lines to be cleaned and televised will be determined by Public Works Field Operations staff. The identified lines shall be cleaned immediately and televised within 48 hours of incident. Video tapes shall be delivered to project inspector, so they can be reviewed and approved for acceptance of the cleaning work.

A 4.30 Drainage

Contractor shall maintain adequate drainage at all times during construction. Changing of natural runoff flow locations or concentrating flows to a point of potential harm to the adjacent property shall not be allowed.

A 4.31 Towing of Vehicles

The Contractor shall follow applicable City of Colleyville Ordinances should it be determined that vehicles parked upon a City street must be moved in order to perform street maintenance or construction.

A 4.32 Cleanup

The Contractor shall maintain the construction site in a neat and orderly manner at all times and remove daily the trash, paper, rubbish, and debris resulting from the Contractor's operations or that of employees. In particular, all curb and gutter and sidewalk shall be backfilled as soon as possible.

Before the project is accepted by the City, all rocks, stones, and other construction debris, equipment, remaining construction materials, trash, etc. shall be removed from the construction site. The entire construction site shall be graded and cleaned to present a neat appearance prior to acceptance of the project. All necessary cleanup work shall be considered subsidiary to the various bid items on this contract. Refer to Section B 2.3 for removal and disposal of excess materials and debris.

A 4.33 Project Signs

The Contractor shall furnish and erect one or more signs identifying the project at locations selected by the City. The sign shall be substantially in accordance with the appurtenant drawings and shall be constructed of 3/4inch exterior plywood. Signs shall be placed in a prominent location and maintained in good condition until the completion of the project. Project signs will not be paid for directly but will be considered subsidiary to the various other unit prices. Projects signs will be removed by the Contractor upon the completion and acceptance of the project.

A 4.34 Salvaging of Material

All salvaged material shall remain the property of the City and salvable material which is destroyed or damaged due to negligence of the Contractor shall be replaced with new material by the Contractor at no expense to the City. Salvaged material, unless designated for reuse, shall be returned to the Public Works warehouses or storage yards by the Contractor. Returned salvaged materials shall be inspected by a Public Works or Water Utilities representative prior to acceptance of the material and issuance of a receipt for the material. Concrete blocking and extraneous material shall be removed prior to delivery.

A 4.35 Dust Nuisance

It shall be the responsibility of the Contractor to take preventive measures to eliminate, reduce, or alleviate any dust nuisance in his work area by the use of hoses, water trucks, etc. This control of dust nuisance is most important in populated areas. The method used will be approved by the City. Should the Contractor fail to control dust as outlined above, the City may suspend the work, as outlined in Section A 3.15 until corrective measures are taken.

A 4.36 Markers

The Contractor shall identify and reference all right-of-way and property line markers along the route of construction. The Contractor shall replace all markers damaged or destroyed during construction, under the supervision of a Registered Professional Land Surveyor, at no cost to the City.

A 4.37 Tree Protection and Trimming

This Section includes the protection and trimming of existing trees that interfere with, or are affected by, execution of the Work, whether temporary or permanent construction.

The Tree Protection Zone is defined as the area surrounding individual trees or groups of trees to remain during construction, and defined by the drip line of individual trees or the perimeter drip line of groups of trees, unless otherwise indicated.

Submittals

A. Tree Pruning Schedule: Written schedule from arborist detailing scope and extent of pruning of trees to remain that interfere with or are affected by construction.

B. Qualification Data: For tree service firm and arborist. An experienced tree service firm that has successfully completed tree protection and trimming work similar to that required for this Project and that will assign an experienced, qualified arborist to Project site during execution of tree protection and trimming. An arborist certified by ISA or licensed in the jurisdiction where Project is located.

C. Certification: From arborist, certifying that trees indicated to remain have been protected during construction according to recognized standards and that trees were promptly and properly treated and repaired when damaged.

D. Maintenance Recommendations: From arborist, for care and protection of trees affected by construction during and after completing the Work.

Preparation

A. Temporary Fencing: Install temporary fencing around tree protection zones to protect remaining trees and vegetation from construction damage. Maintain temporary fence and remove when construction is complete.
   1. Install chain-link fence according to ASTM F 567 and manufacturer's written instructions.

B. Protect tree root systems from damage caused by runoff or spillage of noxious materials while mixing, placing, or storing construction materials. Protect root systems from ponding, eroding, or excessive wetting caused by dewatering operations.

C. Mulch areas inside tree protection zones and within drip line of trees to remain and other areas indicated.
   1. Apply 4-in average thickness of organic mulch. Do not place mulch within 6 inches of tree trunks.

D. Do not store construction materials, debris, or excavated material inside tree protection zones. Do not permit vehicles or foot traffic within tree protection zones; prevent soil compaction over root systems.

E. Maintain tree protection zones free of weeds and trash.

F. Do not allow fires within tree protection zones.

Excavation

A. Install shoring or other protective support systems to minimize sloping or benching of excavations.

B. Do not excavate within tree protection zones, unless otherwise indicated.

C. Where excavation for new construction is required within tree protection zones, hand clear and excavate to minimize damage to root systems. Use narrow-tine spading forks and comb soil to expose roots.

   1. Redirect roots in backfill areas where possible. If encountering large, main lateral roots, expose roots beyond excavation limits as required to bend and redirect them without breaking. If encountered immediately adjacent to location of new construction and redirection is not practical, cut roots approximately back from new construction.
   2. Do not allow exposed roots to dry out before placing permanent backfill. Provide temporary earth cover or pack with peat moss and wrap with burlap. Water and maintain in a moist condition. Temporarily support and protect roots from damage until they are permanently relocated and covered with soil.

D. Where utility trenches are required within tree protection zones, tunnel under or around roots by drilling, auger boring, pipe jacking, or digging by hand.
   1. Root Pruning: Do not cut main lateral roots or taproots; cut only smaller roots that interfere with installation of utilities. Cut roots with sharp pruning instruments; do not break or chop.

Regrading

A. Grade Lowering: Where new finish grade is indicated below existing grade around trees, slope grade beyond tree protection zones. Maintain existing grades within tree protection zones.

B. Grade Lowering Within Protection Zone: Where new finish grade is indicated below existing grade around trees, slope grade away from trees as recommended by arborist, unless otherwise indicated.
   1. Root Pruning: Prune tree roots exposed during grade lowering. Do not cut main lateral roots or taproots; cut only smaller roots. Cut roots with sharp pruning instruments; do not break or chop.

C. Raising Grade: Where new finish grade is indicated above existing grade around tree, slope grade beyond the protection zone. Maintain existing grades within protection zone.

D. Minor Fill Within Protection Zone: Where existing grade is 2 inches or less below elevation of finish grade, fill with topsoil. Place topsoil in a single uncompacted layer and hand grade to required finish elevations.

Tree pruning

A. Prune trees to remain that are affected by temporary and permanent construction.

B. Prune trees to remain to compensate for root loss caused by damaging or cutting root system. Provide subsequent maintenance during Contract period as recommended by arborist.

C. Pruning Standards: Prune trees according to ANSI A300 (Part 1), as follows:
   1. Type of Pruning: Crown cleaning.
   2. Type of Pruning: Crown thinning.
   3. Type of Pruning: Crown raising.
   4. Type of Pruning: Crown reduction.
   5. Type of Pruning: Vista pruning.
   6. Type of Pruning: Crown restoration.

D. Cut branches with sharp pruning instruments; do not break or chop.

E. Chip removed tree branches and spread over areas identified by Architect or stockpile as directed by Owner.

Tree repair and replacement

A. Promptly repair trees damaged by construction operations within 24 hours. Treat damaged trunks, limbs, and roots according to arborist's written instructions.

B. Remove and replace trees indicated to remain that die or are damaged during construction operations that arborist and Landscape Architect/Engineer determines are incapable of restoring to normal growth pattern.

1. Provide new trees of same size and species as those being replaced for each tree that measure 4 inches or smaller in caliper size; plant and maintain as specified in Section A 4.38 Tree Planting.
2. Provide new trees of 6-inch caliper size and of a species selected by Landscape Architect/Engineer when damaged trees more than 6-inches in caliper size, measured above grade, are required to be replaced. Plant and maintain new trees as specified in Section A 4.38 Tree Planting.

C. Aerate surface soil, compacted during construction, 10 feet beyond drip line and no closer than 36 inches to tree trunk. Drill 2-inch diameter holes a minimum of 12 inches deep at 24 inches o.c. Backfill holes with an equal mix of augered soil and sand.

Disposal of waste materials

A. Burning is not permitted

B. Disposal: Remove excess excavated material and displaced trees from Owner's property.

C. Chipping: Removed trimmings and trees may be chipped into mulch and reused onsite upon approval of Landscape Architect/Engineer or stockpiled as directed by Owner.

A 4.38 Tree Planting

This Section includes the installation of trees as required in the plans.

Provide quantity, size, genus, species, and variety of trees, shrubs, ornamental grasses and groundcover indicated and scheduled for landscape work and complying with applicable requirements of ANSI Z60.1, American Standard for Nursery Stock.

Measure trees with branches and trunks or canes in their normal position. Do not prune to obtain required sizes. Take caliper measurements six inches above ground for trees up to and including 4" caliper size, and twelve inches above ground for larger sizes. Measure main body of all plant material of height and spread dimensions, do not measure from branch or root tip-to-tip.

Plants shall be approved by the Landscape Architect/Engineer before planting, for compliance with requirement for genus, species, variety, size, and quality. Every canopy and accent tree shall be approved by Landscape Architect/Engineer before planting occurs. Landscape Architect/Engineer retains right to further inspect plants for size and condition of balls and root systems, insects, injuries, and latent defects, and to reject unsatisfactory or defective materials at any time during progress of work. The Contractor shall remove rejected plant materials immediately from project site and replace with acceptable material at no additional cost to the Owner.

Delivery, handling and storage

A. Delivery of Trees: Do not prune prior to delivery, except as approved by Landscape

Architect/Engineer. Provide adequate protection of root systems from drying winds and sun. Do not bend or bind-tie trees in such a manner as to damage bark, break branches, or destroy natural shape. Provide protective covering during delivery. Any tree in full leaf will be sprayed with anti-desiccant prior to delivery.

B. Deliver trees after preparations for planting have been completed and plant immediately. If planting is delayed more than six hours after delivery, set plant materials and trees in shade, protect from weather and mechanical damage, and keep roots moist.

C. Do not remove container grown stock from containers before time of planting.

D. While awaiting planting do not store any plant materials on concrete, asphalt or any surfaces which reflect large amounts of heat during storage.

Job conditions

A. Timing: Tree planting shall not take place June through August, except as approved by the Landscape Architect/Engineer. A planting schedule shall be submitted to the Landscape Architect/Engineer for approval.

B. Coordination with Lawns: Protect existing lawn areas to the greatest extent practical during construction. Seed all areas disturbed during construction with approved grass.

Guarantee and replacement

A. All plant material installed under the Contract shall be guaranteed to remain alive and in healthy, vigorous condition for a period of two (2) years after date of written Final Acceptance of project landscape installation.

B. Replace all plant materials that are dead, dying, unhealthy or unsightly as determined by the Project Landscape Architect/Engineer. Replacements shall be in accordance with the drawings and specifications and shall be guaranteed as set forth in Section A above. The cost of replacements is at the Contractor=s expense. Material is to be replaced within fifteen (15) days of written notice by Owner or Project Landscape Architect/Engineer.

C. Warranty shall not include damage or loss of plants due to Acts of God, theft, fire, acts of vandalism, or negligence on the part of the Owner, as determined by the Project Landscape Architect/Engineer.

D. Contractor shall remove all wrapping materials per tree planting details and remove staking at the end of the 1st year of the guarantee period.

Topsoil

A. Native Topsoil: Existing topsoil shall be screened to omit rocks and rock chips over two (2") inch diameter, as well as trash, vegetation, and debris at the site will be used. If sufficient quantities of onsite topsoil are not available, offsite sources may be used upon approval of the Landscape Architect/Engineer.

Soil Amendments to Existing Topsoil

A. Fertilizer:
    1. Shall be organic fertilizer containing the following minimum percentages of available plant nourishment, by weight 5-3-2 (N-P-K), such as Garden-Ville Soil Food, Sustane, or approved equal.
    2. Fertilizer shall be delivered mixed as specified in standard size bags, showing weight, analysis, and name of manufacturer, and shall be stored in a weatherproof storage place, and in such a manner that it will be kept dry and its effectiveness will not be impaired. Any fertilizer which becomes caked or otherwise damaged, making it unsuitable for use, will not be accepted.
        a. Specification submittal: Submit a sample label or specification of the fertilizer proposed to be used for approval of the Landscape Architect/Engineer.

B. Compost:
    1. Shall be decomposed, sterile organic material such as cotton hulls, pine bark, or sterile manure products or approved equal. This material shall have been composted at least nine (9) months and shall be free of fungus, grass, weed seed, debris, or any toxic substances, as produced by Soil Building Systems, Inc., Dallas, Texas; Texas Earth Resources, Inc., Dallas, Texas; or approved equal.
        a. Sample and Specification Submittal: Submit a producer's specification and a one (1) quart sample of the compost proposed to be used for the Owner's approval.

C. Root Stimulator: Shall be liquefied seaweed, Maxicrop brand, or approved equal.

D. Mulch: Shall be shredded hardwood or shredded cedar bark, free of sticks, stones, clay or other foreign materials.
    1. Submittal: Submit a one (1) quart sample of proposed mulch for approval by Owner.

E. Weed Controller: Shall be Round-up as manufactured by Monsanto, Inc., or approved equal.

F. Contractor shall supply the Landscape Architect/Engineer with copies of the invoices and delivery tickets for all soil amendments.

G. Water: Water shall be available at the site via irrigation system. Water required in connection with planting will be furnished and paid for by the Owner provided it is not used in a wasteful manner. Any hose or other watering equipment shall be provided by the Landscape Contractor to water

planting areas until the job is accepted by the Owner.

H. Sample and Specification Submittal: Submit a producer's specification and a one (1) quart sample of each soil amendment proposed to be used for the Owner's approval.

Temporary irrigation

All trees not covered by the proposed irrigation must be irrigated with temporary irrigation bags. Drip irrigation bag shall be Treegator, or approved equal.

Tree staking

All trees shall be staked and guyed per the tree planting detail(s) shown in the plans. At the end of the 1st year of the guarantee period, the Contractor shall remove all stakes and guys.

Plant material

A. General: Provide container grown plant materials, except as otherwise indicated, grown in a recognized nursery in accordance with good horticultural practice, with healthy root systems developed by transplanting or root pruning. Provide only healthy stock free of disease, insects, eggs, larvae, and defects such as knots, sun scald, injuries, abrasions, or disfigurement. Trunks will be centered in root ball. Pruning cuts larger than :" will be cause for rejection of plant material. If Contractor proves that container grown trees of the specified type and size are unavailable the Landscape Architect/Engineer may approved balled and burlapped stock or make substitutions.

B. Plant name and location: the names and locations of all plants are noted in the drawings. The nomenclature of all plant materials is per hortus third by l. H. Bailey. Plant materials not conforming with these two references will be rejected by the landscape architect/engineer.

C. Quality and Size: All plant materials shall be first class representatives of their normal species or variety unless otherwise specified. They shall have a habit of growth that is normal for the species and shall be healthy, shapely, well-rooted, and vigorous. All plant materials shall be free from insect pests, plant diseases, and injuries. The containers and balls of all plants delivered to the site shall be free from any weeds or grasses which could be considered noxious or objectionable; i.e., nutgrass or Johnsongrass. ALL PLANT MATERIALS SHALL BE EQUAL TO OR EXCEED THE MEASUREMENTS SPECIFIED ON THE PLANTING PLAN WHICH ARE THE MINIMUM ACCEPTABLE SIZES. They shall be measured after pruning with the branches in normal position. The requirements for measurement, branching, grading, quality, balling and burlapping of plants specified generally follow the code of the standards currently recommended by the American Association of Nurserymen, Inc., in the American Standards for Nursery Stock.

D. Label at least one tree of each variety with a securely attached waterproof tag bearing legible designation of botanical and common name.

E. Rejection of Plants: Landscape Architect/Engineer shall approve plants prior to planting. Plant material having any of the following features, but not limited to, will be subject to rejection:

1. An excessive amount of abrasions of the bark.
2. Dried or damaged root system.
3. Dried or damaged top wood of deciduous plants, or dried or damaged foliage and top wood of evergreens.
4. Prematurely opened or damaged buds.
5. Disease or insect infestation, including eggs or larvae.
6. Dry, loose, cracked, broken, and/or undersized balls or containers which do not conform to the sizes shown on the plans.
7. Evidence of heating, molding, freezing, wind burn, sun scald, etc.
8. Container plants that are overgrown or root-bound.
9. Plants with bench balls (roots repacked with soil).
10. Plant balls encased in nonbiodegradable plastic or other impervious material.
11. Field grown, or collected plants, transplanted into containers less than six (6) months earlier.
12. Trees which have damaged, pruned, crooked, malformed, or multiple leaders, unless multiple leaders are specified or are normal for the species.
13. Plants with disfiguring knots or fresh cuts of limbs over one inch that have not completely calloused.
14. Plants that do not possess a normal balance between height and spread for the species.
15. Plant containers that are not structurally sound (cracked, bent, etc.).
16. Plants in containers with less than three-fourths (:) planting medium depth.
17. Any other physical damage or adverse conditions that would prevent thriving growth or cause an unacceptable appearance.
18. Plants that do not meet the standards shown on the plans.

<u>Deciduous and evergreen trees</u>

A. Provide trees of height, width, caliper, etc., as shown on the plans.

B. Shade trees: Provide single stem trees with a straight trunk and intack leader, unless otherwise indicated.

<u>Requirements for container grown stock</u>

A. General: Provide healthy, vigorous, well-rooted plant materials established in container in which they are sold. Provide balled and burlapped stock, when required trees exceed maximum size recommended by ANSI Z60.1 for container grown stock.

B. Established container stock is defined as a tree grown in or transplanted into a container and grown in the container for a length of time sufficient to develop new fibrous roots, so that root mass will retain its shape and hold together when removed from container (minimum of 6 months).

C. Containers: Use rigid containers which will hold ball shape and protect root mass during shipping. Provide trees established in containers of not less than minimum sizes recommended by ANSI X60.1 for kind, type, and size of trees required.

Tree planting

A. Cooperate with other contractors and trades working in and adjacent to landscape work areas. Examine drawings which show development of entire site and become familiar with scope of other work required.

B. Layout individual tree locations and areas for multiple plantings. Stake locations and outline areas and secure Landscape Architect/Engineer's acceptance before start of planting work. Make minor adjustments as may be requested by Landscape Architect/Engineer.

Layout

A. Location and spacing for plants and outline of areas to be planted shall be as denoted by stem location or by notations on the plan. All tree planting locations shall be staked by the Landscape Contractor and shall be approved by the Landscape Architect/Engineer prior to digging the planting pits.

B. Delivery of Plant Materials: Plants shall be packed and protected during delivery and after arrival at the site, against climatic, seasonal, wind damage, or other injuries, and at no time shall be allowed to dry out.

C. Protection of Plant Materials: All plants shall be handled so that roots are adequately protected at all times from drying out and from other injury. The balls of balled plants which cannot be planted immediately on delivery shall be "heeled in" for protection with soil mulch, straw, or other acceptable material.

D. Setting the Plants: All plants shall be planted in pits, centered, and set to touch such depth that the finished grade level at the plant after settlement will be the same as that at which the plant was grown. Each plant shall be planted upright and faced to give the best appearance or relationship to adjacent plants or structures. No burlap shall be pulled out from under balls or balls broken when taken from containers. All broken or frayed roots shall be cut off cleanly. Prepared soil shall be placed and compacted carefully to avoid injury to roots and to fill all voids. When the hole is nearly filled, add water and root activator, mixed per manufacturer's recommendations, and allow it to soak away. Fill the hole to finished grade and form a shallow saucer around each tree or shrub by placing a ridge of topsoil around the edge of each pit after planting.

Excavation

A. Excavate pits, beds, and trenches according to drawings with sloped “rough” sides. Leave soil in bottom of pit undisturbed. Avoid creating smooth or “glazed” sides of pit. Do not excavate tree pits until preliminary approval has been obtained from the Landscape Architect/Engineer.

B. Dispose of unsuitable subsoil removed from landscape excavations. Do not mix with planting soil or use as backfill.

C. Obstructions: If rock, underground construction, or other obstructions are encountered in excavation for planting of trees, notify Landscape Architect/Engineer. New locations may be selected by Landscape Architect/Engineer, or change order may be issued to direct removal of obstructions to depth of not less than six (6") inches below required planting depth upon approval by the Owner.

D. Drainage: Test planting pits for adequate percolation. If subsoil conditions indicate retention of water in planting areas, or if seepage or other evidence indicating presence of underground water exists, notify Landscape Architect/Engineer before backfilling. A change order may be issued to direct installation of drain tile or other measures beyond drainage requirement indicated upon approval by the Owner.

E. Fill excavations with water and allow to percolate out before setting trees.

Tree planting

A. Existing topsoil where stated on landscape plans will be used for tree planting.

B. Before mixing and placing, clean existing topsoil of roots, plants, sod, stones, clay lumps, and other extraneous materials harmful or toxic to plant growth, and dispose of off site. Use only existing soil from the site as backfill.

C. Tree Planting Pits:

1. All tree planting pits shall be a minimum of two times larger in diameter than the root ball, as shown on the planting detail(s).
2. Tree planting pits shall be backfilled with the soil excavated from the tree pits unless the soil is contaminated by lime stabilized subgrade. If the topsoil is contaminated, remove and replace with clean topsoil.

D. Setting and Backfilling:

1. Set plant stock on undisturbed soil, plumb and in center of pit or trench with top of ball two (2") inches above finished landscape grades. Remove burlap from top of root ball as shown on detail(s). Remove any nylon, plastic, or wire materials completely. Remove pallets, if any, before setting. Do not use stock if ball is cracked or broken before or during planting operation. When set, place specified backfill around base and sides of ball, and work each layer to settle backfill and eliminate voids and air pockets. When excavation is approximately 2/8 full, water thoroughly before placing remainder of backfill. Repeat watering until no more is absorbed. Water again after placing final layer of backfill.

E. Set container grown stock as specified for balled and burlapped stock, except remove container before setting. Carefully remove cover and sides of wooden boxes after partial backfilling so as not to damage root balls.

F. DO NOT construct water retention basins around tree pits.

G. All plants will be mulched after planting with a three (3") inch deep layer of mulch material entirely covering the area around each plant. Mulch shall not be piled around trunk. Root flare must be visible after mulching.

H. Install drip irrigation bags as per manufacturer=s instructions, where irrigation system is not provided.

I. Unless otherwise directed by Landscape Architect/Engineer, do not cut tree leaders, and remove only injured or dead branches. Any pruning shall be in accordance with standard horticultural practices. Stake trees per detail immediately after planting. If after pruning, the plant has become misshapen or changed in appearance, the plant will be rejected.

Cleanup

A. After all planting operations have been completed, remove all trash, excess soil, empty plant containers and rubbish from the property. All scars, ruts and other marks in the ground caused by this work shall be repaired and the ground left in a neat and orderly condition through the site. Contractor shall pick up all trash resulting from this work no less frequently than each Friday before leaving the site, once-a-week, and/or the last working day of each week. All trash shall be removed completely from the site.

B. The Contractor shall leave the site area broom clean and shall wash down all paved areas within the Contract area, leaving the premises in a clean, safe condition.

Maintenance

A. General:
   1. Maintain plant materials and lawn areas until final acceptance of the project.
   2. Correct defective work as soon as apparent or as directed by Project Landscape Architect/Engineer.
   3. All debris (including clippings, leaves, etc.) shall be removed from project site.
   4. Coordinate with irrigation contractor to ensure functional irrigation system. Notify Project Landscape Architect/Engineer should any conflicts arise. Hand water all areas that do not have automatic irrigation system until fully established.

B. Trees:
   1. Maintenance shall include litter removal, watering, pruning, fertilizing, weeding and the application of appropriate herbicides, insecticides and fungicides as necessary.
   2. Corrective Measures: Staking work, reset settled plants and remulching in order to maintain specified depth of mulch.

Protection

No heavy equipment shall be moved over the planted areas unless the soil is again prepared, graded, leveled, and replanted. It will be the responsibility of this Contractor to protect all paving surfaces, curbs, utilities, plant materials, and any other existing improvements from damage. Any damages shall be repaired or replaced at no cost to the Owner.

Acceptance

Refer to Section Guarantee and Replacement.

Expiration of guarantee period

The Contractor shall be responsible for notifying the Owner thirty (30) days prior to the expiration of the guarantee period. The Contractor shall coordinate a meeting at such time with the Owner to inspect all plant material for its health. All plant material deemed to be dead or unhealthy is to be replaced at the Contractor's expense and shall be guaranteed for a time period equal to that of the original guarantee. Contractor shall remove all wrapping materials at the end of the 1st year of the guarantee period.

A 4.39 Storm Water Pollution Prevention Plan

This item shall govern the control measures necessary to prevent and control soil erosion, sedimentation, and water pollution which may degrade receiving waters including rivers, streams, lakes, reservoirs, ground water, and wetlands. The control measures contained herein shall be installed and maintained throughout the construction contract and coordinated with any permanent or temporary pollution control features specified elsewhere on the plans and in the specifications to assure effective and continuous water pollution control throughout the construction and post construction periods.

These control measures shall not be used as a substitute for the permanent pollution control measures unless otherwise directed by the City in writing. The controls may include silt fences, straw bale dikes, rock berms, diversion dikes, interceptor swales, sediment traps, and basins, pipe slope drains, inlet protection, stabilized construction entrances, seeding, sodding, mulching, soil retention blankets or other structural or non-structural storm water pollution control.

Items of Work and Materials

It will be the Contractor's responsibility to determine the type and quantity of temporary erosion control measures required on the project. The materials used will be as specified in Section B of these specifications.

Preconstruction Submittals

This project is subject to the Texas Commission on Environmental Quality's (TCEQ) General Permit requirements for construction projects, through the Texas Pollutant Discharges Elimination System (TPDES) Program. On projects larger than five (5) acres, the Contractor shall submit a Notice of Intent (NOI) and applicable fees to TCEQ at least seven (7) days (if submitted by paper) or immediately (if submitted online) prior to the start of any construction activity. Because the City is also considered by TCEQ to be a Primary Operator, the Contractor shall also prepare the Notice of Intent (NOI) for the City of Colleyville and submit applicable fees to TCEQ at least seven (7) days (if submitted by paper) or immediately (if submitted online) prior to the start of any construction activity. The Contractor shall provide the City of Colleyville a copy of the NOI's.

On projects one (1) acre and larger but less than five (5) acres, the Contractor shall be required to post a signed and certified site notice at the construction site prior to the start of any construction activity. The Contractor shall provide the City of Colleyville a copy of the signed and certified construction site notice at least two (2) days prior to commencement of construction activities.

The information contained in the NOI's and TCEQ Site Notices shall be in accordance with the TPDES General Permit Regulations.

The Contractor shall provide to the City a site specific "Storm Water Pollution Prevention Plan" (SWPPP), in accordance with the TPDES General Permit Regulations, prior to submitting either the NOI or TCEQ site notice. An erosion control plan has been included in the construction plans for the contractor's use in preparation of the SWPPP. The SWPPP shall be prepared and certified by a licensed professional civil engineer who is familiar with the TCEQ TPDES General Permit requirements. The SWPPP shall be subject to approval by the City and/or TCEQ. The SWPPP shall contain information as required by the TPDES General Permit Regulations, including, but not limited to:

- Site Description - including a site map, description of construction activity, estimate of disturbed area, runoff coefficient, and name of receiving waters.

- Description of Controls - including plans for controlling erosion and sedimentation caused by

construction activity by utilizing hay bales, silt fences, detention/retention structures, check dams, sand bag barriers, or other approved best management practices.

- Construction Implementation - including phasing of construction activities and corresponding sequencing of erosion/pollution control measures. The Contractor shall perform his construction operations in accordance with best management practices to control erosion/pollutants in storm water discharges during construction.

- Information on endangered species and critical habitat.

- Current description of construction and waste materials stored on-site with updates as appropriate. Description of controls to reduce pollutants from these materials including storage practices to minimize exposure of the materials to storm water, spill prevention and response.

Payment for the preparation and submittal of the NOI (for both City and contractor) and the SWPPP, including any revisions necessary throughout the duration of the construction contract, shall be considered subsidiary to other items bid.

The SWPPP shall include all areas on the project that require protection. It is the Contractor's responsibility to install the control measures at the appropriate time to coincide with the Contractor's proposed project schedule and phasing. If the Contractor feels additional control measures not shown on the SWPPP are necessary due to phasing plans, it is the Contractor's responsibility to indicate such in a written request to modify the SWPPP prior to start of construction. The engineer will evaluate the request and, if approved, will negotiate an appropriate change order, if necessary.

Jobsite Paperwork

The following shall be maintained on the project site by the Contractor at all times:

A. Post near main entrance to project site or at project site office:
   1. NPDES permit number or NOI if permit number is not assigned.
   2. Local contact person with phone number.
   3. Brief description of project.
   4. Location of SWPPP if site is inactive or does not have an on-site location to store the plan.

B. SWPPP including any revisions.

C, Copy of the NPDES General Permit as published in the Federal Register.

D. Inspection reports for inspections performed every fourteen (14) days and within 24 hours after every 1/2-inch rain.

E, Record of construction activities:
   1. Dates when grading activities will occur.

2. Dates when construction activities will temporarily and/or permanently cease on a portion of the project
3. Dates when ground cover will be initiated on disturbed areas.

F. Current description of construction and waste materials stored on-site with updates as appropriate. Description of controls to reduce pollutants from these materials including storage practices to minimize exposure of the materials to storm water, spill prevention and response.

Construction Requirements

A. The Contractor shall provide control measures to prevent or minimize the impact to receiving waters as required by the plans and/or as directed by the City in writing in accordance with an approved erosion and sediment plan or SWPPP.

In any disturbed area where construction activities have ceased, permanently or temporarily, the Contractor shall initiate stabilization of the area by the use of seeding, mulching, soil retention blankets or other appropriate measures within fourteen (14) calendar days.

The Contractor shall effectively prevent and control erosion and sedimentation on the site at the earliest practicable time as outlined in the approved schedule. Control measures, where applicable, will be implemented prior to the commencement of each construction operation or immediately after the area has been disturbed.

The Contractor shall limit the amount of disturbed earth to the area(s) shown on the plans or as directed by the City. The City has the authority to limit the disturbed surface area exposed by construction operations. If, in the opinion of the City, the Contractor is not able to effectively control soil erosion and sedimentation resulting from the construction operations, the City will limit the amount of disturbed area to that which the Contractor is able to control.

Should the control measures fail to function effectively, the Contractor shall act immediately to bring the erosion and sedimentation under control by maintaining existing controls, adding controls as needed or as directed by the City's Representative. When in the opinion of the City's Representative the site is adequately stabilized, the control measures, except mulches and soil retention blankets, will be removed and properly disposed of by the Contractor. Soil retention blankets shall be removed only when, in the opinion of the City's Representative, final permanent perennial seeding would be adversely affected by the presence of an existing soil retention blanket.

All erosion, sediment and water pollution controls will be maintained in good working order. Inspections should be made at least once every seven (7) days. A rain gauge provided by the Contractor shall be located at the project site. Within 24 hours of a rainfall event of (0.5) inch or more as measured by the project rain gauge, the Contractor and City's Representative will inspect the entire project to determine the condition of the control measures. Sediment shall be removed and devices repaired as soon as practicable but no later than seven (7) calendar days after

the surrounding exposed ground has dried sufficiently to prevent further damage from equipment operations needed for repairs.

In the event of continuous rainfall over a 24 hour period, or other circumstances that preclude equipment operation in the area, the Contractor shall install backup control measures, as determined by the City's Representative as soon as practical. Any corrective action needed for the control measures shall be accomplished in the sequence directed by the City's Representative.

B. The Contractor shall also conform to the following practices and controls. All labor, tools, equipment, and incidentals to complete the following work will not be paid for directly, but shall be considered as subsidiary work to the various items included in the contract.

1. Disposal areas, stockpiles, and haul roads shall be constructed in manner that shall minimize the amount of sediment that may enter receiving water. Disposal areas shall not be located in any flood plain or receiving water. Construction roads may not be located in or cross any receiving water without prior approval of the City's

2. Representative and shall be done in compliance with applicable rules and regulations.

3. Construction operations in receiving water shall be restricted to those areas where it is necessary to perform the work shown on the plans. Whenever streams are crossed, temporary bridges, timber mats or other structures shall be used.

4. Protected Storage for paints, chemicals, solvents, fertilizers, and other potentially toxic materials shall be provided by the Contractor at a location approved by the City's Representative.

5. Construction staging areas and vehicle maintenance areas shall be constructed by the Contractor in a manner to minimize the area disturbed (use barriers to confine the area) and to prevent the runoff of pollutants at a location approved by the City's Representative. When work areas or material sources are located adjacent to a receiving water, control measures such as diversion dikes or rock berms, shall be used to keep sediment and other contaminants from entering the adjacent receiving water. Care shall be taken during the construction and removal of such barriers to minimize down-gradient sedimentation.

6. All receiving water shall be cleared as soon as practicable of temporary embankment, temporary bridges, matting, false work, piling, debris, or other obstructions placed during construction operations that are not a part of the finished work.

7. Disturbance of vegetation shall be minimized and limited to only what is shown on the construction plans or as directed by the City's Representative in writing.

8. The Contractor shall clean paved surfaces as necessary by the end of each day to remove sediment which has accumulated on the roadway.

C. The project shall not be accepted until the Contractor has cleaned up all areas to the satisfaction of the City's Representative. The project shall also not be accepted until the Contractor provides a uniform perennial vegetative cover with a density of 70 percent of adjacent undisturbed areas, or, if in the opinion of the City's Representative, permanent measures such as rip rap, gabions, or geotextiles, supplemented by temporary measures such as mulching with seed, straw bale dikes, silt fences, earth dams, etc. have been employed that shall control erosion, sedimentation, and water pollution until sufficient vegetative cover can be established.

Notice of Termination

A Notice of Termination (NOT) must be submitted by the Contractor (for both the City and Contractor) to TCEQ within 30 days of project completion, and a copy provided to the city, on all five (5) acre or larger projects. For smaller projects, the Contractor shall complete the applicable portion of the site notice related to removal of the site notice, and submit a copy of the completed site notice to the city within 30 days of project completion.

Measurement and Payment

A storm water pollution prevention plan (SWPPP) has been included in the plans and bid items for the proposed erosion/pollution control measures have been included in the bid Proposal. The bid prices for the control measures shall include all costs necessary to provide materials, equipment, and labor necessary to install, maintain and remove all control measures

If the Contractor is required to install temporary erosion, sediment and water pollution control measures due to negligence, carelessness, lack of maintenance, or failure to install permanent controls as a part of the work scheduled, and measures are ordered by the City's Representative, such work shall not be measured for Payment but shall be performed at the Contractor's expense. All labor, tools, equipment and incidentals to complete the work shall not be paid for under applicable contract items, but considered subsidiary to the various bid items.

When the need for control measures cannot be attributed to the Contractor's negligence, carelessness, lack of maintenance, or failure to install permanent water pollution control measures and these measures are shown on the plans and/or directed by the City's Representative, these measures shall be measured and paid for in accordance with applicable contract bid items. For work performed under the requirements of this item which is not comparable to work performed under contract bid items, such work shall be performed by agreed unit prices or lump sum basis. Removal of control measures not incorporated as permanent control measures shall be measured and paid for in accordance with applicable contract bid items.

In case of failure on the part of the Contractor to prevent and control soil erosion, sedimentation, and water pollution which may degrade receiving water, the City's Representative reserves the right to

employ outside assistance or to use City forces to provide the necessary corrective measures. All costs including engineering costs will be deducted from any moneys due or becoming due to the Contractor.

PART B – PAVING AND DRAINAGE SPECIAL PROVISIONS

SECTION B 1 PAVING AND DRAINAGE MATERIALS

This section of the specifications contains the specifications for material used in the project and become a permanent part thereof. Should individual specifications fail to be sufficiently complete in some detail, it will not relieve the Contractor of full responsibility for providing material of high quality to ensure total structural integrity of the infrastructure.

B 1.1 Defective Materials, Equipment or In-Place Construction

Materials and equipment not conforming to the requirements of these specifications will be rejected and shall be removed immediately from the site of the work, unless permitted to remain by the engineer. Rejected materials, the defects of which have been subsequently corrected, shall have the status of new material.

In-place construction not conforming to the requirements of these specifications will be removed and replaced at the Contractor's expense or reworked at the Contractor's expense as deemed appropriate by the engineer. Tests made on in-place construction which has been replaced or reworked due to failure to meet project specifications will be authorized by the engineer and the cost of such tests will be the expense of the Contractor. Testing will be performed by testing company under contract with the City of Colleyville at the rates specified by that contract.

If the Contractor fails to satisfactorily repair, replace or remove the defective work or materials immediately upon receipt of written notice, the City will have authority to cause such remediation to be performed and to deduct the cost thereof from any monies due or to become due to the Contractor..

B 1.2 Materials and Workmanship: Warranties and Guarantees

Under the terms of the warranties which arise from these contract documents and/or by the terms of any applicable special warranties required by the contract documents, if any of the work in accordance with this contract is found to not be in accordance with the requirements of the contract documents, the Contractor shall correct such work promptly after receipt of written notice from the City of Colleyville or the architect, engineer or other entity as the contract documents may provide. This obligation shall survive acceptance of the work under the contract and termination of the contract. In order to facilitate a prompt response, Contractor agrees to provide for warranty service to the extent practical, from local businesses, including goods and services, when such goods and services are comparable in availability, quality and price. If Contractor fails within a reasonable time after written notice to correct defective work or to remove and replace rejected work, or if Contractor fails to perform the work in accordance with the contract documents, or if Contractor fails to comply with any provision in the contract document,

either the City of Colleyville or its designee may, after seven (7) days written notice to Contractor, correct and remedy any such deficiency at the expense of the Contractor.

B 1.3 Borrow

There is insufficient material from the street excavation to complete all fills as shown on the construction plans. Therefore, it is the Contractor's responsibility to locate a suitable source of select borrow material for completing the fills on the project. Prior to using any offsite borrow material, the material must be approved by the City of Colleyville. The following will be required prior to approval:

A. The Contractor must obtain a written, notarized certification from the landowner of each proposed borrow source stating that to the best of the landowner's knowledge and belief there has never been contamination of the borrow source site with hazardous or toxic materials.

B. The Contractor shall provide adequate testing to determine that the borrow source material is not contaminated with hazardous or toxic materials. The geotechnical engineer performing the testing for the Contractor shall notify the City in writing of his/her approval of the material. No recycled soil will be allowed for use on this project without prior consent from the engineer.

C. Based on geotechnical testing performed on existing soil from the project site, a lime/cement application rate has been determined for subgrade stabilization as set forth in these special provisions. The quantities included in the Proposal are based on the determined application rate. Before using any offsite borrow material for subgrade purposes, the Contractor shall provide necessary testing to determine the lime/cement application rate for the proposed borrow material. The results of these tests shall be submitted to the City in writing by the geotechnical engineer performing the testing for the Contractor. If the lime/cement application rate required for the offsite borrow material is greater than the rate specified in these special provisions, the Contractor shall be responsible for the cost of the additional lime/cement required or locate an alternative borrow source. If the application rate required for the borrow material is less than the rate specified in these special provisions, the Contractor will be paid for the actual quantity of lime/cement used on the project. As per CMJ Engineering Geotechnical Report dated February 20, 2014 application rates shall be consistent with the following:

TABLE 1 – RECOMMENDED % AND QUANTITIES OF LIME/CEMENT

Plasticity Index (PI)	Assumed Unit Dry Weight (pcf)	% Lime	Quantity of Lime (lbs/sy)	% Cement	Quantity of Cement (lbs/sy)
0 – 15	120	0	0	5	36*
16 – 25	116	3	21	5	35
26 – 35	112	4	27	5	34
36 – 45	100	5	30	6	36

*Note: 36 lbs/sy is the minimum amount for this PI range independent of the soil unit dry weight

D. The Contractor shall provide testing (ASTM D 698) to determine the optimum density and moisture

content for the borrow material if used as treated subgrade.

E. The borrow material shall be tested for the presence of soluble sulfates. Any soil with a content of soluble sulfate in excess of 2000 ppm will not be approved.

F. No organic material, trash, debris, trees, clippings or other deleterious material will be allowed in offsite borrow material.

Payment for Borrow is based on plan quantity. Contractor shall verify excavation/fill quantities and shall notify City of Colleyville in writing of concurrence or disagreement with plan quantities prior to start of construction. Any discrepancies in quantities shall be resolved prior to beginning excavation. No adjustments to plan quantities shall be allowed once excavation/fill activities have begun.

B 1.4 Filling

Fills shall be constructed at the locations and to the lines and grades indicated on the drawings. When rock excavation is used, it shall be broken or crushed so that the maximum dimension is four (4") inches. No rock will be allowed in the upper twelve (12") inches of the fill. Equipment for compacting fills shall be sheepsfoot rollers, rubber-tired rollers, and other approved equipment capable of obtaining required density. The combined excavation and fill placing operation shall be blended sufficiently to secure the best practicable degree of compaction. Fill shall be compacted to at least ninety-five percent (95%) Standard Proctor Density at optimum moisture content, ± two percentage points, as determined by ASTM D 698. The suitability of the materials shall be subject to approval of the City of Colleyville's laboratory. Dump, then spread and mix successive loads of material to give a horizontal layer of not more than eight (8") inches in depth, loose measurement. After each layer of fill has been spread to the proper depth, it shall be thoroughly manipulated with a disc plow or other suitable and approved equipment until the material is uniformly mixed, pulverized, and brought to a uniform approved moisture content. No fill material shall be rolled until the layer of material has a uniform moisture content which will permit the proper compaction under that degree of moisture content which is the optimum for obtaining the required compaction. Dry any material having a moisture content to high for proper compaction by aeration until the moisture content is lowered to a point where satisfactory compaction may be obtained. If the moisture of the fill material is too low, add water to the material and thoroughly mix by blading and discing to produce a uniform and satisfactory moisture content. If, in the opinion of the City of Colleyville's laboratory or inspector, the rolled surface of any layer or section of the fill is too smooth to bond properly with the succeeding layer or adjacent section, roughen by discing or scarifying to the satisfaction of the City of Colleyville's laboratory before placing succeeding layer or adjacent sections.

No recycled soil will be allowed for use on this project without prior consent from the engineer.

B 1.5 Hydrated Lime

The hydrated lime to be used on this job shall conform to NCTCOG Section 301.2 with the exception of 301.2.1.2 Quicklime. No quicklime will be allowed on any project. Hydrated lime shall only be used upon a recommendation from a Geotech Engineer and written approval from the City of Colleyville.

B 1.6 Lime Stabilization of Sub-Grade

Prior to beginning any lime modification, the subgrade shall be brought to the required line, grade, cross-section, and proof rolled in accordance with specification requirements. Proof rolling shall be in accordance with TxDOT, Item 216. The cost of proof rolling shall be considered subsidiary to this item.

After the subgrade has been shaped, the roadway will be scarified to full depth and width of modification. Full depth will be eight (8") inches below finished grade and full width will be that distance from one (1') foot behind the back of curb on each side of the roadway.

Lime will be applied to that area defined so that the initial mixing operation can be completed during the same working day. Lime will be applied by the "slurry method".

Lime and water shall be combined to form a mixture for the lime application. Past experience has proven that approximately 3,200 pounds of lime to 500-600 gallons of water will produce the satisfactory mixture.

The slurry will be applied with an approved distributor or water truck by making multiple passes, if necessary, to apply the correct amount of lime. The distributor or water truck will be equipped with an agitator to keep the slurry in a consistent mixture.

For applications greater than or equal to 40 pounds per square yard, the initial application shall be applied in two equal parts on day one (1) and day two (2). This is subsidiary to the lime stabilization item.

Mixing with a pulvimixer will immediately follow the lime application(s) until 100% of all material will pass a two-inch (2") sieve. The lime treated subgrade shall then be sealed with a pneumatic roller and left for an initial curing (mellowing) period of no less than 72 hours (3 days) and no more than 168 hours (7 days) measured from day one (1) of the initial application. During the initial curing (mellowing) period, the lime treated subgrade shall be maintained at the optimum moisture content to plus (+) four (4) percentage points. The final remix and compaction shall be completed within 168 hours (7 days) measured from day one (1) of the initial application. If the final remix and compaction are not complete within 168 hours (7 days) measured from day one (1) of the initial application then an additional lime application will be required. The additional lime application amount shall be 50% of the original total application rate and shall be added to the lime treated subgrade. Further, the moisture content of the prepared subgrade shall be maintained at optimum or above until the next subsequent pavement course is installed. If this moisture decreases below optimum, the incorporation of additional moisture by scarifying and re-compaction the prepared grade will not be permitted. If at any time the prepared subgrade needs to be disturbed to incorporate moisture, an additional application of lime at 50% of the original application rate will be required. NO additional payment shall be made if these additional lime applications are required.

For the final remix the subgrade shall be re-scarified to a depth of six (6") inches and pulverized until all material conforms to the following:

Passing 1" Sieve	100%
Passing #4 Sieve	60%

Final compaction shall be accomplished in two (2) three-inch (3") lifts and compacted to at least 95% of Standard Proctor Density as defined by TEX 153-E. The allowable field moisture content at 95% Standard Proctor Density shall be maintained at optimum to plus (+) four (4) percentage points. A curing seal of emulsified asphalt, MS-1, shall be applied to the compacted subgrade at a rate of 0.15 gallons per square yard within 24 hours of passing density tests. This is subsidiary to the lime stabilization item.

No stabilizer, either concentrated or diluted, shall be allowed to enter a storm drain system or a natural waterway. The stabilizer shall be applied in a manner that prevents puddling and/or runoff. Runoff will be considered a spill. All spills shall be immediately reported to the City of Colleyville's Public Works Department at (817) 503-1360 during normal working hours and to the Colleyville Fire Department Dispatcher (817) 743-4522 during evenings and weekends. The spill shall be contained, neutralized, cleaned up, and removed from the site. Washing down the spill is not allowed. This is subsidiary to the lime stabilization item.

B 1.7 Flexible Base

All flexible base shall be in accordance with TxDOT Item 247.

Type "A" Grade 1 Flex Base shall be used as subgrade material under the proposed HMAC pavement. An acceptable alternative to Type "A" Grade 1 Flex Base is crushed concrete. Crushed concrete shall be categorized as Type "D" Grade 1 Flex Base. Flex Base shall be thoroughly compacted and placed to a depth specified on the plans.

Type A"		
Crushed or Broken Aggregate	Retained on Square Sieve	Percent
	1 ¾ inch	0
	7/8 inch	10 – 35
	3/8 inch	30 – 50
	No. 4	45 – 65
	No. 40	70 – 85
	Max LL	35
	Max PI	10
	Wet Ball Mill, Max Amount	40
	Max Increase in passing No. 40	20

Payment for Flexible Base shall include all materials, labor, equipment, hauling and placement. Measurement shall be compacted in-place plan quantities by the square yard to the thickness specified on the plans.

Daily tickets will be submitted by the Contractor and signed by the inspector.

B 1.8 Cement-Treated Base (CTB)

Cement Treated Base shall be in accordance with TxDOT Item 276. Use strength "L". In any areas where the City determines the subgrade is unstable or unsuitable, the subgrade material shall be removed and be replaced with CTB compacted to 95% of TEX-153E. Unless a separate item is included in the Proposal, CTB shall be subsidiary.

B 1.9 Epoxy Bonding Agent

Epoxy used for tie bars drilled into existing concrete shall be submitted to the project inspector for approval.

B 1.10 Hot Mix Asphaltic Concrete (HMAC)

Mixture Design

The Job Mix Formula shall be designed by the Contractor in accordance with the requirements of this special provision, TxDOT Bulletin C-14 and TxDOT Test Method Tex-204-F and tested in accordance with TxDOT Test Methods Tex-201-F and Tex-202-F, with the exception that the laboratory density will be determined as a percentage of the mixture maximum theoretical density. The maximum theoretical specific gravity shall be determined in accordance with TxDOT Test Method Tex-227-F on trial samples of the mixture near optimum asphalt content and conform to the requirements herein. The Contractor shall submit the Job or Plant Mix Formula for review on forms acceptable to the City for each source of supply and type of mixtures specified. Total sand content shall not exceed 18% for Type "D" mix. The bulk specific gravity will be determined for each aggregate to be used in the design mixture. The mixture shall be designed to produce a mixture within the density and stability requirements shown below. In addition, washed gradations of the aggregate in the job mix formula shall be plotted on the 0.45 power chart for comparison with the maximum density line.

Stability and Density

The mixture shall be designed to produce an acceptable mixture within tolerance, at or near optimum density. The mixture molded in the laboratory in accordance with TxDOT Test Method Tex-206-F and the bulk specific gravity of the laboratory compacted mixture determined in accordance with TxDOT Test Method Tex-207-F should have the following percent of maximum theoretical density as measured by TxDOT Test Method Tex-227-F and stability conforming to TxDOT Test Method Tex-208-F:

Optimum Density Range	Stability, Percent
92 to 97 Percent	Not Less Than 42%

Types

The paving mixtures shall consist of a uniform mixture of coarse aggregate, fine aggregate and asphaltic material. Mineral filler may also be required.

When properly proportioned, the mineral aggregate shall produce a gradation which will conform to the limitations for master grading given for the type specified unless otherwise shown on plans. The gradation will be determined in accordance with TxDOT Test Method Tex-200-F (Dry Sieve Analysis) and shall be based on aggregate only. The amount of asphaltic material shall conform to the limitations shown for the paving type specified in the following tables.

Type "B" (Fine Grade Binder or Leveling-up Course)

	Percent Aggregate by Weight or Volume	Tolerance
Passing 1” sieve	100	-2%
Passing 7/8” sieve	95 to 100	± 5%
Passing 5/8” sieve	75 to 95	± 5%
Passing 3/8” sieve	60 to 80	± 5%
Passing No. 4 sieve	40 to 60	± 5%
Passing No. 10 sieve	27 to 40	± 3%
Passing No. 40 sieve	10 to 25	± 3%
Passing No. 80 sieve	3 to 13	±3%
Passing No. 200 sieve	1 to 6	±3%

The asphaltic material shall form from 3.5 to 7 percent by weight or volume of the mixture (tolerances are ±0.5% by weight or ±1.2% by volume), unless specified otherwise on the plans.

Type "D" (Fine Grade Surface Course)

	Percent Aggregate by Weight or Volume	Tolerance
Passing 1/2” sieve	100	-2%
Passing 3/8” sieve	85 to 100	± 5%
Passing No. 4 sieve	50 to 70	± 5%
Passing No. 10 sieve	32 to 42	± 5%
Passing No. 40 sieve	11 to 26	± 3%
Passing No. 80 sieve	4 to 14	±3%
Passing No. 200 sieve	1 to 6	±3%

The asphaltic material shall form from 4 to 8 percent by weight or volume of the mixture (tolerances are ±0.5% by weight or ±1.2% by volume), unless specified otherwise on the plans.

Sampling and Testing for Field Control

Extraction tests for bitumen content and aggregate gradation shall be made for each 500 tons produced or fraction thereof. Extraction tests shall conform to TxDOT Test Method Tex-210-F. Tests for stability of the asphalt mixture shall conform to TxDOT Test Method Tex-208-F. The mixture shall not vary from the grading proportions of the aggregate and the asphalt content by more than the respective tolerances and shall be within the limits specified for master grading.

Tolerances in Relation to Approved Design

The aggregate portion of the paving mixture produced shall not vary from the design gradation by more than the tolerances shown in the above tables. The material passing the No. 200 sieve is further restricted to conform to the limitations for the master grading for the type specified. The asphaltic material portion of the paving mixture shall not vary from the design amount by more than the allowed tolerance and is also restricted to conform to the master limits. The method of test for determining the aggregate gradation and asphalt content of the mixture shall be TxDOT Test Method Tex- 210-F or other methods of proven accuracy.

Recycled Asphalt Pavement (RAP)

All RAP Material must meet TxDOT Item 340. Do not exceed 15% RAP by weight in Type "B" mixtures; or 5% RAP by weight in Type "D" mixtures.

In-Place Compaction Control

In-place compaction control is required for all mixtures. Asphaltic concrete should be laid and compacted to contain no more than eight (8) percent and no less than three (3) percent air voids unless otherwise indicated. The percent air voids will be calculated using the maximum theoretical specific gravity of the mixture determined according to TxDOT Test Method Tex-227-F. Roadway specimen, which shall either be cores or sections of asphalt pavement, will be tested according to TxDOT Test Method Tex-207-F. The same specimen shall be used for determining both the maximum theoretical density and field density. Specimens used for field density determinations shall be carefully crumbled, using heat, if necessary, and the maximum theoretical density determined as specified. If heating is necessary, the specimen shall be heated to the lowest temperature required for proper preparation of the sample. The use of nuclear field density determinations shall not be accepted as the basis for acceptance with respect to density. However, an approved nuclear gauge may be used to establish a rolling pattern.

The Contractor shall be responsible for assuring that the compaction of the asphaltic concrete being laid will attain between three (3) and eight (8) percent air voids. The Contractor's responsibility for the required compaction includes the selection of rolling equipment and the selection of rolling patterns to achieve the required compaction within the guidelines provided herein. The above selections of equipment and procedures must provide the required qualities of profile, smooth riding surface, and consistent workmanship in appearance.

Initial testing will be the responsibility of the City of Colleyville. The cost of any retest will be the responsibility of the Contractor. Additional information is provided in Section B 2.40 of these Provisions.

Asphalt Transitions

Transitional asphalt shall have a minimum thickness of six (6") inches or shall match existing pavement thickness, whichever is greater. Transition width shall be a minimum two (2') feet for temporary and a minimum of four (4') feet for permanent. Unless a separate item is included in the Proposal, asphalt transition shall be subsidiary.

Measurement and Payment
Hot mix will be measured by the ton of composite hot mix, which includes asphalt, aggregate, and additives.

The work performed and materials furnished in accordance with this item will be paid for at the unit price bid for HMAC of the type, surface aggregate classification, and binder specified. These prices are full compensation for surface preparation, materials including tack coat, placement, equipment, labor, tools, and incidentals.

B 1.11 Tack Coat

The unit bid prices for coarse graded base course and fine graded surface course shall include the application of a tack coat to each layer of asphaltic concrete before the next layer is applied and a tack coat shall also be applied to any exposed concrete edges that shall abuts any hot mix asphaltic concrete. The tack coat shall be a liquid asphalt complying with the specifications of the Asphalt Institute for SS-1h, MS-2 Emulsified Asphalt. The tack coat shall be applied to each layer at a rate not to exceed 0.05 gallons per square yard of surface.

B 1.12 Asphaltic Prime Coat

A prime coat shall be used on the stabilized base material immediately after the base material has been compacted to specified density and cut to grade. The prime coat shall be a liquid asphalt complying with the specification of the Asphalt Institute for type MS-2 Emulsified Asphalt. The prime coat shall be applied to the surface of the base at a rate of 0.20 to 0.40 gallons per square yard of surface and allowed to penetrate as far as possible. The cost of furnishing and installing the asphalt prime coat shall be considered subsidiary to the unit prices bid for hot mix asphaltic concrete.

B 1.13 Reinforcing Steel

All reinforcing steel used on this project shall comply in all respects to TxDOT Item 440. Payment for reinforcing steel shall be considered subsidiary to the various bid items.

B 1.14 Temporary Traffic Signals

Wood Poles, Class 4: Furnish jack pine, Norway pine, or western red cedar poles conforming to ANSI 05.1.

Cable: For traffic control cable, furnish 600 volt AC 14 AWG, stranded copper conductor, according to IMSA 20-1.

Wire sizes are minimum requirements. The City will determine if larger wire size is needed to keep the voltage drop below five (5) percent.

Guy, Span, and Messenger Wire: 3/8-inch nominal diameter, 7-strand, zinc-coated steel wire conforming to ASTM A 475, with a utility grade breaking strength of 15,400 pounds.

Guy, Span, And Messenger Wire Mounting Hardware: Engineer-approved hardware consisting of the following: machine bolts, 1 1/2-inch curved square washers, straight to angle thimbleye bolts, thimble eyenuts, angle thimbleye eyes, ovaleye bolts, standard eye nuts, strand-vise deadends, serving sleeves, messenger hangers, drive hooks, sidewalk guy fittings, guy wire thimbles, guy strain insulators, guy safety markers, anchor rods, guy adapters, expanding anchors, and screw anchors.

Furnish 5/8-inch minimum diameter bolts with square nuts. For eye hardware, use dropforged steel. Use galvanized metal hardware.

For guy strain insulators, furnish ANSI class 54-2 insulators with maximum wire diameter of 1/2-inch and minimum tensile strength of 12,000 pounds.

Separate sidewalk guy fittings by no more than six (6') feet of 2-inch rigid metallic galvanized conduit. Attach the pole plate to the pole with one 5/8-inch machine bolt and two 1/2-inch by 4-inch minimum lag bolts.

For guy safety markers, use yellow or orange plastic a minimum of seven (7') feet long.

For anchor rods, furnish 5/8-inch minimum diameter rods with a minimum breaking strength of 15,500 pounds.

Use expanding anchors having a minimum expanded area of 125 square inches.

Use screw anchors having a minimum helix area of 78 square inches 10-inch diameter with a minimum rod diameter of 1-1/4 inches and 66 inches long.

Tether and Messenger Wire: Furnish 1/4-inch nominal diameter, 7-strand, zinc coated steel tether wire conforming to ASTM A 475 with common grade breaking strength of 1900 pounds.

Tether Wire Mounting Hardware: Furnish galvanized wire rope tether wire clips, drive hooks, serving sleeves.

Signal Faces: Furnish the housing, visor, optical units, lenses, reflectors, and lamp receptacle conforming to ITE standards for adjustable face vehicle traffic control signal heads. Furnish traffic signal lamps conforming to ITE standards for traffic signal lamps.

Span Wire and Tether Wire Signal Head Mounting Hardware: Furnish only fittings designed for span wire mounting applications. The contractor may also use these fittings for the tether wire connection, or the contractor may use a tether clamp assembly. Use hardware of unpainted aluminum or that is federal yellow in color. For traffic signal head mounting lock nuts, use 1 1/2-inch hexagon, galvanized malleable iron. Use nuts 1/2-inch thick and measuring 2-1/2 inches across flat to flat. Use reinforcement plates, stiffener plates, or both, as the signal head manufacturer recommends.

Cable: Ensure that the current carrying neutral wire is white in color.

B 1.15 Reinforced Concrete Pipe

Pipe for storm sewers and culverts shall conform to the latest specifications for "Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe," A.S.T.M. Designations. All pipe shall be machine made by a process which will provide for uniform placement of zero slump concrete in the form of compaction by mechanical devices which will assure a dense concrete in the finished product. All excavation, bedding, jointing, and backfilling shall be done in accordance with the specifications outlined in Sections 501.6, 504.3, and 504.4 of the NCTCOG Specifications except as modified by these special provisions.

The Contractor will be required to furnish and use a laying schedule supplied by the manufacturer showing location of all bends, fittings, and beveled end joints required to accurately construct the system, including curves, as shown on the plans. The pipe will not be laid until the laying schedule has been reviewed and accepted by the City for construction purposes.

The laying schedule shall be based on all pipe joints constructed to the "home" or normal position and the distance between the ends of adjacent pipe sections will be essentially uniform around the periphery of the pipe. Cold Applied Preformed joint sealer (Ram neck) shall be used on all joints and the joint gap range shall not exceed the manufacture recommendations for curved or straight sections.

Payment for all reinforced concrete pipe shall be based on the contract unit price bid per linear foot of pipe measured along the centerline of the pipe in the trench and shall be full compensation for all labor and materials necessary to make the complete installation, including excavation, bedding, jointing, backfilling and Ram neck (or approved equal) joint sealer. The cost of constructing concrete collars shall be considered subsidiary to the unit prices bid for reinforced concrete pipe.

After the trench has been cut to depth below the barrel of the pipe, the bedding shall be brought up to a point slightly above the grade. Bell holes shall be formed, a trough scooped out to grade and the pipe laid and jointed as specified.

The pipe shall be bedded in a minimum of six (6") inches of crushed stone except in rock or in wet or unstable trenches where an additional three (3") inches of crushed stone will be added to the standard

bedding requirements. Crushed stone shall meet NCTCOG 504.2.2 Standard Crushed Rock - Aggregate Grade 4. River rock/gravel will be allowed as long as it meets this gradation requirement.

After the pipe has been laid and the joints made, embedment material (NCTCOG 504.2.2) shall be placed from the bottom of the pipe to the top of pipe. The material shall be placed uniformly on both sides of the pipe in order to prevent disturbance of the pipe and, if necessary, blocking shall be placed against the sides of the trench to prevent displacement of the pipe.

For the specifications for the remaining backfill operations, see Section B 2.27, "Mechanically Compacted Trench Backfill Specification".

B 1.16 Corrugated Metal Pipe

Corrugated metal pipe will only be used when specified. Corrugated metal pipe used on this project shall be bituminous coated and smooth lined helically corrugated steel pipe and pipe-arch with a continuously welded butt seam or lock seam.

The pipe shall be fabricated from flat coils. The base metal, spelter coating, and fabrication shall meet the applicable requirements of AASHTO M-36. Each pipe shall have two annular corrugations rolled in each end. Each pipe shall have two lifting lugs welded to the outside of the pipe.

Pipe Diameter	Corrugation	Gage
72"	5" x 1" or 3" x 1"	16
66"	5" x 1" or 3" x 1"	16
60"	5" x 1" or 3" x 1"	16
54"	2-2/3" x ½"	14
48"	2-2/3" x ½"	14
42" and smaller	2-2/3" x ½"	16
Arch Pipe	2-2/3" x ½"	16

After the ends have been rolled, the pipe shall be coated with bituminous material, inside and outside, to a minimum thickness of 0.05 inches as required by AASHTO M-190 for Type "A" coating. The pipe shall be centrifugally lined on the inside with bituminous material to form a smooth surface which fills the corrugations to a minimum thickness of one-eighth (1/8") inch above the crests of the corrugations. The bituminous lining material shall meet the requirements of AASHTO M-190. All saddle branch fittings for the storm sewer laterals shall also have coating and lining as specified for pipe.

Coupling bands shall be the same base material and spelter coating as the pipe. Bands shall be 0.064 inches thick and minimum ten and one-half (10-1/2") inches wide. Bands shall be bituminous coated and shall have two (2) corrugations for indexing in annular pipe ends. Bands 12-inch diameter through 30-inch diameter shall be one (1) piece, and 36-inch diameter through 96-inch diameter shall be two (2) piece, and 102-inch diameter through 144-inch diameter shall be three (3) piece. Band laps 12-inch diameter through 48-inch diameter shall be joined by one (1) galvanized bar, bolt, and strap connector.

Band laps 54-inch diameter through 144-inch diameter shall be joined by two (2) galvanized bar, bolt, and strap connectors.

The pipe shall be placed on a bedding layer of a minimum of three (3") inches of loosely placed granular material in order to provide a stable but relatively yielding cushion for the pipe. When rock excavation is encountered this bedding layer should be increased to twelve (12") inches.

Where the soil encountered at the established grade is a quicksand, muck, or unstable material, such unstable soil shall be removed and replaced with suitable stable material in uniform layers of suitable depth for compaction as directed by the engineer.

Backfilling for the metal pipe structure is a critical phase of the construction, and strict adherence to construction methods is required. After metal pipe structure has been completely assembled on the proper line and grade and headwalls constructed when required by the plan details, granular material shall be placed along both sides of the completed structures equally, in uniform layers not exceeding six (6") inches in depth (loose measurement), wetted if required and thoroughly compacted between adjacent structures and between the structures and the sides of the pipe. Granular material, as used in this section, shall be defined as free-flowing pit run sand, free of stones, clay, organic material, and debris. This material shall have a P.I. less than ten (10). Above the three-fourths point of the structure, the fill shall be placed uniformly on each side of the pipe layers not to exceed twelve (12") inches.

For backfilling, until a minimum cover of twelve (12") inches is obtained, only hand operated tamping equipment will be allowed within vertical planes two (2') feet beyond the horizontal projection of the outside surfaces of the structure. Backfill shall be compacted to 90% of Standard AASHTO Density (ASTM D698).

Unless otherwise shown on the plans or permitted in writing by the engineer, no heavy earth moving equipment will be permitted to haul over the structure until a minimum of four (4') feet of permanent or temporary, compacted fill is in place. Pipe damaged by the Contractor's equipment shall be removed and replaced by the Contractor at no additional cost.

During the backfilling operations, special emphasis is placed on the need for obtaining uniform backfill material and uniform compacted density throughout the length of the structure so that unequal pressure will be avoided. Extreme care will be taken to ensure proper backfill under the structure.

Prior to adding each new layer of loose backfill material, until a minimum of twelve (12") inches of cover is obtained, an inspection will be made of the inside periphery of the structure to determine any local or unequal deformation caused by improper construction methods. If, in the opinion of the engineer, any pipe becomes deformed during backfilling operation or as result of subsequent circumstances during the project, the Contractor shall correct such deformation at his own expense and at the direction of the engineer.

Any and all scratches, scrapes or other damage to the bituminous coating and lining of the pipe shall be repaired by recoating or otherwise as directed by the engineer.

Payment for all Smooth Lined Corrugated Steel Pipe shall be based on the contract unit price bid per linear foot of pipe measured along the centerline of the pipe in the trench and shall be full compensation for all labor and materials necessary to make the complete installation.

B 1.17 High Density Polyethylene Pipe (HDPE)

This item shall govern the furnishing and installation of all High Density Corrugated Polyethylene Smooth Wall Pipe and associated fittings necessary for constructing all storm drain facilities, all of which shall conform to AASHTO M-294 specification for High Density Corrugated Polyethylene Pipe and Fittings. The pipes shall be of the sizes, types, and dimensions shown on the plans and shall include all connections and joints to new or existing pipes, storm sewer manholes, inlets, headwalls, and other appurtenances as may be required to complete the work. High Density Polyethylene Corrugated Smooth Wall Pipe may be used when HDPE is shown on the plans or awarded as an alternative item to Reinforced Concrete Pipe (RCP).

The pipe and fittings shall be manufactured by extrusion or molding methods as called for in AASHTO M294. High density polyethylene material shall meet the requirements of ASTM D 3350 Cell Classification 335420C.

Trench width shall be the minimum for proper placement and compaction of embedment and backfill.

Embedment material shall be crushed rock with the following gradation:

0% retained on 1¼ inch
95-100% retained on #10

Depth of bedding material below the pipe shall be four (4) inches minimum (six (6) inches in rock cuts) for all pipe sizes, unless otherwise directed by the engineer or shown on the plans. For specifications for the remaining backfill operations, see Section B 2.27, “Mechanically Compacted Trench Backfill Specification”..

Manufactures recommendations for connection methods and materials necessary to accomplish tight and secure joints shall be strictly followed. This includes HDPE connections or HDPE to reinforced concrete pipe. When a connection occurs between HDPE and RCP, a concrete collar shall be used as shown in Standard Construction Details.

Minimum pipe stiffness at five (5%) percent deflection shall be as stated within AASHTO M294 when tested according to ASTM D 2412. The Contractor shall provide written certification from the manufacturer that the pipe and related fittings meet the minimum requirements within AASHTO M294. The pipe and fittings may be rejected for failure to meet any of this specification, and may be retested to establish conformity in accordance with the specification.

Payment for HDPE shall be based on the contract unit price bid per linear foot of pipe measured along the centerline of the pipe in the trench and shall be full compensation for all labor and materials necessary to make the complete installation, including excavation, bedding, jointing, and backfilling. The cost of constructing concrete collars shall be considered subsidiary to the unit prices bid for HDPE.

B 1.18 Concrete Structures

Manholes and inlets shall be constructed to the size and location shown on the plans. Construction shall be in accordance with TxDOT Item 465, "Manhole and Inlets" except as noted on the plans or in these special provisions. Payment shall be made for the manholes, inlets, and other drainage structures complete in place at the unit price bid in the Proposal. The payment shall include all work and materials necessary to complete the structure, including excavation and backfill. No additional pay will be made for manhole ring and lid, or grade rings.

No precast storm drain manholes or curb inlets will be allowed unless approved by the engineer prior to construction.

Concrete for all concrete drainage structures, manholes, and inlets shall be Class "A" with a minimum compressive strength of 3,000 psi at 28 days. A minimum of five (5) sacks of cement (Type I) shall be used per cubic yard and the maximum water-cement ratio shall not exceed 6.5 gallons per sack.

Concrete for channel lining and rip-rap shall also be Class "A" concrete having a minimum compressive strength of 3,000 psi at 28 days.

The desired slump for Class "A" concrete shall be three (3") inches and the maximum allowable slump shall be four (4") inches.

Air entrainment (5 %, ± 1.5%) is required for all exposed concrete.

Calcium Chloride will not be permitted. Air-entraining, retarding, and water reducing admixtures must be approved and shall conform in all respects to NCTCOG 303.2.3.

Aggregates for Class "A" concrete shall be either Grade 2 or Grade 3 for coarse aggregate, and Grade 1 for fine aggregate. Grades specified above refer to those outlined in TxDOT Item 421.

Forms used in the construction, concrete placement, and concrete finishing, shall comply in all respects to the requirements of TxDOT Item 420.

All concrete shall be vibrated and be cured for a minimum of four (4) curing days. The acceptable methods for curing the concrete are as follows:

Form Curing: Forms left in place in contact with the concrete.
Water Curing: Water curing using either wet mats, water spray or ponding.
Membrane Curing: Compound may be used.

All weight supporting forms shall remain in place a minimum of four (4) curing days after which they may be removed if the concrete has attained a flexural strength of 500 psi as evidenced by strength tests of beam specimens cast at the time of the pour. If beams have not reached the required strength after four (4) days, the forms shall be left in place fourteen (14) days.

B 1.19 Reinforced Concrete Box Culvert

Reinforced box culverts may be cast-in-place or an approved precast reinforced box culvert. Cast in place box culvert shall be constructed in accordance with TxDOT Item 462. The precast section shall be designed in accordance with NCTCOG 501.6.2. If multiple precast box sections are used, the void space between culvert walls shall be backfilled using flowable fill of at least 600 psi concrete. Flowable fill will not be paid for directly, but will be considered subsidiary to other items of construction.

Measurement for payment shall be by the linear feet of box culvert, complete in place including reinforcing steel. The linear feet shall be calculated using the length measured between the ends of the culvert barrel along the central axis as installed or constructed.

See Section B.1.15 Reinforced Concrete Pipe for joint make-up and joint sealer specifications.

Payment shall be based on the contract unit price per linear foot of box culvert complete in place. Payment shall be full compensation for furnishing all materials, labor and incidentals and performing all work necessary to complete the work including excavation and backfill.

The box culvert shall be bedded on a minimum of six (6") inches of crushed stone except in rock or in wet conditions where an additional three (3") inches of crushed stone will be added to the standard bedding requirements.

B 1.20 Curb Inlets

The unit prices bid for curb inlets shall include all structural excavation, Class "A" Concrete, reinforcing steel, manhole rings and covers, transition curb and gutter as shown, and backfilling. Providing neat lines can be cut in the soil, outside forms will not be required from the bottom to the construction joint. All inlets will be backfilled by mechanically tamping native material in layers not exceeding six (6") inches in compacted thickness to at least 95 percent of Standard Proctor density (ASTM D 698).

Inlet tops shall not be cast until pavement is complete. Manhole lids shall be tack welded in place with three to four equally spaced one-inch welds. All concrete shall be vibrated.

B 1.21 Steel Guard Rail

The steel guard rail shall be "Galvanized Steel Beam Guard Fence" conforming to the details shown on the plans and to the requirements of TXDOT Item 560.

B 1.22 Galvanized Gabions with PVC Coating

Gabion structures consist of rectangular, compartmented, woven wire mesh baskets filled with stone used to build earth retaining and erosion control structures such as: retaining walls, channel linings, headwalls and flexible aprons for pipes, slope protection, bridge revetments and weirs.

Materials

Gabions shall be prefabricated in accordance with ASTM A975 to the size called for on the plans, or as otherwise approved. Gabions shall consist of galvanized wire with an additional PVC coating woven into a uniform, hexagonal-shaped double twist pattern with openings approximately 3-1/4" x 4-1/2". The mesh shall be fabricated in such a manner as to be non-raveling and to provide the required flexibility and strength.

All wire used for gabions, including lacing wire, shall have a tensile strength of 54,039-68,259 psi in accordance with ASTM A641 Class 3, soft temper. Elongation shall not be less than 12% in accordance with ASTM A370. The zinc coating shall meet the requirements of ASTM A641, Class 3, soft temper coating and shall be a minimum quantity of 0.70 oz/ft2 for wire 0.087" in diameter, 0.80 oz/ft^2 for wire 0.106" in diameter, 0.85 oz/ft^2 for wire 0.120" and 0.134" in diameter and 0.90 oz/ft^2 for wire 0.154" in diameter.

Mesh wire, selvage wire and lacing wire diameters for galvanized gabions with a PVC coating shall be in accordance with the nominal diameters listed in Table 1. Tolerances of all wire diameters shown shall be +/- 0.004". All testing of wire diameters shall be prior to fabrication.

Nominal Gabion Wire Diameters

	Galvanized Wire	Galvanized Wire With PVC Coating
Mesh Wire	0.120” (US 11 gauge)	0.106” (US 12 gauge)
Selvage Wire	0.154” (US 9 gauge)	0.134” (US 10 gauge)
Lacing Wire	0.087” (US 13-1/2 gauge)	0.087” (US 13-1/2 gauge)

Polyvinyl Chloride (PVC) used to coat gabion wire shall meet the following specifications:
Color - gray; Nominal Thickness - 0.020 inches; Minimum Thickness - 0.015 inches; UV Resistance - 3000 hours using apparatus Type E when tested according to ASTM D1499 and ASTM G23; Salt Spray Test - 3000 hours when tested according to ASTM Bl17; Abrasion Resistance - weight loss not more than 12% according to ASTM D1242. The PVC coating shall be uniformly applied and shall be free from cracks, splits, stretched or stressed areas.

Assembled gabions will form a rectangular unit with a minimum thickness of twelve (12") inches. The base and sides are to be woven into a single unit. The bottom of the end panels shall be factory connected to the body in such a manner that the strength and flexibility at the point of connection is approximately equal to that of the mesh. The lid for specially fabricated gabions may be separate construction. The gabion shall be divided into cells of approximately equal size by factory connected diaphragm panels

using mesh of the same type and gauge as the body of the gabion. The diaphragm panels shall be secured in proper position on the base in such a manner that no additional tying is necessary. The length of the cell shall not exceed its horizontal width. All perimeter edges of the wire mesh forming the body, end and diaphragm panels shall have a heavier gauge selvage wire woven into the edge of the mesh panel. All cut edges of the mesh panels forming the body, tops of ends and diaphragms shall be securely attached to a heavier gauge selvage wire by a minimum of two complete turns of the wire mesh around the selvage wire.

Lacing wire shall be supplied for securely fastening the gabions during all steps of assembly and construction. Lacing wire shall be included with the gabions in sufficient quantity for tying gabions in accordance with the specifications. No other wire except of the type supplied with the gabions may be used.

Gabions furnished by a manufacturer shall be of uniform size and subject to dimension tolerance limits of +/- 5%. The gabions shall be certified by a notarized, sworn affidavit from the manufacturer showing compliance with the specification requirements.

Gabion Rock

Used to fill the gabions shall be clean, hard, durable, 4" to 8" well-graded crushed limestone. Not more than 15% of the rock (by weight) shall pass a 4" opening. The rock shall be clean and shall be stored and handled in a manner to prevent contamination. Prior to placing the rock, samples shall be delivered to site and shall be approved for gradation and appearance by the engineer.

Geotextile Fabric

Used as a filter media, when specified on the plans, shall be placed along the gabion structure as shown in the plans. The fabric to be used shall be: Mirafi 140N or equal.

See Section B 2.51 for construction standards.

B 1.23 Material Safety Data Sheet

Contractor shall provide a copy of the Material Safety Data Sheet (MSDS), product specifications, Manufacturer's warranty, and application instructions to City for approval prior to commencing work, if applicable.

SECTION B 2 PAVING AND DRAINAGE CONSTRUCTION STANDARDS

B 2.1 Purpose of Special Project Specifications

This project shall be constructed in accordance with the STANDARD SPECIFICATIONS FOR PUBLIC WORKS AND TRANSPORTATION CONSTRUCTION (COG) as issued by the North Central Texas Council of Governments as it may be amended from time to time, which specifications,

including the General Conditions of the Agreement therein contained, as specifically incorporated herein and made a part of this agreement the same as if written herein; provided that where any discrepancies occur between the SPECIAL PROVISIONS (Section No. 11), the SPECIAL PROJECT SPECIFICATIONS and the STANDARD SPECIFICATIONS, the governing order shall be:

1. SPECIAL PROVISIONS
2. SPECIAL PROJECT SPECIFICATIONS
3. STANDARD SPECIFICATIONS

The SPECIAL PROJECT SPECIFICATIONS are included herein for the purpose of including in the contract documents further specifications not covered by the STANDARD SPECIFICATIONS.

B 2.2 Concrete Pavement

A. DESCRIPTION: This item shall consist of a pavement of portland cement concrete, with reinforcement as shown on plans, with or without monolithic curbs, constructed as herein specified on the prepared subgrade or other base course in conformity with the thickness and typical cross-sections shown on plans and to the lines and grades established by the Engineer. Concrete shall be considered of satisfactory quality provided it is made (a) of materials accepted for the job, (b) in the proportions established by the Engineer and (c) mixed, placed, finished and cured in accordance with the requirements of this specification and meets the requirements herein specified.

B. MATERIALS:

1. **Cement**: The cement shall be Type 1 of a standard brand of portland cement. Type III cement shall be used when high early strength concrete is required by the plans or special provisions. If the use of high early strength cement is not specified, the Contractor desires to use it, he shall obtain written permission of the Engineer and shall assume all additional costs incurred by the use of such cement. Type I and Type III cement shall conform to the requirements of ASTM Designation: C 150. When Type III cement is used, the average strength of briquettes at the age of 7 days shall be higher than that attained at 3 days. Either the tensile or the compressive tests may be used for either type cement. In addition to the requirements of ASTM Designation C 150, the specific surface area of Type I cement shall not exceed 2,000 square centimeters per gram as measured by the Wagner Turbidimeter in accordance with Test Method Tex-310-D.

   Bulk or sacked cement may be used, and a bag shall contain 94 pounds net. All bags shall be in good condition at the time of inspection. Bags varying more than 3 percent from the specified weight may be rejected and if the average net weight in any shipment as shown by weighing 50 bags taken at random is less than that specified, the entire shipment may be rejected. Bulk cement shall be weighed on approved scales as herein prescribed.

Any cement which has become partially set or which contains hard lumps or cakes, or cement salvaged from discarded or used bags, shall not be used. Any cement storage shall be suitable weather-tight building or bin which will protect the cement from dampness, and cement shall be so placed as to provide easy access for property inspection and identification of each shipment.

2. **Admixtures**: No admixtures shall be used in the concrete without prior approval, and all approved admixtures shall meet applicable AASHO, ASTM, and CSA requirements.

   Air-entraining agents shall have proven compatibility with all local concrete materials, including cement, and shall be capable of providing in the concrete the required air contents and an air-void system known to produce durable, scale-resistant concrete.

   Admixtures other than air-entraining agents shall not be used until trial mixes with job materials have shown them to be compatible at job temperatures. Trial mixes must also show that desired properties will be imparted to the fresh concrete without any subsequent loss of strength or durability in the hardened concrete.

3. **Coarse Aggregate**: Coarse aggregate shall consist of durable crushed limestone of reasonably uniform quality throughout, free from injurious amounts of salt, alkali, vegetable matter of other objectionable material, either free or as an adherent coating on the aggregate. It shall not contain more than 0.25 percent by weight of clay lumps, nor more than 1.0 percent by weight of shale nor more than 5.0 percent by weight of laminated and/or friable particles when tested in accordance with Test Method Tex-413-A.

   Coarse aggregate shall have a wear of not more than 38 percent when tested according to Test Method Tex-410-A, and when tested by standard laboratory methods shall meet the following grading requirements:

Retained on 1 3/4″ sieve			0%
Retained on 1½″ sieve	0	to	5%
Retained on 3/4″ sieve	30	to	65%
Retained on 3/8″ sieve	70	to	90%
Retained on No. 4 sieve	95	to	100%
Loss by Decantation Test Method Tex-406-A			1.0% Maximum

Where the coarse aggregate is delivered on the job in two or more sizes or types, each type and/or size shall be batched and weighed separately.

A supply of aggregate adequate for two (2) days paving shall be stockpiled at the concrete plant. All aggregates shall be handled and stored in such a manner as to prevent size segregation and contamination by foreign substances. When segregation is apparent, the aggregate shall be remixed. At the time of its use, the aggregate shall be free from frozen material and aggregate containing foreign materials will be rejected. Coarse aggregate that contains more than 0.5 percent free moisture by weight shall be stockpiled for at least 24 hours prior to use.

Adequate storage facilities shall be provided for all approved materials. The intermixing of nonapproved materials with approved materials either in stockpiles or in bins will not be permitted. Aggregates from different sources shall be stored in different stockpiles unless otherwise approved by the Engineer.

Aggregates shall be stockpiled in such a manner to prevent segregation and maintained as near as possible in a uniform condition of moisture.

Each aggregate stockpile shall be reworked with suitable equipment at such times, as required by the Engineer to remix the material to provide uniformity of the stockpile.

4. **Fine Aggregate**: Fine Aggregate shall consist of sand or a combination of sands, and shall be composed of clear, hard, durable, uncoated grains. Unless otherwise shown on plans, the acid insoluble residue of the fine aggregate shall be not less than 28 percent by weight when tested in accordance with Test Method Tex-612-J.

5. **Fine Aggregate Exclusive of Mineral Filler**: Fine aggregate shall be free from injurious amounts of salt, alkali or vegetable matter. It shall not contain more than 0.5 percent of weight of clay lumps. It shall not contain manufactured sand. When subjected to the color test for organic impurities, Test Method Tex-408-A, the fine aggregate shall not show a color darker than the standard.

When the fine aggregate is tested in accordance with Test Method Tex-317-D, it shall have tensile strength of mortar equal to or greater than the strength of standard Ottawa sand mortar.

Unless specified otherwise, fine aggregate shall meet the following grading requirements:

Retained on 3/8” sieve			0%
Retained on No. 4 sieve	0	to	5%

Retained on No. 8 sieve	0	to	20%
Retained on No. 16 sieve	15	to	50%
Retained on No. 30 sieve	35	to	75%
Retained on No. 50 sieve	70	to	90%
Retained on No. 100 sieve	90	to	100%
Retained on No. 200 sieve	97	to	100%

Fine aggregate will be subjected to the Sand Equivalent Test (Test Method Tex-203-F). The sand equivalent value shall not be less than 80, or less than the value shown on the plans, whichever is greater. A combination of manufactured sand and natural materials will be allowed. The acid insoluble residue of fine aggregate used in concrete subject to direct traffic shall be not less than 60 percent by weight when tested in accordance with Test Method Tex 612-J.

6. **Mineral Filler**: Mineral filler shall consist of clean stone dust, crushed sand, crushed shell or other approved inert material. When tested in accordance with Test Method Tex-401-A, it shall meet the following requirements:

Retained on No. 30 sieve			0%
Retained on No. 200 sieve	0	to	35%

Where fine aggregate is delivered to the job in two or more sizes or types, each type and/or size of material shall be batched and weighed separately. Where mineral filler is used, it shall be batched and weighed separately. At the time of its use, the fine aggregate shall be free from frozen material, and aggregate containing foreign material will be rejected.

All fine aggregate shall be stockpiled for at least 24 hours prior to use.

7. **Mixing Water**: Water for use in concrete and for curing shall be free from oil, acids, organic matter or other deleterious substances and shall not contain more than 1,000 parts per million of chlorides as C1. no more than 1,000 parts per million of sulfates as SO4.

Water from municipal supplies approved by the State Health Department will not require testing, but water from other sources will be sampled and tested before use in structural concrete. A sample of approximately one gallon will be submitted to Materials and Tests Division, Camp Hubbard, Austin, for test and approval.

Tests procedure shall be in accordance with AASHTO Designation: T 26.

8. **Joint Filler**: Boards for expansion joint filler and for contraction and longitudinal joints shall be of the size, shape and type indicated on the plans.

   Boards shall be obtained from redwood timber. They shall be sound heartwood and shall be free from sapwood, knots, clustered birdseye, checks and splits. Occasional sound or hollow birdseye, when not in clusters, will be permitted provided the board is free from any other defects that will impair its usefulness as a joint filler.

9. **Joint Sealing Material**: Unless otherwise shown on the plans, joint sealing material shall conform to the requirements for one of the type listed herein. The material shall adhere to the sides of the concrete joint or crack and shall form an effective seal against infiltration of water and incompressibles. The material shall not crack or break when exposed to low temperatures.

10. **Hot Poured Rubber**: This sealer shall be a rubber asphalt compound which when heated shall melt to the proper consistency for pouring and shall solidify on cooling at atmospheric temperatures.

    The material when tested in accordance with Test Method Tex-525-C shall meet the following requirements:

    Penetration:

32°F, 200 grams, 60 seconds	not less than 0.28 cm		
77°F, 150 grams, 5 seconds	0.45	to	0.75 cm

    Flow:

5 hours, 140°F, 75° incline	not more than 0.5 cm

    Bond and Extension:

15°F, 5 cycles	There shall be no cracking of the joint sealing material or break in the bond between the joint material and the mortar pieces.

11. **Preformed Compression Seal**: The material furnished shall comply with the specification for "Preformed Polychloroprene Elastomeric Joint Seals for Concrete Pavement," ASTM Designation: D 2628 as hereafter modified.

    The compression set clamp described in ASTM Designation: D 395 shall measure approximately 7″ x 9″ x 11/32″ to permit the testing of large size seals. In lieu of spacers or shims, a double locknut adjustment may be used with the larger seals. Properly prepared thin sections may be "plied-up" to obtain the necessary thickness for specified tests.

The preformed elastomeric joint sealer shall have a maximum Oil Swell of 60 percent when tested in accordance with ASTM Designation: D 471.

Acceptance shall be based upon the manufacturer's certification in accordance with ASTM Designation: D 2628, Article 8.1.1A. Certification shall be supplied in all cases, with the purchaser's option to accept or reject under Article 8.1.3, testing by the purchaser.

Use shall be made of a lubricant-adhesive in the installation of this seal. The lubricant-adhesive shall be compatible with the seal and with the concrete and shall be unaffected by the normal moisture in the concrete. It shall be a single- component compound containing only polychloroprene and soluble phenolic resins blended with antioxidants and acid acceptors in an aromatic hydrocarbon solvent mixture. It shall remain fluid in the manufactured conditions at temperatures between 5°F and 120°F and have a reasonable working life compatible with installation procedures.

The adhesive shall be stored at temperatures between 50°F and 80°F. The adhesive container shall be stamped with the date of manufacture and shall not be more than 9 months old when used. It shall be applied in accordance with the manufacturer's recommendations.

