

CITY OF INDEPENDENCE, MISSOURI



WATER MAIN INSTALLATION STANDARDS

Last update: September 29, 2011



City of Independence Water Department



STANDARDS AND SPECIFICATIONS FOR WATER MAIN EXTENSIONS AND RELOCATIONS

Table of Contents

	<u>Page No.</u>
FORWARD	
<u>INSTRUCTIONS TO CONTRACTOR</u>	
IC-1 General Statement	1
IC-2 Scope	1
IC-3 Definitions	1
IC-4 Performance and Maintenance Bond	2
IC-5 Insurance	2
IC-6 Licenses, Permits and Certificates	3
IC-7 Pre-Construction Conference	3
IC-8 Construction Notification	4
IC-9 Engineering Plans	4
IC-10 Reference Standards	4
IC-11 Field Changes	4
IC-12 Acceptance of Water Pipe	4
<u>PIPELINE MATERIALS</u>	
PM-1 General	5
PM-2 Ductile Iron Pipe and Fittings	5
Fitting Metal Thickness	5A
PM-3 Polyethylene Encasement	6
PM-4 Valves	6
PM-5 Valve Boxes, Bases, Lids, Covers and Valve Stem Extension	7
PM-6 Fire Hydrant	7
PM-7 Inspection of Materials	9
PM-8 Thrust Restraints	9
<u>EXISTING UTILITIES AND IMPROVEMENTS</u>	
EU-1 Location of Underground Utilities	10
EU-2 Protection of Property & Existing Improvements	10
EU-3 Removing and Restoring Street Pavement, Driveways, and Other Surfaced Areas	10
EU-4 Maintenance of Traffic	11

Table of Contents (Cont.)

<u>EXCAVATION AND TRENCHING</u>		<u>Page No.</u>
EX-1	Scope	12
EX-2	General	12
EX-3	Blasting	12
EX-4	Unauthorized Excavation	13
EX-5	Removal of Water	13
EX-6	Sheeting and Shoring	13
EX-7	Stabilization	13
EX-8	Trench Excavation	14
EX-9	Highway and Railroad Crossing	16
EX-10	Expedited Crossings	16
EX-11	Barricades and Warning Signs	16
<u>LAYING AND BACKFILL</u>		
LB-1	Pipe Installation	17
LB-2	Polyethylene Encasement	19
LB-3	Setting Valves and Fittings	20
LB-4	Setting Fire Hydrants	20
LB-5	Blow-off Assemblies	21
LB-6	Air Release Assemblies	21
LB-7	Connections to Existing Mains	21
LB-8	Street Surface Restoration	21
<u>WATER MAINS NEAR SEWERS</u>		
WMS-1	Horizontal Separation	22
WMS-2	Vertical Separation	22
WMS-3	Unusual Conditions	22
WMS-4	Sewer Manholes	22
<u>WATER MAINS DISINFECTION</u>		
WD-1	Water Main Disinfection	23
<u>CONCRETE</u>		
CS-1	Scope	24
CS-2	Concrete	24
CS-3	Mixing	24
CS-4	Forms	24
CS-5	Placing of Concrete	24
CS-6	Curing	25

Table of Contents (Cont.)

<u>CONSTRUCTION DETAILS</u>	<u>Page No.</u>
Typical Hydrant Installation: Straight Set	CD-1
Typical Hydrant Piping Layout: Straight Set	CD-2
Typical Valve and Valve Box Installation – Roadway	CD-3
Typical Valve and Valve Box Installation	CD-4
Typical Valve Stem Extension	CD-5
Typical Thrust Blocking for – Bends	CD-6
Typical Thrust Blocking for – Tees	CD-7
Typical Thrust Blocking for – Plugs	CD-7A
Typical Field Lok Gasket Installation for Ductile Iron Pipe – 11-1/4°, 22-1/2°, 45° and 90° (Bends)	CD-8
Typical Field Lok Gasket Installation for Ductile Iron Pipe – Tees	CD-9
Typical Field Lok Gasket Installation for Ductile Iron Pipe – Dead Ends	CD-10
Typical Encasement Under Roadway for Ductile Iron Pipe – 6” thru 20”	CD-11
Typical Encasement Under Railroad for Ductile Iron Pipe – 6” thru 20”	CD-12
Typical Encasement Under Railway and Roadway for Ductile Iron Pipe 6” thru 20”	CD-12A
Polyethylene Encasement for Ductile Iron Pipe	CD-13
Typical Blow-off Assembly – Dead End	CD-14
Typical Blow-off Detail	CD-15
Typical Tapping Sleeve Connection	CD-16
Typical Blow-off Connection	CD-17
Typical Sanitary Sewer Main Crossing Water Main	CD-18
Standard Laying Conditions for Ductile Iron Pipe	CD-19
Typical Air Release Pit	CD-20
Typical 2” Air Release Pit	CD-20A
Joint Deflection for Ductile Iron Pipe	CD-21
Night Plug for Ductile Iron Pipe	CD-22
Marker Post Detail	CD-23
Concrete Drive Replacement	CD-24
Gravel Drive Replacement	CD-25
Asphalt Drive Replacement	CD-26
City Street Cut Replacement	CD-27
Typical Driveway Plan	CD-28



City of Independence Water Department



FORWARD

The City of Independence Water Department is dedicated to helping its customers. Experience has shown that a uniform standard for installation for water mains is the best way to accomplish our common goals. These standards are not intended to be restrictive or burdensome, but to assist in expediting water main construction. It is, therefore, required that water main construction comply with these standards.

This booklet is offered to assist architects, engineers, contractors and inspectors in the planning and construction of water mains.

No set of rules or instructions will cover all conditions. The Water Department welcomes and encourages all inquiries concerning unusual or special needs of customers.

The Water Department should be contacted about each project as early as possible to provide time for necessary plan review, job checking, scheduling, and proper coordination.

Due to constant progress in the development of materials and methods, some procedures outlined herein may be modified. Upon request, information will be supplied concerning changes and revisions.

Persons making regular use of this booklet should maintain contact with the Water Department.

City of Independence Water Department



City of Independence Water Department



STANDARDS FOR WATER MAIN INSTALLATION

INSTRUCTIONS TO CONTRACTOR

IC-1. GENERAL STATEMENT: The purpose of these Standards is to provide for the furnishing of all materials, labor, equipment, tools, superintendence, and other services necessary to construct, complete with appurtenances, water main extensions as approved by the Water Department.

IC-2. SCOPE: These Standards are general in scope and will refer to conditions which may not be encountered. Any provision of these Standards which pertains to a nonexistent condition and is not applicable to the work to be performed shall have no meaning and shall be disregarded.