12. **Asphalt Board**: Asphalt board when used in accordance with plans shall be of required size and uniform thickness and when used in transverse joints, shall conform approximately to the shape of the pavement crown as shown on plans. Asphalt board shall consist of two liners of 0.016-inch asphalt impregnated paper filled with a mastic mixture of asphalt and vegetable fiber and/or mineral filler. Boards shall be smooth, flat and straight throughout, and shall be sufficiently rigid to permit easy installation. Boards that crack or shatter during installing and finishing operations will not be acceptable. Board shall be furnished in lengths equal to one-half the pavement width or in lengths equal to the width between longitudinal joints and may be furnished in strips or scored sheet of the required shape. When tested in accordance with Test Method Tex-524-C the asphalt board shall not deflect from the horizontal more than ¾-inch in 3½ inches.

13. **Load Transmission Devices for Expansion and Contraction Joints**: Approved load transmission devices, if used in accordance with provisions of project and specifications, shall meet the requirements specified herein.

14. **Steel Dowel Bars**: Smooth steel bar dowels, if used in accordance with provisions of project plans, shall be of the size and type indicated on plans and shall be open- hearth, basic oxygen or electric-furnace steel conforming to the mechanical properties specified for grade 60 in ASTM Designations: A 615. The free end of dowel bars shall be smooth and free of shearing burrs.

When required by plans, one end of each dowel bar shall be encased in an approved cap having an inside diameter of 1/16 inch greater than the diameter of the dowel bar. The cap shall be of such strength, durability and design as to provide free movement of the dowel bar and shall be approved by the Engineer prior to use. One end of the cap shall be filled with a soft felt plug or shall be void in order to permit free movement of the dowel bar for a distance equivalent to 150 percent of the width of the expansion joint used. The dowel caps and dowel bars shall be held securely in place by bar ties as shown on plans, or an approved equivalent thereof.

15. **Metal Installing Devices for Joint Assembly**: Metal installing devices for expansion and contraction joint assemblies (such as welded wire bar chairs, bar stakes, and marker channels, channel caps, etc.) shall be as shown on plans or may be similar devices of equivalent or greater strength, approved by the Engineer, that will secure the joint assembly in correct position during the placing and finishing of concrete. Load transmission devices used in joint assemblies shall be secured in position by a transverse metal brace of the type and design shown on plans, or may be secured by other approved devices of equivalent or greater strength that will provide positive mechanical connection between the brace and each unit (other than by wire tie) and prevent transverse movement of each load transmission device.

16. **Steel Reinforcement**: Unless otherwise shown on the plans, steel reinforcing bars as required including the tie bars shall be open-hearth, basic oxygen or electric- furnace new billet steel or Grade 60 or Grade 40 for concrete reinforcement. Bars that require bending shall be Grade 40 conforming to requirements of ASTM Designation: A-615.

    High yield reinforcing steel shall be either (1) open hearth, basic oxygen or electric- furnace new billet steel conforming to the requirements of ASTM Designations: A- 615 Grade 60 or (2) rail steel bars for concrete reinforcement, conforming to the requirements of ASTM Designation: A-616 Grade 60. (Bars produced by piling method will not be accepted.) High yield reinforcing steel bars shall be further identified by a special marking rolled into each bar. Unless otherwise designated on plans, all reinforcing steel shall be deformed bars conforming to the requirements of pertinent ASTM Specifications.

17. **Membrane Curing Compound**: The membrane curing compound shall comply with the requirements of the Section B 2.3, "Membrane Curing," Type 2 white pigmented.

C. EQUIPMENT: All equipment and tools necessary for handling materials and performing all parts of the work shall be approved by the Engineer and shall conform to TxDOT Item 360.4.

D. PROPORTIONING CONCRETE:

1. **Concrete Control**: The City shall furnish at its expense continuous plant control of the concrete by having full time a commercial laboratory at concrete plants to make the following test and inspection:
   a. Check incoming aggregates, fine and coarse, for gradations, specific gravity, unit weight, abrasion wear, etc.
   b. Determine moisture contents of the aggregates to adjust bin weights to comply with designs.
   c. Make all concrete designs in accordance with Specifications.
   d. Check scales as needed for accuracy.
   e. Help maintain proper slumps, as specified.
   f. Send inspection reports for each day's operations.

   The laboratory providing plant control shall cast field specimens and perform related tests for every 100 cubic yards of concrete manufactured, or any portion thereof, at the City's expense. Each set of beams shall consist of 3 beams.

2. **Concrete Mix Design**: The concrete shall be composed of Normal Portland Cement or High-Early-Strength Portland Cement, coarse aggregate, fine aggregate and water. The coarse aggregate cannot be less than sixty percent (60%) of the total combination of aggregates by volume. High-Early-Strength Portland Cement may be used only when specifically approved by the Engineer in writing and the concrete made therewith shall be subject to all applicable provisions of these specifications.

   Within a period of not less than ten (10) days prior to the start of concreting operations, the Contractor shall submit to the Engineer a design of the concrete mix he proposes to use together with samples of all materials to be incorporated into the mix and a full description of the source of supply of each material component. The design of the concrete mix shall conform to the provisions and limitation requirements of these specifications. When the design mix has been approved by the Engineer, there shall be no change or deviation from the proportions thereof or sources of supply except as hereinafter provided. No concrete may be placed on the job site until the mix design has been approved by the Engineer in writing to the contractor.

   It is the intent of this specification to develop and use an economical mix design with the proportion of fine aggregate in the concrete mix near the upper limit of the range that permits proper placing, finishing, and texturing and which will fulfill all requirements of this specification when using acceptable materials as furnished by the Contractor. Where hand finishing is permitted, the addition of one-half sack of cement (6 sacks total) per cubic yard shall be required.

   The concrete mix design shall have an entrained air content of 5 percent, ±1½ percent.

After the mix proportions and water-cement ratio required to produce concrete of the specified strength have been determined, placing of the concrete may be started.

The strength of the concrete in the completed pavement will be determined by compressive strength test specimens, or flexural strength test specimens, made, cured and tested as provided in THD Bulletin C-11. Modifications of the mix design will be made by the Engineer on the basis of the conformity of the strength of these test specimens with the requirements and intent of this specification.

Changes in the water-cement ratio and the mix design, including an increase in cement factor, if necessary, will be made when the average 7-day flexural strength of the concrete, as indicated by the last 10 flexural strength values (modulus of rupture) obtained from tests of beams made from concrete of the same water-cement ratio, departs from the desired minimum average strength of more than 4 percent.

The Engineer, at his option, may reject as non-representative any individual flexural strength value in each group of ten where strengths more than 10 percent above or below the average for the group are indicated and compute the average flexural strength on the basis of the remaining values. When the concrete fails to meet any of the requirements for workability, the Engineer will attempt to correct this condition by changing the mix design or by requiring the use of mineral filler. In case it is necessary to change aggregates, to use an additional aggregate or to use admixtures, preliminary strength tests will be required. Should tests representing 3 days production consistently indicate a considerable departure from the minimum specified strength, even though within the above limits, appropriate changes in the water-cement ratio and mix proportions will be made.

All concrete shall be designed for a minimum compressive strength at 28 days of three thousand six hundred pounds per square inch (3,600 psi) and a minimum flexural strength of five hundred seventy-five pounds per square inch (575 psi) at the age of seven (7) days when Type I Portland Cement is used. If Type III cement is used, a flexural strength at seven (7) days of six hundred pounds per square inch (600 psi) will be required. Flexural strength will be determined as a simple beam with center point loading (A.S.T.M. Designation C 293). While concreting operations are in progress, beam and cylinder specimens shall be made by the City's independent laboratory according to the STANDARD SPECIFICATIONS FOR PUBLIC WORKS AND TRANSPORTATION CONSTRUCTION AS ISSUED BY THE NORTH CENTRAL TEXAS COUNCIL OF GOVERNMENTS. All concrete having a minimum compressive strength at 28 days of 3,600 psi and a minimum flexural strength of 575 psi at 7 days shall have a minimum cement content of 5.5 sacks per cubic yard.

If the concrete fails to meet the strength requirements, as shown by the failure of any flexural or compressive test specimen on two out of three consecutive day's tests, the engineer shall require the cement factor increased in increments of one half (½) sack of

cement per cubic yard of concrete until the strength requirements are met and also require the contractor to redesign the mix. No increased compensation will be allowed the contractor for a necessary increase in the cement factor. Failure of all test specimens, either flexural or compressive on any day's run of concrete, may be cause for rejection of that particular section of pavement and become mandatory upon the engineer to terminate all concreting operations and require the contractor to submit a redesign of the concrete mix.

3. **Workability**: Concrete shall be uniformly plastic, cohesive and workable. Workable concrete is defined as concrete which can be placed without honeycomb and without voids in the surface of the pavement after the specified finishing machine has been over a given area twice. Workability shall be obtained without producing a condition such that free water appears on the surface of the slab when being finished as specified. Where water appears on the surface of the concrete after finishing and this condition cannot be corrected by reasonable adjustment in the batch design, the bleeding will be immediately corrected by one of the following measures or a combination of two or more of the following listed measures:

   a. Redesign of the batch.
   b. Addition of mineral filler to fine aggregate.
   c. Increase of cement content.
   d. Use of an approved admixture.

   The mix will be designed with intention of producing concrete which will have a slump of 1½ inches when tested in accordance with the STANDARD SPECIFICATIONS FOR PUBLIC WORKS AND TRANSPORTATION CONSTRUCTION AS ISSUED BY THE NORTH CENTRAL TEXAS COUNCIL OF GOVERNMENTS. The maximum slumps shall be as follows.

   a. Slipform Placement – 2 inches maximum
   b. Machine placement other than slipform – 3 inches maximum
   c. Hand placement – 4 inches maximum

E. SUBGRADE AND FORMS:

1. **Preparation of Subgrade**: Where stabilized subbase is not provided the subgrade shall be excavated as required, all unstable or otherwise objectionable material removed, and all holes, ruts and depressions filled with approved material. Rolling and sprinkling shall be performed when and to the extent directed, and the roadbed shall be completed to or above the plane of the typical sections shown on plans and the lines and grades established by the Engineer. Material excavated in the preparation of the subgrade shall be utilized in the construction of adjacent shoulders and slopes, and any additional material required for the completion of the sections shall be secured from sources

approved by the Engineer. Drainage of the roadbed shall be maintained at all times. Sealed or treated subgrade cut in the preparation of the subgrade or setting of pavement forms shall be resealed or the subgrade restored to the original condition as directed by the Engineer.

The subgrade planer shall be operated from approved forms immediately ahead of paving operations, and the subgrade shall be finished to the exact section of the bottom of the pavement as shown on plans. Where traveling form pavers are used the subgrade planer shall operate on a prepared track grade or be controlled by electronic sensors operating from a stringline that established line and grade. It shall be tested with the approved template, operated and maintained by the Contractor. The subgrade shall be maintained in a smooth, compacted condition in conformity with the required section and established grade until the pavement is placed and shall be kept thoroughly wetted down sufficiently in advance of placing any pavement to ensure its being in a firm and moist condition for at least 2 inches below the prepared surface. Sufficient subgrade shall always be prepared in advance to ensure satisfactory prosecution of the work. No equipment or hauling shall be permitted on the prepared subgrade except by special permission of the Engineer, which will be granted only in exceptional cases and only where suitable protection in the form of two-ply timber mats or other approved material is provided.

2. **Placing and Removing Forms**: The subgrade under the forms shall be firm and cut true to grade so that each form section when placed will be firmly in contact for its whole length and base width, and exactly at the established grade. Any subgrade under the forms below established grade shall be corrected, using suitable materials, place, sprinkled and rolled as directed. Forms shall be staked with at least three pins for each 10-foot section. A pin shall be placed at each side of every joint. Form sections shall be tightly joined and keyed to prevent relative displacement. Forms shall be cleaned and oiled each time they are used. Forms shall be set for sufficient distance in advance of the point where concrete is being placed to permit a finished and approved subgrade length of not less than 300 feet ahead of the mixer. Conformity of the grade and alignment of forms shall be checked immediately prior to placing concrete, and all necessary corrections made by the Contractor. Where any form has been disturbed or any subgrade becomes unstable, the form shall be reset and rechecked.

   In exceptional cases, the Engineer may require suitable stakes driven to the grade of the bottom of the forms to afford additional support. Sufficient stability of forms to support the equipment operated thereon and to withstand its vibration without springing or settlement shall be required. If forms settle and/or deflect over 1/8 inch under finishing operations, paving operations shall be stopped and the forms shall be reset to line and grade.

   Forms shall remain in place for not less than 8 hours after the concrete has been placed. They shall be carefully removed in such a manner that little or no damage will be done to the edge of the pavement. Any damage resulting from this operation shall be immediately

repaired. After the forms have been removed, the ends of all joints shall be cleaned, and any honeycombed areas pointed up with approved mortar. In cases of severe honeycomb, the pavement will be removed.

Immediately after pointing is complete, the form trench, if used, shall be filled with earth from the shoulders in such a manner as to shed water from rainfall or curing away from the edge of the pavement. On completion of the required curing, the subgrade or shoulders adjacent to the pavement shall be placed in condition to maintain drainage.

Any grade revisions shall be established by the Engineer. No additional payment over the contract unit price will be made for any pavement of a thickness exceeding that required on the plans.

F. CONCRETE MIXING AND PLACING:

1. **Mixing Methods**: The concrete shall be mixed in a mixer conforming to the requirements of TxDOT Item 360.4(3). Ready-Mix concrete may be used for curbs, irregular sections and/or small placements such as turnouts and leaveouts.

2. **Mixing**: The aggregates, mineral filler, if required, cement and water shall be measured separately, introduced into the mixer, and mixed for a period of not less than 50 seconds nor more than 90 seconds, measured from the time the last aggregate enters the drum to the time discharge of the concrete begins. The required water shall be introduced into the mixing drum during the first 15 seconds of mixing. The entire contents of the drum shall be discharged before any materials of the succeeding batch are introduced.

   a. The Engineer may increase the minimum mixing time to that necessary to produce thoroughly mixed concrete based on inspection or appropriate uniformity tests. The mixing time may be varied at any time as necessary to produce acceptable concrete.

   b. If a central mixer is used, the concrete shall be discharged into the specified hauling equipment and delivered to the road site. If truck agitators are used, the concrete shall be continuously agitated at not less than one nor more than six rpm as directed by the Engineer.

   c. The maximum size of the concrete batch, absolute volume, shall not exceed 120 percent of the rated size of the mixer (40.8 cubic feet maximum batch for the 34 cubic foot paver). Spilling of material from the mixer drum shall be corrected by reducing the size of the batch. Retempering or remixing of concrete will not be permitted.

   d. The initial batch of concrete mixed after each time the mixer is washed out shall be

enriched by additional mortar. The additional mortar shall be one sack of cement and three parts sand.

3. **Weather Conditions**: All weather temperatures will be based on readings forecasted by WBAP broadcasting station (817.787.1111).

   Except by specific written authorization of the Engineer, concrete shall not be placed when the temperature is below 40°F and falling but may be placed when the temperature is above 35°F and rising, the temperature being taken in the shade and away from artificial heat.

   When such permission is granted, the Contractor shall furnish an approved enclosure, such as canvas-covered framework, to enclose and protect all pavement so placed, and shall maintain the temperature of the air surrounding the concrete at not less than 50°F for not less than 5 days. When concrete is being placed in cold weather, other than under the conditions stated above, the Contractor shall have available a sufficient supply of an approved covering material to immediately protect concrete if the air temperature falls to 32°F, or below, before concrete has been placed 4 hours. Such protection shall remain in place during the period the temperature continues below 32°F or for a period of not more than 5 days. Neither salt nor other chemical admixtures shall be added to the concrete to prevent freezing. The Contractor shall be responsible for the quality and strength of concrete under cold weather conditions and any concrete damaged by freezing shall be removed and replaced at his expense.

4. **Placing Concrete:** Concrete shall be placed only on approved subgrade or subbase, and unless otherwise indicated on plans, the full width of the pavement shall be constructed monolithically. The concrete shall be rapidly deposited on the subgrade in successive batches and shall be distributed to the required depth and for the entire width of the pavement by shoveling or other approved methods. Rakes shall not be used in handling concrete. Workmen will not be permitted to walk in the concrete with any earth or foreign material on their boots or shoes.

   The placing operation shall be continuous. At the end of the day, or in case of unavoidable interruption or delay of more than 30 minutes, a transverse construction joint shall be placed at the point of work stoppage, provided the point at which work has been suspended is not less than eight feet (8') from the last regularly established joint. If the length is less than eight feet (8'), the concrete shall be removed back to the last regularly established joint.

   When the concrete is to be placed in separate lanes, the junction line shall not deviate from the true line more than 1/2 inch at any point and shall be finished as shown on plans.

Concrete shall be distributed to such depth that when consolidated and finished, the slab thickness required by plans will be obtained at all points and the surface shall not, at any point, be below the established grade. Special care shall be exercised in placing and spading concrete against forms and at all joints to prevent the forming of honeycombs and voids.

If a central mixer is used, the Contractor shall provide a system satisfactory to the Engineer for determining that concrete delivered to the road meets the specified requirements for mixing and time of placing.

5. **Time**: Concrete shall not be placed before the time of sunrise and shall not be placed later than shall permit the finishing of the pavement during sufficient natural light.

Temperature/Time Requirements

Max Time (1)

Concrete Temp (At Point of Placement)	(No Retarding Agent) Minutes	(With Retarding Agent) Minutes
Non-Agitated Concrete		
All temperatures	30	45
Agitated Concrete		
Above 90F	45	75
Above 75F thru 90F	60	90
75F and Below	90	120

(1) Normal dosage of retarder

Any concrete not placed as herein prescribed within the time limits specified will be rejected.

6. **Hot Weather Concrete Placing:** Concrete with a temperature of 85°F or higher will require a retarding agent admixture.

The maximum temperature of concrete at the time of placement will not exceed 100°F. All concrete that exceeds this temperature limit will be rejected.

It shall be the Contractor's and/or his supplier's responsibility to take steps to control the temperature below 100°F.

7. **Reinforcing Steel and Joint Assemblies**: All reinforcing steel, including steel wire

fabric reinforcement, tie bars, dowel bars, and load transmission devices used in accordance with plan provisions shall be accurately placed and secured in position in accordance with details shown on plans. Reinforcing bars shall be securely wired together at alternate intersections, following a pattern approved by the Engineer, and at all splices, and shall be securely wired to each dowel intersected. When wire fabric is used, it replaces only the longitudinal and transverse bars and shall be securely wired together at all splices and to each dowel intersected. Tie bars shall be installed in the required position by the method and device shown on plans or by approved method and device equivalent thereto. Bar coatings required by plans, and of material specified, shall be completed and the bars and coating shall be free of dirt or other foreign matter at the time of installation in the concrete.

Tightly adhered scale or rust which resists removal by vigorous wire brushing need not be removed except that excessive loss of section to the reinforcement due to rust shall be cause for rejection. Excessive loss of section shall be defined as loss of section to the extent that the reinforcement will no longer meet the physical requirements for the size and grade of steel specified.

Where plans require an assembly of parts of pavement joints, the assembly shall be completed, placed at required location and elevation, and all parts rigidly secured in required position by the method and devices shown on plans or by approved method and devices equivalent thereto. Dowel bars shall be accurately installed in joint assemblies in accordance with plans, each parallel to the pavement surface and to the center line of the pavement, and shall be rigidly secured in required position by such means (as shown on plans, or approved equivalent thereto) that will prevent their displacement during placing and finishing of the concrete. Unless specifically authorized by the Engineer in writing, the load transmission devices, shall be accurately installed in joint assemblies in accordance with plans, each unit vertical with its length parallel to the center line of the pavement, and all units shall be rigidly secured in required position by such means (as shown on plans, or approved equivalent thereof) that will prevent their displacement during placing and finishing of the concrete. Header boards, joint filler and other material used for forming joints shall be accurately notched to receive each load transmission device. All load transmission devices shall be free to rust and clean when installed in the concrete.

8. **Construction Joints**: Intentional stoppage of the placing of the concrete shall be at either an expansion joint or at a weakened plane joint. The following provisions shall govern for each type of joint at which the placing of concrete is stopped.

When the placing of concrete is stopped at an expansion joint, the complete joint assembly shall be installed and rigidly secured in required position as shown on plans. A bulkhead of sufficient cross-sectional area to prevent deflection, accurately notched to receive the load transmission devices or dowels, as the case may be, and shaped accurately to the cross-section of the pavement shall be provided and installed as a back-up for the joint filler and rigidly secured in required position to permit accurate finishing of

the concrete up to the joint. After the concrete has been finished to the joint, formation of the joint seal space and finishing of the joint shall be executed as specified herein and in accordance with plan requirements. The back-up bulkhead shall remain in place until immediately prior to the time when concrete placing is resumed, when it shall be carefully removed in such manner that no element of the joint assembly will be disturbed. The exposed portion of the joint assembly shall be free to adherent concrete, dirt or other material at the time placing of the concrete is resumed.

When placing of concrete is stopped at a weakened plane joint, all applicable provisions of paragraph (a) above shall apply in addition to the following requirements:

The face of the bulkhead adjoining the slab end shall be notched and grooved to fit the exposed half section of the joint assembly and shall be shaped to form the slab end at the center of the joint as shown on the plans. The half- width of joint seal-space may be formed by a strip of required section placed and removed in accordance with plan requirements for construction of transverse contraction joints. The Contractor shall have available a bulkhead shaped to the section of the pavement. This bulkhead must be drilled to permit the continuation of all longitudinal reinforcing steel through the construction joint and shall be of sufficient section and strength to prevent deflection.

Immediately upon the unintended stoppage of the placing of concrete, the Contractor shall place the available concrete to a line and install the above described bulkhead at right angles to the centerline of the pavement, perpendicular to the surface and at the required elevation. Concrete shall be placed and finished to this bulkhead. Any concrete remaining on the subgrade ahead shall be removed and disposed of as directed. When placing of the concrete is resumed before the concrete has set to the extent that the concrete will stand on removal of the bulkhead, the new concrete shall be rodded with the first. An edge created by a construction joint of this type shall have a joint seal space and shall be sealed as required for contraction joints.

G. JOINTS:

1. **General**: All transverse and longitudinal joints when required in the pavement shall be of the type or alternate type shown on plans and shall be constructed at required location, on required alignment, in required relationship to tie bars and joint assemblies, and in accordance with details shown on the plans. Such stakes, braces, brackets or other devices shall be used as necessary to keep the entire joint assembly in true vertical and horizontal position. Where concrete base is overlaid by asphaltic concrete the joints shall be prepared as specified herein, but joint sealing will not be required unless specified on plans.

   If necessary for proper installation of the sealer, excessive spalling of the joint groove shall be repaired to the satisfaction of the Engineer in the manner which he prescribes.

Careful workmanship shall be exercised in the construction of all joints, to ensure that the concrete sections are completely separated by an open joint or by the joint materials and to ensure that the joints will be true to the outline indicated.

2. **Expansion Joints**: Transverse expansion joints shall be formed perpendicular to the centerline and surface of the pavement and shall be constructed in accordance with the sequence of operations shown on plans. After the transverse finishing machine and before the longitudinal finishing machine have passed over the joint, the Contractor shall test the joint filler for correctness of position and make any required adjustment in position of the filler and shall install the joint seal space form in accordance with plans. After removal of the joint seal form as required by plans, the joint seal space above the joint filler shall be thoroughly sandblasted or machine routed to remove all projecting concrete, laitance, dirt or foreign matter. The concrete faces of the joint seal space shall be left true to line and section throughout the entire length of the joint. On completion of curing of the pavement, the joint sealing filler of the type specified shall be placed in accordance with plans. The faces of the joint seal space shall be clean and surface dry at the time joint sealing filler is placed. On completion of the joint seal, the pavement adjacent to the joint shall be left free of joint sealing material. The joint seal space shall be exactly above and not narrower than the joint filler with no concrete overhangings.

3. **Weakened Plane Joints**: Weakened plane joints shall consist of transverse contraction joints and longitudinal joints and shall be sawed as specified on the plans. The saw shall be power driven, shall be manufactured especially for the purpose of sawing concrete, and shall be capable of performing the work. Saw blades shall be designed to make a clean smooth cut having a width and depth of cut as detailed on the plans. Tracks adequately anchored, chalk, string line or other approved methods shall be used to provide true alignment of the joints. The concrete saw shall be maintained in good operating condition and the Contractor shall keep a stand-by power saw on the project at all times when concrete operations are under way.

   If membrane curing is used, the portion of the seal which has been disturbed by sawing operations shall be restored by the Contractor by spraying the areas with additional curing seal.

   a. Contraction joints: Transverse contraction joints shall be sawed joints perpendicular to the centerline and the surface of the pavement and shall be constructed by the method, and in sequence of operations, as shown on plans. Where sawed joints are used, contraction joints at intervals shown on the plans shall be sawed as soon as sawing can be accomplished without damage to the pavement and before 24 hours after the concrete has been placed, the exact time to be approved by the Engineer. The remaining contraction joints shall be sawed in a uniform pattern as directed by the Engineer, and they shall be completed before

uncontrolled cracking of the pavement takes place. All joints shall be completed before placing concrete in succeeding lanes and before permitting traffic to use the pavement.

b. Longitudinal Joints: Longitudinal joints shall be of the type or alternate types shown on plans and shall be constructed of specified materials in accordance with provisions of the plans. Longitudinal joints shall be constructed accurately to required lines, shall be perpendicular to the pavement surface at the joint, and the pavement surface over and adjacent to the joint shall be finished as specified.

Longitudinal joints shall be sawed as soon as sawing can be accomplished without damage to the pavement and before 24 hours after the concrete has been placed, the exact time to be approved by the Engineer. Sawing shall not cause damage to the pavement and the groove shall be cut with a minimum of spalling. No traffic (including construction traffic) shall be permitted on the pavement until the longitudinal joint is cut.

4. **Joint Sealers**: Joint sealers shall be either of the types shown below:

Hot Poured Rubber: This material shall be melted in an approved oil-bath kettle equipped with temperature indicators and continuously operated mechanical agitators. The material shall not be heated above 450°F and any material heated above that temperature will be rejected.

For placement in vertical joints (curb faces, etc.) either of the following procedures may be used.

a. An amount of the mixed material may be set aside until partial curing has taken place and carefully trowelled into the joint with a suitable tool.

b. The portion of the joint in the roadway shall be poured and cured. The vertical curb faces shall then be taped or formed and the material poured into the vertical joint from the top.

Preformed Compression Seal: After the joints in the hardened concrete have been repaired (if necessary) and cleaned to the satisfaction of the Engineer, the material shall be installed into each joint by means of an appropriate hand or power operated installation device using the lubricant-adhesive specified. The seal shall be installed in a compressed condition and shall be free of an objectionable amount of curling and twisting during installation in the joint groove. It shall be of such material and so installed that it will effectively seal joints in concrete against water, dirt, and stones throughout repeated cycles of expansion and

contraction. Stretching of the compression seal during installation in the joint will not be permitted.

5. **Asphalt Board**: Premolded materials, wherever used, shall be anchored to the concrete on one side of the joint by means of copper wire or nails not lighter than No. 12 B & S gage. Such anchorage shall be sufficient to overcome the tendency of the material to fall out of the joint.

6. **Curbs**: The curb shall be constructed in lengths equal to the adjoining pavement slab lengths, and expansion joints shall be provided in the curb opposite each transverse expansion joint in the pavement. Expansion joint material shall be of the same thickness, type and quality as specified for the pavement and shall be of the section as shown for the curb. All expansion joints shall be carried through the curb.

   Transverse contraction joints shall be sawed across the curb at the same location and at the same time as sawing of the transverse contraction joints in the pavement are sawed.

   A finish coat of mortar shall be applied on the exposed surfaces of the monolithic curbs. The mortar shall be composed of one part of portland cement and two parts of fine aggregate. A mortar coat will not be required for extruded curbs.

   The curb face, lower radius and top of curb shall be plastered with the sand-cement mortar. The mortar shall be applied with a template or "mule" made to conform to the curb dimensions shown on plans. All exposed surfaces of the curb shall be finished with steel trowel and brushed to a smooth and uniform surface. The mortar finish as required shall be subsidiary to the Item, "Concrete Pavement."

H. SPREADING AND FINISHING:

1. **Machine Finishing**: All concrete pavement shall be finished mechanically with approved power-driven machines, except as herein provided. Hand finishing will be permitted on the transition from a crowned section to a superelevated section without crown on curves, and on straight line superelevation sections less than 100 feet in length. Hand finishing will also be permitted on that portion of a widened pavement outside the normal pavement width, on sections where the pavement width is not uniform, or required monolithic widths are greater than that of available finishing machines.

   Machine finishing of pavement shall include the use of power-driven spreaders, power-driven vibrators, power-driven transverse strike-off, and screed, or such alternate equipment as may be substituted and approved under TxDOT Item 360.10(1). Further, any machine finishing equipment that rides on previously placed forms will be prohibited on any roadway with a total width of more than 28', nor will they be allowed on any divided roadway of any width.

All concrete pavement shall be consolidated by a mechanical vibrator. As soon as the concrete has been spread between the forms, the approved mechanical vibrator shall be operated to consolidate the concrete and remove all voids. Hand manipulated vibrators shall be used for areas not covered by the mechanical vibratory unit.

After finishing is complete and the concrete still workable, the surface shall be tested for trueness with an approved 10-foot steel straightedge. The straightedge shall be operated from the side of the pavement, placed parallel to the pavement centerline and passed across the slab to reveal any high spots or depressions. The straightedge shall be advanced along the pavement in successive stages of not more than one-half its length. Practically perfect contact of the straightedge with the surface will be required, and the pavement shall be leveled to this condition, in order to ensure conformity with the surface test required below after the pavement has fully hardened. Any correction of the surface required shall be accomplished by adding concrete, if required, and by operating the longitudinal float over the area. The surface test with the straightedge shall then be repeated.

For one-lane pavement placement and uniform widening, the equipment for machine finishing of concrete pavement shall be as directed by the Engineer, but shall not exceed the requirements of these specifications.

After completion of the straightedge operation, the first pass of the baker broom shall be made as soon as construction operations permit and before the water sheen has disappeared from the surface. This shall be followed by as many passes as required to produce the desired texture depth satisfactory to the engineer. There shall be no unnecessary delays between passes. The baker broom shall be free from encrusted mortar.

2. **Hand Finishing**: Hand finishing shall be resorted to only upon specific authorization by the Engineer. Six sacks of cement per cubic yard shall be required for all hand finish concrete.

   When hand finishing is permitted, the concrete shall be struck off with an approved strike-off screed to such elevation that when consolidated and finished the surface of the pavement shall conform to the required section and grade.

3. **Emergency Procedures**: The Contractor shall have available a conventional garden spray type can containing a commercially available monomolecular film compound. This shall be applied in the case of equipment breakdown or other emergencies to prevent the pavement from drying too rapidly. The use of this product will give the Contractor additional time to provide adequate texturing.

After completion of dragging and about the time the concrete becomes hard, the edge of the slab and joints shall be carefully finished as directed by the Engineer, and the pavement shall be left smooth and true to line.

4. **Surface Testing**: After the concrete has been placed 12 hours or more, the Engineer will test the surface of the pavement with a 10 foot straightedge. Unless specified otherwise, the surface shall not vary from the straightedge by more than 1/8 inch between any two (2) contacts, when measured longitudinally or transversely. Any high spots causing a departure from the straightedge in excess of that specified shall be ground down by the Contractor to meet the surface test requirements. Where the texture of the pavement is removed by extensive grinding, the texture shall be restored by grooving the concrete to meet the surface finishing requirements.

I. CURING: All concrete pavement shall be cured by protecting it against loss of moisture for a period of not less than 72 hours from the beginning of curing operations. Immediately after finishing operations have been completed, the entire surface of the newly laid concrete shall be covered and cured in accordance with the requirements specified for whichever of the following methods the Contractor may elect. Newly laid concrete base to be overlaid by asphaltic concrete shall not be cured by "Membrane Curing," and surfaces not to be overlaid by asphaltic concrete shall not be cured by "Asphalt Curing." In all cases in which curing requires the use of water, the curing shall have prior right to all water supply or supplies. Failure to provide sufficient cover material of the type the Contractor elects to use, failure to maintain saturation in wet curing methods, lack of water to adequately take care of both curing and other requirements, or other failures to comply with curing requirements shall be cause for immediate suspension of concreting operations and removal of any sections which are improperly cured. The covering material used in curing shall be removed as necessary to saw joints or to comply with the requirements for "Surface Test." The concrete surface shall be maintained wet with a water spray, if required, and the covering material replaced immediately on completion of sawing and testing and any required surface correction.

J. PROTECTION OF PAVEMENT AND OPENING TO TRAFFIC:

1. **Protection of Pavement**: The Contractor shall erect and maintain the barricades required by plans and such other standard and approved devices as will exclude public traffic and traffic of his employees and agents from the newly placed pavement for the periods of time hereinafter prescribed. Portions of the roadway, or crossings of the roadbed required to be maintained open for use by traffic, shall not be obstructed by the above required barricades. Crossings of the pavement required by plans, or by construction sequence, during the period prior to opening to traffic as herein specified, shall be provided with an adequate and substantial bridge, approved by the Engineer.

2. **Opening Pavement to Traffic**: The pavement shall be closed to all traffic, including vehicles of the Contractor, until the concrete is at least 7 days old and has attained a

minimum average modulus of rupture as required under Section D.2 "Concrete Mix Design," of this specification. This period of closure to all traffic may be extended if, in the opinion of the Engineer, weather or other conditions make it advisable to provide an extension of the time of protection.

At the end of the 7 day period and as long thereafter as ordered by the Engineer, and if so desired by the Contractor, the pavement may be opened for use by vehicles of the Contractor provided the gross weight (vehicle plus load) of such vehicles does not exceed 14,000 pounds. Such opening, however, shall in no manner relieve the

Contractor from his responsibility for the work. On those sections of the pavement thus opened to traffic, all joints shall first be sealed, the pavement cleaned and earth placed against the pavement edges before permitting vehicles thereon.

After the concrete in any section is 14 days old, or as long thereafter as ordered by the Engineer, such section of pavement may be opened to all traffic as required by plans or when so directed by the Engineer. On those sections of the pavement thus opened to traffic, all joints shall first be sealed, the pavement cleaned, earth placed against the pavement edges and all other work performed as required for the safety of traffic. Such opening, however, shall in no manner relieve the Contractor from his responsibility for the work.

When High Early Strength Concrete resulting from the use of Type III cement as required by plans or special provisions is used, the pavement may be opened to all traffic after the concrete is 7 days old, or as long thereafter as ordered by the Engineer, subject to the same provisions governing the opening after 14 days as above prescribed.

Where the Contractor desires to move any equipment not licensed for operation on public highways, on or across any pavement opened to traffic, he shall protect the pavement from all damage by means of two-ply timber mats of 2 inch stock or runways of heavier material laid on a layer of earth, all as approved by the Engineer.

3. **Emergency Opening to Traffic**: The Engineer may require the opening of pavement to traffic prior to the minimum time specified above under conditions of emergency which in his opinion require such action in the interest of the public. In no case shall the Engineer order opening of the pavement to traffic within less than 72 hours after the last concrete in the section is place. The Contractor shall remove all obstructing materials, place earth against the pavement edges and perform other work involved in providing for the safety of traffic as required by the Engineer in ordering emergency opening. Orders for emergency opening of the pavement to traffic will be issued by the Engineer in writing.

K. PENALTY FOR DEFICIENT PAVEMENT THICKNESS: Refer to Council of Governments Specification 5.8.6.

No additional payment over the contract unit price will be made for any pavement of a thickness exceeding that required by the plans.

L. MEASUREMENT: When provided by plans and proposal, concrete pavement will be measured by the square yard of the surface area of completed and accepted work. The surface area will be so construed to also include that portion of the pavement slab extending beneath the curb. When concrete pavement is to be measured by the square yard and monolithic curb is required, monolithic curb will be subsidiary to the item for reinforced concrete pavement.

M. PAYMENT: The work performed and materials furnished as prescribed by this item and measured as provided under "Measurement" will be paid for at the unit price bid for Reinforced Concrete pavement, or the adjusted unit price for pavement for deficient thickness as provided under "Penalty for Deficient Pavement Thickness," which price shall be full compensation for shaping and fine grading the roadbed, including furnishing and applying all water required; for furnishing, loading and unloading, storing, hauling and handling all concrete ingredients, including all freight and royalty involved; for placing and adjusting forms, including supporting material or preparing track grade; for mixing, placing, finishing, sawing, cleaning and sealing joints, and curing all concrete; for furnishing and installing all reinforcing steel; for furnishing all materials for sealing joints and placing longitudinal, expansion and weakened plane joints, including all steel dowel caps and load transmission devices required, and wire and devices for placing, holding and supporting the steel bars, load transmission devices and joint filler material in proper position, for coating steel bars where required by plans, and for manipulations, labor, equipment, appliances, tools, traffic provisions and incidentals necessary to complete the work.

Excavation required by this item in the preparation of the subgrade and for the completion of the shoulders and slopes will be measured and paid for in accordance with the provisions governing the Items of "Unclassified Roadway Excavation."

Sprinkling and rolling required for the compaction of the rough subgrade in advance of fine grading will be measured and paid for as indicated in the governing items of excavation. Maintenance of a moist condition of the subgrade in advance of fine grading and concrete placing will not be paid for directly but shall be considered subsidiary work, as provided above.

B 2.3 Membrane Curing

A. DESCRIPTION: This item shall consist of curing concrete pavement, concrete pavement (base), curbs, gutters, retards, sidewalks, driveways, medians, islands, concrete rip-rap, cement stabilized rip-rap, concrete structures, and other concrete as indicated on the plans by impervious membrane method.

B. MATERIALS: The membrane curing compound shall comply with the "Standard Specification for Liquid Membrane-forming Compounds for Curing Concrete," ASTM Designation: C 309, Type 1 clear or translucent, or Type 2 white pigmented. The material shall have a minimum flash point of 80°F when tested by the "Pensky-Martin Closed Cup Method."

It shall be of such consistency that it can be satisfactorily applied as a fine mist through an atomizing nozzle by means of approved pressure spraying equipment at atmospheric temperatures above 40°F.

It shall be of such nature that it will not produce permanent discoloration of concrete surfaces nor react deleteriously with the concrete or its components. Type 1 compound shall contain a fugitive dye that will be distinctly visible not less than 4 hours nor more than 7 days after application.

The compound shall produce a firm, continuous, uniform moisture impermeable film free from pinholes and shall adhere satisfactorily to the surfaces of damp concrete. It shall, when applied to the damp concrete surface, at the rate of coverage specified herein, dry to touch in not more than 4 hours and shall adhere in a tenacious film without running off or appreciably sagging. It shall not disintegrate, check peel or crack during the required curing period.

The compound shall not peel or pick up under traffic and shall disappear from the surface of the concrete by gradual disintegration.

The compound shall be delivered to the job only in the manufacturer's original containers, which shall be clearly labeled with the manufacturer's name, the trade name of the material, and a batch number or symbol with which test samples may be correlated.

The water retention test shall be in accordance with Test Method Tex-219-F. Percentage loss shall be defined as the water lost after the application of the curing material was applied. The permissible percentage moisture loss (at the rate of coverage specified herein) shall not exceed the following:

24 hours after application.....2 percent
72 hours after application.....4 percent

C. CONSTRUCTION METHODS: The membrane curing compound shall be applied after the surface finishing has been completed, and immediately after the free surface moisture has disappeared. The surface shall be sealed with a single uniform coating of the specified type of curing compound applied at the rate of coverage recommended by the manufacturer and directed by the Engineer, but not less than 1 gallon per 180 square feet of area. The Contractor shall provide satisfactory means and facilities to properly control and check the rate of applications of the compound.

The compound shall be thoroughly agitated during its use and shall be applied by means of approved power pressure sprayers. The sprayers shall be equipped with satisfactory atomizing nozzles. Only on small miscellaneous items will the Contractor be permitted to use hand-powered spray equipment.

The compounds shall not be applied to a dry surface and if the surface of the concrete has become dry, it shall be thoroughly moistened prior to application of membrane by fogging or mist application. Sprinkling or coarse spraying will not be allowed.

At locations where the coating shows discontinuities, pinholes, or other defects; or if rain falls on the newly-coated surface before the film has dried sufficiently to resist damage, an additional coat of the compound shall be applied immediately at the same rate of coverage specified herein.

To ensure proper coverage, the Engineer shall inspect all treated areas after application of the compound for the period of time designated in the governing specification for curing, either for membrane curing or for other methods. Dry areas are identifiable because of the lighter color or dry concrete as compared to damp concrete. All suspected areas shall be tested by placing a few drops of water on the suspected areas. If the water stands in rounded beads or small pools which can be blown along the surface of the concrete without wetting the surface, the water-impervious film is present. If the water wets the surface of the concrete as determined by obvious darkening of the surface, or by visible soaking into the surface, no water-impervious film is present. Should the foregoing test indicate that any area during the curing period is not protected by the required water- impervious film, an additional coat or coats of compound shall be applied immediately, and the rate of application of the membrane compound shall be increased until all areas are uniformly covered by the required water-impervious film.

When temperatures are such as to warrant protection against freezing, curing by this method shall be supplemented with an approved insulating material capable of protecting the concrete for the specified curing period.

If at any time there is reason to believe that this method of curing is unsatisfactory or is detrimental to the work, the Contractor, when notified, shall immediately cease the use of this method and shall change to curing by one of the other methods specified under this contract.

D. MEASUREMENT AND PAYMENT: Work and materials prescribed herein will not be paid for directly but shall be included in the unit price bid for the items of construction in which these materials are used.

B 2.4 Detours and Barricades

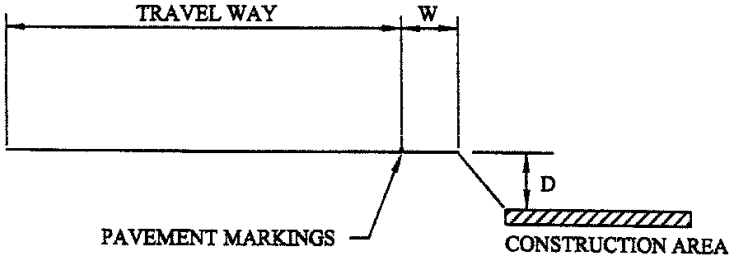
The Contractor shall submit to the inspector two (2) copies of a Traffic Control Plan designed and sealed by a licensed professional engineer two (2) weeks prior to closing any street or causing any obstruction to traffic on any street. The Contractor shall not proceed with the implementation of the Traffic Control Plan until notified by the Inspector that the plan has been accepted. The Traffic Control Plan shall be drawn at a scale not less than 1"=200' unless approved by the inspector and such that it is legible and shall include proposed street closings, detours, barricade placements, and sign placement, including advance warning signs, temporary signals and pavement markings if necessary. The Contractor shall furnish and erect suitable barricades, signs, signals and appropriate pavement markings to protect motorists and pedestrians, as set forth in the latest edition of the *Texas Manual on Uniform Traffic Control Devices*. The barricades, signs, signals and pavement markings shall be constructed, placed, and adequately maintained as set forth in the Traffic Control Plan or as directed by the engineer or his/her authorized representative. All barricades, signs, signals, pavement markings, and hours of restrictions shall conform to and be set in accordance with the *Texas Manual on Uniform Traffic Control Devices*. Unless otherwise approved by the engineer or his/her authorized representative, two-way traffic shall be maintained on all roadways under construction at all times. If it becomes necessary to detour traffic off the existing paved roadway for more than seven (7) days, a hard surface driving lane, such as asphalt, shall be properly constructed and maintained by the Contractor throughout the duration of the detour. All temporary tie-ins shall be constructed of 4-inch Type B asphalt over a compacted subgrade (standard compaction). Subsequent maintenance of all detours and tie-ins shall be considered subsidiary to the unit prices bid for temporary asphalt. Cutting, removing, and replacing the asphalt for utility installations, excavation, and/or liming operations shall be considered subsidiary to the initial placement of asphalt and will not be paid for each re-installation. Asphalt shall be replaced within seven (7) days of removal for these activities. A bid item shall be included for furnishing, installing, maintaining and final removal of the asphalt.

CONTRACTOR IS RESPONSIBLE FOR MAINTAINING TEMPORARY TIE INS.

Where pavement drop-offs occur, traffic control plans shall be as outlined in the *Texas Manual on Uniform Traffic Control Devices*. These guidelines are applicable to construction work where continuous pavement edges or drop-offs exist parallel and adjacent to a lane used for traffic.

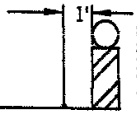
When performing maintenance on major arterials, Contractor shall use portable message boards to inform the public of the construction date, length of project, and to expect delays. The signs shall be operational 24 hours a day. Portable message boards shall be erected seven (7) calendar days prior to beginning work, and all verbiage shall be approved by the City Engineer.

No direct compensation (unless bid item included) will be made to the Contractor for furnishing, installing, and maintaining any Traffic Control Devices, including but not limited to message boards, barricades, warning signs, signals, pavement markings, and detours and their subsequent maintenance and removal. This is to be considered subsidiary to the several items for which unit prices are requested in the Proposal. Should it be necessary for the City to provide and/or maintain signs, barricades, signals, and markings the cost of such shall be deducted from the monthly estimate.



"W" GREATER THAN OR EQUAL TO 30' NO DEVICE NEEDED

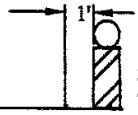
"W" LESS THAN 30' BUT GREATER THAN OR EQUAL TO 12' WITHOUT CURB OR 2' WITH CURB



SPACING OF VERTICAL PANELS SHALL COMPLY WITH THE LATEST EDITION OF THE TEXAS MANUAL OF UNIFORM TRAFFIC CONTROL DEVICES

"W" LESS THAN 12' WITHOUT CURB OR 2' WITH CURB AND:

Ⓐ "D" = 2" TO 6"



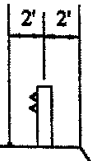
SPACING OF VERTICAL PANELS SHALL COMPLY WITH THE LATEST EDITION OF THE TEXAS MANUAL OF UNIFORM TRAFFIC CONTROL DEVICES

Ⓑ "D" GREATER THAN 6" TO 24"

4' MIN. (6' DESIRED)

30 OR 55 GALLON DRUMS SPACING OF 30 OR 55 GAL. DRUM SHALL COMPLY WITH THE LATEST EDITION OF THE TEXAS MANUAL OF UNIFORM TRAFFIC CONTROL DEVICES

Ⓒ "D" GREATER THAN 24"



MBGF, CONCRETE MEDIAN BARRIER OR "W" SECTION ON DRUMS FOR SLOPES STEEPER THAN 2:1 (IF SLOPE IS 2:1 OR FLATTER DETAIL 'B' MAY BE USED)

TRAFFIC CONTROL DEVICE DETAIL

B 2.5 Access to Private Properties

The Contractor shall maintain all private drives in an accessible condition to allow residents ingress and egress before leaving the job site, except during the placing and curing of drive approaches. All commercial drives and other locations with high traffic volumes, as directed by the engineer, shall be maintained with 4-inch Type B asphalt over a compacted subgrade (standard compaction). Subsequent maintenance of drives shall be considered subsidiary to the unit prices bid. Cutting, removing, and replacing the asphalt for utility installations, excavation, and/or liming operations shall be considered subsidiary to the initial placement of asphalt and will not be paid for each re-installation. Asphalt shall be replaced within seven (7) days of removal for these activities.

The Contractor will leave with the engineer the phone numbers of responsible persons available twenty-four (24) hours a day to handle emergencies concerning egress and ingress. If a vehicle becomes stranded due to an inaccessible condition, any legitimate claims arising from such conditions shall be the sole responsibility of the Contractor. If such claims are not settled prior to the monthly pay estimate, they shall be deducted from that estimate.

B 2.6 Removal of Items

The removal of existing concrete curb and gutters, concrete valley gutters, concrete drive, and existing drainage features, approaches shall be at the locations indicated by the engineer and shall be paid for under the right-of-way preparation pay item unless a separate bid item is included in the Proposal. All concrete curb and gutter and drive approaches removed will be broken out at existing construction expansion joints if possible. Where existing concrete is removed at a location other than a joint, the slab will be sawed in a neat straight line the full depth of the slab. The cost for sawing and breaking shall be considered subsidiary to the unit price bid for concrete removal. The Contractor shall make every effort to protect all concrete surfaces that will remain. Any remaining surfaces damaged during removal operations by the Contractor will be replaced at the Contractor's own expense.

Disposal of excess materials and debris resulting from construction, including but not limited to concrete, excess soil, forms, and rebar shall be removed and disposed of on a daily basis, unless other disposal schedule is approved by inspector. Depending on type of material or debris, dump trucks should be the primary source of disposal. Contractor will be responsible for providing the necessary equipment or vehicle for such task.

Dump trucks must be tarped while in transit to disposal sites. Tarps must be secured and not torn or tattered. All applicable State and local laws and ordinances relating to hauling, handling, and disposal of such materials shall be complied with. Use of Roll Off Box shall meet the City's Ordinances.

The responsibility of locating suitable disposal sites for removal items on this project will be solely a function of the Contractor. The City of Colleyville will in no way be responsible for the actions of the Contractor if he disposes of excess material in locations that are not approved. No dumping or disposal of excess material will be allowed in floodplains or below the 100-year flood elevation of drainage ways.

B 2.7 Right-of-Way Preparation

Right-of-way preparation shall be in accordance with NCTCOG Section 203.3, General Site Preparation. "Preparing right-of-way" shall be measured on a lump sum basis unless indicated otherwise. In addition to the items described in the NCTCOG Specification, removal of all pavements (concrete and asphalt) shall be included in the lump sum bid item. The lump sum bid for this item shall not exceed ten (10%) percent of the total amount bid for the entire project. A prorated portion of the lump sum bid shall be paid monthly until such work is completed. No dumping or disposal of excess material will be allowed in floodplains or below the 100-year flood elevation of drainage ways. The Contractor should take special precautions to avoid damaging any trees outside the construction limits and any other trees which the engineer may designate to remain.

B 2.8 Roadway Excavation

All roadway excavation on this project shall be unclassified and shall be performed in full accordance with NCTCOG Section 203.4, "Unclassified Street Excavation." Payment for excavation is based on plan quantity. Contractor shall verify excavation/fill quantities and shall notify City of Colleyville in writing of concurrence or disagreement with plan quantities prior to start of construction. Any discrepancies in quantities shall be resolved prior to beginning excavation. No adjustments to plan quantities shall be allowed once excavation/fill activities have begun. It shall be the responsibility of the Contractor to locate a suitable disposal site outside the right-of-way limits to dispose of both excess and unsuitable material from roadway excavation not needed in roadway fill and embankment. No separate payment shall be made for disposal of excess or unsuitable material. No dumping or disposal of excess material will be allowed in floodplains or below the 100-year flood elevation of drainage ways. Disposal shall be performed in accordance with appropriate laws and ordinances.

B 2.9 Unclassified Structural Excavation

The excavation for the construction of the inlets, box culverts, and junction boxes is not classified. Payment for the excavation shall be subsidiary to the unit price bid for each structure in the bid Proposal.

B 2.10 Unclassified Channel Excavation

Channel excavation shall be in accordance with NCTCOG Section 203.5 except as amended here. Any fill required to bring the channel to the required lines, grades and cross-sections will be subsidiary to this pay item.

If the channel is to be lined with concrete, the sides and bottom of the channel shall be kept at the existing moisture level after excavation and prior to placement of concrete. Moisture level shall be maintained by manual watering or other approved method. Cost of maintaining moisture level shall be considered subsidiary.

B 2.11 Site Grading

All vegetation shall be removed from areas where fill is to be placed. Topsoil shall be grubbed, removed, and stockpiled. After the fill has been placed and compacted, the topsoil shall be spread to a thickness of four (4") inches in all proposed areas that require it. The topsoil shall be free from grass, roots, sticks, stones, or other foreign materials. After placement is complete, the surface of the topsoil shall be finished to a reasonably smooth surface so grass may be planted and maintained.

Site grading will be based on the elevations and grades shown on the Grading and Paving Drawings. Filling, construction of embankments, removal, stockpiling, and spreading topsoil and offsite disposal of excess material will be considered incidental and subsidiary to excavation and shall not be a separate pay item.

No extra payment shall be made for rock excavation or crushing rock material for placement in fill areas. This work shall be considered incidental to site grading and shall not be a separate pay item.

B 2.12 Compacted Roadway Fill and Embankment

All compacted roadway fill and embankments constructed on this project shall be in accordance with NCTCOG , Section 203.7, "Embankment", except as amended herein or a shown on the plans.

All fill material shall be compacted in lifts of loose depth not exceeding eight (8") inches and compacted to at least 95% of Standard Proctor Density at optimum moisture content, ± two (2) percentage points, as determined by ASTM D 698. Each lift shall be tested before a subsequent lift is allowed to be placed. It shall be the responsibility of the Contractor to locate a suitable disposal site outside the right-of-way limits and to dispose of any excess material not needed for constructing embankments to the established grade, shape of the typical sections shown on the plans, and detailed sections or slopes. No dumping or disposal of excess material will be allowed in floodplains or below the 100-year flood elevation of drainage ways. Disposal shall be performed in accordance with appropriate laws and ordinances.

No recycled soil will be allowed for use on this project without prior consent from the engineer.

The placement and compaction of fill material in roadway and embankment areas on this project shall be measured and paid for separately from the "Roadway Excavation". Measurement for compacted roadway fill and embankment shall be for in-place embankment after compaction to the density specified on the plans. Measurement shall be in cubic yards as determined on the basis of the natural ground cross-section and the finished lines and grades as shown in the plans and computed by the method of average end areas from the project cross-section.

The price bid per cubic yard for "Compacted Roadway Fill and Embankment" shall be full compensation for furnishing all labor, materials, tools, equipment, and incidentals necessary to complete the embankment, including cost of water, sprinkling, wetting, and rolling in accordance with the plans and specifications.

B 2.13 Concrete Curb and Gutter

Concrete curb and gutter shall be placed at locations along the project where portions of the existing curb and gutter is removed. Curb and gutter shall be replaced at a minimum thickness of six inches (6") or shall match existing curb and gutter thickness, whichever is greater. In cases where 100% of the existing curb and gutter is to be removed, it shall be replaced with the Standard 24 inch curb and gutter section. All concrete used for curb and gutter in the City of Colleyville will have a cement content of not less than five (5) sacks of cement per cubic yard of concrete, 5% entrained air (± 1.5%), and a minimum compressive strength at 28 days of 3,000 pounds per square inch. The unit price bid for curb and gutter shall include all reinforcing steel, including #4 "L" bars at every twenty-four inches (24"). Curb and gutter will be paid by the linear foot. Expansion joints shall be placed at all intersections, P.Cs, P.Ts, driveways, inlets, other curb and gutter or every 200 feet. All expansion joints shall not be less than one-half inch (1/2") in thickness with longitudinal dowels. Dowel shall be three No. 4 smooth bars, 24 inches in length. One-half of the dowel shall be coated with asphalt and terminated with an expansion cap. All work shall be in compliance with NCTCOG Section 305.1. All loose material between the forms will be removed and the grade wetted prior to the placing of the concrete. An approved curing compound shall be applied to the surface in accordance with the Curing Specification. All curbs shall be vibrated to eliminate "honeycomb" appearance. If "honeycombed" appears, the contractor shall grout back side to smooth out the surface.

Locations where homeowners have installed drain pipes that run through the curb, curb opening casting will be required to discharge water through the curb. Drain outfall shall be installed flush with the curb. It is the Contractor's responsibility to connect existing pipe to the curb opening casting and ensure connection is secure with no water leaks or dirt infiltration.

B 2.14 Concrete Valley Gutters

All concrete valley gutters shall have a minimum thickness of six (6") inches or shall match existing valley gutter thickness, whichever is greater. Concrete valley gutters shall be reinforced with #4 bars on eighteen-inch (18") spacing in both directions. All concrete shall have a minimum cement content of 5.5 sacks per cubic yard of concrete, 5% entrained air (± 1.5%) and a minimum compressive strength at 28 days of 3,600 pounds per square inch. All concrete shall be vibrated and an approved curing compound shall be applied to the surface.

B 2.15 Concrete Driveways

All concrete driveways shall have a minimum thickness of five (5") inches for residential driveways and six (6") inches for commercial driveways or shall match existing driveway thickness, whichever is greater. Driveways shall be composed of concrete having a minimum cement content of 5 sacks per cubic yard of concrete, 5% entrained air (± 1.5%) and a minimum compressive strength at 28 days of 3,000 pounds per square inch. The unit bid price shall also include #4 bars on eighteen-inch (18") centers both ways. All concrete shall be vibrated and an approved curing compound shall be applied to the surface.

The City will replace only those existing driveways specified. Any new drives installed by the Contractor under criteria other than the above will be at his own expense.

Contractor shall notify all businesses and residents in writing 48 hours prior to removal of their driveways.

B 2.16 Reconstruction of Drives

Existing drives which will be destroyed by proposed construction and which will be reconstructed are specifically called out on the plans and construction shall conform to this special provision. After construction operations are completed in the street area, these drives shall be reconstructed to original or better condition than existed before construction and to satisfaction of the engineer. Existing surface and base materials and storm drain pipe may be reused if approved by the engineer. Where new materials will be required in order to reconstruct drives to the required condition, the Contractor shall be aware of their need and they shall be incidental to the price requested. All work shall conform to the applicable standard and special project specifications. Payment for reconstructing drives shall be a price per square yard of typical concrete driveway or a price per square yard of exposed aggregate concrete driveway. Such price shall include all materials, labor, and supervision for the completed construction.

B 2.17 Concrete Sidewalks

Sidewalks shall have a minimum thickness of five (5") inches and be constructed of concrete with a minimum cement content of five (5) sacks of cement per cubic yard of concrete, 5% entrained air (± 1.5%), and a compressive strength of not less than 3,000 pounds per square inch at 28 days. Reinforcing steel shall be #4 bars on eighteen-inch (18") centers located two (2") inches below the top surface of the sidewalk. All concrete shall be vibrated and as soon as the concrete has obtained its initial set, a white pigmented approved curing compound shall be applied.

In general, the grade of the sidewalks shall be established with respect to the curb. Forms shall be set for all sidewalks and shall be true to line and grade. Forms shall be set to provide a cross slope of no more than 2% across the sidewalk toward the street unless otherwise shown on the plans. All forms shall remain in place at least 24 hours.

The plane of all joints shall make a right angle with the surface of the pavement. No joints shall have an error in alignment of more than 1/2"-inch at any point. The edges of the slab at all joints, except where the joints are sawed, shall be rounded with an edger having a radius of 1/4"-inch, except as otherwise shown on the plans. The edging shall also be done symmetrically on each section with the plane of the joint.

Longitudinal expansion joints, joints used to separate new from old concrete, and all joints around all fire hydrants shall be made of conventional 1/2"-inch asphalt expansion joint material extending completely through the concrete unless otherwise specified on the plans.

Transverse expansion joints shall be 3/4"-inch in width and be made of high grade redwood placed through the concrete at a spacing not to exceed 40 feet. No. 4 x 18" smooth steel dowels shall be placed

on eighteen-inch (18") centers through each redwood expansion joint, one end of each dowel being wrapped or otherwise prevented from bonding to the concrete.

Contraction joints shall be made in the sidewalk at regular intervals, such intervals generally being equal to the width of the sidewalk.

The Contractor shall grade or fill, as necessary, along the sidewalk to match the existing ground. Care will be used to ensure that adjacent property outside the right-of-way line is protected.

When sidewalks are constructed adjacent to retaining walls, the plans shall specify if the sidewalk and retaining wall are to be constructed as separate items or as a sidewalk with wall unit. The sidewalk with wall unit shall be constructed in accordance with the City of Colleyville typical details and shall be paid on a linear foot basis for various wall heights up to four (4') foot. When specified to be constructed as separate items, the limits of pay for the sidewalk shall be all of the sidewalks up to the face of the retaining wall on a square yard basis. The retaining wall shall be paid under retaining wall on a cubic yard basis.

Barrier-Free Ramps

Sidewalks shall be constructed barrier free and fully accessible. Curb ramps are required at all intersections between sidewalks and streets. At driveways, the curb shall be laid down and the sidewalk section shall be maintained through the driveway. All concrete shall be vibrated and the ramps be constructed in accordance with the detail shown on the plans. Ramp slopes shall not exceed one-inch (1") rise in twelve (12") inches. All landings shall be 5'x5' minimum with a maximum 2% slope in any direction.

All ramps shall be constructed with an ADA compliant 2' x 4' Colonial Red (Federal Color No. 20109) Cast In Place Detectable/Tactile Warning Surface Tile as manufactured by Armor Tile or 4" x 8" x 2¼" ADA complaint detectable warning pavers in Antique (shade #32) as manufactured by Whitacre-Greer or in River Red as manufactured by Pavestone, or approved equal. Curb ramps will be measured and paid by each unit. All incidentals, including but not limited to, the transition, the landing, curb, pavers and sidewalks all the way to the tie-in as necessary to meet ADA compliance, the concrete below the detectable warning device, the bedding sand shall be subsidiary to the unit price bid for each ramp.

B 2.18 Concrete Medians

All concrete for concrete medians and median noses shall have a minimum thickness of four (4") inches. Reinforcement shall be #4 bars on eighteen-inch (18") centers both ways or as shown on the plans. All Class "C" concrete shall have a minimum cement content of six (6) sacks per cubic yard and a minimum compressive strength at 28 days of 3,600 pounds per square inch. All concrete shall be vibrated. Redwood expansion joints shall be placed at the end of the nose radius and at every 40 feet. Curing shall be in accordance with curing information in Section C 1.24 Concrete. Curing and reinforcement shall be considered subsidiary to the various bid items.

Concrete Panel Replacement

All concrete paving shall be replaced at a minimum thickness of eight (8”) inches or shall match existing pavement thickness, whichever is greater. Paving shall be reinforced with #4 rebar on eighteen-inch (18”) spacing both directions. Contractor shall dowel six (6”) inches into existing pavement to accomplish tie-in with #4 rebar, 24 inches in length, every eighteen (18”) inches with epoxy.

Any curb replacement associated with concrete paving shall be considered integral to the paving and will be paid at the same unit price. All expansion joints in curbs shall conform to the joint locations in the slab. All expansion joints in the slab (newly replaced paving) shall conform to existing expansion joint unless otherwise approved by the Inspector. Joint Filler material shall be used and all joints shall be filled with top seal. Contractor shall submit mix design for high early strength concrete that meets specification and cures for traffic within 48 hours. All concrete shall be vibrated.

B 2.19 Mechanically Compacted Trench Backfill Specification

After free moisture is gone from the embedment material, the ditch shall be backfilled with native material and compacted by mechanical methods. If hand pneumatic tampers are used, the backfill shall be placed in layers not exceeding six (6") inches in loose thickness and thoroughly compacted at least 95% Standard Proctor density at optimum moisture content, ± two percentage points as determined by ASTM D 698. Backfill shall be placed in uniform layers completely across the trench, and compaction shall proceed in an orderly, uniform manner. If compaction is performed by the use of heavy tamping (sheep's foot) rollers, backfill shall be placed in layers not exceeding nine (9") inches in loose thickness and compacted to at least 95% Standard Proctor density at optimum moisture content, ± two (2) percentage points as determined by ASTM D 698.

For lines under the proposed roadway and laid prior to new street construction, the backfill shall continue to within two (2’) feet of the top of subgrade. At this point the trench shall be widened a minimum of one (1') foot on each side. The remaining two (2') feet shall be native material, compacted in six (6") inch loose lifts at optimum moisture content, ± two (2) percentage points, to a density of at least 95% of maximum dry density, as determined by ASTM D 698.

The City of Colleyville shall be responsible for testing during backfill operations. If a test does not meet the requirements as outlined above, the Contractor shall be responsible for additional tests until the above requirements are met.

Payment shall be subsidiary to unit prices bid for pipe.

Flowable Backfill

Flowable backfill shall consist of a mixture of native sand or a blend of native sand/manufactured sand, cement, fly ash and water which produces a material with unconfined compressive strength of between 250 and 450 psi after 28 days.

The flowable mixture shall be mixed at a concrete batch plant or a mobile transit mixer and shall have a minimum slump of five (5") inches and a minimum air content of six (6%) percent. The flowable mixture must be allowed to set prior to the placement of any overlying material.

Modified Flowable Backfill

Modified flowable backfill in areas of possible future excavation such as utility installations shall consist of a mixture of native sand or a blend of native sand/manufactured sand, cement, fly ash and water which produces a material with unconfined compressive strength of between 50 and 150 psi after 28 days.

Modified flowable backfill in permanent areas such as abandoned pipe closures, abutments and embankments shall contain the same materials with an unconfined compressive strength of greater than 150 psi after 28 days.

The flowable mixture shall be mixed at a concrete batch plant or a mobile transit mixer and shall have a minimum slump of five (5") inches and a minimum air content of six (6%) percent.
The flowable mixture must be allowed to set prior to the placement of any overlying material.

The Contractor shall submit to the engineer a mix design for the type of flowable backfill to be used ten (10) days prior to the start of the backfill operation. When the mix design has been approved by the engineer there shall be no changes or deviation from the proportions or sources of supply except as approved by the engineer.

Flowable backfill will be allowed for the following:

Backfill	Structural Fill	Miscellaneous Uses
Bridge Abutments	Road Base	Abandoned Sewer Mains
Box Culverts	Pipe Bedding	Soil Erosion
Sewer Trenches	Mud Jacking	Slope Stabilization
Utility Trenches		Abandoned Tank Fill
Conduit Trenches		

B 2.20 Backfill and Backfill Material

Backfill operations shall begin immediately following removal of the forms on the permanent improvements. All loose concrete, rocks, roots, trash, and other debris shall be removed from the excavation prior to any backfill being placed.

Backfill material shall consist of the native material obtained from the street excavation unless in the opinion of the engineer, this material is unsuitable for use. The material shall not contain trash, rock, concrete, asphalt, lime shavings, gravel or other debris. Sand shall not be used for backfill material unless the native soil in the construction area is sandy in nature. All backfill material will be considered subsidiary to the unit price bid for the permanent improvements.

Backfill shall be placed in such a manner as to eliminate voids in the backfill material. The use of power equipment to place the backfill, or to bring it to grade, shall be limited to small farm-type tractors. Bring the backfill material to within four (4") inches of proper finished grade. The top four (4") inches shall be placed in accordance with Specification B 2.18 "Topsoil."

B 2.21 Topsoil

A minimum of four (4") inches of topsoil shall be placed on all disturbed areas adjacent to permanent improvements within the project limits. The topsoil shall be free from stone, rock, lumps, clods of hard earth, plants or their roots, sticks and other foreign material and shall be brought to the lines and grades as established by the engineer. Under no circumstances will topsoil be accepted unless it is free from the aforementioned contaminants. Contractor may use approved means of treating the topsoil to ensure its acceptability. This item shall be considered subsidiary to the other items in this project and shall not be a separate pay item.

The existing topsoil from the project limits may be used if Contractor stockpiles and protects it properly. No trash, lime shavings or other foreign material, shall be added to this stockpile. Topsoil material shall be stockpiled at locations approved by the engineer, and after completion of permanent improvements, topsoil shall be placed on all disturbed areas so as to provide a minimum four-inch (4") depth of topsoil. The topsoil shall be tilled to a 1/2"-1" diameter size.

The City of Colleyville retains the authority to require the Contractor to provide topsoil meeting the following specification should the Contractor fail to maintain the integrity of the stockpiled existing topsoil.

The soil texture shall be classified as loam or sandy loam according to the following criteria:

	(% Passing)Loam	(% Passing)Sandy Loam
Sand (0.074 to 4.76 mm diameter)	25 – 50%	45 – 85%
Silt (0.002 to 0.074 mm diameter)	30 – 50%	Less than 50%
Clay (smaller than 0.002 mm) (Hydrometer Analysis)	5 – 25%	Less than 20%

Soil texture shall be determined by utilizing processes as prescribed in ASTM D 422.

B 2.22 Hydro-Mulch Seeding

This item shall consist of preparing ground, providing, and planting seed, or a mixture of seeds, of the kind specified along and across such areas as are designated by the engineer.

The type seed used shall be in accordance with NCTCOG Section 202.6, and approved by the engineer. All seed must carry a Texas Seed Label showing purity and germination, name and type of seed and that the seed meets all requirements of the Texas Seed Law. Seed furnished shall be of the previous season's crop and the date of analysis shown on each tag shall be within nine (9) months of the time of delivery to

the project. Each variety of seed shall be furnished and delivered in separate bags or containers. A sample of each variety of seed shall be furnished for analysis and testing when directed by the engineer. Grass seed shall equal or exceed 95% purity and 90% germination.

Planting of hulled Bermuda grass seed shall be done between the months of April through September. The density of seeds planted shall be 80 pounds per acre. A blend of 30 pounds Rye grass and 40 pounds unhulled Bermuda may be used between the months of September through April.

The designated areas shall be raked, leveled and fine graded as necessary to provide a smooth uniform grade, free of ruts, depressions, humps and objectionable soil clods, prior to seeding. The area shall also be free of weeds, rubbish, and building materials. Any low areas shall also be filled to prevent ponding. All particles in the seed bed shall be reduced to less than one-inch (1") in diameter or they shall be removed. The area to be seeded shall be loosened or disked prior to placement of seed in areas that appear to be overly compacted or to destroy existing vegetation, at the direction of the engineer or authorized representative. The cost of any chemical treatment to the soil in order to establish a uniform stand of grass will be subsidiary to "Hydro-mulch Seeding." Seeding of the type specified shall be performed in accordance with the requirements in NCTCOG Section 202.6 except as hereinafter described

The seeded areas shall be watered as necessary to establish grass as described in Establishment and Acceptance of Seeding.

In accordance with NCTCOG 202.6.4.4, alternate methods for placement of seed may be used if approved by the engineer.

Establishment and Acceptance of Seeding

Regardless of unseasonable climatic conditions or other adverse conditions affecting planting operations and the growth of the grass, it shall be the sole responsibility of the Contractor to establish a uniform stand of grass as herein specified. When adverse conditions such as drought, cold weather, high winds, excessive precipitation, or other factors prevail to such an extent that satisfactory results are unlikely, the City of Colleyville may, at his own discretion, stop any phase of the work until conditions change to favor the establishment of grass.

Uniform Stand of Grass

A uniform stand with complete coverage of the specified grass shall be defined as not less than 150 growing plants per square foot seeded. Growing plants shall be defined as healthy grass plants of two blades or more at least two (2") inches tall.

Post-Planting Maintenance

Maintenance shall begin immediately after each portion of grass area is planted. It will be the Contractor's responsibility to maintain the existing grades and leave them in a true and even condition after planting. All planted areas will be protected and maintained by watering, weed control, mowing, and replanting as

necessary for at least 30 days after initial planting and for as much longer as necessary to establish a uniform stand with complete coverage of the specified grass.

Fertilizing

Fertilizing shall consist of providing and distributing fertilizer over such areas as are designated on the plans and in accordance with NCTCOG 202.4 Fertilizer and this section. The fertilizer shall be applied uniformly over the area specified to be fertilized and in the manner directed.

The fertilizer shall be pelleted or granular fertilizer and shall be applied uniformly over the entire area specified to be fertilized and in the manner directed for the particular item of work. The fertilizer shall be dry and in good physical condition. Fertilizer that is powdered or caked will be rejected. Distribution of fertilizer for the particular item of work shall meet the approval of the Engineer.

Unless otherwise indicated on the plans, fertilizer shall be applied uniformly at the average rate of 400 pounds per acre for all types of seeding.

Measurement and Payment

Work and acceptable material for "hydro-mulch seeding" will be measured by the square yard, complete in place.

The work performed and materials furnished and measured as provided under "Measurement" will be paid for at the unit price bid for "Seeding" which price shall be full compensation for furnishing all materials and for performing all operations necessary to complete the work, including fertilizer. Once a "uniform stand of grass" is provided, the City will provide payment for the seeding. See definition of "uniform stand of grass" above.

B 2.23 Sodding/Turfgrass Planting

This work includes labor, material, and equipment for soil preparation, fertilization, planting, and other requirements regarding turfgrass planting areas. Payment for sodding shall include the cost of all fertilizer and water. Grass sod variety shall match existing and adjacent property.

Submittals

Delivery Receipts and Invoices: All delivery receipts and copies of invoices for materials used for this work shall be subject to checking by the Owner and shall be subsequently delivered to the office of the Owner.

Samples and Producers' Specifications: Various samples, certificates, and specifications of seed, fertilizer, sand, compost, other soil amendments and other materials shall be submitted for approval as required by subsequent sections of this specification.

Type

Turfgrass sod shall be "Buchloe Dactyloides" (Buffalograss) 'Prairie Grass' variety. Sod shall consist of stolons, leaf blades, rhizomes, and roots with a healthy, virile system of dense, thickly matted roots throughout the soil of the sod for a thickness not less than 3/4″-inch. Sod shall be alive, healthy, vigorous, free of insects, disease, stones, and undesirable foreign materials and grasses. The grass shall have been mowed prior to sod cutting so that the height of the grass shall not exceed two (2″) inches. Sod shall have been produced on growing beds of clay or clay-loam topsoil. Sod shall not be harvested or planted when its moisture condition is so excessively wet or dry that its survival will be affected. All sod is to be harvested, delivered, and planted within a 36 hour period of time. Sod shall be protected from exposure to wind, sun and freezing. If sod is stacked, it shall be kept moist and shall be stacked roots-to-roots and grass-to-grass.

Dimensions

All sod shall be machine cut to uniform soil thickness of one-inch (1″) plus or minus 1/4-inch. All sod shall be of the same thickness. Rectangular sections of sod may vary in length, but all shall be of equal width and of a size that permits the sod to be lifted, handled, and rolled without breaking. Broken pads and torn, uneven ends will be unacceptable.

Solid Sodding

Prior to laying the sod, the planting beds shall be raked smooth to true grade and moistened to a depth of four (4″) inches, but not to the extent causing puddling. The sod shall be laid smoothly, tightly butted edge to edge, and with staggered joints. The sod shall be pressed firmly into contact with the sod bed by rolling or by hand tamping with an approved tamper so as to eliminate all air pockets, provide a true and even surface, and insure knitting without displacement of the sod or deformation of the surfaces of sodded areas. Following compaction, fine screened soil of good quality shall be used to fill all cracks between sods. Excess soil shall be worked into the grass with suitable equipment and shall be well watered. The quantity of fill soil shall be such that it will cause no smothering of the grass.

If sod is placed after September 15, final acceptance on the grass will not occur until after April 15. The grass shall not be over-seeded with rye. The Contractor shall water the grass until the grass is accepted.

Fertilizer

Fertilizer shall be an organic commercial product uniform in composition, free flowing, and suitable for application with approved equipment. Fertilizer shall be delivered to the site in fully labeled original containers. Fertilizer which has been exposed to high humidity and moisture, has become caked or otherwise damaged making it unsuitable for use, will not be acceptable.

Fertilizer shall be an organically based product (nutrients contained in the project shall be derived solely from the remains, part of the remains, or a by-product of a once-living organism) supplying nitrogen, phosphorus and potassium in a 1-1-1 to 5-5-5 analysis, such as Green Sense (3-1-2) or Sustane (5-4-2), or approved alternate formulation. The fertilizer shall contain a variety of cultures of soil-borne bacteria and trace elements, and be high (min. 18% each) in humus and humic acid. The Contractor shall submit a sample label or specification of the fertilizer proposed to be used for the Owner's approval. The specified fertilizer shall be applied at the rate of twenty pounds (20 lbs.) per 1,000 square feet according to specific label. Fertilizer shall be applied over sodded areas after planting, but not more than two (2) days later.

Herbicides

Herbicides will be applied as necessary for the eradication of weeds. The Contractor will choose an appropriate herbicide for application with respect to the kind of turfgrass being planted, climatic conditions, site conditions, and the state of work and the approved City chemical list available through the Parks Department. The applied herbicides shall not be detrimental to the establishment of turfgrass. Herbicides shall be approved for application by relevant U.S. Government agencies such as the U.S. Department of Agriculture and the Environmental Protection Agency. A pre-emergent that will not cause root pruning of new sod must be applied when sod is laid.

The rates and methods of application shall be in strict conformance with local, state and federal laws and regulations. Applications shall follow the manufacturer's recommendations. All applications must be licensed by Texas Structural Pest Control Board or Texas Department of Agriculture.

Weed Control

The Contractor shall apply appropriate herbicides in the following situations:

- Where weeds are present in the prepared soil, prior to the commencement of planting operations.
- Where weeds are present in the planted turfgrass areas, prior to the establishment of the turfgrass to a uniform stand.
- In the planted turfgrass areas, where the presence of weeds precludes the acceptability of the turfgrass as a uniform stand.
- In other situations where the Owner judges that the presence of weeds is detrimental to the establishment or acceptability of the turfgrass.

Placement

All turfing operations shall be executed across the slope, parallel to finished grade contours.

Soil Preparation

Scarification shall be accomplished to loosen the soil, destroy existing vegetation, and prepare an acceptable sod bed. Initial tillage shall be done in a crossing pattern for double coverage, then followed by a disc harrow. Depth of scarification shall be one to one and one half inches (1-1/2″).

Soil shall be further prepared by the removal of debris, building materials, rubbish, weeds, and stones larger than two (2″) inches in diameter. During the soil preparation process, a "Rock Pick" or other approved piece of machinery shall be used to gather surface stones as small as one-inch (1″) in diameter. The Contractor shall be responsible for the disposal of collected materials.

After scarifying and cleaning, all areas to be planted shall be leveled, fine graded, and dragged with a weighted spike harrow or float drag. The required result shall be the elimination of ruts, depressions, humps, and objectionable soil clods. Unless specified by the Owner medians shall be crowned in the center with cross slopes of approximately two (2%) percent. This shall be the final soil preparation step to be completed before the commencement of fertilizing and planting.

Approval

Owner shall approve bed preparation before grass planting begins.

Establishment and Acceptance

Regardless of unseasonable climatic conditions or other adverse conditions affecting planting operations and the growth of the turfgrass, it shall be the sole responsibility of the Contractor to establish a uniform stand of turfgrass as herein specified below. When adverse conditions such as drought, cold weather, high winds, excessive precipitation, or other factors prevail to such an extent that satisfactory results are unlikely, the Owner may stop any phase of the work until conditions change to favor the establishment of turfgrass.

Uniform Stand of Turfgrass

A uniform stand with complete coverage of the specified grass shall be defined as not less than 150 growing plants per square foot. Growing plants shall be defined as healthy grass plants of two blades or more at least one and one-half inches (1-1/2″) tall. A uniform stand of turfgrass shall be free of weeds. No payment will be made for turfgrass until a uniform stand of grass has been established. Partial projects will not be accepted. A uniform stand of grass over four (4″) inches in height will not be accepted.

Thirty (30) days following planting, the Owner will inspect the medians to verify establishment as described above. Contractor will be required to replant and/or maintain any areas of grass that are unacceptable to the Owner until they meet the standards above.

Post-Planting Maintenance

Maintenance shall begin immediately after each portion of grass area is planted. All planted areas will be protected and maintained by watering, weed control, and replanting as necessary to establish a uniform stand with complete coverage of the specified grass. The entire project will continue to be replanted and maintained by the Contractor until complete coverage and acceptance are achieved over 100% of the area. Any water equipment deemed necessary by the Contractor will be provided by the Contractor.

Watering

Use a temporary irrigation system to irrigate the entire planted area daily for the first ten (10) days on which less than one-half inches (1/2″) of rain has fallen in the previous 24 hours and then two (2) times per week for the balance of the month following planting. Water trucks will be permitted as a means of irrigating the sodded areas.

Weed Control

Appropriate herbicides shall be applied as necessary as previously specified.
Grass shall be edged where it is adjacent to concrete areas.
All concrete areas where weeds are growing in the joints must be trimmed or chemically sprayed. These areas must have all growth removed.
Ant infestations must be treated with Award or Amdro.

Grading

It is the Contractor's responsibility to maintain the existing grades and leave them in a true and even condition after planting turfgrass.

Erosion Control

Throughout the project and the maintenance period for turfgrass, it is the Contractor's responsibility to maintain the topsoil in place at specified grades. Topsoil and turfgrass losses due to erosion will be replaced by the Contractor until establishment and acceptance is achieved.

Clean Up

The Contractor shall remove any excess material or debris brought onto the site or unearthed as a result of his turfgrass operations.

Guarantee

The Contractor shall guarantee all materials used for this work to be type, quality, and quantity specified.

B 2.24 Slope Erosion Control

Erosion control material shall be "Curlex Blanket" heavy jute netting such as "AMXCO Curlex Blanket," or approved equal (no plastic meshes are allowed), and shall be applied after seeding is complete. Heavy jute mesh shall be open plain weave of unbleached single jute yarn, averaging 130 pounds per spindle of 14,400 yards. Jute mesh shall be furnished in approximately 90 pound rolled strips. Other criteria for jute mesh shall be as follows:

Length: approximately 75 yards
Width: 48" (+/- one inch)
0.78 warp ends per width of cloth
41 weft ends per yard
Weight of cloth: 1.22 pounds per linear yard ((+/- 5%)

Staples shall be of No. 15 gauge steel wire formed into a "U" shape six (6") inches long.

To install erosion control material on channel slopes, bury the up-channel end in a trench six (6") inches deep. After the jute is buried, the trench shall be tamped firmly closed. Using a steel tube or 3/4-inch pipe through the paper core of the roll with a rope on each end will enable the operator to lower the roll down the slope. The material should be applied without stretching. The material should lie smoothly, but loosely on the soil surface. In order to keep the area as smooth as possible, workers should avoid, as much as possible, walking directly on the seed bed, either before or after the jute is applied. In cases where one roll ends and another is needed, the up-channel piece should overlap the second roll by at least eighteen (18") inches. Where two or more widths are applied side by side, an overlap of at least four (4") inches shall be maintained. The material shall be brought to level area before terminating. The end shall be across the fold on twelve-inch (12") centers. Outside edges, centers, and overlaps on banks shall be stapled on two-foot (2') intervals. Each width of cloth will have a row of staples down the center as well as along each edge. On soft or sandy soil or windy areas, apply staples in alternate slanting position and space at closer intervals (12" to 18"). For extra hard soil or shale areas, use sharp pointed, hardened steel three-inch (3") fence-type staple. Outside edges shall have loose topsoil spread over them to allow for smooth entry of water. The entire jute covered area should be rolled with a smooth roller weighing 50 to 75 pounds per foot of length.

Any clods, debris, etc., which hold the jute off the ground, shall be stamped into the soil. The netting shall completely cover all areas to be protected from erosion. Overlaps must be ample and well stapled so that no gapping can occur. The material shall be in intimate contact with the surface at all points. If some areas experience severe erosion, two layers shall be in intimate contact with the surface at all points.

The quantity shown in the Proposal is a rough estimate as the actual amount and location of the jute mesh will be determined in the field as directed by the engineer in areas where excessive slopes exist. Overlapping of material will not be paid for double.

Heavy jute netting will be paid for at the unit price bid per square yard, which price will be full compensation for furnishing and placing all materials, including all labor, tools, equipment, and incidentals necessary to complete the work.

B 2.25 Six-Inch (6") Reinforced Concrete Riprap

Concrete riprap shall be used, at the direction of the engineer, for slope protection as needed. This work shall be paid for at the price bid per square yard, which price shall include all excavation, slope grading and shaping, concrete, and reinforcing steel, necessary for completion of this item. Reinforcing steel shall be #4 bars on eighteen-inch (18") centers both ways.

B 2.26 Non-Woven Filter Fabric for Inlet Protection

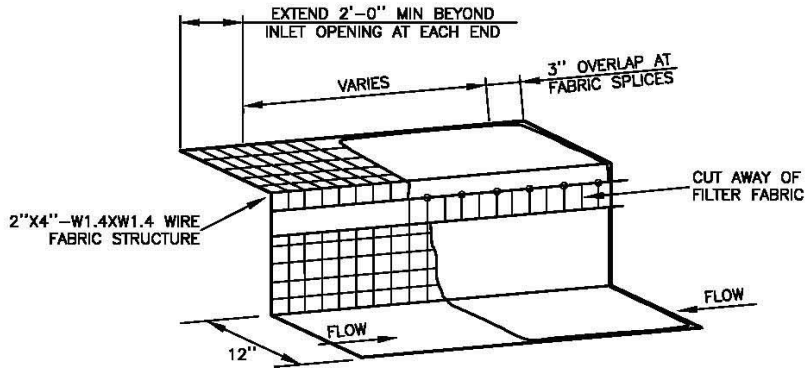
Contractor shall only use surface course inlet filters that have a minimum height or diameter of nine (9") inches and have a minimum length that is two (2') feet longer than the length of the curb opening. See diagram below. Surface course inlet filters shall not be designed to completely block the inlet opening.

The filter fabric shall be of a synthetic material that will allow storm water to freely flow through while trapping sediment and debris. The geotextile shall be non-biodegradable and resistant to degradation by ultraviolet exposure and resistant to contaminants commonly encountered in storm water. Use filter fabric that is capable of reducing effluent sediment concentrations by no less than 80% under typical sediment migration conditions.

Straw, straw fiber, straw bales, pine needles, straw logs, and leaf mulch are not permissible filter materials.

When applicable, the filter fabric of curb inlet filters has the following Minimum Average Roll Values (MARV) for physical properties:

Weight	ASTM D 3776	Oz/yd^2	3.0
Grab Tensile Strength	ASTM D 4632	Lbs	80
Grab Tensile Elongation	ASTM D 4632	%	50
Puncture Strength	ASTM D 4833	Lbs	40
Mullen Burst Strength	ASTM D 3786	Psi	150
Trapezoid Tear Strength	ASTM D 4533	Lbs	30
Fabric Opening Size	ASTM D 4751	US Std Sieve (max)	50
Permittivity	ASTM D 4491	Sec – 1	1.5
Water Flow Rate	ASTM D 4491	$Gal/min/ft^2$	100
Ultraviolet Resistance	ASTM D 4355 (500 hrs)	%	70



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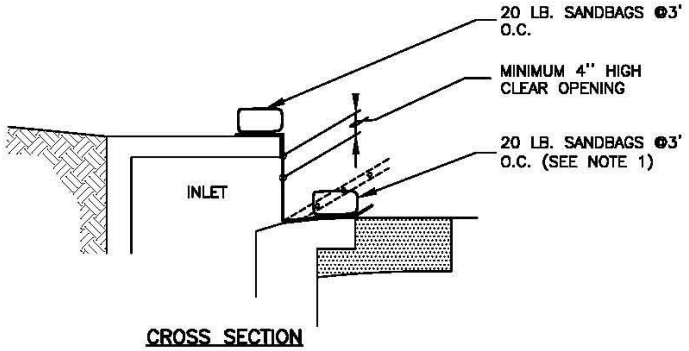


CROSS SECTION

NOTES:

1. WHERE MINIMUM CLEARANCES CAUSE TRAFFIC TO DRIVE IN THE GUTTER, THE CONTRACTOR MAY SUBSTITUTE A 1" X 4" BOARD SECURED WITH CONCRETE NAILS 3' O.C. NAILED INTO THE GUTTER IN LIEU OF SANDBAGS TO HOLD THE FILTER DIKE IN PLACE. UPON REMOVAL, CLEAN ANY DIRT/DEBRIS FROM NAILING LOCATIONS, APPLY CHEMICAL SANDING AGENT AND APPLY NON-SHRINK GROUT FLUSH WITH SURFACE OF GUTTER.
2. A SECTION OF FILTER FABRIC SHALL BE REMOVED AS SHOWN ON THIS DETAIL OR AS DIRECTED BY THE ENGINEER OR DESIGNATED REPRESENTATIVE. FABRIC MUST BE SECURED TO WIRE BACKING WITH CLIPS OR HOG RINGS AT THIS LOCATION.
3. DAILY INSPECTION SHALL BE MADE BY THE CONTRACTOR AND SILT ACCUMULATION MUST BE REMOVED WHEN DEPTH REACHES 2".
4. CONTRACTOR SHALL MONITOR THE PERFORMANCE OF INLET PROTECTION DURING EACH RAINFALL EVENT AND IMMEDIATELY REMOVE THE INLET PROTECTIONS IF THE STORM-WATER BEGINS TO OVERTOP THE CURB.
5. INLET PROTECTIONS SHALL BE REMOVED AS SOON AS THE SOURCE OF SEDIMENT IS STABILIZED.

B 2.27 Mowing During Construction

Contractor shall maintain existing parkways and medians at all times during construction by providing periodic mowing to meet the applicable City Ordinances. Any code violation or citation issued for not maintaining these areas will be the responsibility of the contractor. Contractor will also be responsible for any cost incurred if city forces or city contractor performs the mowing due to lack of response from the contractor. Such cost shall be deducted from the monthly pay estimate. Payment for mowing shall be considered subsidiary to other items.

B 2.28 Tree Removal

All trees and bushes scheduled for removal shall be removed during their winter dormancy, i.e., after the leaves have shed on deciduous trees. The removal shall occur after dormancy and no later than March 15, unless otherwise authorized by the engineer. All trees and bushes that are cut down shall be hauled off the same day. Tree removal shall be in accordance with NCTCOG Section 203.3, General Site Preparation.

Contractor will fully comply with any and all federal, State and local laws related to the removal of trees including but not limited to the Migratory Bird Treaty Act. Contractor will be responsible for any fines, penalties, or damages due to any such violations of law and any such fines, penalties, or damages will be subject to the indemnification provision of this contract.

Tree Trimming

While maintaining a healthy tree crown, the lower branches of all trees that overhang the sidewalk shall be trimmed to a height of eight (8') feet above proposed sidewalk. Trimming shall also be done to protect trees from damage by construction equipment. All cuts shall be clean and smooth, with the bark intact with no rough edges or tears. Tree trimming shall be done in accordance with the International Society of Arborists or National Association of Arborists Standards. Payment for tree trimming and protection is considered subsidiary to the contract unless otherwise noted.

B 2.29 Portland Cement Treated Subgrade

This item shall govern for treating subgrade, by the addition of Portland cement and mixing and compacting the treated material to the required density, as herein specified and in conformity with the typical sections, lines, grades and thickness as shown on the plans or as established by the engineer.

Portland cement shall be Type I of a standard brand, unless otherwise directed by engineer.

Equipment

The machinery, tools, and equipment necessary for proper prosecution of the work shall be on the project and approved by the engineer prior to beginning work on this item. All machinery, tools, and equipment used shall be maintained in a satisfactory working condition.

Construction Methods

The completed course shall be uniformly treated, free from loose or segregated areas, of uniform density and moisture content, well bound for its full depth and shall have a smooth surface.

Preparation of Subgrade or Existing Base

Prior to scarifying or pulverizing existing material, the subgrade or existing base shall be shaped to conform to the typical sections as shown on the plans or as established by the engineer. This work shall be done in accordance with the provisions of the applicable bid Items. When shown on the plans, any existing asphaltic concrete pavement shall be removed and paid for in accordance with the applicable bid items.
When shown on the plans and when directed by the engineer, the Contractor shall proof roll the roadbed before pulverizing or scarifying existing material. Soft spots shall be corrected as directed by the engineer.

When the Contractor elects to use a cutting and pulverizing machine that will process the material to the plan depth, the Contractor will not be required to excavate to the secondary grade or windrow the material. This method will be permitted only if a machine is provided which will insure that the material is cut uniformly to the proper depth and which has cutters that will plane the secondary grade to a smooth surface over the entire width of the cut. The machine shall be of such design that a visible indication is given at all times that the machine is cutting to the proper depth.

In lieu of using the cutting and pulverizing machine, the Contractor shall excavate and windrow the material to expose the secondary grade to the typical sections, lines and grades as shown on the plans or as established by the engineer. Then the windrowed material shall be uniformly replaced before cement is applied.

Pulverization

The existing material as shown on the typical section shall be pulverized so that a minimum of 80 percent shall pass the No. 4 sieve.

When shown on the plans or approved by the engineer, this pulverization requirement may be waived when the material contains a substantial amount of aggregate.

Application of Cement

The amount of cement to be added will be shown on the plans. Cement shall be spread only in that area where the mixing, compacting, and finishing operations can be completed during the same working day. Unless otherwise approved by the engineer, the cement treatment operation shall not be started when the air temperature is below 40 degrees F and falling, but may be placed when the air temperature is above 35 degrees F and rising. The temperature will be taken in the shade and away from artificial heat. Cement shall not be placed when weather conditions in the opinion of the engineer are unsuitable.

The cement shall be spread by an approved spreader and all cement shall be slurried or by bag distribution. It shall be distributed at a uniform rate and in such a manner as to reduce to a minimum the scattering of cement by wind. Cement shall not be applied when wind conditions, in the opinion of the engineer, are such that blowing cement becomes objectionable to adjacent property owners or dangerous to traffic.

Mixing

Only single or multiple soil stabilizer mixers shall be used.

After any required mixing of the material(s), the cement shall be dry mixed with the material(s) prior to the addition of water. Immediately after dry mixing, water shall be uniformly applied. After mixing, the mixture shall be in a loose evenly spread state ready for compaction. The mixture shall be mixed and compacted in one (1) lift.

Compaction Methods

Compaction shall continue until the entire thickness of the mixture is uniformly compacted. Compaction shall be completed within two (2) hours of the addition of water to the dry mixed material. The treated material shall be sprinkled and rolled as directed by the engineer. All irregularities, depressions or weak spots which develop shall be corrected immediately by scarifying the areas affected, adding or removing treated material as required, reshaping, and re-compacting at the Contractor's expense.

Should the material lose the required stability, compaction or finish before the next course is placed or the project is accepted, it shall be removed and replaced, unless otherwise approved by the engineer. Removal and replacement will be at the Contractor's expense.

Density Control

Unless otherwise shown on the plans, the course shall be sprinkled as required herein and compacted to the extent necessary to provide not less than 95 percent standard Proctor Density.

When the material fails to meet the density requirements or should the material lose the required stability, density or finish before the next course is placed or the project is accepted, the treated material shall be removed and replaced, unless otherwise approved by the engineer. Removal and replacement with acceptable treated material will be at the Contractor's expense.

Finishing

Immediately after compaction, the surface of the mixture shall be clipped, skinned, or tight bladed by a maintainer or subgrade trimmer to a depth of approximately 1/4-inch, removing all loosened materials. The loosened materials shall be disposed of at the Contractor's expense and at a location approved by the

engineer. The surface shall then be rolled with a pneumatic tire roller, adding small increments of moisture as needed during rolling.

Throughout this operation, the shape of the course shall be maintained and the surface upon completion shall be smooth and in conformity with the typical sections, lines and grades as shown on the plans or as established by the engineer.

Curing

The completed section shall be moist cured for three (3) days or prevented from drying by addition of an asphalt material at the rate of 0.05 to 0.20 gallon per square yard as determined by the engineer. The asphalt used shall be of the type and grade shown as on the plans or as approved by the engineer.

Tolerances

Density Tolerances: The engineer may accept the work providing not more than one (1) out of the most recent five (5) density tests performed is below the specified density, provided the failing test is no more than three (3.0) pounds per cubic foot below the specified density.

Moisture Tolerances: The percentage of moisture in the mixture at the beginning of compaction shall be within + two (2.0) percentage points of optimum unless otherwise approved by the engineer. If the percentage of moisture is outside the allowable tolerance, the Contractor shall adjust operations to meet this requirement.

Grade Tolerances: In areas on which pavement is to be placed, any deviation in excess of 1/4-inch in cross section and 1/4-inch in sixteen (16) feet measured longitudinally shall be corrected by loosening, adding, or removing material, reshaping, and compacting by sprinkling and rolling.

Measurement

Cement treated subgrade will be measured by the square yard of the surface area to the lines and grades shown on the typical sections. Cement will be measured by the ton , dry weight.

Payment

The work performed and materials furnished in accordance with this item will be paid for at the unit price bid for “Cement treated subgrade”. “Cement” will be paid for at the unit price bid per ton , dry weight. This price shall be full compensation for shaping existing material, loosening, proof rolling, pulverizing, providing cement, spreading, road mixing, compacting, blading, shaping, finishing, curing including curing materials, replacing if required, and for all mixing water, labor, tools and incidentals necessary to complete the work except as otherwise provided for in this specification.

B 2.30 Lime and Cement Modification of Subgrade Soils

Prior to beginning any modification work, the subgrade shall be brought to the required line, grade, cross-section, and proof rolled in accordance with specification requirements. Proof rolling shall be in accordance with TxDOT Item 216. The cost of proof rolling shall be considered subsidiary to this item.

This item shall consist of treating the subgrade by scarifying, addition of lime slurry, initial mixing and curing, re-scarifying, addition of cement slurry, final mixing and compacting the material to the required density. This item applies to the subgrade, i.e., natural ground, embankment or existing pavement structure and shall be constructed as specified herein and in conformity with the typical sections, lines and grades as shown on the Plans or as established by the Engineer.

Materials: Soil

Soil shall consist of approved material free from roots, vegetation or other objectionable matter encountered in the subgrade. Rocks or similar debris larger than four (4") inches shall be removed from the subgrade prior to treatment. Acceptable material shall also be used in preparation of the roadbed in accordance with this specification. Prior to beginning subgrade treatment, the area to be treated shall be proof rolled to identify any soft or unstable areas. Any soft or unstable areas shall be excavated and re-compacted with acceptable material to 95 percent of Standard Proctor density at zero (0) percent to + four (4) percent wet of optimum moisture content. Any unsuitable or deleterious material found during proof rolling shall be removed and disposed of.

Materials: Lime

The Contractor can use Type A, Hydrated Lime (a dry powdered material consisting essentially of calcium hydroxide) or he may use Type B, Commercial Lime Slurry (a liquid mixture of essentially hydrated lime solids and water in slurry form). The lime and lime slurry shall meet the following chemical and physical requirements:

	TYPE	
	A	B
Chemical:	90.0 min[1]	87.0 min[2]
Total "active" lime content, % by mass (i.e. % by mass $Ca(OH)_2$ + % mass CaO, if present)		
Unhydrated lime content, % by mass CaO		
----------	5.0 max	--
"Free Water" content, % by mass, H_20	5.0 max	--
Physical:		
Wet sieve requirement, as % by mass residue:		
Retained on 3.35 mm sieve	0.2 max	0.2 max[2]
Retained on 600im sieve	4.0 max	4.0 max[2]

Dry sieve requirement, as % by mass residue:		
Retained on 25.0mm sieve	--	--
Retained on 19.0mm sieve	--	--
Retained on 150im sieve	--	--

Note 1: No more than 5.0 percent by mass CaO (unhydrated lime) will be allowed in determining the total “active” lime content.
Note 2: In “solids content” of slurry.
Note 3: The amount of total "active" lime content, as CaO, in the material retained on the 3.35 mm sieve must not exceed 2.0 percent by mass of the original Type C lime.

All slurry shall be furnished at or above the minimum "Dry Solids" content as approved by the Engineer and must be of a consistency that can be handled and uniformly applied without difficulty. The slurry shall be free of liquids other than water and any materials of a nature injurious of objectionable for the purpose intended.

Hydrated lime shall be stored and handled in closed weatherproof containers until immediately before distribution on the roadway subgrade. If storage bins are used, they shall be completely waterproof. If lime is furnished in trucks, each truck shall have the weight of lime certified on public scales or the Contractor shall place a set of standard platform truck scales or hopper scales at the location provided by the Engineer.

Materials: Portland Cement

The Contractor shall use bulk cement, Type I Portland cement conforming to ASTM C 150 or Type I/II cement, as directed by Engineer. All apparatus for handling, weighing and spreading the cement shall be approved by the Engineer in writing before use on the project. Cement weighing and distribution equipment shall be as specified below (Equipment).

Portland cement shall be stored and handled in closed weatherproof containers until immediately before distribution on the roadway subgrade. If storage bins are used, they shall be completely waterproof. If cement is furnished in trucks, each truck shall have the weight of cement certified on public scales or the Contractor shall place a set of standard platform truck scales or hopper scales at the location provided by the Engineer.

Water

Water shall be clean and free of oil, acid, alkali, organic matter, or other deleterious substances. Water which is suitable for drinking or ordinary household uses may be accepted for use without being tested.

Equipment

The machinery, tools and equipment necessary for proper execution of the work shall be on the project and approved by the Engineer prior to the beginning of the construction operations, and be maintained in good working order.

Slurry distribution trucks must be equipped with an agitator to keep the additive (Hydrated Lime or Cement, as appropriate) and water in a homogeneous suspension. Mixture shall be uniform in consistency from beginning to end of the distribution operation.

Equipment used shall be of a type sufficient to insure that the soil subgrade is cut uniformly to the proper depth and shall have cutters that will plane the secondary grade to a smooth surface over the entire width of the cut. The machine shall be of such a design that a visible indication is given at all times the machine is cutting to the proper depth.

Construction Methods

It is the primary requirement of this specification to secure a completed course of treated material containing a uniform blend of lime and cement, free from loose or segregated areas, of uniform density and moisture content, well bound for its full depth and with a smooth surface suitable for placing subsequent courses. It shall be the responsibility of the Contractor to regulate the sequence of his work, to use the proper amount of lime and cement, maintain the work and rework the courses as necessary to meet the above requirements.

The roadbed shall be constructed and shaped to conform to the typical sections, lines, and grades as shown on the Plans or as established by the Engineer. The subgrade shall be firm and able to support, without significant displacement, the construction equipment and obtain the compaction herein specified. Soft or yielding subgrade shall be corrected and made stable before construction proceeds.

Lime Modification

Prior to beginning any lime modification, the subgrade shall be brought to the required line, grades and cross-section in accordance with the specification requirements.

After the subgrade has been shaped, the roadway will be scarified to full depth and width of modification. Full depth will be eight (8") inches below finished grade or as indicated on the Plans and full width will be that distance from one (1') foot behind the back of curb on each side of the roadway. Scarification shall be accomplished using a motor grader with short teeth, or other appropriate means assuring accurate depth of scarification.

Lime Slurry Placement: Lime shall be spread only on that area where the mixing and sealing operations can be continuous and completed in one operation. Lime will be applied by the "slurry" method when application is in the corporate limits of the City of Colleyville, Texas.

The lime slurry will be applied with an approved distributor truck by making multiple passes, if necessary, to uniformly apply the correct amount of lime as specified in the Plans. The distributor truck will be equipped with an agitator to keep the lime slurry in constant mixture.

Initial Mixing: Immediately following lime application, thoroughly mix the slurry into the subgrade with a pulvimixer until 100% of all material will pass a two (2") inch sieve. If necessary, make passes at various angles across the site to facilitate breaking up of large clods. The lime modified material shall then be rolled with pneumatic roller to seal the lift, and left to cure for a minimum of 24 hours. During the curing period, the subgrade shall be kept at least two (2%) percent above its optimum moisture content.

Cement Stabilization

Prior to beginning any cement stabilization, the previously treated subgrade shall be re-scarified to full depth and width of modification. Full depth will extend to the underlying untreated material but must not extend into the underlying untreated material. Full width will be that distance from one (1') foot behind the back of curb on each side of the roadway. Scarification shall be accomplished using a motor grader with short teeth, or other appropriate means assuring accurate depth of scarification.

Cement Slurry Placement: Cement shall be spread only on that area where the mixing and compaction can be continuous and completed in one operation. Cement shall be applied by the "slurry" method. The cement shall be mixed with water to form a slurry of the solids content designated by the Engineer.

Cement slurry shall be applied with an approved distributor truck by making multiple passes, if necessary, to uniformly apply the correct amount of cement as specified in the Plans. The distributor truck shall be equipped with an agitator to keep the cement slurry in a consistent mixture. The cement slurry must be dispensed as soon as practical, but within a maximum of 45 minutes from the addition of cement to the slurry water.

Unless otherwise approved by the Engineer, the cement treatment operation shall not be started when the air temperature is below 40 degrees F and falling, but may be placed on unfrozen ground when the air temperature is above 35 degrees F and rising. The temperature will be taken in the shade and away from artificial heat. Cement shall not be placed when weather conditions are unsuitable in the opinion of the Engineer.

Final Mixing: Immediately following cement slurry application, thoroughly mix the slurry into the subgrade with a pulvimixer. If necessary, make passes at various angles across the site to facilitate breaking up of oversized clods. The previously lime treated material and cement slurry shall be thoroughly mixed until, in the opinion of the Engineer, a homogeneous, friable mixture of material and cement is obtained, free of all clods or lumps. Materials shall be mixed as thoroughly as possible at the time of the cement application and brought to a minimum of two (2%) percent above its optimum moisture content. The material shall be kept moist as directed by the Engineer.

If the cement-modified soil mixture contains clods, they shall be reduced in size by raking, blading, discing, harrowing, scarifying or the use of other approved pulverization methods so that when all non-

slaking aggregates retained on the No. 4 sieve are removed, the remainder of the soil material without cement mixed throughout shall meet the following requirements when tested in the moist condition by laboratory sieves:

Minimum Passing 1-1/2" Sieve	100%
Minimum Passing No. 4 Sieve	60%

Final Compaction

Compaction of the subgrade shall begin immediately after final mixing and after final gradation has been met. Final compaction of the subgrade shall be complete within six (6) hours of initial cement slurry placement.

The course shall be sprinkled, if necessary, and compacted to provide the density specified below as determined by the use of the Standard Proctor (TEX 153-E) Moisture / Density Relationship. Testing shall occur after the subgrade is brought to the required lines and grades shown on the Standard Details.

Description	Density, Percent	Moisture, Percent
For cement-modified subgrade that will receive subsequent courses	Not less than 95%, except when shown otherwise on the plans	Optimum to plus 4% unless shown otherwise on the plans

The testing will be as outline in Test Method ASTM D 2922 and ASTM D3017 or other approved methods. In-place density tests shall be performed at the rate of one per 300 linear feet of paving for two (2) lanes. If the material fails to meet these density requirements it shall be reworked as necessary to meet said requirements. Reapplication of cement slurry will be required by the Engineer to aid in recovering lost strength from reworking. Throughout this entire operation the shape of the course shall be smooth and in conformity with the standard details shown on the plans and to the established lines and grades. Should the material due to any reason or cause lose the required stability, density and finish before the next course is placed or the work is accepted, it shall have cement incorporated at originally specified rate, repulverized, and be recompacted and refinished at the sole expense of the Contractor.

Finishing of the completed section shall be accomplished by rolling as directed with a pneumatic tire or other suitable roller sufficiently light to prevent hair cracking.

Maintenance of Subgrade Condition

The Contractor shall make provisions for maintaining the compacted subgrade in a moist condition for a secondary curing time. The requirement is to maintain the in situ moisture at least two (2) percentage points above optimum conditions throughout the treated section. This is to be accomplished by frequent light sprinkling of the surface. During this secondary curing time, all construction vehicles shall be prohibited from the subgrade for a minimum of two (2) days.

The Contractor shall maintain the completed subgrade within the limits of his contract in good condition, satisfactory to the Owner as to grade, crown and cross section until such time as the surface course is constructed. All irregularities or other defects that may occur shall be repaired by the Contractor as his expense.

All over-excavated areas (shy grade) will require additional depth of pavement. No additional cement treated subgrade will be allowed on top of the initially processed grade (no scabbing).

The moisture content of the prepared subgrade shall be maintained at optimum or above until the next subsequent pavement course is installed. If this moisture decreases below optimum, the incorporation of additional moisture by scarifying and re-compaction the prepared grade will not be permitted. If at any time the prepared subgrade needs to be disturbed to incorporate moisture, an additional application of cement at 100% of the original application rate of cement will be required. NO additional payment shall be made if these additional cement applications are required.

Measurement and Payment

This work shall be measured by the square yard of completed and accepted lime modified / cement stabilized treated subgrade. Measurement of both the lime and cement shall be by the ton, 2,000 pounds of dry weight, as determined by certified weight tickets. No allowance shall be made for any materials used or work done outside the limits shown on the Plans and Typical Sections. The work performed and material furnished as prescribed by this item and measured as provide in this item shall be paid for at the unit price bid for lime modified / cement stabilized soil, which price shall be full compensation for scarifying the soil materials; for handling; hauling and spreading the lime slurry; for mixing the lime slurry into the subgrade through pulverization; for roll sealing and curing the subgrade; for re-scarifying the lime modified subgrade; for handling; hauling and spreading the cement slurry; for mixing the cement slurry into the lime modified subgrade through pulverization; for establishing final gradation; for spreading and shaping the mixture; compacting the mixture, including all rolling required for this compaction; surface finishing; and for all manipulation, labor, equipment, appliances, tools and incidentals necessary to complete the work and carry out the maintenance provisions in this specification.

Lime and cement materials measured as provided in this item shall be paid for at the unit price bid for lime and cement materials, which price shall be compensation for furnishing the material; for all freight involved, for all unloading and storing; and for all labor, equipment, fuels, tools and incidentals necessary to complete the work, all in accordance with the Plans and these Specifications.

B 2.31 Testing

The Construction Manager of Public Works, as he/she deems necessary, shall have the authority to test materials, equipment and in-place construction to verify compliance with project specifications. The expense of tests shall be paid for by the City except as specifically noted within this special provision. The failure of the City to make any tests shall in no way relieve the Contractor of his responsibility to provide materials, equipment, and in-place construction which comply with project specifications. The Contractor shall provide such facilities as the engineer may require for collecting and forwarding samples

and shall not, without specific written permission of the engineer, use the materials represented by the samples until tests have been made and materials approved for use. The Contractor will furnish adequate samples without charge to the City of Colleyville.

In case of concrete, the aggregates, design minimum and the mixing and transporting equipment shall be approved by the engineer before any concrete is placed, and the Contractor shall be responsible for replacing any concrete which does not meet the requirements of the contract documents.

The strength of the concrete shall be determined during the construction by taking a minimum of three (3) test cylinders and/or two test beams during each 50 cubic yards of continuous pouring. These tests shall be conducted by an approved testing laboratory and the initial tests shall be paid for by the City of Colleyville. The cost of additional testing to isolate areas not complying with the specifications shall be paid for by the Contractor.

Beam strength tests permitted by the specifications for early form removal shall be conducted by an approved testing laboratory and the cost shall be borne by the Contractor.

B 2.32 Temporary Batch Plant

If the Contractor chooses to construct a temporary batch plant, the following conditions (at a minimum) must be satisfied prior to approval from the City.

- Batch plant must be permitted by the City of Colleyville. A copy of Notice of Intent (NOI) and approved Storm Water Pollution Prevention Plan must be on the premises.
- Location map must be provided indicating routes for raw material delivery.
- Location map must be provided indicating that the nearest recreational area, school, or residence is located at least 300 feet away.
- Letter of Permission must be provided by the City of Colleyville of the property (on which the batch plant is to be constructed) requiring that the Contractor leave the site in as good or better condition.
- The start and stop dates for operation of the plant must be provided.
- It must be stated that the batch plant will be used to provide concrete for no other project(s) without written approval from the City of Colleyville.

No additional pay will be made for the temporary batch plant.

B 2.33 Crushed Rock Bad Weather Protection

During periods of bad weather, the Contractor shall put in place, on excavated streets, an amount of Type A, Grade 1, flex base sufficient to provide temporary access to private non-commercial property. Crushed concrete flexible base meeting TxDOT Item 247, Grade 1 is also acceptable to provide temporary access to private property. All flex base will be removed and stockpiled for future use at other locations as necessary. Any base removed and hauled off the project site without approval from the engineer will be replaced by an equal quantity at the Contractor's expense. Special care will be taken by the Contractor

during placement and removal of the flex base, not to unnecessarily combine the flex base with native material on the project. If special care is not taken by the Contractor, an equal quantity of flex base will be replaced at the Contractor's expense. Daily tickets will be submitted and signed by the inspector or his representative no later than one (1) week after delivery. Any tickets not submitted within this time frame or signed by the inspector shall not be paid.

NOTE: The use of flex base as a means to detour traffic or maintain two lanes of traffic will not be paid under this item.

The tons of material shown as the bid quantity is a rough estimate as the actual amount used will be determined by the need for temporary and/or emergency access during construction.

B 2.34 Adjustment or Relocation of Water Services, Meters and Meter Boxes

The Contractor shall be responsible for relocating or adjusting (horizontal and vertical), and bringing to grade water services, water meters, and meter boxes, within the limits of this project. This shall include the adjustment or relocation of the service line on the City's side of meter (from main to the meter), the quarter bend, the curb stop or angle valve, depending on service size, and the meter. The meter with curb stop or angle valve shall be adjusted to 6" to 8" below the final grade. Relocation or adjustment of the customer's service line shall be performed by a licensed plumber and shall be considered subsidiary. All of the work shall be in accordance with the latest revisions of the Standard Specifications for Waterworks and Sewerage Improvements. The Contractor shall also endeavor to keep meters accessible during the project construction for reading purposes. In the event the meters are covered during construction, the Contractor shall mark their locations with stakes and shall uncover the meters within 24 hours when notified to do so by the inspector. Water meter boxes broken by the Contractor shall be replaced at the Contractor's own expense. If any portion of the meter box is in a concrete sidewalk, the meter box shall be relocated to outside the limits of the sidewalk/driveway, and replaced with a meter box approved by the City. As directed by the inspector, each meter adjustment or relocation shall be surveyed and a Grade Verification Sheet shall be completed by the Contractor and inspector. All adjustments and relocations will be subsidiary to other bid items.

B 2.35 Vertical Adjust of Sanitary Sewer Manholes, Sanitary Sewer Cleanouts, and Water Valves

All water valves, sanitary sewer manholes, and cleanouts will be marked and located by the engineer and/or his representative prior to the start of construction. Prior to the application of the lime/cement slurry, all manholes, cleanouts, and water valves shall be adjusted to approximately one (1") foot below the bottom of the proposed subgrade. Prior to the placement of any pavement, the Contractor shall verify the locations of all valves, manholes, and cleanouts that were previously located for him by the inspector. For existing manholes that are being adjusted to proposed grade, the Contractor shall replace old manhole ring and lid with new manhole ring and lid (Bass & Hays VRM 30 or approved equal). All manholes, water valves, and cleanouts may be blocked out or brought to proper grade before placement of concrete pavement. Where hot mixed asphaltic concrete is used, adjustment to proper grade shall be made after placement of the top layer of coarse grade binder. It shall then be encased in concrete for a minimum of six (6") inches in depth and the concrete shall be a minimum of twelve (12") inches wide at all points

around the water valves, cleanouts, or manholes. Valve stacks shall be ductile iron only. In the event the top of the operating nut for any valve is more than six (6') feet deep from the finished ground elevation, valve stem extensions shall be furnished and installed by the Contractor to bring the operating nut to within three (3') feet of the finished ground level. Payment for the valve stem extension shall be subsidiary to other unit prices bid in the Proposal.

Payments for sanitary sewer cleanout adjustments shall be subsidiary to other unit prices bid in the Proposal.

It shall be the sole function of the Contractor to re-establish the location of all valves, manholes, cleanouts, etc. If the Contractor, through carelessness or negligence, damages any valve, manhole, or cleanout that has previously been located for him, it will be the Contractor's responsibility to replace the same. Should the Contractor fail to re-establish the location and adjust any valve, manhole, or cleanout, he will be required to perform the necessary work to raise the same at no additional charge to the City of Colleyville.

Where manholes, cleanouts, or gate valves are to be raised within the proposed fill slopes or in areas other than a concrete or asphalt surface, the manhole, cleanout or gate valve shall be raised at least six (6”) inches higher than the proposed finished grade.

Except as called for on the plans, the Contractor shall not be responsible for the relocation of power poles, gas meters, telephone cable boxes and signs, gas pipeline markers, fire hydrants, light poles, traffic signs and signals, or for adjustment of the top elevation of gas and telephone manholes which are in direct conflict with improvements. If these items have not been relocated and/or adjusted at the time of construction and the plans do not require the Contractor to adjust them, the Contractor shall inform the engineer and/or his representative of the problem.

Sanitary sewer manholes may be adjusted up to twelve (12”) inches in additional height above the cone section with grade rings. Adjustments over twelve (12”) inches shall be accomplished using pre-cast or cast-in-place manhole sections with GS5.

Payments for sanitary sewer manhole adjustments will be made at the unit prices bid for each which shall be full compensation for all labor and materials necessary to make the complete adjustment.

B 2.36 Sprinkler Relocations

Sprinkler relocations may be required on this project. Either the City of Colleyville or the Contractor shall be responsible for sprinkler relocations. Regardless, prior to construction, the Contractor and inspector shall identify and document the sprinkler systems that will be affected by the construction of the project. The Contractor shall contact the owner of each sprinkler system and arrange to test each system. In the presence of the inspector, the Contractor shall: (1) determine if the system functions properly, (2) identify the layout of the system and, (3) document in writing the layout and function of the system. The work described above is required by the Contractor for all projects and should be considered subsidiary to the unit prices bid for other items.

If the Contractor is responsible for actual irrigation relocations, a dollar amount has been included in the Proposal to reimburse the Contractor for any required sprinkler relocations. The amount is only an estimate. Prior to beginning construction, the Contractor shall contact the City of Colleyville of each sprinkler system and arrange to test each system. When construction activities approach a sprinkler system, the Contractor shall cut all feed lines to the system and salvage existing sprinkler heads for re-use (if feasible). The feed lines shall be cut at the right-of-way line. All of these activities shall be coordinated with the inspector. The Contractor shall obtain a licensed irrigator to repair or replace sprinkler systems with equal or better materials as the existing system. The Contractor shall submit copies of monthly invoices from the licensed irrigator for all sprinkler work performed during the month. The amount of the invoice plus 15% will be paid on the next monthly estimate. Payment will only be made based on the invoices submitted; therefore, the full dollar amount included in the Proposal for sprinkler relocations may or may not be paid. No payment will be made for adjustments except those determined necessary by the inspector. All sprinkler systems affected must be fully functional prior to final acceptance of the project.

If the City is responsible, the Contractor shall forward the documentation of the sprinkler systems to the inspector. When construction activity approaches a sprinkler system, the Contractor shall provide the inspector seven days' notice to allow for relocation of the sprinkler system.

B 2.37 Temporary Street Repairs for Trenches

Complete Excavation and Rebuild

This specification is applicable when the roadway is to be completely excavated and rebuilt. A temporary driving surface shall be required on all street cut openings. It shall be composed of permanent type paving material, specifically excluding gravel or flexbase as the surface material, unless approved by the engineer. A four-inch (4") hot mix asphaltic concrete (Type B) surface shall then be placed on compacted CTB by the Contractor as soon as possible after completing the backfill, but always within five (5) working days after completion of the work involving the cut. All temporary street repair shall be considered subsidiary to the various bid items on this contract. Any temporary driving surface that fails to provide an acceptable driving surface shall be removed and replaced at the Contractor's expense, as directed by the engineer.

Mill and Overlay or Reclamation

This specification is applicable when the roadway is to be rehabilitated by mill and overlay or by reclamation. A temporary driving surface shall be required on all street cut openings and shall be in accordance with the Existing Street Backfill and Repair Details. The driving surface shall be placed by the Contractor as soon as possible after completing the backfill, but always within 5 working days after completion of the work involving the cut. All temporary street repair shall be considered subsidiary to the various bid items on this contract. Any temporary driving surface that fails to provide an acceptable driving surface shall be removed and replaced at the Contractor's expense, as directed by the engineer.

B 2.38 Restoration of Existing Paved Surfaces

The Contractor shall be responsible for maintenance of existing paved roadway surfaces within the project limits throughout the duration of the project. The Contractor shall perform daily inspections and restoration work required to provide an acceptable driving surface, as determined by the engineer. Restoration of paved surfaces shall be of asphalt, unless otherwise approved by the engineer. Should the Contractor be notified by the City of unacceptable roadway conditions, the Contractor shall restore the surface within 24 hours. Should it become necessary for the City to provide for the restoration of the surface, the cost of such shall be deducted from the monthly estimate. All asphalt for restoration of existing paved surfaces shall be considered subsidiary to the various bid items on this contract.

B 2.39 Trenchless Technology/Boring

In using trenchless technology or boring the following applies:

A. Prior to construction, all existing public facilities shall be physically located in the field when crossing over or under water lines, sanitary sewer, or storm drains or where the existing facility is running in the same direction and is within five (5') feet of the proposed facility.

B. Construction shall be made in such a manner that will minimize interference with vehicular traffic and shall not weaken or damage the existing street. The location of the boring pits shall be a minimum of five (5') feet from the roadway to prevent undermining of the curb, gutter, or shoulder section. The pit shall be dug to a depth sufficient to maintain a minimum boring depth of 48 inches below the traffic surface. Jetting types of boring equipment are not allowed. All overcutting shall be remedied by pressure grouting the entire length of the installation. The pits or trenches excavated to facilitate this operation shall be backfilled and compacted immediately after work is completed.

C. The contractor shall be able to locate the bore head at all times in accordance with the latest technologies and provide the location of the bore to the director upon request.

D. All directional boring shall have the locator place bore marks and depths while the bore is in progress. Locator shall place a mark at each stem with a paint dot and indicate the depth at every other stem.

B 2.40 Conduit

All plastic conduit shall be schedule 40, rigid, high impact polyvinylchloride, conforming to Federal Specification W-C-1094 and Underwriters' Laboratories, Inc., Standard UL 651.

Prior to the installation of conduit, the City of Colleyville shall be notified so that a representative may be present to inspect the installation of the conduit. Failure to contact the City of Colleyville shall constitute grounds for rejecting conduit which has been installed without the presence of a representative of the City of Colleyville.

All conduit shall be placed in accordance with line and grade, details and dimensions as shown on the plans, or as directed by the engineer. All ends of pipe shall be reamed to remove burrs. All splicing of conduit shall be done by using standard couplings manufactured for this purpose. All bare ends of conduit for future connections by others shall be capped with standard conduit caps. The location of ends of all conduit for future electric circuits in structures shall be marked by a "Y" at least three (3") inches high, cut into the face of curb, gutter or wall directly above the conduit.

All conduit shall be placed a minimum of six (6") inches below the bottom of the pavement base, ten (10") inches for non-metallic conduit and in no case shall be of a greater depth than 30 inches measured from the top of curb. Installation under existing pavements may be accomplished by jacking, tunneling, or drilling. Conduit shall extend six (6") inches behind back of curb unless otherwise called for on the plans.

Conduit in medians shall be placed in the median at a depth of eighteen (18") inches to 30 inches as shown on the plans. Where pull boxes or junction boxes are required in medians which are to be surfaced, they shall be installed by the Contractor at the location and grade as shown on the plans or as directed by the engineer.

All necessary fittings for proper installation of conduit in the pull-box shall be furnished and installed by the Contractor. Where it is required that pull-boxes be installed, the conduit shall be fitted with standard 90 degree ell fittings to enter the pull-box from the bottom. A nipple shall be attached to the ell of sufficient length so that the distance from the top of the pull-box to the end of the nipple shall be eight (8") inches.

A No. 9 galvanized pull wire shall be placed in all conduit, and prior to the placement of paving, the wire shall be moved back and forth to ensure that the conduit is free from obstructions. Before final acceptance of the conduit work, this method of checking shall again be incorporated to ensure that the paving operations have not rendered the conduit useless. It shall be the Contractor's responsibility to remove and replace all damaged conduit at his own expense.

All plastic conduit shall have factory bends.

Conduit locations shown on the plans are for bidding purposes only and may be changed with permission of the City of Colleyville to avoid underground obstacles. The Contractor shall furnish and install conduit to an electrical service point to be determined by the City of Colleyville prior to the beginning of construction.

Measurement and Payment

Conduit of the size specified on the plans shall be measured by the linear foot along the main line of conduit. Fittings shall not be measured directly but shall be considered subsidiary to this item.

Conduit, as measured in this item, shall be paid for at the unit price bid for "conduit" of the size specified, which prices shall be full compensation for furnishing and installing all conduit, for all excavation, for all

gravel backfill, for furnishing and installing all fittings, for furnishing and installing pull-boxes, and for all labor, materials, tools, equipment, and incidentals necessary to complete the work.

B 2.41 Gabions

See material guidelines in Section B 1.22.

General

The gabions shall be installed in accordance with the size, type, and alignment as shown on the plans. PVC coated gabions shall be used in the areas as specified and shown on the plans. The placement of the gabions shall be in close conformity to the lines and grades shown on the plans and shall be in strict accordance with these specifications.

Geotextile Fabric Placement

After excavation to the subgrade elevation has been performed, the geotextile fabric (when specified) shall be placed to the limits as shown on the plans. Care shall be taken not to place the fabric in a manner exceeding the limits shown on the plans. Where splices occur, adjacent pieces of geotextile shall be overlapped a minimum of eighteen (18") inches. Fabric shall be secured, when necessary, by pins or other suitable means before placing the gabions. Excess fabric protruding past the finished gabions shall be cut off.

Gabion Assembly

Gabions are assembled in the following steps:

1. Unfold the baskets on a hard, flat surface and stamp out all kinks
2. Fold up the front, back, and end panels and fasten the panels together with the projecting heavy gauge selvage wire by twisting the selvage wire around the selvage wire of the other panel two complete turns.
3. Fold the inner diaphragm panels up and secure in the same manner.
4. Tie all edges of the diaphragms and end panels to the sides of the gabion by the tying method as specified below.

Tying Method

PROPER TYING OF GABIONS AT ALL STEPS IN THE ASSEMBLY AND CONSTRUCTION OF THE GABION STRUCTURE IS CRITICAL TO THE PERFORMANCE OF THE FINISHED GABION STRUCTURE.

Gabions must be tied in the specified manner at each step of construction:

Initial assembly

1. Tying to adjacent gabions along all contacting edges

2. Tying of lid to sides
3. Tying of lid to top of diaphragms
4. Re-tying of the cut gabions

All tying of gabions shall be performed in the following manner:

1. Cut a length of lacing wire approximately five feet long.
2. Secure the lacing wire onto the gabion at the end by looping and twisting the tie wire together.
3. Proceed tying with double loops (made at the same point) every five inches apart. The basket pieces should be pulled tightly together during the tying operation.
4. Secure the other end of the lacing wire by again looping and twisting the wire around itself. No other wire except of the type supplied with the gabions may be used for tying the gabions.

Gabion Placement

After each gabion has been assembled, it shall be placed in position empty and shall be tied to adjacent gabions along all contacting edges in order to form a continuously connected structural unit.

Filling Gabions

IT IS CRITICAL TO THE PERFORMANCE OF THE FINISHED GABION STRUCTURE THAT GABIONS ARE FILLED TO THEIR MAXIMUM DENSITY WITH VOIDS IN THE GABION MINIMIZED.

When the assembled empty gabions have been installed and tied together, the gabions shall be filled in the following manner:

1. The gabions may be filled by machine, but shall be filled in layers or lifts not exceeding twelve (12”) inches . Care shall be taken when placing the rock into the gabions to insure that the gabions are not damaged or bent. Do not drop rock from a height greater than three (3') feet. Suitable sized and appropriate machinery will help prevent damage to the gabions during the filling operation. Edges of gabions and diaphragms may be protected when necessary by tying steel reinforcement to the edges of the gabions or other suitable guard mechanisms to prevent damage or deformation of the gabions.
2. After a twelve-inch (12") layer of rock has been placed in the cell, sufficient hand manipulation for the rock shall be performed to minimize voids and result in a maximum density of rock in the gabion.
3. Gabions that are three (3') feet high shall have a looped inner tie wire installed in each cell connecting the front and back faces of any unsupported face at the vertical third points, or twelve (12") inches and 24 inches from the base of the gabions . Individual cells may not be filled to a height greater than twelve (12") inches above any adjacent cell unless looped inner tie wires are installed in both directions.
4. Each gabion shall be filled to its maximum density, which is slightly higher than the sides and the surface smoothly leveled minimizing voids.

Closing Gabions

After the rock has been leveled, the lids shall be pried down and over with a bar or lid closing tool until the edge of the lid and the edge of the gabion are together. Care shall be taken so that the mesh is not excessively deformed. It should require a light stretching in order to bring the two gabion pieces together. The heavy projecting selvage wire of the lid shall then be twisted around the heavy selvage wire on the sides two (2) complete turns. The lid shall then be tied to the sides of the gabions and the tops of the diaphragms in the specified tying method. The lids of the gabions shall also be tied to adjacent gabions along all contacting edges to insure the formation of a continuous, connecting structural unit. Special attention shall be given that all projecting sharp ends of wire are turned in on the completed gabion structure.

Cutting Gabions

Gabions may be cut to form curves or bevels. Overlap the cut pieces and re-tie in the specified manner. Re-tying shall be in a manner so as to produce a closed cell when completed. Excess mesh wire shall be cut off or shall be tightly and neatly laced down. Care shall be taken that all projecting wire ends are turned inwards or cut off.

Quality Control

Proper tying of gabions during all steps of construction and gabions being filled to their maximum density with a minimum amount of voids is critical to the performance of the finished gabion structure. Therefore, compliance with the technical specifications will be closely and thoroughly inspected. Any work not meeting the implied quality will be rejected.

Measurement and Payment

Measurement of gabion structures shall be based on the volume in cubic yards of gabions installed and filled to their maximum density with a minimum of voids and shall include the volume of embedded items when applicable. Gabion structures shall be paid for at the contract unit price per cubic yard. The unit price shall include full compensation for placing all materials (gabions, rock, geotextile and/or granular filter media) and for furnishing all tools, labor, equipment, and other incidentals necessary to complete and install the gabion structure in accordance with the intent of the plans and specifications. Excavation and removal items will be paid for separately. Filling required to prepare finish grade for gabion placement will be incidental to payment for excavation. Areas over excavated beyond the limits of proposed gabions or natural rock will be backfilled with excavated material free of large rocks, stones, vegetation or debris. This backfilling will not be paid for separately but shall be incidental to items bid.

B 2.42 Temporary Traffic Signals

Temporary signals shall be considered for all existing signalized intersections within the limits of this project. This section describes furnishing, installing, maintaining, and removing intersection temporary traffic signals. Temporary traffic signals are considered a part of the Traffic Control Plan and no

additional pay will be made to the Contractor for this work. Material specifications can be found in Section B 1.14 of this specification.

Install and maintain City supplied signal controller cabinet, signal controller and video imaging video detection systems (VIVDSs). The City Engineer may request changes to the timing intervals during the project as required by construction or traffic conditions. Make all engineer-requested changes within 24 hours. Furnish and install the temporary electrical service for temporary traffic signals according to the requirements of the applicable electrical utility. Provide an affidavit to the electrical utility in a timely manner so the electrical utility can schedule service turn on. If required, install the electrical service.

Provide and install wood poles, posts, tether wire, messenger wire, tether wire hardware, messenger wire hardware, guy wire, span wire, guy wire hardware, and span wire hardware, traffic signal cable, traffic signal faces mounting hardware, electrical service, traffic signal faces, traffic signal back plates as per standard detail sheets.

Request a signal inspection of the complete temporary traffic signal installation. Make this request to the City Engineer at least three (3) working days before the requested inspection. The engineer will not grant turn an approval until the contractor corrects all discrepancies.

All traffic signal installation shall conform to the latest *Texas Manual on Uniform Traffic Control Devices* (TMUTCD). Verify the span heights throughout the project duration.

Place all signal faces as directed by the City Engineer. Make every effort to give maximum visibility to all signals intended for view by the motoring public.

Provide the name, address, and telephone number of the persons qualified and assigned to maintaining the temporary traffic signal to the City Engineer. Ensure this persons is available 24 hours a day, seven (7) days a week, from the start of the project until the temporary traffic signal is not needed Ensure that emergency calls are received by an individual and not by an answering machine.

The City of Colleyville will make every effort to have permanent signals relocated, in place, and in working order as required by the time the project is accepted. If this does not occur, it will not delay project acceptance; and a separate agreement between the general contractor, sub-contractor, and the City of Colleyville may be written so the City of Colleyville takes over responsibility of payments to the traffic control sub- contractor for on-going maintenance and removal of the temporary signals.

Before activating the temporary traffic signal, verify the signal indications and operation of the signal with the City Engineer.

The contractor will transfer VIVIDS from any signalized intersection with existing VIVIDS to the temporary facilities. The City of Colleyville Field Operations Division will provide (loan) VIVIDS to the contractor for installation and use on the temporary signal(s) for any signalized intersection without VIVIDS.

Upon acceptance of new signal and completion of work, the contractor will switch control of the intersection over to the permanent cabinet installation including relocating the VIVIDS. Remove all signal cable and wires, wood poles, wood posts, control cabinet, control equipment, and incidental materials. Upon deactivation of the temporary signal, call the electrical utility immediately for the temporary electrical service disconnect.

Remove the temporary traffic signal faces the same day the permanent traffic signal is turned on.

Immediately remove the wood poles and wood posts obstructing the view of the new permanent signal faces. Remove remaining wood poles and wood posts within 3 working days of new permanent signal activation.

Immediately after removing the wood poles and wood posts, backfill the holes, compacting every twelve (12") inches with an engineer-approved material.

Maintenance

Immediately correct lamp/LED outages within 24 hours of the reported outage.

Respond within one hour of notification to provide corrective action to any emergency such as but not limited to knockdowns, signal cable problems, and all equipment failures. If equipment becomes damaged or faulty beyond repair, replace it within one working day. In order to fulfill this requirement, maintain, in stock, sufficient amounts of materials and equipment to provide repairs.

The City of Colleyville will maintain all emergency vehicle pre-emption devices.

B 2.43 Base Failure Repair

All base failures will be repaired with Type "B" HMAC, or as specified by the Inspector. Material will be placed and compacted in four-inch (4") lifts and shall be flush with the existing milled surface. Minimum depth is eight (8") inches and final depth will be achieved once solid subgrade is reached.

Base failures that appear in front of citizen's driveways will be repaired the same day the street is milled. Base failures on the remainder of the road surface must be made safe for vehicular traffic the same day the street is milled until permanent repairs are made. Contractor must complete all base failures on each street within three (3) working days or a penalty of $1,000 per day for each day in excess of the 3 working days will be assessed.

On residential streets, Contractor will be required to use a Gradall type excavator or backhoe to excavate the base failure.

Contractor shall immediate load excavated material into a truck. Excavated material shall not be placed on top of the milled surface at any time.

Asphalt shall be delivered to the job site and placed in the prepared area for repair. Contractor shall not dump loads of asphalt in the street.

Areas that require repair or asphalt reclamation will be determined by the Inspector. If the Inspector determines that more than 30 percent of the street has base failures, or determines that the weight of the excavation equipment will cause more than 30 percent of the street to fail, asphalt reclamation will be performed instead of a base failure repair.

Depth required for excavation of base failures will be determined by the project Inspector. Measurements for base failure repairs will be verified by the Contractor of Inspector at the end of each working day.

The city of Colleyville will pay for areas agreed upon by the Contractor and Inspector.

PART C - WATER AND SEWER SPECIAL PROVISIONS

SECTION C 1 WATER AND SEWER MATERIALS

C 1.1 General

This section of the specifications contains the detail specifications for all major materials which enter into the project and become a permanent part thereof. The specifications are intended to be so written that only new materials, not deteriorated from its original and manufactured state, of the best quality and grade will be furnished, that manufacturing procedures for the product be controlled with failure-preventative type processes, and that good workmanship will produce a first class product. The specifications are formulated to provide total performance of each product within the frame of its intended use and as such, every detail requirement of the controlling specification shall be met even though this necessitates selective upgrading of another. The fact that individual specifications may fail to be sufficiently complete in some detail will not relieve the Contractor of full responsibility for providing material of high quality under the total performance concept and to protect them adequately until incorporated into the system or structure. All pipe, fittings and appurtenances used for potable water applications shall be listed in the National Sanitation Foundation listing of approved materials.

C 1.2 Specification References

When reference is made in these specifications to a particular ASTM, AWWA, ANSI, AASHTO, ACI, NSF Standard or other specification, it shall be understood that the latest revision of such specification shall apply.

C 1.3 Substitutions

The specifications for materials set out the minimum standard of quality which the City believes necessary to procure a satisfactory project. No substitutions will be permitted until the Contractor has received written permission of the Engineer to make a substitution for the material which has been specified.

Where the term "or equal," or "or approved equal" is used, it is understood that if a material, product, or piece of equipment bearing the name so used is furnished it will be approved as the particular trade name was used for the purpose of establishing a standard of quality acceptable to the City. If a product of any other name is proposed for use, the Engineer's approval thereof must be obtained in writing before the proposed substitute is procured by the Contractor. Wherever the term "or equal" is used it is understood to mean "or approved equal." It shall be understood that the Contractor shall have the full responsibility of proving that the proposed substitution is, in fact, equal.

C 1.4 Operation and Maintenance Manuals

The contractor shall provide when specified two (2) copies of operation and maintenance manuals for all manufactured equipment supplied. Manufactured equipment shall include the following: pumps, motors, valves, flow meters, fire hydrants, backflow preventers, instruments (electronic and mechanical), or any other device which required any type of cyclic maintenance. The manuals shall be bound in a three ring binder and shall be tabbed by section. At a minimum the manual sections shall include but not be limited to:

- Table of Contents
- Theory of Operation
- Warranty Information
- Maintenance Cycles Required
- Maintenance Materials Required (i.e. lubricants) Spare Parts List
- Schematic Drawings & Diagrams

C 1.5 Concrete Pipe and Fittings

This specification governs the manufacture of concrete pressure pipe for use primarily in water supply and distribution systems. Except as otherwise specified, the pipe and fittings shall be designed and manufactured in accordance with the following AWWA standards:

Standard Product

AWWA C301 "Manufacture of Prestressed Pressure Pipe, Steel Cylinder Type, for Water and Other Liquids"

AWWA C303 "Concrete Pressure Pipe, Bar-Wrapped Steel Cylinder Type"

AWWA C304 "Design of Prestressed Pressure Pipe, Steel Cylinder Type, for Water and Other Liquids"

Brief descriptions of the various types of concrete pressure pipe to be manufactured under this specification are as follows:

Prestressed Concrete Lined Cylinder Pipe. This pipe has a welded sheet-steel cylinder, manufactured by the spiral or straight seam method, with steel joint rings welded to its ends. A core is then constructed which consists of lining the cylinder with concrete, either poured or centrifugally cast within the steel cylinder. High tensile strength prestressing wire is then wound around the outside of the steel cylinder at a predetermined stress and securely fastened at both ends. The core and wire are then covered with a Portland cement mortar coating. Pipe joints are self-centering with a preformed rubber gasket designed so that the joint will be watertight under all normal service conditions.

This pipe is manufactured in accordance with AWWA C301. The minimum nominal joint length is sixteen (16') feet. Normally used sizes of this pipe are from sixteen-inch (16") to 60-inch diameters.

Prestressed Concrete Embedded Cylinder Pipe. This pipe is similar to prestressed concrete lined cylinder pipe except that the core is composed of a steel cylinder embedded in concrete instead of a steel cylinder with only an inside lining of concrete.

This pipe is manufactured in accordance with AWWA C301. The minimum nominal joint length is sixteen (16') feet. Normally used sizes of this pipe are from 48-inch to 96-inch inch diameters.

Bar-Wrapped Concrete Cylinder Pipe. This pipe consists of a welded sheet-steel or plate-steel cylinder manufactured by the spiral or straight seam method with the joint rings attached. A cement mortar lining is centrifugally cast inside the steel cylinder. A mild steel rod is spirally wrapped under measured tension on the steel cylinder, and a protective Portland Cement mortar concrete coating is applied to the outside of the cylinder and rod. This pipe is manufactured in accordance with AWWA C303. This pipe is normally furnished in joint lengths of 24 feet to 40 feet with shorter length specials. Normally used sizes of this pipe are from ten-inch (10") to 60-inch diameters.

General Requirements

The type of pipe to be supplied shall be as shown on the plans and/or in the special provisions for each project.

If requested by the City, the manufacturer shall submit a successful experience record in the design and construction of the type of concrete pressure pipe involved. Each type of pipe shall have the complete approval of the Underwriters' Laboratories, Inc., for the manufacture of the pipe specified and diameters up to 96 inches . Pipe shall have NSF standard approval.

The pipe manufacturer shall furnish a factory trained, job experienced field representative who shall visit the project at least weekly during the course of installation and be present at the unloading of the pipe at delivery to insure proper handling. They will also be subject to call by the Contractor or Owner to advise and assist with the solution of field problems.

The City shall at all times have free access to the manufacturer's plant while production is in progress. The City may at any time refuse to accept pipe made when the plant is failing to follow the stipulations of the specifications in regard to workmanship, or failing in provisions to insure a uniform product coming within the permissible variations of the specifications as to size, thickness, position of reinforcing steel, and curing of pipe. The interior pipe surface shall be relatively smooth and free from pits, etc. No pipe with cracks in either the exterior or interior mortar coatings will be acceptable unless such cracks are minor hairline cracks as defined by the manufacturer.

Where designated, joints shall be bonded using an approved electrical conducting material to insure continuity between sections of pipe for the application of cathodic protection measures in accordance with the latest industry standards. Bonding straps shall be provided past in-line valves to assure electrical continuity.

Test stations shall be provided at the appropriate locations as indicated on the plans to insure proper bonding and effectiveness of cathodic protection measures.

No cracks will be permitted in the lining of the pipe except for minor hairline cracks. Cracks in the vicinity of the spigot of prestressed pipe and those cracks in the vicinity of circumferential wrappers and outlets shall not be allowed, unless after inspection it is determined that they do not interfere with the performance of the pipe and they are accepted by the manufacturer so as to not void the warranty.

The Contractor shall furnish the City shop drawings of the pipe and fittings to be furnished which shall include a tabulated layout schedule referenced to plan stationing and grade lines as shown on the project drawings.

Such drawings shall be subject to the review of the City. Fabrication of pipe and fittings shall not commence until such review has been completed by the City or its authorized representative or such has been waived in writing. Three (3) copies of the preliminary drawings shall be submitted for approval. Six (6) copies of the final drawings will be required.

Unless otherwise noted on the plans or in the special provisions, all concrete pressure pipe shall be designed for 150 psi working pressure.

Unless otherwise directed by the Engineer or required in the project specifications, design stresses shall conform to the requirements of AWWA C304 for prestressed pipe or the design appendix of AWWA Manual M9 for Bar-Wrapped Pipe.

Fittings and specials shall comply in all respects with the requirements of AWWA C301 or AWWA C303 or AWWA C304 as applicable for the type and class of pipe required by the plans and project specifications.

Flanged outlets shall be insulated at all points where external valves, pipe, fittings, etc., are connected to the line. The Contractor shall furnish an insulating flange kit, flange gaskets, insulating sleeves, and two (2) plastic washers for each bolt approved by the Owner or his/her representative.

Bolts, nuts, and washers for flanged outlet connections shall be carbon steel. After installation they shall be encased with mortar in a pipe diaper.

Where taps are threaded, a brass or bronze bushing shall be used between the steel coupling affixed to the pipe and the corporation stop or other outlet device. The steel coupling shall be completely embedded in the pipe wall and covered with the mortar coating of the pipe. Nylon and galvanized bushings are not acceptable.

Pipe for installation in tunnels or conduits shall have a minimum of two 24-inch wide mechanically impacted mortar bands one and one-half (1½") inches thick placed at approximately the third points of

each pipe length. The exterior of the joint recess of tunnel pipe shall be filled with an approved flexible pre-formed joint sealer.

When requested, the manufacturer shall furnish an affidavit of compliance that all pipe and fittings comply with the applicable portions of the appropriate AWWA standard and that all tests required by the standard have been performed. Copies of the test reports required by Section 1.9 of either AWWA C301, AWWA C303, or AWWA C304 shall be made available to the City, upon request.

In addition, the City may, at its expense, retain the services of an independent testing laboratory to certify or monitor the testing performed by the manufacturer.

Pipe will be rejected for failure to meet any of the requirements of these specifications. Pipe delivered which does not comply with the requirements of Section B 2.3, and which has defects which cannot be repaired using normal acceptable methods shall be rejected and shall be immediately removed from the construction site.

C 1.6 Asbestos-Cement Pressure Pipe

THIS MATERIAL SHALL NOT BE USED FOR NEW WATER LINE CONSTRUCTION, BUT IS INCLUDED FOR GUIDANCE FOR REPAIR, MAINTENANCE AND CONNECTION TO EXISTING WATER LINES.

This specification governs the manufacture of asbestos-cement pressure pipe for water distribution systems. This pipe is composed of a mixture of Portland cement, silica, and asbestos fiber and is completely free of organic or metallic substances.

All asbestos-cement pipe and couplings shall comply with AWWA C400 and ASTM C269, Type II.

Standard pipe lengths shall be thirteen (13') feet. Up to ten (10%) percent of the total footage of any one size and class of pipe may be furnished in random lengths. The maximum outside diameters for the various sizes shall be limited to the following: 6"-7.60", 8"-9.62", 10"-12.12", and 12"-14.38".

To facilitate spotting of valves and fittings, short lengths may be furnished either machined overall (MOA) or machined each end (MEE). For ease of installation, the MOA may be made of PVC manufactured to the dimension of asbestos-cement pipe in the same pressure class as the pipe being furnished.

Pipe six (6") inches in diameter shall be Class 200. Pipe eight (8") inches and larger in diameter shall be Class 150.

Couplings shall be of the sleeve type suitable for use with a rubber or rubber-type sealing gasket. The gaskets shall be furnished with each coupling and shall be the Nonoil Resistant type as set forth in ASTM D 1869, "Rubber Rings for Asbestos-Cement Pipe".

Fittings will be ductile iron and shall be cement mortar lined inside with seal coat in accordance with ANSI A21.4 (AWWA C104). The outside coating will be in accordance with ANSI A21.6 (AWWA C106).

Fittings shall be either mechanical joint or push-on joint in accordance with Section C 1.19. Asbestos-cement to ductile iron or P.V.C. adapters will be used where required. Bolts for flange connections shall be Type 304 stainless steel with nylon coated nuts and washers or silicon bronze nuts and washers.

Asbestos-cement water pipe shall be approved by the Underwriter's Laboratory and shall be accepted by the State Fire Insurance Commission for use in water distribution systems in cities and towns of Texas.

Asbestos-cement water pipe shall also bear the seal of approval ("NSF" mark) of the National Sanitation Foundation Testing Laboratory for potable water pipe.

All service connections through two (2") inches shall be made using a factory made heavy tapped coupling with brass bushing which is threaded into the fitting body in combination with an epoxy seal. The outlets shall be AWWA taper thread for 3/4-inch and one-inch (1"). For two-inch (2") taps, iron pipe threads (I.P.T.) shall be used. For service taps made at locations other than tapped couplings, a service clamp conforming to the requirements set forth in Section C 1.17 shall be used.

Asbestos-cement pipe may be rejected for failure to meet any of the requirements of this specification.

C 1.7 Polyvinyl Chloride (PVC) Water Pipe

(Four-inch (4”) through twelve-inch (12”) diameter)

This specification governs the manufacture of unplasticized polyvinyl chloride (PVC) plastic pipe with integral thickened wall bells for water distribution systems in sizes four-inch (4") through twelve-inch (12").

All pipe shall be Class 150 (DR 18) unless otherwise specified or shown on the plans.

All pipe shall meet or exceed the requirements of AWWA C900, latest revision, and have cast iron pipe outside dimensions.

All pipe shall have a rubber ring joint. Provisions must be made for contraction and expansion at each joint with a rubber ring.

An integral thickened bell will be a part of each joint. Minimum thickness through the pipe bell and ring seating areas shall be as specified in AWWA C900 or AWWA C905, latest revision.

Pipe and fittings must be assembled with non-toxic lubricant.

Laying lengths shall be twenty (20') feet plus or minus (±) one (1") inch. All pipe shall have physical dimensions as shown in Table 1.

All fittings shall be mechanical joint or push-on joint iron fittings complying with Section C 1.19.

Bolts, nuts and washers used in flange and mechanical joint connections shall be high strength, low alloy steel similar to CORTEN or equal.

Service saddles shall be used for all taps. No direct tapped connections to PVC pipe will be allowed. Service saddles shall comply with Section C 1.17.

PVC water pipe shall be approved by the Underwriters' Laboratory and shall be accepted by the State Fire Insurance Commission for use in water distribution systems in cities and towns of Texas.

PVC water pipe shall also bear the seal of approval ("NSF" mark) of the National Sanitation Foundation Testing Laboratory for potable water pipe.

Each length of pipe shall be tested to two (2) times the pressure rating of the pipe for a minimum dwell of five (5) seconds.

To assure high quality extrusion, the pipe produced by each extrusion outlet shall be tested by the acetone immersion method at least every eight (8) hours.

When requested, the manufacturer will furnish certification that the pipe furnished meets all requirements of this specification.

Pipe may be rejected for failure to meet any requirements of this specification.

PVC WATER PIPE DIMENSIONS

Nominal Size (Inches)	**Outside Diameter (Inches)**	**Class 150 (DR 18) Minimum Wall Thickness (Inches**
4	4.8	0.267
6	6.9	0.383
8	9.05	0.503
10	11.10	0.617
12	13.20	0.733

C 1.8 Polyvinyl Chloride (PVC) Water Pipe

(Fourteen-inch (14”) through 48-inch diameter)

This specification governs the manufacture of unplasticized polyvinyl chloride (PVC) plastic pipe with integral thickened wall bells for water distribution systems in sizes fourteen-inch (14") through 48-inch.

All pipe shall be Pressure Rating 235 psi unless otherwise specified or shown on the plans.

All pipe shall meet or exceed the requirements of AWWA C905, latest revision, and have cast iron pipe outside dimensions.

All pipe shall have a rubber ring joint. Provisions must be made for contraction and expansion at each joint with a rubber ring.

An integral thickened bell will be a part of each joint. Minimum thickness through the pipe bell and ring seating areas shall be as specified in AWWA C900 or AWWA C905, latest revision.

Pipe and fittings must be assembled with non-toxic lubricant.

Laying lengths shall be twenty (20') feet plus or minus (±) one (1") inch.

All fittings shall be mechanical joint or push-on joint or flanged ductile iron fittings complying with Section C 1.19.

Bolts, nuts, and washers used in flange and mechanical joint connections shall be high strength, low alloy steel similar to CORTEN or equal.

Service saddles shall be used for all taps. No direct tapped connections to PVC pipe will be allowed. Service saddles shall comply with Section C 1.17.

PVC water pipe shall be approved by the Underwriters' Laboratory and shall be accepted by the State Fire Insurance Commission for use in water distribution systems in cities and towns of Texas.

PVC water pipe shall also bear the seal of approval ("NSF" mark) of the National Sanitation Foundation Testing Laboratory for potable water pipe.

Each length of pipe shall be tested to four (4) times the class pressure of the pipe for a minimum dwell of five (5) seconds.

To assure high quality extrusion, the pipe produced by each extrusion outlet shall be tested by the acetone immersion method at the beginning of each production run for each size or when running conditions are changed that could affect extrusion quality.

When requested, the manufacturer will furnish certification that the pipe furnished meets all requirements of this specification.

Pipe may be rejected for failure to meet any requirements of this specification.

C 1.9 Ductile Iron Pipe

This specification governs the manufacture of ductile iron pipe for water distribution systems and sewage collection systems.

All ductile iron pipe shall be asphaltic coated outside and manufactured in accordance with the latest revision of ANSI/AWWA C151/A21.51.

All pipe shall be new.

All ductile iron pipe for water service shall be cement mortar lined in accordance with the latest revision ANSI/AWWA C104/A21.4 and must be approved by the National Sanitation Foundation.

All ductile iron pipe and fittings for sanitary sewer service shall be internally lined with a virgin polyethylene coating complying with ANSI/ASTMD 1248 compounded with an inert filler and sufficient carbon black to resist ultraviolet rays during storage of the pipe and fittings. The polyethylene shall be bonded to the interior of the pipe or fitting by heat. All surface areas to be lined shall be blast cleaned comparable to the requirements of SSPC-SP6 or NACE #3. Polyethylene linings shall cover the inner surface of pipe and fittings extending from the spigot end to the gasket socket. Lining in pipe and in fittings shall be 40 mils nominal thickness.

Ductile iron pipe shall be designed in accordance with the latest revision of ANSI/AWWA C150/A21.50, for a minimum 150 psi (or project requirements, whichever is greater) rated water working pressure plus a 100 psi minimum surge allowance and a 2 to 1 factor of safety and a service allowance of 0.08 inches. Minimum external earth load shall be calculated assuming a prism load and a minimum soil density of 120 pcf, or project requirements, whichever is greater. Minimum external live load shall be the AASHTO H-20, or project requirements, whichever is greater. Laying condition and depth of cover shall be in accordance with the plans.

Ductile iron pipe shall have either push-on joints, flanged or mechanical joints in accordance with ANSI A21.11 (AWWA C111) entitled "American National Standard for Rubber-Gasket Joints for Cast-Iron and Ductile-Iron Pressure Pipe and Fittings".

Bolts, nuts, and washers used in flange and mechanical joint connections shall be high strength, low alloy steel similar to CORTEN or equal.

Dimensions, coatings, linings, joint types, etc., shall conform to Section C 1.19, Ductile Iron Fittings, of these specifications. Only ductile iron fittings shall be used on ductile iron pipe. All fittings must be approved by the National Sanitation Foundation.

Ductile iron pipe shall be approved by the Underwriters' Laboratory and shall be accepted by the State Fire Insurance Commission for use in fire protection systems without penalty.

All ductile iron pipe and fittings shall be tested in accordance with the applicable provisions of the specifications relating thereto.

Ductile iron pipe and fittings may be rejected for failure to meet any of the requirements of this specification.

C 1.10 Polyvinyl Chloride (PVC) Gravity Sewer Pipe

This specification governs the manufacture of unplasticized polyvinyl chloride (PVC) plastic gravity sewer pipe with integral wall bell and spigot joints for the conveyance of domestic sewage.

Four-inch (4") through Fifteen (15") Diameter: Pipe and fittings four-inch (4") through fifteen-inch (15") in diameter shall comply in all respects to ASTM D 3034 SDR 26 pipe and ASTM D 2412 with pipe stiffness of 115 psi.

Eighteen-inch (18") through 36-inch Diameter: Pipe and fittings eighteen- inch (18") through 36-inch in diameter shall comply in all respects to ASTM F 679 and ASTM D 2412 with pipe stiffness of 115 psi.

Joints for the piping system shall be sealed with a rubber ring gasket and shall comply with ASTM D 3212. Gasket shall comply with ASTM F 477 and shall be of a composition and texture resistant to common ingredients of sewage and industrial waste, including oils and ground water, and which will endure permanently under the conditions imposed by this use.

Fittings and accessories shall be manufactured and furnished by the pipe supplier or approved equal and have bell and/or spigot configuration identical to that of the pipe.

Minimum pipe stiffness at five (5%) percent deflection shall be 115 when calculated in accordance with ASTM D 2412.

At manholes, rubber gasket water stops or Kor-N-Seal connectors as manufactured by NDC, Inc., Milford, New Hampshire, or equal will be used to provide a positive watertight connection. Fernco coupling devices, or approved equal, will be used to connect to existing pipelines.

Each pipe shall be identified with the name of the manufacturer, nominal size, cell classification, ASTM designation, SDR ratio or pipe stiffness designation and manufacturer code.

PVC gravity sewer pipe and fittings may be rejected for failure to meet any of the requirements of this specification.

C 1.11 Reinforced Concrete Pipe with Rubber Gasket Joints

This specification governs the manufacture of reinforced concrete pipe with rubber gasket joints used for the conveyance of domestic sewage.

Reinforced concrete pipe manufactured under these specifications shall conform to ASTM C 76 or ASTM C 655 with modifications set forth in this specification. Rubber gasket joints shall conform to ASTM C 443.

Aggregates for the concrete shall comply with the requirements of ASTM C 33 with the additional requirement that aggregate shall have a minimum of fifty (50%) percent of calcium carbonate equivalent.

Pipe furnished under this specification shall be designed for the required "D-Load" in accordance with ASTM C 655. Proof of design will be required if requested. Calculations shall be submitted for approval and shall be done in accordance with accepted ultimate strength design procedures or generally accepted empirical design procedures accepted by the City.

All pipe shall be machine made by a process which will provide for uniform placement of zero slump concrete in the form and compaction by mechanical devices which will assure a dense concrete in the finished product.

The minimum laying length of each joint shall be six (6') feet for sizes up to and including fifteen-inch (15") through 78-inch. Laying length requirements do not apply to bends, wyes, and other special fittings which may be required or for special radius pipe.

Pipe and fittings shall be steam cured in accordance with methods prescribed in ASTM C 76 or any other method or combination of methods approved by the City.

All steel reinforcement shall be in accordance with ASTM C 76 and shall be circular. The maximum permissible absorption shall be six and one-half (6.5%) percent.

The basic physical pipe dimensional design for thickwall pipe shall be identical to the next larger three-inch (3") increment for standard pipe size, up through and including 51-inch diameter.

It shall be the next six-inch (6") increment for size54-inch and larger. The pipe shall be reduced internally to the inside diameter as specified on the plans.

The reinforcing steel shall be placed as required on the next larger size to provide an additional sacrificial lining of either one and one-half inches (1½") or three inches (3") of concrete cover over the reinforcing steel.

Proof of design in accordance with Section 6 of ASTM C 655 must be submitted to the City.

Connecting joints shall be made using a flexible watertight rubber-type compression gasket in accordance with ASTM C 361. The rubber gasket shall be the sole element of the joint depended upon to provide watertightness and shall be required to meet and be tested in accordance with ASTM C 443.

A. Joint Design. The joint design shall consist of a bell or groove on one end of a unit of pipe and a spigot or tongue on the conic surfaces of the inside of the bell or groove, and the outer surfaces of the spigot or tongue shall be parallel and shall not be more than three (3) degrees for pipe sizes through fifteen (15) diameter nor more than two (2) degrees for larger sizes. The spigot or tongue shall be so shaped as to provide a groove within which the gasket will be largely confined when compressed. The joint shall be designed such that the gasket is not required to support the weight of the pipe.

B. Rubber Gaskets. All rubber-type gaskets shall be of the round O-ring design and shall be extruded or molded and cured in such a manner that any cross-section will be dense, homogeneous, and free of porosity, blisters, pitting and other imperfections.

   The rubber gasket shall be fabricated from a high grade rubber-like compound. All gaskets shall meet and be tested in accordance with ASTM C 443.

   The gasket shall be a continuous ring which, when in position in the gasket seat on the spigot or tongue end of the pipe, shall not be stretched more than twenty-five (25%) percent of its original circumference.

C. Tolerances. The joint design shall be such that the parallel surfaces upon which the gasket may bear during closure shall extend a distance of not less than one (1") inch from the edge of the gasket seat toward the outer edge of the bell when the joint is in a normal fully closed position.

D. Deflection. The joint design shall provide for the deflection of a pipe unit by opening one side of the outside perimeter of the joint 1 / 2 - inch wider than the full "home" position without reducing its watertightness. Where greater deflections are required than provided by the joint design, beveled joints or elbows shall be provided.

E. Approval. Joint designs and type of rubber gaskets shall be subject to approval by the Engineer prior to installation.

All fittings and specials including all bends, tees, etc., shall be manufactured on machines and in the same manner as straight joint concrete pipe under these specifications except that joint lengths may be shorter than the minimum listed. The quality of the concrete, workmanship, and bell and spigot joint detail for rubber gasket joints will be subjected to the same requirements as straight joints of pipe.

Each length of pipe shall bear the initials or name of the person, company, or corporation by whom manufactured, date of manufacture, and the class of pipe. The markings shall be indented or stenciled on the exterior or interior of the barrel near the bell and shall be plainly legible for purpose of identification.

The City shall at all times have free access to the manufacturer's plant while production is in progress, and may at any time refuse to accept pipe made when the plant is failing to follow the stipulations of the specifications in regard to workmanship, or failing in provisions to insure a uniform product coming within the permissible variations of the specifications as to size, thickness, position of reinforcing steel, and curing of pipe. The City may reject pipe if adequate means and methods are not provided so as to insure the manufacture of a product of uniform high quality.

The pipe shall be required to meet and be tested in accordance with ASTM C 76 or ASTM C 655 as applicable.

The connecting joints shall be subject to the hydrostatic tests set forth in ASTM C 443.

The rubber gasket shall be required to meet and be tested in accordance with ASTM C 443 or ASTM C 361.

Repairs will be permitted as set forth in ASTM C 76 and/or ASTM C 655 except field repairs will only be allowed upon approval of the City's representative. If, in the opinion of the City's representative, repairs should not be made, the pipe section, fitting, etc., will be rejected and removed from the construction site. Once rejected, the pipe section, fittings, etc., may not be used on a City project.

The pipe may be rejected for having defects or failure to meet requirements as follows:

A. Variations in dimensions exceeding the permissible variations prescribed.

B. A piece broken out of the bell, spigot, or tongue or groove end of such size that the watertightness of the joint should be impaired.

C. Any shattering or flaking of concrete or other conditions indicating any improper concrete mix.

D. Lack of uniformity in placement of steel that might preclude all joints being typical of those tested.

E. Cracks sufficient to impair the strength, durability, or serviceability of the pipe.

F. Failure to conform to any of the specifications herein set forth or referenced.

G. The complete absence of distinct web-like markings, which may be indicative of a deficiency of water in the concrete mix, from the external surface of the pipe made by any process in which the forms are removed immediately after the concrete has been placed unless specimens submitted for test that do not have such web-like markings shall have passed the physical tests required by these specifications.

H. Failure of the pipe to go completely "home" due to binding of spigot against bell or tongue against groove.

I. Failure to pass any of the tests required by these specifications.

J. Joint sections with spalls, cracks, fractures, or other imperfections that could adversely affect the performance of the joint.

C 1.12 Fire Hydrants

This specification governs the manufacture of fire hydrants used in the water distribution system. Except for supplementary details, changes, or additions set forth herein, fire hydrants shall comply with AWWA C 502, "Fire Hydrants for Ordinary Water Works Service."

Fire hydrants shall be post type with compression main valve closing with the line pressure. All hydrants shall be of the "traffic" type with easily replaceable frangible parts designed to break on traffic impact. Hydrants shall be designed for a working pressure of 150 psi.

Fire hydrants shall be Mueller Centurion or an equivalent as approved by the City.

A. Main Valve Size. Five and one-fourth (5¼") inches I.D. minimum.

B. Inlet Connection. Six- inch (6") mechanical joint or as otherwise shown on the contract drawings. Bolts, nuts and washers used in flange and mechanical joint connections shall be high strength. Low alloy steel similar to CORTEN or equal.

C. Depth of Bury. Normally four (4') feet unless otherwise shown on the plans or called for in the contract documents. The maximum permissible-depth of bury is six (6') feet. Fire hydrants installed between four (4') feet and six (6') feet depth shall be installed with Grade Loc fittings as manufactured by Assured Flow Sales, Inc., or standard ductile iron fittings as described in section C 1.19 of these specifications.

D. Barrel Sections. Hydrants shall have upper and lower barrel sections with the joint designed to be at least two (2") inches above finished grade. The union between the upper and lower barrels shall be made by a traffic safety device such as a two-part safety flange, four-part segmental coupling, or breakable lugs in combination with breakable bolts. The design will permit rotation of the upper barrel to position the nozzles in any direction. Upper and lower barrel flanges shall be integrally cast.

E. Nozzles. The upper barrel shall include two (2) hose nozzles and one (1) steamer nozzle located on the same plane. All nozzles shall be equipped with cap chains and gaskets for all nozzle caps. Nozzle caps to have one-inch (1") square nuts.

1. Hose Nozzles. The two (2) hose nozzles shall be two and one-half (2½") inches I.D. with National Standard threads.

2. Steamer Nozzle. The steamer nozzle shall be four and a half (4 1/2") inches I.D. (Mueller Gauge 4-482) with the following characteristics:

   - Major Diameter - 4.982".
   - Pitch Diameter - 4.820".
   - Minor Diameter - 4.632".
   - Root Diameter - 4.570".
   - Threads per Inch - 4".
   - 4.5" Hyro-Storz Adapter

F. Direction to Open. Turn to left (counter clockwise).

G. Operating Nut. The operating nut shall be one and one-half (1 1/2") inch pentagon measured flat to flat with a minimum of one (1") inch and shall have a weather shield cast integrally with the nut.

H. Color of Finish Paint above Ground Line. Two coats of safety red over a shop prime coat.

I. Paint shall be brushed on and not sprayed.

J. Stem. Provision shall be made in the design of the stem to disconnect the stem from the hydrant parts above the standpipe breakpoint in the event of a traffic accident.

K. The union between the upper and lower stems shall be made by a breakable coupling. The design shall be such that excessive turning torque on the stems in either the opening or closing cycle is not transmitted to the weakened section of the coupling.

L. Drainway. The drainway shall be all bronze. Drain water shall not come in contact with the internal cast iron parts of the shoe while exiting the hydrant through the drainway.

M. Main Valve. The main valve and seat ring shall be removable through the upper barrel from above ground. The main valve seat ring shall thread directly into a bronze insert.

N. O-Rings. O-rings shall be furnished in lieu of stem packing.

O. Only those manufacturers whose hydrants have been specifically approved by the City's Standard Water/Sewer Products Committee will be approved in the City's water system. This approval will be based on the following items; disqualification of project may occur at any time as a result of failure to comply with the following provisions.

Approvals

A. Drawings. Each manufacturer of fire hydrants manufactured under these specifications shall have on file at the City certified assembly drawings of the hydrant proposed to be furnished. Any proposed exceptions, changes, or modifications of design must be accompanied by new detailed drawings and statement of changes made. Failure to meet this requirement is sufficient cause for disqualification. Drawings furnished shall show principal dimensions, including metal thickness, construction details, and materials used.

B. Experience Record. No hydrant manufacturer will be considered which has not been regularly manufactured and in continuous use for at least ten (10) years in the United States. User references must be provided outlining products use for at least five (5) years.

C. Affidavit of Compliance. An affidavit of compliance to the effect that the hydrant complies in all respects to these specifications shall accompany each request for approval.

D. Field Evaluation. The manufacturer shall provide a hydrant, at no cost to the City for a minimum one (1) year period of field evaluation and testing. The hydrant must perform in a manner acceptable to the City for the one (1) year trial period.

E. Parts Availability. The manufacturer shall guarantee that all repair parts shall be delivered to the City within two (2) working days of request.

The hydrostatic tests set forth in AWWA C 502 shall be fully met and complied with.

Failure to meet any of the requirements set forth in AWWA C 502 or these specifications shall be cause for rejection.

C 1.13 Gate Valves and Tapping Sleeves and Valves

This specification governs the manufacture of double disc gate valves, resilient seated gate valves and tapping sleeves and valves for use in the water supply and water distribution system. Except for supplementary details, changes, or additions set forth herein, gate valves and tapping valves shall conform to AWWA C500, "Gate Valves for Water and Sewerage Systems.

Resilient seat (wedge) gate valves shall conform to the applicable portions of AWWA C509, "Resilient-seated Gate Valves for Water and Sewerage Systems."

All double disc gate valves shall be iron body, bronze mounted, parallel seat, non-rising stem, internal wedging type. All resilient-seated gate valves shall be iron body, bronze mounted, resilient-seated, non-rising stem.

All valves, unless otherwise shown, shall be installed in the vertical position.

Supplemental Information

A. Bonnet Bolting. Body bolts, studs, and nuts shall be plated with one of the following:

- ASTM A 165 Type NS (Heavy Cadmium Plated)
- ASTM A 164 Type LS (Electrodeposited Zinc)
- ASTM A 123 (Galvanized Hot Dip)

B. Valve Ends. Valves shall have, flanged, mechanical joint, or concrete cylinder ends (P-381) or any combination as may be specified. Bolts, nuts and washers used in flange and mechanical joint connections shall be high strength, low alloy steel similar to CORTEN or equal.

C. Gates and Rings. All gates four-inch (4") or larger shall be cast iron with bronze gate rings, and gates four-inch (4") and smaller than four-inch (4") may be solid bronze.

D. Wedging Devices.

1. Gate valves four-inch (4") and smaller shall have solid bronze wedges.

2. Valves above four-inch (4") may have solid bronze or cast iron bronze mounted wedges. The bronze mounting shall be built as an integral unit mounted over or supported on a cast iron base.

3. Wedging surfaces on valves up to sixteen-inch (16") shall be bronze to cast iron.

4. Wedging surfaces on valves sixteen-inch (16") and larger shall be bronze to bronze. Other moving surfaces integral to the wedging action shall be bronze to cast iron.

E. Valve Seats-Resilient Seated: Resilient seats shall be manufactured in accordance with the requirements of ANSI/AWWA C509, latest revision.

F. Valve Stems and Nuts

1. Stem nuts shall be of non-galling, high grade red brass or bronze and shall have threads of sufficient length to develop the full strength of the stem.

2. Stems as received shall meet the minimum strengths as specified. Upset stems on valves larger than sixteen-inch (16") will not be permitted.

G. Stuffing Boxes. All valves three-inch (3") through twelve-inch (12") shall be equipped with double O-rings, and provisions shall be made for this replacement of the upper O-rings when the valve is fully open. All geared valves will be equipped with conventional packing in the main stuffing box.

Stuffing box bolts and nuts shall be plated in accordance with ASTM A 165, Type NS (Heavy Cadmium Plated); ASTM A 164, Type LS (Electrodeposited Zinc); or ASTM A 123 (Galvanized Hot Dip).

H. Hand Wheels and Operating Nuts.

1. All valves two-inch (2") and larger in diameter shall be nut operated unless otherwise specified.

2. Hand wheels shall be furnished only when called for on the plans or in the contract documents.

3. All valves shall open by turning left (counter clockwise).

I. Gearing. Spur gearing with gear cases shall be provided on all valves sixteen-inch (16") and larger.

J. Gear Cases. Gear cases shall be furnished on all geared valves and shall be of the extended type with cast iron side plates. Stuffing boxes shall be located on top of the bonnet and shall be outside the gear case. Gear cases shall be lubricated and enclosed with oil seal or O-rings at all shaft openings to prevent the entrance of water. Gear cases shall be cast iron.

K. By-Pass Valves.

1. All gate valves fourteen-inch (14") and larger will be furnished and equipped with by- pass valves.

2. Properties, construction, and design requirements herein specified are applicable to by-pass valves with the additional requirement that the stems of by-pass valves larger than four-inch (4") shall have the same physical qualities set forth in AWWA C500 for valves 30-inch and larger.

L. Valves for Installation in Vertical Pipe Lines: Valves sixteen-inch (16") and larger ordered for installation in vertical pipe lines shall be equipped with bronze shoes and slides. Valves four-inch (4") through twelve-inch (12") shall be double disc, square bottom valves.

M. Valve Stem Extensions. Where circumstances require that the gate valve operating nut be installed at a depth greater than six (6') feet, it shall be equipped with a non-rising extension stem. The extension shall be one and one-quarter (1¼") inches solid core steel with the upper operating nut welded to the stem. The upper operating nut on the extension shall be four (4") inches to twelve (12") inches below the valve box. This stem shall have a coupling sufficient so that it will attach securely to the operating nut of the valve. The upper end of the extension stem shall terminate in a square wrench nut. A four and one-half-inch (4½") diameter steel plate, one-quarter-inch

(¼") thick rock shield shall be welded to the stem two (2") inches below the bottom of the top operating nut.

Tapping Valves

Tapping valves shall conform to AWWA C500 and these specifications. Approved resilient seat (wedge) gate valves will also be acceptable. In addition, tapping valves shall meet the following requirements:

A. Tapping valves shall have oversize seat rings to permit entry of standard tapping machine cutters.

B. In the open position, valve gates shall be clear of the ports so that the cutter will pass through without making contact with the gates.

C. Valves shall have an inlet flange conforming to ANSI B16.1, Class 125, with a machined projection or recess to mate with tapping sleeve outlet flange to assure correct alignments.

D. Valves shall have standard mechanical joint outlet end and shall be designed to fit any standard tapping machine.

Tapping Sleeves

Tapping sleeves shall be all stainless steel when available.

Tapping sleeves four-inch (4") through twelve-inch (12") shall be either 21/45 strength cast iron, Grade 60-40-18 ductile iron or heavy welded steel with fusion bonded epoxy coating 12 mil thickness. The two sections shall be bolted together with high strength, low alloy, corrosion resistant steel CORTEN bolts and nuts or approved equal.

The branch outlet of the tapping sleeve shall be flanged.

Approval

A. Only those manufacturers (Mueller or approved equal) whose valves have been specifically approved by the City will be approved for use in the City's water system.

B. Drawings. Each manufacturer of valves manufactured under these specifications shall have on file at the City a detailed drawing of each type and size of valve proposed to be furnished. Any exceptions, changes, or modifications or design must be accompanied by new detailed drawings and statement of changes made. Failure to meet this requirement is sufficient cause for disqualification. Drawings furnished shall show principal dimensions, including metal thickness, construction details, and materials used.

C. Affidavit of Compliance. An affidavit of compliance to the effect that the valve complies in all respects to these specifications shall accompany each request for approval.

D. Experience Record. No valve manufacturer will be considered which has not been regularly manufactured and in continuous use for at least ten (10) years in the United States. User references must be provided outlining products use for at least 5 years.

E. Field Evaluation. The manufacturer shall provide a valve, at no cost to the City for a minimum one (1) year period of field evaluation and testing. The valve must perform in a manner acceptable to the City for the one (1) year trial period.

F. Parts Availability. The manufacturer shall guarantee that all repair parts shall be delivered to the City within two (2) working days of request.

All valves shall be tested by the manufacturer in accordance with AWWA C500 or C509. Any leaking at the test pressure through any castings or between the bronze ring and the cast iron body shall cause the casting to be rejected. No plugging or patching to stop leakage will be permitted.

Failure to meet any of the requirements set forth in AWWA C500, C509 or this specification shall be cause for rejection.

C 1.14 Combination Air Valves

This specification governs the manufacture of combination air valves (air release and air vacuum) for use in the water supply and water distribution systems and shall conform to ANSI/AWWA C512, latest revision "Air Release, Air/Vacuum and Combination Air Valves for Water Works Service."

Air valves shall be combination air valves. These valves are designed to fulfill the functions of an air and vacuum valve to intake and exhaust large quantities of air and an air release valve to permit the escape of air accumulated in a pipe line of the high point when the line is under pressure and in operation. Combination air valves eight (8") inches and smaller shall be self- contained in one unit. Combination air valves larger than eight (8") inches may be a combination of the two valves.