IC-3. DEFINITIONS: Any word, phrase, or other expression defined hereunder and used in these Standards shall have the meaning herein given:

DEVELOPER: An individual, firm, partnership, joint venture, corporation, company or association who desires a water main extension and who by means of a contract with the City agrees to pay all bills for engineering, labor, and materials used on the design, construction, and installation of said water main extension.

CITY: City of Independence, Missouri.

CONTRACTOR: The individual, firm, partnership, joint venture, corporation, company or association contracting with the developer to perform the construction and installation of said water main extension.

DIRECTOR: The Director of the Independence Missouri Water Department or his authorized representative.

DISTRIBUTION MANAGER: The manager of the Transmission and Distribution System of the Independence, Missouri Water Department.

ENGINEER: Unless otherwise specified, the term "Engineer" when used in these Standards and Specifications shall mean the individual, firm, partnership, joint venture, corporation, company or association contracting on behalf of the Applicant to perform the design of said water main extension.

ENGINEERING SUPERVISOR: The Supervisor of the Independence, Missouri Water Department Engineering Division or his authorized representative.

STANDARDS FOR WATER MAIN INSTALLATION (Cont.)

INSPECTOR: The agent appointed by the Engineering Supervisor to assist in the inspection of all material and labor. The inspector will keep the Engineering Supervisor informed as to progress of the work and the manner in which it is being done. The Inspector has authority to reject defective and improper materials and to suspend any work that is being improperly done, all in accordance with these standards, subject to the final decision of the Engineering Supervisor.

PERMITS, LICENSES, AND CERTIFICATES: An official document issued by the City, County, State or other governing body, authorizing the construction of a water main extension or relocation, or any appurtenance thereto, in an area of their jurisdiction.

PLANS: The official, certified drawings, standard plans, profiles, details, and supplemental drawings or reproductions thereof, furnished by the Engineer which show the location, character, dimensions and details of the work.

SHOP DRAWINGS: All drawings, diagrams, illustrations, brochures, schedules, and other data which are prepared by the Contractor, a sub-contractor, manufacturer, supplier, or distributor and which illustrate the equipment, material, or some portion of the work.

STANDARD: Unless otherwise specified, the term “Standard” refers to the most current edition of “STANDARDS FOR WATER MAIN INSTALLATION” as distributed by the Independence, Missouri Water Department.

THE WORK: All work to be done and the equipment, supplies, and materials to be furnished by the Contractor on each Water Main Extension.

IC-4. **PERFORMANCE AND MAINTENANCE BOND:** Before the Water Department will make connection, the Developer or his agent, servant, employee, independent contractor, or such other persons, firm, partnership, corporation, or association by whom such work is to be performed shall file with the Water Department a performance and maintenance bond in an amount equal to the estimated cost of the City’s installation cost conditioned that such work has been done in accordance with the Water Department’s Standard and guaranteeing the work and maintenance of trenches for a period of one (1) year from the date of connection.

IC-5. **INSURANCE:** The Developer or his independent contractor agrees to carry, at his own expense, liability insurance naming the City of Independence, Missouri as being held harmless against all claims for damage to property or injury to persons by reason of such construction work.

STANDARDS FOR WATER MAIN INSTALLATION (Cont.)

The following must be included on Insurance Certificate:

- (1) Public Liability Insurance:

Bodily Injury	\$300,000.00	Per Person
	500,000.00	Per Occurrence
Property Damage	500,000.00	Per Occurrence

- (2) Auto Liability

Bodily Injury	\$300,000.00	Each Occurrence
	300,000.00	Aggregate
Property Damage	150,000.00	Each Occurrence
	150,000.00	Aggregate
	or	
	500,000.00	Combined Single Limit

- (3) Worker's Compensation and Employer's Liability as required by the State of Missouri.

- (4) City of Independence must be named as held Harmless.

- (5) All certificates of insurance shall state that ten (10) days written notice will be given to the City before the policy is canceled or changed.

A copy of said insurance shall be issued to the City of Independence Water Department, Engineering Division, and said insurance shall remain in effect until said work has been completed and accepted by the City.

IC-6. LICENSES, PERMITS AND CERTIFICATES: All licenses, permits, certificates, etc., required for and in connection with the work to be performed under the provisions of the Water Main Extension Agreement Contract shall be secured by the Developer or his Contractor entirely at his own expense prior to starting any construction work. The requirements of the authority or authorities issuing the license, permit, or certificate shall be fully complied with, and a copy of said licenses, permits and certificates shall be issued to the City of Independence Water Department, Engineering Division.

IC-7. PRE-CONSTRUCTION CONFERENCE: The Developer or his Contractor will be required to schedule a Pre-Construction Conference with the City of Independence Water Department prior to starting construction of pipeline.

STANDARDS FOR WATER MAIN INSTALLATION (Cont.)

IC-8. **CONSTRUCTION NOTIFICATION**: The Contractor shall give to the Water Department two days notice, in writing, or verbal, of his intent to start to work. The notification must include the following:

- (1) Starting Date
- (2) Job Number and Location
- (3) Foreman's Name
- (4) Contractor's Phone Number

IC-9. **ENGINEERING PLANS**: The Developer shall furnish four (4) copies of his engineering plans and specifications for installation of piping system with necessary easements, pipe, fire hydrants, valves, fittings and connections to existing Waster Department mains clearly shown. The plans and specifications will be reviewed by the City of Independence Water Department and one copy will be returned to either the Applicant or his Engineer with either comments to be incorporated into the plans and stamped "RETURNED FOR CORRECTION" or stamped "NO EXCEPTIONS NOTED." If plans and specifications have comments to be incorporated, or they are disapproved, they must be revised and resubmitted to the Water Department for approval prior to the start of any construction.

IC-10. **REFERENCE STANDARDS**: Reference to the standards of any technical society, organization, or association, or to codes of local or state authorities, shall mean the latest standards, code specification, or tentative standard adopted and published at the date of construction, unless specifically stated otherwise.

IC-11. **FIELD CHANGES**: Any change from the approved plans and specifications shall require prior written approval from the Engineering Supervisor or Inspector.

IC-12. **ACCEPTANCE OF WATER PIPE**: When the work has been completed, a final review of the work will be made by the Engineering Supervisor and the Inspector for determination of acceptance by the Water Department. Developer will receive a letter of acceptance when the water main installation is accepted into the distribution system by the Water Department.



City of Independence Water Department



PIPELINE MATERIALS

PM-1. GENERAL: All pipeline materials necessary for the complete installation of the work shall be furnished by the Developer or his Contractor. All materials shall be new and shall comply with the standards that follow unless approval for other is given by the Director.