Valves shall have cast iron bodies and stainless steel floats. Seats shall be Buna-N synthetic rubber against bronze or stainless steel. All other internal parts such as float guides, bushings, baffle retaining screws, etc., shall be bronze or stainless steel.

Inlets shall be threaded for twoinch (2") valves. Three-inch (3") valves may have either threaded or flanged inlets as shown on the contract drawings. Valves four-inch (4") and larger shall have flanged inlets.

Valves shall be designed for an operating pressure of 200 psi and shall be tested to 150 percent of that pressure.

Air valves may be rejected for failure to conform to the requirements of this specification.

C 1.15 Miscellaneous Valves

The valves governed by this specification are the following:

- Flap Valves.
- Non-Slam Check Valves. (externally weighted)
- Swing Check Valves.

These valves shall be manufactured to swing check valves (internally weighted) as designated in the list of approved materials.

Flap Valves

Flap valves shall have a cast iron body and shall be composed of three (3) parts: frame, flap, and connecting hinge pin. The flap and frame shall have a solid bronze seat and gate rings that are mated and matched. The hinge pin shall be bronze.

The valves shall close when hanging at a slight angle from vertical.

Non-Slam Check Valves

Non-slam check valves shall be cast iron and designed for 150 psi working pressure. Valves shall be tested to 200 percent of working pressure. Non-slam check valves shall have solid bronze seat and gate rings, pivot pins, and pivot pin bushings.

Swing Check Valve (Externally Weighted)

Swing check valves shall be fully bronze mounted with cast iron body. If so designated on the contract drawings, swing check valves will be furnished with spring and lever or lever and weight.

Swing check valves shall be for 150 psi working pressure and be tested to 200 percent of working pressure.

Swing Check Valve (Internally Weighted)

Swing check valves shall be fully bronze or stainless steel mounted with cast iron or heavy steel body. All internally weighted check valves will be fusion bonded epoxy coated in accordance with AWWA C550.

Swing check valves shall be designed for 150 psi working pressure and be tested to 200 percent of working pressure.

Failure to meet any of the requirements set forth in this specification shall be cause for rejection.

C 1.16 Service Saddles

This specification governs the manufacture of bronze ductile iron and stainless steel service saddles used for tapping water service pipe under normal pressure.

Service saddles shall consist of a contoured saddle fastened to the pipe by two (2) "U" bolts for double strapped clamps or by stainless steel bands. The saddle shall be sealed against the pipe with a neoprene or Buna-N gasket and shall have a heavy hub tapped with a corporation stop thread. Clamps shall be designed for 150 psi working pressure.

Saddles

Shape. Saddles shall be shaped so as to provide a minimum 180 degree coverage around the pipe.

Outlet. The saddle hub shall have a wall thickness of not less than one-half- inch (½") including threads. The hub shall be tapped with corporation stop threads of the size specified. Threads shall be in accordance with AWWA C800.

Material. Saddles shall be composed of bronze conforming to ASTM B 62, 304 stainless steel, or ductile iron conforming to ASTM 536. Ductile iron saddles shall be covered by a black nylon fused coating or epoxy coating approximately 10 to 12 mils in thickness, with approximate dielectric strength of 1,000 V/mil.

Marking. The clamp casting shall be clearly marked by letters and numerals cast thereon showing the manufacturer's name as well as the size and type of pipe for which the clamp is designed.

Straps

Shape. Bronze straps shall be formed flat on one (1) side to fit uniformly against the wall of the pipe. Rod diameter shall be not less than five-eighths-inch (5/8") flattened to three-fourths-inch (3/4") on one side. Straps shall be threaded for sufficient distance so that at least one- half-inch (½") of the threads remain after the clamp is fully tightened on the pipe. Nuts shall be bronze of the same material as the saddle or straps and have minimum dimensions equal to or larger than heavy hexagon nuts. Stainless steel straps shall have a band at least two (2") inches in width, and bolts, shall be Type 304 stainless steel with Type 304 stainless steel nuts and washers, or nylon coated nuts and washers, or silicon bronze nuts and washers.

Material. Bronze straps shall be constructed of material conforming to ASTM B 98 or ASTM B 124. Stainless steel bands shall be Type 304 (18-8) stainless steel.

Gaskets shall be composed of neoprene or Buna-N rubber cemented to the saddle to facilitate installation.

Each saddle shall be subjected to an air test to 85 psi while submerged in water by the manufacturer and shall show no evidence of leakage.

At the City's option, service clamps shall be subjected to a 300 psi hydraulic test and shall not leak or show signs of structural failure.

Failure to meet any of the requirements set forth in this specification shall be cause for rejection.

C 1.17 Copper Tubing and Brass Goods for Water Service Connections

This specification governs the manufacture of seamless copper tubing and miscellaneous brass goods such as corporation stops, curb stops, couplings, unions, adapters, branch connections, etc., used to construct water service connections in the domestic water system, manufactured in accordance with ANSI/AWWA C800, latest revision, "Underground Service Line Valves and Fittings."

Brass Goods. Brass goods shall be all brass of 85-5-5-5 alloy, as defined in ASTM B 62, which has a normal composition of 85 percent copper and five (5%) percent each of tin, lead, and zinc, plus or minus one (1%) percent.

Copper Tubing. Copper tubing used for one-inch (1") water service lines shall be Type K, Soft (Annealed). Copper tubing for two-inch (2") water services shall be Type K Hard. All copper tubing shall conform to ASTM B 88, "Seamless Copper Water Tube," or Federal Specification WW-T-799. Two-inch (2") diameter service lines shall be straight lengths with compression fittings. For one-inch (1") water service lines, no joints will be allowed from the corporation stop to the curb stop.

All material used shall be approved by the National Safety Foundation.

Brass Goods. Brass shall have a tensile strength of not less than 30,000 psi when tested in accordance with Figure 5 of ASTM B 208.

Fittings shall be designed for 200 psi working pressure. When subjected to hydrostatic test pressures one and one-half (1½) times working pressure or when subjected to a minimum of 85 psi air pressure while submerged in water, fittings shall not leak or show signs of structural failure.

Brass goods containing brass to brass moving parts shall be shipped prelubricated with a light fluid lubricant between moving parts. Lubricant shall remain fluid indefinitely, either in storage or in service.

Copper Tubing. Copper tubing shall have a minimum ultimate tensile strength of 30,000 psi.

Seating surfaces of the ground key type shall be tapered and shall be accurately fitted together by turning the key and reaming the body. Seating surfaces shall be lapped together using suitable abrasives to insure accurate fit. The large end to the tapered surface of the key shall be reduced in diameter for a distance that will bring the largest end of the seating surface of the key into the largest diameter of the

seating surface of the body. The taper seat in the body shall be relieved on the small end so that the small end of the key may extend through, to prevent wearing of a shoulder and to facilitate proper seating of the key. The stem end of the key, key nut, and washer shall be so designed that if the key nut be tightened to failure point, the stem of the key shall not fracture. The nut and the stem shall withstand a torque on the nut of at least three (3) times the manufacturer's recommended torque requirements.

Corporation stops shall be so designed as to rotate about the axis of the flow passageway within a circle of rotation small enough to properly clear the inside of any standard tapping machine of appropriate size.

Corporation stops shall be male AWWA thread on the inlet side and copper service thread on the outlet side and shall be used only for one-inch (1") taps.

The ball stop shall have a full port opening with straight-through flow, and Teflon coated, bronze ball with a minimum of 0.5 mil thickness coating. The operating stem shall be one piece construction. No roll pins will be allowed.

Plug type stop shall have full port opening with straight-through flow. Seating surfaces shall be brass (or Teflon coated brass) to rubber O-rings, providing positive pressure seal without mechanical means. Material for rubber O-rings should conform to requirements of ASTM D 200.

Inlet and outlet threads, of the types specified, shall conform to the applicable tables of AWWA C800, and threads shall be protected in shipment by a plastic coating or other equally satisfactory means.

The brass curb stop configuration shall be female iron pipe threaded on both ends. The maximum and minimum laying lengths for a three-quarter-inch (3/4”) curb stop are three and three-eighths inches (3-3/8”) and three and one-half inches (3-1/2”) respectively. The maximum and minimum laying lengths for a one-inch (1”) curb stop are three and three-quarter inches (3-3/4”) and four and one-quarter inches (4-1/4”) respectively. All curb stops shall be the less stop design.

Flanged angle valves shall be of inverted key style with "O" ring gaskets. Inlet to be compression type with a Buna N beveled gasket. Compression nut shall have an approved restraining device to lock down on the copper tubing. Outlet shall be flanged for drop-in gaskets with bolt holes for either one and one-half-inch (1 ½") or two-inch (2") meters. Design is to include lock wings and flow directional arrow.

All castings shall be smooth, free from burrs, scales, blisters, sand holes, and defects of every nature. Nuts shall be smooth cast and shall have symmetrical hexagonal wrench flats. All thread fittings, of all types, shall have NPT threads, and male threaded ends shall be protected in shipment by a plastic coating or other equally satisfactory means. Compression tube fittings shall have a Buna N beveled gasket. Compression nut shall have an approved restraining device to lock down on the copper tubing.

Copper tubing shall be tested for material, tensile strength, and expansion in accordance with the applicable ASTM specifications. Brass goods included in this section shall be tested in accordance with the applicable provisions of the specifications relating thereto.

Copper tubing and brass goods may be rejected for failure to meet any of the requirements of these specifications.

C 1.18 Ductile Iron Fittings

This specification governs the manufacture of ductile iron fittings, for use with the various types of water pipe used for the conveyance of domestic water.

All fittings shall comply with AWWA A C110/A21.10 or AWWA C153/A21.53, latest revision, and shall be manufactured in the United States. All material used shall be approved by the National Sanitation Foundation.

Joints for ductile iron fittings shall be in accordance with ANSI/AWWA C111/A21.1.

A. Mechanical Joint. Mechanical joints shall comply in all respects to ANSI 21.10. The joint shall be furnished complete with accessories. All bolts used with mechanical joint connections shall be high strength, corrosion-resistant steel such as CORTEN or equal.

B. Push-On Joint. Push-on joints shall comply with ANSI/AWWA C111/A21.1.

C. Flanged Joint. Flange dimensions, bolt hole pattern, and flange bolt size shall comply with ANSI/AWWA C111/A21.1. All bolts, nuts, and washers used for flanged joints shall be high strength, low alloy steel similar to CORTEN or equal.

D. Special Joint. Special end condition fittings using combinations of bells, spigots, mechanical, push-on, or special internally locked joints will be to dimensions in accordance with ANSI A21.10.

All ductile iron fittings shall have a standard cement mortar lining in accordance with ANSI/AWWA C104/A21.4 and ANSI/AWWA C110/A21.10.

All fittings shall be installed with a double layer of polyethylene wrap. Polyethylene encasement shall comply with ANSI/AWWA C105/A21.5.

Ductile iron fittings may be rejected for failure to meet any of the requirements of this specification.

C 1.19 Cast Iron Castings

This specification governs the manufacture of all commercially designed or City of Colleyville designed cast iron castings. Specifically included are manhole rings and cover, cleanout castings with lids, valve boxes and covers, water meter covers, and meter box lids.

Material used in the construction of casting shall conform to the ASTM requirements shown:

Material	ASTM	Grade
Gray Iron Castings	A 48	Class 30 minimum
Gray Iron Castings	A 126	Class B

All cast iron castings shall be manufactured in United States.

Castings shall be of uniform quality and free from blow holes, porosity, hard spots, shrinkage defects, swells, cracks, or other injurious defects. All castings shall be free from fins, burrs, sand and slag. The surface of all castings shall be smooth and true to pattern.
All castings shall be stress relieved by shot blasting.

Surfaces shall be machined as indicated or where otherwise necessary to secure true flat surfaces. Covers and grates shall fit properly into frames and fit uniformly and solidly.

All manhole lids shall have pick bars.

All castings shall be painted with one coat of rust inhibitive coating as approved by the Engineer. Where appropriate, castings shall be coated with hot or cold applied tar.

All matching (bearing) surfaces of watertight manhole rings and covers shall be suitably machined so as to be free from any irregularities and shall incorporate a watertight gasket or "O" ring mounted in a retaining recess as standard design.

The manhole cover shall be held securely in place by stainless steel bolts and washers. Watertight manhole covers shall be furnished with pick bars.

Where applicable, bolts, fasteners, springs, and plungers shall be as shown on the drawings or as described in the contract documents.

The City normally incorporates standard commercial design castings into project specifications. However, some castings are of special design, and specific dimensions, materials, characteristics, etc., are in the contract drawings or specific job specifications. Any castings to be substituted for products specified in Part E must first be approved in writing by the City of Colleyville. All items must meet the specifications included herein and shall be interchangeable with the items specified.

Cast iron castings and/or appurtenances may be rejected for failure to meet any of the requirements of this specification.

C 1.20 Polyethylene Wrap for Ductile Iron Pipe and Fittings

These specifications govern the manufacture of polyethylene film to be used as a wrap to protect buried ductile iron pipe and fittings. Polyethylene wrap shall be used for all pipe, fittings and appurtenances to ductile iron water and sanitary sewer pipelines.

Polyethylene encasement for ductile iron piping shall conform to ANSI/AWWA C105/A21.5, latest revision. The polyethylene film shall be eight (8) mils thick, with minimum flat tube widths as shown in Table 1 for the specified pipe sizes. The film shall be extracted from polyethylene resin, Type 1, Class C, Grade E-1, and as specified in ASTM D 1248, with the following characteristics:

Flow Rate - 0.4 maximum
Tensile Strength - 1,200 psi
Elongation - 300% minimum
Dielectric Strength - resistivity 800 volts per mil thickness, minimum

Polyethylene tube seams and overlaps may be wrapped and held in place by means of two-inch (2") wide plastic backed adhesive tape with a minimum thickness of ten (10) mils. Maximum thickness shall be consistent with a pliable installation.

MINIMUM WIDTH OF FILM TUBE (FLAT WIDTH)

Nominal Pipe Size (Inches)	Flat Tube Width (Inches)
4	16
6	20
8	24
10	27
12	30
14	34
16	37
18	41
20	45
24	53

Polyethylene wrap may be rejected for failure to meet any of the requirements of this section.

C 1.21 Sanitary Sewer Manhole Components

This specification governs the manufacture of components used for the construction of sanitary sewer manholes.

Foundation and Inverts

Concrete for cast-in-place foundations and/or inverts for sanitary sewer manholes shall be Class "A" as defined in Section C 1.24, "Concrete," of these specifications.

Precast bases with formed inverts for watertight connection to precast reinforced concrete manhole sections will be permitted if manufacturing process and resultant product are approved by the City.

Mortar

Mortar and/or grout used for invert finishing, grouting of ring and lid, etc., shall be composed of one (1) part cement to two (2) parts sharp sand.

Precast Reinforced Concrete Manhole Sections

Precast reinforced concrete manhole sections shall comply with ASTM C 478, "Precast Reinforced Concrete Manhole Sections," with the following additions:

A. All pipe shall be machine made by a process which will provide for uniform placement of zero (0) slump concrete in the form and compaction by mechanical devices which will assure a dense concrete in the finished produce. However, reducer cones may be wet-cast.

B. Aggregates shall comply with ASTM C 33 except that aggregate shall have a minimum of 50 percent calcium carbonate equivalent.

C. Minimum wall thickness shall be as specified for Wall B in the "Class Tables" of ASTM C 76.

D. Manholes shall use precast sections of the bell and spigot or tongue and groove design with trapped type preformed O-ring rubber gaskets conforming to ASTM C 443.

E. Risers shall be available in standard lengths of one through six feet (1'-6') in increments of one foot (1').

F. Manhole steps will not be furnished.

G. Exterior surfaces shall be coated with two mop coats of Tnemec 450 Heavy Tnemecol or Koppers Bitumastic Super Service, black or an equivalent system approved by the Engineer.

Cast-In-Place (Monolithic) Concrete Manholes

Concrete for cast-in-place (monolithic) concrete manholes shall be Class "A".

Forms for cast-in-place (monolithic) concrete manholes shall provide a smooth interior surface. Forms shall provide for a minimum wall thickness of six (6") inches and a minimum inside diameter at the base of four (4') feet. The inside diameter at the top of the barrel shall not be less than 30 inches.

The exterior surfaces of the manhole shall be coated with two mop coats of Tnemec 450 Heavy Tnemecol or Koppers Bitumastic Super Service, black, or an equivalent system approved by the Engineer.

Frames and Covers

All manhole frames and covers shall be in accordance with Section C 1.20, "Cast Iron Castings" All covers shall have pick bars. The seating surfaces shall be matched (machined) for smooth fit. Manhole covers shall cast to include the wording: City of Colleyville.

A double ring of one-half inch (½") GS/5 Precast Concrete Sealant, as manufactured by General Sealants, Inc., or CS102 Con Seal as manufactured by Concrete Sealants, Inc., shall be used to seal the frame to concrete and between all grade rings used in adjusting the manhole. The exterior of the grade rings and frame shall then be mortared.

Watertight rings and covers shall have machined matching surfaces with a watertight gasket held securely in place with stainless steel bolts and washers.

Pipe Connections

Rubber boots shall be installed at all pipe penetrations of the manhole to Kor-N-Seal connectors as manufactured by NPC, Inc., Milford, New Hampshire, or equal, shall be used to provide a positive watertight connection for all precast manholes.

Grade Rings

Grade rings shall be solid (not split) type, reinforced in accordance with ANSI/ASTM C 478. Outside diameter shall be 40 inches and inside diameter shall be 24 inches . Depths of sections used shall be maximum available to minimize number of joints. Minimum thickness of grade rings to be two-inch (2").

C 1.22 Embedment Materials

This specification governs the quality of materials used for foundation and embedment materials in the construction of water and sanitary sewer lines.

Rock Foundation

A. Description. Rock foundation is used to create a stable trench bottom in wet unstable or "spongy" conditions. Rock foundation shall be composed of sound and durable particles of crushed limestone.

B. Gradation. Sizes shall be well graded from passing the one-inch (1") but retained on the seven-eighths inch (7/8") screen minimum size to a maximum size of five (5") inches in greatest dimension.

C. Wear. The percent of wear shall not exceed 35 percent when tested in accordance with ASTM C 131.

D. Deleterious Substances. Rock foundation shall contain no more than one (1%) percent by weight of organic matter, clays, loam, or pebbles and shall contain no more than five (5%) percent by weight of any one or combination of slate, shale, schist, or soft sandstone particles.

Crushed Rock Embedment (Sewer Lines)

A. Description. Crushed rock embedment shall be composed of sound durable limestone particles. The standard gradation will be used with all pipes.

B. Gradation.

STANDARD CRUSHED ROCK Embedment

Retained on 1 inch sieve ..... 0 - 5%
Retained on 1/2 inch sieve ..... 40 - 75%
Retained on No. 4 sieve..... 90 - 100%
Retained on No. 8 sieve..... 95 - 100%

C. Note: This gradation is for Gradation Size Number 4 as defined in ASTM C 33.

D. Wear. The percent of wear shall not exceed 35 percent when tested in accordance with ASTM C 131.

E. Deleterious Substances. Crushed stone embedment shall contain no more than one (1%) percent by weight of organic matter, clays, loam, or pebbles and shall contain no more than five (5%) percent by weight of any one or combination of slate, shale, schist, or soft particles of sandstone.

Granular Embedment for Water Lines

A. Description. Granular embedment material shall be free flowing sand or like material or mixed sand and pea gravel. This material may be an inferior grade of "pit run" sand, not

normally considered satisfactory for construction purposes, and may be used directly from pits without processing. Granular embedment material shall be such that, when wet, it will not form mud or muck.

B. Gradation.

Retained on 2 inch sieve	0%
Retained on 1 inch sieve	0 - 10%
Retained on No. 40 sieve	0 - 40%
Retained on No. 100 sieve	90 - 100%

C. Plasticity. The plasticity index of the soil fraction passing the No. 40 sieve shall not be greater than two (2).

D. Deleterious Substances. Granular embedment material shall be free from large stones, clay, and organic material and shall be a relatively uniform material.

Select Materials

Select materials will be defined as gravel, fine rock cuttings, sand, sandy loam or loam free of excessive clay. When wet, the material shall not form mud or muck.

Concrete for Foundation, Embedment and/or Encasement

Portland Cement concrete used for pipe foundation, embedment, and/or encasement shall comply in all respects to the requirements set forth in Section C 1.24, "Concrete," of these specifications. Concrete shall be Class "B".

Materials may be rejected for failure to meet any of the requirements of this section.

C 1.23 Concrete

This section governs all materials used and the handling, measuring, proportioning and mixing of such materials in producing concrete for structures or for incidental or miscellaneous construction.

Concrete shall be composed of Portland Cement, coarse aggregate, fine aggregate, admixtures as required, and water proportioned and mixed as hereinafter provided in these specifications.

Where the type or class of concrete is not shown on the plans or specifically designated in the specifications, concrete used shall be Class "A".

It is the intent of this specification to permit "ready mix," "central mix," or "transit mix" concrete. However, the Contractor will be required to submit evidence that the concrete to be furnished meets

all requirements of these specifications including testing by an independent laboratory at the contractor's expense.

Materials

A. Cement. Portland Cement shall be Type I (Normal), Type II (Sulfate Resistant), or Type III (High Early Strength) in accordance with ASTM C 150. Unless otherwise shown, all cement used shall be Type I.

B. Coarse Aggregate. Coarse aggregate shall consist of gravel or crushed stone meeting the requirement of ASTM C 33 "Concrete Aggregate." Coarse aggregate with a wear exceeding 40 when tested in accordance with ASTM C 131 will not be acceptable.

C. Fine Aggregate. Fine aggregate shall be composed of natural sand, conforming to ASTM C 33.

D. Admixtures.

1. Air Entraining Admixture. Air entraining admixtures shall conform with ASTM C 260. The total average air content shall be in accordance with American Concrete Institute 211.1.

2. Water Reducing Admixture. Water reducing admixtures, if used, shall comply with ASTM C 494. They shall be accurately measured and added to the mix in accordance with the manufacturer's recommendations.

E. Water. Water for concrete shall be clean and free from injurious amounts of oil, acid, alkali, salt, organic matter, or other deleterious substances. Water from the City's mains is acceptable with no testing required.

F. Curing Materials.

1. Sheet Materials. Waterproof paper, polyethylene film, and white burlap-polyethylene film shall conform to ASTM C 171.

2. Curing Compound. Membrane curing compound shall conform to ASTM C 309. Curing compound shall either be Type 1, clear or translucent, or Type 2, white pigmented.

Storage of Materials

A. Storage of Cement. Cement may be delivered in bulk or in bags which are marked plainly with the brand and name of manufacturer. Immediately upon receipt, cement shall be stored in a dry, weathertight and properly ventilated structure which excludes moisture. All storage facilities shall be subject to approval and shall be such as to permit easy access for inspection and identification. Sufficient cement shall be in storage to complete any pour of concrete started. In order that

cement may not become unduly aged after delivery, records of delivery dates shall be maintained, and the Contractor shall use any cement which has been stored at the site for 60 days or more before using cement of lesser age. No cement will be used which is lumped or caked, or has been stored more than 90 days, or when the cement temperature exceeds 170 degrees F.

B. Storage of Aggregates. The handling and storage of concrete aggregate shall be such as to prevent the admixture of foreign materials. If the aggregates are stored on the ground, the sites for the stockpiles shall be grubbed, cleared of all weeds and grass, and leveled. The bottom layer of aggregate shall not be disturbed or used without recleaning.

C. Different sizes of aggregates shall be stored in such a manner as to prevent intermixing. Materials in all stockpiles shall be handled in such a manner that segregation of materials within the pile will be avoided and shall be built up in layers not over three (3') feet in depth. Should segregation occur, the aggregates shall be remixed to conform with the grading requirements. Unless otherwise authorized by the Engineer, all fine aggregates shall be stockpiled at least 24 hours before mixing to reduce the free moisture content.

Measuring of Materials and Measuring Equipment

All materials shall be measured separately and accurately and batches shall be uniform. The coarse and fine aggregate shall be measured, or weighed, loose and separately.

When volumetric proportioning is used, the Contractor shall furnish and use approved measuring boxes, pans, or mechanical devices which will give exact volumes of aggregates required for the several classes of concrete involved. Devices used shall be constructed and plainly marked so that the Engineer can conveniently and accurately check the exact quantity of each aggregate being used in any or all batches. A bag of cement as packed by the manufacturer and weighing 94 pounds will be considered as one (1) cubic foot. When proportion by weight is used, the capacity of the weighing equipment shall be adequate to permit required weighing of materials without delaying the production of the mixer. Scales to be used shall be approved by the Engineer and shall be certified in place.

Each scale installation shall be provided with standard 50 pound test weights made of high quality cast iron, cast and finished in such a manner that no foreign material will adhere to the surface, and sealed in the manner prescribed by the United States Bureau of Standards. The minimum number of test weights required shall be of a weight equivalent to ten (10%) percent of the net load capacity of the scales to the nearest greater 50 pounds, but in no case shall less than two (2) weights be furnished.

The device used for measuring the quantity of water shall indicate the quantity in gallons and fractions thereof. The operating mechanism shall regulate the quantity required for any given batch within one (1%) percent, and the supply inlet shall be cut off automatically when water is being discharged into the mixer.

Concrete Proportions

A. General. American Concrete Institute 211.1 shall be the basis for selecting the proportions for concrete made with aggregates of normal and high density and of workability suitable for usual cast-in-place structures.

B. Mix Design. The Contractor shall be responsible for the design of concrete consistent with the minimum requirements of strength and proportions stated herein. The proportions of materials entering into mix to produce concrete of satisfactory quality shall be determined by laboratory tests prior to the beginning of concrete placement. Design shall be in accordance with ACI 211.1, "Recommended Practice for Selecting Proportions Concrete," subject to maximum water cement ratio, minimum cement content, and minimum strengths set forth herein.

C. Workability. In general, the workability of any mix shall be that required for the specific placing conditions and method of placement. The concrete shall be of such workability that it can be worked readily into all corners and around reinforcing without segregation of materials or having free water collect on the surface. Compliance with specified slump limitations shall not necessarily designate a satisfactory mix. The Engineer may require changes in proportions at any time as necessary to obtain a mix having satisfactory properties. The slump tests will be made in accordance with ASTM Method of Test for Slump of Portland Cement Concrete, Designation C-143.

In no case shall the amount of coarse material be such as to produce harshness in placing or honeycombing in the structure when forms are removed.

Concrete Classification

The following table sets forth the classification of concrete used for water and sewer construction in the City of Colleyville:

Class	f'c 28-day psi	Cement Bags/ C.Y.	Max. Water Content (Gal./Bag)	Max. Slump (In.)	Max. Size Aggr. (In.)	Use
A	3,000	5	6.5	5	1-1/2	General. All reinforced concrete structures unless otherwise specified.
B	2,000	4	8.0	4	1-1/2	Blocking, Cradle Concrete Bedding.
C	3,600	6	6.0	4	1-1/2	General. Top Slabs direct traffic structures.

D	1,500	3	8.5	4	1-1/2	Concrete Backfill.

The maximum amount of coarse aggregate (dry loose volume) per cubic foot of finished concrete shall not exceed 0.82 cubic feet.

The maximum amount of water as set forth in the table of concrete classification is based on the assumption that the aggregates are in a saturated, surface dry condition. If additional water is required to obtain the desired slump, a compensating amount of cement will also be added. In no case will the maximum allowable water-content ratio be exceeded.

The concrete mix will be designed with the intention of producing concrete with compressive strengths equal to or greater than those shown when tested in accordance with ASTM C 39, "Compressive Strength of Cylindrical Concrete Specimens."

When tested at seven (7) days, concrete cylinders will have attained at least two-thirds (2/3) the required 28 day compressive strength in order for the strength of the concrete to be considered satisfactory.

Mixing Conditions

A. General. The concrete shall be mixed in quantities required for immediate use, and any concrete which is not in place within the time limits specified shall not be used. Retempering of concrete will not be permitted.

B. Concrete Temperature. No concrete shall be placed when the temperature of the concrete to be placed is greater than 90 degrees For less than 50 degrees F. The temperature of the concrete to be placed will be taken using a thermometer immediately prior to placement with the point of measurement being in the chute or bucket.

C. Cold Weather. No concrete shall be mixed without the approval of the City when the air temperature is at or below 40 degrees F (taken in the shade away from artificial heat) and falling. If authorized by the City, concrete may be mixed when the air temperature is at 35 degrees F and rising. All cold weather concreting shall be done in accordance with ACI-306.

D. Hot Weather. Hot weather is defined as any combination of hot air temperature, low relative humidity, and wind velocity that in the judgment of the Engineer would impair the quality of the concrete. All hot weather concreting shall be in accordance with ACI 305. Concrete shall be placed in the forms without the addition of any more water than required by the design (slump). No excess water shall be added on the concrete surface for finishing. Control of initial set of the concretes and extending the time for finishing operations may be accomplished with the use of an approved water-reducing and set retarding admixture as specified above.

Maximum time intervals between the addition of mixing water and/or cement to the batch and the placing of concrete in the forms shall not exceed the following:

Air or Concrete Temperature Addition of Water to Placement	Maximum Time From (whichever higher)
Non-Agitated Concrete	
Up to 80 degrees Fahrenheit	30 minutes
Over 80 degrees Fahrenheit.	15 minutes
Agitated Concrete	
Up to 75 degrees Fahrenheit.	90 minutes
75 to 89 degrees Fahrenheit.	60 minutes
Over 90 degrees Fahrenheit (maximum permissible concrete temperature).	45 minutes

The use of an approved set-retarding admixture will permit the extension of the above time maximums by 30 minutes, for agitated concrete only.

Under extreme hot temperature, wind, or humidity conditions, the City may require the use of the set-retarding agent, or may suspend concreting operations if quality of the concrete being replaced is not acceptable.

Curing

Careful attention shall be given to the proper curing of all concrete. Curing methods shall use sheet materials conforming to ASTM C 171 or membrane curing compound conforming to ASTM C 309. Membrane curing compound will not be used on surfaces to be rubbed or on which additional concrete is to be placed.

All concrete shall be cured as set forth in Section C 30.14.

Rejection

Concrete may be rejected for failing to meet any of the requirements of this specification.

C 1.24 Reinforcing Steel

This specification governs the manufacture of all reinforcing steel used in the construction of reinforced concrete.

Reinforcing steel manufactured under these specifications shall confirm to the following specifications of the American Society for Testing and Materials as follows:

ASTM A 82, "Cold-Drawn Steel Wire for Concrete Reinforcement."

ASTM A 185, "Welded Steel Wire Fabric for Concrete Reinforcement."

ASTM A 615, "Deformed and Plain Billet-Steel Bars for Concrete Reinforcement."

All bar reinforcement shall be Grade 60 open hearth, basic oxygen, or electric furnace new billet steel except that stirrups and tie bars may be Grade 40.

Wire for fabric reinforcement shall be cold-drawn from rods hot-rolled from open hearth, basic oxygen, or electric furnace billet steel.

Steel reinforcement shall be stored above the surface of the ground upon platforms skids, or other supports and shall be protected as far as practicable from mechanical injury and surface deterioration caused by exposure to conditions producing rust.

When placed in the work, reinforcement shall be free from dirt, paint, grease, oil, or other foreign materials. Reinforcement shall be free from injurious defects such as cracks and laminations.

Rust, surface seams, surface irregularities or mill scale will not be cause for rejection, provided the minimum dimensions, cross-sectional area, and tensile properties meet the physical requirements for the size and grade of steel specified.

Reinforcement shall be bent cold and true to the shapes indicated on the plans. Bending shall preferably be done in the shop. Irregularities in bending shall be cause for rejection.

C 1.25 Street and Pavement Repair Materials

This specification governs the quality of materials used to repair streets or other pavements after the installation of water and sewer lines.

Any Portland Cement concrete used for street or pavement repair shall comply in all respects to the requirements set forth in Item C 1.24, "Concrete," of these specifications for the class of concrete called for on the plans or set forth in the project documents.

Cement Stabilized Backfill Material

A. 2:27 Backfill or Cement Stabilized Sand. Backfill material designated as "2.27 backfill material" shall be a lean concrete mix containing two (2) sacks of cement per cubic yard of material. Aggregate used for 2:27 backfill material shall be a free flowing well-graded granular material passing a 1 - 1/2 inch screen and free from sticks, lumps, clay balls and organic matter. The 2:27 backfill material shall be poured wet or dry as directed by the City, and all 2:27 backfill shall be mixed in a concrete mixer of a type approved by the City.

B. Cement Treated Base. Cement treated base shall consist of aggregate, cement, and water uniformly mixed in a central plant and hauled to the project site. Cement treated base shall have a minimum cement content by weight of four (4%) percent and a minimum compressive strength at seven (7) days of 300 pounds per square inch. If necessary, the minimum cement content shall be adjusted upward to provide the minimum required compressive strength.

C. Storage and Use. Cement treated materials shall be placed in ditch the same day that they are mixed and/or delivered to the job site.

Crushed Stone Base

A. Description. Crushed stone base shall consist of stone, argillaceous limestone, calcareous clay particles, with or without stone, or conglomerate, and shall not contain thin or laminated pieces or an excess of shale, dirt, organic matter or other injurious materials.

B. Gradation.

Retained on 1 - 3/4 in sieve..... 0%
Retained on No. 4 sieve..... 45 - 65%
Retained on No. 40 sieve ..... 60 - 85%

Material passing the No. 40 sieve shall meet the following requirements when the test samples are prepared and tested in accordance with the applicable ASTM specifications:

The liquid limit shall not exceed 40. The plasticity index shall not exceed twelve (12).

C. Abrasion. The material shall have a percentage of wear not exceeding 40 when tested in accordance with ASTM C 131.'

Hot Mix Asphaltic Concrete – Course Graded Binder Course

A. Description. Coarse graded binder course hot mix asphaltic concrete used for street and pavement repair in the City of Colleyville is identical to Type "A" hot mix asphaltic concrete as set forth in TxDOT Item 340. This gradation is normally used as a "base" course on which a fine graded surface course is placed.

B. Gradation.

Passing 1½ in. sieve	100%
Passing 1¼ in. sieve	95 - 100%
Passing 7/8 in. sieve	70 - 90%
Passing ½ in. sieve	50 - 70%
Passing No. 4 sieve	30 - 50%
Passing No. 10 sieve	20 - 34%
Passing No. 40 sieve	5 - 20%
Passing No. 80 sieve	2 - 12%
Passing No. 200 sieve	1 - 6%

The asphaltic material shall form three (3%) to six (6%) percent of the mixture by weight unless otherwise specified.

C. Stability. The Hveem stability shall be not less than 35.

Hot Mix Asphaltic Concrete – Fine Graded Surface Course

A. Description. Fine graded surface course hot mix asphaltic concrete used for street and pavement repair in the City of Colleyville is identical to Type "D" hot mix asphaltic concrete as set forth in TxDOT Item 340. This material is normally used as a "surface" course either on flexible base, concrete, or hot mix base courses.

B. Gradation.

Passing ½ in. sieve	100%
Passing 3/8 in. sieve	85 - 100%
Passing No. 4 in. sieve	50 - 70%
Passing No. 10 sieve	32 - 42%
Passing No. 40 sieve	11 - 26%
Passing No. 80 sieve	4 - 14%
Passing No. 200 sieve	0 - 6%

The asphaltic material shall form from four (4%) to eight (8%) percent of the mixture by weight unless otherwise specified.

C. Stability. The Hveem stability shall not be less than 35.

D. Tack Coat. The unit bid prices for coarse graded base course and fine graded surface course shall include the application of a tack coat to each layer of asphaltic concrete before the next layer is applied and a tack coat shall also be applied to any exposed asphalt or concrete edges that shall abut any hot mix asphaltic concrete. The tack coat shall be a liquid asphalt complying with the specifications of the Asphalt Institute for Type RC-70 or RS-1.

C 1.26 Casing Pipe for Water and Sewer Crossings

This specification governs the manufacture of reinforced concrete pipe, corrugated metal pipe, and steel pipe used as casing pipe for water and sewer lines.

Reinforced Concrete Pipe

Reinforced concrete pipe used for casing pipe shall conform to ASTM C 76. The pipe class shall be as shown on the project plans or set forth in the specifications. When not specified, the minimum pipe class used for casing pipe shall be Class III. The pipe joints shall be tongue and groove, but a rubber O-ring joint seal is not required for casing pipe.

Corrugated Metal Pipe

A. Products. All corrugated metal pipe used for casing for water and sewer lines shall conform to AASHTO M 36. "Zinc Coated (Galvanized) Corrugated Iron for Steel Culverts and Underdrains." All pipe shall be Type I. Zinc coated iron or steel sheets used in the manufacture of the corrugated metal pipe shall conform to AASHTO M 218.

B. Corrugations. Pipe corrugations may be either 2-2/3" x 1/2", 3" x 1", or 5" x 1".

C. Metal Thickness. Unless otherwise specified on the plans or in the contract documents, pipe 36-inch in diameter and smaller shall have a wall thickness not less than 0.064 inches (16 Gage), pipe 42-inch through 54-inch in diameter shall have a minimum wall thickness of 0.079 inches (14 Gage), and pipe 60-inch and larger in diameter shall have a minimum wall thickness of 0.109 inches (12 Gage).

D. Couplings. Couplings bands shall be of the same base metal and have the same coating as the pipe. Bands shall have a minimum metal thickness of 0.064 inches (16 Gage) and shall have a minimum width of ten and one-half (10-1/2") inches.

E. Pipe Coating. All corrugated metal pipe used for pipe casing shall be bituminous coated in accordance with AASHTO M 190. The pipe coating shall be Type A, and the minimum thickness of the coating shall be 0.05 inches measured on the crest of the corrugations.

Steel Pipe

A. Products. All steel pipe used for pipe casing for water and sewer lines shall conform to one of the following ASTM specifications:

ASTM Designation	Title
A 134	"Electric-Fusion (Arc) - Welded Steel Plate Pipe (sizes 16 in. and over)"

A 139 "Electric-Fusion (Arc) - Welded Steel Plate Pipe (sizes 4 in. and over)"
A 211 "Spiral-Welded Steel or Iron Pipe."

B. Wall Thickness. All pipe shall be designed to have a wall thickness sufficient to sustain the maximum expected overburden as well as the concentrated live loads without deflecting the pipe in excess of five (5%) percent. However, steel casing with wall thickness less than 0.250 inches will not be acceptable in any circumstances.

C. Joints. Steel pipe for casing installations may be shop fabricated in convenient section lengths for transportation to the job site. These sections shall be combined by field welding to provide a single casing assembly over the limits set forth in the plans. Such casing pipe butt welds shall be continuous and free of slag holes.

D. Coatings. All steel pipe casing shall be cleaned and shop coated inside and out. A uniform bituminous coating at least 0.05 inches in thickness shall then be applied inside and out to the casing. Touch-up after field welding shall be equal to required shop coatings.

E. Casting pipe may be rejected for failing to meet any of the requirements of this specification.

C 1.27 Materials for Erosion Control

This specification governs the quality of materials used for permanent and temporary erosion control after the installation of water and sanitary sewer lines.

Hydromulching

When water or sanitary sewer line construction is outside of proposed and/or existing pavement, the entire trench width shall be hydromulched after backfill and compaction operations have been completed. Areas outside the trench area which have been undermined by excavation or damaged during backfill operations shall also be hydromulched.

A. Description: Seeding shall consist of preparing and planting seed or a mixture of seed of the kind specified along and across such areas as may be designated on the plans and in accordance with these specifications.

B. Planting Season: All planting shall be completed between the dates specified for each type except when specifically authorized in writing by the Engineer. The seed planted shall be of a type specified with the mixture, rate and planting dates as follows:

1. Type I: Bermuda Grass (hulled) 2 pounds per 1,000 square feet - March 15 through September 15.

2. Type II: Mixture of Bermudagrass (unhulled) and Annual Rye Grass, 8 pounds per 1,000 square feet (Bermudagrass 2 pounds, Rye Grass 6 pounds) –September 15 through March 15.

C. Fertilizer:

1. General: Fertilizer shall be a commercial product, uniform in composition, free flowing and suitable for application with approved equipment. Fertilizer shall be delivered to the project site in fully labeled original containers. Fertilizer which has been exposed to high humidity or moisture or has become caked or otherwise damaged, shall be rejected.

2. Initial Planting Application: Fertilizer for the initial planting application shall be of an organic base containing by weight the following (or other approved) ratio of nutrients: 1-2-1 (N-P-K); also containing ten (10%) to fifteen (15%) percent sulfur in sulfate form and traces of iron and zinc as required and approved by the Engineer.

3. Post Planting Application: Fertilizer for the post planting application shall be a chemical base fertilizer containing by weight the following ratio of nutrients: 3-1-2 (N-P- K). Thirty (30) days after planting, turfgrass areas shall receive an application of the specified fertilizer at the rate of one (1) pound of nitrogen per one thousand (1000) square feet.

4. Hydromulch:

1. Mulch will be manufactured from hardwoods only and will be refined specifically for turf hydromulch applications. Three approved mulches are manufactured by Conwed, Weyerhauser and Texas Fiber Co.

2. Following soil preparation, seed, fertilizer, mulch and water shall be mixed together and applied to the planting area in the following quantities and rates:

Item	**Rate per 1000 Square Feet**
Turfgrass	Seed as specified above
Fertilizer	9 Pounds
Water	23 Gallons
Mulch	46 Pounds

5. Maintenance: Contractor will provide irrigation for at least 30 days after planting and for as much longer as necessary to provide a uniform stand of grass. A uniform stand of grass is defined as not less than 100 growing plants per square foot. Growing plants shall be defined as healthy grass plants of two blades or more at least 1½ inches tall. Growth shall be sufficient that at least one mowing is required before the grass areas are accepted by the Owner.

6. Replanting: All areas that do not produce a uniform stand of grass must be replanted and maintained until a uniform stand of grass is established.

Erosion Control Matting

In addition to hydromulch seeding, erosion control matting will be required where existing or proposed side slopes are 3:1 or steeper within natural channels, drainage ditches, channel banks or embankments: and in areas where the engineer determines that the soil is erodible. Depending upon the type of soil, steepness of the slope and the channel velocity, either Curlex Blankets (Regular or Hi-Velocity) or Enkamat (7010 or 7020) erosion control matting (or their equivalent) shall be placed upon the areas which have been hydromulch seeded.

Silt Fencing

The fabric should conform to the following properties, as determined by the Federal Highway Administration Task Force 25 Guidelines, as measured in the weakest direction:

Test Designation	Topic	Average Roll Minimum Value
ASTM D 4632	Grab Strength	90 lbs @ 12”/min.
ASTM D 4632	Grab Elongation	15% @ 12”/min.
ASTM D 4751	Equivalent Opening Size (EOS)	U.S> Sieve No. 20
ASTM D 4491	Permittivity	>.01 sec. -1
ASTM D 4355	U.V. Resistance (500 Hrs Exposure)	70%

The Mullen burst strength shall be greater than 150 psi. The edges shall be treated to prevent unraveling.

Support: Fence posts shall be spaced a maximum of six feet apart. Woven wire will be used to support the material. Fence posts are to be 4"x4" wood posts or fabricated steel posts.

Gabion Structure Assembly

Gabions shall consist of rectangular, compartmented wire baskets filled with stone used for slope or bank protection and erosion control on open channels.

Gabion baskets shall consist of uniform hexagonal wire mesh woven in a double twist pattern with openings fabricated in such a manner as to be non-raveling and designed to provide the required flexibility and strength.

The perimeter edges of the twisted wire mesh shall be woven around a reinforcing wire in a manner designed to prevent slippage. The edges of the mesh shall be securely selvedged. All corners shall be reinforced by heavier wire.

Gabions shall be so fabricated that the sides, ends, lid, base and diaphragms can be readily assembled at the construction site into rectangular baskets with a minimum thickness of one foot. Where the length of the gabion exceeds 1½ times its horizontal width, the gabion shall be divided, by diaphragms of the

same mesh and gauge as the body of the gabion, into cells whose length does not exceed the horizontal width. Diaphragms shall be secured in the proper position on the base section.

All dimensions are subject to a tolerance of five (5) percent.

Wire shall conform to the following requirements in accordance with current Federal Specifications QQW-461 Class 3 - Finish 5 - Soft.

Wire for Fabric (Diameter)	3.00 mm plus or minus 2.5 percent
Wire for Selvedges and Corners (Diameter)	3.90 mm plus or minus 2.5 percent
Wire for Binding and Connecting (Diameter)	2.20 mm plus or minus 2.5 percent
Tensile Strength (PSI)	60,000 to 70,000
Weight of Zinc Coating for All Wire	0.80 oz/square foot

The stone shall be graded from three (3") to eight (8") inches. The stone shall have a specific gravity of at least 2.40 and shall have a percent of wear not more than 40 when tested in accordance with Texas Department of Transportation Test Method TEX-410-A.

Geotextile fabric for use as filter media shall be placed with a minimum overlap of eighteen (18") inches. Fabric shall be secured as necessary with pins or other suitable means before placing gabion baskets.

As an alternate to Geotextile fabric, a protective aggregate filter layer may be utilized. The filter shall be designed by a Registered Professional Engineer specializing in Geotechnical Engineering.

Gabions may be rejected for failure to meet any of the requirements of this specification.

SECTION C 2 WATER AND SEWER INSTALLATION STANDARDS

C 2.1 Scope

This section of the specifications contains detailed specifications and descriptions covering the major items of construction and the workmanship necessary for building and completing the various components of a water and/or sewer project. These specifications are written with the intention that materials and workmanship of such a quality are provided as to result in an economical quality balance, which will produce first class unit installations that integrate as functional additions into total systems, all to the initial and long term advantage of the City. The material and work shall meet each and every requirement of these specifications even if it necessitates the upgrading of some work components. The fact that these specifications may fail to be as complete as to cover all details will not relieve the Contractor of full responsibility for providing a complete project of high quality, first class finish and appearance that is satisfactory for operation.

C 2.2 Use of Valves in Existing System

The contractor shall not operate any valve in the existing water system. The valves will be operated only by a City's employee. The City will inspect all valves prior to initial acceptance of the project. All repairs or replacements required to restore satisfactory operation of the valve shall be at the expense of the Contractor.

C 2.3 Removal and/or Adjustment of Existing Structures

This section of the specifications covers the removal and/or adjustment of existing facilities and structures. The removal and satisfactory disposal, adjustment, and replacement of existing structures shall be in accordance with the plans and these specifications.

All structures which are to be salvaged shall be removed in such a manner as to prevent being unduly damaged.

Materials or parts of structures which are to be broken up, dismantled or removed, and which are to be salvaged shall be removed, loaded, cleaned up, hauled, and unloaded at the site designated on the plans or as directed by the City. Materials which are not designated to be salvaged shall become the property of the Contractor and shall be properly disposed of by the Contractor at the Contractor's cost and expense. Asbestos-cement pipe shall be left in the ground where practical. Asbestos-cement pipe removed shall be disposed of in accordance with E.P.A. requirements for the disposal of asbestos materials.

Existing concrete pavements, driveways, curbs, gutters, sidewalks, etc., to be removed shall be broken up and disposed of at approved sites. The limits for removal will be as specified and any excess removal and the replacement thereof shall be at the entire cost and expense of the Contractor. Where permanent paving (concrete or asphaltic concrete) is to be cut, the pavement shall be cut full depth before opening the ditch to insure a neat straight edge. An approved power driven concrete saw, manufactured especially for the purpose of sawing concrete, shall be suitable for the work to be performed, and the cut shall be vertical to the top and face. The exposed face of the cut shall be vertical for the full depth of the pavement. Saw blades shall be designed to make a clean, smooth cut and guides shall be used to provide true alignment of the cut.

The area where the pavement is to be removed by the use of a concrete saw shall be designated on the plans or as designated by the City's representative.

After the removal of structures, all excavations not to be occupied by new work, and all holes created, shall be backfilled with approved materials thoroughly compacted in place.
All damage done to adjacent property or structures shall be repaired by the Contractor at the Contractor's cost and expense to the satisfaction of the City. Any unsightly places created shall be cleaned up and the site left in a neat, clean and orderly condition.

Removal and Replacement of Fence

The Contractor shall do the necessary removing of fencing on the right-of-way and shall rebuild same after the pipe line work is completed. The fences shall be rebuilt of the same quality of materials or better than that which was removed. All posts, wires and other material shall be sound, straight, equal to or better than the materials removed. Gates shall be replaced in a manner acceptable to the Inspector, and all corner, gate and end posts shall be well braced.

Where fences are removed, the Contractor shall be responsible for the protection of livestock, etc. with temporary fencing.

Poles, Signs, Guy Wires, Etc.

The Contractor shall be responsible for all damage to street sign posts and signs within the limits of operations that remain in place or are removed and replaced. In the event street sign posts and signs are damaged or destroyed by the Contractor's operations, they shall be replaced at the Contractor's expense.

If requested by the Contractor, regulatory and street name signs which interfere with construction or repair work shall either be relocated or made portable by City traffic forces as needed to avoid undue interference with construction activities, provided that all such regulatory and street name signs remain visible to vehicular and pedestrian traffic.

Other Utilities

All water mains, water services, sanitary sewers, sanitary sewer house laterals, storm sewers, power conduits, gas mains, gas service laterals telephone lines, cable television lines, and other appurtenances encountered during construction shall be supported or replaced as necessary to insure uninterrupted service.

Where the exact depth of a utility is not shown on a plan, or the utility is not shown, excavation shall be made prior to reaching the obstruction in order to determine adjustments in grade if needed to prevent interference. Redesign to eliminate conflicts may be necessary, and extra compensation will not be paid for such delays.

When it is necessary to remove or adjust another utility, a representative of that utility will be notified to decide method and work to be done. The Contractor shall make satisfactory arrangements with other utilities for the cutting or adjustments required. No extra compensation will be paid due to delays caused by removal of public utility structures or for hand excavation required in or around such structures.

The Contractor will be held liable for any negligent or willful damage to any other utility and shall be expected to pay for the cost of all necessary repairs and any damages resulting to public or private property therefrom.

Method for Measurement

When the items specified are classified separately in the proposal and contract as separate pay items, measurement for payment will be made as described in the proposal. When the items specified are not classified separately in the proposal contract as separate pay items, such items will be considered as incidental work and the cost thereof shall be included in such contract pay items as are provided in the proposal and contract.

Basis of Payment

When the items specified are classified separately in the proposal and contract as separate pay items, payment will be made at the unit prices set forth. When the items specified are not classified separately in the proposal and contract as separate pay items, such items will be considered as incidental work and the cost thereof shall be included in such contract pay items as are provided in the proposal and contract.

C 2.4 Excavation, Embedment and Backfill

This section of the specifications contains detailed specifications and descriptions concerning the following items of work:

A. The furnishing of all labor, materials, tools, equipment and machinery necessary for cleaning and removing from the site of the work, wherever located, all obstructions, trees, stumps, brush, vegetation, wood and debris, and all earth, rock, and other materials to be excavated.

B. The removal of existing structures except where specifically paid for as set forth in Section C 2.3, "Removal and/or Adjustment of Existing Structures".

C. The furnishing, placing, and maintaining of all sheeting, shoring, and bracing necessary to protect the work and adjacent properties and to support all adjacent structures above and below the ground.

D. Providing for all pumping, bailing, and draining necessary to keep the excavation free from seepage water and water from other sources.

E. Providing for the uninterrupted flow of sewers and surface waters during progress of construction including bypass pumping or temporary lines.

F. Removing, after the completion of the work, of all sheeting, shoring, and bracing not necessary to support the sides of the excavation.

G. The furnishing and placing of all embedment called for on the plans and contained in the specifications.

H. The satisfactory disposal of excess and unsuitable materials not required or which cannot be used for backfilling.

I. Backfilling, tamping, compacting, and refilling, after settlement, of all excavation areas.

J. The backfilling of all streets, alleys, rights-of-way, easements and other lands, private or public, damaged or occupied by the Contractor in the performance of the contract.

K. The replacement of topsoil, where called for on the plans or set forth in the specifications, after backfilling operations have been completed.

L. Sodding, sprigging, seeding, or hydromulching where required.

M. There will be no classification of excavation. Excavation will include all materials encountered, including rock, regardless of their nature or the manner in which removed.

Borings and Subsurface Information

Any subsurface information shown on plans shall not in any manner be construed as a warranty on the part of the City of the exact nature of the subsurface conditions that will be encountered during construction of the work. It is intended only as a guide to the Contractor in making investigations preliminary to submitting a bid for the work.

Bidders must satisfy themselves as to the actual existing subsurface conditions, including, but not limited to depth, location, and sizes of pipes or conduits of various kinds in place.

Excavation - General

The construction site shall be prepared for construction operations by the removal and disposal of all obstructions and objectionable materials. It is the intent of this specification to provide for the removal and disposal of all objectionable materials not specifically provided for elsewhere by the plans and specifications to a depth of not less than 1 foot below the foundation or subgrade. The removal of such items shall be accomplished prior to excavation operations. The removal and disposal of such items will not be measured or paid for as a separate contract pay item. Such items will be considered as incidental work and the cost thereof shall be included in such contract pay items as are provided in the proposal and contract.

In general, all excavations shall be made by open cut from the surface of the ground and shall be no greater in width or depth than is necessary to permit the proper construction of the work in accordance with the plans and these specifications. The amount of excavation approximately to grade shall not exceed 100 feet from the end of the completed pipe, and no excavation shall be over 300 feet in advance of the completed pipe, unless otherwise authorized.

The sides of the excavation shall be cut and maintained as nearly vertical as practicable to one foot (1') above the top of the pipe and in accordance with current O.S.H.A. Standards. The entire foundation area in the bottom of all excavation shall be firm and stable and, unless necessary, materials shall not be disturbed below grade. "Grade" in this instance is the base of the embedment as will be called for on the plans and/or as detailed. However, any soft, spongy, disintegrated, or other unsuitable materials shall be removed to the depth below grade as directed by the City. Such materials removed shall be replaced with foundation materials as specified in Section C 1.22, "Embedment Materials ", or with other material satisfactory to the City and thoroughly compacted in place to the finish grade elevation.

Where the character of the foundation material is such that a proper foundation cannot be prepared at the elevation shown on the plans, then when directed in writing by the City, the Contractor shall deepen the excavation so that a proper foundation can be prepared. If, in the opinion of the City, the condition is the result of the Contractor's negligence to make proper provisions for adequate drainage of the excavation, the cost of the foundation material will not be reimbursed. If the Contractor elects to undercut the trench and use gravel and drain pipe as an underdrain in lieu of, or in conjunction with, pumping, bailing, draining or well point, the additional work will be considered as incidental work and additional compensation will not be allowed.

Embedment for the pipe, or the pipe itself, will not be laid in water. If the Contractor overcuts the trench it will be brought back to grade by the use of compacted select material from the ditch excavation. The final cleaning and preparing of the foundation area shall be done immediately prior to the placing of the embedment materials or structures.

Maximum Width of Trench

The width of trench at a point one (1') foot above the top of the pipe being laid shall conform to the following table.

Pipe Type	**Size (Inches)**	**Min Width of Trench**	**Max Width of Trench**
Pipe With Bells	6” through 30”	O.D. + 12”	O.D. + 16”
Pipe With Bells	36” and larger	O.D. + 16”	O.D. + 24”
Pipe With Sleeves, Sockets or Couplings	4” through 12”	O.D. + 12”	O.D. + 16”
Pipe With Sleeves, Sockets or Couplings	15” and larger	O.D. + 16”	O.D. + 21”

The above widths are for trenches without sheeting, shoring, or bracing.

If the maximum allowable trench width is not maintained to a point one (1') foot above the top of pipe, the Contractor shall provide at his expense the next higher class of embedment as directed by the City which will provide adequate support for the pipe material being installed.

Depth of Cut Shown on Plans

Profile elevations shown on plan-profile sheets for sanitary sewer lines are flow line elevations. Grade stakes placed in the field normally are measured from elevations of reference point hub to flow line of pipe to be installed. Payment for depth of cut will be measured from the actual ground elevation at the center line of the pipe to the flow line of the pipe to be installed.

Profile elevations shown on plan-profile or profile sheets for water lines are top of pipe elevations.

Bottom of Ditch in Rock

Where rock is encountered in the ditch at the elevation where the bottom of the pipe rests, the ditch shall be undercut a minimum of six (6") inches or to the depth indicated on the plans or appurtenant drawings for any special type of bedding.

Pipe Foundation in Wet Trench

When ground water is encountered, six (6") inches of crushed stone shall be used in lieu of any other type embedment material. Where the only purpose of the crushed stone is to provide a dry, stable working surface for the convenience of the Contractor, no additional payment will be made for the use of crushed stone in lieu of lesser embedment material.

Rock foundation, as defined in Section C 1.22 of these specifications, is to be used only in the event that the trench bottom is so unstable that normal construction will not be permitted. Rock foundation will be placed only at the direction and in the location indicated by the City.

Blasting

The use of explosives is discouraged. If the use of explosives is necessary and approval by the City is granted, the Contractor may elect to use explosives in the prosecution of the work. Utmost care shall be exercised so as not to endanger life or property. The Contractor shall use only such methods as are currently utilized by persons, firms, or corporation engaged in a similar construction business. The Contractor shall be solely responsible for the determination as to whether explosives shall be used. The Contractor shall indemnify the City of Colleyville whole and harmless against any claim of damage or injury to persons or property, real or personal, resulting from the use of explosives by the Contractor or any subcontractor. The Contractor shall furnish the City of Colleyville evidence of insurance sufficient to cover any such possibility. Insurance shall include the City of Colleyville as an additional insured.

All explosives shall be stored in a safe and secure manner, under the care of a competent guard at all times, and all such storage places shall be marked clearly "DANGEROUS- EXPLOSIVES." Blasting caps and explosives shall be stored separately, and not more than 50 pounds of explosives shall be stored on the site. The method of storing and handling explosives and highly inflammable materials shall conform with Federal and State laws, City of Colleyville ordinances, and Colleyville

Fire Department regulations. The Contractor shall notify each utility company having structures in proximity to the site of the work of the intention to use explosives, and such notice shall be given sufficiently in advance to enable the companies to take such steps as they may deem necessary to protect their property for injury. Such notice shall not relieve the Contractor of responsibility for any damage resulting from blasting operations.

No blasting will be permitted within state highway right-of-way without written permission from the Texas Department of Transportation.

The blasting area will be covered with heavy timbers chained together, a rope mat, or some equally effective method of blast protection, reviewed by the City. In addition to the "DANGEROUS-EXPLOSIVES" sign displayed, two signs marked "EXPLOSIVES, TURN ALL RADIOS OFF" shall be placed in conspicuous locations readily visible to vehicular traffic and not less than 350' from the blasting cap storage area. During each blast, exposed pipe shall be covered with planking.

Trench Safety, Sheeting, Shoring and Bracing

The sides of all excavation shall be supported in accordance with O.S.H.A. regulations. In wet, saturated or flowing materials, where it is necessary to install tight sheeting of cofferdams, wood or steel sheet piling shall be used. All sheeting, shoring and bracing shall have sufficient strength and rigidity to withstand the pressure exerted and maintain the sides of the excavation properly in place and protect all persons or property from injury or damage. When excavations are made adjacent to existing building or other structures or in paved streets, particular care shall be taken to adequately sheet, shore and brace the sides of the excavation to prevent undermining of or settlement beneath the structures or pavement. Underpinning of adjacent structures or pavement shall be done by the Contractor at his own cost and expense. When required, the pavement shall be removed, the void satisfactorily refilled, compacted, and the pavement replaced. The entire expense of such removal and subsequent replacement thereof shall be borne by the Contractor.

The removal of all trench safety equipment, sheeting, shoring and bracing shall be done in such manner as not to endanger or damage either new or existing structures, private or public properties, and so as to avoid cave-ins or sliding of the banks. All holes or voids left by the removal of the sheeting, shoring or bracing shall be immediately and completely filled and compacted with suitable materials.

Pumping, Bailing and Draining

The Contractor shall immediately remove all surface or seepage water from sewers, drains, ditches, and other sources which may accumulate during the excavation and construction work, by providing the necessary underdrains or otherwise, and by doing the necessary pumping, bailing or draining. The Contractor shall have available at all times sufficient equipment in proper working order for doing the work herein required. All water removed from excavations shall be disposed of in an approved manner, so as not to create unsanitary conditions, cause environmental damage, nor to cause injury to persons or property, or damage to the work in progress, nor to interfere unduly with the use of streets, private driveways or entrances. No water shall be allowed to flow through or

over unset concrete or through the completed line. Adequate plugs or night caps shall be properly installed on pipe ends when the work is unattended. No water removed from the site shall be discharged to the City's sanitary sewer system without prior approval of the City.

Disposal of Excavated Materials

Suitable excavated materials shall be piled adjacent to the work, in accordance with O.S.H.A regulations, to be used for backfilling. Excavated materials unsuitable for backfilling, or in excess of that required for backfilling, shall be disposed of by the Contractor. The location of suitable disposal sites is solely the responsibility of the Contractor and must be suitable to the Texas Natural Resource Conservation Commission; the City shall in no way be responsible for the actions of the Contractor. No disposal shall be allowed in flood plains or below the 100-year flood elevation of drainage ways.

Desirable topsoil, sod, etc., shall be carefully removed and piled separately adjacent to the work when required. Excavated materials shall be handled at all times in such manner as to cause a minimum of inconvenience to public travel and to permit safe and convenient access to private and public property adjacent to or along the line of the work. The excavated material not suitable for bedding or backfill will be disposed of by the Contractor and suitable selected material will be provided at no cost to the City.

Protection of Trees, Plants, Shrubbery, Etc.

No trees shall be removed unless so noted on the plans or upon the specific approval of the City. Where trees, plants, shrubbery, etc., are adjacent to the line of the work and are not to be removed or removed and replaced, the Contractor shall protect such trees, plants, shrubbery, etc., by substantial guards; and if, in the opinion of the City, such trees, plants, shrubbery, etc., would be damaged by machinery, etc., hand excavation may be required. The Contractor shall be responsible for all damages to adjacent trees, plants, shrubbery, etc. All damaged limbs over one (1") inch in diameter shall be sawed clean adjacent to the damaged area or at the trunk and dressed with a suitable tree wound paint. The cost of such protection will not be paid for as a separate contract pay item, and the costs thereof shall be included in such pay items as are provided in the proposal and contract.

Embedment

Embedment describes the material in the area below, around, and above the pipe as described below. Embedment shall be one of the following types and conform to the requirements of Section C 1.22 "Embedment Materials":

A. Class "A" Embedment. The trench shall be undercut to a point four (4") inches below the outside of the pipe. The pipe shall be laid to grade on concrete blocks or bricks and properly jointed. The pipe will then be restrained to prevent flotation. Class "B" Concrete will then be poured on either side of the pipe to form the bedding under the pipe and up the sides of the pipe to a depth of one-fourth (1/4) the outside diameter (O.D.) of the pipe. Prior to the placement of granular embedment, grades will be checked to insure that no flotation or settlement has occurred.

Granular embedment material as defined in Section C 1.22 shall then be placed to a point six (6") inches above the top of the pipe barrel in three-inch (3)" to six-inch (6") lifts and compacted to 95 percent ± two (2%) percent of maximum dry density as defined in ASTM D 698, latest revision.

B. Class "B" Embedment. The ditch shall be excavated to a minimum of six (6") inches below the finished grade. A minimum six (6") inches of crushed stone shall then be placed in the trench. The crushed stone shall then be compacted, graded and bell holes dug. The pipe shall then be placed on the firm trench bottom and jointed. Crushed stone embedment shall then be placed to six (6") inches above the top of the pipe and compacted.

C. Class "C" Embedment. The trench shall be undercut to a point six (6") inches below the barrel of the pipe. Six (6") inches of granular embedment material as defined in Section C 1.22 shall then be placed in the ditch and compacted. Bell holes shall then be excavated in the embedment material and the pipe laid and jointed. Granular embedment material shall then be carefully placed around the pipe haunch area to a point six (6") inches above the top of the pipe. The embedment shall then be thoroughly consolidated by mechanical tamping to 95 percent ± two (2%) percent of maximum dry density as defined in ASTM D 698, latest revision.

D. Class "D" Embedment. The trench shall be undercut to a point six (6") inches below the barrel of the pipe. Six (6") inches of granular embedment material shall be placed in the ditch and compacted. Additional granular material shall then be placed alongside the pipe to a depth of one-fourth (1/4) the outside diameter of the pipe above the bottom of the pipe and compacted. Select material shall then be placed in the trench to a point six (6") inches above the top of the pipe and consolidated by mechanical tamping to 95 percent ± two (2%) percent of maximum density as defined in ASTM D 698, latest revision.

E. Class "E" Embedment. The ditch shall be excavated to a minimum of four (4") inches below the finished grade. A minimum four (4") inches or one-eighth (1/8) of the outside diameter of the pipe of crushed stone shall then be placed in the trench. The crushed stone shall then be compacted, graded and bell holes dug. The pipe shall then be placed on the firm trench bottom, and granular embedment material placed along the sides of the pipe to six (6") inches above the top of the pipe barrel. The granular embedment material shall be placed in three-inch (3") to six-inch (6") lifts and compacted to 95 percent ± two (2%) percent of maximum dry density as defined by ASTM D 698, latest revision.

F. Class "F" Embedment. The ditch shall be excavated to a minimum of four (4") inches below the finished grade. A minimum four (4") inches or one-eighth (1)/8 of the outside diameter of the pipe of crushed stone shall then be placed in the trench. The crushed stone shall then be compacted, graded and bell holes dug. The pipe shall then be placed on the firm trench bottom and jointed. Select material shall be placed under the haunch area of the pipe and along the sides to six (6") inches above the top of the pipe. The select material shall be place in three-inch (3") to six-inch (6") lifts and compacted to 95 percent ± two (2%) percent of maximum dry density as defined by ASTM D 698, latest revision.

Backfill

The placing of backfill shall not begin until the pipe has been laid, jointed and embedded. The excavation shall be backfilled only with materials approved by the City. Normally, material excavated from the ditch will be used for backfill, except when granular material is used, provided that all hard rock, stones, or boulders having any dimensions greater than two (2") inches, debris and roots larger than two (2") inches, and any soil balls or clods greater than the maximum allowed lift are removed.

A. Tamped Native Material. After free moisture is gone from the embedment material, the ditch shall be backfilled with native material and compacted by mechanical methods. If hand pneumatic tampers are used, the backfill shall be placed in layers not exceeding six (6") inches in loose thickness and thoroughly compacted to 95 percent Standard Proctor density at optimum moisture content, + two (2%) percent as determined by ASTM D698, latest revision. Backfill shall be placed in uniform layers completely across the trench, and compaction shall proceed in an orderly, uniform manner. If compaction is performed by the use of heavy tamping (sheep's foot) rollers, backfill shall be placed in layers not exceeding six (6") inches in loose thickness and compacted to 95 percent Standard Proctor density at optimum moisture content, + two (2%) percent as determined by ASTM D 698, latest revision.

B. Sand Backfill. At the option of the Contractor, in areas where the PI of the native material is less than fifteen (15), and the PI of the native material has been verified by testing, granular embedment material (field sand) may be used as backfill material. If this option is selected, the granular embedment material shall be placed above the previously installed and compacted pipe embedment material shall be backfilled as described above.

C. Backfill in areas with new street construction. The backfill as described above shall continue to within two (2') feet of the subgrade. At this point the trench shall be widened a minimum of one (1') foot on each side. The remaining two (2') feet shall be native material, mechanically compacted in six-inch (6") loose lifts at optimum moisture content, + two (2%) percent, to a density of 95 percent of maximum dry density, as determined at ASTM D698, latest revision.

D. Testing. The City of Colleyville shall be responsible for testing during backfill operations. If a test does not meet the requirements as outlined above, the Contractor shall be responsible for the cost of additional testing until the compaction requirements are met.

Backfill of Service Line Trenches

Backfill requirements for water or sewer house service lines shall be the same as that required for the line to which they connect unless otherwise specified.

Backfill under Existing Utilities

When existing utility lines have soil or other backfill material removed from beneath them, they will be backfilled in accordance with these specifications before the remaining backfill is placed.

Maintenance of Streets during Construction

The Contractor shall at all times maintain the surfaces of streets on which he/she is working or has worked. The maintenance required will include the filling of holes, blading or otherwise smoothing of the street surfaces (particularly the trench area), cleaning and removal of surplus excavation material, rubbish, etc., sprinkling of streets with water to abate dust nuisance, and the elimination of interference resulting from blocking the street to residents thereon. Any or all of such operations shall be performed by the Contractor upon demand by the City, but the Contractor shall not wait for instruction from the City before performing maintenance work obviously in need of being done to meet the requirements of these specifications. All costs of work covered by this paragraph shall be included in the prices bid for the various items of work, and no separate payment will be made. In the event the Contractor fails or refuses to properly maintain the barricades and/or surfaces of streets on which work is being performed, the City after due notice to the Contractor's Superintendent, will perform the necessary maintenance, and all costs to the City incurred in the performance of such work will be deducted from any monies due or to become due to the Contractor for work performed, or the Contractor will be billed for such costs directly as the City shall elect. Notice to the Contractor to be given by the City shall be in writing, and it shall be delivered to the Contractor's Superintendent or authorized agent. Except in emergency cases, where immediate action is required, the Contractor shall have 24 hours in which to comply with the instructions of the City. Should the Contractor fail to do so, the City will proceed with the work as set forth above. The Contractor shall provide traffic protection as specified in the City of Colleyville's Work Area Traffic Control Manual.

Where traffic must cross open trenches, such as street intersections and driveways, the Contractor shall provide suitable backfill bridges, protective barricades and such other safety equipment as required. The use of machinery must be so regulated as to preclude any unnecessary interference with traffic, utilities, etc. The Contractor shall abide by all applicable Federal, State or Local laws governing excavation work including OSHA and E.P.A. regulations.

Depth of Cover

A. Sewer lines. Sewer lines shall be laid to the grades shown on the plans.

B. Water Lines. Unless otherwise shown on the plans or plan-profile sheets, water lines in the locations described shall have the following minimum depths of cover:

    1. City Streets. Within the right-of-way of city streets, all water lines will be laid with the top of the pipe a minimum of 42 inches below the top of the existing or proposed curb, whichever is lower.

2. County Type Roads. Where water lines are installed within the right-of-way of county type roads (no curb and gutter), the top of the water line shall be at least 48 inches below the elevation of the lowest roadside (borrow) ditch existing on either side of the road.

3. Open Country. Across open country, cover over water lines shall be a minimum of 48 inches (48").

Conditions of Payment

A. Water Lines. Trenching, embedment, and backfilling for the installation of water lines will be paid at the unit prices set forth in the plans and in the contract documents.

B. Sewer Lines. Trenching, embedment, and backfilling for the installation of sewer lines will be paid at the unit prices set forth in the plans and contract documents for the various increments of depth of cut.

C. Trench Foundation Materials. Trench foundation materials will not be paid for as a separate pay item unless its use is directed by the City.

D. Subsidiary Items. The following items and/or others not covered by specific bid items will be included in the price bid per foot for the various sizes of water lines and sewer lines over twelve (12") inches in diameter or for "Trenching and Backfill" for sewer lines twelve (12") inches and smaller in diameter:

1. Excavation.

2. Furnishing, placing, and compacting embedment material.

3. Pumping, bailing, and draining as may be required.

4. Maintaining satisfactory condition of streets in work area.

5. Disposal of excess material from ditch (spoil).

6. Placing backfill above embedment.

7. Compaction of embankment above embedment layer by tamping, or other methods as required to obtain the densities specified.

8. Clean-up.

9. Finishing trench surfaces (not including pavement replacement to a condition satisfactory to the Owner.

Measurement

Where trenching and backfill is listed as a pay item in the contract documents (for sewer lines 12" and smaller in diameter), it shall be measured by the linear foot in the various depth of cut brackets.

Rock cushion will be measured by the cubic yard. Pay quantities will be based upon a six (6") inch depth and the maximum permissible trench width as set forth in this section unless a greater depth is ordered by the City.

Payment

Where trenching and backfill is listed as a pay item in the contract documents (for sewer lines twelve (12") inches and smaller in diameter), it shall be paid for at the unit price bid per linear foot of the various depth of cut brackets.

Rock cushion will be paid for at the unit price bid per cubic yard.

C 2.5 Installation of Concrete Pressure Pipe and Fittings

This section of the specifications covers the installation of any of the various types of concrete pressure pipe and fittings used primarily in the domestic water system.

Where plan-profile or profile sheets are included in the plans, concrete water lines shall be laid to the grades shown.

Where grades are not shown, minimum cover as set forth in Section C 2.4 shall be maintained.

Embedment

A. Prestressed Pipe. The minimum permissible bedding for Prestressed Concrete Cylinder Pipe manufactured in accordance with AWWA C301 shall be Class "D" as set forth in Section C 2.4.

B. Bar-Wrapped Pipe. The minimum permissible bedding for Bar-Wrapped Concrete Cylinder Pipe manufactured in accordance with AWWA C303 shall be Class "C" as set forth in Section C 2.4.

C. Pipe Cover in Excess of Ten (10') Feet. Where the depth of backfill over the top of the pipe exceeds ten (10') feet, the embedment shall be of the class shown on the plans or set forth in the contract documents.

Pipe Handling

Pipe, fittings, valves and other accessories shall be hauled to and distributed at the site of the project by the Contractor; they shall at all times be handled with care to avoid damage. In loading and unloading they shall be lifted by hoists, cranes or rolled on skidways in a manner which avoids sudden shock.

Under no circumstances shall pipe be dropped. Pipe handled on skidways must not be skidded or rolled against pipe already on the ground. Pipe shall be placed on the site of the work parallel with the trench alignment and with bell ends facing the direction in which the work will proceed.

Proper implements, tools, equipment and facilities shall be provided and used by the Contractor for the safe and correct prosecution of the work. All pipe, fittings, specials, valves, etc., shall be lowered into the trench by means of a suitable machine and shall not be rolled or dumped into the trench. The equipment shall have sufficient capacity to handle the pipe. The method of construction shall be subject to the City's approval. Before being lowered into the trench, each joint of pipe shall be inspected and any unsound or damaged pipe shall be repaired or rejected.

The pipe shall be kept free of all debris during the laying operation. The pipe shall be swept or swabbed prior to installation. The swab should be of a design acceptable to the City. At the close of each operating day the open end of the pipe shall be effectively sealed against the entrance of all objects, especially water. No pipe shall be laid in water or when the trench conditions or the weather are unsuitable for such work, except in an emergency and then only upon permission of the City.
All pipe shall be laid accurately to established lines and grades with valves and fittings at the required location and with joints centered and spigots pushed home.

Where it becomes necessary to make deflections in line of the pipe, sections of pipe with beveled ends or fabricated fittings shall be used. Minor deflection of the line of the pipe may be obtained in standard pipe joints; however, the maximum joint opening caused by such deflection shall not exceed the recommendations of the pipe manufacturer. Random length pipe and/or grade adapters may be used to make unforeseen changes in the field.

Pipe Jointing

Sections of pipe shall be tightly fitted together, and care shall be exercised to obtain true alignment and grade.

Before laying each joint of pipe, the bell and spigot rings shall be thoroughly cleaned by wire brushing and wiping until clean and dry. The gasket and the inside surface of the bell shall be lightly lubricated with a suitable solution (flax soap) which will facilitate the telescoping of the joint. When pipe is being laid, the gasket shall be placed on the spigot ring, and the spigot end of the pipe shall then be entered into the bell of the last, previously laid pipe and telescoped into position. No "blocking up" of pipe or joints will be permitted.

A. Inside Cement Mortar Joints: The inside joint recess of pipe shall be filled with mortar and finished smooth with a hand trowel after the joint is engaged. If approved by the City prior to the commencement of pipe laying operations, mortar for the inside joint of pipe 24-inch and smaller in diameter may be deleted provided that exposed steel in the inside joint recess is coated with a paint recommended by the pipe manufacturer and approved by the City.

B. Outside Cement Mortar Joint. After the spigot has been telescoped into the bell and the joint checked and found satisfactory, a wrapper shall be placed around the pipe, covering the joint. The wrapper shall be of the quality manufactured by the Mar-Mac Manufacturing Company or approved equal, and shall be hemmed at each edge to allow threading with a steel strap to securely fasten the wrapper around the pipe by means of a stretcher and sealer. The wrapper shall have a minimum width of seven (7") inches for 33-inch pipe and smaller and nine (9") inches for pipe larger than 33-inch diameter and sufficient length to encircle the pipe, leaving enough space between the ends at the top to allow the cement mortar to be poured. The entire joint shall be poured with cement mortar and consolidated and rodded or agitated to eliminate voids. Prior to pouring the cement mortar, the joint shall be thoroughly cleaned. Any joint showing shrinkage or excessive cracking shall be cleaned and remade.

Cement Mortar. The mortar used at the joint shall consist of one (1) part Portland cement to two and one-half (2-1/2) parts fine, sharp clean sand mixed with water to the consistency of thick cream. The mortar required at the interior joint shall not be placed in freezing weather unless adequately protected from freezing.

Careful inspection shall be made of each joint to insure a smooth continuous interior surface. The interior of the pipe shall be thoroughly cleaned and cleared of any obstructions that may reduce its carrying capacity.

Where designated on the plans, joints will be electrically bonded and by-pass connectors installed past valves to maintain a continuous electrical circuit through the entire length of pipe.

Welded Pipe Joints

Where indicated on the plans or specified in the specifications, the concrete pressure pipe shall have welded joints.

Pipe furnished for this type installation shall have joints trimmed or prepared for joint welding, as recommended by the manufacturer and approved by the Engineer.

Before laying, the bell and spigot rings shall be thoroughly cleaned for welding by wire brushing and wiping.

In placing the pipe, the sections shall be fitted together with care being taken to secure true alignment and grades as shown on the plans.

For lined cylinder prestressed pipe, welds will be skip welds as recommended by the manufacturer. For embedded cylinder prestressed pipe, welds will be made on the interior of the pipe and will be continuous.

Slag shall be removed from each welded joint and visually inspected for blow holes prior to application of grout.

Protective Coating Applied in Field

The Contractor shall provide a one-inch (1") minimum thickness concrete or cement mortar coating in the field for the protection of all exposed steel such as flanges, caulked joints, threaded outlets, closures, etc. The cement mortar used shall consist of one part Portland cement to two and one-half parts of fine, sharp (plaster) sand. Where shown, coating is to be reinforced with wire mesh.

Any surface receiving a cement mortar coating shall be thoroughly clean and wetted with water just prior to placing the cement mortar coating. After placement, care shall be taken to prevent the cement mortar coating from drying out too rapidly by covering with damp earth or burlap. Cement mortar coating shall not be applied during freezing weather.

Tunnel Installation

Concrete pressure pipe shall have uniform alignment and bearing when installed as a carrier pipe in a tunnel or encasement pipe. To provide straight alignment and grade, concrete paving within the encasement may be necessary. Concrete pressure pipe to be installed in an encasement pipe will be manufactured with one (1") inch thick x 24 inch wide bands of mechanically impacted mortar in addition to the normal coating as set forth in Section C 1.5 of these specifications. To prevent carrier pipe from floating, a minimum of one hold down jack per joint shall be placed on the pipe. Alternate means and methods for securing pipe in place may be submitted for consideration.

A. Twenty-one (21") inch Pipe and Smaller. The first pipe shall be placed in the tunnel leaving the bell end extending outside the tunnel approximately one (1') foot. Interior joint protection shall be applied in a manner consistent with the requirements for all other portions of the pipeline. "Flex-Protex" joint filler as manufactured by the Mar-Mac Manufacturing Co., Inc., or approved equal, shall be placed over the spigot of the second pipe, the rubber gasket positioned in the spigot groove, joint lubricant applied to the joint surfaces, the joint engaged, and the gasket position checked. Both pipe shall then be moved into the tunnel, again leaving the bell end of the second pipe extending approximately one foot outside the tunnel. The above steps shall be repeated until all pipe are placed in the tunnel.

B. Twenty-four (24") inch Pipe and Larger. "Flex-Protex" joint filler, or approved equal, shall be used for Bar- Wrapped Concrete Cylinder Pipe, and AWWA C301 Prestressed Concrete Lined Cylinder Pipe. Exterior joint protector placed according to its manufacturer's instructions shall be used for AWWA C304 Prestressed Concrete Embedded Cylinder Pipe. The joint filler shall be placed over the spigot, the rubber gasket positioned in the spigot groove, and joint lubricant applied to the joint surfaces prior to moving each pipe into the tunnel separately. The joint engagement shall be accomplished and the gasket position checked as each pipe is placed in its final position in the tunnel.

Casing pipe used with concrete pressure pipe shall generally be sized to provide a minimum of fifteen (15") inch clear space above the carrier pipe, with allowance made for bottom skid

requirements. After the installation of the carrier pipe in the casing, each end of the casing pipe shall be sealed with brick and mortar or other approved means.

Pipe Technician

The pipe manufacturer shall furnish a factory trained, job experienced field representative who shall visit the project at least weekly during the course of installation and at the unloading of the pipe at delivery to insure proper handling. The technician will also be subject to call by the Contractor or City to advise and assist with the solution of field problems.

Hydrostatic Test

All taps and corporation stops necessary for the proper testing or chlorination of the main shall be furnished and installed by the Contractor.

Pressure testing of concrete pressure water mains shall be in accordance with Section C 2.31 of these specifications.

Thrust Blocking

Reaction or thrust blocking shall be provided at each hydrant, valve, bend, tapping sleeve, tee and at reducers or fittings where changes in pipe diameter occur. Thrust blocks shall be centered on the longitudinal axis of the pipe and extended to solid undisturbed ground. The size and shape of the thrust blocking shall be as shown on the drawings or as specified in the contract documents.

Measurement

Concrete pressure pipe will be measured for payment as the length of installed pipe of the various sizes, types, and classes measured horizontally from the center of fitting or end of pipe without any deduction for the length of intermediate fittings or valves.

Fittings and specials will be considered subsidiary to the length of installed pipe except where they are set forth as separate items in the proposal included in the contract documents.

Payment

Payment for concrete pressure pipe shall be made at the price bid per foot of pipe installed, which bid price shall be full payment for all labor and materials necessary to make the complete installation.

Where fittings and specials are set forth separately in the proposal, payment will be made at the unit price bid. Otherwise, payment will not be made separately for fittings and specials but will be considered subsidiary to the unit price or prices bid for pipe.

C 2.6 Installation of Asbestos-Cement Pressure Pipe

Asbestos-cement pressure pipe shall not be used for new water line construction, but is included for guidance for repair, maintenance, and connection to existing water lines.

Where plan-profile or profile sheets are included in the plans, asbestos-cement lines shall be laid to the grades shown.

Where grades are not shown, minimum cover as set forth in Section C 2.4 shall be maintained.

Embedment

The minimum permissible embedment for asbestos-cement pressure pipe with ten (10') feet or less cover shall be Class "C" as set forth in Section C 2.4 of these specifications. This embedment requires a six (6") inch envelope of granular embedment material completely around pipe.

When the depth of backfill over the top of the pipe exceeds ten (10') feet, the embedment shall be of the class shown on the plans or set forth in the contract documents.

Storage

Safe storage shall be provided for material until it has been incorporated into the completed project. The interior of all pipe, couplings, rings, fittings, and other accessories shall be kept free from dirt and other foreign matter at all times.

Pipe Handling

At all times material shall be handled with care to avoid damage. Whether moved by hand, skidways, or hoists, material shall not be dropped, bumped, or allowed to impact on itself. In distributing the material at the work site, it shall be unloaded adjacent to or near the location where it is to be installed.

Laying and Jointing of Pipe

A. Lowering of Pipe and Accessories into Trench. Pipe shall not be lowered into the trench until the pipe bed has been brought to grade. All pipe and accessories shall be inspected for defects. Dirt and other foreign matter shall be removed from the interior and the machined ends before lowering into the trench. Pipe and accessories shall be lowered carefully into the trench in a manner that will prevent damage to pipe and fittings or injury to the installers. The sealing surfaces of all materials shall be kept clean during installation.

B. Pipe Joints. The machined ends of pipe to be jointed, coupling grooves, and rubber rings shall be cleaned immediately before assembly, and assembly shall be made as recommended by the manufacturer. Care should be taken not to reverse the gasket when placed in the bell. Each pipe joint shall be sealed with a coupling consisting of an asbestos-cement sleeve and two rubber

rings or an equivalent coupling or joint of equivalent strength and performance. The pipe joint shall not be deflected either vertically or horizontally beyond the limits recommended by the manufacturer.

1. When pipe laying is not in progress, the open ends of installed pipe shall be closed to prevent entrance of trench water into the line.

2. Whenever water is excluded from the interior of the pipe, enough backfill shall be placed on the pipe to prevent flotation. Any pipe that has floated shall be removed from the trench and the bedding corrected. No pipe shall be laid when the weather is unsuitable for the proper installation as determined by the City.

C. Pipe Cutting. Pipe-cutting methods that produce a smooth square cut end without damage to the pipe and that minimize or eliminate airborne particles shall be employed. Safety procedures as recommended by the manufacturers of asbestos-cement pipe shall be strictly adhered to.

D. End Preparation. Whenever it is necessary to cut a length of pipe in the field, the end shall be prepared as follows:

1. The pipe end of random lengths shall be machined by commercially available field lathes designed for this purpose to ensure that the diameter, profile, and roundness meet the pipe manufacturer's specifications. The machined surface which the compression ring seals shall be smooth and cylindrical to ensure joint integrity.

2. The pipe end of machined overall lengths shall be beveled in accordance with the pipe manufacturer's specifications.

E, Length of Pipe at Fittings and Rigid Structures. When rigid joints are formed by caulked materials or by bolts with rubber ring seals, such as at fittings, the length of eight (8") inch diameter and smaller pipe fitted into the bell of the fittings shall not exceed 3 ft. 3 in. and the length of ten (10") inch diameter and larger pipe shall not exceed 6 ft. 6 in. At least one flexible joint shall be used between two adjacent rigid joints. A coupling shall be cast in the wall of rigid structures at the point of entry of pipelines to provide flexibility at the wall. To provide additional flexibility, the pipe at the point of entry shall have a laying length of not more than 6 ft. 6 in.

Thrust Blocking

Reaction or thrust blocking will be provided at each hydrant, valve, bend, and tee and at reducers of fittings where changes in pipe diameter occur. Thrust blocks shall be centered on the longitudinal axis of the pipe and extended to solid undisturbed ground. This size and shape of the thrust blocking shall be as shown on the drawings or as specified in the contract documents.

Plugging of Dead Ends

Plugs shall be inserted into the bells of all dead-end fittings. Spigot ends of fittings and plain ends of pipe shall be capped. Thrust blocking shall be provided at all dead ends of pipe that are capped or plugged. Capped or plugged outlets to fittings shall be tied to the fittings and shall be restrained according to the fitting manufacturer's recommendations.

Measurement

The Measurement of asbestos-cement pressure pipe for Payment purposes will be the horizontally measured length of the line along its main axis from the center of fitting to center of fitting or end of pipe without deduction for the length of intermediate fittings or valves.

Payment

Payment will be made at the unit price bid per linear foot of pipe installed for the various classes and sizes of pipe. Such Payment shall be full compensation for all labor and materials including trenching, embedment, and backfilling - necessary to make the complete installation.

Tapped coupling for water services will not be paid for directly but will be considered subsidiary to the unit prices bid for the various sizes of water services unless specifically set forth as a separate item in the contract documents.

C 2.7 Installation of Polyvinyl Chloride (PVC) Water Pipe

This section of the specifications covers the installation of polyvinyl chloride (PVC) pressure pipe manufactured under AWWA C900 or AWWA C905 for use in the water distribution system.

Where plan-profile or profile sheets are included in the plans, PVC lines shall be laid to the grades shown. Where grades are not shown, minimum cover as set forth in Section C 2.5shall be maintained.

Embedment

The minimum permissible Embedment for PVC pressure pipe with ten (10') feet or less cover shall be Class "C" as set forth in Section C 2.4 of these specifications. Basically, this Embedment requires a six (6") inch envelope of granular Embedment material completely around the pipe.

Where the depth of backfill over the top of the pipe exceeds ten (10') feet, the Embedment shall be of the class shown on the plans or set forth in the contract documents.

Storage

Safe Storage shall be provided for material until it has been incorporated into the complete project. The interior of all pipe, couplings, rings, fittings, and other accessories shall be kept free from dirt and

other foreign matter at all times. The pipe shall be adequately protected, as recommended by the manufacturer, from damage from sunlight during Storage.

Pipe Handling

At all times material shall be handled with care to avoid damage. Whether moved by hand, skidways, or hoists, material shall not be dropped, bumped, or allowed to impact on itself. Any damaged pipe will be rejected.

In distributing the material at the work site, it shall be unloaded adjacent to or near the location where it is to be installed.

Pipe Curvature

If necessary, the trench may be curved to change direction or avoid obstruction within the limits of the curvature of the pipe as shown in the following table:

Pipe Size Minimum	Allowable Radius (Feet)
4	100
6	150
8	200
10	250
12	300

The approximate force and offset per twenty (20') feet length to accomplish these curvatures for Class 150 pipe are as follows:

Pipe Size (Inches)	Offset Per 20' Length (Inches)	Force per 20' Length (Pounds)
4	23	20
6	16	60
8	12	135
10	9	250
12	8	425

Pipe Laying and Jointing

The pipe shall be laid and jointed in the following manner:

A. Clean Ring and Spigot. The gasket, groove, and pipe spigot shall be wiped clean of all foreign materials.

B. Install Gasket. Insert the ring in the groove taking care to see that the gasket is evenly seated and free from twists. Some pipe gaskets are installed at the factory.

C. Apply Lubricant. Lubricate the spigot end of the pipe from the pipe end to the full insertion mark. The coating should be the equivalent of a brush coat of enamel paint. Use only the lubricant approved by the manufacturer. After the spigot end has been lubricated it must be kept clean and free of dirt, sand, or Embedment material. If foreign matter adheres to the lubricated end, the spigot must be wiped clean and relubricated.

D. Assembly. After the pipe sections are aligned, the spigot end should be pushed into the bell or coupling until it hits the stop and/or the reference or insertion mark is in the proper location. The recommended assembly method is using a bar and a block. Pullers such as a "come along" may also be used if the pipe is protected from the chain or cable.

E. Use of Swab. A swab shall be pulled through each joint after the joint is embedded in the trench.

Pipe Cutting and Beveling

All field cuts must be square (perpendicular to the pipe centerline), and pipe shall be marked completely around its entire circumference prior to cutting to assure a square cut.

Using a factory finished end as a guide, all field cut pipe shall be beveled using a bevel tool, a coarse file, or a rasp.

PVC Pipe in Casings

When PVC pressure pipe is installed in casings, skids shall be used along the pipe barrel to insure that the pipe does not rest on its bells or couplings as recommended by the manufacturer. Skids may extend for the full length of a pipe - including bell and spigot portions - or may be spaced at intervals. Skids shall be fastened securely to the pipe with strapping, cables, or clamps. Raci spacers will not be allowed. Stainless steel straps with rubber gromets only.

Thrust Blocking

Reaction or Thrust Blocking shall be provided at each hydrant, valve, bend, tapping sleeve, tee and at reducers or fittings where changes in pipe diameter occur. Thrust blocks shall be centered on the longitudinal axis of the pipe and extended to solid undisturbed ground. The size and shape of the Thrust Blocking shall be as shown on the drawings or as specified in the contract documents. Joint restraining devices manufactured and installed in conformance with the requirements of UNI B-13 "Recommended Standard Performance Specification for Joint Restraint Devices for Use with Polyvinyl Chloride (PVC) Pipe" may be used for AWWA Standard C900 pipe.

Measurements

The Measurement of PVC pressure pipe for Payment purposes will be the horizontally measured length of the line along its main axis from center of fitting to center of fitting or end of pipe without deduction for the length of intermediate fittings or valves.

Payment

Payment will be made at the unit price bid per linear foot of pipe installed for the various classes and sizes of pipe. Such Payment shall be full compensation for all labor and materials including trenching, Embedment, and backfilling necessary to make the complete installation.

C 2.8 Installation of Ductile Iron Pipe

This section of the specifications covers the installation of ductile iron pressure pipe. Except as modified below installation of ductile iron pipelines shall be in accordance with ANSI/AWWA C600.

Where plan-profile or profile sheets are included in the plans, ductile iron lines shall be laid to the grade shown.

Where grades are not shown, minimum cover as set forth in Section C 2.5 shall be maintained.

Embedment

The minimum permissible Embedment for ductile iron pressure pipe shall be Class "C" as set forth in Section C 2.4. of these specifications. This Embedment requires a six (6") inch envelope of granular Embedment material completely around the pipe.

Polyethylene Wrapping

All ductile iron pressure pipe used in the water distribution system shall be fully wrapped – including appurtenances - with polyethylene wrapping as set forth in Section C 1.20 of these specifications.

Ductile iron pressure pipe used in the sanitary sewer system shall also require a polyethylene wrapping unless specifically shown otherwise on the plans or called for in the project contract documents.

Pipe Handling

Ductile iron pipe and appurtenances shall be lowered into the trench in such a manner as to preclude damage to the pipe, appurtenance, their linings and the polyethylene wrap. Damage to the lining shall be repaired in accordance with provisions set forth in ANSI/AWWA C104/A21.4. Damage to the polyethylene wrap shall be repaired in accordance with provisions set forth in ANSI/AWWA

C105/A21.5. The pipe is to be kept clean during laying operations and sealed against the entrance of all objects at the close of each operating day.

Where it becomes necessary to deflect the pipe to avoid obstructions, the deflection of each joint shall be made in accordance with the manufacturer's recommendations.

Joint Making

The type of joints will be mechanical joint or push-on joints as set forth in Section C 1.18 of these specifications. The methods of making each type of joint will be in accordance with the requirements of ANSI/AWWA C600.

Ductile Iron Pipe Sewer Lines

Ductile iron used in sewer lines construction shall be of the class and joint type as shown on the plans and set forth in the documents. Embedment shall also be of the class shown on the plans and set forth in the contract documents.

At connections of ductile iron pipe to PVC, clay, concrete or other types of sewer pipe, prefabricated watertight connectors shall be used. If such connectors are not available and pipe to pipe connection are required, any excess space in pipe bells shall be properly caulked and sealed. The entire joint connection shall then be encased with a minimum of six (6") inches of Class "A" concrete reinforced as shown in the "Concrete Encasement" detail of the Standard Details. It shall extend along the pipe a minimum distance of one pipe diameter on each side of the joint.

Ductile Iron Pipe in Tunnel

Ductile iron pipe installed through casing pipe shall be of mechanical or push-on joint. Timber skids, or other types acceptable to the City, shall be furnished and installed as necessary. Each joint shall be made up complete, tightened, and gasket position gauged prior to the pipe being placed into final position in the casing pipe.

Thrust Blocking

Reaction or Thrust Blocking shall be provided at each hydrant, valve, bend, tee, tapping sleeve, and at reducers or fittings where changes in pipe diameter occur. Thrust block shall be centered on the longitudinal axis of the pipe and extended to solid undisturbed ground. The size and shape of the Thrust Blocking shall be as shown on the drawings or as specified in the contract documents.

Measurement

The Measurement of ductile iron pressure pipe for Payment purposes will be the horizontally measured length of the line along its main axis from center of fitting to center of fitting or end of pipe without deduction for the length of intermediate fittings or valves.

Ductile Iron fittings will be measured separately.

Payment

Payment will be made at the unit price bid per linear foot of pipe installed for the various classes and sizes of pipe. Such Payment shall be full compensation for all labor and materials including trenching, Embedment, and backfilling necessary to make the complete installation.

C 2.9 Installation of Vitrified Clay Sewer Pipe

This section of the specifications covers the installation of vitrified clay sewer pipe and is provided as guidance for repair and/or maintenance of existing vitrified clay sewer pipe only.

Embedment

The minimum permissible Embedment for vitrified clay sewer pipe with ten (10') feet or less cover shall be Class "F" as set forth in Section C 2.4. of these specifications.

Where the height of backfill over the top of the pipe exceeds ten (10') feet, Class "B" Embedment as defined in Section C 2.4 shall be the minimum permissible Embedment.

Pipe Handling

At all times material shall be handled with care to avoid damage. Whether moved by hand, skidways, or hoists, material shall not be dropped, bumped, or allowed to impact on itself.

Pipe and fittings shall be handled and stored so that no weight, including the weight of the pipe itself, will bear on or be supported by the pre-molded joint material. The spigot ring shall not be dragged on the ground or allowed to be damaged by contact with gravel, crushed stone, or other hard objects.

Laying and Jointing

A. Laying. The pipe and specials shall be so laid in the trench that after the project is completed to the grade interior surface shall conform accurately to the grade and alignment indicated on the plans. Pipe shall be laid with the bell (or groove) upgrade unless otherwise approved by the engineer.
B. Cleaning. Before laying, the interior of the bell shall be carefully wiped smooth and clean and the annular space shall be kept free from dirt, stones or water. All water must be kept out of bell hole during laying.

C. Jointing. Pipe shall be installed and joints made up in complete conformance with the instructions and recommendations regarding proper installation and assembly furnished by the manufacturer.

Connections to Manholes and Other Structures

Where pipe connects with outside faces of manhole walls or the outside faces of the walls of other structures, a short pipe stub twelve (12") to eighteen (18") inches in length shall be extended from the manhole or other wall face to provide a flexible joint near the wall face. Where connecting to an existing manhole, a temporary watertight plug shall be installed in the line at the downstream end (outlet pipe) of the manhole unless service is disrupted. This may be the case where more than one line ties into the manhole. If a disruption of existing service occurs, the new system (line) should be plugged a minimum of three (3') feet from the connection or removal of the plug shall not be done prior to the acceptance of the new system. The Contractor will be required to remove all water and other materials from the new sanitary sewer system prior to its connection. The ground water, construction water, and/or other materials shall not be discharged into the City's existing sanitary sewer system. The Contractor's failure to abide by this specification may result in their being barred from doing future construction.

Measurement

The Measurement of vitrified clay sewer pipe for Payment purposes will be horizontally measured length of the line from center of the fitting or manhole to center of fitting or manhole without deduction for intermediate fittings or manholes.

Trench depth shall be measured from the surface of the ground to the flow line of the pipe.

Payment

Payment will be made at the unit price bid per linear foot of pipe for the pipe sizes and trench depths as set forth in the contract documents. Such Payment shall be full compensation for all labor and materials –including trenching, and backfilling necessary to make the complete installation.

C 2.10 Installation of Polyvinyl Chloride (PVC) Sewer Pipe

This section of specifications covers the installation of PVC sewer pipe for gravity flow sewers.

Embedment

The minimum Embedment for PVC sewer pipe shall be Class "B" as defined in Section C 2.4 of these specifications.

Storage of Pipe and Fittings

The interior, as well as all sealing surfaces of all pipe, fittings, and other accessories shall be kept free from dirt, and foreign matter. Pipe bundles shall be stored on flat surfaces with uniform support. Pipe and gaskets stored outside shall be protected from sunlight as recommended by the manufacturer.

Clear plastic sheets shall not be used, and air circulation shall be provided under covering. Gaskets shall be kept away from oil, grease, electric motors (which produce ozone), excessive heat and direct rays of the sun.

Pipe Handling

Materials shall at all times be handled properly to prevent damage in accordance with manufacturer's recommendations. Pipe and fittings shall not be thrown, dropped, or dragged.

Curved Alignment

Where curved alignment is required, the recommended allowable minimum curve radii PVC sewer pipe shall be based on the formula:

R = 300 D; where

R = minimum allowable radius of curvature form bending,
D = outside pipe diameter, (where R and D are in the same dimensional units.)

Jointing

A. Cutting and Beveling Pipe: For shorter than standard pipe lengths, field cuts may be made with either hand or mechanical saws or plastic pipe cutters. Ends shall be cut square and perpendicular to the pipe axis. Spigots shall have burrs removed and ends smoothly beveled by a mechanical beveler or by hand with a rasp or file. Field spigots shall be stop-marked with felt tip marker or wax crayon for the proper length of assembly insertion. The angle and depth of field bevels and lengths to stop-marks shall be comparable to factory pipe spigots.

B. Bell Holes for Elastomeric Seal Joints. The bell hole shall be no larger than necessary to accomplish proper joint assembly. When joint has been made, the void under the bell shall be filled with bedding or haunching material to provide adequate support to the pipe throughout its entire length.

C. Assembly of Joints. All joints shall be assembled in accordance with the recommendations of the manufacturer. Proper Jointing may be verified by rotation of the spigot by hand or with a strap wrench. If unusual Jointing resistance is encountered or if the insertion mark does not reach the flush position, disassemble the joint, inspect for damage, reclean the joint components and repeat the assembly steps.

Branch Connections

Fittings for service branches in new construction shall be molded or fabricated with all gasketed connections. Taps into existing lines shall use a gasketed fitting in conjunction with a repair sleeve coupling or a gasketed saddle wye or tee with all stainless steel clamps. Saddles may be mounted

on pipe with solvent cement or gasket but shall be secured by metal banding. Saddles shall be installed in accordance with manufacturer's recommendations. Holes for saddle connections shall be made by mechanical hole cutters or by keyhole saw or sabre saw. Holes for wye saddles shall be laid out with a template and shall be deburred and carefully beveled where required to provide a smooth hole shaped to conform to the fitting.

The Contractor will be permitted to use fittings which are prefabricated using pipe sections, molded saddles and PVC solvent cement, provided the solvent cement used in fabrication has cured at least 24 hours prior to installation. Cemented mitered connections without socket reinforcement shall not be permitted. Only PVC primer and solvent cement shall be used in cementing in accordance with the cement manufacturer's recommendations and ASTM D2855. "Making Solvent-Cemented Joints with PVC Pipe and Fittings."

Manhole Connections

All manhole connections shall be made using proper water stops. If Portland cement grout is incorporated in the manhole connection, the grout shall be of a type that expands, rather than shrinks, upon curing. Where connecting to an existing manhole, a temporary watertight plug shall be installed in the line at the downstream end (outlet pipe) of the manhole unless service is disrupted. This may be the case where more than one line ties into the manhole. If disruption of existing service occurs, the new system (line) should be plugged a minimum of three (3') feet from the connection to the existing system (line or manhole). The final connection or removal of the plug shall not be done prior to the acceptance of the new system. The Contractor will be required to remove all water and other materials from the new sanitary sewer system prior to its connection. The ground water, construction water, and/or other materials shall not be discharged into the City's existing system. The Contractor's failure to abide by this specification may result in their being barred from doing future construction.

PVC Pipe in Casing

Runners or cradles shall be used to support all pipe in casings. One end of the casing spacer or skid shall be secured at the insertion mark on the spigot end of the pipe to avoid over assembly during the installation of the pipe in the casing. Wooden skids shall not be made of creosote treated wood. The maximum span between the supports for pipe lengths of twenty (20') feet shall not exceed that shown in the following table:

MAXIMUM RECOMMENDED SUPPORT SPACING FOR 20-FOOT LENGTHS OF PVC SEWER PIPE AT MAXIMUM TEMPERATURE OF 73.4 DEGREES F (23 DEGREES C)

Nominal Pipe Size (Inches)	Unsupported Span (Feet)
4	6.25
6	6.75
8	7.5
10	8
12	8.25

Measurement

The Measurement of PVC pipe for Payment purposes will be the horizontally measured length of the line from center of fitting or manhole to the center of fitting or manhole without deduction for intermediate fittings or manholes.

Trench depth shall be measured from the surface of the ground to the flow line of the pipe.

Payment

Payment will be made at the unit price bid per linear foot of pipe for the pipe sizes and trench depths as set forth in the contract documents. Such Payment shall be full compensation for all labor and materials - including trenching, Embedment, and backfilling - necessary to make the complete installation.

C 2.11 Installation of Reinforced Concrete Pipe

This section of the specifications covers the installation of reinforced concrete pipe with rubber gaskets for use in the sanitary sewer system.

Embedment

Where the depth of cut - measured from the pipe flow line to the surface of the ground - does not exceed ten (10') feet, the minimum permissible Embedment for Class III pipe, as defined in ASTM C 76, shall be Class "E" as defined in Section C 2.4 in these specifications.

For all other pipe classifications and trench depths, the Embedment shall be as shown on the plans.

Pipe Handling

Care shall be taken to prevent any collision of one pipe section with another which will result in chipping or spalling, particularly to joint surfaces.

Pipe Laying and Jointing

A. Inspection. Allowable manufacturing irregularities of the pipe shall be fitted and adjusted so that the lower one-half of the inside surfaces of adjacent sections of pipe will provide the best possible flow conditions. Prior to Jointing, an inspection shall be made to be certain that the pipe ends and gaskets are thoroughly clean with no foreign matter adhering to them.

B. Jointing. The bell groove slopes of the preceding pipe shall be coated with a lubricated material, such as flax soap or other lubricant approved by the manufacturer for this purpose. Petroleum lubricants will not be permitted. The pipe shall then be assembled by pulling the tongue or spigot of the joint being laid into the groove or bell of the preceding pipe with sufficient force necessary to make a tight seal on the gasket. All joints shall be checked with a feeler gauge. If any irregularity in the position of the gasket is detected at any point on the entire circumference of the pipe, the pipe shall be removed and the gasket examined for cuts. If the gasket is undamaged, it may be used again, but both it and the joint must be relubricated. Before the pipe sling is removed, the rubber gasket of the joint shall be checked for proper position as outlined above. Jointing shall be done in a manner to prevent damage to the pipe and joints.

C. Laying. The pipe and specials shall be so laid in the trench that after the project is completed the interior surface shall conform accurately to the grade and alignment indicated on the plans. Pipe shall be laid with the bell (or groove) end upgrade unless otherwise approved by the engineer.

Measurement

The Measurement of reinforced concrete sewer pipe for Payment purposes will be the horizontally measured length of the line from center of fitting or manhole to center of fitting or manhole without deduction of intermediate fittings or manholes. Trench depth shall be measured from the surface of the ground to the flow line of the pipe.

Payment

Payment will be made at the unit price bid per linear foot of pipe for the pipe sizes and trench depths as set forth in the contract documents. Such Payment shall be full compensation for all labor and materials - including trenching, Embedment, and backfilling -necessary to make the complete installation.

C 2.12 Installation of Ductile Iron Fittings

This section of the specifications covers the installation of ductile iron fittings.

Types of Fittings

Ductile iron fittings shall consist of crosses, tees, bends, offsets, plugs, caps, sleeves, connecting pieces, etc. for use with PVC and ductile iron piping systems.

Jointing

A. Mechanical Joint. Shall comply with procedure set forth in Section C 1.18 of these specifications

B. Push-On Joint. Shall comply with procedure set forth in Section C 1.18 of these specifications.

C. Flanged Joints. Flanged connections shall be made by means of erection bolts and drift pins without undue forcing and with no restraint on the ends of the pipe or fittings which would prevent pressure from being evenly and uniformly applied to the gasket. The gaskets shall be full face, manufactured true to shape from approved black neoprene rubber stock of a thickness not less than one-sixteenth (1/16") inch. The gasket shall be of virgin stock and shall conform to the physical and test requirements specified in ANSI WA C111. Finished gaskets shall have holes punched by manufacturer and shall match the flange pattern in every respect. Frayed cut edges resulting from job site gasket fabrication shall not be acceptable except under emergency conditions, and then only when specifically approved. The pipe or fitting must be free to move in any direction while bolting. Flanged bolts shall be installed with all bolt heads faced in one direction except specified otherwise.

Polyethylene Wrapping

All ductile iron fittings shall be fully wrapped (double wrapped) with polyethylene wrapping as set forth in Section C 1.20 of these specifications.

Measurement

Ductile iron fittings will be measured for Payment by weight in tons. Pay weights will be based on the weights set forth in ANSI A21.53 (AWWA C153). Pay weights for mechanical joint fittings will not include joint accessories such as follower rings, bolts, or gaskets.

Payment

Payments will be made at the unit price bid per unit weight of ductile iron fittings. Such Payment shall be full compensation for all labor and materials necessary to make the complete installation.

C 2.13 Fire Hydrant Installation

This section of the specifications covers the installation of fire hydrants.

Fire Hydrant Leads

All fire hydrant leads shall be at least six (6") inches in diameter. Where fire hydrant leads are stubbed from mains eight (8") inches and larger in diameter, a gate valve shall be installed in the hydrant lead between the fire hydrant and the main. Where fire hydrants are located along the major

thoroughfares or streets with large volumes of traffic, a gate valve will be installed in the hydrant lead regardless of the size of the supply main if so directed by the City. On fire hydrant leads requiring gate valves the gate valve shall be restrained to the main.

Fire Hydrant Location

Where possible, fire hydrants shall be located so that the face of the fire hydrant is three (3) to five (5') feet behind the back of the curb with the steamer nozzle facing the street. Fire hydrants will be located outside of curb returns at intersections and outside of all sidewalks.

The City may vary this location somewhat if street paving procedures require it.

Depth of Bury

The normal depth of bury shall be four (4') feet unless otherwise shown. In no case shall the depth of bury exceed six (6') feet. Where main depths are greater than six (6') feet, offsets, bends, and fittings as required shall be used to reduce the depth of bury to no more than six (6') feet. Fire hydrants installed between four (4') feet and six (6') feet deep shall be installed with Gradeloc or ductile iron fittings.

Installation

The hydrant shall be set vertical and to a depth such that the center of the steamer nozzle is not less than sixteen (16") inches nor more than twenty (20") inches above curb grade.

Each fire hydrant shall be set on a concrete slab as shown in standard detail W-2.

Around the base of the hydrant there shall be placed not less than seven (7) cubic feet of washed gravel to provide reservoir capacity so that the hydrant will completely drain when closed.

The hydrant shall be carefully and firmly blocked against firm trench walls with Class "A" concrete. Provisions must be made to protect the hydrant drain from blockage.

Measurement

Fire hydrants will be measured for Payment per each, complete in place. Offsets, bends, or fittings for the adjustment of depth of fire hydrant bury shall be considered subsidiary to the price bid for the fire hydrant.

Payment

Payment for fire hydrants will be made at the unit price bid for each, which unit price will include all necessary extensions. Such Payment shall be full compensation for all labor and materials necessary to make the complete installation.

C 2.14 Gate Valve and Tapping Sleeve and Valve Installation

This section of the specifications covers the installation of gate valves and tapping sleeves and valves.

Handling Gate Valves

Valves shall be carefully handled and lowered into position in such a manner as to prevent damage to any part of a valve. The valve shall be placed in the proper position and held securely until all connections have been made.

Installing Gate Valves

Where valves are to be placed in concrete vaults or structures, the floor or bottom shall be completed before installing the valve. The valve shall be securely blocked so that its weight is carried by the floor rather than being supported by the connected piping.

Valves not housed in concrete structures shall be supported on the bottom and sides by Class "A" concrete. An adjustable cast iron valve box and cover shall be provided for each buried valve including by-pass valves. All valve boxes shall be two (2) piece screw type with the stem or extension (if required to bring operating nut to within four (4') feet of natural ground or finished grade) in a truly vertical position with the box centered over the operating nut.

The use of pieces of asbestos-cement, PVC, or cast or ductile iron pipe as valve boxes shall not be permitted. However, ductile iron pipe shall be used on valves deeper than six (6') feet, but in all cases the top portion shall be an adjustable screw type valve box. Ductile iron pipe shall not be in pieces, but shall be one solid piece.

When the valve box is in position and the top of the box adjusted to the proper elevation, select backfill material shall be placed around the valve box and thoroughly tamped. After compaction the contractor shall verify that the valve has remained in a vertical position for ease of valve operation.

Installing Tapping Sleeves and Valves

Mechanical joint and two (2) piece tapping sleeves shall be used. The use of caulked type tapping sleeves will not be permitted.

Prior to placement of the tapping sleeve, the surface of the pipe to be tapped shall be thoroughly cleaned.

Tapping sleeves shall be oriented so that the valve setting shall be truly vertical.

The procedure for installing tapping valves shall be identical to that described above for gate valves. Concrete blocking shall be placed in accordance with standard detail W-5. The tapping sleeve shall have thrust blocking placed as for a tee or plug.

Measurement

If gate valves and tapping sleeves and valves are not included as subsidiary components of a structure or connection they shall be measured by the units of various size complete in place including concrete pads, required valve stem extensions, and valve boxes and covers.

Payment

Payment for the various sizes of gate valves and tapping sleeves and valves will be made at the unit prices bid which shall be full compensation for all labor and materials necessary to make the complete installation.

C 2.15 Combination Air Valves

This section of the specifications covers the installation of combination air valves in the water supply and water distribution system.

Valve Sizes

Minimum size valves and fittings shall be in accordance with the following table or as indicated on the plans:

Main Size	Valve Size
16" through 36"	2"
39" and larger	3"

Equivalent sized taps shall be provided for the above sized valves.

Access Manhole and Exhaust Piping

All air and combination air valves shall be installed in manholes having a minimum inside diameter of 48 inches. Outside paved areas, Class III Reinforced Concrete Pipe (ASTM C 76) may be used for the access manhole with a 3/8-inch thick steel cover with a two-inch (2") rim sized to fit over the pipe.

Outside paved areas, the exhaust piping may penetrate the steel cover of the access manhole. Inside paved areas, the exhaust piping shall be sloped upward to a point outside the paved area.

Measurement

Air valves and combination air valves will be measured per each, by size, complete in place including required main taps or outlets, valves, fittings, piping, access manholes and covers, etc., complete in place.

Payment

Payment for the various sizes of combination air valves shall be made at the unit prices bid which shall be full compensation for all labor and materials necessary to make the complete installation.

C 2.16 Installation of Miscellaneous Valves

This section of the specifications covers the installation of miscellaneous valves, flap valves and check valves, in the water and sanitary sewer systems.

Handling

Valves shall be carefully handled and lowered into position in such a manner as to prevent damage to any part of the valve. The valve shall be placed in the proper position and held securely until all connections have been made. Valves shall be wrapped with polyethylene wrap as described in Section C 2.17.

Installation of Flap and Check Valves

Where check valves are to be placed in concrete vaults or structures, the floor or bottom shall be completed and inspected before installing the valve. The valve shall be securely blocked so that its weight is carried by the floor rather than being supported by the connected piping.

When installing flap valves on the end of a pipe run, the valve shall be installed in a truly vertical position.

Measurement

Where miscellaneous valves are not included as subsidiary components of a structure or connection, they shall be measured by the units of various size complete in place.

Payment

Payment for the various sizes of miscellaneous valves will be made at the unit prices bid which shall be full compensation for all labor and materials necessary to make the complete installation.

C 2.17 Installation of Polyethylene Wrap

This section of the specifications covers the installation of polyethylene wrap on ductile iron pipe and all fittings and valves in accordance with ANSI A21.5/AWWA C105, latest revision.

In order to form a dielectric barrier against electrolytic soil action polyethylene wrap shall be used on all ductile iron pipe fittings and appurtenances.

Installation on Pipe

To install polyethylene wrap on ductile iron pipe, the following procedure shall be followed:

A. Place Wrapping on Pipe: By the use of a sling or pipe tongs, the pipe shall be raised a suitable working distance off the ground. A polyethylene tube approximately two feet longer than the pipe joint shall be slipped over the spigot end of the pipe, centered, and the excess length gathered near the hoisting sling. The wrapping shall be taped so that smooth unwrinkled wrapping extends one foot past the spigot end. The polyethylene tape furnished shall be in conformance with Section C 1.20.

B. Lower Pipe into Place. The pipe shall be lowered into the trench and the joint made with the preceding pipe section. A shallow bell hole must be made at joints to facilitate installation of the polyethylene tube.

C. Complete the Wrapping Installation. After the pipe joint has been made, the bunched polyethylene from the preceding length of pipe shall be pulled over the new pipe length and taped or otherwise secured. The end of the polyethylene on the new pipe section shall be slipped over the first wrap until it overlaps the joint for one (1') foot the end of the preceding length of pipe. The overlap shall be secured in place.

D. The slack width shall be taken up to make a snug, but not tight, fit along the pipe barrel and secured at the quarter points.

E. Repairs. Any rips, punctures, or other damage to the polyethylene shall be repaired with polyethylene tape or with a short length of polyethylene tube cut open, wrapped around the pipe, and secured in place.

F. Successive Pipe Runs. Repeat steps a. through d.

Installation on Fittings and Specials

Fittings, such as bends and reducers, shall be wrapped in a manner similar to that described in paragraph C 1.20. However, all bolts on mechanical joint and/or flanged fittings shall receive an extra (separate) wrapping of polyethylene in addition to that described herein. This wrapping shall be beneath the overall wrapping and shall be taped in place using the approved materials. Polyethylene wrapping shall have no bulges, large air gaps or pockets which can accommodate ground water left when the wrapping is completed.

Appurtenances such as valves, hydrants, crosses, etc., shall be wrapped by splitting, tucking and overlapping the polyethylene tube, then closing the field made splices with the required tape. All seams shall be folded twice prior to taping in accordance with AWWA C 105.

Material to cover valves may be acquired from the overlapping excess polyethylene tube on the adjacent pipe lengths. The tubing should be drawn over the bell of pipe on either side and insulated with field made seams as described above.

Hydrants shall be encased with the polyethylene tubing slipped over the hydrant and extended to a point two (2) to three (3") inches above the ground line. The wrap shall be perforated in the drain region to allow normal drain function of the hydrant.

All fittings and specials that require concrete blocking shall be completely wrapped prior to pouring the concrete blocking.

Measurement and Payment:

The furnishing and installing of polyethylene wrapping will not be measured and paid for directly but will be considered subsidiary to the unit prices bid for installing pipe, valves, or fittings, complete in place.

C 2.18 Water Service Line Installation

This section of the specifications governs the construction of water services used to connect the customer's water meter to the City main.

"Service" shall be defined as a service line to an individual customer consisting of a corporation stop, Type "K" copper tubing, quarter bend coupling, curb stop, meter coupling, threaded galvanized pipe nipple, and a second meter coupling. A meter box, furnished by the Contractor, shall be placed over the curb stop and connected threaded galvanized nipple spacer. Thread protector caps shall be placed on any exposed pipe threads.

"Bullhead" service shall not be allowed and is defined as an individual service line with branches at the end to serve two customers consisting of a corporation stop, Type "K" copper tubing, quarter bend coupling, U-branch connection and curb stops. Each leg of the U-branch connection shall have a curb stop, meter coupling and threaded galvanized nipple spacer and be enclosed in a City furnished meter box. All exposed pipe threads shall be protected with a thread protector.

Taps

All taps in ductile iron water mains shall be installed through a bronze double strap tapping saddle.

Taps in concrete cylinder water mains shall be made where possible at locations where factory fabricated threaded couplings exist. A bronze or brass bushing shall separate the corporation stop from the steel coupling. At locations other than where factory fabricated threaded couplings exist, taps shall be made through a double strap tapping saddle. Taps in PVC water lines shall be made using double strap tapping saddles.

Taps shall not be made at an angle of more than 45 degrees above the spring line of the pipe. All taps on PVC water mains shall be in accordance with Unibell standards.

Location and Depth of Cover

All water services shall be located so that the edge of the meter box nearest the street is located three (3') feet behind the back of the curb unless otherwise approved by the City. At the point where the water services cross beneath the curb, the minimum depth of cover from the bottom of pavement shall be three (3') feet. The end of the water service shall be located six (6") inches to ten (10") inches below the top of the meter box when the meter box is placed flush with the finish grade of the parkway. Where meter banks are installed (three or more meters), permanent metal tags with addresses shall be installed on the service line at the curb stop to correlate the service with the address to be served. Where existing services are to be connected to for tie-ins or relocations, a compression coupling shall be used to make the connection. Only full length joints of pipe shall be used for connecting to an existing service or for a new service being installed within the pavement area of a street for services larger than one-inch (1") in diameter. No couplings shall be installed within the pavement area of the street for services one-inch (1") in diameter and smaller.

Meter Box Installation

After the curb and gutter and base courses of asphalt have been installed and the street contractor has restored to good condition the parkway area behind the curb, the contractor shall install a Contractor furnished meter box over the end of each water service.

Testing

Each water service line shall be checked for leaks and full flow at the time the water mains are pressure tested.

Measurement

Water services will be measured for Payment per each, classified according to size, location, and length--if different categories of length are set forth in the Proposal or other contract documents.

Payment

Water services will be paid for at the unit price for each complete in place, including all labor and materials necessary to make the complete installation, including tapping the main with or without tapping saddle as required.

C 2.19 Vault and Manhole Construction

This section of the specifications covers the construction of vaults for water valves, control devices, large meters, etc., and sanitary sewer manholes.

Water Line Vaults

Vaults may be of Class "A" reinforced concrete, precast reinforced concrete or as specifically shown on the project plans. If not shown on the project plans or appurtenant drawings, the following requirements shall govern:

A. Cast-in-place vault walls shall be formed on both sides to the specified thickness. Unless shown otherwise on the project plans or in the contract documents, walls shall not be less than six (6") inches in thickness.

B. The top slab, floor and inside walls of vaults shall be completely sealed with two coats of Thoroseal (off-white) as manufactured by Thoro System or as approved by the City. Any visible leakage, no matter how small, shall be sealed and stopped.

Manholes

Standard sanitary sewer manholes shall be constructed as monolithic concrete structures or as precast reinforced concrete structures. Fiberglass may be used only when specifically approved by the Engineer.

A. Foundations. Foundations of manholes for sanitary sewer shall be of Class "A" concrete. The bottom of the foundation shall be at least eight (8") inches below the bottom of the pipe and shall extend at least six (6") inches past the outside of the manhole. The trough shall be smooth, accurately shaped, and in accordance with the plans. Where changing line sizes, the crowns (top insides) of the pipe shall be matched unless otherwise approved by the Public Works Department. The invert of the manholes shall be shaped and smooth so that no projections will exist and flow channels will be formed in the inverts so that the manhole will be self-cleaning and have smooth flow transitions. They shall be free of areas where solids may be deposited as sewage flows through the manhole from all inlet pipes to all outlet pipes. Where the pipe can be laid continuously through the manhole, the pipe can be placed in the base. Pipe boots such as Kor-n-Seal connection, or approved equal, shall be installed around the pipes where they pass through the manhole wall. After the construction of the manhole, the pipe can be trimmed by cutting out the top half of the pipe after the concrete base is constructed and has cured sufficiently. If it is not possible to lay the pipe continuously through the manhole base, the base may be poured and formed directly in the concrete of the manhole base. The invert bench shall have a minimum slope of 1/4-inch per foot to the pipe trough. The manhole invert shall extend from wall to wall. At changes of direction or changes of grade the minimum drop across the manhole invert shall be 0.1 foot or as shown on the plans.

   Pipe extending from the manhole shall be cradled in concrete to the first pipe joint in the same pour as the manhole foundation.

Rock cushion shall be used beneath manhole bottoms where water is encountered. In the event that ground water is present during the pouring of a cast-in-place manhole foundation, a pump shall be used to remove the ground water. Prior to pouring, the subgrade shall be stable, free from muck, etc. After the concrete foundation has been poured, the pump shall continue to run for at least one (1) hour to enable the concrete to obtain its initial set.

B. Precast Reinforced Concrete Manholes. The standard sanitary sewer manholes of the precast reinforced concrete type shall be constructed of ASTM C 76 Class III reinforced concrete pipe and shall be of the bell and spigot design incorporating trapped ring gaskets.

In precast manhole construction, combinations of joint lengths shall be selected to minimize the number of individual segments required to provide the total depth specified. Long joints shall be used in the bottom with shorter segments utilized for the top adjustments. The inside diameter of the manhole shall be 48 inch or 60 inch.

Pipe boots such as Kor-n-Seal flexible pipe to manhole connection or approved equal shall be installed at all connections to manhole bases of the diameter pipe being installed. The material is to be EPDM Rubber.

Where precast manhole bottoms are utilized, the excavation shall be undercut by a minimum of six (6") inches and shall be backfilled to grade with one-inch (1") diameter washed rock.

C. Cast-In-Place (Monolithic) Concrete Manholes. Cast-in-place concrete manholes shall have an inside diameter at the base of four (4') feet or six (6') feet and an inside diameter at the top of the barrel of not less than 30 inches. The manhole shall have a minimum wall thickness of five inches (5") and shall be smooth having no form marks on the interior wall or exterior wall of the manhole exceeding one-quarter inch (1/4") in depth. Concrete used for the manhole barrel shall be Class "A" with a slump of five (5") inches to seven (7") inches during the pour. During the pour of the concrete in the manhole barrel forms, thorough rodding or vibrating shall be completed after approximately each two (2') feet of pour into the form. If cold joints are necessary due to a time lapse of more than one (1) hour between pours or the adjustment of the manhole, a concrete bonding adhesive shall be applied to the existing concrete. A concrete collar at least four (4") inches thick shall extend a minimum of eight (8") inches above and below the new joint around the outside of the manhole. If honeycombing of the barrel of the manhole is found to be present after removal of the forms, such honeycombing shall be repaired as directed by the Engineer. Any form marks shall be smoothed and grouted as directed. Covers may be used at the option of the Contractor to protect the concrete to prevent cracking during the curing process and to protect the manhole during freezing temperatures. The manhole shall not be backfilled for at least twelve (12) hours after forms have been removed. Cast in place manholes shall be coated prior to backfill with two mop coats of Ertech 2100 Non-Fibered Asphaltic Emulsion or a coating approved by the Engineer.

Water stops, a flexible pipe to manhole connector, or approved equal, will be installed around the pipe at all pipe-manhole wall penetrations. The material shall conform to ASTM C923.

D. Grout. The grout to be used in all types of manholes for both the precast and cast-in-place manholes for inverts, the grouting of the ring and lid, and cold joints shall consist of one part cement to two parts masonry sand.

Testing of Manholes

All manholes shall be vacuum tested. Manholes shall be tested in the presence of the City's Representative. The vacuum test shall consist of applying a vacuum to the manhole.

Each manhole shall be tested after the installation has been completed. All pipes entering the manhole shall be plugged, taking care to securely brace the plug from being drawn into the manhole. The test head shall be placed at the inside of the manhole cover frame, the seal inflated and the manhole shall be tested in accordance with the following. A vacuum of ten (10") inches of mercury shall be drawn and the vacuum pump shut off. With the valves closed, the time shall be measured for the vacuum to drop to nine (9") inches of mercury. The manhole shall pass if the time is greater than 60 seconds for 48-inch diameter and 75 seconds for 60-inch diameter manholes. For manholes deeper than twenty (20') feet, the test times shall decrease by one (1) second per foot of additional manhole depth.

Measurement

If vaults are not included as subsidiary components of a larger structure, they shall be measured by the units of various sizes and types complete in place.

Measurement for manhole structures shall be on a per each basis for a basic depth of six (6') feet. Extra depth in excess of the basic depth of six (6') feet shall be measured in one-tenth foot (0.1') increments.

Payment

Payments for the various sizes and types of vaults will be made at the unit prices bid for each which shall be full compensation for all labor and materials necessary to make the complete installation.

Payment for manhole structures will be made at the unit prices bid per each. Extra depth for manholes in excess of the basic six (6') foot depth will also be made at the unit prices bid per linear foot. Payment for manholes and accompanying extra depth will be full compensation for all labor and materials necessary to make the complete installation.

C 2.20 Installation of Sanitary Sewer Cleanouts

This section covers the installation of sanitary sewer cleanouts used on the end of some sanitary sewer mains.

Cleanouts shall be installed on sanitary sewer mains where shown on the project plans. Cleanout installations shall consist of a 22-1/2 degree bend (1/16 bend) encased in Class "B" concrete, the appropriate length of six (6") inch diameter pipe for the cleanout stack, and the cleanout casting with cover installed on a 10" x 2' -0" x 2' -10" concrete slab and encased in Class "B" concrete. All cleanouts shall be a minimum of six (6") inches in diameter.

All castings with covers used for cleanouts on sanitary sewer mains shall be heavy duty cast iron.

Measurement

Cleanouts installed on sanitary sewer mains shall be measured per each, regardless of depth.

Payment

Payment for cleanouts installed on sanitary sewer mains will be made at the unit price bid per each which shall be full compensation for all labor and materials to make the complete installation.

C 2.21 Installation of Sanitary Sewer Services

This section of the specifications covers the construction of sanitary sewer services used to connect the customer's sanitary sewer system at the property line or utility easement to the City's main.

A sanitary sewer service shall be defined as a service line connecting the customer's sewer system at the property line or utility easement to the City's main and shall consist of the service combination tee wye, the necessary Class "B" concrete cradle or crushed stone for the tee wye, the service pipe necessary to extend the line from the main to the customer's property line and a plug placed in the end of the service line.

Services for single family residences shall normally be four inches (4") in diameter.

Extra Depth Sanitary Sewer Services

Where the sanitary sewer main is at a depth much greater than that necessary to serve the abutting property, an extra depth or deep sanitary sewer service connection shall be installed. The extra depth service is identical to a standard or "normal" sanitary sewer service except that pipe risers will be installed at a maximum 45 degree angle into the trench walls to connect the combination tee wye and 45 degree bend to the service pipe.

Slope and Depth of Cover

Where possible, a minimum slope of two (2%) percent slope down toward the main will be maintained on all sewer services.

Where the sanitary sewer main is located in the street and the abutting property slopes to the street, the sanitary sewer service shall normally have a minimum depth of four (4') feet below the top of the curb at the point where it passes beneath the curb.

Where abutting property slopes away from the sanitary sewer main, sewer services shall be placed at a depth adequate to serve the normally expected use of the abutting property.

Where water and sanitary sewer services cross, they shall be treated in accordance with the TCEQ regulations.

Marking

The end of each sewer service shall be marked with heavy gauge polyethylene tape, six (6") inches in width with a thickness of 0.004 inches. The film should be yellow in color on which has been printed, "Caution Buried Sewer Line Below", in a continuous print. The heavy gauge polyethylene tape shall be that as manufactured by Allen System Marking Tape or approved equal. The tape shall have a minimum tensile strength of 1,700 psi lengthwise and 1,200 psi crosswise.

The tape shall be securely tied to the end of the sewer service and placed in such a manner that when the trench is backfilled, approximately six (6) to twelve (12") inches of tape will be visible above the ground. The tape above ground shall be firmly attached to a two-inch (2") by four-inch (4") stake four (4') feet long.

Measurement

Sanitary sewer services or extra depth sanitary sewer services will be measured for Payment per each, classed according to size and length if different categories of length are set forth in the Proposal or other contract documents.

Payment

Sanitary sewer service or extra depth sanitary sewer service will be paid for at the unit price for each, complete in place, including all labor and materials necessary to make the complete installation.

C 2.22 Elevated Crossings

This section of the specifications covers the installation of elevated crossings of water or sanitary sewer lines over creeks and waterways.

Foundations

Foundations for elevated crossings will be drilled shafts of a diameter sufficient to carry the dead and superimposed loads. Where rock is present, drilled shafts shall penetrate into sound rock at least 2 feet.

Where no rock is present, the minimum depth of drilled shafts shall be at least ten feet (10') below the bottom of the stream bed.

The use of spread footings as a foundation for elevated crossings is to be avoided.

All drilled shafts will be constructed of Class "A" concrete in accordance with the plans.

Carrier Pipe

Where the pipe acts as a structural beam and is not supported by a truss, I beam, etc., the pipe shall be either ductile iron or concrete cylinder pipe specifically manufactured and fabricated for the individual project. There shall be at least one foundation support for each joint of pipe. At each support, the carrier pipe shall be secured to the support with galvanized steel straps.

Anchorages

Elevated crossings shall be anchored at each end where the pipe structure enters the ground. Anchorages shall be constructed of Class "B" concrete and of such a size and configuration as shown in the plans and specifications.

Crossing Appurtenances

For sanitary sewer main crossings a manhole shall be placed at each end of the crossing behind the anchorages. For water line crossings twelve (12") inches and smaller, a valve shall be placed at each end of the crossing behind the anchorages.

Measurement

Elevated crossings will be measured for Payment as specified in the respective items in the proposal at the unit price bid.

Payment

The contract price shall be full compensation for all labor and materials necessary to make the complete installation.

C 2.23 Construction of Bored, Jacked or Tunneled Crossings

This section of the specifications governs the installation of encasement or carrier pipe for water and sanitary sewer mains by the methods of jacking, boring or tunneling.

Where encasement or carrier pipe is required to be installed under railroad embankments or highways, streets, or other facilities by jacking, boring or tunneling methods, construction shall be made in a manner that will not interfere with the operation of the railroad, highway, or other facility, and will

not weaken or damage any embankment or structure. During construction operations, barricades and lights to safeguard traffic and pedestrians shall be furnished and maintained, as approved by the City, until such time as the backfill has been completed and then shall be removed from the site. The Contractor shall notify the Railroad Company or Texas Department of Transportation at least 48 hours prior to construction. The Contractor shall provide insurance with limits as required by the governing authority.

The drilling of pilot holes for the alignment of pipe prior to its installation by jacking, boring or tunneling will not be a requirement but may be necessary to maintain grade. The drilling of pilot holes will be considered as incidental work and the cost thereof shall be included in such contract pay items as are provided in the proposal and contract.

The Contractor shall take the proper precautions to avoid excavating beyond the limits of excavation needed to install the pipe. All damages shall be repaired or replaced at the Contractor's expense. The removal of any obstruction that conflicts with the placing of the pipe will not be measured for Payment or paid for as a separate contract pay item.

The removal of any such obstruction will be included in such contract pay items as are provided in the proposal and contract.

The Contractor shall dispose of all surplus materials at the Contractor's expense.

Jacking, boring, or tunneling may be used in lieu of open cut at the Contractor's discretion. No additional compensation will be provided.

All excavations shall be safely secured at all times to prevent unauthorized access to the excavation site.

Construction by Jacking

If the grade of the pipe at the jacking end is below ground surface, suitable pits or trenches shall be excavated for the purpose of conducting the jacking operations and for placing end joints of the pipe. This excavation shall not be carried to a greater depth than is required for placing of the guide and jacking timbers and no nearer the roadbed than the minimum distance shown on the plans.

At the other end of the pipe, an approach trench shall be excavated accurately to grade. All open trenches and pits shall be braced and shored in such a manner to adequately prevent caving or sliding of the walls into the trench or pit and be in accordance with OSHA standards for trench safety.

Heavy duty jacks suitable for forcing the pipe through the embankment shall be provided. In operating jacks, even pressure shall be applied to all jacks used. A suitable jacking head not less than 6 inches larger than the outside diameter of the pipe, usually of timber, and suitable bracing between jacks and jacking head shall be provided so that pressure uniformly will be applied to the pipe uniformly around

the ring of the pipe. The jacking head shall be of such weight and dimensions that it will not bend or deflect when full pressure is applied at the jack. The jacking head shall be provided with an opening for the removal of excavated materials as the jacking proceeds. A suitable jacking frame or backstop shall be provided. The pipe to be jacked shall be set on guides which are straight and securely braced together in such a manner to support the section of the pipe and to direct it in the proper line and grade. All timber and other materials used in the construction of the jacking assembly will be of such quality and dimensions that they will withstand all stresses to which they are subjected in such a manner as to insure even pressures on the pipe during jacking operations. The whole jacking assembly shall be placed so as to line up with the direction and grade of the pipe.

As the jacking proceeds, the embankment materials shall be excavated slightly in advance of the pipe in such a manner to avoid making the excavation larger than the outside diameter of the pipe, with the excavated material being removed through the pipe. The excavation for the underside of the pipe, for at least one-third of the circumference of the pipe, shall conform to the grade of the pipe. The excavation for the top half of the pipe shall conform closely to the outside diameter of the pipe and a clearance greater than two (2") inches will not be permitted. All voids between the pipe and the earth will be filled with grout proportioned one (1) part Portland cement to five (5) parts washed sand and an air entrainment agent to facilitate grout flow if necessary. Grout holes may be provided in the pipe or grouting may be made through drill holes from the ground surface if practical. The grouting shall follow immediately upon completion of the jacking operation.

All carrier pipe installed by jacking shall be supported by quarter point cradle of Class "B" concrete across the jacking pit and to the first joint in the ditch section on each end.

The distance that the excavation shall extend beyond the end of the pipe depends on the character of the material, but it shall not exceed two (2') feet in any case. Preferably, the pipe shall be jacked from the low or downstream end. Lateral or vertical variation in the final position of the pipe from the line and grade established by the plans will be permitted only to the extent of one (1") inch per ten (10') feet, provided that such variation shall be regular and only in one direction and that the final grade the flow line shall be in the direction indicated on the plans.

When jacking of pipe is once begun, the operation shall be carried on without interruption, insofar as practicable to prevent the pipe from becoming firmly set in the embankment.

Any pipe damaged in jacking operations shall be repaired or removed and replaced at the Contractor's expense.

The pits or trenches excavated to facilitate jacking operations shall be filled immediately after the jacking of the pipe has been completed unless an encasement pipe only has been installed; in which case, the trenches and pits shall be left open until the carrier pipe has been laid through and manholes have been built if required. The pipe or trenches will then be backfilled.

Construction by Boring

The hole shall be bored mechanically with a suitable boring assembly designed to produce a smooth, straight shaft and so operated that the completed shaft will be at the established line and grade. The size of the bored hole shall be of such diameter to provide ample clearance for bells or other joints. All carrier pipe installed by boring shall be supported by quarter point cradle of Class "D" concrete across the boring pit and to the first joint in the ditch section on each end. All bore pits and other excavations shall be completed in accordance with OSHA standards.

All voids will be grouted with a 1:5 minimum mix of Portland cement and clean washed sand with sufficient air entertainment to facilitate flow. Grout will be considered a part of the unit price of the boring operation.

Construction by Tunneling

The tunnel shall be excavated in such a manner and to such dimensions which will permit placing of the proper supports necessary to protect the excavation in accordance with OSHA standards. The Contractor shall take proper precautions to avoid excavating earth or rock or shattering rock beyond the limits of excavation shown on the plans. All damages by excavating and blasting, either to surface or subsurface structures, shall be repaired or replaced at the Contractor's cost and expense.

Adequate provisions shall be made for safety and health of the workers in accordance with OSHA standards. All equipment operated in the tunnel shall be powered by either air or electricity. No equipment will be permitted in the tunnel that uses a petroleum product for fuel. Electric lights shall be used for illumination of the tunnel construction.

The Contractor shall monitor the quality of air in the tunnel in accordance with OSHA standards.

A sufficient supply of fresh air shall be provided and maintained at all times in all underground places and provisions shall be made for the quick and complete removal of gases and dust resulting from blasting or other tunnel operations. Except when unnecessary due to natural ventilation, artificial ventilation shall be maintained in the tunnel by ventilating plants of ample capacity operated when needed to meet the preceding requirements.

If required by the plans or if required for safety, suitable steel or timber sheeting, shoring and bracing shall be used to support the sides and roof of the excavation. Supports may be left in place provided that they clear the encasement or carrier pipe. No separate Payment will be made for supports left in place. Nothing contained herein shall prevent the Contractor from placing such temporary or permanent supports as shall be deemed necessary, nor shall it be construed as relieving the Contractor from full responsibility for the safety of the work, and for all damages to persons and property.

If specified, the entire void between the outside of the pipe and the tunnel walls shall be backfilled with Class "D" concrete or grouted with 1:5 minimum mix grout of Portland cement and clean washed sand with sufficient entrained air to facilitate flow. The minimum thickness of concrete

required for backfill in excess of the minimum dimensions shown on plan will be at the entire expense of the Contractor. The carrier pipe shall be inspected by televising or other means to insure that the pipe is constructed to proper line and grade prior to placement of grout.

All pipe damaged during operations shall be repaired or removed and replaced at the Contractor's expense.

Joints

When reinforced concrete pipe 24 inches and larger in diameter with tongue and groove joints is used for the encasement pipe, the interior joints for the full circumference shall be sealed and packed with mortar and finished smooth and even with the adjacent section of pipe.

Measurement

Openings provided by jacking, boring or tunneling will be measured for Payment in linear feet along the center line of the opening measured from face to face of the trench ends or pit walls between which the jacking, boring or tunneling traverses, and will not be classified for Payment according to depth. The carrier pipe when required will be measured for pay as provided elsewhere in these specifications. The encasement pipe will be considered to be included in the unit price bid for jacking, boring or tunneling.

The Contractor will only be paid for the limits of the openings as shown on the plans and contract specifications. Any overrun, except as approved by the City, will be at the Contractor's expense.

Payment

Openings provided by jacking, boring or tunneling will be paid for at the contract unit price per linear foot, complete in place, as provided in the proposal and contract. The contract unit price shall be the total compensation for furnishing and placing all materials; and for all labor, tools, equipment, encasement pipe and incidentals necessary to complete the work. The carrier pipe, when required, will be paid for as provided elsewhere in these specifications.

C 2.24 Removal and Replacement of Paved Surfaces

This section of the specifications covers the removal of paved surfaces for the installation of water and sanitary sewer facilities and the replacement of these paved surfaces after the utilities have been installed.

Detours and Barricades

The Contractor shall deliver a construction traffic control plan to the City Transportation Department for approval. After approval, the Contractor shall, before closing any street or causing any obstruction to traffic on any street, furnish and erect suitable barricades and warning signs to protect

the traveling public, as set forth in the Texas Municipal Uniform Traffic Control Devices (TMUTCD). The barricades and warning signs will be constructed, placed, and adequately maintained as directed by the City.

Cuts of Sidewalk, Driveway, or Curb and Gutter

When a sidewalk, driveway, or curb and gutter are cut, such cuts shall be made with a pavement saw. At the discretion of the Owner, the Contractor may break out sidewalks, driveways, curb and gutter, etc., to the nearest expansion joint, but no additional Payment will be made for the removal and replacement of the additional pavement unless previously approved by the City.

Pavement Cuts

Prior to removal, all existing pavement shall be cut with a pavement saw the full depth of the pavement to be removed. If the depth of cut is not sufficient and a ragged edge results, the pavement shall again be sawed and a neat straight edge established. The additional saw cut and pavement replacement shall be at the Contractor's expense.

In reinforced concrete streets, the reinforcement shall be cut at the centerline of the ditch and bent back.

Pavement Replacement

A. Type 1. Asphalt Street HMAC - Hot Mix Asphaltic Concrete.

1. The existing pavement shall be sawed to a neat straight line and removed. This line shall be as shown in the standard details for existing street backfill and repair.

2. The pipe and Embedment shall be installed as shown in the standard Embedment details, and Embedment material shall extend to a point at least one (1') foot above the top of the pipe.

3. Tamped native material shall then be placed in the ditch from the top of Embedment to the bottom of the 2:27 concrete or cement treated base as shown on the standard detail for existing street backfill and repair.

4. This material shall be thoroughly compacted after placement.

5. An eight-inch (8") layer of 2:27 concrete or cement treated base, extending twelve (12") inches outside the ditch line on each side shall be placed to a point six (6”) inches below the existing surface.

6. A tack coat of MS-Z or SS-1 shall be applied to the surface of backfill material and the edge of the existing hot mix. The tack coat shall be applied to each layer at a rate not to exceed 0.05 gallons per square yard of surface.

7. Six (6”) of HMAC Type D or two (2") inches of HMAC Type D and four (4”) inches of HMAC Type B or shall be placed and compacted.

B. Type 2. All Concrete Streets

1. The existing pavement shall be sawed full depth to a neat straight line and removed. This line shall be at least twelve (12") inches back of the firm banks of the ditch when the ditch width conforms to maximum and minimum widths as set forth in Section C 2.4.

2. The pipe and Embedment material shall be installed, as shown in the Embedment details and granular Embedment material or crushed stone shall extend to a point at least one (1') foot above the top of the pipe. This material shall be thoroughly tamped after placement.

3. Tamped select native material shall then be placed in the ditch from top of Embedment to within one foot (1') below the bottom of the existing concrete surface.

4. Eight (8”) inches of 2:27 concrete or cement treated base backfill material shall be placed in the ditch to the bottom of the original pavement surface.

5. Any material remaining between the sawed removal lines shall be removed to the bottom of the original pavement surface.

6. Install No. 4 rebar doweled at least 30 inches in length on 24” inch centers into existing pavement. Steel rebar shall be No. 4 bars on 24” centers installed both ways.

7. All concrete paving shall be replaced at a minimum thickness of six (6”) inches or to match existing pavement thickness and shall be poured and finished by broom or burlap drag to match existing surface. Type 2 (white pigmented) curing compound shall be applied to the surface of the slab.

Measurement

There shall be no separate pay item for sawing or removal of plain or reinforced concrete pavement, slabs, drives, aprons, sidewalks, curbs and gutters, etc. The cost of sawing and removal shall be considered in the replacement costs.

The various types of pavement replacement shall be measured by the square yard based on maximum trench width as set forth in Section C 2.4 and this section or by the linear foot of pavement to be repaired measured along the ditch centerline. Additional ditch width above that set forth in Section C 2.4 and this section will not be measured for Payment unless specifically approved by the City.

Payment

Payment for the various types of pavement replacement shall be made at the unit prices bid which shall be full compensation for all labor and materials necessary to make the complete installation.

C 2.25 Utilities Construction within Texas Department of Transportation Right-of-Way

This section of the specifications covers the construction of water and sanitary sewer lines within highway right-of-way under the jurisdiction of TxDOT.

Where proposed lines are in a state highway right-of-way, the work shall not be started until the Contractor has an approved permit from TxDOT, received through the City. In addition, the Contractor shall notify the TxDOT maintenance foreman at least 48 hours prior to commencing any work covered by the approved permit.

The Contractor shall provide and employ adequate warning signs, barricade, lights, watchman, etc., to fully protect workers and the traveling public in accordance with TxDOT requirements.

When the crossing of a highway is permitted by open cut, the Contractor shall prosecute the work in such a manner that one-half the traveled roadway is open to traffic at all times.

Highway crossings shall be tunneled and cased in accordance with Section C 2.34. However, in certain cases only where specifically shown on the plans, the Contractor shall make the crossing by open cut.

No changes shall be made in location as shown on the plans within the limits of a state highway right-of-way without prior authorization of TxDOT and the City.

Backfill Requirements

All backfill requirements in this section shall conform to current TxDOT requirements.

After the installation of the pipe and the Embedment, the ditch shall be backfilled with Type 1 Backfill in all cases except the following:

Type 2 Backfill, when allowed by the permit, agreement, or by the TxDOT representatives, may be used only in trenches parallel and adjacent to right-of-way lines and in areas where there will be no earthwork construction or construction traffic except that this method may be used for placing backfill which will later be removed by highway construction.

Types 3 or 4 Backfill may be required for special conditions where the possibility of settlement or erosion of backfill must be eliminated or when, after backfill is started, it becomes apparent that Type 1 Backfill is unsuitable.

Types of Backfill

A. Type 1 Backfill (Compacted Backfill). Type 1 Backfill shall consist of compacted material obtained from suitable soil excavated from the trench, or from sources outside the highway right-of-way. Material shall be free of rock, lumps, or clods that will not break down under compaction.

Backfill material shall be placed in the trench in layers not to exceed six (6") inches in depth and compacted. Water shall be added as required to facilitate compaction.

Compaction shall be done with rollers or mechanical tamps. Use of rollers will be permitted only when such use is not believed detrimental to any highway facility and the type roller used is acceptable to the TxDOT representative. When rollers are employed, mechanical tamps shall be used along sides of trench to compact any backfill that cannot be reached with rollers. Compacting shall be continued until a backfill density equal to that of the adjacent undisturbed material has been obtained.

Where trenches lie within the limits of drainage ditches and channels which are in rock, the Type 1 Backfill used in trench shall be sealed with one (1') foot of concrete backfill struck off flush with the top of rock.

B. Type 2 Backfill (Water Jetted Backfill). Type 2 Backfill shall consist of suitable material excavated from the trench or other acceptable material obtained from sources outside the highway right-of-way.

Backfill shall be placed in the trench in layers not to exceed two (2') feet in depth by blading, dozing, or other approved means and then jetted with water delivered under pressure through a metal jet. After the trench is filled and jetted, additional material shall be mounded thereon and rolled with construction equipment.

C. Type 3 Backfill (Stabilized Sandy Soil or Washed Sand). Stabilized backfill shall consist of either sandy soil free of lumps and clods or washed concrete sand, stabilized with two sacks of Portland cement per cubic yard.

If aggregates are not sufficiently moist to produce a mixture suitable for compaction, water shall be added as required. Either transit mix or stationary type mixers may be used. After mixing, the stabilized material shall immediately be placed in the trench in uniform layers not to exceed six (6") inches in depth and compacted as specified for Type 1 Backfill. Compaction shall be completed within two hours after mixing.

D. Type 4 Backfill (Lean Concrete). Concrete backfill shall contain either one or two (2) sacks of Portland cement per cubic yard of concrete as may be specified by the agreement or permit or by the TxDOT representative.

Concrete aggregates shall be washed.

Concrete may be mixed on the project in an approved mixer or in an approved central mixing plant. Slump shall be between three (3) and six (6") inches as directed by the TxDOT representative.

Concrete shall be deposited in lifts not to exceed eighteen (18") inches in depth. Sufficient vibration shall be done to eliminate voids but care shall be exercised that contamination by adjacent soil does not occur during vibration. All concrete shall be placed within one hour after mixing.

Measurement

Open ditch excavation and backfill within highway right-of-way will not be measured separately from other trenching and backfill but will be measured as set forth in Section C 2.4 as a part of the overall job total.

Boring and tunneling within highway right-of-way will be measured as set forth in Section C 2.23.

Payment

Boring and tunneling within highway right-of-way will be paid for at the unit price bid as set forth in Section C 2.23.

C 2.26 Connection to Existing Water Mains

This section of the specifications governs the connection of repaired, renovated, or new water mains and/or facilities to existing water mains.

Connection to an existing water main shall include not only branch connections but in-line connections for the purpose of making required pipe adjustments as well. Any connections or series of connections required to be performed on an existing water main shall meet with the City's specific approval as to the seasonal period when the work can be performed, the length of time required for the work to be completed, the work procedures proposed, or any other facet that could affect curtailment of quality or quantity of water supply to the affected area. The work shall be performed with stringent built-in safeguards (such as adequate back-up equipment, labor and materials available) to insure that the time schedules are met without failure and subsequent setback. Every effort shall be made to accomplish as much of the work as possible before the actual tie-in is made into the existing main. This is especially applicable where vertical and horizontal concrete thrust blocks are a necessity to impose proper restraint of the pipe when the main is returned to full service. A detailed schedule of operations for making such connections shall be approved by the City before any work commences.

It shall be generally understood that water mains sixteen (16") inches in diameter and larger shall not be removed from service during the months of May through October unless specified otherwise in the project contract documents, and then only (since this work is so closely dependent on seasonal conditions) with the final approval of the City. The City is the final authority on all scheduled "shut-offs" or interruptions to service.

Where indicated on the plans and/or herein specified, the Contractor shall connect the new main with existing mains. The Contractor shall furnish all labor, materials, equipment, and services required for the locating and uncovering of the existing line, the making of cuts in the line, the removal, relocation, and/or lowering of existing lines as required, de-watering of the trench, connecting of the existing line into the new main and all appurtenant work required for a complete connection. Relocated mains or lines shall be laid so that all valve stems shall be set vertically.

Only such connections to existing mains as are necessary to load, test, and sterilize mains under construction with water from City mains will be permitted prior to the chlorination of new mains. All other connections to existing mains shall be made only after the new main has been satisfactorily disinfected and the City has authorized the connections. The Contractor will be required to plug and block lines, crosses, tees, or other fittings installed in the new main to permit testing and chlorination prior to the making of connections. Such plugs and blocking shall be adequate to withstand a test pressure of 150 p.s.i.g.

Where cut-ins are made immediately adjacent to valves which are under pressure, the Contractor shall take all necessary precautions to brace such valves with temporary blocking and bracing which shall be of ample size and properly placed to prevent movement or blowing off of any pipe, valves, or fittings due to water pressure on the main.

Notice to Businesses and Industries, Public Schools, and Other Water Customers before Stopping Water Service for Scheduled Work

The Contractor will notify all business and industries in the affected area a minimum of 24 hours prior to disrupting water service due to scheduled water shut-offs. All water shut-offs will be scheduled through the City's representative. If the water shut-off will be a hardship on any business or industry, the Contractor will make tie-ins and other water shut-offs after hours (5:30 PM thru 6:00 AM and/or weekends) at a time convenient to the water customers. No additional Payment shall be made when after-hours work is necessary to accommodate water customers.

Failure to notify water customers may result in damage to equipment and could result in claims against the Contractor. In case of emergency shut-offs or repairs, the affected customers shall be notified immediately after repairs are made and/or service restored so that all facilities can be checked.

The Contractor shall notify all other water customers by giving a minimum of 24 hours notice prior to disruption of service. Residents shall be notified either in person or by placing a notice on the door of the dwelling. The notice shall contain the reason for the disruption or service, the time the water is to be turned off, and the approximate length of time the water is to remain off. Notices are available

from the Public Works Department. The Contractor is responsible for proper completion of the form prior to distribution.

Measurement

Connections to existing water mains will not be measured for Payment unless specifically set forth in the Proposal and other contract documents.

Payment

If specifically set forth in the contract documents, Payment for connections to existing water mains will be paid for at the unit price bid. Otherwise, Payment for connections to existing water mains will be considered subsidiary to the various other unit prices.

C 2.27 Cleaning and Sterilization of Water Mains

This section of the specifications covers the cleaning and sterilization of water mains prior to placing them into service in the City's water system.

Before any newly constructed water main is placed into service, it shall be cleaned, sterilized, and tested until the bacteria count in the water within the main meets the standards of purity established by the TCEQ and the City of Colleyville. No service from the main will be provided any customer until these standards are met.

Precautions during Construction

During the construction operations, workers shall use care to assure that all installed surfaces of the system which will come in contact with the City water supply are maintained in a sanitary condition.

Every effort must be made to keep the inside of the pipe, fittings, and valves free of all loose foreign matter. Any time that the pipe fittings or valves become contaminated with loose foreign matter, the Contractor shall, at no additional expense to the City, restore the pipe, fittings or valves to a sanitary condition. Sanitary condition will be defined as being free of any foreign substance. The final determination as to the sanitary condition of the pipe will be made by the City.

As each joint of pipe is being laid, it shall be swabbed with a clean and effective cleaning tool as approved by the City.

Exposed open ends of pipe shall be temporarily blocked or capped with a water tight cap during construction. Particular care shall be taken to protect pipe ends at any time actual laying is not in progress.

Cleaning

Cleaning shall be accomplished by passing an appropriate sized "Poly-Pig(s)" through the pipe. The "Poly-Pigs" shall be minimum five (5) pounds per cubic foot density and shall be the double spiral wrapped type. The "Poly-pigs" shall be operated in accordance with the manufacturer's recommendations. Soft or uncoated "Poly-Pigs" will not be acceptable. The procedure for "Poly-Pigging" shall be as follows:

A. The Contractor shall prepare the main for the installation and removal of "Poly Pigs" as required.

   1. In general, this will consist of furnishing all equipment, material, and labor to satisfactorily expose cleaning wyes, remove cleaning wye covers, etc., as directed by the City and to insert the "pigs" into the mains at points indicated on plans. On mains twelve (12") inches or smaller, the Contractor will insert the "Poly-Pig" into the pipeline at points indicated on plans while installing the water main.

   2. At point of expulsion of the "Poly-Pig", the Contractor shall prevent back flow of purged water into the main after passage of the pig. On small pipe, through twelve (12") inches, back water can be prevented re-entry into the pipe by the temporary installation of mechanical joint bends and pipe joints to provide a riser out of the trench. Excavation of the trench may serve the same purpose. Where a trench is used, the excavation shall be lined with polyethylene and secured, and a ditch be cut to allow the water to drain from the excavation.

   3. After passage of the "Poly-Pig" and flushing of all back water from the pipe, the Contractor shall continue to flush the main until the water runs clear and no noticeable sand or debris can be seen in a white sample cup or until notified by the City. The Contractor shall complete work at openings by plugging and blocking, installing cleaning wye blind flanges, etc., then backfill and complete all appurtenant work necessary to secure the system.

B. Under direct supervision of the City Representative, the Contractor will shuttle "Poly-Pigs" through the main from point of insertion to exit. Where the pipe in the main forms a loop distribution system, every effort will be made to sweep the complete system.

C. Short dead end pipe sections not swabbed by the pig shall be flushed.

D. The procedure set forth below in section STERILIZATION shall be followed prior to any flushing or sampling taking place.

E. Appropriate erosion control methods will be placed to prevent transportation of silt or other debris away from the work site during flushing. This may include restricting flow to avoid damage to adjacent landscape and exposed earthen surfaces.

Sterilization

The following procedure shall be used for sterilization:

A. Chlorine will be injected into the section of line being sterilized so that its entire capacity will be filled with water containing chlorine in the amount of 50 parts per million (p.p.m.) or in such other quantity as determined by the City. The contractor shall provide a service tap near the water source end of the line, minimum size 3/4-inch, for the injection of the chlorine solution. The sterilizing agent shall be introduced at one end of the section and the water released from the opposite end until the sterilizing agent is present at the discharge end in such quantity as to indicate a residual chlorine of 50 p.p.m. or as otherwise determined by the City. All valves shall then be closed and the sterilizing solution permitted remain in the pipe line section for not less than 24 hours. Chlorination shall be executed in accordance with "Procedures for chlorination and sampling of new water lines" published by the Pierce-Burch Water Treatment Plant and described below.

B. At the end of the sterilizing period, the sterilizing solution shall be discharged from the pipe and replaced with City water direct from a City main. The solution may be discharged to the City sanitary sewer system under the direction of the City Engineer.

C. A sample of water from the sterilized main shall be taken (not through a fire hydrant) from a suitable tap under the supervision of the City and submitted to the Pierce-Burch Water Purification Plant Laboratory. The Contractor shall provide a service tap near the discharge end of the line, minimum size 3/4-inch, for obtaining a water sample for analysis. If the test shows a satisfactory quality of water, the line so sterilized may then be placed in service. If the sample shows unsatisfactory quality of water, the process of sterilization shall be repeated until a satisfactory water sample is obtained.

Authorization

Sterilization of the line or any section thereof shall not begin until the City's approval of the method, apparatus, sterilizing agent, and disposal of chlorinated water, for the section of the line has been obtained.

PROCEDURES FOR CHLORINATION AND SAMPLING OF NEW WATER LINES

To assist the contractor, the procedures for chlorination and sampling of new lines in Colleyville, are provided in this section.

Contractor Responsibilities:

Install a riser with a hose bib at the end of the new line for sampling purposes. It should be two (2) – three (3') feet above the ground. Fire hydrants are not the best place to obtain a sample.

A. Using the following table, determine the amount of HTH needed to disinfect the amount of water mains you have laid and cleaned. Remember that the table is made for 100 linear feet of pipe. To use it for any other lengths of pipe you must use the formula given below. The following procedure should be used to disinfect new water lines:

Pipe Size (Inches)	HTH per 100 LF (Pounds)	Time required to pull HTH Solution through 100 LF of pipe using a flow of 700 gpm from fire hydrant
6	0.10	15 seconds
8	0.16	22 seconds
10	0.25	35 seconds
12	0.37	50 seconds
16	0.65	1 minute, 30 seconds
18	0.82	2 minutes
20	1.02	2 minutes, 20 seconds
24	1.46	3 minutes, 20 seconds
27	1.85	4 minutes, 15 seconds
30	2.29	5 minutes, 15 seconds
33	2.77	6 minutes, 20 seconds
36	3.29	7 minutes, 30 seconds
42	4.48	10 minutes, 15 seconds

For quantities of pipe other than 100 LF:

$$= \frac{\text{(chart quantity) x (actual LF)}}{\text{(100 LF)}}$$

Example: The following calculates the amount of HTH needed for 867 LF of 12" line and 1,289 LF of 20" line, and also indicates the time required to pull the chlorine solutions through the pipe.

$$\text{HTH} = (0.37) \times \frac{\text{(867 LF)}}{\text{(100 LF)}} = 3.21 \text{ lbs of HTH}$$

$$\text{HTH} = (1.02) \times \frac{\text{(1,289 LF)}}{\text{(100 LF)}} = 13.15 \text{ lbs of HTH}$$

Total lbs of HTH needed = 3.21 + 13.15 = 16.36 lbs

$$\text{Time} = (50 \text{ sec}) \times \frac{\text{(867 LF)}}{\text{(100 LF)}} = 7 \text{ min } 14 \text{ sec}$$

$$\text{Time} = (2 \text{ min } 20 \text{ sec}) \times \frac{\text{(1,289 LF)}}{\text{(100 LF)}} = 30 \text{ min}$$

Total time needed = 7 min 14 sec + 30 min = 37 min 14 sec

B. Dissolve the HTH in a clean 55 gallon drum (used only for this purpose) or some other suitable container. Use caution when doing this since HTH can release strong chlorine fumes when the containers are first popped open, especially in warm weather. Mix the HTH with tap water and stir well. Complete mixing is important to the disinfection process. The vapor from the mixture should not be inhaled, especially in an enclosed environment!

Determine the number of 55 gallon drums that you will need to mix up by using the following:

$$\text{Drums} = \frac{\text{total time}}{10 \text{ min}}$$

Example:
Drums = $\frac{37 \text{ min}}{}$ = 4 drums of chlorine solution * 10 min

* From the example in No. 1

Determine the pumping rate of the chlorine solution:

# of 55 gal drums needed x 55 gal total minutes needed

Example:

4 drums x 55 gal. drum = 5.9 gal per min 37 minutes

To determine how many pounds of HTH you will need to add to each 55 gallon drum:

$$\text{lbs of HTH needed per drum} = \frac{\text{tot.lbs HTH needed}}{\text{\# of 55 gal drums needed}}$$

Example:

$$\text{lbs of HTH/drum} = \frac{16.36 \text{ lbs}}{4 \text{ drums}} = 4.1 \text{ lbs/HTH per drum}$$

C. Feed this SOLUTION until the chlorine solution from the drums is nearly gone. Then begin checking the residual at the opposite end of the line (as explained below). If the residual is not up to 50 ppm, continue feeding the chlorine solution. You may have to mix up an additional drum of chlorine and feed some more. Be sure to open the sample riser hose bib to allow it to be disinfected also.

D. Check the chlorine residual. A chlorine test kit which may be purchased at any pool supply store and at many grocery stores is adequate. However, these kits are only designed to measure a chlorine concentration up to 3.0 to 3.5 ppm. You need to be able to measure a concentration of 50 ppm. To do this you must dilute the sample of water coming from the new line. To measure the concentration of chlorine in the new line:

- Purchase an eye dropper (at any grocery store or pharmacy).
- Put six (6) drops of sample into the test kit vial.
- Fill to the mark with distilled water or normal Colleyville City tap water.
- Proceed with the kit instructions.
- Take the reading from the kit and multiply by twenty (20).

Example: 2.8 x 20 = 56 ppm chlorine in the new line

- When a residual of 50 ppm of chlorine has been achieved valve off the line and allow it to sit for at least 24 hours.
- Arrange a time with your inspector to flush the water from the line and have the inspector obtain a bacteriological sample.

City's Responsibility

A. Help the contractor during the chlorination process to insure that: the correct amount of HTH is put into solution, it is fed through the new line properly, there is a chlorine level of 50 ppm in the entire line, it sits for at least 24 hours, it is completely flushed prior to sampling, and there is an appropriate sample collection site.

B. Obtain a bacteriological sample bottle from the Colleyville Public Works Water Division. Check the chlorine residual at the sample collection point. Check the chlorine residual at a representative site in the area, make sure that the two are similar. (If the residual in the new line is 3.5 ppm and the normal residual in the system in that area is 1.4 ppm, the new line has not been flushed entirely.) Be sure that the contractor remembers to flush the sample collection riser and hose bib.

C. Disinfect the hose bib with chlorine bleach. Allow the bleach to remain in contact with the hose bib for five (5) minutes. Turn on the hose bib and allow it to run at a high rate for five (5) minutes. Adjust the flow to a steady slow stream. Remove the cap from the sample bottle and hold it in one hand with the inside of the cap facing down. Fill the sample bottle to the 100 mL mark. Return it to the laboratory as soon as possible before 3:00 p.m. (Monday- Friday, 8:00 a.m. - 3:00 p.m.) at the latest on the day that the sample is taken. Fill out the lab paperwork identifying the site, the date the sample was taken and the chlorine residual that was obtained prior to sampling.

   No samples will be submitted to the laboratory for the two days prior to a City holiday or weekend associated with the holiday unless prior arrangements are made.

D. The inspector will be provided with the results of the sample within 48 hours of having submitted it to the lab or by 9 a.m. on Monday for samples that are submitted on a Thursday or Friday. A sample will be found to pass or fail. If the sample fails, the lab will also

give recommendations to whether the new line needs to be rechlorinated or just flushed again.

E. If the sample fails, the inspector will make sure that the contractor follows the recommendations of the lab. When the new line is ready for a bacteriological resample, the inspector will arrange a date and time with the lab. A laboratory technician will take the resample. The Contractor will be responsible for the cost of the re-test.

Measurement and Payment

No separate payment will be made for the cleaning and testing specified herein, and the cost thereof shall be included and considered subsidiary to the various other items.

C 2.28 Deflection Testing of PVC Sanitary Sewer Mains

This section of the specifications covers the deflection testing by the Contractor of PVC sewer mains.

Deflection testing will be done after the sanitary sewer installation is complete and all backfill has been completed and in place for at least 30 days. The Contractor will pull a mandrel through the pipe to test for a maximum five (5%) percent deflection. The mandrel will be constructed and sized as listed on the mandrel deflection table.

Mandrel Deflection Table

5 PERCENT DEFLECTION MANDREL

Nominal Size, In.	Mandrel O.D., In.	Tolerance In.	Nearest 1/16	Min Runner Length In.	Min # of Mandrel Runners
6	5.45	± 0.01	5-7/16	4	6
8	7.28	± 0.01	7-4/16	4	6
10	9.08	± 0.01	9-1/16	5	8
12	10.79	± 0.01	10-13/16	6	8
15	13.20	± 0.01	13-3/16	8	8
18	16.13	± 0.01	16-2/16	8	12
21	19.00	± 0.01	19	8	12
24	21.36	± 0.01	21-6/16	8	12
27	24.07	± 0.01	24-1/16	8	12
18	16.53	± 0.01	16-1/2	8	9
21	19.30	± 0.01	19-5/16	8	9
24	22.08	± 0.01	22-1/16	8	9
27	24.84	± 0.01	24-13/16	8	9
30	27.62	± 0.01	27-5/8	10	9
33	30.38	± 0.01	27-5/8	10	9
36	33.15	± 0.01	33-1/8	12	9
42	38.68	± 0.01	38-11/16	12	9

Measurement and Payment

No separate Payment will be made for the deflection testing of PVC sewer mains. The cost of deflection testing shall be included in and subsidiary to the cost of installation of PVC sewer mains.

C 2.29 TV Inspection of Sanitary Sewer Mains

This section of the specifications covers the City inspection by closed circuit television (TV) of all sanitary sewer mains.

Part of the final inspection on all projects shall include a closed circuit TV inspection of the completed sanitary sewer pipe installation, exclusive of services, and all imperfections in the installed facility revealed by the TV survey shall be remedied by the Contractor prior to the acceptance of the project as complete. All TV survey work, including furnishing of necessary personnel, equipment and materials, shall be performed by the City at no cost to the Contractor, but the Contractor shall fully cooperate with the City in the making of this TV survey.

Contractor Responsibilities

The Contractor shall insert a continuous yellow plastic polypropylene line with no knots having a diameter of ¼-inch or larger in all sanitary sewer mains, exclusive of services, to aid in the threading of TV cable and camera controls. The polyethylene line shall be extended to and secured to the top of each manhole and cleanout. The sewer main shall be thoroughly cleaned and flushed with water, by the Contractor, prior to TV inspection. Mains that are live, such as sanitary sewer renewals, shall have the plastic line taut to the upper portion of the pipe so as to prevent blockage of the sanitary sewer.

Basis for TV Acceptance

Sewer mains will receive T.V. inspection acceptance if no visible defects are detected as described herein. Sewer mains laid at 0.7% grade or greater shall retain no water at any point. Sewer mains laid at less than 0.7% grade may retain a maximum of one (1") inch of water. Swags or dips in excess of one (1") inch will require grade correction by the Contractor.

Measurement and Payment
No separate Payment will be made for the TV inspection of sanitary sewer mains, including the installation of the yellow plastic polypropylene line, but the cost thereof shall be included and considered subsidiary to the various other items.

C 2.30 Air Testing of Sanitary Sewer Mains

This section of the specifications describes the procedures to be used in air testing sanitary sewer mains where such procedures are required prior to acceptance by the City.

All pipe shall be backfilled prior to air testing.

Air tests shall be made by the pressure drop versus time method.

For pipes less than 36 inches in diameter, the air test shall be performed by testing complete sections of pipe between manholes. For pipes 36 inches in diameter and over, the air test may be performed by testing each joint connection individually. The Contractor shall have the option, however, of testing pipe over 36 inches in diameter by testing sections of pipe over various lengths if so desired.

The Contractor shall furnish all material, equipment and labor necessary to perform the air test. Air gauges shall be recently calibrated and shall be stamped showing the date of calibration.

Should the sanitary sewer system fail air testing, the Contractor shall repair the leaks and retest at no expense to the City.

Testing Pipe Less Than 36-inches in Diameter

Pneumatic plugs shall have a sealing length equal to or greater than the diameter of the pipe to be inspected. Pneumatic plugs shall resist internal test pressures without requiring external bracing or blocking. All air used shall pass through a single control panel.

Three individual hoses shall be used for the following connections: From the control panel to pneumatic plugs for inflation; from the control panel to a sealed line for introducing the low- pressure air; and from a sealed line to control panel for continually monitoring the air pressure rise in the sealed line.

The air compressor shall be of adequate capacity for charging the system.

The following procedure shall be used for air testing a sewer system: All pneumatic plugs shall be seal-tested before being used in the actual test installation. One length of pipe shall be laid on the ground and sealed at both ends with the pneumatic plugs to be checked. Air shall be introduced into the plugs to 25 psig. The sealed pipe shall be pressurized to five (5) psig. The plugs shall hold against his pressure without bracing and without movement of the plugs out of the pipe.

After a manhole-to-manhole reach of pipe has been backfilled and the pneumatic plugs checked, the plugs shall be placed in the line and inflated to 25 psig. Low pressure air shall be injected into the line until the internal pressure reaches 4 psig. Two minutes shall then be allowed for the pressure to stabilize. If the pipe section to be tested is submerged in ground water, a pipe probe shall be inserted into the backfill adjacent to the centerline of the pipe. The pressure in the probe shall then be determined by reading the pressure when air first begins to slowly pass through it. This reading is back pressure due to ground water submergence, and all gauge pressures in the test should be increased by this amount. After the pipe pressure has stabilized at 3.5 psig or the adjusted pressure due to ground water submergence, a stop watch shall be started and the time required for the internal pressure to reach 2.5 psig determined. Minimum permissible holding time for runs of single pipe diameter are indicated in the table at the end of this section of the specifications.

Testing Pipe 36-inches and Larger in Diameter

Pipe 36 inches and larger in diameter may be air tested at each joint by utilizing a joint tester similar to the Cherne Joint Tester. No joint shall be air tested until the pipe has been backfilled. At no time shall pipe installation exceed 100 feet from the latest joint tested unless sections of pipe are being tested. The time allowed for the pressure drop from 3.5 psig to 2.5 psig shall be ten (10) seconds. Failure to pass the air test shall be cause for rejection. Rejected pipe shall be removed. Reinstallation and/or repairs may be made at the option of the City.

Basis for Air Test Acceptance

Sewer mains will receive air test acceptance only after meeting the test requirements. If the installation fails to meet this requirement, the Contractor shall, at his sole expense, determine the cause of test failure. The Contractor shall then repair or replace any defective material or work and retest the main.

Measurement and Payment

No separate Payment will be made for the tests specified herein, but the cost thereof shall be included and considered subsidiary to the various other items.

AIR TEST TABLES

MINIMUM HOLDING TIME IN MINUTES AND SECONDS REQUIRED FOR PRESSURE

TO DROP FROM 3.5 TO 2.5 PSIG

1	2	3	4	Specifications Time for Length (L) Shown in (min:sec) NOTE: TO BE USED WHEN TESTING ONE DIAMETER ONLY										
Pipe Diameter (in.)	Min. Time min:sec	Length for Min Time (ft.)	Time for Longer Length (sec.)	100 ft.	150 ft.	200 ft.	250 ft.	300 ft.	350 ft.	400 ft.	450 ft.	500 ft.	600 ft.	650 ft.
4	3:46	597	.380 L	3:46	3:46	3:46	3:46	3:46	3:46	3:46	3:46	3:46	3:48	4:07
6	5:40	398	.854 L	5:40	5:40	5:40	5:40	5:40	5:40	5:42	6:24	7:07	8:33	9:15
8	7:34	298	1.520 L	7:34	7:34	7:34	7:34	7:36	8:52	10:08	11:24	12:11	15:11	16:27
10	9:26	239	2.374 L	9:26	9:26	9:26	9:53	11:52	13:51	15:49	17:48	19:47	23:44	25:43
12	11:20	199	3.418 L	11:20	11:20	11:24	14:15	17:05	19:56	22:47	25:38	28:29	34:11	32:02
15	14:10	159	5.342 L	14:10	14:10	17:48	22:15	26:42	31:09	35:36	40:04	44:31	53:25	57:52
18	17:00	133	7.692 L	17:00	19:13	25:38	32:03	38:27	44:52	51:16	57:41	64:05	76:55	83:20
21	19:50	114	10.470 L	19:50	26:10	34:54	43:37	52:21	61:00	69:48	78:31	87:15	104:42	113:20
24	22:40	99	13.674 L	22:47	34:11	45:34	56:58	68:22	79:46	91:10	102:33	113:58	136:45	148:09
27	25:30	88	17.306 L	28:51	43:16	57:41	72:07	86:32	100:57	115:22	129:48	144:14	173:05	187:30
30	28:20	80	21.366 L	35:37	53:25	71:13	89:02	106:50	124:38	142:26	160:15	178:04	213:41	231:30
33	31:10	72	25.852 L	43:05	64:38	86:10	107:43	129:16	150:43	172:21	193:53	215:28	258:34	286:06
36	34:00	66	30.768 L	51:17	76:55	102:34	128:12	153:50	179:29	205:07	230:46	256:25	307:42	333:21
39	36:50	61	36.114 L	60:11	90:17	120:22	150:28	180:34	210:39	240:45	270:51	300:56	361:08	391:14

C 2.31 Pressure Testing of Water Lines

This section of the specifications covers the pressure testing of water lines prior to their sterilization and placement into service in the domestic water system.