PM-2. DUCTILE IRON PIPE AND FITTINGS:

PM-2.01. Ductile Iron Pipe: All pipe and fittings to be incorporated into the City's potable water system shall be ductile iron pipe with a maximum joint deflection of 5 degrees in accordance with the following specifications: Centrifugally cast ductile iron pipe, with Tyton joints complete with necessary gaskets and lubricant in accordance with ANSI/AWWA Specifications C151/A21.51 for ductile iron pipe. Pipe will be furnished cement lined per ANSI/AWWA C104/A21.4, seal coated inside and bituminous coated outside. Nominal 18-foot lengths in quantity pipe class, and M.T., as shown below:

- I. 6-inch Class 52 Tyton Joint Cast Ductile Iron pipe, .031" M.T.
- II. 8-inch Class 52 Tyton Joint Cast Ductile Iron Pipe, 0.33" M.T.
- III. 12-inch Class 52 Tyton Joint Cast Ductile Iron Pipe, 0.37" M.T.

Fittings are to be ductile-iron with Tyton joint per ANSI/AWWA C110/A21.10 specifications.

The Tyton joint shall conform in all respects to requirements for the push-on joint in ANSI/AWWA C111/A21.11 specifications.

All ductile-iron fittings to have a rated minimum working pressure of 350 psi M.T. and a maximum joint deflection of 5 degrees.

- I. 6-inch Class 350 Tyton Joint Cast Ductile Iron, See Page 5a for M.T.
- II. 8-inch Class 350 Tyton Joint Cast Ductile Iron, See Page 5a for M.T.
- III. 12-inch Class 350 Tyton Joint Cast Ductile Iron, See Page 5a for M.T.

Outside coating: petroleum asphaltic coating approximately 1 mil in thickness.

Cement-mortar inside lining: cement lining in accordance with ANSI/AWWA C104/A21.4 Standard for Cement-Mortar Lining for Ductile Iron Fittings for Water.

PIPELINE MATERIALS (Cont.)

FITTING METAL THICKNESS

FITTING SIZE	11 1/4° Min. M.T.	22 1/2° Min. M.T.	45° Min. M.T.	90° Min. M.T.
6"	.37	.37	.37	.37
8"	.39	.39	.39	.39
12"	.43	.43	.43	.43

NOTE: All fittings are to be Trim Tyton® as manufactured by U.S. Pipe or approved equal. Coating and lining shall be Permafuse® epoxy applied at the manufacturing facility of the fitting. Permafuse® epoxy shall be NSF-61 approved.

All fittings and pipe shall be manufactured in the United States.

PIPELINE MATERIALS (Cont.)

Alternate coating and lining; ductile iron fittings may be coated with a 6-8 mil nominal thickness fusion bonded epoxy conforming to requirements of ANSI/AWWA C550 and C116/A21.16.

PM-3. POLYETHYLENE ENCASUREMENT:

PM-3.01. Polyethylene Encasement: All ductile iron pipe fittings, valves, and other appurtenant items shall be encased in polyethylene material as specified in the polyethylene encasement specifications contained herein. Polyethylene encasement materials shall be:

20-INCH POLYWRAP (for 6-inch and 8-inch pipe)

Polyethylene encasement of Ductile Iron Pipe in accordance with ANSI/AWWA C105/A21.5. It shall be Flat 20-Inch and be a natural color (not black) with an 8 mil thickness. It shall be perforated at 20-foot intervals.

30-INCH POLYWRAP (for 12-inch pipe)

Polyethylene encasement of Ductile Iron Pipe in accordance with ANSI/AWWA C105/A21.5. It shall be Flat 30-Inch and be a natural color (not black) with an 8 mil thickness. It shall be perforated at 20-foot intervals.

PM-3.02. Adhesive tape shall be a general purpose adhesive tape 1-inch wide and approximately 8 mils thick, such as Scotchtape No. 50, Polyken No. 900, Tapecoat CT, or accepted equal.

PM-4. VALVES

PM-4.01. Gate Valves: The type, size, and location of valves shall be as shown on the accepted plans. Except as modified or provided herein, all gate valves in pipelines shall be 250 psi (pressure rating shall be cast on the outside of the valve), d.i. resilient-seated, tight closure gate valves, with non-rising stems, with TYTON[®] joint ends and name shall be cast on near the bell for recognition conforming with all applicable requirements of ANSI/AWWA C509 and C500.

PM-4.02. Valve Coating: All internal and external surfaces shall be coated with a fusion bonded epoxy to a minimum thickness of 8 mils. Said coating shall be non-toxic, impart no taste to water and shall conform to ANSI/AWWA C550. Said coating shall be applied prior to assembly such that all exposed external areas, including end connection bolt holes, body to bonnet bolt holes shall be coated with epoxy.

PM-4.03. Valve Gate: The gate shall consist of a ductile iron gate having a vulcanized synthetic rubber coating with no rubber-to-metal seams or edges to the waterway when in fully closed position. The gate shall provide zero leakage at the water working pressure in either direction.

PIPELINE MATERIALS (Cont.)

PM-4.04. Stainless Steel Bolts and Nuts: The bolts and nuts that fasten the bonnet shall be ANSI Type 34 or 316 stainless steel.

PM-4.05. Valve Seals: The valves shall be provided with two O-ring stem seals, one located above and one below the stem collar. The area between the O-rings shall be filled with lubricant. The "O" ring stem seal shall be replaceable with the valve under pressure in the full-open position.

One anti-friction washer shall be located below and one above the thrust collar. All seals between valve parts, such as body and bonnet and bonnet cover, shall be O-rings.

PM-4.06. Valve Operation: All valves shall be equipped with a two-inch (2") square wrench nut and THE DIRECTION OF ROTATION TO OPEN THE VALVE SHALL BE TO THE LEFT (COUNTER CLOCKWISE).

PM-5. VALVE BOXES, BASES, LIDS, COVERS, AND VALVE STEM EXTENSION:

PM-5.01. Valve Boxes: All valve boxes shall be made of cast or ductile iron, as manufactured by Clay and Bailey Manufacturing Company, or accepted equivalent. All roadway valve boxes shall consist of a base (no. 2260-6), shaft section of 6" diameter ductile iron pipe, top section and a lid marked "Water" (No. 2196). Valve boxes for valves not in a roadway shall have a base, a minimum 4 1/4" diameter shaft with lid marked "Water" and consist of an adjustable slip or screw type two-piece valve box or a minimum 6" diameter PVC pipe SDR-26 with lid marked "Water" (no 2194). See Construction Detail CD-3 and CD-4 for installation requirements. A valve box trench adaptor may be used in place of the valve box.

PM-5.02. Valve Stem Extension: When the distance from the top of the valve cover to the valve operating nut exceeds 3 feet, each buried valve shall be provided with an extension stem and operating nut. See Construction Detail CD-5 for installation requirements.

PM-6. FIRE HYDRANT: Fire hydrants shall conform to the requirements of AWWA Standard for Dry-Barrel Fire Hydrants (ANSI/AWWA C-502); and in addition, shall be listed by Underwriters Laboratories and Factory Mutual Research Corp. Cast marks or other permanent means shall be used to identify the fire hydrant as conforming to these standards.

Hydrants shall be rated for 250 psi operating pressure and tested at 500 psi per section 5.1 of AWWA C502. Production testing of each hydrant shall be performed at 500 psi to ensure proper assembly and operation and detect any imperfections. All iron parts, as designated in section 3.1.2 of AWWA C/502, shall be ductile iron.

Gray iron shall not be permitted, except for those parts which are designated to break upon traffic impact. The depth of bury shall be as stated on the drawings.

PIPELINE MATERIALS (Cont.)

Nozzles shall have two 2-1/2" hoses 180° apart and one 4-1/2" pumper. All nozzles shall be at same elevation. Nozzle threads shall be National Standard Fire Hose Coupling Screw Thread as described in Appendix A of AWWA C502. Nozzle caps shall be provided with chains and gaskets. Nozzles shall be reversed threaded into the upper barrel and mechanically locked into place.

Hydrant shall be 5-1/4" main valve opening minimum, and shall be of the full compression design, opening and closing with the pressure. The main valve seat ring shall thread into a bronze subseat and all the gaskets sealing the seat ring shall be on a bronze-to-bronze seating surface. The seat ring threads shall not serve as a pressure seal. The entire valve and rod assembly shall be removable by use of a small lightweight seat removal wrench.

The drain valves shall allow complete drainage of all residual water in the hydrant. The circumferential drain passage inside the hydrant shall be bronze on all surfaces.

All exterior bolting and fasteners below the ground line shall be stainless steel. Plated steel bolts and nuts are not acceptable.

Hydrant shall be the breakaway type, with a frangible ground line and rod coupling designed to break upon traffic impact and prevent further damage to the hydrant and connecting piping. The frangible coupling shall allow the upper section to be rotated to any desired position. Couplings which employ lugs, keeper devices, or a breakaway barrel are not acceptable. Frangible bolts are not acceptable either, due to the possibility of the use of non-frangible bolts.

Hydrant operating nuts shall be ductile iron and shall be pentagonal in shape, 1-1/2" point to flat (AWWA standard). The operating nut shall function as a weather shield. Hydrant shall open to the left.

The operating mechanisms shall utilize two "O" ring seals between the revolving nut and bronze-sheathed upper section of the valve rod. The top of the rod shall also be fitted with a travel stop nut to limit downward travel of the rod. All-weather grease shall be used to reduce friction in the thruster collar while opening the hydrant. The hydrant inlet shall be Tyton[®] Joint. Opening shall be 6 inches.

- Hydrant shall be painted orange with black nozzle caps and chain using Benjamin Moore & Co., Industrial Maint. Coating, Orange M22-65, Black M22-82.
- Manufacturer shall certify that hydrants furnished meet this specification.
- Fire hydrants shall be U.S. Pipe Metropolitan 250, American Darling or equal and approved.

PIPELINE MATERIALS (Cont.)

PM-7. INSPECTION OF MATERIALS: The Contractor shall submit (prior to construction) complete literature, shop drawings, and manufacturer's specifications on all material he proposes to furnish in connection with the Contract Agreement. Acceptance of such detailed information by the Engineering Supervisor will not release the Contractor of the responsibility for any error which may exist as the Contractor shall be responsible for the satisfactory completion of all work within the limits of the Contract. When required by the Standards or by the Engineering Supervisor, the Contractor shall furnish evidence in the form of test results or certificates that the material incorporated in the work conforms to the Standards.

All pipe, fittings, specials, valves, and other materials to be used in the construction of the water main shall be inspected by the Inspector prior to installation. The Contractor shall furnish any necessary labor or equipment required by the Inspector to complete their inspection. No pipe, fitting, specials, valves, or other material shall be placed until they have been inspected by the Inspector.

Inspection and conformance of the materials to this Standard will not relieve the Contractor of his subsequent responsibility regarding the materials. Any defective materials shall be removed and replaced by the Contractor at his own expense.

PM-8. THRUST RESTRAINTS:

PM-8.01. Thrust Blocks: Thrust blocking shall be designed for a minimum internal pipe pressure of 175 pounds per square inch plus 50% surge. Concrete for thrust blocks shall have a twenty-eight (28) day compression strength of two thousand (2000) psi. The blocking shall be kept clear of the entire bell configuration of any adjacent joint and shall be poured against undisturbed earth. All thrust blocks shall meet the criteria found on Construction Details CD-6, CD-7 and CD-7A.

Bearing areas for concrete thrust block are based on soil having an allowable safe lateral bearing of one (1) ton per square foot. Calculated area must be increased for soils with lower bearing capacity.

PM-8.02. Field Lok Gaskets: The use of Field Lok Gaskets 350[®] is acceptable in lieu of concrete thrust block restraint, provided they are manufactured by the U.S. Pipe and Foundry Company, and installed in accordance with the recommendations of the Ductile Iron Pipe Research Association, but no less than the lengths shown on Construction Details CD- 8, CD-9, and CD-10.



City of Independence Water Department



EXISTING UTILITIES AND IMPROVEMENTS

EU-1. **LOCATION OF UNDERGROUND UTILITIES:** The Contractor shall locate all underground utilities and other obstacles which will be encountered during the course of construction; and locations shall be established before excavation by power-driven equipment. Destruction or damage to any utility such as telephone conduits, gas mains and services, water mains, valves, hydrants and services, electrical conduits, culverts, sewers, etc., shall be repaired or replaced at the expense of the Contractor.

EU-2. **PROTECTION OF PROPERTY AND EXISTING IMPROVEMENTS:** The Contractor shall protect from damage or injury all existing improvements. Any such items inadvertently damaged shall be replaced or repaired at the Contractor's expense.

Water and gas mains, sanitary and storm sewers, telephone and electric power conduits and cables, and house drains and services shall be exposed in advance of excavation so that they may be protected against damage and so that minor changes in grade and alignment may be made.

If the Contractor desires the removal of an existing sewer, conduit, cable, tree, shrub, curb, or pavement to facilitate construction, such item not conflicting with the final location of the water main or appurtenances thereto, he shall apply to the proper authority for permission for such temporary removal with the expressed understanding that if such permission is granted, all costs incurred in removing and replacing the item shall be paid by the Contractor.

Adequate provision shall be made for the flow of sewers, drains, and water courses encountered during construction; and the structures which may have been disturbed shall be satisfactorily restored upon completion of the work.

Trees, fences, poles, guy wires and anchors, shrubs, flower beds, sod, and all other property shall be protected unless their removal is authorized; any property damaged shall be satisfactorily restored by the Contractor.