After the pipe has been laid and backfilled, it shall be subjected to a hydrostatic pressure test by raising the pressure in the pipe to 150 psi at the low point of the test section.

Duration of Test

The duration of each test shall be three (3) hours.

Test Procedures

Tests shall be made against valves when available, or by placing temporary plugs and bulkheads in the pipe, and filling the line slowly with water. Care shall be used to see that all air vents are open during the filling.

If the Contractor proposes to test against an existing valve, the Contractor shall be satisfied that the valve is not leaking prior to making the connection. If the connection is made but a satisfactory pressure test cannot be accomplished because of valve leakage, the Contractor shall remove the connection and plug and block the new line in order to perform the pressure test necessary for City acceptance. No direct compensation will be made for this work, and it will be considered subsidiary to the various bid items.

After the line, or section thereof, has been completely filled, it shall be allowed to stand under a slight pressure for at least 48 hours to allow the escape of air from any air pockets. During this period, the bulkheads, valves, and connections shall be examined for leaks. The water necessary to maintain the test pressure shall be measured through a meter or by other means satisfactory to the City.

Before applying the specified test pressure, all air shall be expelled from the pipe. In the event it is necessary to expel air from high points other than where air valves are provided, the Contractor may tap the line for this purpose and afterwards tightly plug the tap.

Visual Examination

During the last two hours of the test, the entire route of the pipeline shall be inspected to locate any leaks or breaks. Any defective joints, cracked or defective pipe, fittings, or valves discovered in consequence of this pressure test shall be removed and replaced with sound material and the test shall be repeated until satisfactory results are obtained.

Any and all noticeable leaks shall be repaired regardless of whether the actual leakage is within the allowable.

Permissible Leakage and Makeup Water

No pipe installation will be accepted until or unless the makeup water is less than twelve (12) gallons per mile per 24 hours per inch of nominal diameter of pipe.

Makeup water is defined as the quantity of water to be pumped into the newly laid pipe, or any valved section of it, necessary to maintain the specified test pressure after the pipe has been filled with water and the air expelled.

Permissible Leakage in Three Hour Period

3-Hr. Leakage in Gallons

Size Main	per 100 Linear Feet of Main
6"	0.22
8"	0.29
10"	0.37
12"	0.44
14"	0.51
16"	0.59
18"	0.66
20"	0.74
24"	0.88
30"	1.10
36"	1.32
42"	1.54
48”	1.77
54”	1.99

Measurement and Payment

No separate Payment will be made for the tests specified herein, and the cost thereof shall be included and considered subsidiary to the various other items.

C 2.32 Concrete Structures and Concrete Blocking and Cradle

This section of the specification shall govern the construction of concrete structures or concrete structural units as well as the construction of concrete cradles and blocking for pipelines.

Materials used in the performance of work described in this section of the specifications shall comply with Section C 1.23, "Concrete," and C 1.24, "Reinforcing Steel," of these specifications.

Structural Excavation and Backfill

This item shall govern the excavation for the placing of such structures as indicated or specified; for the disposal of all material from such excavation; and for the backfilling around completed structures to the level of the original ground. Unless otherwise provided, the work included hereunder shall provide for the removal of old structures or portions thereof, trees, and all other obstructions when such removal is necessary for the proper completion of the proposed construction. Excavation will be unclassified.

Excavation shall be done in accordance with the lines and depths indicated on the plans or as established by the Engineer. Unless written permission is given by the City, no excavation shall be more than three (3') feet from the footing in any direction.

The final elevation to which a foundation is to be constructed shall be as shown on the plans or as raised or lowered when such alterations are judged proper to satisfactorily comply with the design requirements for the structure. Should it be found necessary, in the judgment of the City, to increase or decrease the depth of footings from that shown on the plans, the necessary alterations in the details of the structure shall be accomplished in a manner as directed by the City.

When a structure is to rest on an excavated surface other than rock, special care shall be taken not to disturb the bottom of the excavation and the final removal of the foundation material to grade shall be performed just before the footing is to be placed.

The excavation shall be maintained in a dry condition. All pumping or bailing from the interior of any excavation shall be done in such a manner as to prohibit the movement of water through or alongside any concrete being placed.

As soon as practicable, the excavated areas around the structure shall be backfilled with approved material.

Backfill which will not support any portion of the completed structure shall be placed in layers not more than eight (8") inches in loose Measurement or as otherwise recommended and shall be compacted to a density equal to the adjacent undisturbed material. Material for backfill shall be composed of earth only and shall contain no wood, roots, other concrete, stones, trash, or debris of any kind.

Backfill which will support any portion of the structure shall consist, to maximum extent available, of the excess earth obtained from structure and trench excavations. Additional material may be obtained from borrow pits as necessary.

All materials placed in fills and embankments shall be free from rocks or stones larger than three (3") inches in their greatest dimension, brush, stumps, logs, roots, debris, and organic or other deleterious materials. No rocks or stones shall be placed in the upper eighteen (18") inches of any fill or

embankment. Rocks or stones within the allowable size limit may be incorporated in the remainder of fills and embankments provided they are distributed so that they do not interfere with proper compaction.

After preparation of the fill or embankment site, the subgrade shall be leveled and rolled so that the surface materials of the subgrade will be as compact and well bonded with the first layer of the fill or embankment as specified for subsequent layers.

All fill and embankment materials shall be placed in approximately horizontal layers not to exceed eight (8") inches in uncompacted thickness. Material which is deposited in piles or windrows by excavating and hauling equipment shall be spread and leveled before compaction.

Each layer of material being compacted shall have a uniform moisture content to insure satisfactory compaction. The Contractor will be required to add water and harrow, disc, blade, or otherwise work the material in each layer to insure uniform moisture content and adequate compaction. Each layer shall be thoroughly compacted by rolling or other method approved by the Engineer to 95 percent of the maximum density at optimum moisture content as determined by ASTM D 698. If the material fails to meet with the density specified, the compaction methods shall be altered as necessary to obtain the specified density. All compaction shall be accomplished at a moisture content from zero (0) to two (2%) percent above optimum.
No backfill shall be placed against any abutment or retaining wall until such structure has been in place at least seven (7) days. Backfill placed around abutment and piers shall be deposited on both sides to approximately the same elevation as at the same time.

General Requirements

Prior to starting work the Contractor shall inform the City as to the methods of construction and the amount and character of equipment he proposes to use, the adequacy of which shall be subject to the approval of the City.

Plans for forms and false work to be used in the construction of the various units of a structure shall be submitted if requested by the City. Such plans shall be sufficiently complete to show all essential details of the proposed forms, false work, and bracing.

Forms for walls or columns shall not be erected on concrete footings until the concrete in the footing has cured at least two (2) curing days. Concrete may be placed in walls or columns as soon as the forms and reinforcing steel placement have been approved by the City. Approval by the City of any construction methods, equipment, or form and false work plans will not relieve the Contractor of responsibility for the safety or correctness of methods used, adequacy of equipment, or from carrying out the work in full accordance with the contract.

Curing Day

A curing day will be any calendar day on which the atmospheric temperature, taken in the shade and away from artificial heat, is above 50 degrees F. for at least eighteen (18) hours. Colder days may be counted if proper provisions are made, and the air temperature adjacent to the concrete is maintained above 50 degrees F. throughout the entire day.

Construction Joints

Construction joints shall be placed as shown on the plans unless otherwise specifically authorized. All construction joints shall be made on horizontal and vertical planes and formed with mortises of keys made in the concrete unless shown otherwise on the plans. Sufficient section shall be provided in horizontal and vertical keys to resist shear. Where construction joints are placed, forms shall be tightly framed around the reinforcing steel to prevent the escape of mortar, and the joint shall be so made that its trace in the exposed face of the finished structure will be an exactly vertical or horizontal line. Where, to accomplish this purpose, finishing strips are needed, they shall be nailed to the forms and the concrete carefully finished to them. The surface of finished concrete and forms shall be thoroughly cleaned and wetted immediately before resuming concreting. Care shall be exercised to obtain maximum density and insure against honeycomb, etc.

Special care shall be taken to remove all laitance and to roughen any smooth set surface with picks or by other approved methods before the plastic concrete is placed against the old concrete.

Forms

Except where otherwise specified, forms may be constructed of either timber or metal as elected by the Contractor.

Forms shall be designed for the pressure of a liquid weighing 150 pounds per cubic foot. The rate of placing the concrete shall be taken into consideration in determining the depth of the equivalent liquid. An additional live load of 50 pounds per square foot shall be allowed on horizontal surfaces.

If at any stage of the work, the forms show signs of bulging or sagging, that portion of the concrete causing such conditions shall be removed immediately, if necessary, and the forms shall be reset and braced securely against further movement.

Nominal one inch lumber surfaced to a uniform width and thickness will be permitted for general use on the various portions of structures if backed by a sufficient number of studs and wales. All forms shall be face lined with an approved type of form lining material. If desired by the Contractor, facing for such surfaces may be constructed of three-quarter (3/4") inch plywood backed by adequate studs and wales, in which case form lining will not be required.

Forms shall be built mortar tight and of material of sufficient strength to prevent bulging between supports and shall be set and maintained to the lines designated until the concrete is sufficiently

hardened to permit form removal. Forms shall be maintained in such a manner as to prevent warping and shrinking. All details of form construction shall be subject to the approval of the City, and permission to place concrete will not be given until the form work is complete to its satisfaction.

Where corners occur, suitable chamfer strips shall be placed at the angle of the forms to round off or bevel them.

All forms shall be constructed so as to permit removal without injuring the concrete.

At the time of placing concrete, the forms shall be clean and entirely free of all chips, dirt, sawdust, and other extraneous matter.

For thin wall sections and other locations where access to the bottom of the forms by other methods would be cumbersome and inadequate, clean-out openings shall be provided.

Only approved form spreaders shall be used.

Metal form ties of an approved type shall be used to hold forms in place, and they shall have provision to permit ease of removal of the metal as hereinafter specified.

Metal ties shall be held in place by devices attached to walls. Each device shall be capable of developing the strength of the tie.

All metal appliances used inside of forms to hold them in correct alignment shall be removed to a depth of at least one-half (1/2") inch from the surface of the concrete and shall be so constructed that the metal may be removed without undue injury to the surface by chipping or spalling. Such devices, when removed, shall leave a smooth opening in the concrete. Burning off of rods, bolts, or ties will not be permitted. Where wire ties are used, all wires, upon removal of the forms, shall be cut back at least one-half (1/2") inch from face of the concrete with a sharp chisel or nippers.

All cavities produced by the removal of metal ties shall be carefully cleaned and completely filled with re-tempered sand cement mortar mixed in proportion of one to three, and the concrete shall be left smooth and even.

Reinforcing Steel

When placed in the work, reinforcement shall be free from dirt, paint, grease, oil or other foreign materials. Before being placed in the work, reinforcement shall be cleaned of all loose mill scale and rust. Tightly adhered scale or rust which resists removal by vigorous wire brushing need not be removed except that excessive loss of section to the reinforcement due to rust shall be cause for rejection. Excessive loss of section shall be defined as loss of section to the extent that the reinforcement will no longer meet the physical requirements for the size and grade of steel specified. Reinforcement shall be placed in the position shown on the plans. In the plane of the steel parallel to

the nearest surface of concrete, bars shall not vary from plane placement by more than one-twelfth of the spacing between bars. In the plane of the steel perpendicular to the nearest surface of concrete, bars shall not vary from plan placement by more than one-quarter (1/4") inch.

The reinforcing steel shall be spaced its required distance from the face of the forms by means of approved galvanized metal spacers or approved precast mortar or concrete blocks. All reinforcing steel shall be wired together at all intersections. Before any concrete is placed, all mortar shall be cleaned from the reinforcement.

Reinforcement shall be supported and tied in such manner that a practically rigid cage of steel is provided. If the cage is not adequately supported to resist settlement or floating upward of the steel, overturning of truss bars, or movement in any direction during concrete placement operations, permission to continue concrete placement will be withheld until corrective measures are taken. Sufficient Measurements shall be made during concrete placement to insure compliance with spacing and clearance requirements herein specified. All reinforcing bars in all members shall be supported rigidly in their correct locations, in slabs, beams, walls, columns, drilled shafts, or footings.

No concrete shall be deposited until the City has inspected the final placement of the reinforcing metal and given permission to place concrete.

Placing Concrete – General

The Contractor shall give at least 24 hours advance notice prior to pouring concrete in any unit of the structure to permit the inspection of forms, the placement of reinforcing steel, and the preparations for the mixing and placing of the concrete. The mixing of concrete and placing of same in the form shall not be commenced until the City has given its approval of the forms, the placing of reinforcing and miscellaneous steel, and the Contractor's arrangements for mixing and placing concrete. No concrete shall be placed in any unit prior to completion of the form work and the placement of the reinforcing and other steel. No concrete shall be placed before the completion of any other operation which might prove detrimental to the concrete.

Whenever it is necessary to continue the mixing, placing and finishing of concrete after the daylight hours, the site of the work shall be brilliantly lighted so that all operations are plainly visible. In general, however, concrete placing shall be so regulated as to permit finishing operations to be completed in the daylight hours.

The City reserves the right to order postponement of concrete placing operations when, in its opinion, impending weather conditions may result in rainfall or low temperatures which will impair the quality of the finished work. In case rainfall should occur after placing operations are started, the Contractor shall provide ample covering to protect the work. In case of drop in temperature, the provisions set forth herein shall be applied.

The sequence and manner of placing concrete shall be as provided on the plans. The operation of depositing and compacting the concrete shall be conducted so as to form a compact, dense, impervious mass of uniform textures which shall show smooth faces on all surfaces.

The method and manner of placing shall be such as to avoid the possibility of segregation of the aggregate or the displacement of the reinforcement. Concrete shall not have a free fall sufficient to cause segregation of materials. Tremies shall be used in order that the free fall of mix shall be held to a maximum of three (3') feet, unless otherwise approved by the Engineer.

Each part of the forms shall be filled by depositing concrete directly as near its final position as possible. The coarse aggregate shall be worked back from the face of the forms and the concrete shall be forced under and around the reinforcement bars without displacing them. Depositing large quantities at one point in the forms and running or working it along the forms will not be allowed.

After the concrete has taken initial set, the forms or the reinforcing steel shall not be jarred or any strain placed on projecting reinforcement.

Chutes, troughs, or pipes used as aids in placing concrete shall be arranged and used so that the ingredients of the concrete will not be separated. Open troughs and chutes shall extend, if necessary, down inside the forms or through holes left in the forms, or the ends of such chutes shall terminate in vertical downspouts. All chutes, troughs, and pipes shall be kept clean and free from coating by hardened concrete by a thorough flushing with water before and after each placement. Water used for flushing shall be discharged clear of the concrete in place.

Where the Contractor's operations involve the placing from above, that is, directly into an excavated area in or through the completed forms, particularly in the case of abutments, piers, columns, retaining walls, walls, floors, footings, and deep girders, all concrete so placed shall be deposited through a vertical sheet metal or other approved pipe not less than six (6") inches nor more than ten (10") inches in diameter. The pipe shall be made in sections so that the outlet may be adjusted to proper heights during placing operations.

Concrete shall be placed in continuous horizontal layers approximately twelve (12") inches in thickness. The rate of delivery shall be so arranged that a cold joint is not allowed to form between loads. The Contractor shall avoid unauthorized construction joints by placing required portions of abutments, piers, walls, floors, slabs, columns or superstructures in one continuous operation. As a safety precaution, openings in the forms shall be provided for the removal of laitance and other foreign material.

All concrete shall be well compacted and the mortar flushed to the surface of the forms by continuous working with concrete spading implements and mechanical vibrators of an approved type. Vibrators of the type which operate by attachment to forms or reinforcement will not be permitted. The vibrators shall be applied to the concrete immediately after deposit and shall be moved throughout the mass, thoroughly working the concrete around the reinforcement, embedded fixtures, and into the corners and angles of the forms until it has been reduced to a plastic mass. The mechanical vibrator shall not be

operated so that it will penetrate or disturb layers placed previously which have become partially set or hardened. The vibration shall be of sufficient duration to accomplish thorough compaction and complete Embedment of reinforcement and fixtures but shall not be done to an extent that will cause segregation. Vibration shall be supplemented by hand spading to insure the flushing of mortar to the surface of all forms.

Placing Concrete in Cold Weather

No concrete shall be placed when the atmospheric temperature is at or below 40 degrees F., taken in the shade away from artificial heat unless permission is given by the City. In cases where the temperature drops below 40 degrees F. after the concreting operations have been started, the Contractor shall furnish sufficient canvas and frame work or other type of housing to enclose and protect the structure in such a way that heated air around the forms and fresh concrete can be kept at a temperature not less than 40 degrees F. for a period of five days after the concrete is placed.

It is understood that the Contractor is responsible for the protection of concrete placed under any and all weather conditions. Permission given by the City to place concrete during low temperature or freezing weather will in no way relieve the Contractor of the responsibility for satisfactory results. Should concrete placed under such conditions prove unsatisfactory, it shall be removed and replaced by the Contractor at his expense.

The concrete shall be placed in horizontal layers of not more than twelve (12") inches in thickness extending from end to end or side to side of the section between walls or approved joints. A time interval of no longer than 30 minutes shall elapse between the placing of successive layers. The concrete shall be compacted, evenly distributed and placed around the reinforcement, openings and structure so that honeycomb and/or defective areas are eliminated.

Wall forms shall at all times during the placing of the concrete and until its initial set has occurred, be maintained in true alignment and grade. During the placing of the concrete, frequent inspection shall be made and the necessary corrective measures taken if forms or supports show any tendency to become displaced.

Forms shall be removed in accordance with a time schedule to be approved by the City, and all defective areas, tie pits, etc., shall be immediately treated in accordance with the requirement of other items of these specifications.

Types of Finishing for Concrete

In general, except as elsewhere permitted in these specifications, special documents, specific plans, or by direction of the City, finishes shall be an integral part of a monolithic process. The following schedule of finishes shall apply according to their applicability unless otherwise specified, amended, or extended.

A. Screeding. Screeding is an operation normally associated with horizontal concrete surfaces such as slabs. Screeding shall be done as soon as concrete has been approximately leveled. The screed shall be designed adaptable to the use intended, shall have provision for vertical adjustment, and shall be sufficiently rigid to remain true to shape during use.

B. The screed shall be vertically adjusted so as to leave the concrete surface at an elevation slightly above grade after the initial strike off to allow for consolidation and finishing. Continue screeding and tamping alternately or in unison until the concrete is properly consolidated and surface voids are eliminated. The surface shall then be brought to a smooth, true alignment by means of longitudinal screeding, then finished as specifically required.

C. Surface Rubbing. Carborundum fluted surface stones provide an abrasive which, when applied in surface rubbing at the proper time in the concrete aging process, will remove form marks, surface imperfections, and otherwise smooth, shape, or finish the surface.

1. "First Surface Rubbing." As soon as the forms are removed all necessary pointing shall be done. When the pointing has set sufficiently to permit rubbing, all surfaces requiring surface finish shall be wet and given a first surface rubbing with a No. 16 Carborundum Stone or an abrasive of equal quality. The rubbing shall be continued sufficiently to bring the surface to a paste, to remove all form marks and projections, and to produce a smooth dense surface without pits or irregularities. The material that has been ground to a paste shall be carefully spread or brushed uniformly over the surface and allowed to take a reset. The use of cement to form a surface will not be permitted.

   In general, chamfered corners shall not be rubbed in the first surface rubbing.

2. "Final Finish." The surface of the entire structure requiring finish shall be cleaned of all drip marks, dirt, and discolorations and shall be given a final finish rubbing with a No. 30 Carborundum Stone or an abrasive of equal quality. On completion of this rubbing, the finished surfaces shall be neatly stripped with a brush, and the mortar on the surface shall be allowed to take a reset. After the mortar has taken a reset, the surface shall be washed down with clean water. The entire structure shall be left with a clean, neat, and uniform appearing finish, and shall be uniform in color.

D. Wood Float Finish. Surfaces shall be finished using a wood float to a true even plane with no coarse aggregate visible. Sufficient pressure shall be used on the wood float to bring all excess moisture to the surface so that it can be removed. The surface shall have a uniform appearance and shall meet straightness requirements.

E. Steel Trowel Finish. After all surface moisture has disappeared following the wood float finish, surfaces shall be steel trowelled to a smooth, even, impervious finish, free from blemishes including trowel marks. Where indicated on the plans, a floor hardener shall be applied to slabs receiving a steel trowel finish.

F. Brush Finish. Following the steel trowel finish, surface of the concrete shall be brushed lightly with a soft-bristled brush. The brush shall be kept clean and shall be dipped in water frequently so that it will be clean and wet at all times. Brushing shall be limited to that necessary to remove the glaze and produce a nonslip surface.

G. Power-Machine Finish (option). In lieu of hand finishing, surfaces of slabs may be finished by using an approved power finishing machine in accordance with the directions of the machine manufacturer. The preparation of concrete surfaces for finishing by machine shall in general be the same as required for hand finishing, and the finish shall be of the quality required for the specific surface.

Finishing Slabs (Roofs, Tops, Etc.)

As soon as concrete placing operations have been completed for a slab section of sufficient width to permit finishing operations, the concrete shall be approximately leveled and then struck off, tamped, and screeded using a longitudinal screed. The surface shall then be brought to a smooth, true alignment by means of longitudinal screeding, floating, belting, and/or other methods. When templates are used, they shall be of such design as to permit early removal in order to avoid construction joints and to permit satisfactory finishing at and adjacent to the site of the template.

While the concrete is still plastic, the surface shall be straightedged by the use of a standard ten (10') foot metal straightedge. Deviations in excess of permissible variations shall be corrected. The final surface finish of the slab shall be done after the initial straightedging, and corrective adjusting, if required, is completed.

Finishing Exposed Surfaces

All tie wires shall be cut back below the surface and then pointed over. All imperfections such as fins shall be removed and local surface depressions pointed over. Exposed interior surfaces, excluding vaults unless otherwise specified, and exterior surfaces to an elevation of one (1') foot below planned grade, which will be exposed to view after backfilling, shall be surface rubbed with Carborundum fluted surface stones.

Curing Concrete

All upper surfaces not formed shall be cured by one of the following methods:

A. Wet Covering. The surface shall be covered by wet burlap, cotton mats or canvas covering immediately following the finishing operations and shall be kept thoroughly wet for a period of four (4) curing-days after the concrete is placed. Covering shall be held in direct contact with the concrete. Water used for curing shall be free from injurious amount of oil, acid, alkali, salt, or other deleterious substances.

Immediately following the finishing operations, concrete slabs, including roof slabs, shall be covered with wet cotton mats or with a temporary covering of canvas or burlap. The temporary covering will be required when the size of slab, size of mats, or other factors are such that the mats cannot be placed immediately following the finishing operations without marring the finish of the slab.

Canvas or burlap covering material shall weigh not less than twelve (12) ounces per square yard, and the sections shall be placed with a lap at the edges of at least eight (8") inches. Cover material shall be saturated with water before placing and shall be kept saturated as long as it remains in place. Care shall be exercised in the placing of the cover material in order to prevent marring the concrete surface.

When temporary coverings are used, they shall remain in place only until the slab has hardened sufficiently that a cotton mat covering can be substituted without marring or disturbing the slab finish. Cotton mats shall be thoroughly saturated before placing and shall be kept on the slab in a saturated condition for a period of at least four (4) curing- days after the concrete is placed.

B. Impervious Coating. Immediately after finishing, the surface of the concrete shall be covered with a continuous, uniform, water impermeable coating of curing compound. Immediately after removal of the side and end forms, the sides and ends of all concrete shall receive a like coating. The solution shall be applied under pressure with a spray nozzle in such a manner as to cover the entire exposed surface thoroughly and completely with a uniform film.

The rate of application shall be such as to insure complete coverage, but the area covered shall not exceed 200 square feet per gallon of curing compound.

Under normal conditions, the curing compound, after application, shall dry to touch within one (1) hour and shall dry thoroughly and completely within four (4) hours. When thoroughly dry, it shall provide a continuous flexible membrane free from cracks or pinholes and will not disintegrate, check, peel, or crack during the required curing period. If for any reason the seal is broken during the curing period, it shall be immediately repaired with additional sealing solution.

Measurement of Concrete

The quantities of concrete not included in the bid price for a structure, vault, manhole, etc., of the various classifications which constitute the complete and accepted structure will be measured by the cubic yard in place. Only accepted work will be included, and the dimensions used will be those shown on the plans or ordered in writing by the Engineer. Reinforcing steel, not included in the bid price for a structure, vault, manhole, etc., will be measured by the pound, complete in place.

Payment for Concrete

The concrete quantities, measured as provided above and not included in the bid price for the various structures, will be paid for at the unit bid price per cubic yard for the various classifications of

concrete shown. Price will be full compensation for furnishing, hauling, and mixing all concrete materials; placing, curing and finishing all concrete; all grouting and pointing; and for all forms and false work, labor, tools, equipment, and incidentals necessary to complete the work.

Payment for all reinforcing in place and not included in the bid price for various structures, will be paid for at the unit price bid per pound.

Payment for all concrete and reinforcing steel in place in the completed structures shall be included in the bid price for the structures complete in place.

Blocking and Cradle

Concrete blocking including vertical tie-down and horizontal blocking and cradle shall be Class "B" concrete unless specified otherwise or shown on the Standard Details. Concrete cradles shall be placed under the pipe as directed by the City in areas of unsatisfactory foundation conditions or when there is an excessive cover over the pipe.

Blocking at bends shall be computed based upon pipe thrust at bends, or tees, with internal pressure of 150 psi. Where upward thrusts are to be blocked, the concrete blocking shall be of sufficient weight to resist the thrust and the concrete shall be reinforced as directed by the Engineer. Other blocking sizes shall be computed based upon a maximum safe allowable soil bearing pressure of 2,500 pounds per square foot of undisturbed earth.

The concrete blocking shall be placed against undisturbed trench walls, with a minimum of eighteen (18") inches between trench wall and pipe. Blocking shall extend a minimum of 0.75 X pipe diameter below and above the centerline of pipe and shall not extend beyond any joints. If requested by the Engineer, the ends of the thrust blocks shall be contained in wood or metal forms. Where upward thrusts are to be blocked, the concrete shall be formed from the centerline of pipe upward.

Concrete blocking shall be considered subsidiary to the various items. No additional Payment will be made for concrete blocking.

PART D - STANDARD DETAILS

A. PAVING DETAILS

P1: Concrete Street Section
P2: HMAC Street Section
P3: Concrete Arterial Street
P4: Concrete Curb and Gutter
P5: Pavement Joints
P6: Pavement Header, Epoxy Tie Bar
P7: Typical Drive Approach
P8: Sidewalk
P9: Sidewalk Wall, Rip rap
P10: Concrete Valley Gutter
P11: Median Nose Details
P12: Dead End Barricade
P13: Existing Street Backfill and Repair

B. DRAINAGE DETAILS

D1: Standard Curb Inlet
D2: Recessed Curb Inlet
D3: Storm Sewer Manhole or Junction Box
D4: Drop Inlet
D5: Pipe Collar
D6: Safety End Treatment
D7: Concrete Flume/Gabion/Concrete Connection
D8: Concrete Channel/Rip Rap
D9: Pipe Embedment/Subdrain
D10: Silt Fence
D11: Construction Entrance
D12: Rock Berm
D13: Organic Filter Tube
D14: Curb Inlet Protection

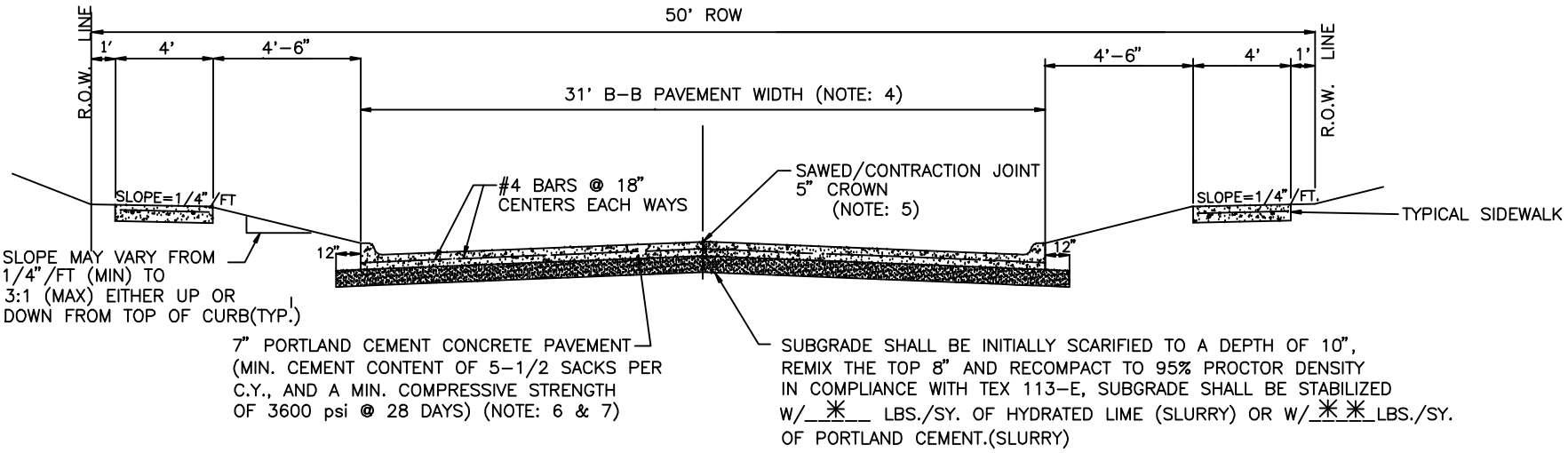
C. WATER DETAILS

W1: Valve Detail with Box and Concrete Pad
W2: Fire Hydrant and Concrete Splash Pad
W3: Standard Fire Hydrant Meter Installation
W4: Water Embedment

W5: Horizontal Thrust Block
W6: Vertical Tie-Down Block
W7: Blow Off Detail
W8: 2" Combination Air Valve Offset Installation
W9: 2" Combination Air Valve Installation
W10: 1" Water Service for 1" and ¾" Outlets
W11: 2" Water Service Details for 2" and 1.5" Outlets
W12: Typical Meter Vault and Appurtenances
W13: Detector Check and Meter Detail
W14: 6" Thru 10" Double Detector Backflow Preventer Assembly

D. SEWER DETAILS

S1: Cast in Place Sanitary Sewer Manhole
S2: Precast Concrete Sanitary Sewer Manhole
S3: Outside Drop Manhole
S4: Inside Drop Manhole
S5: Sanitary Sewer Cleanout
S6: Sanitary Sewer Service
S7: Deep Sanitary Sewer Service
S8: Class "B" Sewer Embedment
S9: Concrete Encasement Water and Sanitary Sewer Mains
S10: Sanitary Sewer Manhole Frame and Cover Detail



31' CONCRETE PAVEMENT SECTION
TYPICAL CROSS SECTION

NTS

NOTES:

1. TRANSVERSE SAWED CONTRACTION JOINTS AT 12' INTERVALS FOR CONCRETE PAVEMENT.

✳ 2. LIME SHALL BE APPLIED AT 6% BY WEIGHT MINIMUM QUANTITY IS 36 LBS/SY. IN SOME AREAS A GREATER QUANTITY (OR A LIME SERIES TEST) MAY BE REQUIRED AT THE CITY'S DISCRETION.

✳✳ 3. CEMENT SHALL BE APPLIED AT 5% BY WEIGHT. MINIMUM QUANTITY IS 30#/SY.

4. 43' BB FOR 2-LANE COLLECTOR, 49' BB FOR 4-LANE COLLECTOR

5. 6" CROWN FOR COLLECTOR.

6. 8" THICKNESS FOR COLLECTOR.

7. HAND POURS SHALL BE 6-SACK.

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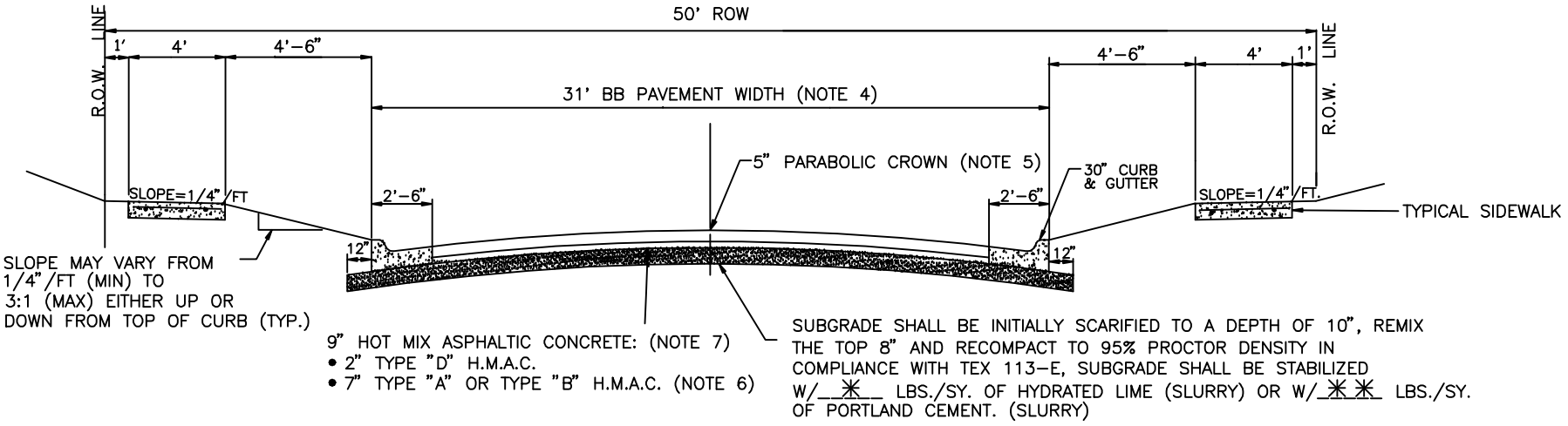
CONCRETE STREET SECTION

CITY OF COLLEYVILLE TEXAS

DEC 2013

P-1



31' H.M.A.C. PAVEMENT SECTION
TYPICAL CROSS SECTION

NTS

NOTES:

1. FOR 30" GUTTER DETAIL, SEE CURB & GUTTER DETAILS.
✳ 2. LIME SHALL BE APPLIED AT 6 % BY WEIGHT MINIMUM QUANTITY IS 54#/SY. IN SOME AREAS A GREATER QUANTITY (OR A LIME SERIES TEST) MAY BE REQUIRED AT THE CITY'S DISCRETION.
✳✳ 3. CEMENT SHALL BE APPLIED AT 5% BY WEIGHT. MINIMUM QUANTITY IS 45#/SY.
4. 43' BB FOR 2-LANE COLLECTOR, 49' BB FOR 4-LANE COLLECTOR
5. 6" CROWN FOR COLLECTOR.
6. 8" THICKNESS FOR COLLECTOR.
7. 10" THICKNESS FOR COLLECTOR.
8. MAX R.A.P. (TYPE-B)=15%, (TYPE-D)=5%

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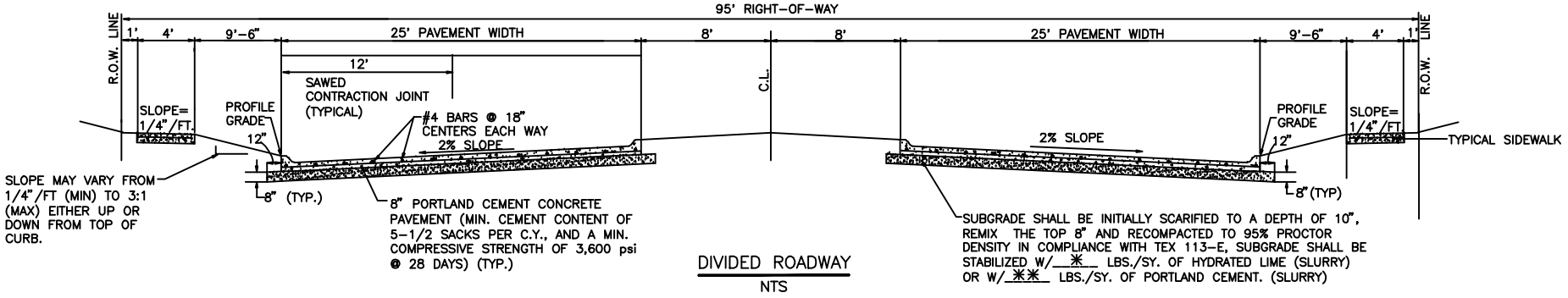
HMAC STREET SECTION

CITY OF COLLEYVILLE TEXAS

DEC 2013

P-2



DIVIDED ROADWAY

NTS

NOTES:

1. TRANSVERSE SAWED CONTRACTION JOINTS AT 15' INTERVALS AND LONGITUDINAL SAWED CONTRACTION JOINTS 12' FROM OUTSIDE BACK OF CURBS.

✳ 2. LIME SHALL BE APPLIED AT 6% BY WEIGHT MINIMUM QUANTITY IS 36#/SY. IN SOME AREAS A GREATER QUANTITY (OR A LIME SERIES TEST) MAY BE REQUIRED AT THE CITY'S DISCRETION.

✳✳ 3. CEMENT SHALL BE APPLIED AT 5% BY WEIGHT. MINIMUM QUANTITY IS 30#/SY.

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CONCRETE ARTERIAL STREET

CITY OF COLLEYVILLE TEXAS

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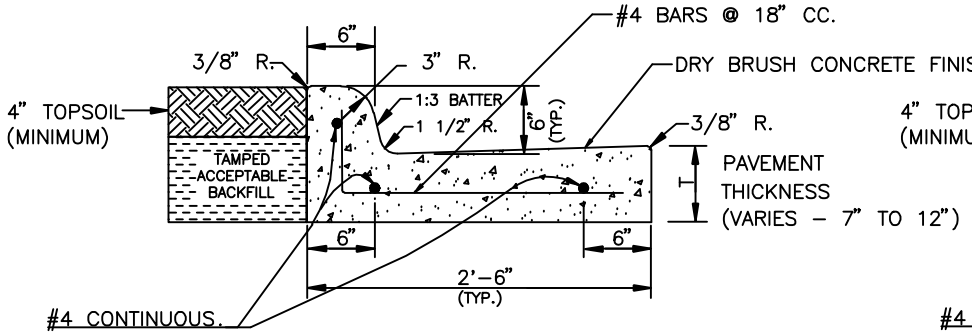
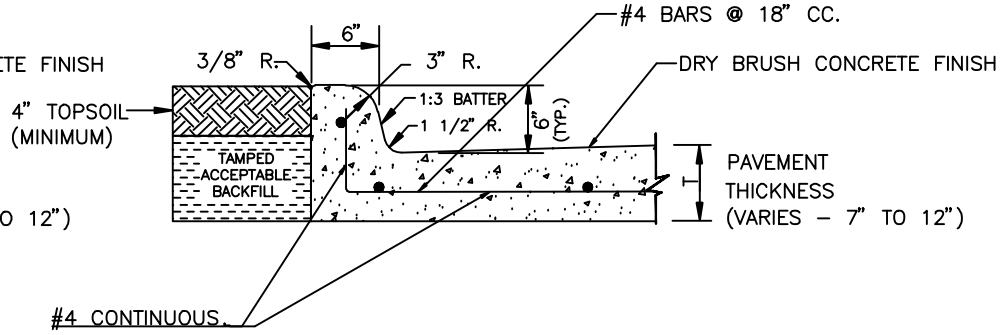


SEPARATE

N.T.S.



INTEGRAL

N.T.S.

NOTES:

1. TOOLED JOINTS SHALL BE PLACED AT FIVE FOOT INTERVALS OR MATCHING ABUTTING SIDEWALK JOINTS AND PAVEMENT JOINTS.
2. EXPANSION JOINTS SHALL BE PLACED AT ALL INTERSECTIONS PC'S, PT'S, DRIVEWAYS, INLETS, OTHER CURB AND GUTTER OR EVERY 200 FEET.
3. CONCRETE SHALL BE 5 1/2 SACK – 3600 PSI.
4. MOUNTABLE CURBS ARE NOT ALLOWED.

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CONCRETE CURB & GUTTER

CITY OF COLLEYVILLE TEXAS

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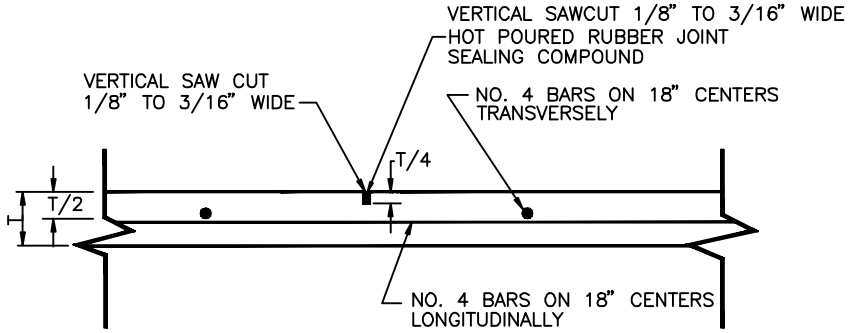
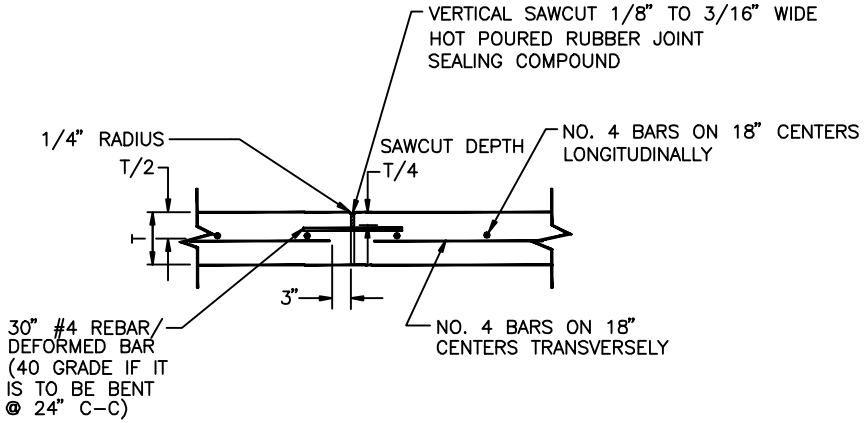


NOTE: TRANSVERSE JOINTS SHALL BE PLACED AT 15'

SAWED CONTRACTION JOINT

NTS



LONGITUDINAL CONSTRUCTION JOINT

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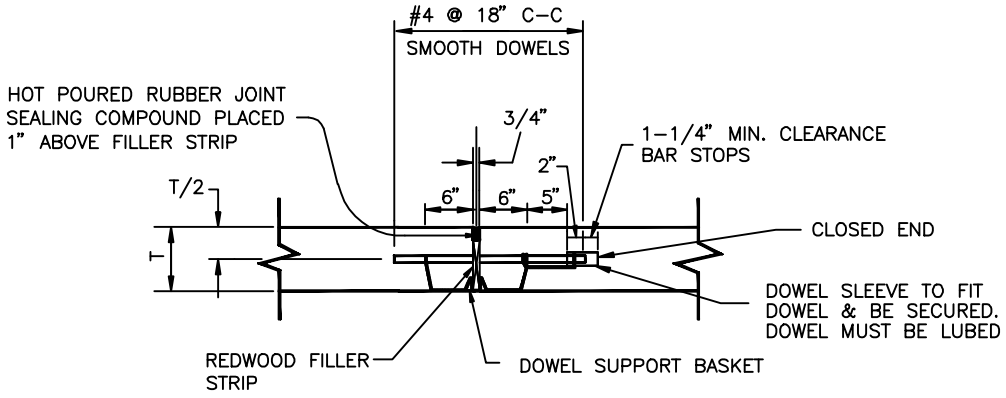

NOTES:
1. PAVEMENT STEEL IS NOT SHOWN FOR CLARITY AND SHALL STOP 3 INCHES FROM JOINT.
2. EXPANSION JOINTS SHALL BE PLACED AT ALL POINTS OF CURVATURE, POINTS OF TANGENCY AND ALL INTERSECTION CURB RETURN POINTS. MAXIMUM SPACING SHALL BE 600 FEET.

TRANSVERSE EXPANSION JOINT

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PAVEMENT JOINTS

CITY OF COLLEYVILLE TEXAS

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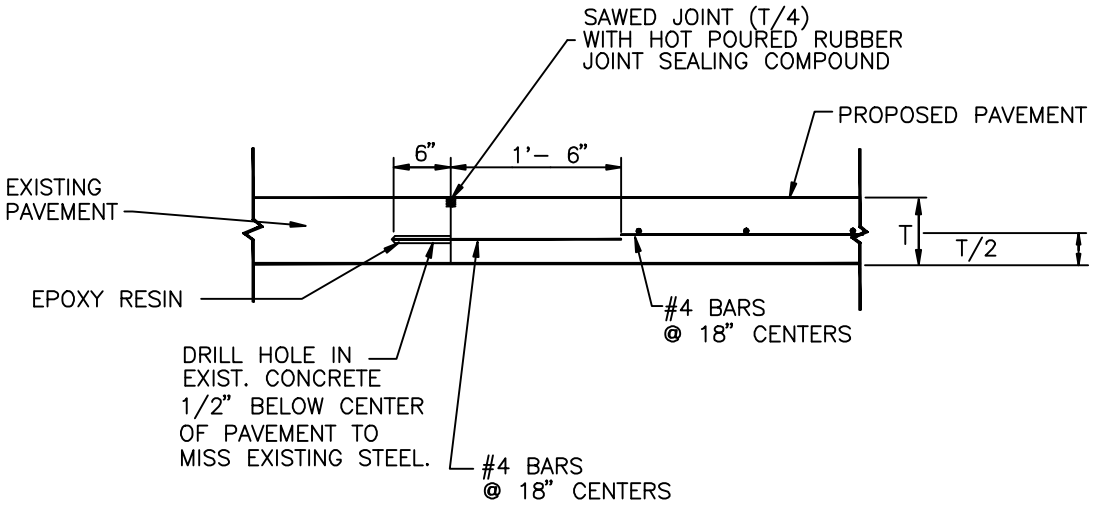
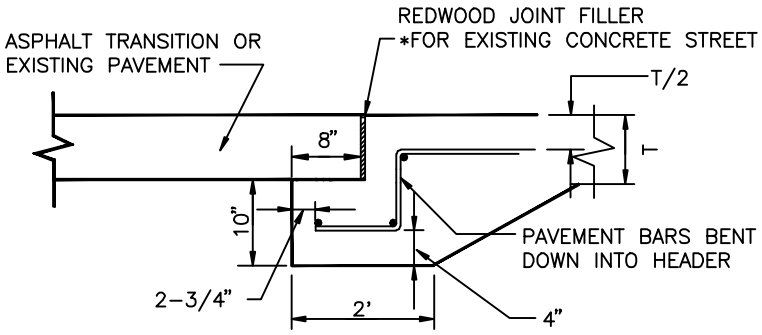


EPOXY TIE BAR

NTS



NOTE: PAVEMENT & HEADER TO BE POURED MONOLITHICALLY

PAVEMENT HEADER

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PAVEMENT HEADER, EPOXY TIE BAR

CITY OF COLLEYVILLE TEXAS

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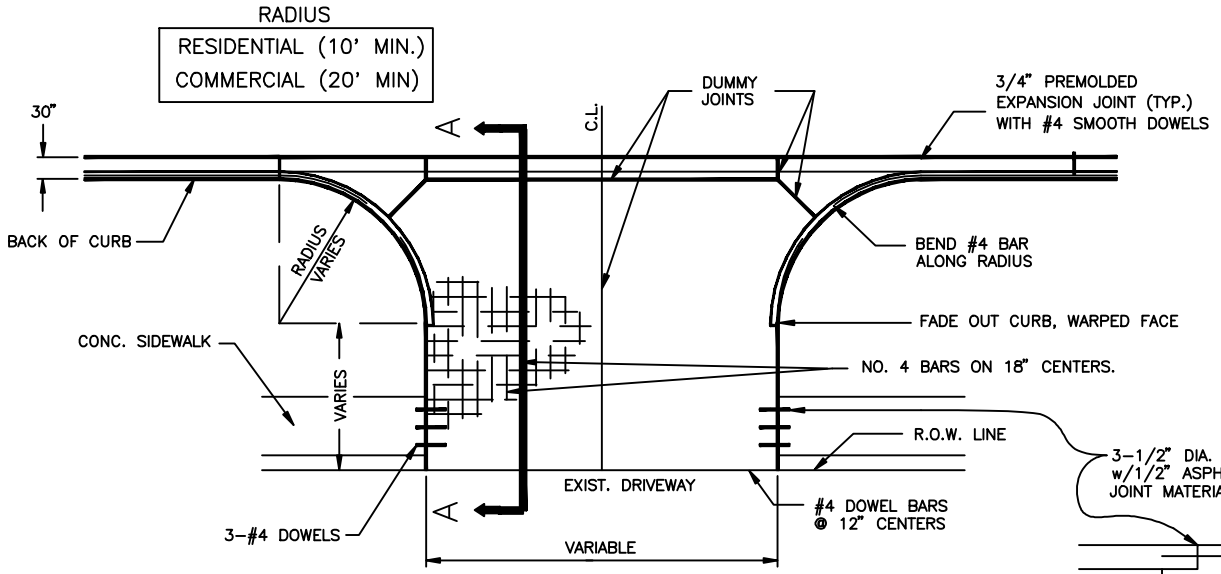
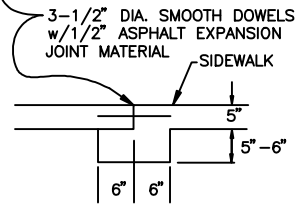
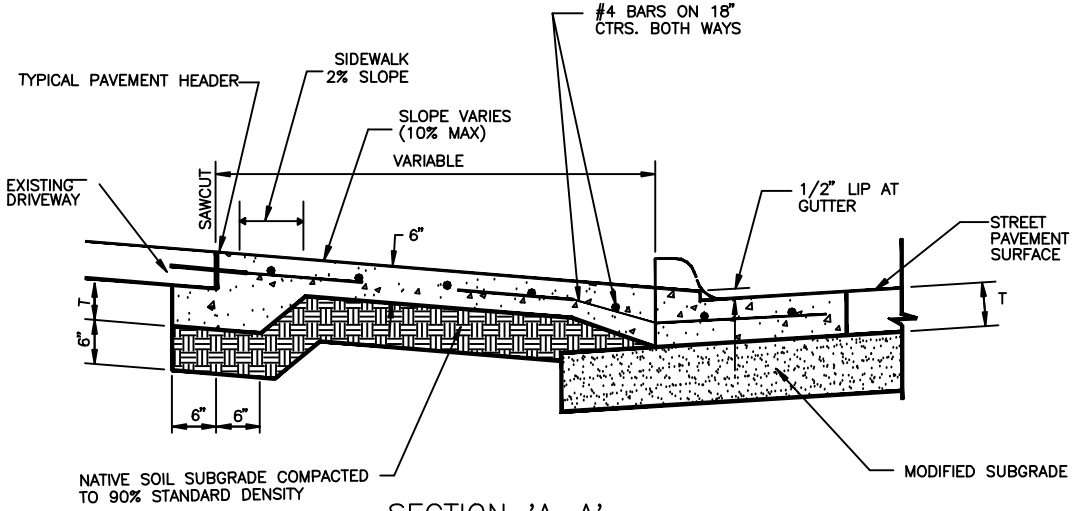


TYPICAL DRIVE APPROACH

NTS



TYPICAL SIDEWALK CONNECTION TO A DRIVE APPROACH



SECTION 'A-A'
(FOR TYPICAL DRIVE APPROACH)

NTS

NOTES:

(1) THE SLOPE OF THE DRIVE WHERE SIDEWALKS CROSS SHALL BE A MAXIMUM 2% . SIDEWALK SHALL BE CONNECTED TO DRIVE WITH #4 BARS ON 18" CENTERS.

(2) REMOVE ANY EXISTING SIDEWALK AT NEAREST JOINT AND CONNECT REPLACED SECTION TO DRIVE WITH 3-#4 SMOOTH DOWELS WITH 1/2" PREMOLDED EXPANSION MATERIAL.

(3) FOR APPROACH CONNECTING TO EXISTING STREET SAWCUT AND REMOVE TO 30" FROM BACK OF CURB OR EXISTING GUTTER LINE.

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TYPICAL DRIVE APPROACH

CITY OF COLLEYVILLE TEXAS

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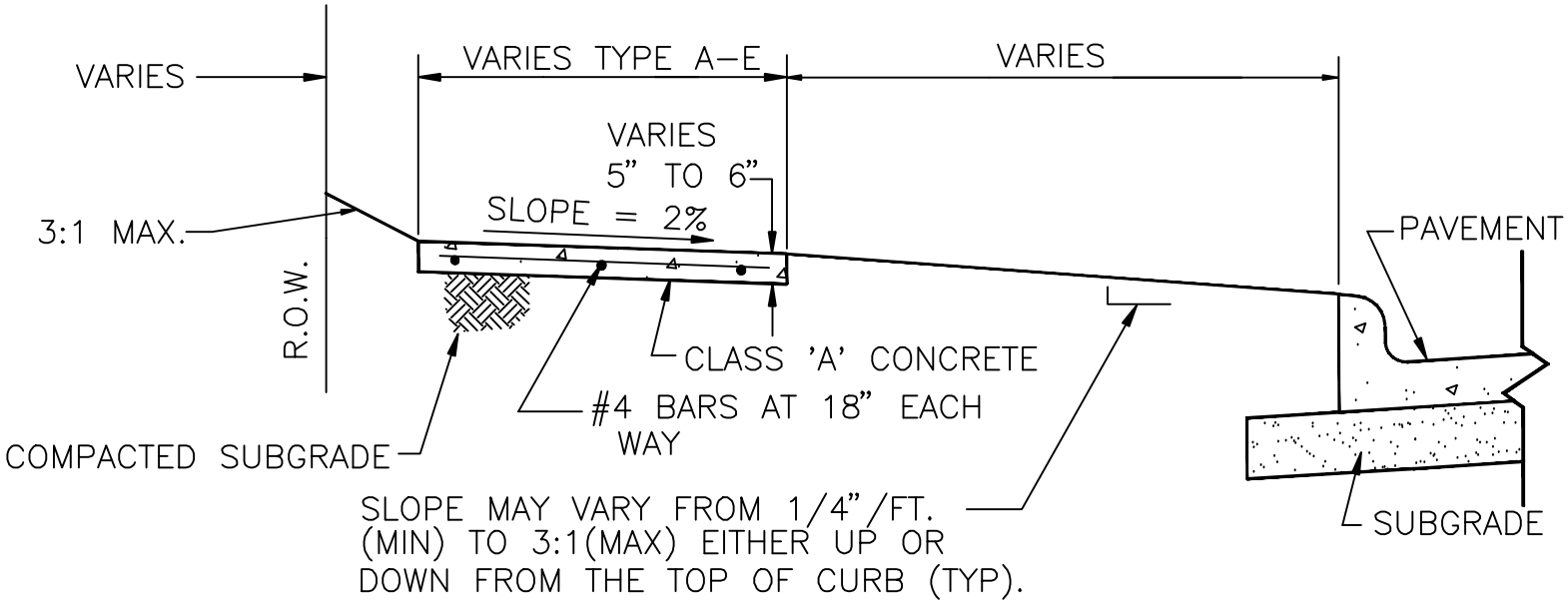
WIDTH & THICKNESS

TYPE A – 4'–0" (5" THICK) (ADA : 5' WIDE PASSING LANE EVERY 200')
TYPE B – 5'–0" (5" THICK)
TYPE C – 8'–0" (6" THICK)
TYPE D – 10'–0" (6" THICK)
TYPE E – 12'–6" (6" THICK)



NOTE: TRANSVERSE EXPANSION JOINT (REDWOOD) EVERY 40', (USE #4 SMOOTH DOWELS)

SIDEWALK

NTS

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SIDEWALK

CITY OF COLLEYVILLE TEXAS

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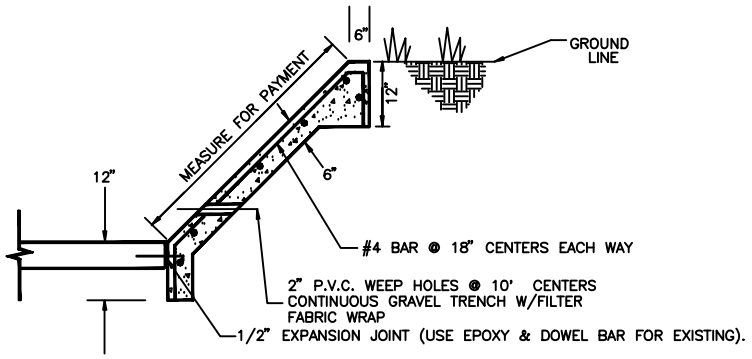
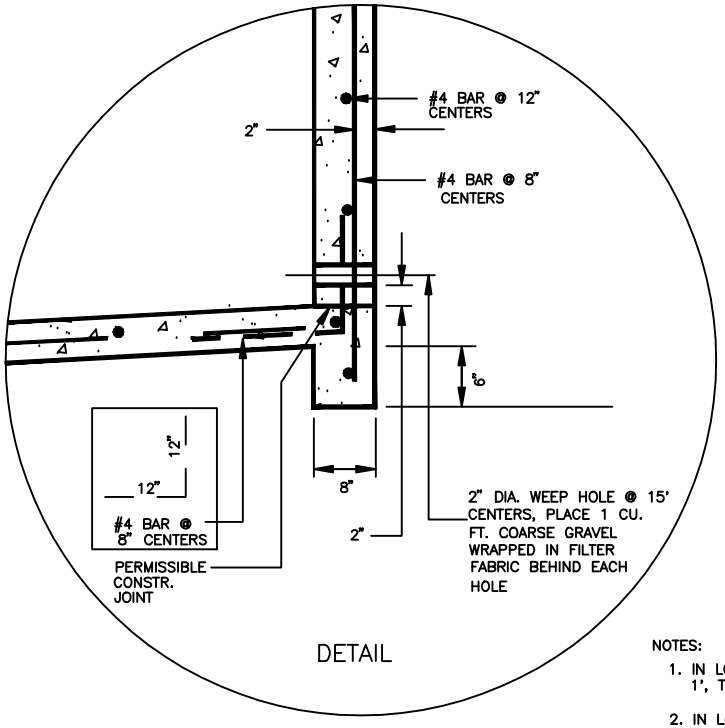
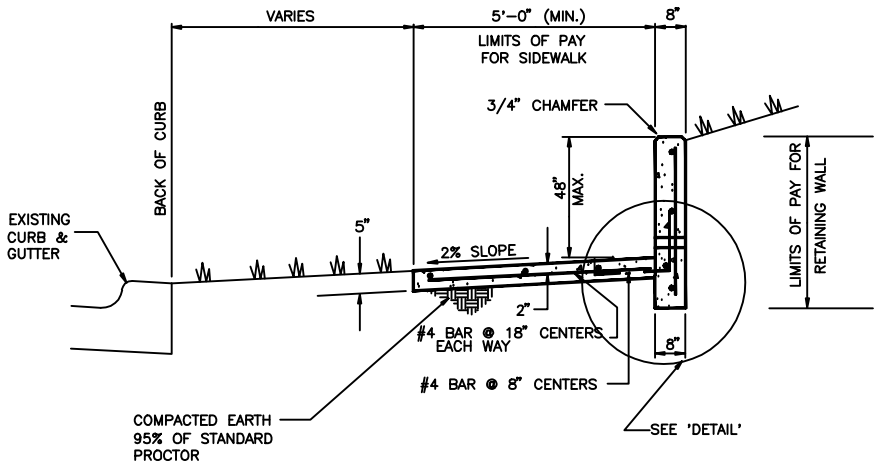
MAXIMUM VERTICAL HEIGHT IS 5'
MAXIMUM SLOPE 1.5H TO 1V

NOTES:
1. STEEL TO BE TIED AND CHAIRED AS NECESSARY TO PLACE STEEL IN CENTER OF 6" SECTION.
2. CONCRETE TO HAVE COMPRESSIVE STRENGTH OF 3,000 psi at 28 DAYS
3. PLACE CONTRACTION/DUMMY JOINTS AT 20' CENTERS AND MATCH EXPANSION JOINTS IN SIDEWALK.
4. FENCE POSTS ARE NOT PERMITTED IN THE CONCRETE.



TYPICAL RIP-RAP
ADJACENT TO SIDEWALK
NTS





NOTES:
1. IN LOCATIONS WHERE WALL HEIGHT DOES NOT EXCEED 1', THE TOE WALL AND WEEP HOLES CAN BE OMITTED.
2. IN LOCATIONS WHERE WALL IS 36" TO 48" THE TOE WALL SHALL BE 1' DEPTH.
3. STEEL REINFORCING IN WALL SHALL BE #4 BARS @ 12" CENTERS HORIZONTALLY AND #4 BARS @ 8" CENTERS VERTICALLY.
4. REDWOOD JOINTS IN WALL SHALL MATCH REDWOOD JOINTS IN THE SIDEWALK. THE WALL SHALL BE DOUBLE CHAMFERED AT THE REDWOOD LOCATIONS.
5. ENDS OF WALL SHALL ALSO BE CHAMFERED.
6. CONCRETE TO HAVE COMPRESSIVE STRENGTH OF 3000 psi AT 28 DAYS.

SIDEWALK WITH WALL
NTS

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SIDEWALK WALL, RIP RAP.

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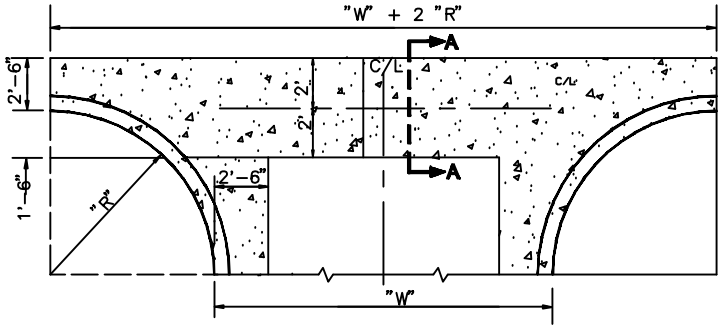
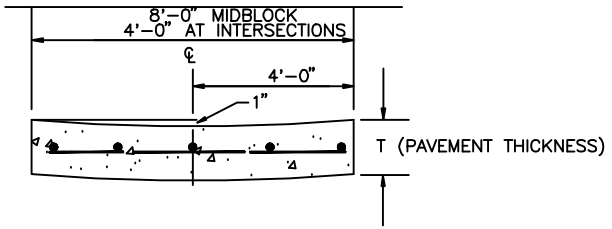


NOTE:
ALL CONCRETE FOR VALLEY GUTTER SHALL BE CLASS "A". REINFORCING STEEL SHALL BE NO. 4 BARS ON 12" CENTERS BOTH WAYS.

VALLEY GUTTER PLAN
NTS



SECTION A–A
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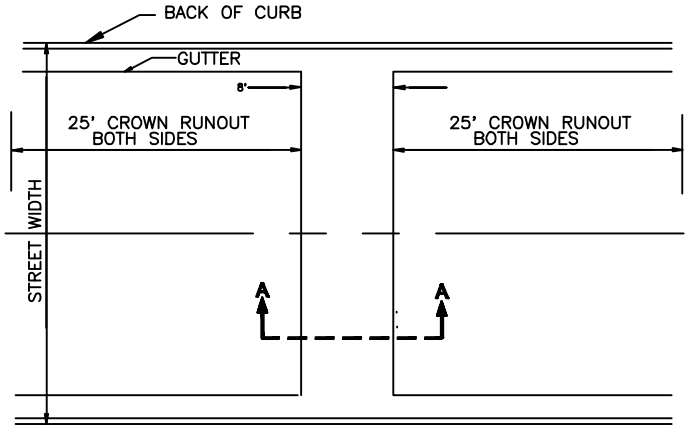

VALLEY GUTTER CROSSING
AN ASPHALT STREET
NTS

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CONCRETE VALLEY GUTTER

CITY OF COLLEYVILLE TEXAS

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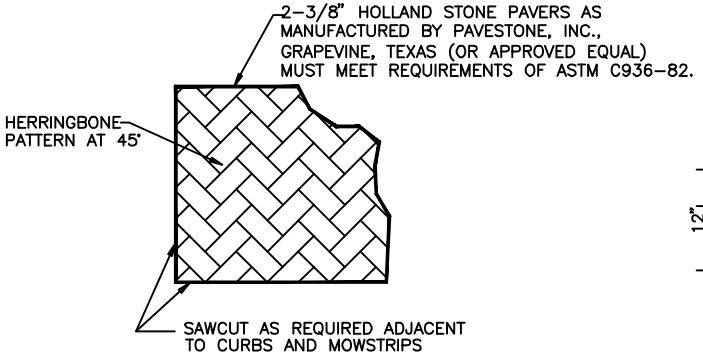
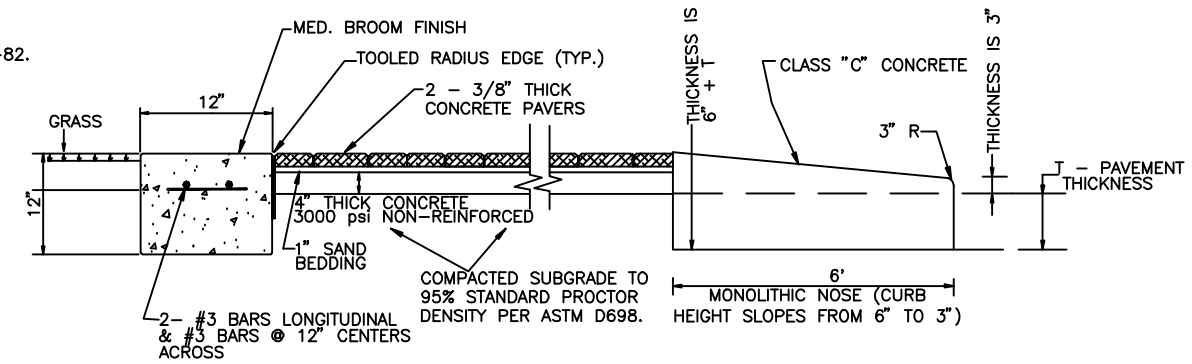
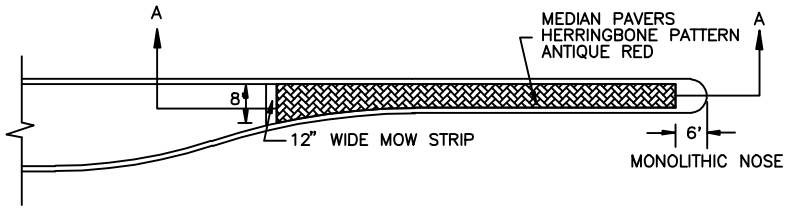


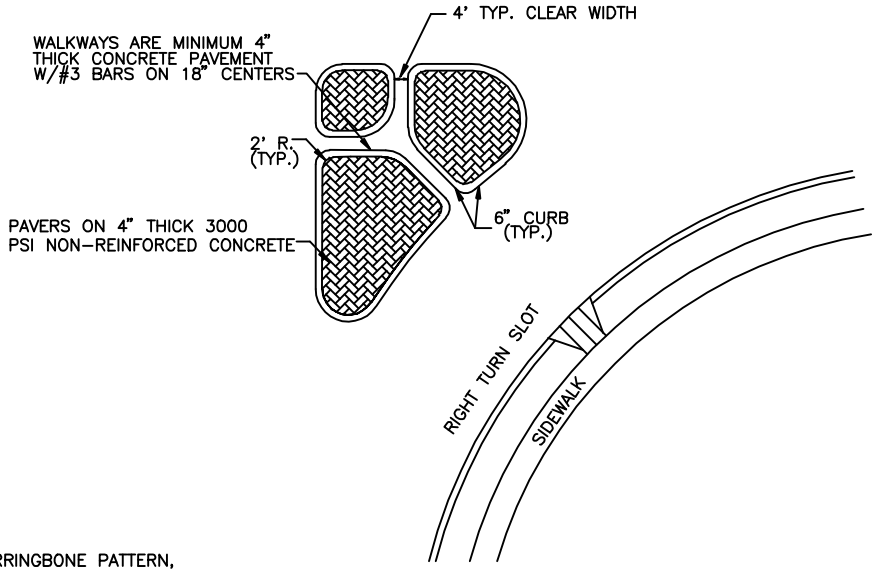
CONCRETE PAVER PATTERN



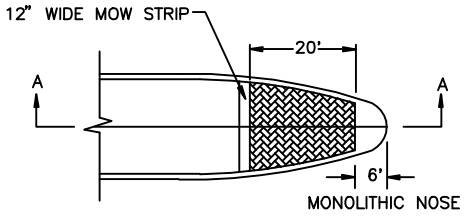
SECTION A-A



MEDIANS LESS THAN 8 FEET WIDE



TYPICAL ISLAND AT INTERSECTION



MEDIAN GREATER THAN 8 FEET WIDE

GENERAL NOTES:

1. INTERLOCKING CONCRETE PAVER HERRINGBONE PATTERN, ANTIQUE RED.
2. 1/2" PREMOLDED ASPHALTIC FIBER EXPANSION JOINT MATERIAL ANY PLACE WHERE CONCRETE ABUTS CONCRETE.
3. STEEL REINFORCING UNDER MEDIAN NOSE IS SAME AS PAVEMENT REQUIREMENT.
4. CONCRETE UNDER PAVERS IS NON-REINFORCED.

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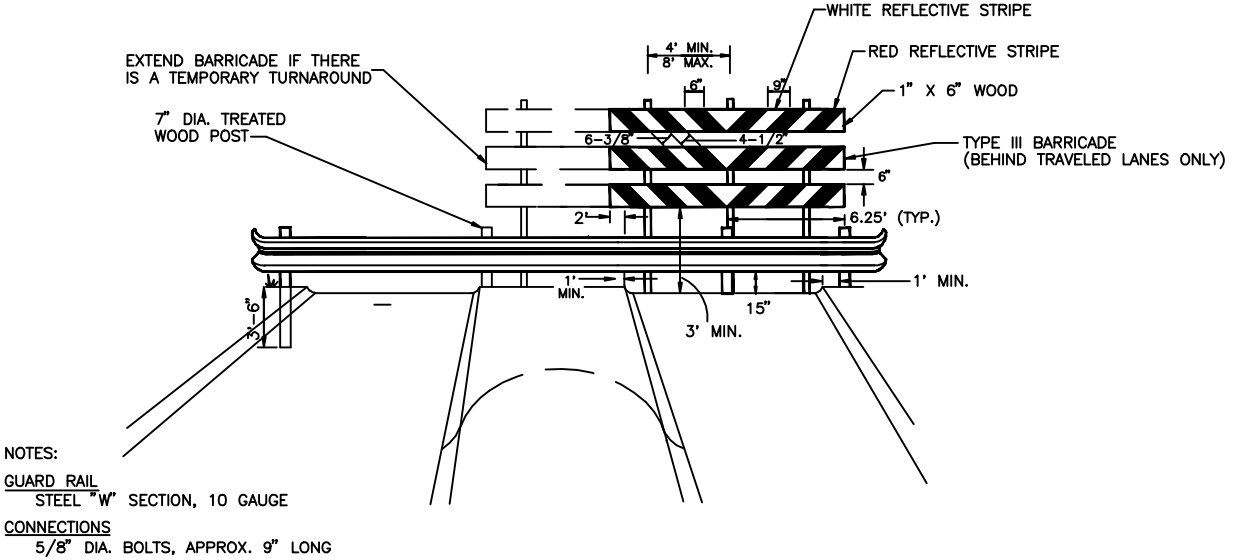
MEDIAN NOSE DETAILS

CITY OF COLLEYVILLE TEXAS

DEC 2013



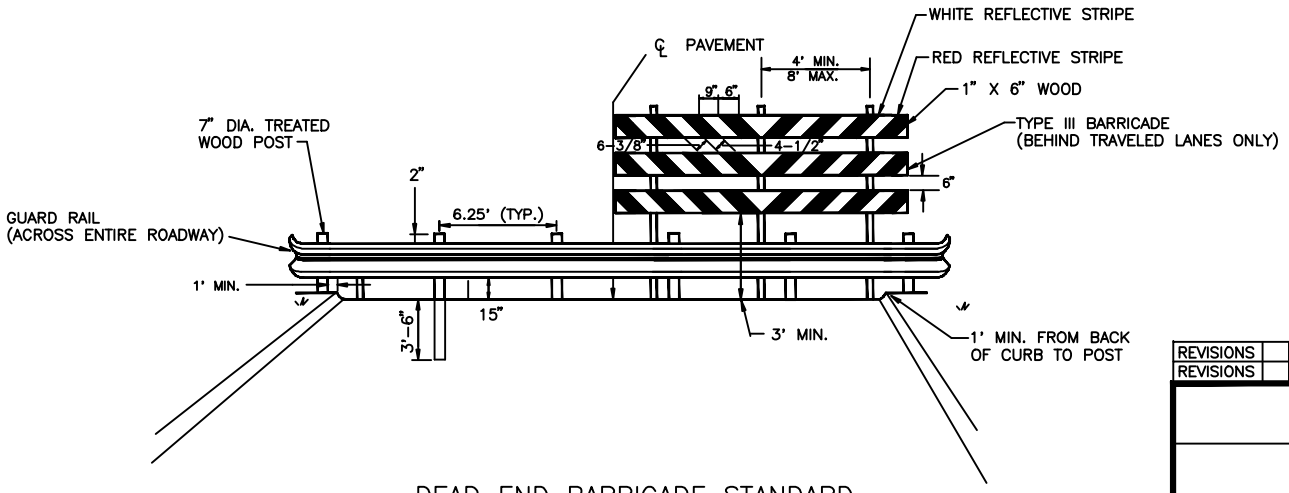
NOTES:

GUARD RAIL
STEEL "W" SECTION, 10 GAUGE

CONNECTIONS
5/8" DIA. BOLTS, APPROX. 9" LONG

DEAD END BARRICADE STANDARD
DIVIDED ROADWAY

NTS



DEAD END BARRICADE STANDARD
UNDIVIDED ROADWAY

NTS

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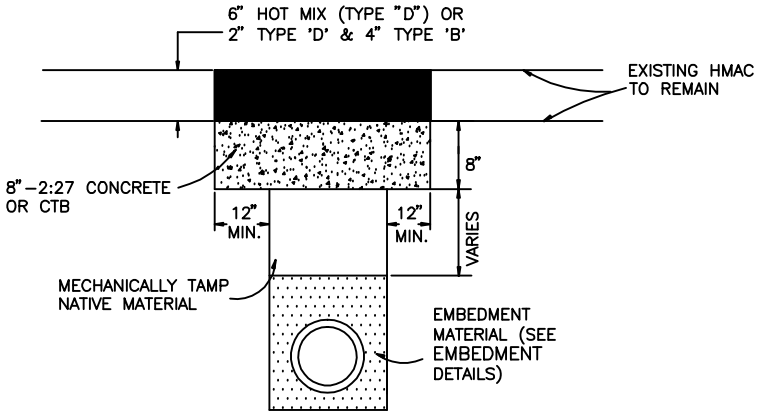
DEAD END BARRICADE

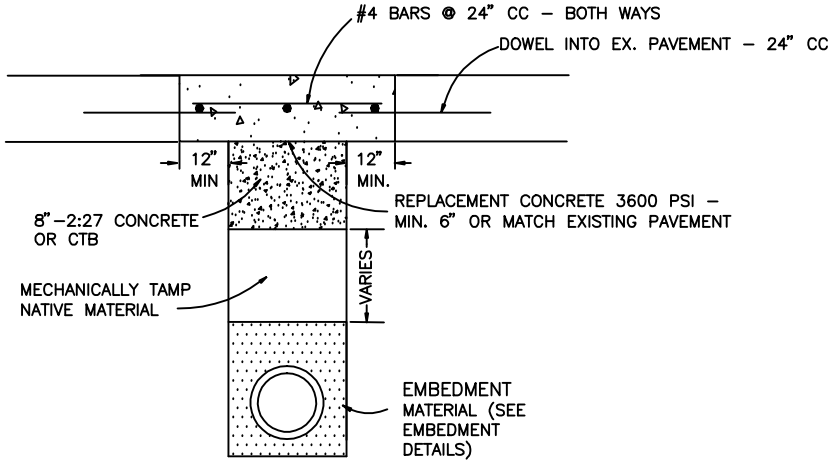
CITY OF COLLEYVILLE TEXAS

DEC 2013

P-12



ASPHALT PAVEMENT



REINFORCED CONCRETE PAVEMENT

NOTES:

1. A SAW SHALL BE USED TO CUT ASPHALT OR CONCRETE FULL DEPTH PRIOR TO OPENING THE DITCH IN ORDER TO INSURE A NEAT STRAIGHT EDGE. BROKEN OR SPALLED EDGES WILL BE RE–SAWED FULL DEPTH BETWEEN JOINTS OR FULL LENGTH OF CUT.
2. CTB – CEMENT TREATED BASE (CONTAINS AGGREGATE) MATERIAL SHALL BE MECHANICALLY TAMPED.

REVISIONS	
REVISIONS	

EXISTING STREET BACKFILL & REPAIR

CITY OF COLLEYVILLE TEXAS

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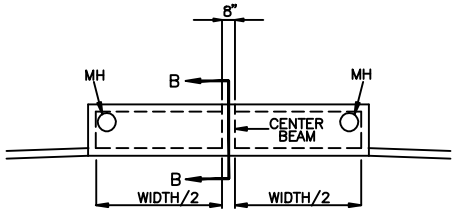
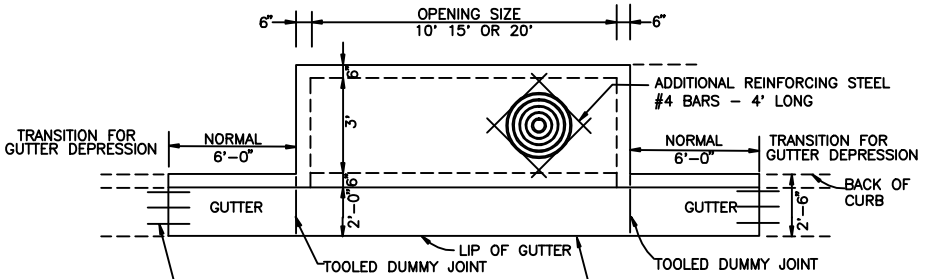


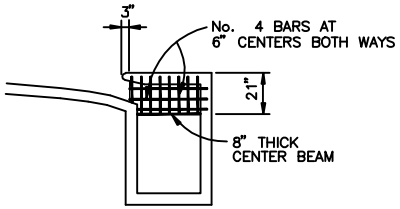
CENTER BEAM FOR 15' AND 20' INLETS

N.T.S



GENERAL NOTES:

1. REINFORCING STEEL SHALL BE #4 BARS ON 12" CENTERS BOTH WAYS FOR GUTTER, BOTTOM SLAB, ENDS, FRONT AND BACK WALLS, AND #4 BARS ON 6" CENTERS BOTH WAYS FOR TOP SLAB. AN ADDITIONAL #6 BAR SHALL BE PLACED IN THE FRONT EDGE OF THE TOP SLAB IN THE INLETS AND ADDITIONAL REINFORCING STEEL SHALL BE PLACED AROUND MANHOLES AS SHOWN.
2. ALL REINFORCING STEEL SHALL BE GRADE 60.
3. ALL CONCRETE SHALL BE CLASS "A".
4. ALL EXPOSED CORNERS SHALL BE CHAMFERED 3/4"
5. ALL REINFORCING STEEL SHALL HAVE A MINIMUM COVER OF 2".
6. ALL BACKFILLING SHALL BE PERFORMED BY MECHANICAL TAMPING TO 95% STANDARD PROCTOR DENSITY.
7. IF MODIFYING AN INLET, I.E. CREATING AN OPEN BACK INLET, THE TOP SHALL BE REMOVED AND RECONSTRUCTED.
8. LOCATION OF MANHOLE OPENING TO BE AT OUTFALL END.
9. ALL 15' AND 20' INLETS WILL REQUIRE TWO MANHOLES ONLY IF THE INSIDE HEIGHT (UNDER THE CENTER BEAM) IS LESS THAN FOUR FEET.
10. LIGHT BROOM FINISH ON ALL SURFACES.
11. SEE SHEET S-10 FOR MANHOLE FRAME AND COVER. CHANGE 'SANITARY SEWER' TO 'STORM DRAIN'.

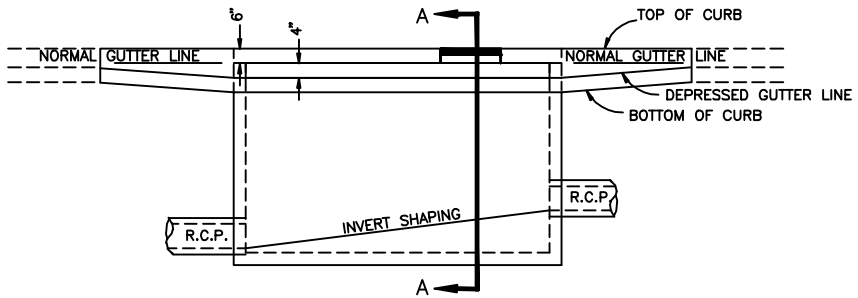


SECTION B-B

N.T.S

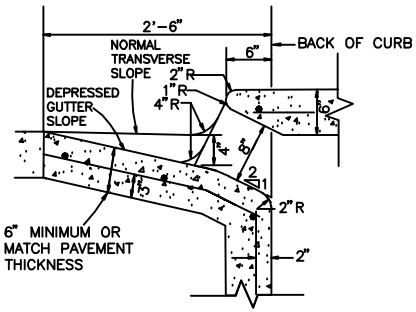
NOTES:

1. ALL 15' AND 20' INLETS WILL REQUIRE A CENTER SUPPORT BEAM
2. ALL OPEN BACK INLETS WILL REQUIRE A CENTER BEAM, REGARDLESS OF INLET TYPE OR SIZE.



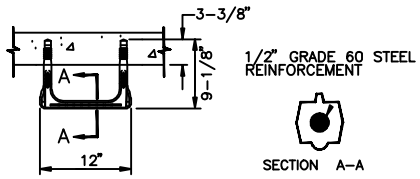
CURB INLET

N.T.S



THROAT DETAIL FOR STANDARD INLETS ON CONCRETE STREETS

NTS

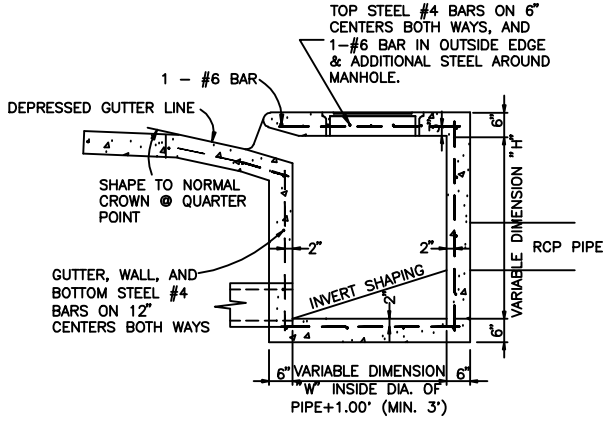


NON-CORROSIVE STEPS

N.T.S.

NOTES:

1. STEPS SHALL CONFORM TO ASTM C478-88a.
2. M.A. IND. INC. NUMBER "PS1-PF" STEPS OR AMERICAN STEP CO., INC. NUMBER ML-10 OR APPROVED EQUAL TO BE INSTALLED PER MANUFACTURERS DIRECTION.
3. STEPS ARE REQUIRED FOR ALL INLETS 4' AND DEEPER.
4. STEPS SHALL BE PLACED 12" ON CENTERS VERTICALLY AND STAGGERED 12" ON CENTERS HORIZONTALLY.
5. THE TOP STEP SHALL BE NO GREATER THAN 1' BELOW THE INSIDE OF THE TOP OF THE INLET, AND THE BOTTOM STEP SHALL BE NO HIGHER THAN 2' FROM THE FLOOR.
6. STEPS SHALL BE PLACED ON A WALL WHICH WILL NOT CONFLICT WITH THE PIPE(S) AND SHALL BE EASILY ACCESSIBLE FROM THE MANHOLE OPENING.



A-A

CURB INLET

CROSS SECTION

N.T.S

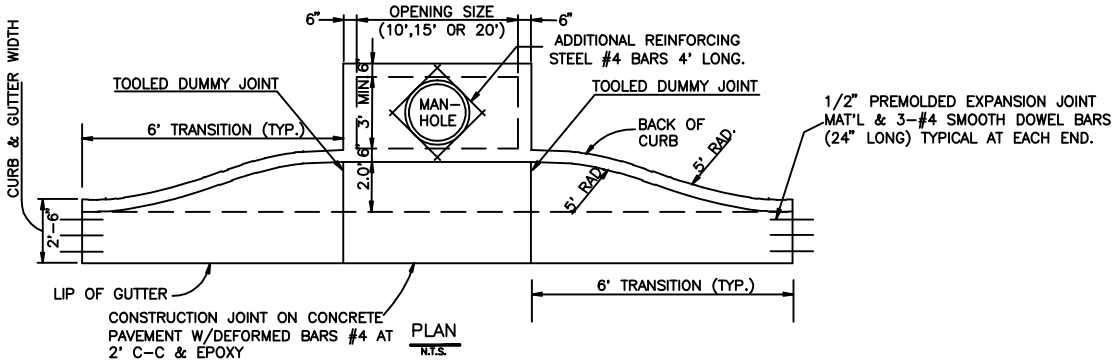
REVISIONS	
REVISIONS	

STANDARD CURB INLET

CITY OF COLLEYVILLE TEXAS

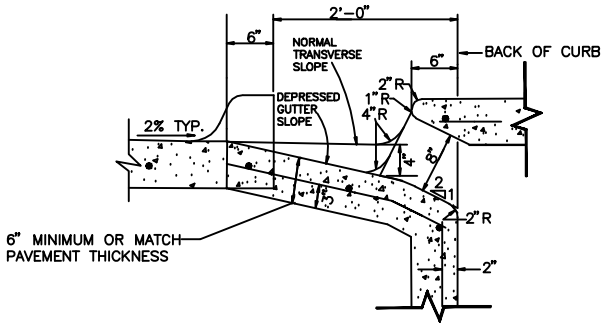
DEC 2013

D-1



CURB INLET RECESSED
10', 15' OR 20' OPENING

N.T.S



THROAT DETAIL FOR RECESSED INLETS
ON CONCRETE STREETS

NTS

NOTES:

1. SEE SHEET D-1 FOR STEPS AND OTHER INLET DETAILS.
2. SEE SHEET S-10 FOR MANHOLE COVER. CHANGE 'SANITARY SEWER' TO 'STORM DRAIN'.