To protect persons from injury and to avoid property damage, adequate barricades, construction signs, and guards as required shall be placed and maintained during the progress of the construction work and until it is safe for traffic to use the trenched roadway or walkway. Whenever required, watchmen shall be provided to prevent accidents. Rules and regulations of local authorities respecting safety provisions shall be observed.

EXISTING UTILITIES AND IMPROVEMENTS (Cont.)

EU-3. REMOVING AND RESTORING STREET PAVEMENT, DRIVEWAYS, AND OTHER SURFACED AREAS: The contractor shall remove and restore all street or roadway pavement, driveways, surfaced parking areas and other surfaced or graveled areas wherever encountered in the laying of pipe, fittings, valves, hydrants, backing blocks, and other appurtenances. All excavation within public right-of-way requires a permit from the Public Works Department, 2nd Floor, City Hall (111 E. Maple) when in Independence, Missouri road right-of-way; Public Works Department, 2nd Floor Jackson County Court House Annex (306 W. Kansas) when in Jackson County, Missouri road right-of-way; and Permit Department, 2nd Floor, Missouri Highway and Transportation Commission (5117 East 31st Street) when in State right-of-way.

All pavement cuts in driveways, parking lots, streets, etc., shall be made with a concrete saw or with tools designed for cutting the pavement with a minimum of damage to the surrounding area. The edges of all cuts shall be smooth and straight and shall be cut per the requirements of the governing authority.

Concrete pavement, asphaltic surface courses, macadam pavements, and any other type of pavement or surface course which is cut or damaged shall be restored to conform to, and as specified in, the "LAYING AND BACKFILL" section of these Standards.

Streets, highways, and roads which, in the opinion of the governing authority, must be opened at the earliest possible time to traffic shall be backfilled and the pavement restored immediately after the pipe and fittings are laid.

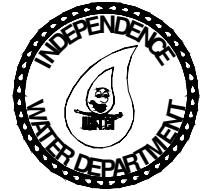
Driveways that are damaged or cut shall be restored equal in all respects to that which was removed.

All graveled areas, or areas otherwise surfaced for parking or for any other reason, which are cut or damaged in the construction shall be returned to a condition equal to that which existed before the construction. All materials used shall be of equal quality to the materials used in the original construction of the surface and shall be subject to the approval of the Owner or Developer.

EU-4. MAINTENANCE OF TRAFFIC: The Contractor shall conduct his work so as to interfere as little as possible with public traffic, whether vehicular or pedestrian. Where thru lanes of traffic will be obstructed, a permit is required from the Transportation Department, 2nd Floor, City Hall (111 E. Maple) when in Independence, Missouri road right-of-way; Public Works Department, 2nd Floor, Jackson County Court House Annex (103 N. Main St.) when in Jackson County, Missouri road right-of-way; and Permit Department, 2nd Floor, Missouri Highway and Transportation Commission (600 NE Colbern Rd., Lee's Summit, MO) when in State right-of-way. Whenever it is necessary to cross or interfere with roads, driveways, walks, whether public or private, the Contractor shall, at his own expense, provide and maintain suitable and safe bridges, detours, or other temporary expedients for the accommodation of public and private travel. He shall give reasonable notice to owners of private drives before interfering with them; provided however, that such maintenance of traffic will not be required at any point where the Contractor has obtained permission from the owner and tenant of private property, or from the authority having jurisdiction over public property involved, to obstruct traffic at any designated point thereon and for the duration of whatever period of time as may be agreed upon.



City of Independence Water Department



EXCAVATION AND TRENCHING

EX-1. **SCOPE**: Excavation and trenching work shall include the necessary clearing, grubbing, and preparation of the site; removal and disposal of all debris; excavation and trenching as required; the handling, storage, transportation, and disposal of all excavated material; all necessary sheeting, shoring, and protection work; preparation of subgrades; pumping and dewatering as necessary or required; protection of adjacent property; and other appurtenant work.

Backfilling, pipe embedment, and surfacing and grading are covered in other portions of these Standards.

EX-2. **GENERAL**: Excavation and trenching work shall be performed in a safe and proper manner with suitable precautions being taken against all hazards and to provide adequate working space and clearances for the work to be performed therein.

The Contractor shall explore and expose any known or possible obstructions in advance of excavation for installation, for the purpose of eliminating abrupt changes in grade requiring the installation of unnecessary fittings.

In paralleling present water and gas mains, the Contractor shall protect all service connections and shall arrange to furnish service to the consumers with a minimum of interruptions.

All excavated material shall be placed in a manner that will not endanger the work and that will avoid obstructing sidewalks and driveways. Gutters shall be kept clear or other satisfactory provisions made for street drainage. Subgrade surfaces shall be clean and free of loose material of any kind when concrete is placed thereon.

EX-3. **BLASTING**: Before any blasting is done within the City Limits of Independence, Missouri, the Contractor shall obtain a blasting permit from the City Engineer's Office, 2nd Floor, City Hall (111 E. Maple) when in Independence, Missouri. No person may do the actual work of preparing, placing, and detonating explosives unless he possesses a blasting permit issued by the City Engineer. The blasting permit and license must be shown to the Water Department Inspector before any blasting work is done.

All existing safety regulations, laws, and ordinances on the storage, transportation, and use of explosives shall be enforced at all times.

Blasting will be permitted only when proper precautions are taken for the protection of persons, the work, private property, public utilities, and the public from damage or injury. Any damage done by blasting will be repaired by the Contractor at his own expense.

EXCAVATION AND TRENCHING (Cont.)

The Contractor shall be liable for all injuries to or deaths of persons or damage to property caused by blasts or explosives.

EX-4. UNAUTHORIZED EXCAVATION: All material excavated below the bottom of concrete walls, footings, slabs on grade, and foundations shall be replaced by and at the expense of the Contractor with material as specified by the authority owning or having jurisdiction or control of said structures.

Any part of the trench excavated below grade shall be corrected with material accepted by the Water Department Inspector and placed and compacted by the Contractor.

EX-5. REMOVAL OF WATER: The Contractor shall provide and maintain adequate dewatering equipment to remove and dispose of all surface and ground water entering excavations, trenches, or other parts of the work. Each excavation shall be kept dry during subgrade preparation and continually thereafter until the pipe to be installed is installed, to the extent that no damage from hydrostatic pressure, flotation, or other cause will result.

All excavations for concrete structures or trenches which extend down to or below static ground water elevations shall be dewatered by lowering and maintaining the ground water surface beneath such excavations a distance of not less than twelve (12) inches below the bottom of the excavation.

Surface water shall be diverted or otherwise prevented from entering excavated areas or trenches to the greatest extent practicable without causing damage to adjacent property.

The Contractor will be held responsible for the condition of any pipe or conduit which he may use for drainage purposes, and all such pipes or conduits shall be left clean and free of sediment.

EX-6. SHEETING AND SHORING: General. Except where banks are cut back on a stable slope, excavation for trenches shall be properly and substantially sheeted, braced, and shored, as necessary to prevent caving or sliding to provide protection for workmen and work.

Specific - Reference must be made to:

Construction Industry Standards OSHA 2207
Part 1926 Occupational Safety and Health Standards
Subpart P Excavations, Trenching and Shoring
Sections 1926.650 through 1926.653

EX-7. STABILIZATION: Trench bottoms shall be firm, dense, and thoroughly compacted and consolidated; shall be free from mud and muck; and shall be sufficiently stable to remain firm and intact under the feet of the workmen.

Trench bottoms which are otherwise solid but which become mucky on top due to construction operations shall be reinforced with one or more layers of crushed stone or gravel. Not more than ½ inch depth of mud or muck shall be allowed to remain on stabilized trench bottoms when the pipe bedding material is placed thereon.

EXCAVATION AND TRENCHING (Cont.)

EX-8. TRENCH EXCAVATION: The Contractor shall not open more trench in advance of pipe laying than is necessary to expedite the work. One block or 300 feet (whichever is the shorter) shall be the maximum length of open trench ahead of pipe laying unless by written permission of the Water Department Inspector.

Except where tunneling is specified on the Construction Plans or by the Water Department, all trench excavations shall be open cut from the surface.

All excavations shall conform to the regulations set forth in the Traffic Code of the City of Independence, Missouri, or governing authority, and shall be protected with adequate lights and barricades.

EX-8.01. Alignment and Grade: The Engineer shall establish lines and grades to govern construction by setting offset stakes every 50 feet (25 feet on curves) and offset stakes with hub elevations at each fitting and appurtenance, such as tee, bend, valve, fire hydrant, etc. Offset stakes are required and shall be marked to indicate the offset and cuts. True copies of "cut" notes shall be furnished by the Engineer to the Contractor and to the Water Department Inspector before construction begins.

The Engineer will notify the Water Department, Division of Engineering, one (1) day prior to staking the project for construction.

Vertical and horizontal alignment of pipes and the maximum joint deflection used in connection therewith shall be in conformity and as specified in the "LAYING AND BACKFILL" section of these Standards.

When possible, stakes shall be set to locate any underground utilities that may conflict with the water main construction. However, in all cases, the Contractor shall be governed by the section of the Standards entitled "EXISTING UTILITIES AND IMPROVEMENTS".

It shall be the Contractor's responsibility to transfer the alignment and grades to the bottom of the pipeline trench.

The Contractor must maintain a constant check of the pipe alignment and trench depth and will be held responsible for any deviations therefrom.

EXCAVATION AND TRENCHING (Cont.)

Unless otherwise shown or indicated on the plans or unless otherwise set forth by the Engineering Supervisor, the horizontal and vertical alignment of the water main shall be maintained to within the following tolerances:

<u>HORIZONTAL</u>	<u>VERTICAL</u>
3" ±	42" to 48" Depth of Cover

EX-8.02. Minimum Cover: Except where otherwise shown, trenches shall be excavated to a depth sufficient to provide a minimum depth of backfill cover over the top of the pipe, as indicated above. Greater pipe cover depths may be necessary on vertical curves or to provide necessary clearance beneath existing pipes, conduits, drains, drainage structures, or other obstructions encountered at normal pipe grades.

Measurement of pipe cover depth shall be made vertically from the outside top of pipe to final ground or pavement surface elevation.

EX-8.03. Limiting Trench Width: Trenches shall be excavated to a width which will provide adequate working space and pipe clearances for proper pipe installation, jointing, and embedment. However, the limiting trench widths below an elevation six (6) inches above the top of the installed pipe shall be as follows:

Pipe Size	Minimum Trench Width in Earth	Maximum Trench Width in Earth	Minimum Trench Width in Rock	Maximum Trench Width in Rock
<u>Ductile Iron Pipe</u>				
6"	24"	30"	24"	30"
8"	26"	32"	24"	32"
12"	28"	34"	28"	36"

EX-8.04. Trench Bottom in Earth: The trench in earth shall have a flat bottom the full width of the trench and shall be excavated to the grade to which the pipe is to be laid. The surface shall be graded to provide a uniform bearing and continuous support for each pipe at every point along its entire length.

EXCAVATION AND TRENCHING (Cont.)

EX-8.05. Trench Bottoms in Rock: All rock excavation shall be carried to a minimum of six (6) inches below the bottom of the pipe. Granular pipe embedment material, as specified in the "LAYING AND BACKFILL" section of these Standards and also as shown in Construction Detail CD-19, "Standard Laying Conditions for Ductile Iron Pipe".

EX-8.06. Trench Grade: If, after placing the pipe in the trench, it is found the prepared trench bottom is not at the proper elevation, the pipe shall be removed and the grade corrected. In no case shall the pipe be raised from and dropped on the trench bottom for the purpose of lowering a subgrade which is too high.

EX-9. HIGHWAY AND RAILROAD CROSSING: The Contractor shall make highway and railroad crossings in accordance with these Standards and as shown in Construction Detail CD-12, "Typical Encasement Under Railroads for Ductile Iron Pipe".

All construction or work performed and all operations of the Contractor, his employees, or his subcontractors within the limits of highway or railroad right-of-ways shall be in conformity with all the requirements and regulations of the authority owning or having jurisdiction over the right-of-way in each case.

The Contractor shall pay fees and obtain permits to make the crossings unless otherwise directed.

EX-10. EXPEDITED CROSSINGS: The installation of crossings for streets, driveways, obstructions, or any other purpose to facilitate the construction or development of projects prior to the actual installation of water mains is prohibited unless prior approval is granted and all material and installations are inspected and approved.

EX-11. BARRICADES AND WARNING SIGNS: The Contractor shall provide and maintain in place all barricades, warning signs, lights, and other safety devices required to protect the work, divert traffic, and warn the general public of open excavations, unfilled trenches, and other areas or conditions which might be hazardous or dangerous during the daytime or at night.



City of Independence Water Department



LAYING AND BACKFILL

LB-1. PIPE INSTALLATION:

LB-1.01. **Handling:** Pipe, fittings, and accessories shall be handled in a manner that will insure installation in a sound, undamaged condition. Equipment, tools, and methods used in unloading, reloading, hauling, and laying pipe and fittings shall be such that the pipe, pipe coating, and fittings are not damaged. Hooks shall not be used. Under no circumstances shall pipe or accessories be dropped or dumped.