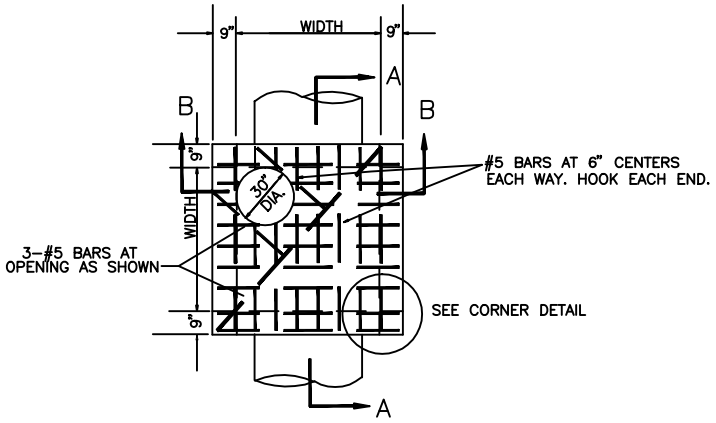
REVISIONS	
REVISIONS	

RECESSED CURB INLET

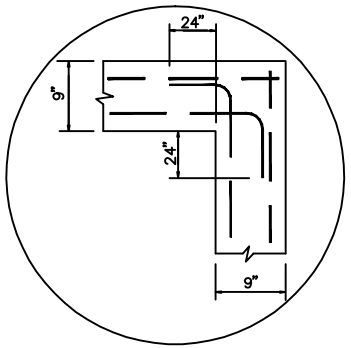
CITY OF COLLEYVILLE TEXAS

DEC 2013

D-2



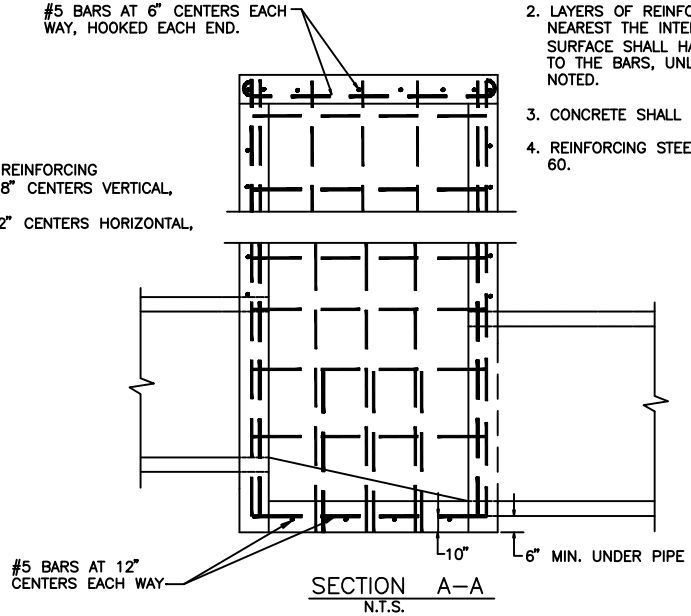
PLAN
N.T.S.



CORNER DETAIL
PLAN VIEW
N.T.S.

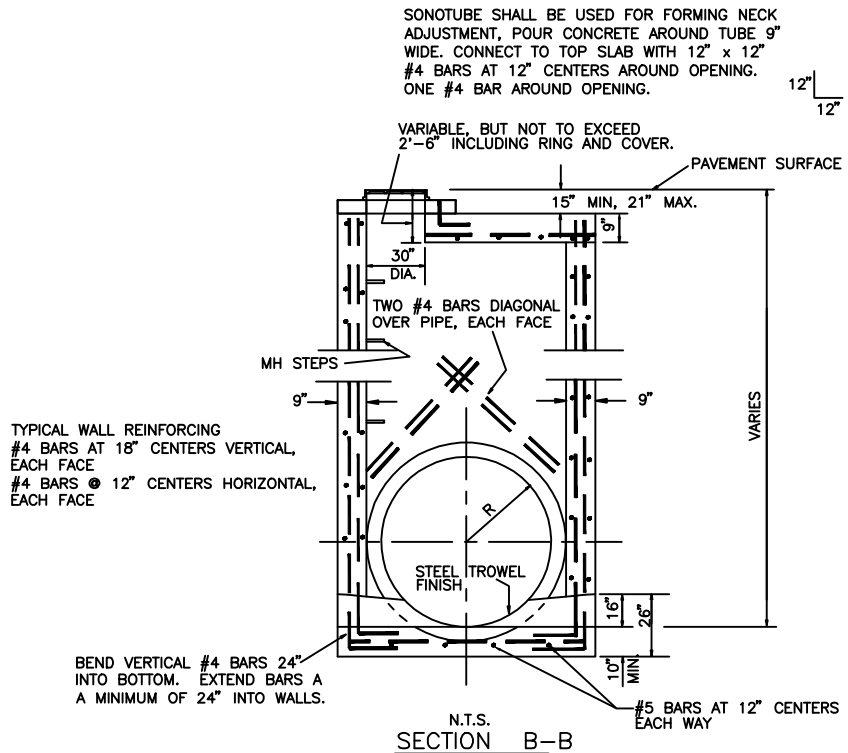
NOTES :

1. SLOPE INVERT OF JUNCTION BOX TO MATCH PIPE FLOWLINES.
2. LAYERS OF REINFORCING STEEL NEAREST THE INTERIOR AND EXTERIOR SURFACE SHALL HAVE A COVER OF 2" TO THE BARS, UNLESS OTHERWISE NOTED.
3. CONCRETE SHALL BE CLASS "A".
4. REINFORCING STEEL TO BE GRADE 60.



SECTION A–A
N.T.S.

SONOTUBE SHALL BE USED FOR FORMING NECK ADJUSTMENT, POUR CONCRETE AROUND TUBE 9" WIDE. CONNECT TO TOP SLAB WITH 12" x 12" #4 BARS AT 12" CENTERS AROUND OPENING. ONE #4 BAR AROUND OPENING.



N.T.S.
SECTION B–B

JUNCTION BOX MAY BE RECTANGULAR BUT NOT LESS THAN 4 FEET IN SHORT DIRECTION.

STORMWATER JUNCTION BOX 4', 5' OR 6' WIDTHS
N.T.S

NOTES:

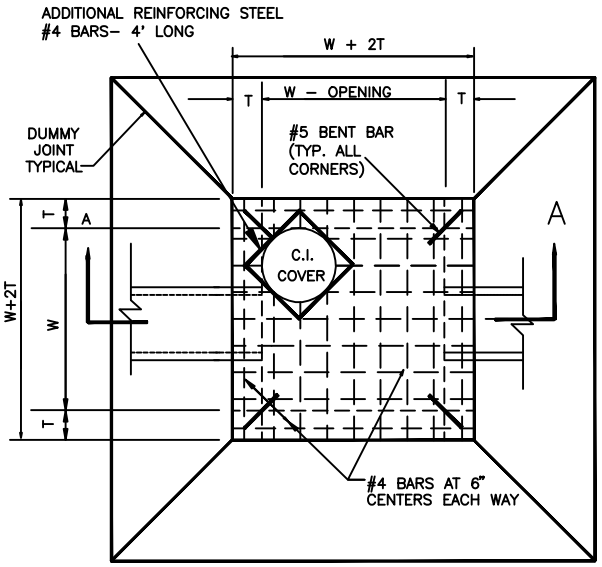
1. SEE SHEET D–1 FOR STEPS AND OTHER INLET DETAILS.
2. SEE SHEET S–10 FOR MANHOLE COVER. CHANGE 'SANITARY SEWER' TO 'STORM DRAIN'.

REVISIONS	
REVISIONS	

STORM SEWER MANHOLE OR JUNCTION BOX

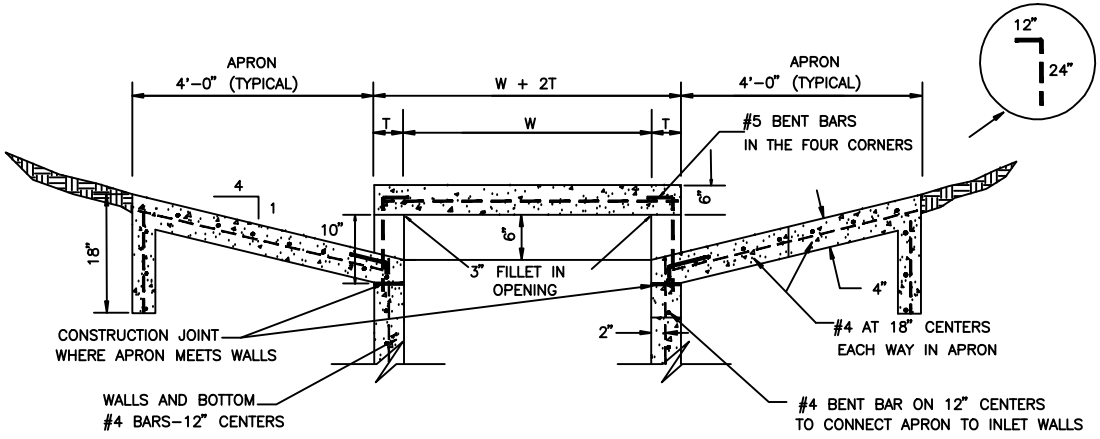
CITY OF COLLEYVILLE TEXAS

DEC 2013



PLAN OF TOP SLAB

N.T.S.



SECTION "A"

N.T.S.

INLET SIZE	T	W
3' SQUARE	6"	3'–0"
4' SQUARE	7"	4'–0"
5' SQUARE	8"	5'–0"
6' SQUARE	9"	6'–0"

GENERAL NOTES:

1. REINFORCING STEEL SHALL BE #4 BARS ON 12" CENTERS BOTH WAYS FOR BOTTOM SLAB AND WALLS, AND #4 BARS ON 6" CENTERS BOTH WAYS FOR TOP SLAB. ADDITIONAL REINFORCING STEEL SHALL BE PLACED AROUND MANHOLES AS SHOWN.
2. ALL REINFORCING STEEL SHALL BE GRADE 60.
3. ALL CONCRETE SHALL BE CLASS "A".
4. ALL EXPOSED CORNERS SHALL BE CHAMFERED 3/4"
5. ALL REINFORCING STEEL SHALL HAVE A MINIMUM COVER OF 2" ON INSIDE FACE WALL.
6. ALL BACKFILLING SHALL BE PERFORMED BY MECHANCIAL TAMPING TO 95% STANDARD PROCTOR DENSITY.
7. ALL DROP INLETS SHALL HAVE ONE OPENING ON EACH SIDE UNLESS OTHERWISE SHOWN ON PLANS.
8. LIGHT BROOM FINISH ON ALL SURFACES.
9. SEE SHEET D–1 FOR STEPS AND OTHER INLET DETAILS.
10. SEE SHEET S–10 FOR MANHOLE COVER. CHANGE 'SANITARY SEWER' TO 'STORM DRAIN'.

REVISIONS	
REVISIONS	

DROP INLET

CITY OF COLLEYVILLE TEXAS

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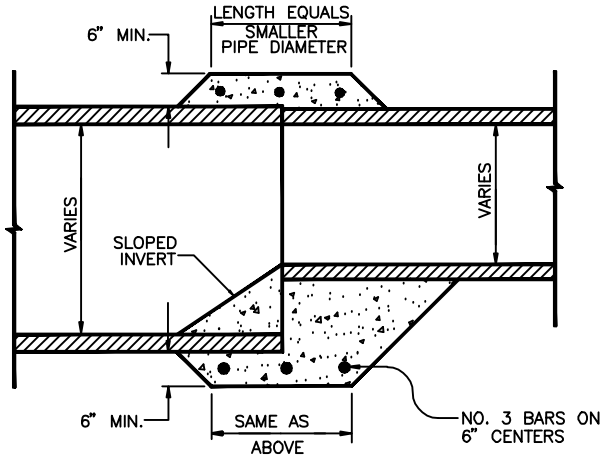


PIPE COLLAR DETAIL

NTS

NOTES

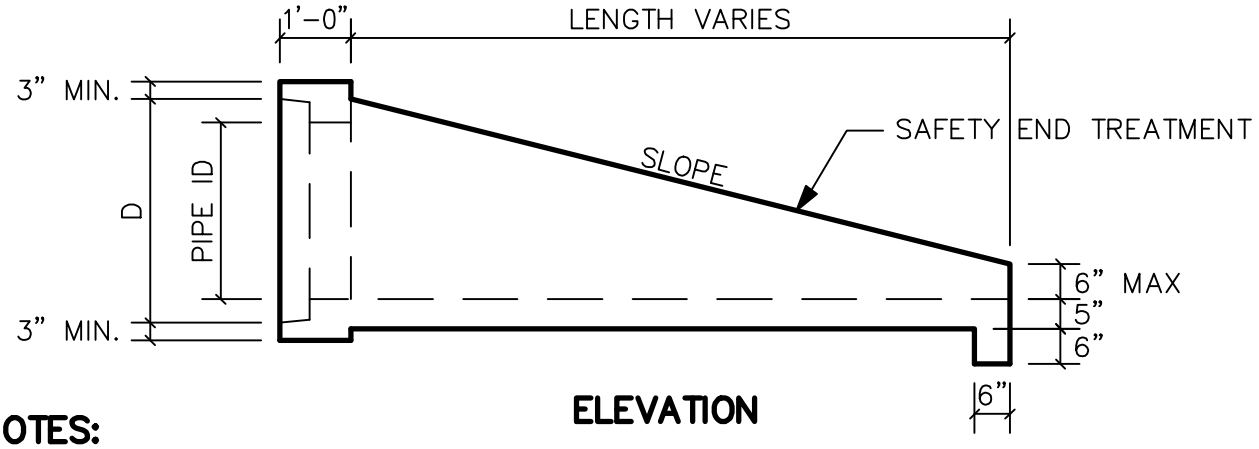
1. THIS PROCEDURE/DETAIL WILL ONLY BE USED WHEN A PREFAB REDUCTION IS NOT POSSIBLE.
2. CONCRETE FOR COLLAR WILL NOT BE PAID FOR DIRECTLY, BUT WILL BE CONSIDERED SUBSIDIARY TO THE VARIOUS OTHER BID ITEMS.
3. CONCRETE SHALL BE 5 SACK 3000 PSI.

REVISIONS	
REVISIONS	

PIPE COLLAR

CITY OF COLLEYVILLE TEXAS

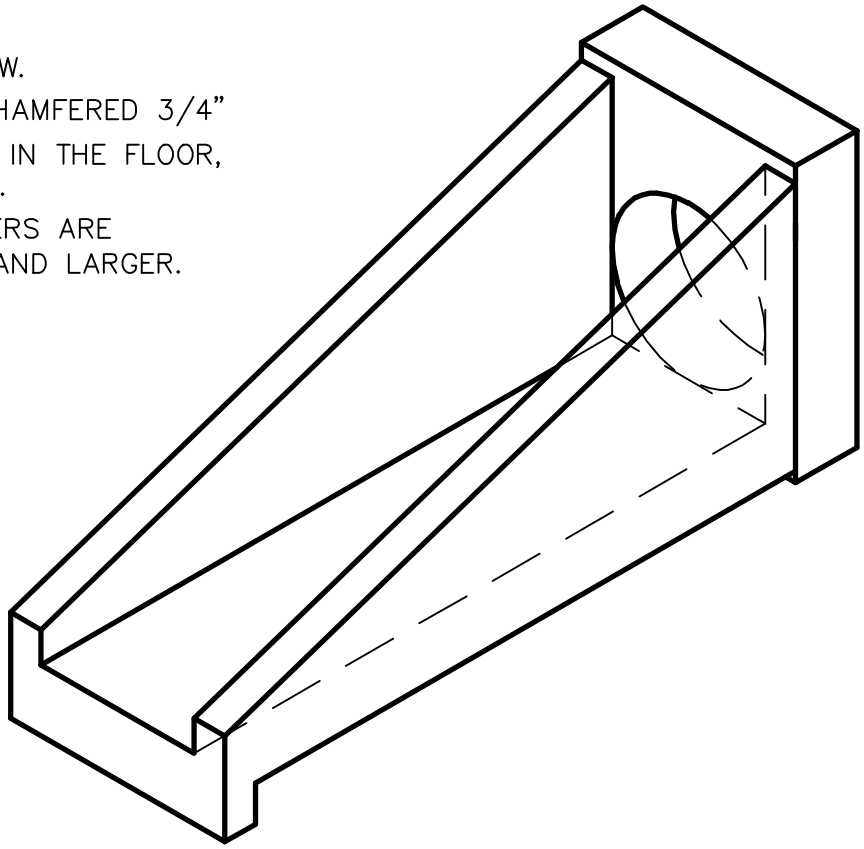
DEC 2013

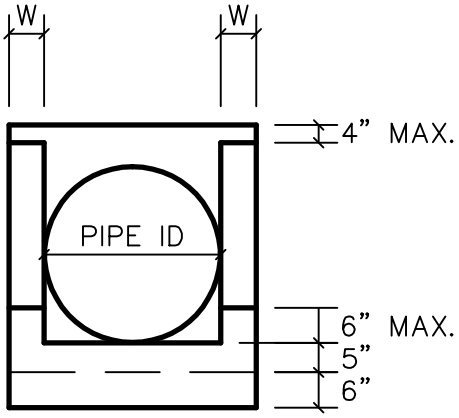


ELEVATION

NOTES:

1. 4500 PSI CONCRETE
2. #4 GRADE 60 REBAR 9" O.C.E.W.
3. ALL EXPOSED CORNERS ARE CHAMFERED 3/4"
4. SWIFT LIFT ANCHORS, LOCATED IN THE FLOOR, SHALL BE USED FOR HANDLING.
5. GALVANIZED STEEL PIPE RUNNERS ARE REQUIRED FOR CULVERTS 36" AND LARGER. USE TXDOT STANDARD.





FRONT ELEVATION

PIPE ID	PIPE OD	SLOPE	D	W
18"	23"	3:1	24"	5"
		4:1		
		6:1		
24"	30"	3:1	31"	5"
		4:1		
		6:1		
30"	37"	3:1	38"	6"
		4:1		
		6:1		
36"	44"	3:1	45-1/2"	6"
		4:1		
		6:1		

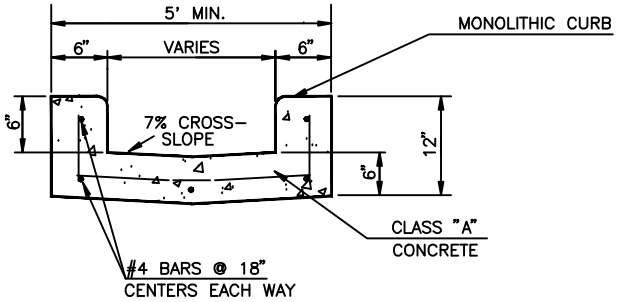
PIPE ID	PIPE OD	SLOPE	D	W
42"	51"	3:1	52-3/4"	8"
		4:1		
		6:1		
48"	58"	3:1	60"	8"
		4:1		
54"	65"	3:1	67"	8"

REVISIONS
REVISIONS

SAFETY END TREATMENT

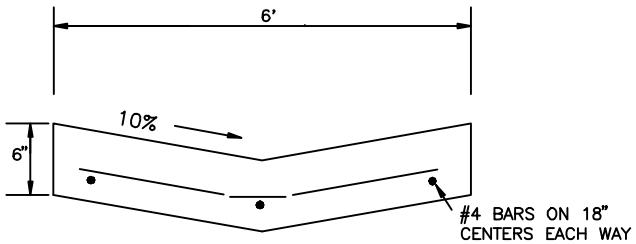
CITY OF COLLEYVILLE TEXAS

DEC 2013



CONCRETE FLUME

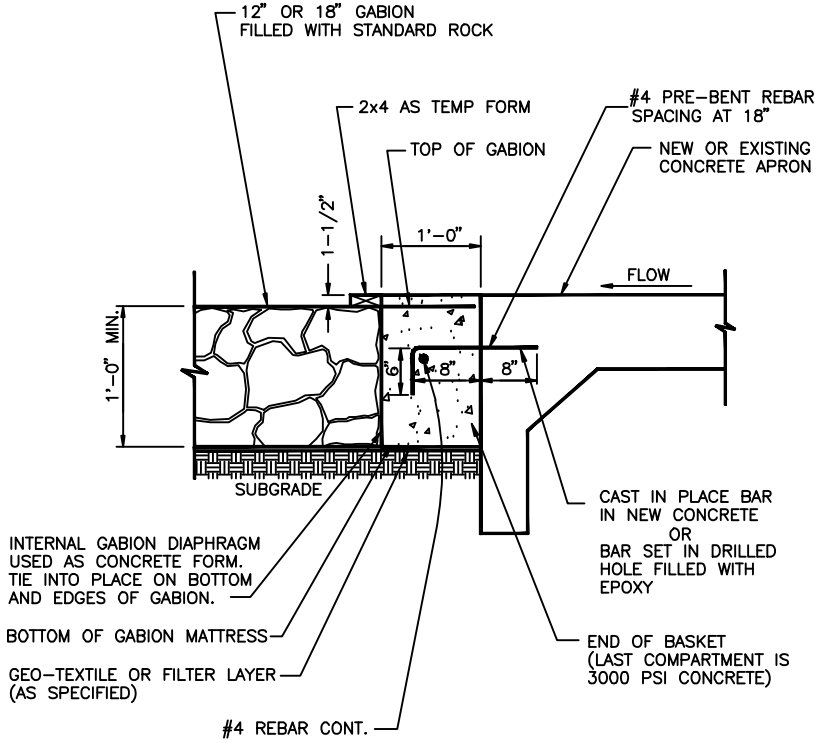
NTS



CURBS MAY BE OMITTED AND USE THE VALLEY SECTION WHEN OVERFLOW IS 10 CFS OR LESS OR WHEN FLOW CAN BE CONTAINED WITHIN THE CONCRETE SECTION.

ALTERNATE

NTS



GABION MATTRESS TO CONCRETE ATTACHMENT DETAIL

NTS

REVISIONS	
REVISIONS	

CONCRETE FLUME
GABION/CONCRETE CONNECTION

CITY OF COLLEYVILLE TEXAS

DEC 2013

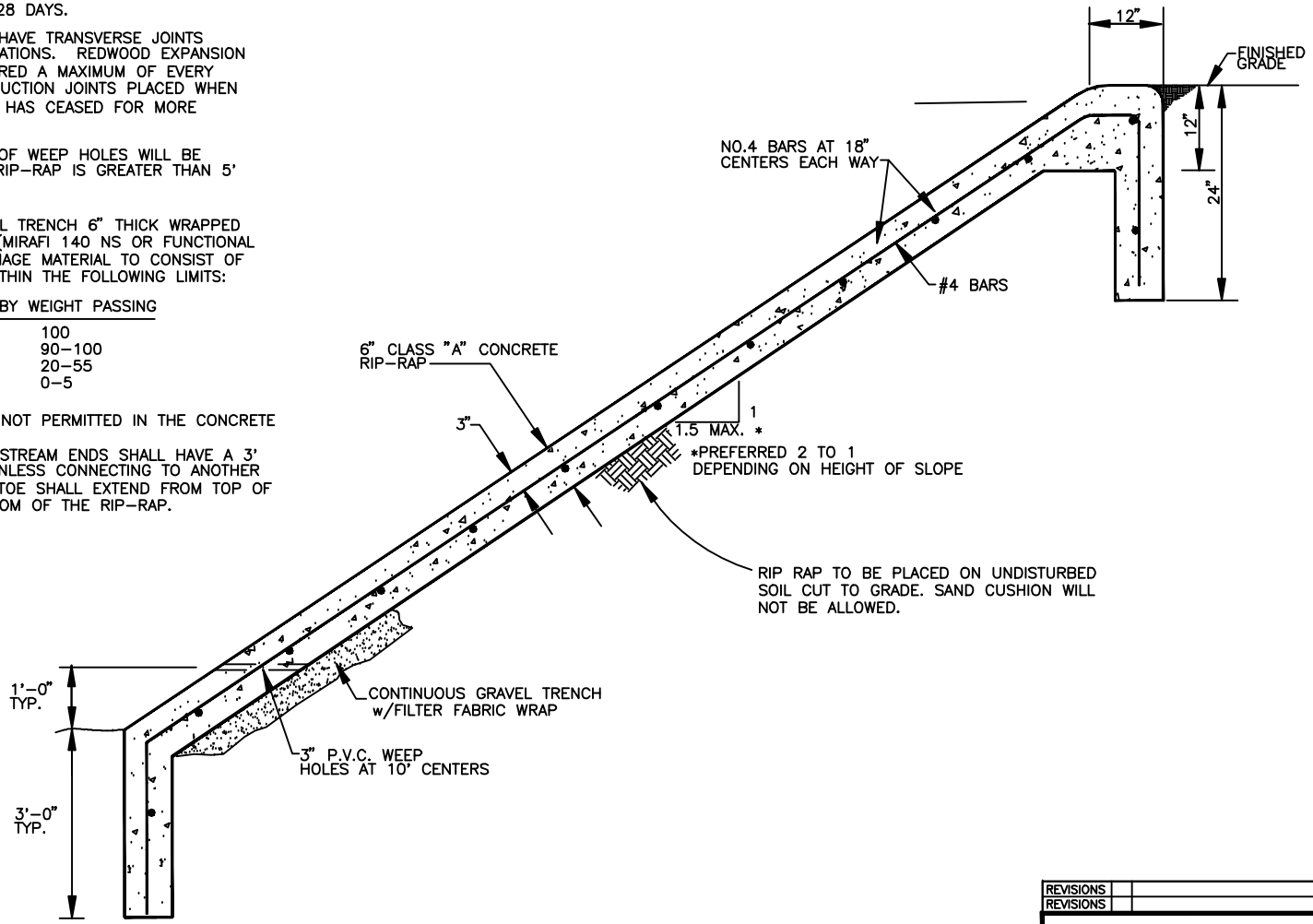
D-7

NOTES:

1. CONCRETE TO HAVE COMPRESSIVE STRENGTH OF 3,000 psi AT 28 DAYS.
2. CONCRETE SHALL HAVE TRANSVERSE JOINTS AT WEEPHOLE LOCATIONS. REDWOOD EXPANSION JOINTS ARE REQUIRED A MAXIMUM OF EVERY 200 FEET. CONSTRUCTION JOINTS PLACED WHEN PAVING OPERATION HAS CEASED FOR MORE THAN 30 MINUTES.
3. ADDITIONAL LAYER OF WEEP HOLES WILL BE REQUIRED WHERE RIP-RAP IS GREATER THAN 5' VERTICAL HEIGHT.
4. CONTINUOUS GRAVEL TRENCH 6" THICK WRAPPED IN FILTER FABRIC (MIRAFI 140 NS OR FUNCTIONAL EQUIVALENT). DRAINAGE MATERIAL TO CONSIST OF GRAVEL GRADED WITHIN THE FOLLOWING LIMITS:

SIEVE SIZE	% BY WEIGHT PASSING
1 INCH	100
3/4 INCH	90-100
3/8 INCH	20-55
No. 4	0-5

5. FENCE POSTS ARE NOT PERMITTED IN THE CONCRETE
6. THE UP AND DOWNSTREAM ENDS SHALL HAVE A 3' DEEP TOE WALL, UNLESS CONNECTING TO ANOTHER STRUCTURE. THE TOE SHALL EXTEND FROM TOP OF BANK TO THE BOTTOM OF THE RIP-RAP.



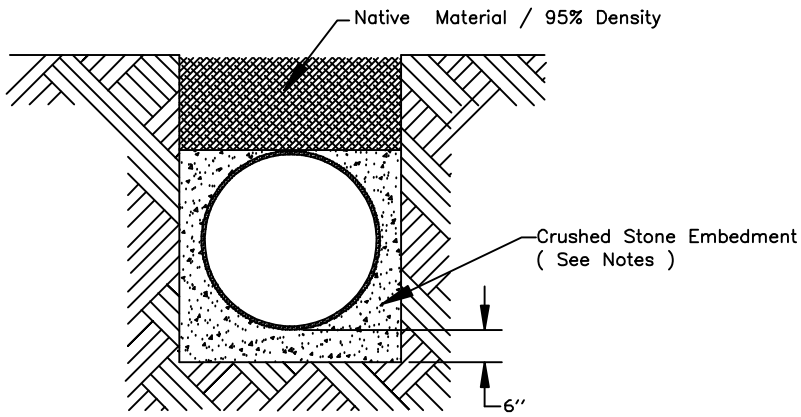
REVISIONS	
REVISIONS	

CONCRETE CHANNEL / RIP RAP

CITY OF COLLEYVILLE TEXAS

DEC 2013

D-8

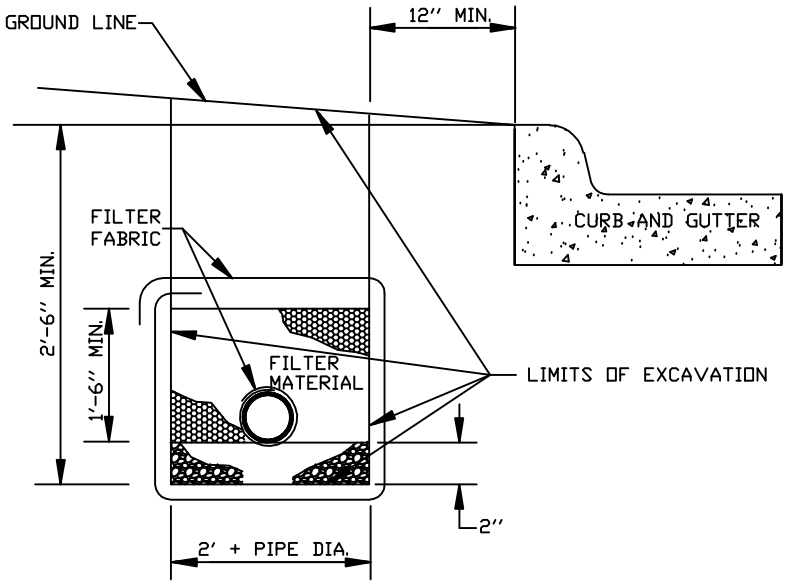


The pipe shall be bedded in a minimum of six inches (6") of crushed stone. In wet or unstable trenches, additional crushed stone will be added to the standard bedding requirements as needed. Crushed stone shall meet C.O.G. 2.1.8 Standard Crushed Rock – Aggregate Grade 4. River rock / gravel will be allowed as long as it meets this gradation requirement.

After the pipe has been laid and the joints made, crushed stone of a quality satisfactory to the engineer shall be placed from the bottom of the pipe to the top of the pipe. The backfill material shall be worked under the haunches of the pipe during the time it is being placed. The material shall be mechanically compacted to 95% Standard Density in lifts not to exceed eight inches (8") (loose)

For the specifications for the remaining backfill operations, see the Trench Backfill Special Provision.

PIPE EMBEDMENT
NTS



SECTION
N.T.S.

FILTER MATERIAL 1/4'' to 1/2'' WASHED PEA GRAVEL

TYPES OF PIPE ACCEPTABLE FOR USE AS SUBDRAIN

1. PERFORATED PVC PIPE.
2. PERFORATED POLYETHYLENE PIPE.

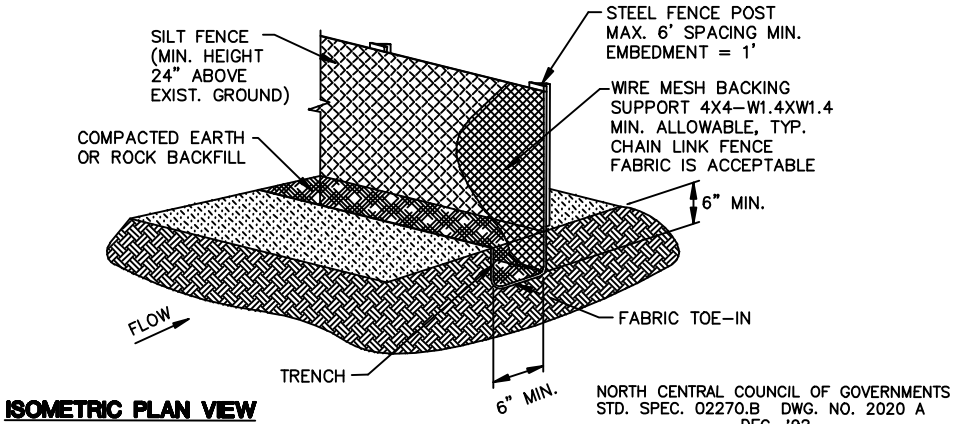
SUBDRAINS
N.T.S

REVISIONS	
REVISIONS	

PIPE EMBEDMENT / SUBDRAIN

CITY OF COLLEYVILLE TEXAS

DEC 2013



ISOMETRIC PLAN VIEW
N.T.S.

NORTH CENTRAL COUNCIL OF GOVERNMENTS
STD. SPEC. 02270.B DWG. NO. 2020 A
DEC. '92

SILT FENCE

SILT FENCE

GENERAL NOTES:

1. STEEL POSTS WHICH SUPPORT THE SILT FENCE SHALL BE INSTALLED ON A SLIGHT ANGLE TOWARD THE ANTICIPATED RUNOFF SOURCE. POST MUST BE EMBEDDED A MINIMUM OF ONE FOOT.

2. THE TOE OF THE SILT FENCE SHALL BE TRENCHED IN WITH A SPADE OR MECHANICAL TRENCHER, SO THAT THE DOWNSLOPE FACE OF THE TRENCH IS FLAT AND PERPENDICULAR TO THE LINE OF FLOW. WHERE FENCE CANNOT BE TRENCHED IN, (e.g. PAVEMENT), WEIGHT FABRIC FLAP WITH ROCK ON UPHILL SIDE TO PREVENT FLOW FROM SEEPING UNDER FENCE.

3. THE TRENCH MUST BE A MINIMUM OF 6 INCHES DEEP AND 6 INCHES WIDE TO ALLOW FOR THE SILT FENCE FABRIC TO BE LAID IN THE GROUND AND BACKFILLED WITH COMPACTED MATERIAL.

4. SILT FENCE SHOULD BE SECURELY FASTENED TO EACH STEEL SUPPORT POST OR TO WOVEN WIRE, WHICH IS IN TURN ATTACHED TO THE STEEL FENCE POST. THERE SHALL BE A 3 FOOT OVERLAP, SECURELY FASTENED WHERE ENDS OF FABRIC MEET.

5. INSPECTION SHALL BE MADE WEEKLY AND AFTER EACH RAINFALL. REPAIR OR REPLACEMENT SHALL BE MADE PROMPTLY AS NEEDED.

6. SILT FENCE SHALL BE REMOVED WHEN THE SITE IS COMPLETELY STABILIZED SO AS NOT TO BLOCK OR IMPEDE STORM FLOW OR DRAINAGE.

7. ACCUMULATED SILT SHALL BE REMOVED WHEN IT REACHES A DEPTH OF HALF THE HEIGHT OF THE FENCE. THE SILT SHALL BE DISPOSED OF AT AN APPROVED SITE AND IN SUCH A MANNER AS TO NOT CONTRIBUTE TO ADDITIONAL SILTATION.

NORTH CENTRAL COUNCIL OF GOVERNMENTS
STD. SPEC. 02270.B DWG. NO. 2020 B
DEC. '92

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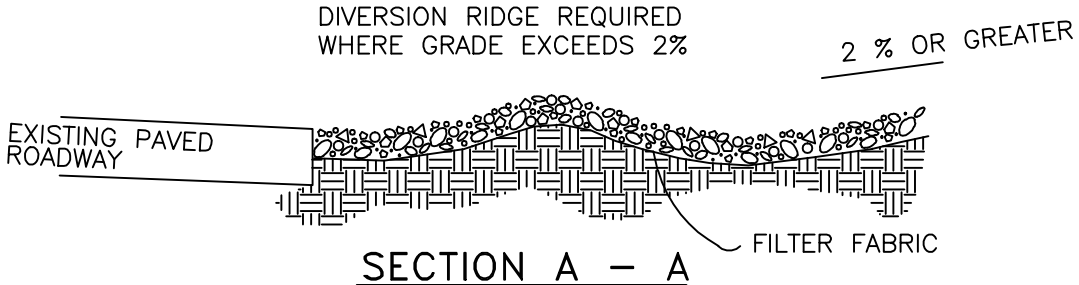
REVISIONS	

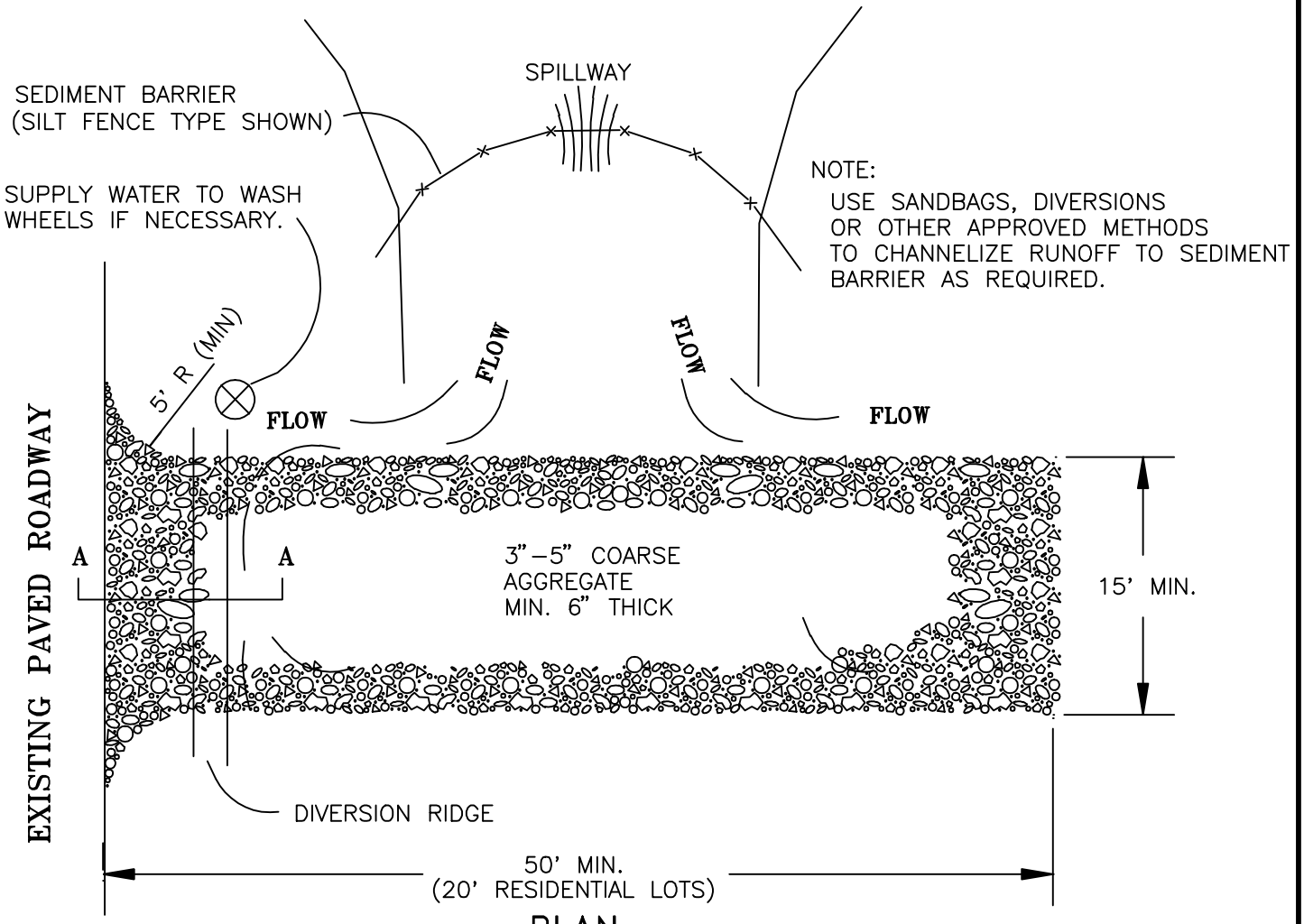
SILT FENCE

CITY OF COLLEYVILLE TEXAS

FEB 2014



SECTION A – A



PLAN

TEMPORARY STONE CONSTRUCTION ENTRANCE / EXIT

N.T.S.

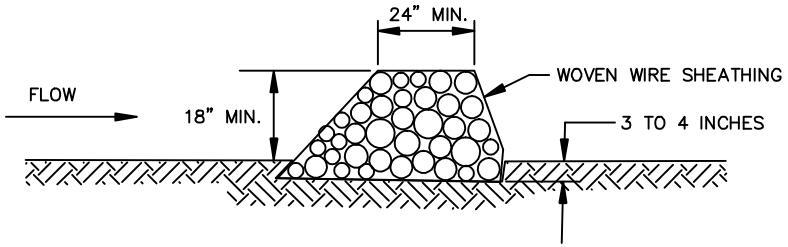
REVISIONS	
REVISIONS	

CONSTRUCTION ENTRANCE

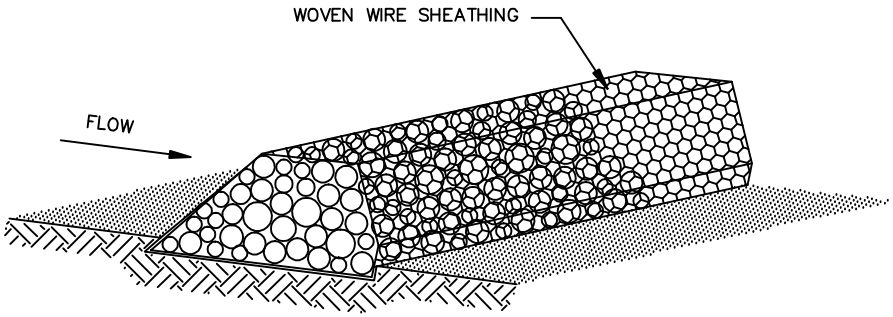
CITY OF COLLEYVILLE TEXAS

FEB 2014

D–11



CROSS SECTION
N.T.S.



ISOMETRIC PLAN VIEW
N.T.S.

ROCK BERM

NORTH CENTRAL COUNCIL OF GOVERNMENTS
DWG. NO. 1060 A
JAN. '98

ROCK BERM

GENERAL NOTES:

1. USE ONLY OPEN GRADED ROCK 4–8 INCHES IN DIAMETER FOR STREAM FLOW CONDITIONS. USE OPEN GRADED ROCK 3–5 INCHES IN DIAMETER FOR OTHER CONDITIONS.
2. THE ROCK BERM SHALL BE SECURED WITH A WOVEN WIRE SHEATHING HAVING A MAXIMUM OPENING OF 1 INCH AND A MINIMUM WIRE SIZE OF 20 GAUGE AND SHALL BE BURIED IN A TRENCH APPROXIMATELY 3 TO 4 INCHES DEEP.
3. THE ROCK BERM SHALL BE INSPECTED EVERY TWO WEEKS OR AFTER EACH 1/2 INCH RAIN EVENT AND SHALL BE REPLACED WHEN THE STRUCTURE CEASES TO FUNCTION AS INTENDED DUE TO SILT ACCUMULATION AMONG THE ROCKS, WASHOUT, CONSTRUCTION TRAFFIC DAMAGE, ETC.
4. WHEN SILT REACHES A DEPTH EQUAL TO ONE–THIRD OF THE HEIGHT OF THE BERM OR ONE FOOT, WHICHEVER IS LESS, THE SILT SHALL BE REMOVED AND DISPOSED OF PROPERLY.
5. WHEN THE SITE IS COMPLETELY STABILIZED, THE BERM AND ACCUMULATED SILT SHALL BE REMOVED AND DISPOSED OF IN AN APPROVED MANNER.
6. ROCK BERM SHOULD BE USED AS CHECK DAMS FOR CONCENTRATED FLOW AND ARE NOT INTENDED FOR USE IN PERIMETER PROTECTION.

NORTH CENTRAL COUNCIL OF GOVERNMENTS
DWG. NO. 1060 B
JAN. '98

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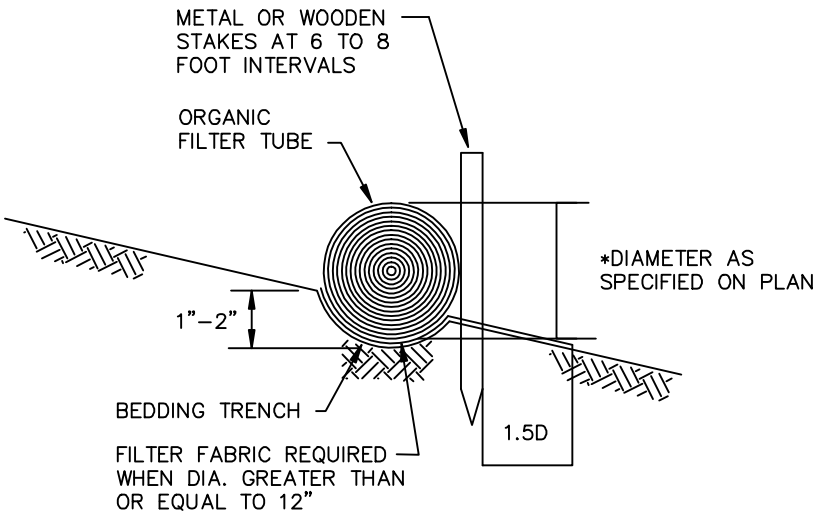
REVISIONS	

ROCK BERM

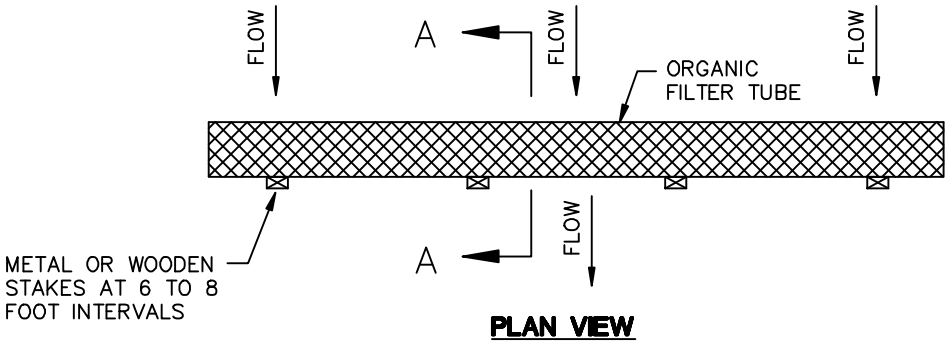
CITY OF COLLEYVILLE TEXAS

FEB 2014

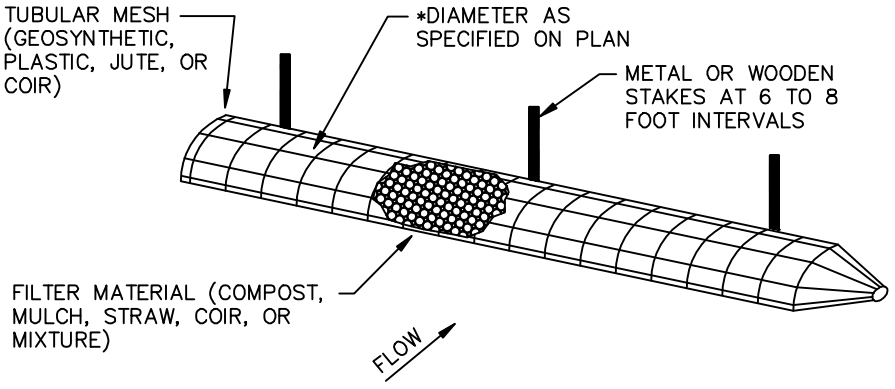


SECTION A-A

NOTE: STAKE FILTER TUBE ON DOWNHILL SIDE AS ILLUSTRATED.



PLAN VIEW



ORGANIC FILTER TUBE DETAIL

ORGANIC FILTER TUBES

N.T.S.

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ORGANIC FILTER TUBE

CITY OF COLLEYVILLE TEXAS

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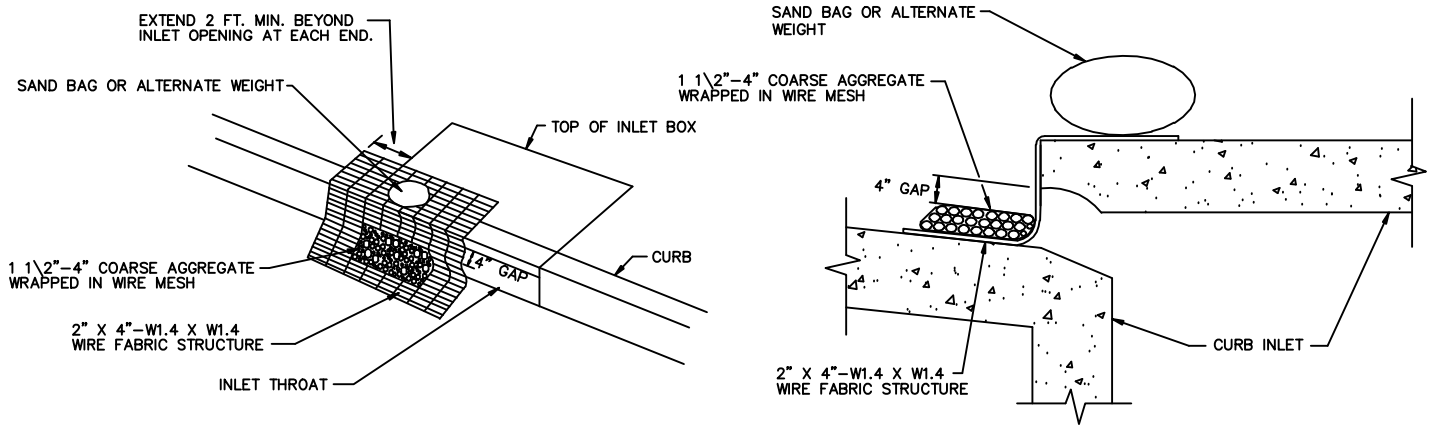

CURB INLET PROTECTION DETAIL

NOT TO SCALE

NOTES:

1. WIRE MESH BACKING MUST BE OF SUFFICENT STRENGTH TO SUPPORT STONE FOR CURB INLETS, WITH WATER FULLY IMPOUNDED AGAINST IT.
2. STONE IS 3"-5" IN SIZE AND CLEAN.
3. FORM THE WIRE FABRIC STRUCTURE TO THE CONCRETE GUTTER AND AGAINST THE FACE OF CURB ON BOTH SIDES OF THE INLET. PLACE CLEAN STONE WRAPPED IN WIRE MESH IN SUCH A MANNER AS TO PREVENT WATER FROM ENTERING THE INLET UNDER OR AROUND THE STONES.
4. THIS TYPE OF INLET PROTECTION MUST BE INSPECTED FREQUENTLY AND THE STONE REPLACED WHEN CLOGGED WITH SEDIMENT.
5. ASSURE THAT STORM FLOW DOES NOT BYBASS INLET BY INSTALLING TEMPORARY EARTH OR ASPHALT DIKES DIRECTING FLOW INTO INLET.
6. CONSTRUCT SIMILAR TYPE STRUCTURE AT BACK OF PROPOSED CURB INLETS WITH OPEN BACKS.
7. STONE WRAPPED IN WIRE MESH MUST BE SECURED TO THE WIRE BACKING WITH CLIPS OR HOG RINGS AT THIS LOCATION.
8. DAILY INSPECTION SHALL BE MADE BY THE CONTRACTOR AND SILT ACCUMULATION MUST BE REMOVED WHEN DEPTH REACHES 2".
9. CONTRACTOR SHALL MONITOR THE PERFORMANCE OF INLET PROTECTION DURING EACH RAINFALL EVENT AND IMMEDIATELY REMOVE THE INLET PROTECTIONS IF THE STORMWATER BEGINS TO OVERTOP THE CURB.
10. INLET PROTECTONS SHALL BE REMOVED AS SOON AS THE SOURCE OF SEDIMENT IS STABILIZED.

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CURB INLET PROTECTION

CITY OF COLLEYVILLE TEXAS

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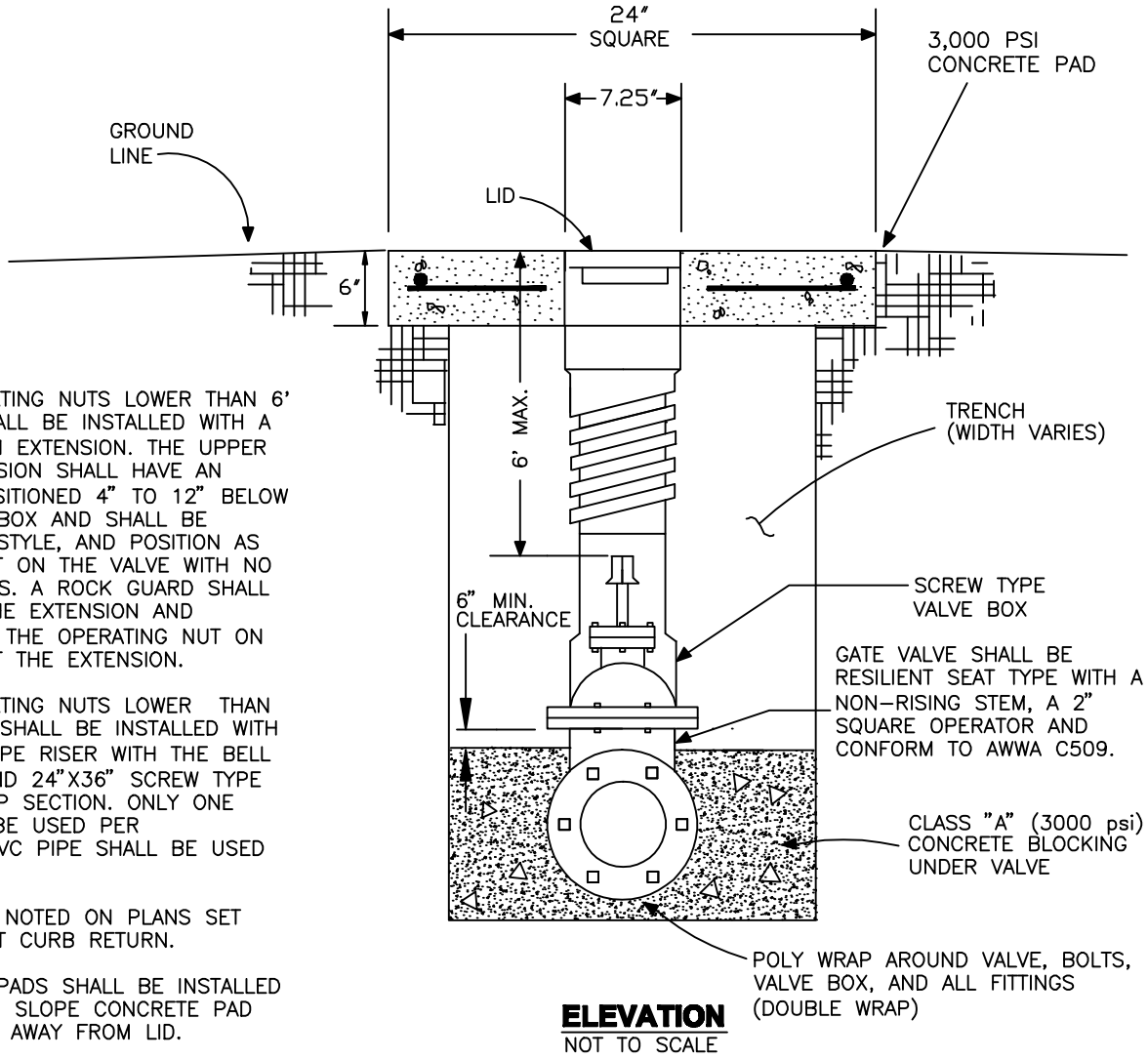
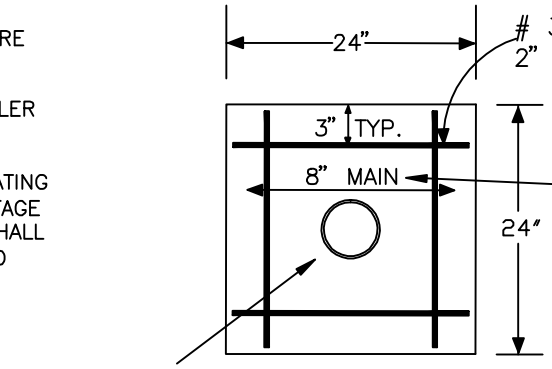


ELEVATION
NOT TO SCALE

NOTES

1. VALVES WITH OPERATING NUTS LOWER THAN 6' BELOW GROUND SHALL BE INSTALLED WITH A 1-1/4" SOLID STEM EXTENSION. THE UPPER END OF THE EXTENSION SHALL HAVE AN OPERATING NUT POSITIONED 4" TO 12" BELOW THE LID OF VALVE BOX AND SHALL BE IDENTICAL IN SIZE, STYLE, AND POSITION AS THE OPERATING NUT ON THE VALVE WITH NO CLIP ON EXTENSIONS. A ROCK GUARD SHALL BE ATTACHED TO THE EXTENSION AND LOCATED 2" BELOW THE OPERATING NUT ON THE UPPER END OF THE EXTENSION.
2. VALVES WITH OPERATING NUTS LOWER THAN 6' BELOW GROUND SHALL BE INSTALLED WITH 6" DUCTILE IRON PIPE RISER WITH THE BELL OVER THE VALVE AND 24"X36" SCREW TYPE VALVE BOX FOR TOP SECTION. ONLY ONE VALVE BOX SHALL BE USED PER INSTALLATION. NO PVC PIPE SHALL BE USED FOR THE RISER.
3. UNLESS OTHERWISE NOTED ON PLANS SET VALVES AND BOX AT CURB RETURN.
4. VALVE BOXES AND PADS SHALL BE INSTALLED AT FINISHED GRADE. SLOPE CONCRETE PAD SURFACED SLIGHTLY AWAY FROM LID.
5. ALL VALVES SHALL BE RESTRAINED BY AN APPROVED THRUST RESTRAINT DEVICE. RESTRAIN VALVE TO NEAREST FITTING WHERE APPLICABLE.
6. VALVE BOXES SHALL BE E.J.I.W. 6850, TYLER PIPE, OR APPROVED EQUIVALENT.
7. ETCH OR IMPRESS CURB WITH "V" (INDICATING DIRECTION OF VALVE LOCATION) AND FOOTAGE TO VALVE BOX. NUMBERS AND SYMBOL SHALL BE 4" IN HEIGHT AND MUST BE NEAT AND LEGIBLE.
8. VALVE BOXES SHALL INCLUDE 2'X2'X6" THICK CONCRETE PAD WITH COVER IN CENTER OF PAD.
9. ALL VALVES SHALL BE SET ON CONCRETE BLOCK FOOTING SUPPORT PRIOR TO POURING CONCRETE BLOCKING.
10. ALL GATE VALVES SHALL BE MUELLER, OR APPROVED EQUAL.
11. ALL VALVES SHALL OPEN LEFT.
12. THIS DETAIL APPLIES TO 6" THRU 12" GATE VALVES



PLAN
CONCRETE PAD
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VALVE DETAIL WITH BOX AND CONCRETE PAD

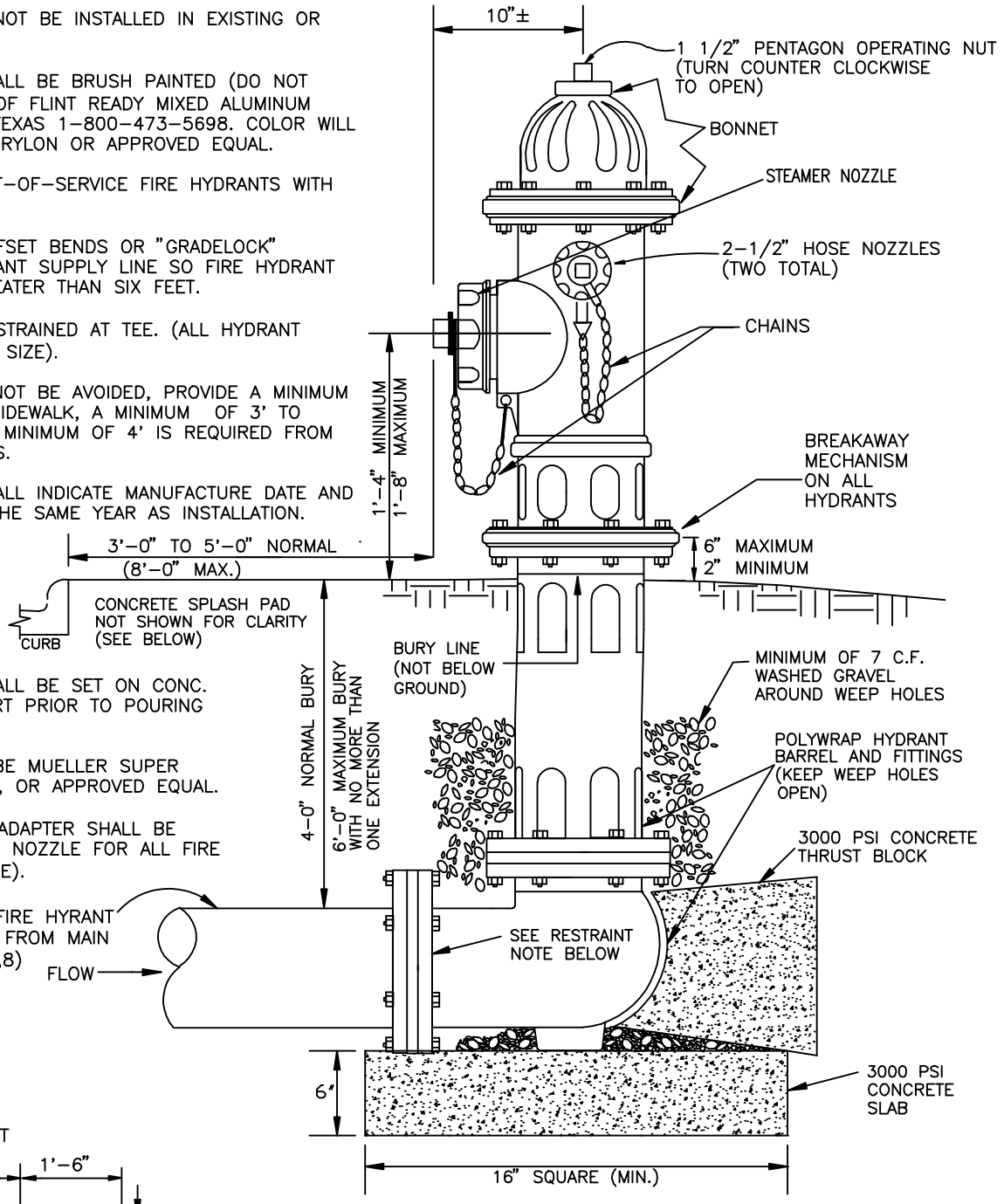
CITY OF COLLEYVILLE TEXAS

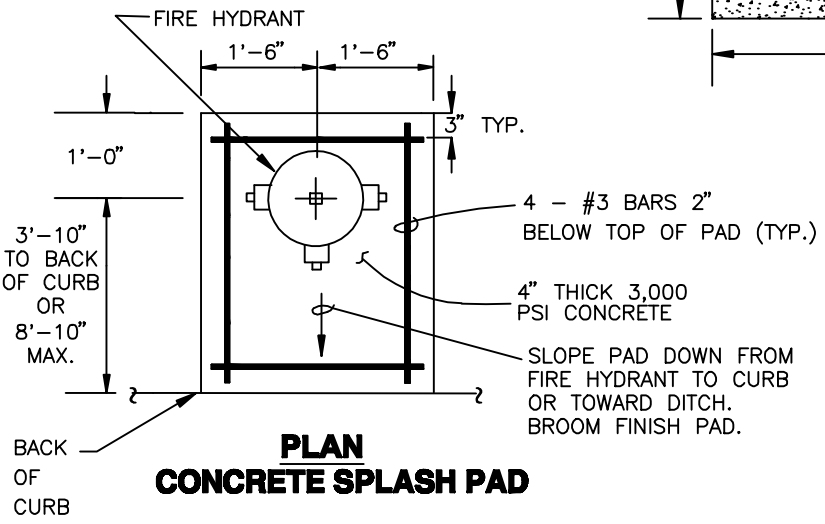
DEC 2013

W-1

NOTES

1. FIRE HYDRANTS SHALL NOT BE INSTALLED IN EXISTING OR PROPOSED SIDEWALKS.
2. ALL FIRE HYDRANTS SHALL BE BRUSH PAINTED (DO NOT SPRAY) WITH 2 COATS OF FLINT READY MIXED ALUMINUM PAINT OF GREENVILLE, TEXAS 1-800-473-5698. COLOR WILL BE KEM LUSTER RED, KRYLON OR APPROVED EQUAL.
3. COMPLETELY COVER OUT-OF-SERVICE FIRE HYDRANTS WITH BLACK PLASTIC.
4. INSTALL RESTRAINED OFFSET BENDS OR "GRADELOCK" FITTINGS ON FIRE HYDRANT SUPPLY LINE SO FIRE HYDRANT BURY DEPTH IS NO GREATER THAN SIX FEET.
5. INSTALL GATE VALVE RESTRAINED AT TEE. (ALL HYDRANT LEADS, REGARDLESS OF SIZE).
6. WHERE SIDEWALKS CANNOT BE AVOIDED, PROVIDE A MINIMUM OF 4' CLEARANCE ON SIDEWALK, A MINIMUM OF 3' TO BACK OF CURB, AND A MINIMUM OF 4' IS REQUIRED FROM DRIVE APPROACH RADIUS.
7. ALL FIRE HYDRANTS SHALL INDICATE MANUFACTURE DATE AND BE MANUFACTURED IN THE SAME YEAR AS INSTALLATION.
8. ALL FIRE HYDRANTS SHALL BE SET ON CONC. BLOCK FOOTING SUPPORT PRIOR TO POURING CONCRETE BLOCKING.
9. FIRE HYDRANTS SHALL BE MUELLER SUPER CENTURION 250, A-423, OR APPROVED EQUAL.
10. 4 1/2" HYDRO-STORZ ADAPTER SHALL BE INSTALLED ON THE MAIN NOZZLE FOR ALL FIRE HYDRANTS (FOR 5" HOSE).





PLAN
CONCRETE SPLASH PAD

NOTE: ALL CONNECTIONS BETWEEN FIRE HYDRANT VALVE AND MAIN SHALL BE FLANGED OR MJ RESTRAINED AS FOLLOWS:

1. SPECIAL MJ ANCHORING FITTINGS
2. "GRADELOCK" ANCHOR FITTINGS
3. RETAINER GLANDS WITH MJ BELL FITTINGS
4. SWIVEL SOLID ADAPTER ON CONCRETE CYLINDER PIPE FLANGED OUTLET

REVISIONS
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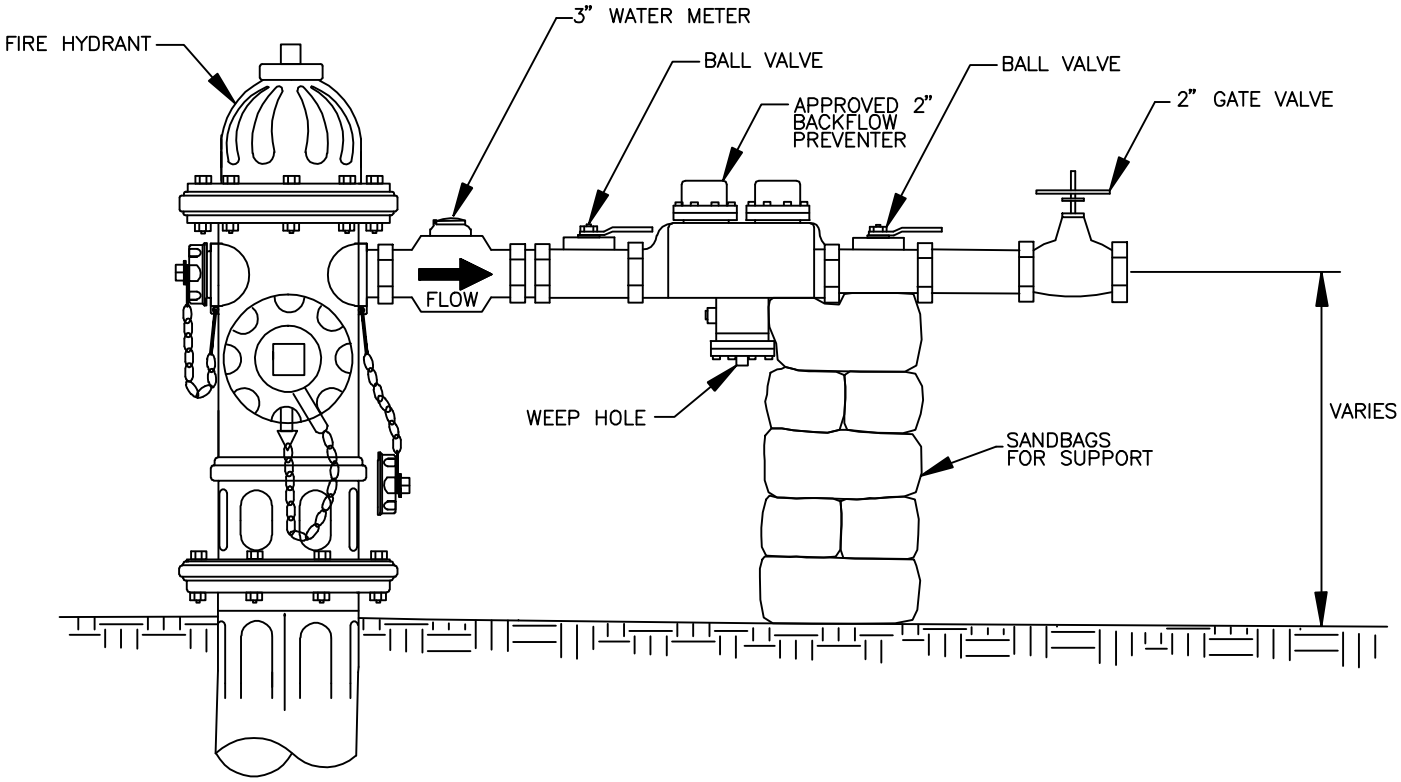
FIRE HYDRANT AND CONCRETE SPLASH PAD

CITY OF COLLEYVILLE TEXAS

DEC 2013

W-2



NOTES:

1. USE OF HYDRANT REQUIRES VALID WATER FIRE HYDRANT METER AGREEMENT. CONTACT UTILITIES BILLING OFFICE FOR APPLICATION.

2. METER AND REDUCED BACKFLOW PRESSURE ZONE (RPZ) BACKFLOW DEVICE SHALL BE FULLY SUPPORTED WHEN CONNECTED TO FIRE HYDRANT.

3. METER AND RPZ BACKFLOW DEVICE SHALL BE APPROVED BY CITY OF COLLEYVILLE. METER MUST BE OBTAINED FROM CITY OF COLLEYVILLE. METER SHALL BE TESTED ANNUALLY BY CITY OF COLLEYVILLE.

4. PRIOR TO ANY USE OF FIRE HYDRANT WATER, THE RPZ MUST BE TESTED BY A CITY–REGISTERED BACKFLOW PREVENTION ASSEMBLY TESTER (BPAT), AND A CURRENT AND PASSING TEST AND MAINTENANCE REPORT (TMR) FOR THE RPZ MUST BE DELIVERED TO THE PUBLIC WORKS DEPARTMENT. BACKFLOW DEVICE SHALL BE TESTED ANNUALLY AND COPY OF TEST SHALL BE SENT TO THE CITY OF COLLEYVILLE BEFORE USAGE WILL BE ALLOWED.

5. CONTRACTOR WILL BE HELD RESPONSIBLE FOR ANY DAMAGE TO FIRE HYDRANT DURING USE.

6. SANDBAGS SHALL NOT OBSTRUCT WEEP HOLE.

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STANDARD FIRE HYDRANT METER INSTALLATION

CITY OF COLLEYVILLE TEXAS

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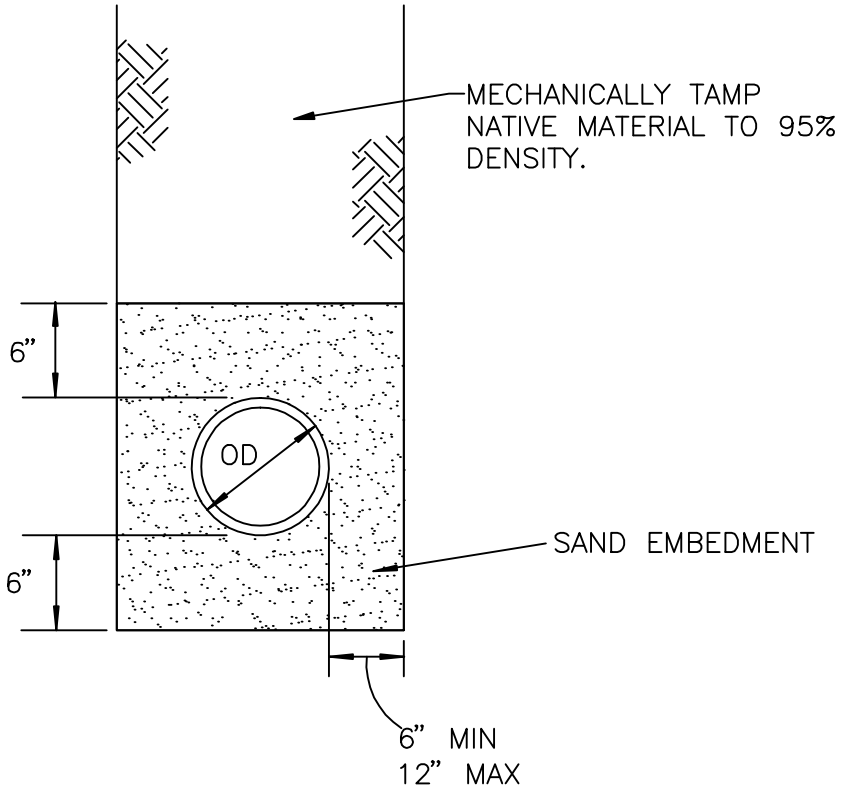
W–3



CLASS "C" EMBEDMENT
TYPICAL WATER MAIN

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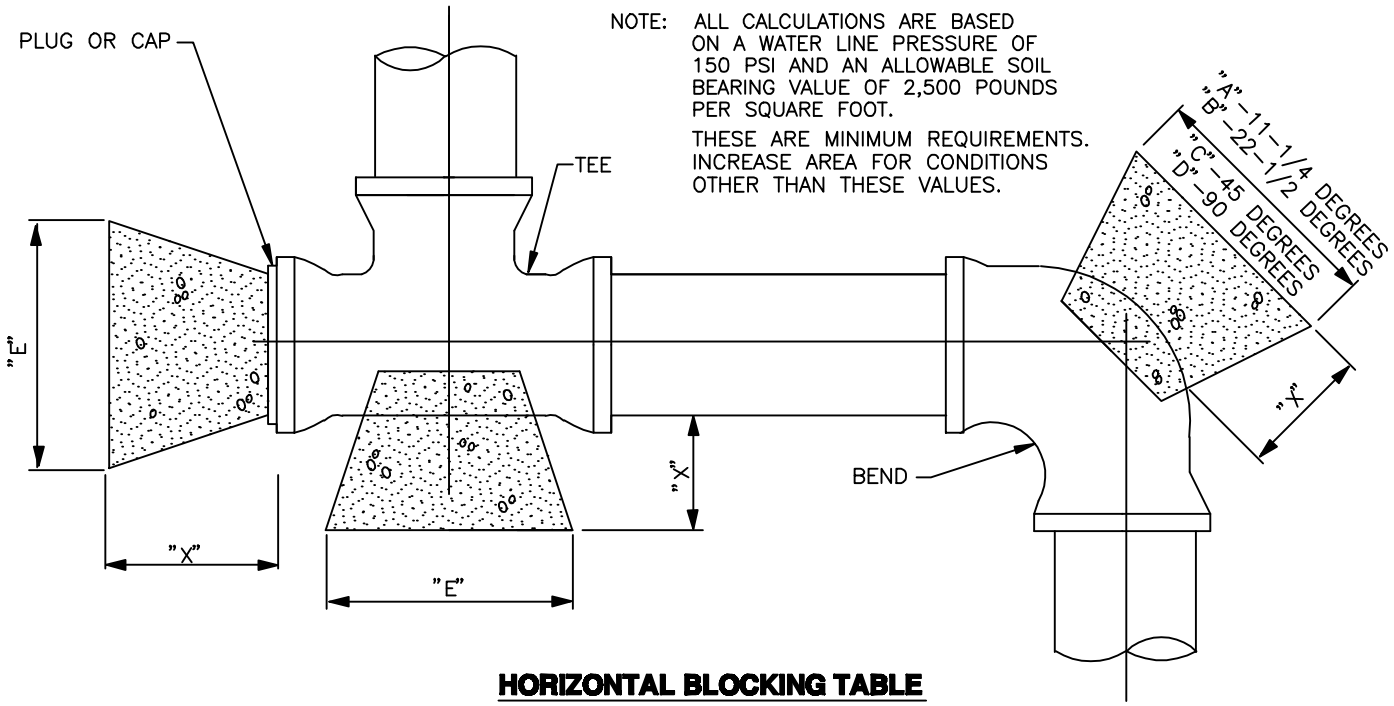
CLASS 'C'
WATER EMBEDMENT

CITY OF COLLEYVILLE TEXAS

DEC 2013

W-4



NOTE: ALL CALCULATIONS ARE BASED ON A WATER LINE PRESSURE OF 150 PSI AND AN ALLOWABLE SOIL BEARING VALUE OF 2,500 POUNDS PER SQUARE FOOT.

THESE ARE MINIMUM REQUIREMENTS. INCREASE AREA FOR CONDITIONS OTHER THAN THESE VALUES.

HORIZONTAL BLOCKING TABLE

PIPE SIZE	"X" DIM. IN. FT.	11-1/4 DEGREES		22-1/2 DEGREES		45 DEGREES		90 DEGREES		TEE & PLUG	
		"A"	MIN. AREA	"B"	MIN. AREA	"C"	MIN. AREA	"D"	MIN. AREA	"E"	MIN. AREA
4"	1.5	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.06	1.00	1.00
6"	1.5	1.00	1.00	1.00	1.00	1.14	1.30	1.55	2.40	1.30	1.70
8"	1.5	1.00	1.00	1.08	1.18	1.52	2.31	2.07	4.27	1.74	3.02
10"	1.5	1.00	1.00	1.35	1.84	1.90	3.61	2.58	6.66	2.17	4.71
12"	1.5	1.00	1.33	1.63	2.65	1.86	5.19	3.10	9.60	2.61	6.79
14"	1.5	1.03	1.81	1.90	3.60	2.66	7.07	3.61	13.06	3.04	9.24
16"	2.0	1.18	2.36	2.17	4.71	3.04	9.23	4.13	17.06	3.47	12.06
18"	2.0	1.33	2.99	2.44	5.96	3.42	11.69	4.65	21.59	3.91	15.27
20"	2.0	1.48	3.70	2.71	7.35	3.80	14.43	5.16	26.66	4.34	18.85
21"	2.0	1.55	4.07	2.85	8.11	3.99	15.91	5.42	29.39	4.56	20.78
24"	2.0	1.77	5.32	3.25	10.59	4.56	20.77	6.20	38.39	5.21	27.14
27"	2.5	1.99	6.73	3.66	13.40	5.13	26.29	6.97	48.58	5.86	34.35
30"	2.5	2.22	8.31	4.07	16.55	5.70	32.46	7.74	59.98	6.51	42.41
33"	2.5	2.44	10.06	4.47	20.02	6.27	39.28	8.52	72.57	7.16	51.31
36"	2.5	2.66	11.97	4.88	23.83	6.84	46.74	9.29	86.37	7.81	61.07
39"	3.0	2.88	14.05	5.29	27.97	7.41	54.86	10.07	101.36	8.47	71.68
42"	3.0	3.10	16.30	5.69	32.43	7.98	63.62	10.85	117.56	9.12	83.13

NOTE: CLASS "B" CONCRETE 2,000 PSI SHALL BE USED FOR ALL BLOCKING UNLESS OTHERWISE NOTED ON STANDARD DETAILS OR PLANS.

THE MINIMUM VERTICAL DIMENSION OF ALL BLOCKING SHALL BE 1.5 TIMES THE PIPE DIAMETER WITH AT LEAST 0.75 TIMES THE PIPE DIAMETER EXTENDING BOTH ABOVE AND BELOW THE PIPE CENTERLINE. THIS DIMENSION DETERMINES THE "A" DIMENSION FOR 11-1/4° BENDS.

FOR 22-1/2°, 45°, 90°, AND TEES AND PLUGS, THE VERTICAL DIMENSION SHALL BE EQUAL TO THE HORIZONTAL DIMENSION SHOWN TO PRODUCE THE REQUIRED MINIMUM AREA.

ALL MINIMUM AREAS ARE IN SQUARE FEET.

BLOCKING TO BE AGAINST UNDISTURBED TRENCH WALLS AND BOTTOM.

AS A MINIMUM, ALL PIPE FITTINGS IN PRESSURE SITUATIONS SHALL ALSO BE RESTRAINED BY AN APPROVED THRUST RESTRAINT DEVICE.

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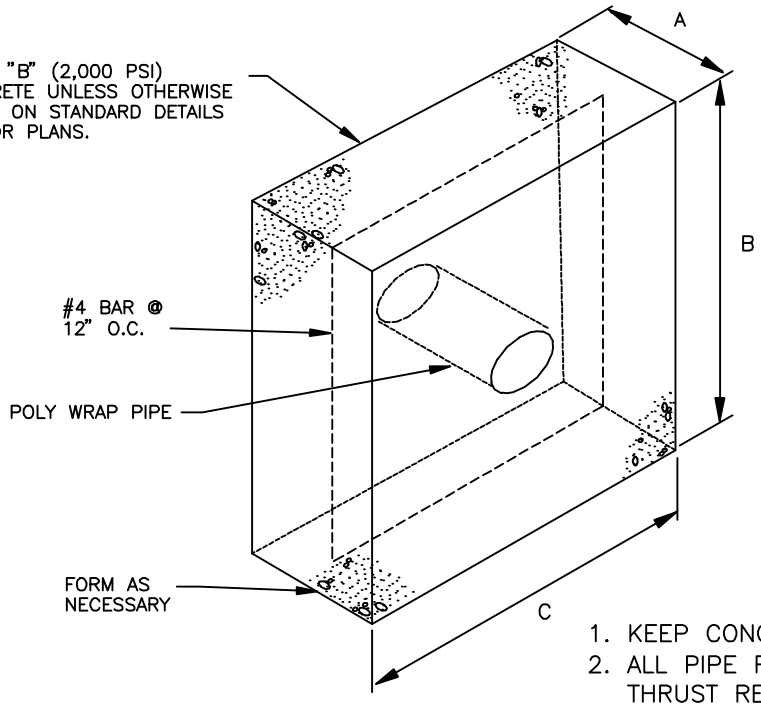
HORIZONTAL THRUST BLOCK

CITY OF COLLEYVILLE TEXAS

DEC 2013

W-5



NOTES:

1. KEEP CONCRETE CLEAR OF PIPE JOINTS & BOLTS.
2. ALL PIPE FITTINGS BE RESTRAINED BY AN APPROVED THRUST RESTRAINT DEVICE.

PIPE NOMINAL DIA. (in.)	BENDS	90°	45°	22-1/2°	11-1/4°
6	*VOL. REQ'D. C.F.	28.27	22.61	11.33	5.65
	A FT.	1.75	1.5	1.0	0.75
	B FT.	4.0	3.88	3.36	2.75
	C FT.	4.0	3.88	3.36	2.75
8	*VOL. REQ'D. C.F.	50.27	40.21	20.11	10.05
	A FT.	2.0	1.75	1.5	1.0
	B FT.	5.0	4.8	3.66	3.2
	C FT.	5.0	4.8	3.66	3.2
10	*VOL. REQ'D. C.F.	78.54	62.83	31.41	15.71
	A FT.	2.25	2.0	1.75	1.5
	B FT.	5.9	5.6	4.25	3.25
	C FT.	5.9	5.6	4.25	3.25
12	*VOL. REQ'D. C.F.	153.94	123.15	61.57	30.79
	A FT.	4.0	3.5	2.0	1.75
	B FT.	6.2	6.0	5.54	4.2
	C FT.	6.2	6.0	5.54	4.2

*VOLUME CALCULATED ON THE BASIS OF CONCRETE REACTING THRUST ON THE RESPECTIVE BENDS UNDER AN INTERNAL PRESSURE OF 150 PSI AND CONCRETE WEIGHT OF 150 LB. PER CU. FT.

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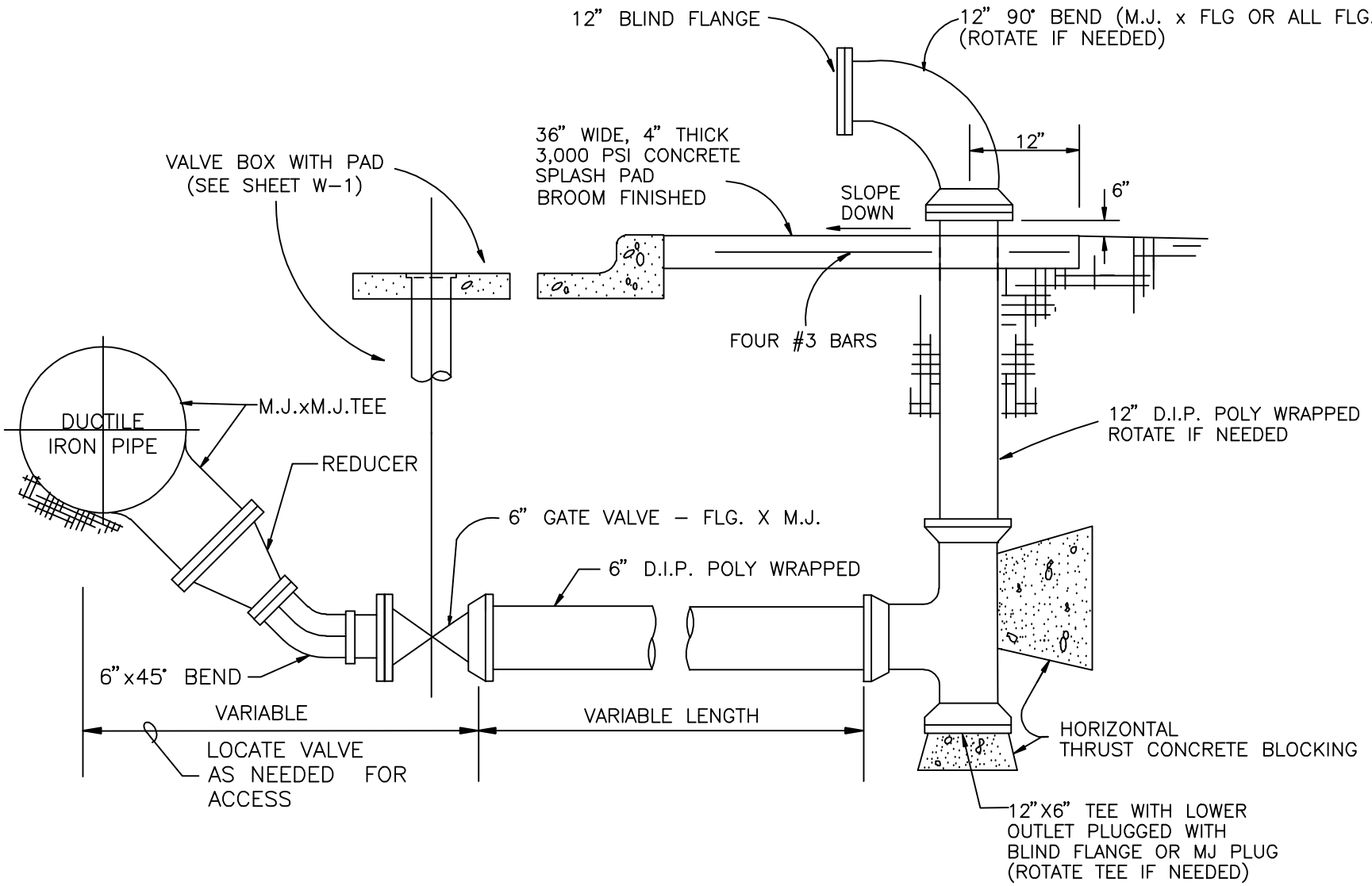
VERTICAL TIE-DOWN BLOCK

CITY OF COLLEYVILLE TEXAS

DEC 2013

W-6



NOTES

1. ALL CONNECTIONS SHALL BE FLANGED OR MJ RESTRAINED WITH APPROVED RETAINER GLANDS OR THRUST RESTRAINT DEVICES.
2. ALL PIPING TO BE DUCTILE IRON WITH ALL BURIED VALVE, PIPE & FITTINGS TO BE POLY-WRAPPED.
3. BRUSH PAINT ALL ABOVE GROUND EXPOSED FITTINGS AND PIPE WITH TWO COATS OF FLYNT READY MIXED ALUMINUM PAINT OF GREENVILLE, TEXAS 1-800-473-5698. SILVER COLOR ONLY.
4. APPLY TO PVC MAIN BY TURNING DOWN TEE AND INSTALLING A 45 DEGREE BEND. MUST BE APPROVED BY ENGINEER OR INSPECTOR.
5. OUTFALL TO HEADWALL OR SIMILAR IF POSSIBLE.