Pipe and fittings on which the cement lining has been broken or loosened shall be replaced by the Contractor.

All pipe coating which has been damaged shall be repaired by the Contractor before installing the pipe.

LB-1.02. **Cutting Pipe:** Ductile iron pipe shall be cut with either a saw or an abrasive wheel.

The cutting of pipe with a **torch will not be permitted.**

Cutting shall be done in a neat manner without damage to the pipe, or the cement lining. Cuts shall be smooth, straight, and at right angles to the pipe axis. After cutting, the end of the pipe shall be beveled. The bevel will be a minimum of 1/4-inch wide at an angle of 30 degrees.

LB-1.03. **Cleaning:** The interior of all pipe and fittings shall be thoroughly cleaned of foreign matter before being installed and **shall be kept clean until the work has been accepted.** Such surfaces shall be wire brushed, if necessary, wiped clean, and kept clean until jointing is completed.

LB-1.04. **Inspection:** Pipe and fittings shall be carefully examined for cracks and other defects immediately before installation. Spigot ends shall be examined with particular care since they are vulnerable to damage from handling. All defective, damaged, or unsound pipe and fittings shall be rejected and marked as such and removed from the site of the work.

LB-1.05. **Alignment of Bell and Spigot Pipe:** Pipelines or runs intended to be straight shall be laid straight. Deflections from a straight line or grade shall not exceed the quantities stipulated in Table 4 of ANSI/AWWA C600. (See Construction Detail CD-21.)

Either shorter pipe sections (not less than 4 feet in length) or special bends shall be installed where the alignment or grade requires them.

LAYING AND BACKFILL (Cont.)

LB-1.06. Laying Pipe: Pipe shall be protected from lateral displacement by pipe embedment material installed, as specified for "Pipe Embedment" (see Construction Detail CD-19). Under no circumstances shall the pipe be laid in water; and no pipe shall be laid under unsuitable trench conditions. (See EX-7. STABILIZATION).

Pipe shall be laid with the bell ends facing the direction of laying except when reverse laying is specifically authorized by the Inspector.

Whenever pipe laying is stopped, the open end of the line shall be sealed with a watertight plug which will prevent trench water from entering the pipe.

The pipe is to be installed inside a tunnel liner in accordance with these Standards and as shown in Construction Detail CD-11 "Typical Encasement Under Roadways for Ductile Iron Pipe" and in Construction Detail CD-12 "Typical Encasement Under Railroads for Ductile Iron Pipe." The ends of each tunnel liner shall be closed with a dry brick wall.

LB-1.07. Trench Backfilling: After the pipes and joints have been inspected, the trench shall be filled with selected material free of rock in the following manner when required by the Inspector: The material shall be carefully placed and tamped under the bell of the pipe to insure a uniform bearing surface and to prevent lateral movement of the pipe, then carefully placed until the fill reaches the one (1) foot depth over the top of the pipe. The remainder of the backfill shall be made by placing the excavated material back in the trench and compacting by a method approved by the local governing authority. Note: No rocks larger than grapefruit size will be allowed in backfill and at no time will there be over 100 lineal feet of pipe left exposed to the atmosphere.

LB-1.08. Rock Excavation: When the excavation is made through rock or other material too hard to be readily removed for admitting the bell of the pipe, the trench shall be excavated at least six (6) inches deeper than the grade of the outside bottom of the pipe, and refilled with ½" x 5/16" clean crushed stone. After the pipe has been installed ½" x 5/16" clean crushed stone will be placed one (1) foot above the pipe.

LB-1.09. Freezing Weather Backfilling: Backfilling during freezing weather shall not be done except by permission of the Inspector. No backfill materials shall be placed on frozen surfaces, nor shall frozen materials, snow, or ice be placed in any backfill.

LB-1.10. Push-On Joints: In the case of the push-on joint, the gasket seat in the bell shall be wiped clean with a cloth after which the gasket should be sprung into place. Thereafter, a thin film of lubricant should be applied to all of the inner surface of the gasket which will come into contact with the entering pipe.

The lubricant and the gaskets shall be as recommended and supplied by the manufacturer of the pipe being used. The lubricant shall be odorless, tasteless, and shall be non-toxic, suitable for use in potable water, and shall be water soluble.

LAYING AND BACKFILL (Cont.)

The plain end of the pipe shall be wiped clean and a thin film of lubricant shall be applied to the outside of the plain end of the pipe and its beveled edge. The plain end of the pipe should then be placed in approximate alignment with the bell of the pipe to which it is to be joined. The joint can be made up with the entering pipe deflected at an angle, but this angle should not exceed the recommended maximum of the manufacturer. The plain end of the pipe should then be lifted and started into the socket so that it is in contact with the gasket.

The joint is made up by exerting sufficient force on the entering pipe so that its plain end is moved past the gasket (which is thereby compressed) until it makes contact with the base of the socket of the bell. This force can be applied by means of a jack type tool, backhoe, or other methods as approved by the Inspector.

LB-1.11. Restrained Joints: Restrained joints shall be installed in strict accordance with Construction Details CD-6, CD-7, CD-7A, CD-8, CD-9 and CD-10.

LB-1.12. Couplings: Mechanical couplings and flanged coupling adapters shall be carefully installed in strict accordance with the manufacturer's recommendations. The ends of pipe couplings shall be clean and smooth.

LB-2. POLYETHYLENE ENCASEMENT:

LB-2.01. General: Polyethylene encasement shall be installed on all ductile iron pipe and fittings. Although not intended to be a completely air and water-tight enclosure, the polyethylene shall prevent contact between the pipe and the surrounding backfill.

LB-2.02. Installation: The polyethylene encasement shall be installed as specified in "Method A" or "Method B" below and as shown on Construction Detail CD-13 "Polyethylene Encasement for Ductile Iron Pipe."

Method A: Polyethylene tubing shall be approximately two (2) feet longer than the length of the pipe section to provide a one (1) foot overlap on each adjacent pipe section. Tube ends are required to be taped in place.

Repair any rips, punctures, or other damages to the polyethylene with adhesive tape or with a short length of polyethylene tube cut open, wrapped around the pipe, and secured with adhesive tape.

Method B: Polyethylene tubing shall be one (1) foot shorter than the length of the pipe section with a three (3) foot length of polyethylene tube centered over pipe joint and lapped over pipe section and its tubing. Tube ends are required to be taped in place.

Repair any rips, punctures or other damage to the polyethylene, as described in Method A.

LAYING AND BACKFILL (Cont.)

LB-2.03. Pipe-Shaped Appurtenances: Bends, reducers, offsets, and any other pipe-shaped appurtenances shall be covered with polyethylene in the same manner as the pipe.