REVISIONS
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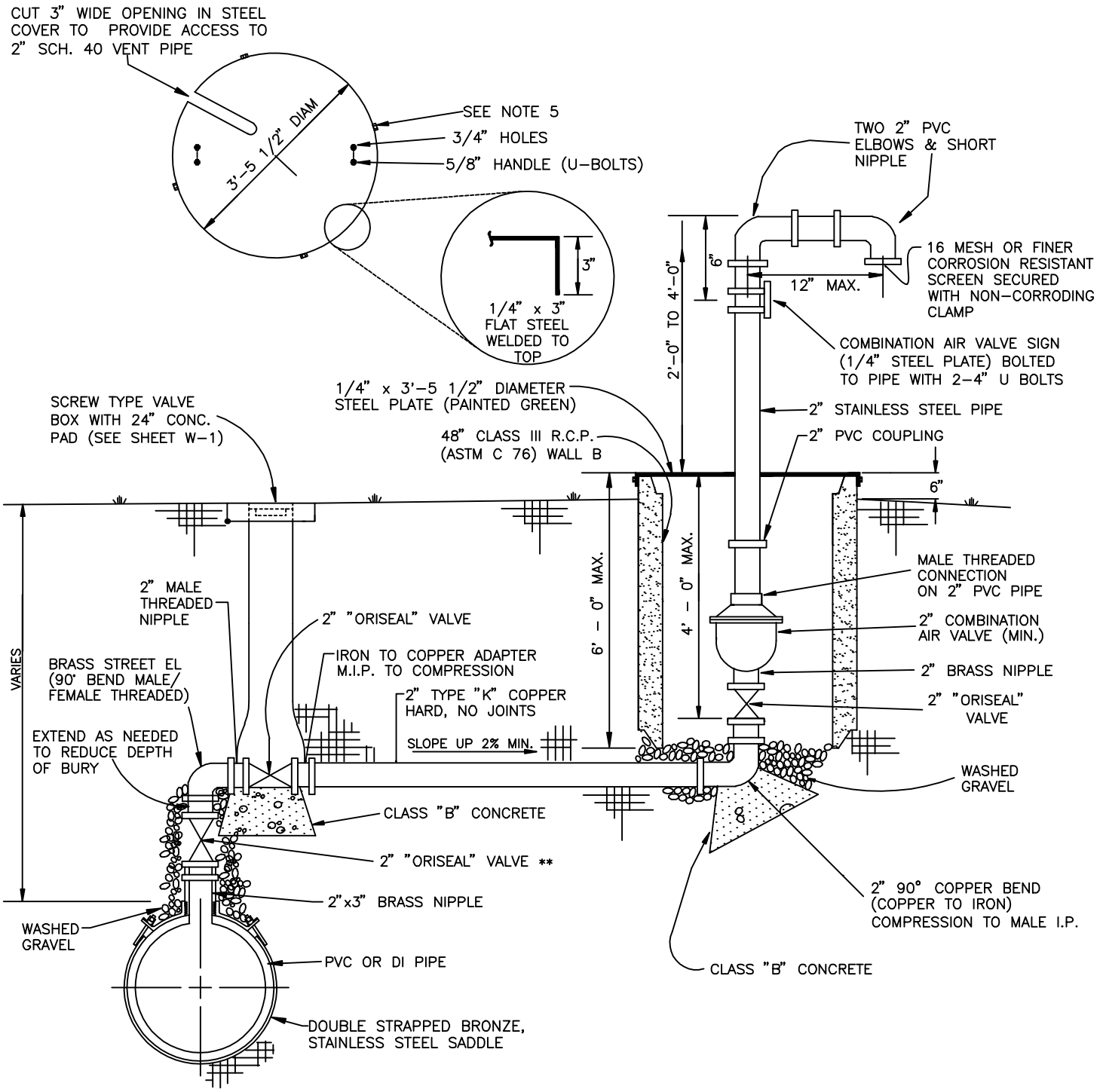
BLOW OFF DETAIL

CITY OF COLLEYVILLE TEXAS

DEC 2013

W-7



NOTES

1. ALL PIPING, FITTINGS, AND VALVES SHOWN ARE FOR 2" COMBINATION AIR VALVE. FOR COMBINATION AIR VALVE INSTALLATION LARGER THAN 2", ALL PIPING, FITTINGS, AND VALVES SHALL BE THE SAME SIZE AS AIR VALVE.
2. ALL ABOVE GROUND METAL PIPING, FITTINGS, SIGNS, ETC., SHALL BE BRUSH PAINTED WITH TWO COATS OF GREEN PAINT TO MATCH STEEL PLATE LID.
3. WRAP SERVICE SADDLE WITH TWO LAYERS OF POLYETHYLENE ENCASEMENT.
4. ALL CONNECTIONS FOR NEW CONSTRUCTION SHALL BE MADE WITH FITTINGS AND BE FLANGED OR MJ RESTRAINED WITH APPROVED RETAINER GLANDS/MEGALUGS.
5. LID REQUIRES SET BOLTS USING 4 EACH 3/8-16 X 1.5" 18-8 STAINLESS STEEL TAP BOLT COURSE THREADED INTO SIDE OF STEEL LID. (USE 5/16" HOLE)

** 2" ORISEAL VALVE REQUIRED WHEN INSTALLING NEW TAP ON EXISTING MAIN. VALVE IS NOT REQUIRED ON NEW CONSTRUCTION

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2" COMBINATION AIR VALVE OFFSET INSTALLATION

CITY OF COLLEYVILLE TEXAS

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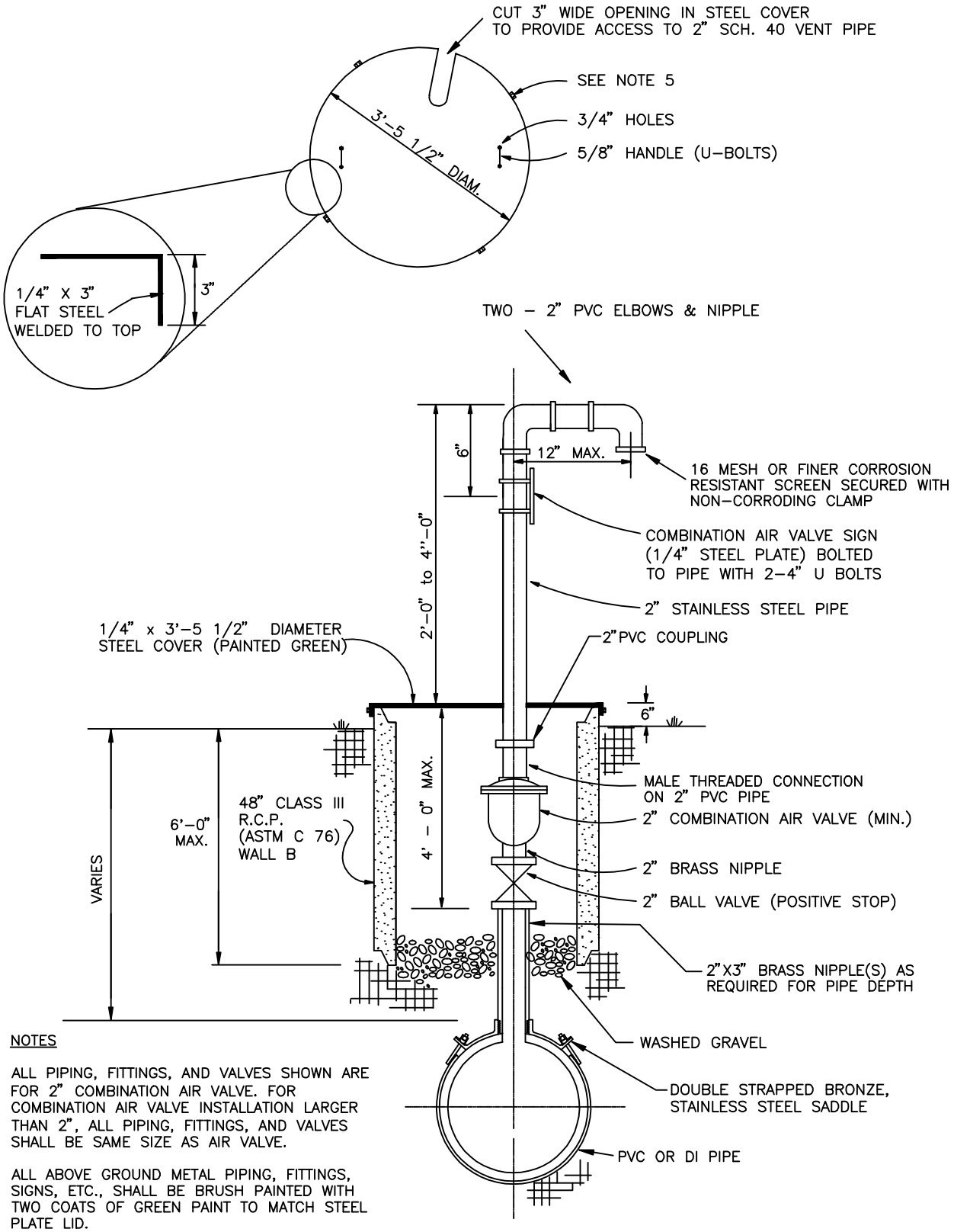
W-8



NOTES

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2. ALL ABOVE GROUND METAL PIPING, FITTINGS, SIGNS, ETC., SHALL BE BRUSH PAINTED WITH TWO COATS OF GREEN PAINT TO MATCH STEEL PLATE LID.
3. WRAP SERVICE SADDLE WITH TWO LAYERS OF POLYETHYLENE ENCASEMENT.
4. VAULT SIZE MAY BE INCREASED BY DESIGN TO ACCOMMODATE LARGER AIR VALVE SIZES, IF NEEDED. MUST BE APPROVED BY ENGINEER.
5. LID REQUIRES SET BOLTS USING 4 EACH 3/8-16 X 1.5" 18-8 STAINLESS STEEL TAP BOLT THREADED INTO SIDE OF STEEL LID.

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2" COMBINATION AIR VALVE INSTALLATION

CITY OF COLLEYVILLE TEXAS

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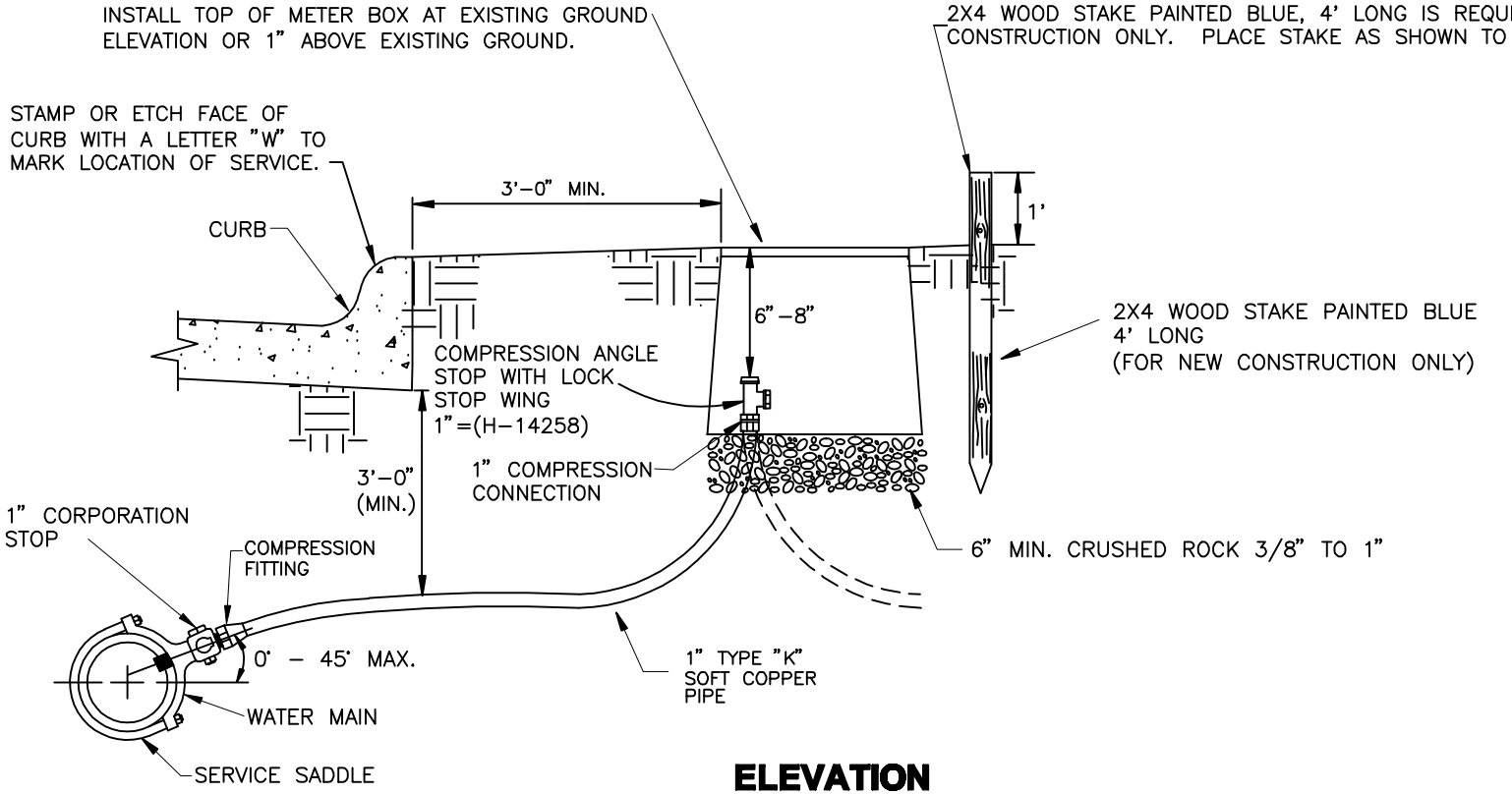
W-9



ELEVATION
NOT TO SCALE

NOTES:

1. DOUBLE STRAPPED BRONZE, STAINLESS STEEL, OR EPOXY COATED DUCTILE IRON SADDLE SHALL BE USED FOR ALL SERVICE TAPS.
2. COPPER SERVICES SHALL BE CONTINUOUS WITH NO JOINTS FROM CORP. STOP TO QUARTER BEND.
3. ALL COPPER FITTINGS SHALL BE COMPRESSION FITTINGS.
4. NO TAPS SHALL BE LESS THAN 1" MINIMUM.
5. METERS SHALL NOT BE INSTALLED IN EXISTING OR PROPOSED SIDEWALKS OR WITHIN 3' OF DRIVEWAYS OR STREETS.
6. METERS AND TAPS SHALL BE LOCATED ON SAME SIDE OF MAIN.
7. FOR NEW DEVELOPMENT, METERS SHALL BE LOCATED 1' OFF LOT LINE.
5. METER BOX SHALL BE OLDCASTLE/CARSON MODEL NO. 1118 MSBC, OR APPROVED EQUAL.

REVISIONS
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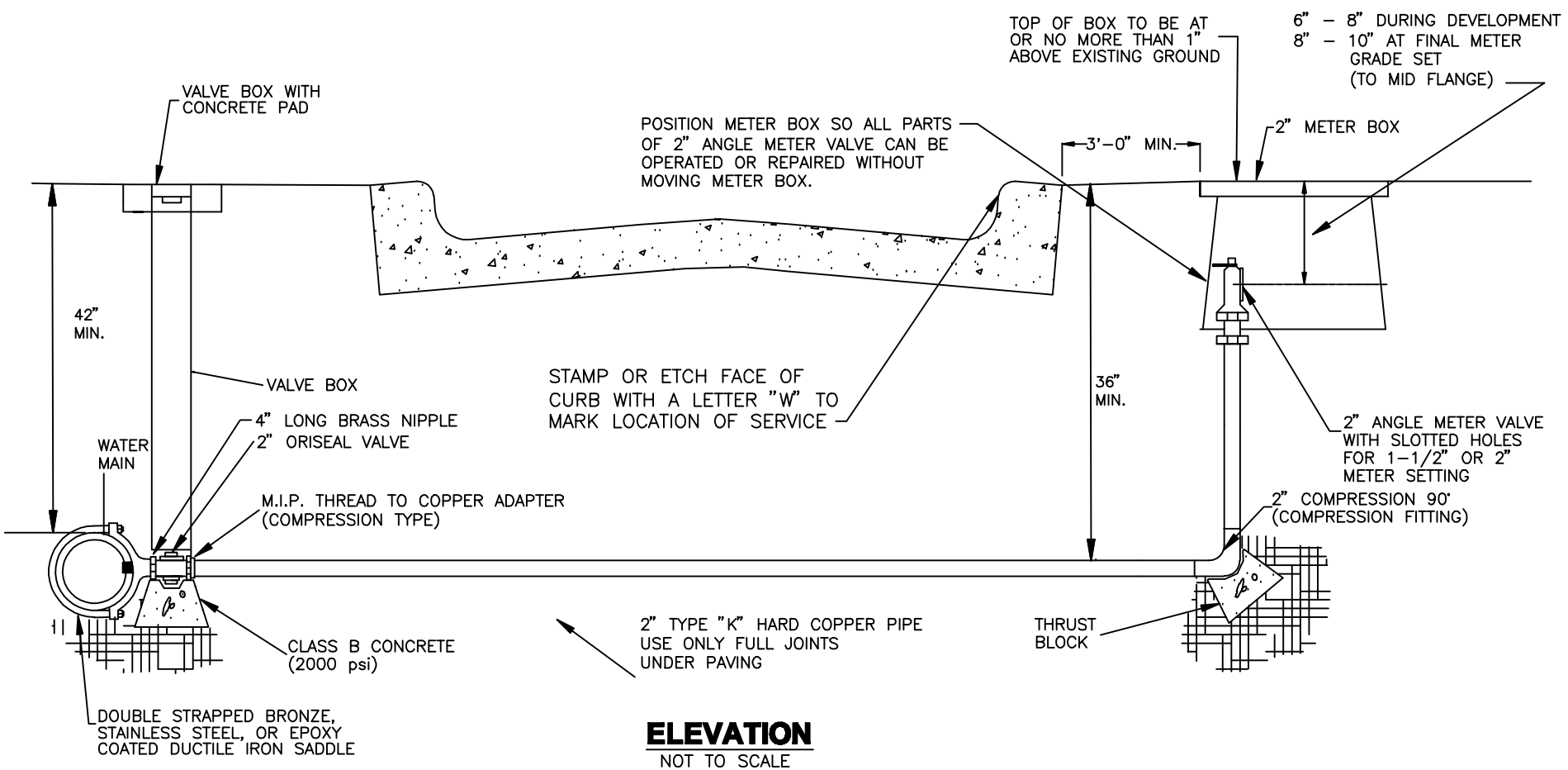
1" WATER SRVICE FOR 1" AND 3/4" OUTLETS

CITY OF COLLEYVILLE TEXAS

DEC 2013

W-10



ELEVATION

NOT TO SCALE

NOTES:

1. DOUBLE STRAPPED BRONZE, STAINLESS STEEL, OR EPOXY COATED DUCTILE IRON SADDLES SHALL BE USED TO TAP ALL MAINS.
2. ALL COPPER FITTINGS SHALL BE COMPRESSION FITTINGS.
3. INSTALL 2" PIPE AND TAP FOR BOTH 1– 1/2" AND 2" METER INSTALLATIONS.
4. MINIMUM 6" TAPS REQUIRED ON ALL WATER MAINS 16" AND LARGER.
5. METERS SHALL NOT BE INSTALLED IN EXISTING OR PROPOSED SIDEWALKS OR WITHIN 3' OF DRIVEWAYS OR STREETS.
6. METERS AND TAPS SHALL BE LOCATED ON SAME SIDE OF MAIN.
7. VALVE BOX AND CONCRETE PAD SHALL NOT BE INSTALLED IN CONFLICT WITH METER BOXES. INSTALL WITH 1' MINIMUM SEPARATION.
8. CONTRACTOR SHALL REMOVE ALL SAND OVER FITTINGS & INSTALL METER BOX PROVIDED BY CITY PRIOR TO REQUESTING METER INSTALLATION.
9. USE 2" X 1" FLANGED REDUCER IF REDUCING TO 1" METER.
10. METER BOX SHALL BE OLDCASTLE/CARSON MODEL NO. 1324, OR APPROVED EQUAL.

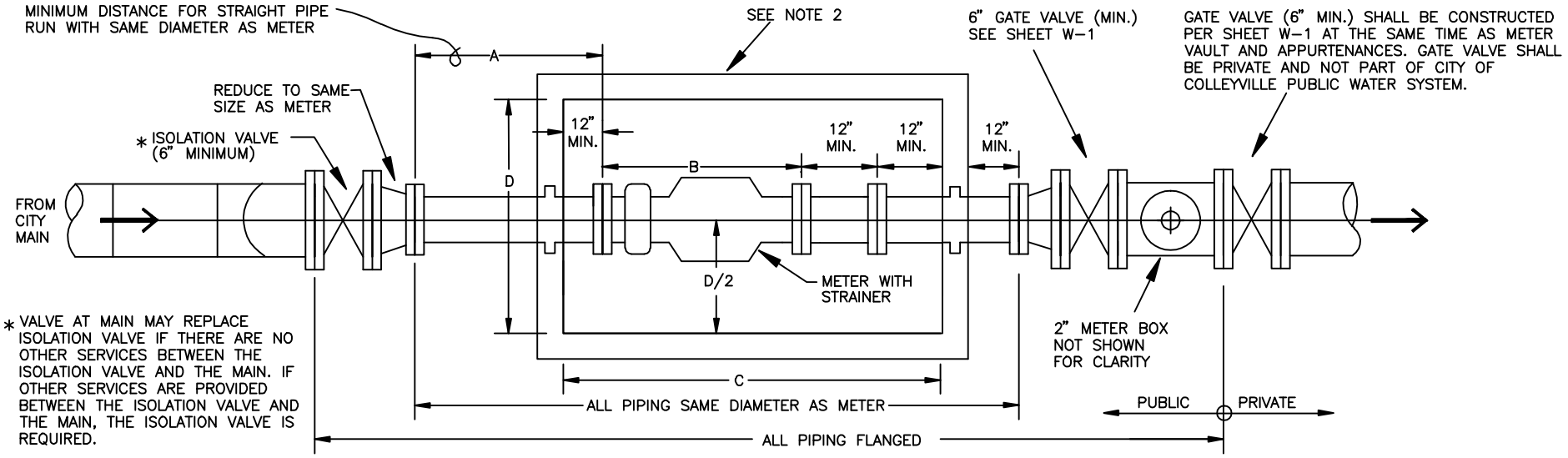
REVISIONS
REVISIONS

2" WATER SERVICE DETAIL FOR 2" & 1.5" OUTLETS

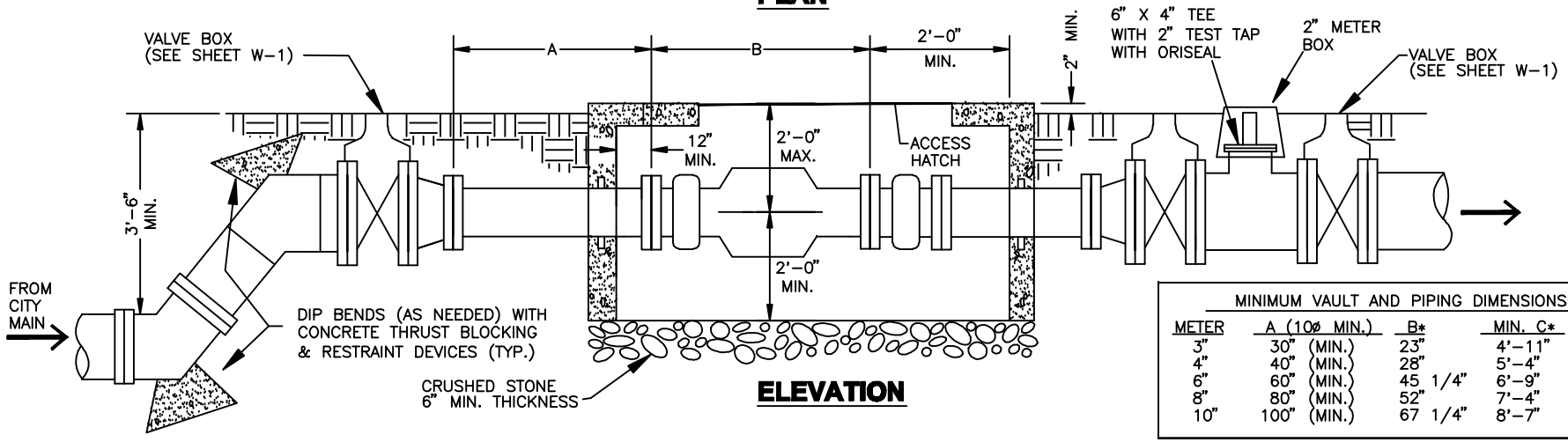
CITY OF COLLEYVILLE TEXAS

DEC 2013

W–11



PLAN



ELEVATION

MINIMUM VAULT AND PIPING DIMENSIONS*

METER	A (10ø MIN.)	B*	MIN. C*	MIN. D
3"	30" (MIN.)	23"	4'-11"	4'-0"
4"	40" (MIN.)	28"	5'-4"	4'-0"
6"	60" (MIN.)	45 1/4"	6'-9"	4'-0"
8"	80" (MIN.)	52"	7'-4"	4'-6"
10"	100" (MIN.)	67 1/4"	8'-7"	4'-6"

*SEE NOTE 2. METER LENGTH (B) MAY CHANGE ANNUALLY AND WILL AFFECT MIN. VAULT LENGTHS (C). DIMENSIONS SHOWN ARE FOR DOMESTIC METERS ONLY. IRRIGATION METERS HAVE SHORTER DIMENSIONS.

NOTES

1. PIPING & BENDS IN METER VAULT SHALL BE FLANGED DUCTILE IRON, CLASS 350. OTHER PIPING & FITTINGS SHALL BE RESTRAINED MJ OR FLANGED DUCTILE IRON.
2. CONTACT PUBLIC WORKS DEPARTMENT FOR CURRENT INFORMATION ON METERS & VAULTS PRIOR TO DESIGN OF METER FACILITY. VAULTS MAY BE CONSTRUCTED OF CAST-IN-PLACE OR PRECAST CONCRETE OR PLASTIC AS APPROVED BY THE CITY.
3. METER VAULT SHALL NOT BE INSTALLED IN EXISTING OR PROPOSED SIDEWALKS, DRIVEWAYS, PAVEMENTS OR ANY TRAFFIC AREAS.
4. ACCESS HATCH FOR METER VAULT SHALL BE 3'-6" X 3'-6" AS MANUFACTURED BY BILCO OR APPROVED EQUAL. HATCH SHALL BE LOCATED FOR EASE OF ENTRY AND ACCESS TO METER.
5. TOP OF VAULT SHALL BE 2" ABOVE GROUND WITH DRAINAGE SLOPING DOWN AWAY FROM VAULT.
6. METER BYPASSES ARE ONLY ALLOWED ON ONE-WAY FEEDS.

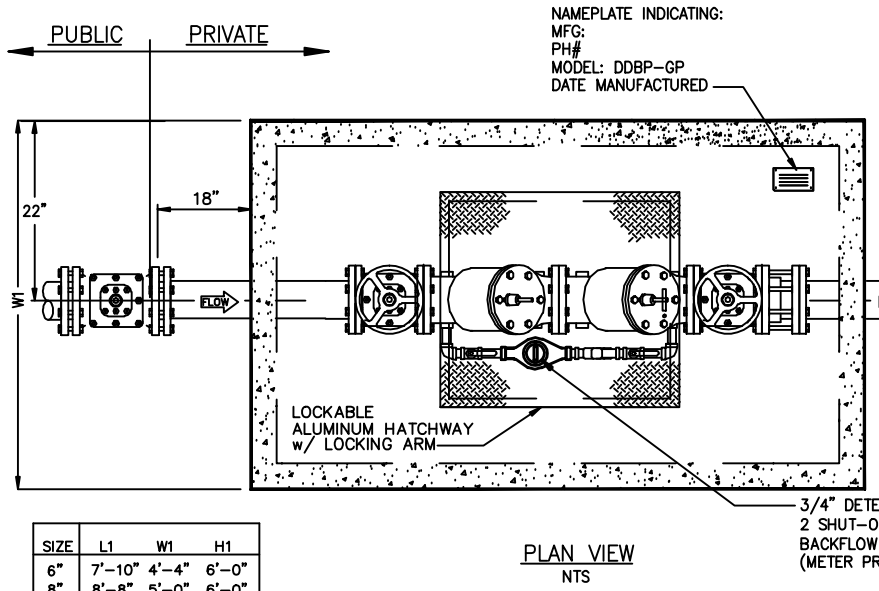
REVISIONS
REVISIONS

TYPICAL METER VAULT & APPURTENANCES

CITY OF COLLEYVILLE TEXAS

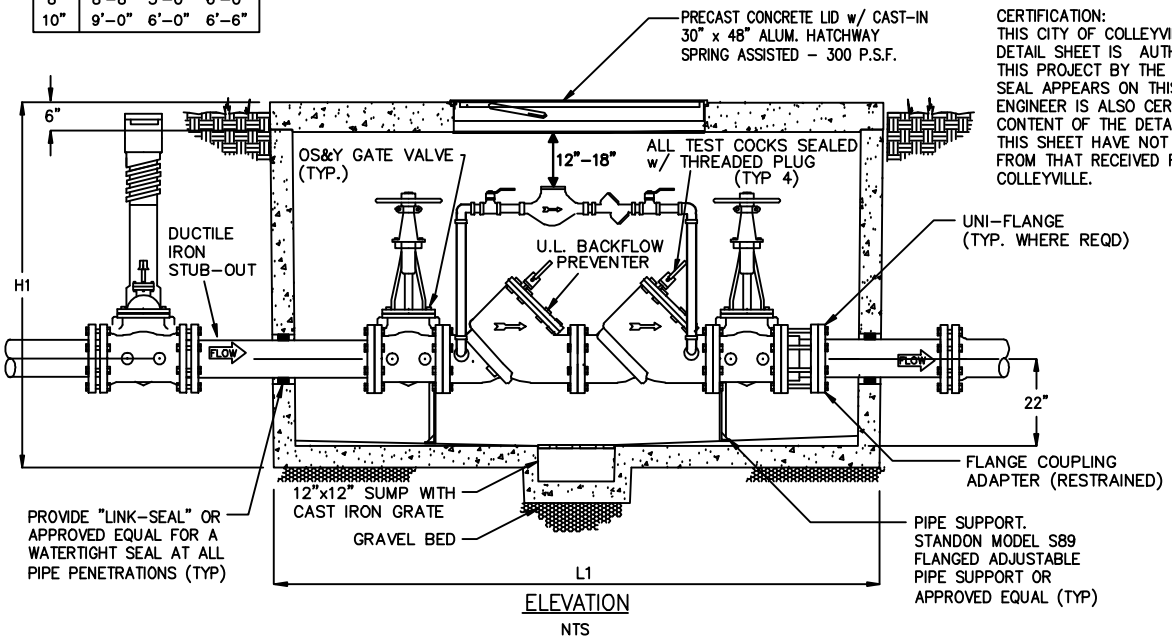
DEC 2013

W-12



SIZE	L1	W1	H1
6"	7'-10"	4'-4"	6'-0"
8"	8'-8"	5'-0"	6'-0"
10"	9'-0"	6'-0"	6'-6"

PLAN VIEW
NTS



ELEVATION
NTS

SPECIFICATIONS :
CLASS 1 CONCRETE WITH DESIGN STRENGTH OF 4500 PSI AT 28 DAYS. UNIT IS OF MONOLITHIC CONSTRUCTION AT FLOOR AND FIRST STAGE OF WALL WITH SECTIONAL RISER TO REQUIRED DEPTH.

CONCRETE :
REINFORCEMENT: GRADE 60 REINFORCED STEEL REBAR CONFORMING TO ASTM A615 ON REQUIRED CENTERS OR EQUAL.

HATCHWAY :
1/4" ALUMINUM DIAMOND PLATE COVER, WITH 1/4" HATCHWAY: EXTRUDED ALUMINUM FRAME. HATCH TO BE FURNISHED WITH 316 STAINLESS STEEL SNAP LOCK & BRASS HINGES.

CERTIFICATION:
THIS CITY OF COLLEYVILLE STANDARD DETAIL SHEET IS AUTHORIZED FOR USE IN THIS PROJECT BY THE ENGINEER WHOSE SEAL APPEARS ON THIS SHEET. THIS ENGINEER IS ALSO CERTIFYING THAT THE CONTENT OF THE DETAILS AND NOTES ON THIS SHEET HAVE NOT BEEN ALTERED FROM THAT RECEIVED FROM THE CITY OF COLLEYVILLE.

ACCESS/MAINTENANCE:
ACCESS MUST BE MADE AVAILABLE TO THE CITY DURING NORMAL WORKING HOURS FOR INSPECTION OF THE ASSEMBLY AND/OR READING THE METER. THE MAINTENANCE OF ALL OF THE EQUIPMENT INSIDE THE VAULT SHALL BE THE RESPONSIBILITY OF THE PROPERTY OWNER.

GENERAL NOTES:
1. ALL CONSTRUCTION SHALL BE IN ACCORDANCE WITH THE CITY OF COLLEYVILLE STANDARD SPECIFICATIONS FOR WATER & SEWER CONSTRUCTION, LATEST EDITION.
2. THE ASSEMBLY SHALL MEET THE REQUIREMENTS OF ASSE 1048 FOR DOUBLE-CHECK VALVES AND AWWA STANDARDS FOR BACK FLOW PREVENTION AND SHALL BE UL LISTED.
3. PROOF OF PAYMENT OF IMPACT FEES MUST BE PROVIDED TO INSPECTIONS BEFORE CONSTRUCTION CAN START.
4. ENTRY LADDER MUST BE INSTALLED IF ASSEMBLY IS NOT INSTALLED ON CENTER.
5. ANY VARIATIONS FROM THIS DETAIL MUST BE APPROVED BY ENGINEER.

LOCATION:
1. THE VAULT SHALL BE LOCATED ON THE OWNER'S PROPERTY AS CLOSE TO THE RIGHT-OF-WAY AS POSSIBLE, IN A LOCATION ACCESSIBLE TO CITY PERSONNEL FOR INSPECTION AND/OR READING OF THE METER.
2. AT THE OWNER'S OPTION, SUBJECT TO CITY APPROVAL, THE DOUBLE-CHECK BACKFLOW PREVENTOR MAY BE INSTALLED INSIDE THE BUILDING. INSTALLATION OF A DETECTOR CHECK (METER) AT THE PROPERTY LINE MAY ALSO BE REQUIRED IF THE BACK FLOW PREVENTION ASSEMBLY IS INSTALLED INSIDE THE BUILDING.

VAULT:
1. THE VAULT SHALL BE PRE-CAST CONCRETE MEETING THE SPECIFICATIONS IDENTIFIED ON THIS DETAIL, MANUFACTURED BY NEW BASIS, OLD CASTLE PRECAST PRODUCTS, OR APPROVED EQUAL.
2. THE VAULT SHALL BE PLACED ON 8-INCH CRUSHED LIMESTONE AND HAVE A 12-INCH BY 12-INCH SUMP DRAIN. THE BOTTOM OF THE VAULT SHALL BE GROUTED TO PROVIDE A SLOPE TO THE DRAIN.

PERMIT/INSPECTION:
1. PERMITS SHOULD BE COORDINATED THROUGH THE CITY OF COLLEYVILLE.
2. THE INITIAL INSTALLATION/INSPECTION OF THIS ASSEMBLY WILL BE THROUGH THE CITY OF COLLEYVILLE. INSPECTION OF THE ASSEMBLY WILL BE MADE BY WATER RESOURCES DIVISION AND MUST BE ACCEPTED PRIOR TO ISSUANCE OF C.O. ANNUAL INSPECTIONS/ TESTING OF THE BACKFLOW WILL BE THE RESPONSIBILITY OF THE PROPERTY OWNER.
3. THE PIPELINE BETWEEN THE UPSTREAM GATE VALVE AND THE BUILDING SHALL BE INSPECTED BY THE FIRE DEPARTMENT.
4. THE PUBLIC WATER LINE WILL BE INSPECTED BY THE PUBLIC WORKS DEPARTMENT.

INSTALLATION:
1. THE DOUBLE-CHECK BACKFLOW PREVENTOR SHALL CONSIST OF ONE ASSEMBLY WHICH INCLUDES TWO INDEPENDENTLY OPERATING CHECK VALVES AND FOUR RESILIENT TEST COCKS FOR TESTING OF THE ASSEMBLY. THE ASSEMBLY SHALL ALSO INCLUDE TWO RESILIENT SEATED (OS&Y) GATE VALVES FOR SHUT OFF AND TEST COCKS. GATE VALVES SHALL BE AS MANUFACTURED BY MUELLER, CLOW OR APPROVED EQUAL. THE DOUBLE CHECK ASSEMBLY SHALL BE WATTS SERIES 709, AMES MODEL C200/C200N, FEBCO MODEL 850/870/870V OR APPROVED EQUAL.
2. THE UNIT AND SHUTOFF VALVES SHALL BE UL/FM APPROVED.
3. THE BYPASS (AUXILIARY) LINE SHALL CONSIST OF AN APPROVED BACK FLOW PREVENTION (COMPLETE WITH TEST COCKS) AND 5/8-INCH BY 3/4-INCH WATER METER (METER SUPPLIED AND INSTALLED BY CITY).
4. THE BYPASS LINE BACK FLOW PREVENTION ASSEMBLY SHALL BE WATTS SERIES 007, AMES SERIES 200, FEBCO 850, OR APPROVED EQUAL.
5. THE BYPASS METER WILL BE PROVIDED AND INSTALLED BY THE CONTRACTOR.
6. THE BACK FLOW PREVENTER SHALL HAVE AN EPOXY COATED DUCTILE IRON OR STAINLESS STEEL BODY WITH REPLACEMENT BRONZE SEAT AND/OR A UNITIZED STAINLESS STEEL AND PLASTIC CHECK ASSEMBLY.

TESTING:
1. THIS ASSEMBLY MUST BE TESTED IMMEDIATELY UPON INSTALLATION. COPIES OF THE TEST REPORTS MUST BE FORWARDED TO THE CITY. COPIES MUST BE PROVIDED TO INSPECTION BEFORE FINAL WILL BE RELEASED.
2. UPON COMPLETION AND TESTING OF THE FIRE LINE/FIRE DEPARTMENT CONNECTION, THE OWNER SHALL BE REQUIRED TO SUBMIT AN ANNUAL TEST REPORT FROM A REPUTABLE TESTING COMPANY (CERTIFIED FIRELINE TESTERS) STATING THAT THE VALVES ARE IN GOOD WORKING CONDITION.

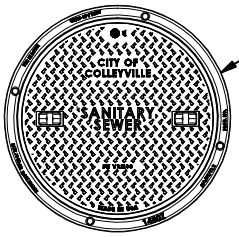
REVISIONS	
REVISIONS	

6" THRU 10" DOUBLE DETECTOR BACKFLOW PREVENTER ASSEMBLY

CITY OF COLLEYVILLE TEXAS

DEC 2013

W-13



32" Ductile Iron Manhole Frame and Cover. Match top of cover with pavement or set cover up to 1/4" (max.) above finished grade in residential areas. See sheet S–10 for manhole frame and cover details.

Manholes constructed within 100 year flood plain shall have watertight ring and lid.

40" O.D x 30" I.D. Precast Concrete Grade Rings

Manhole Frame and Cover

Plaster exterior and interior surface withcoats of non–shrink, hydraulic cement grout including joint between manhole top and concrete pad.

6" CONCRETE PAD

Use double ring of $\frac{1}{2}$" GS/5 Precast Concrete Sealant, as manufactured by General Sealants, Inc., or CS–102 Con Seal, as manufactured by Concrete Sealants, Inc., to seal ring to concrete and between grade rings. (See Note 1.)

30"

Neck

Variable, but not to exceed 2' – 6". (See Note 1.)

End of Transition

Cone

Varies

All concrete shall be class A 3,000 psi compressive strength.

5" (Typ.)

Wall

Coat exterior of manhole with 2 coats of Ertech 2100 Non–Fibered Asphaltic Emulsion or equal.

Diameter 48" or 60"

Channel (Invert)

Bench

6" Min. (Typ.)

Rubber boot at all pipe penetrations (typ.)

8" Min.

Concrete Base

Flowline

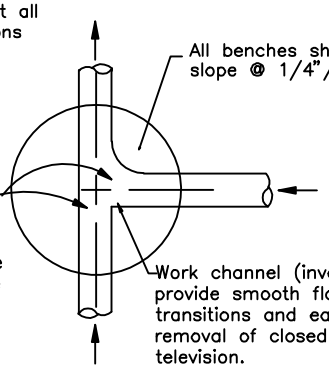
MANHOLE ELEVATION

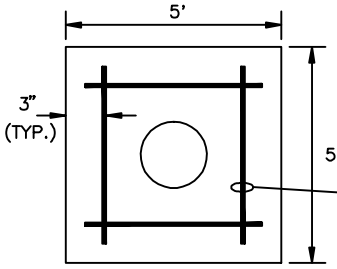
5'–10" or 6'–10" Minimum Dimension (See Note 3.)

Use 6" min. layer of washed rock beneath manhole where ground water is encountered. Bottom to be poured in dry.

Notes:

1. Grade rings may be used to adjust neck 12" or less. When adjustment is greater than 12", contractor shall use sono tube and place concrete for neck adjustment. Precast concrete grade rings shall be constructed by manufacturer in standard 2", 3", 6", 8" and 12" heights.
2. Contractor shall not remove any forms until 24 hours after concrete is placed. No backfill shall begin until 96 hours after concrete is placed.
3. Use 60" inside diameter manholes under <u>any</u> of the following:
   a. depth from top of cover to bottom MH is 10' or greater
   b. pipes into manhole are 15" diameter or larger
   c. manhole is a drop manhole
4. All manhole inverts shall be full depth of sewer pipes. All inverts shall be formed to center of manhole and shall provide smooth flow transitions.
5. All Manholes shall be installed with 5'x5'x6" thick concrete pad with manhole covers in center of pad. Pads shall be reinforced with four No. 4 rebars. Joint Seal around concrete pads.
6. Install approved 6' high fiberglass MH marker within 12" of pad in undeveloped area.
7. Contractor shall rub all interior surfaces to a smooth finish.
8. Grout and Seal between concrete pad and HMAC pavement.





MANHOLE PAD (6" thick)
PLAN

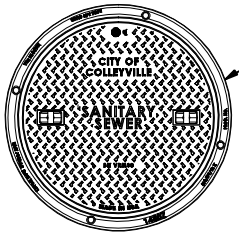
REVISIONS
REVISIONS

CAST IN PLACE SANITARY SEWER MANHOLE

CITY OF COLLEYVILLE TEXAS

DEC 2013

S–1



32" Ductile Iron Manhole Frame and Cover. Match top of cover with pavement or set cover up to 1/4" (max.)above finished grade in residential area. See sheet S-10 for manhole frame and cover details.

Manholes constructed within 100 year flood plain shall have watertight ring and lid.

Plaster exterior and interior surface with coats of Non-shrink hydraulic cement grout including joint between manhole top and concrete pad.

Manhole Frame and Cover

40" O.D. x 30" I.D. Precast Concrete Grade Rings

6" CONCRETE PAD

Variable, but not to exceed 2'-6" (See Note 1.)

End of Transition

Use double ring of GS5 Precast Concrete Sealant, as manufactured by General Sealants, Inc., or CS-102 Con Seal, as manufactured by Concrete Sealants, Inc., to seal ring to concrete and between grade rings. (See Note 1.)

30"

Varies

Concentric Manhole Cone (See Note 6.)

Coat exterior of manhole with 2 coats of Ertech 2100 Non-Fibered Asphaltic Emulsion or equal.

48" or 60" Diameter

Per ASTM C478, Class III Wall B

Riser

ASTM C 478, Class III O-ring rubber gasket joint See detail

Resilient connector at all pipe penetrations Kor-N-Seal or approved equal

Bench

Channel (Invert)

See Note 10

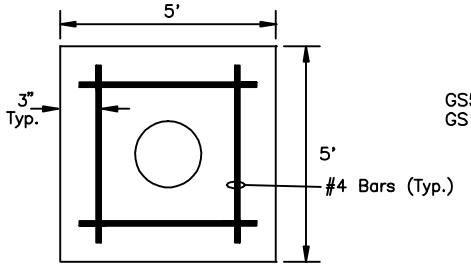
8" Min. Height Conc. Footer

Use 6" min. layer of washed rock beneath manhole where ground water is encountered.

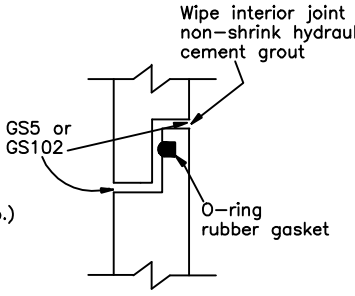
MANHOLE ELEVATION

Notes:

1. Grade rings may be used to adjust neck 12" or less. When adjustment is greater than 12", contractor shall use sono tube and place concrete for neck adjustment. Precast concrete grade rings shall be constructed by manufacturer in standard 2", 3", 6", 8" and 12" lengths.
2. Use 60" inside diameter manholes under any of the following:
   a. depth from top of cover to bottom of MH is 10' or greater
   b. pipes into manhole are 15" diameter or larger
   c. manhole is a drop manhole
3. All manhole inverts shall be full depth of sewer pipes. All inverts shall extend throughout manhole bottom and provide smooth flow transitions.
4. All Manholes shall be installed with 5'x5'x6" thick concrete pad with manhole covers in center of pad. Pads shall bereinforced with four # 4 rebars. Joint Seal around concrete pads.
5. Install approved 6' high fiberglass MH marker within 12" of pad in undeveloped areas.
6. All benches shall be slightly higher than top of pipes and slope gently down to inverts.
7. Eccentric cones and flat tops may be used if required by owner.
8. See Figure 16 for bench and channel (invert) requirements.
9. Grout and seal between concrete pad and HMAC pavement.
10. Concrete Footer to extend 6" from exterior manhole wall.
11. Spray-on epoxy coating required on interior of manholes downstream of lift stations.



MANHOLE PAD (6" thick)
PLAN



JOINT DETAIL

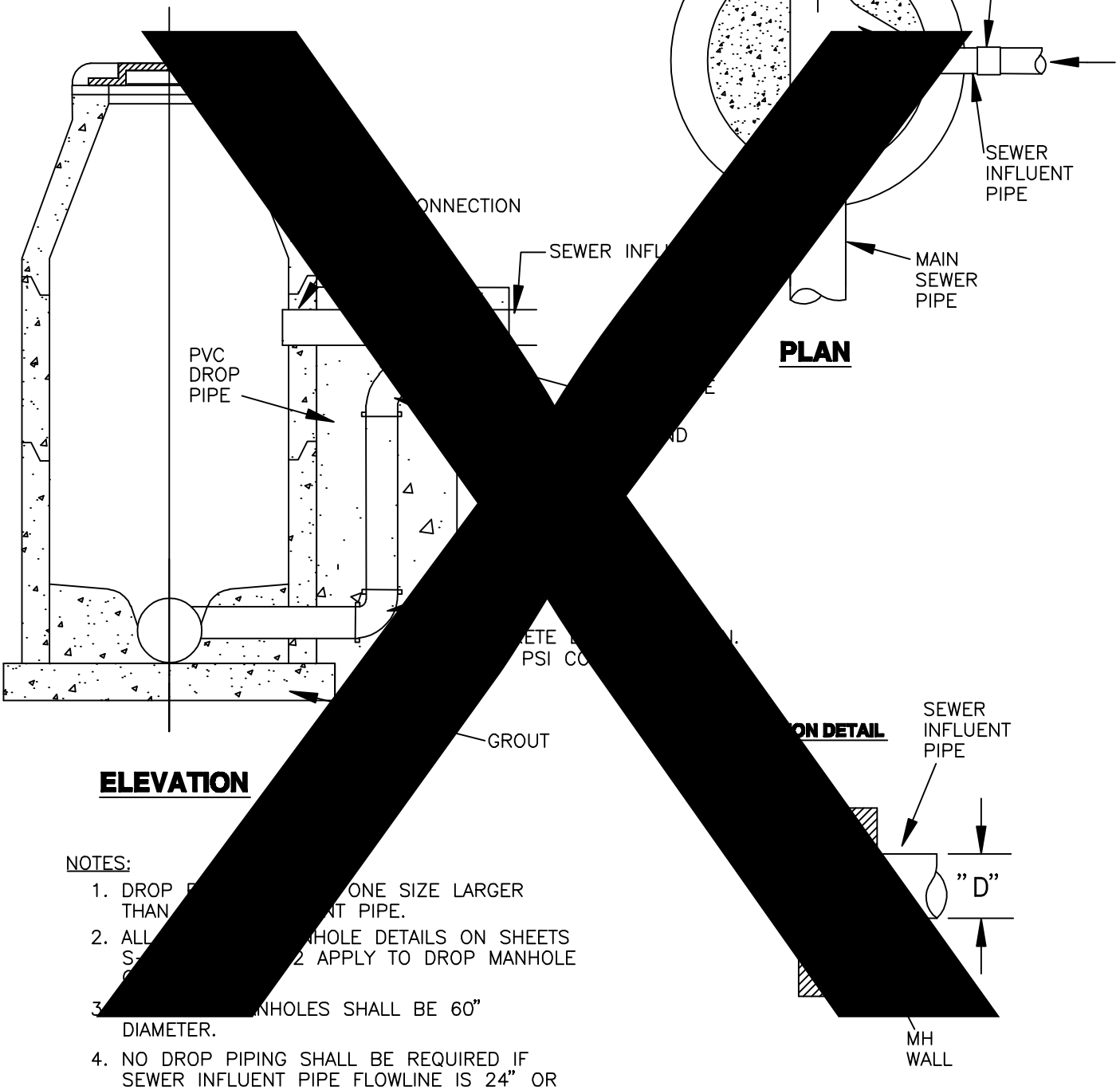
REVISIONS
REVISIONS

PRECAST CONCRETE SANITARY SEWER MANHOLE

CITY OF COLLEYVILLE TEXAS

DEC 2013

S-2



NOTES:

1. DROP P… ONE SIZE LARGER THAN …NT PIPE.
2. ALL …HOLE DETAILS ON SHEETS S… …2 APPLY TO DROP MANHOLE …
3. …NHOLES SHALL BE 60" DIAMETER.
4. NO DROP PIPING SHALL BE REQUIRED IF SEWER INFLUENT PIPE FLOWLINE IS 24" OR LESS ABOVE MAIN SEWER PIPE FLOWLINES OR IF MAIN SEWER PIPE BENCH IS HIGHER THAN SEWER INFLUENT FLOWLINE.
5. USE INSIDE DROP MANHOLE IF INFLUENT PIPE IS 8" IN DIAMETER OR SMALLER.

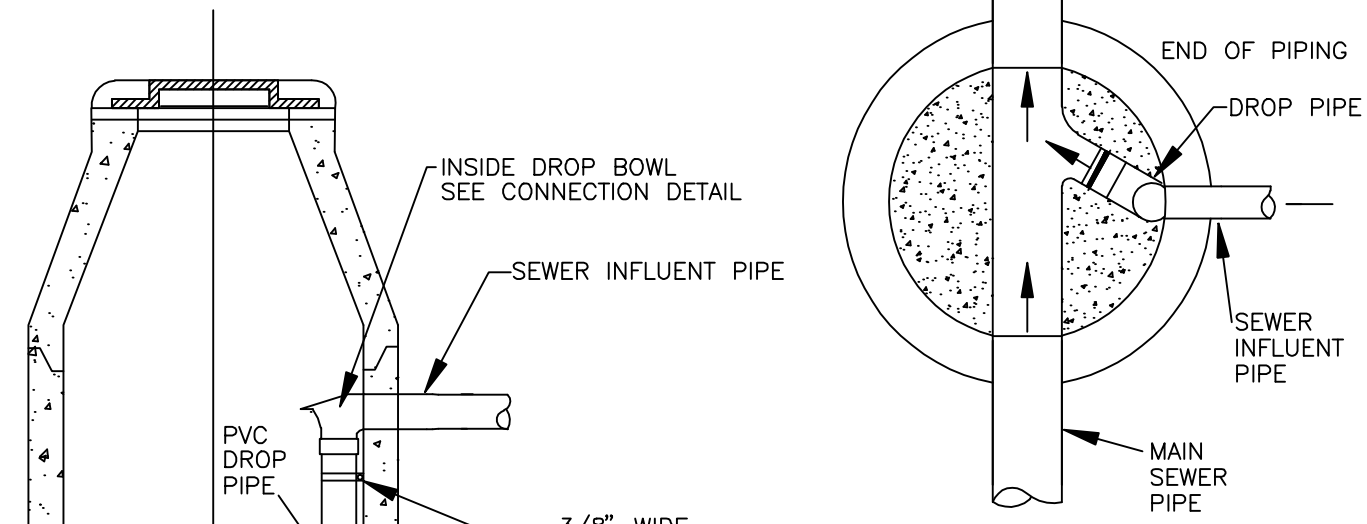
REVISIONS
REVISIONS

OUTSIDE DROP MANHOLE

CITY OF COLLEYVILLE TEXAS

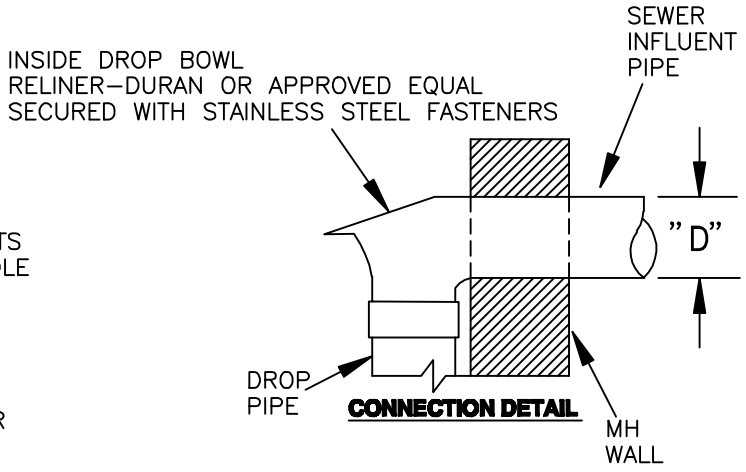
DEC 2013

S-3



PLAN

ELEVATION



NOTES

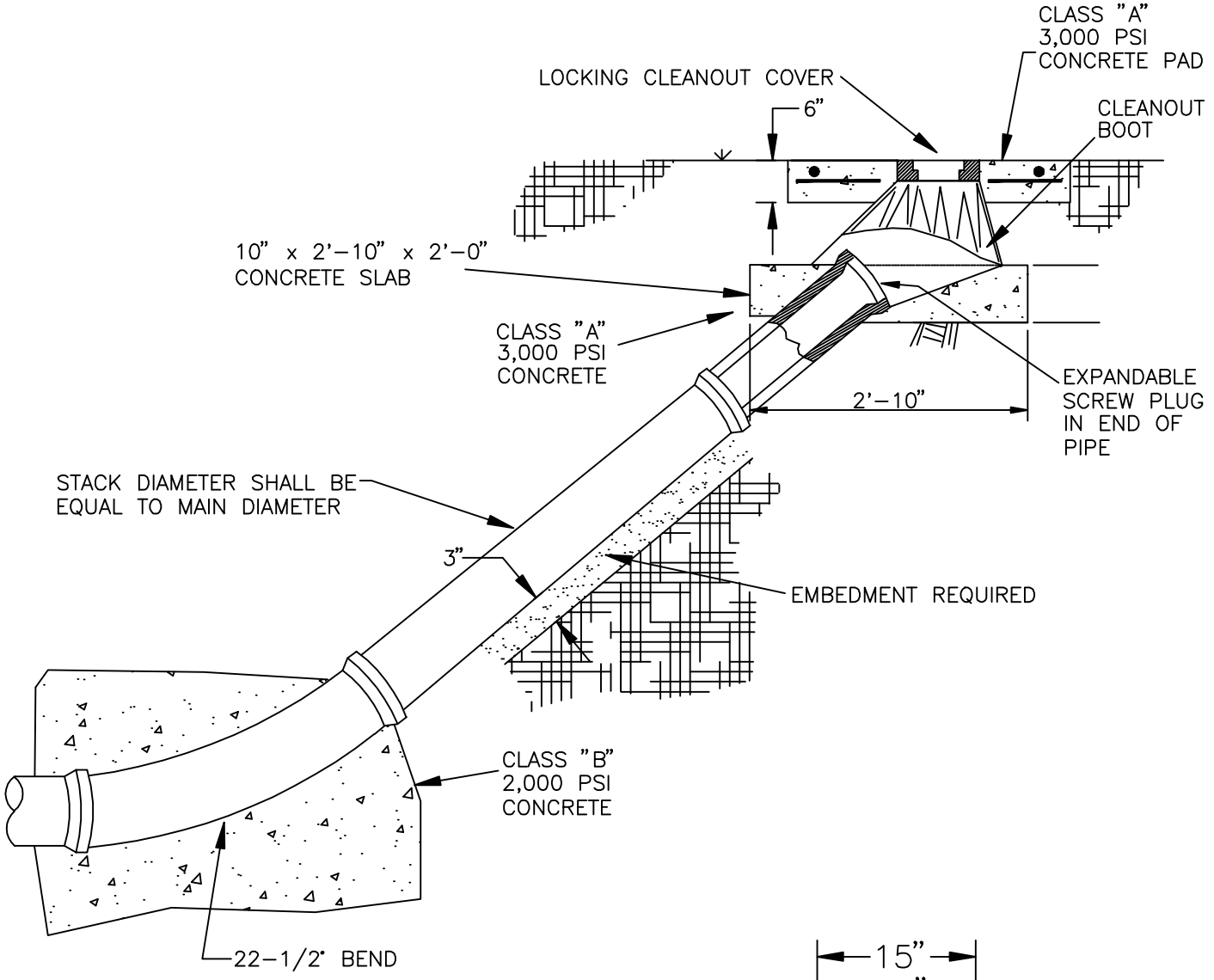
1. DROP PIPE SHALL BE ONE SIZE LARGER THAN SEWER INFLUENT PIPE.
2. ALL STANDARD MANHOLE DETAILS ON SHEETS S–1 AND/OR S–2 APPLY TO DROP MANHOLE CONSTRUCTION.
3. ALL DROP MANHOLES SHALL BE 60" DIAMETER.
4. NO DROP PIPING SHALL BE REQUIRED IF SEWER INFLUENT PIPE FLOWLINE IS 24" OR LESS ABOVE MAIN SEWER PIPE FLOWLINES OR IF MAIN SEWER PIPE BENCH IS HIGHER THAN SEWER INFLUENT FLOWLINE.
5. OUTSIDE DROP CONNECTION REQUIRED IF INFLUENT PIPE IS 10" OR GREATER IN DIAMETER.
6. SPRAY–ON EPOXY COATING REQUIRED ON INTERIOR OF MANHOLE.

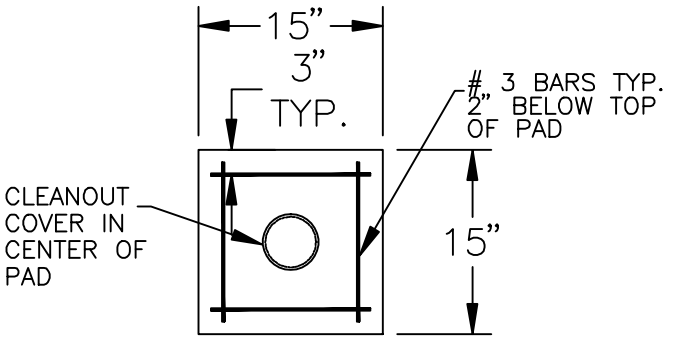
REVISIONS
REVISIONS

INSIDE DROP MANHOLE

CITY OF COLLEYVILLE TEXAS

DEC 2013





CONCRETE CLEANOUT PAD

NOTES:

1. CLEANOUTS ARE NOT PERMITTED FOR USE UNLESS APPROVED BY CITY.
2. PROVIDE CLEANOUT PAD ON EVERY CLEANOUT.
3. THE SIZE OF THE CLEANOUT MUST BE EQUAL TO THE SIZE OF THE WASTEWATER COLLECTION SYSTEM MAIN.
4. CLEANOUTS SHALL NOT BE ALLOWED ON SANITARY SEWER MAINS 10" OR GREATER IN DIAMETER.
5. NO SERVICES ALLOWED ON STACK.

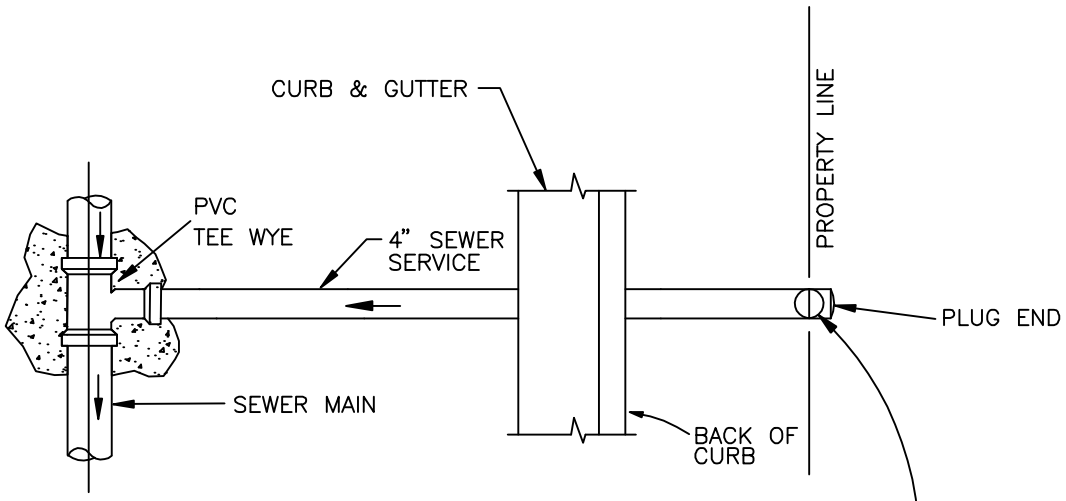
REVISIONS
REVISIONS

SANITARY SEWER CLEANOUT

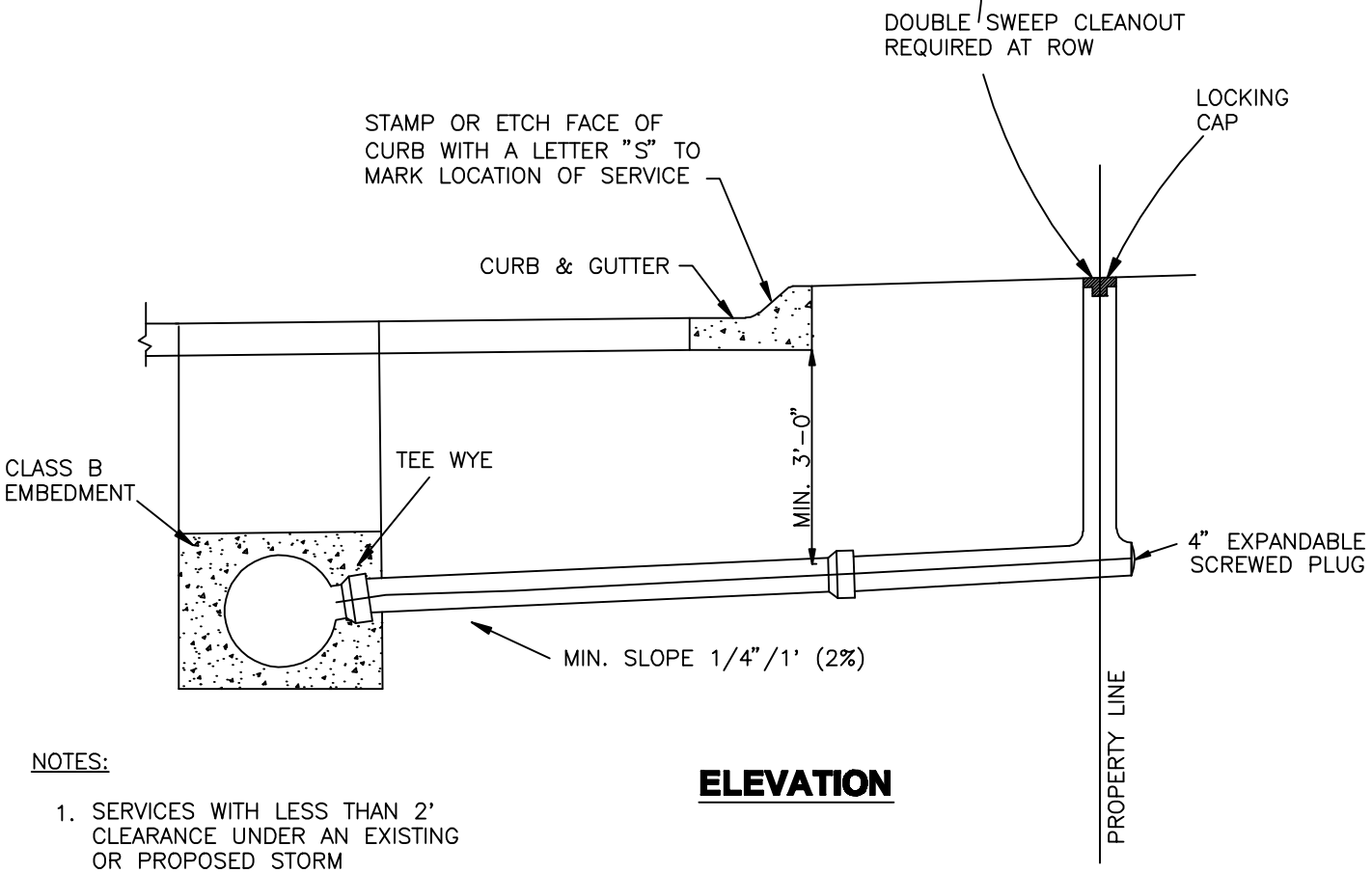
CITY OF COLLEYVILLE TEXAS

DEC 2013

S-5



PLAN



ELEVATION

NOTES:

1. SERVICES WITH LESS THAN 2' CLEARANCE UNDER AN EXISTING OR PROPOSED STORM DRAIN SHALL BE CONCRETE ENCASED.
2. SERVICES SHALL BE SDR-35 PVC PIPE WITH CLASS B EMBEDMENT.
3. NEW SERVICE TAPS ON EXISTING MAINS REQUIRE INSERTA-TEE CONNECTION OR APPROVED EQUAL.

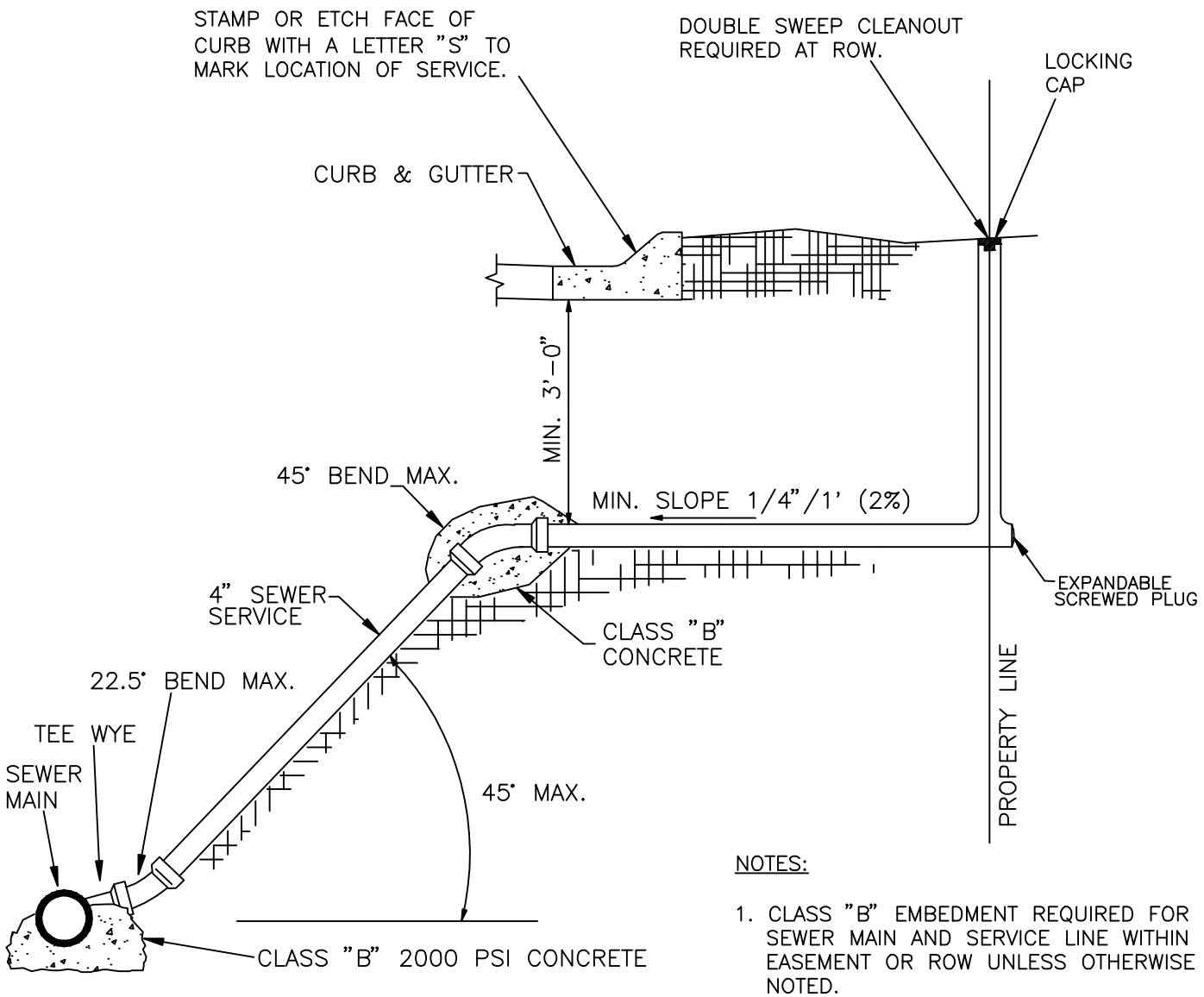
REVISIONS
REVISIONS

SANITARY SEWER SERVICE

CITY OF COLLEYVILLE TEXAS

DEC 2013

S-6



ELEVATION

(PLAN VIEW SAME AS SANITARY SEWER SERVICE)

NOTES:

1. CLASS "B" EMBEDMENT REQUIRED FOR SEWER MAIN AND SERVICE LINE WITHIN EASEMENT OR ROW UNLESS OTHERWISE NOTED.
2. SERVICES SHALL BE SDR-26 PVC PIPE.
3. NEW SERVICE TAPS ON EXISTING MAINS REQUIRE INSERTA-TEE CONNECTION OR APPROVED EQUAL.
4. DEEP SANITARY SEWER SERVICE TO BE USED WHEN DEPTH OF SEWER MAIN IS AT OR EXCEEDS 10'.

REVISIONS
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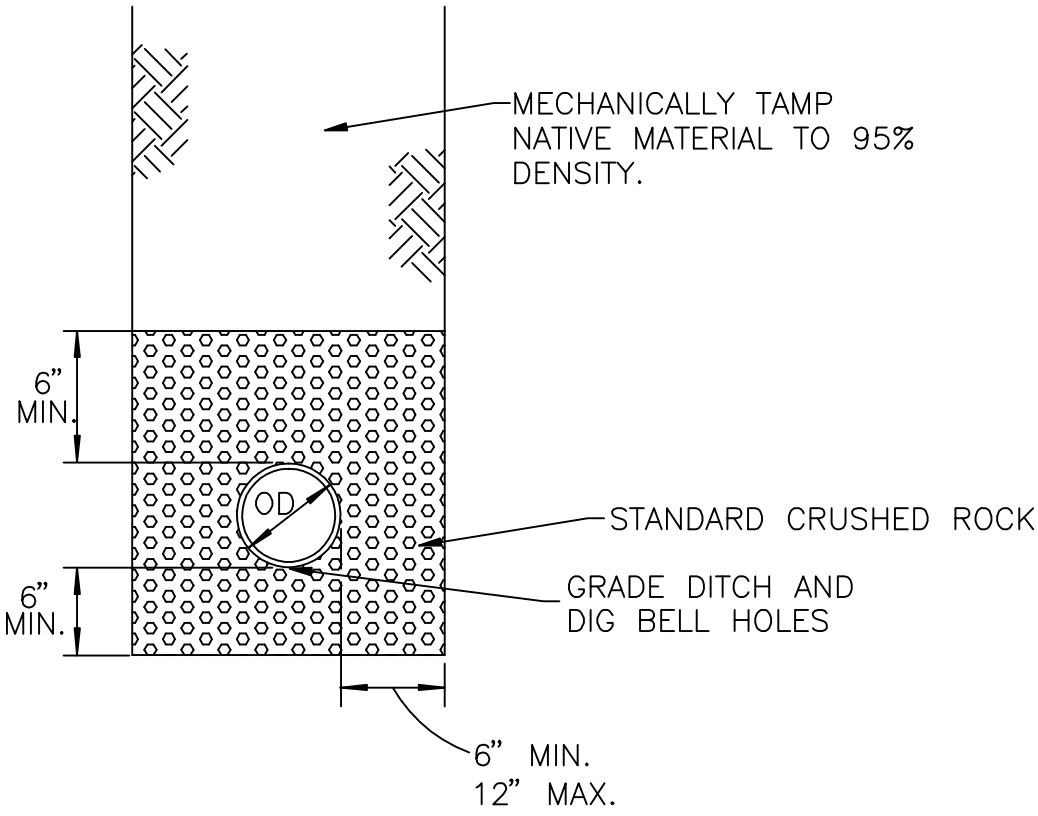
DEEP SANITARY SEWER SERVICE

CITY OF COLLEYVILLE TEXAS

DEC 2013

S-7



CLASS "B" EMBEDMENT
TYPICAL SANITARY SEWER MAIN

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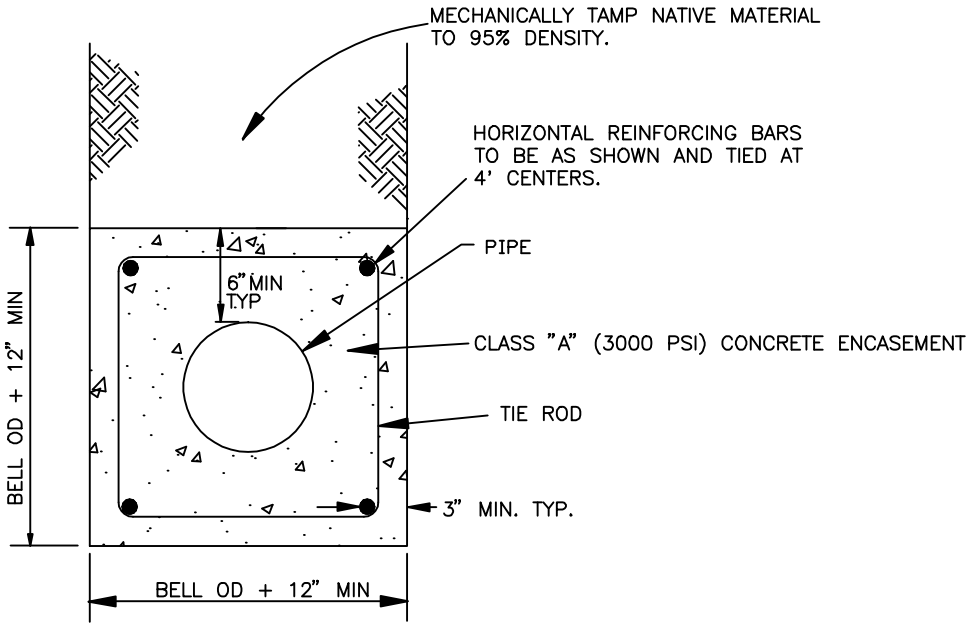
CLASS 'B' SEWER EMBEDMENT

CITY OF COLLEYVILLE TEXAS

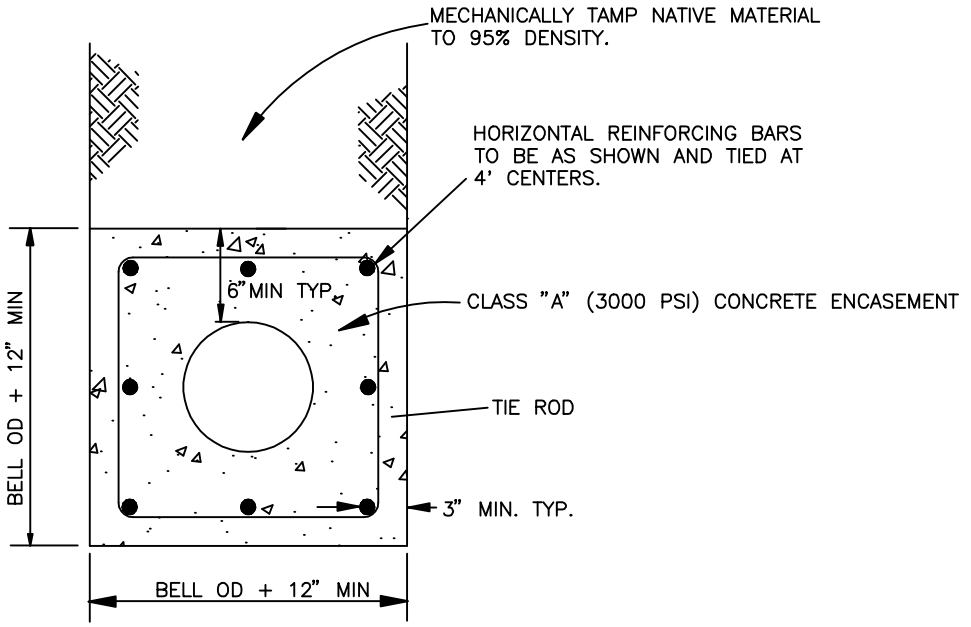
DEC 2013

S-8



6" – 8" PIPE: 4 – #4 HORIZONTAL REINFORCING BARS WITH TIE RODS
10" – 12" PIPE: 4 – #5 HORIZONTAL REINFORCING BARS WITH TIE RODS

CONCRETE ENCASEMENT FOR 12" & SMALLER PIPE



14" – 18" PIPE: 8 – #5 HORIZONTAL REINFORCING BARS WITH TIE RODS
20" – 30" PIPE: 8 – #6 HORIZONTAL REINFORCING BARS WITH TIE RODS

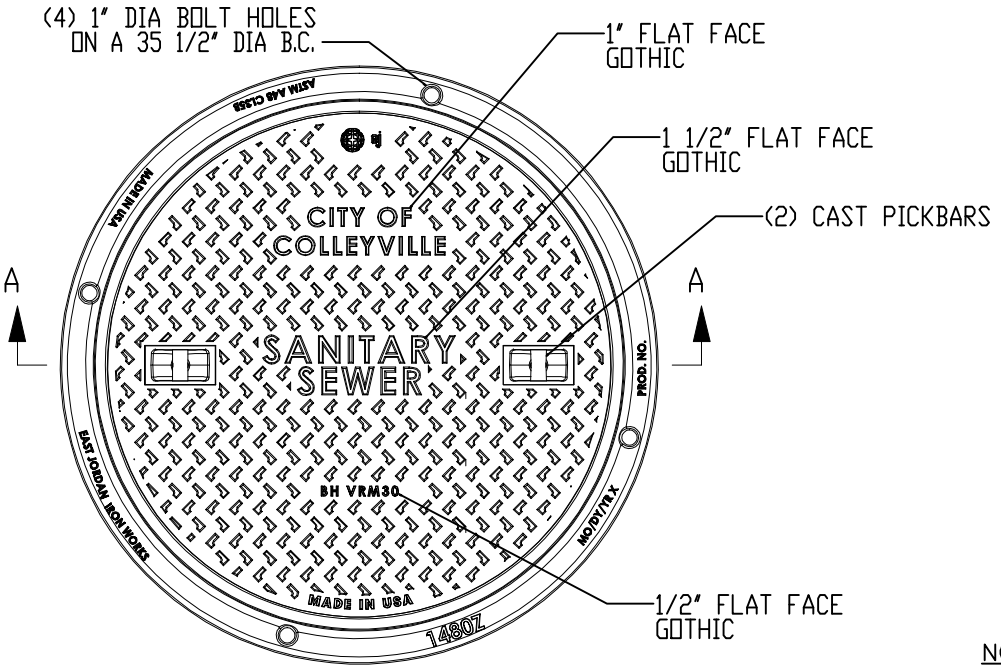
CONCRETE ENCASEMENT FOR 14" - 30" PIPE

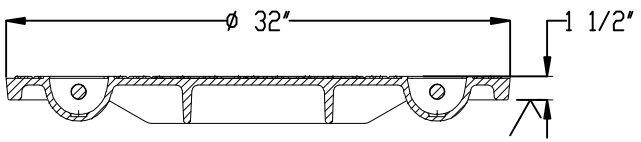
REVISIONS
REVISIONS

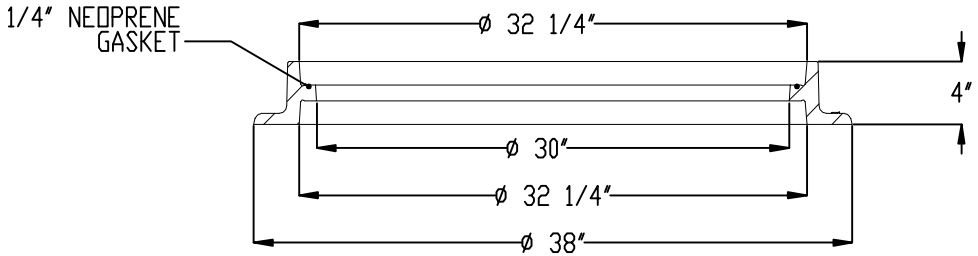
CONCRETE ENCASEMENT
WATER AND SANITARY SEWER MAINS

CITY OF COLLEYVILLE TEXAS

DEC 2013







SECTION A-A

NOTES:

1. MANHOLE FRAME AND COVER SHALL BE AS MANUFACTURED BY BASS & HAYES PRODUCT NO. VRM 30 OR APPROVED EQUAL.
2. THESE MANHOLE COVERS AND FRAMES ARE NOT TO BE USED ON PRIVATE MANHOLES.
3. FOR DRAINAGE FACILITIES (INLETS, MANHOLES AND JUNCTION BOXES), SUBSTITUTE 'STORM DRAIN' FOR 'SANITARY SEWER'.
4. COVER WILL BE NON-LOCKING TYPE.

REVISIONS	
REVISIONS	

SANITARY SEWER MANHOLE FRAME & COVER DETAIL

CITY OF COLLEYVILLE TEXAS

DEC 2013

S-10

Street Sign Specifications

Street signs will be installed by the developer. Standard City of Colleyville signs may be acquired from Centerline Supply (972.647.8300). If streets are private, alternate signs may be used, subject to approval by the Colleyville Community Development Department.

Galvanized Pole
2 3/8" x 12' thin wall round - Centerline Supply Item #30910
50 pound bag of concrete for each pole

Street Sign Blank
Flat 9" H x variable L x .125" thickness

Street Sign Specifications
City Logo 9" x 9" E.G. Film
Blue Background H.I. Film
Reflective white lettering/E.G.

Lettering on post-mounted street name signs shall be composed of initial upper-case letters at least 6 inches in height and lower-case letters at least 4.5 inches in height. Font - Highway B

Supplementary lettering to indicate the type of street (such as Street, Avenue, or Road) or the section of the city (such as NW) may be in smaller lettering, composed of initial upper-case letters at least 3 inches in height and lower-case letters at least 2.25 inches in height. Block numbers shall be 3 inches in height. Font - Highway B

Street Sign Brackets
2 3/8" x 6" Cap and Cross - Centerline Supply Item #30630-CF5 (36" and under sign blank)
2 3/8" x 12" Cap and Cross - Centerline Supply Item #30630-CF5 (over 36" sign blank)

Other Sign Brackets
For stop sign, speed limit and yield signs
2 3/8" Centerline Supply Item #30604-000

Stop Sign 30"
H.I. Film. Stop signs shall be installed a minimum height of 7' from bottom edge of sign to existing ground.

Speed Limit Sign 24" x 30"
H.I. Film. Speed limit signs shall be installed a minimum height of 7' from bottom edge of sign to existing ground.

Yield Sign 30"
H.I. Film. Yield signs shall be installed a minimum height of 7' from bottom edge of sign to existing ground.

Any additional signage not listed must be approved before installation.

We utilize the Manual on Uniform Traffic Control Devices, or MUTCD which defines the standards to install and maintain traffic control devices on all public streets, highways, bikeways, and private roads open to public traffic.