LB-2.04. Odd-shaped Appurtenances: Valves, tees, crosses, and other odd-shaped pieces which cannot practically be wrapped in a tube shall be wrapped with a flat sheet or split length of polyethylene tube. The sheet shall be passed under the appurtenance and brought up around the body. Seams shall be made by bringing the edges together, folding over twice, and taping down. Tape polyethylene securely in place at overlaps, valve stems, and other penetrations.

LB-2.05. Openings in Encasement: Openings for branches, service taps, blow-offs, air valves, and similar appurtenances shall be made by making an x-shaped cut in the polyethylene and temporarily folding the film back. After the appurtenance is installed, tape the slack securely to the appurtenance and repair the cut as well as any other damaged areas in the polyethylene with tape.

LB-3. SETTING VALVES AND FITTINGS: All valves and fittings shall be set and jointed in the manner heretofore specified for cleaning, laying, and jointing pipe. The valves shall be set vertical in the horizontal pipeline. Cast iron valve covers and lids shall be installed by the Contractor and shall be supported and maintained, centered and plumb over the operating nut of the valve with the cover flush with the surface of the roadway or final grade. See Construction Details CD-3, CD-4, and CD-5.

Each valve shall be inspected before installation to insure that all foreign substances have been removed from within the valve body, and shall be opened and closed to see that all parts are in first-class working condition.

Valve boxes and valve bases shall be installed on all valves. Valve box trench adaptors may be used.

All bends and tees shall be provided with adequate thrust blocking or restraint joint. This thrust blocking or restrained joint shall be of plain concrete or field lok gaskets, as specified, and as called for in Construction Details CD-6, CD-7, CD-8, CD-9, and CD-10.

LB-4. SETTING FIRE HYDRANTS: All new hydrant installations shall be as shown in the Construction Details CD-1 and CD-2 and shall include all necessary excavation and backfill to make the installation complete. Hydrant lead to be polyethylene encased to hydrant shoe only.

The weep holes shown on Construction Detail CD-1 of the hydrant shall be kept clear and free to drain. All hydrants shall stand plumb and when placed behind curbs, **the centerline of the hydrant shall be at least twenty-four (24) inches to thirty-six (36) inches from the back of the curb.**

In general, the hydrants shall be rotated so as to have the nozzle facing the street. Special circumstances may require otherwise, as determined by the Inspector.

LAYING AND BACKFILL (Cont.)

LB-5. BLOWOFF ASSEMBLIES: Blow-off Assemblies shall be provided at the locations and in the arrangement shown on the drawings and in conformity with Construction Details CD-14 and CD-15.

The TYTON joint plug shall be drilled and tapped for 2-inch standard pipe threads.

LB-6. AIR RELEASE ASSEMBLIES: Air Release Assemblies shall be provided at the locations and in the arrangement shown on the drawings and in conformity with Construction Details CD-20 and CD-20A.

LB-7. CONNECTIONS TO EXISTING MAINS: When the plans call for a tapping sleeve to be installed on an existing main, the Water Department will make connection of new water mains to existing water mains, as shown on Construction Details CD-16 and CD-17 at the expense of the applicant per Contract Agreement Form #2.

On Construction Detail CD-16, "Typical Tapping Sleeve Connection," it shall be the responsibility of the Contractor to excavate, maintain, barricade and backfill the tap hole.

On Construction Detail CD-17, "Typical Blow-off Connection," Contractor shall excavate within 18 feet of the existing blow-off assembly.

In both Detail CD-16 and Detail CD-17, it is the Contractor's responsibility for horizontal and vertical alignment with existing water main.

LB-8. STREET SURFACE RESTORATION: Wherever street surfacing is cut or disturbed, the Contractor shall remove and restore all street or roadway pavement, furnishing all necessary labor and materials. Care and caution shall be observed when cutting the existing pavement for the installation of the water mains. The opening shall be made with tools designed for cutting the pavement with a minimum of damage to the surrounding area.

It shall be the responsibility of the Contractor to determine the nature and thickness of all pavements and surfacings to be cut and replaced together with any base courses required in connection therewith.

Concrete pavement, asphaltic surface course, macadam pavement, and any other type of pavement or surface course which is cut or damaged shall be replaced to conform to the lines and grades of the original pavement and shall be of equal quality, thickness, and appearance to that removed. Materials and workmanship shall conform to Street Cut Restoration Standards, prepared by the Public Works Department of Independence, Missouri, Public Works Department of Jackson County, Missouri, or Missouri Highway Transportation Commission.

Temporary surfacing shall be provided as necessary during construction so that all streets are kept in passable condition.



City of Independence Water Department



WATER MAINS NEAR SEWERS

WMS-1. **HORIZONTAL SEPARATION**: In accordance with the Missouri Department of Natural Resources, water mains shall be laid at least 10 feet, horizontally from any sanitary sewer, drainage pipe, storm sewer, or manhole. When local conditions prevent a lateral separation of 10 feet, a water main may be laid closer than 10 feet to a sanitary or storm sewer, provided that the water main is laid in a separate trench, or on an undisturbed earth shelf located on one side of the sewer at such an elevation that the bottom of the water main is at least 18 inches above the top of the sewer. When it is impossible to obtain proper horizontal and vertical separation as stipulated above, the sewer must be constructed of mechanical or slip-on ductile iron pipe and should be pressure-tested to assure water-tightness before backfilling.

WMS-2. **VERTICAL SEPARATION**: Whenever water mains must cross sanitary sewers, house sewers, or storm drains, the water main shall be laid at such an elevation that the bottom of the water main is 18" above the top of the drain or sewer. A full length of water main pipe shall be centered over the sewer line to be crossed so that the joints will be equally distant from the sewer and as remote therefrom as possible. This vertical separation shall be maintained for that portion of the water main located within 10 feet, horizontally, or any sewer or drain it crosses. See Construction Detail CD-18, "Typical Sanitary Sewer Main Crossing Water Main."

WMS-3. **UNUSUAL CONDITIONS**: Where conditions prevent the minimum vertical separation set forth above from being maintained, or when it is necessary for the water main to pass under a sewer or drain, the water main shall be laid with Tyton ductile iron pipe and the water main shall extend on each side of the crossing to a distance from the sewer of at least 10 feet. In making such a crossing, a full length of water main pipe must be centered over or under the sewer to be crossed, so that the joints will be equidistant from the sewer and as remote therefrom as possible. The sewer line must also be constructed of ductile iron pipe with slip-on or mechanical joints until the normal distance from the sewer line to the water main is at least 10 feet. Where a water main must cross under a sewer, a vertical separation of 18 inches between the bottom of the sewer and the top of the water main shall be maintained, with adequate support, especially for the larger sized sewer lines, to prevent them from settling on and breaking the water main. The sewer shall be constructed of ductile iron pipe for a distance of 10 feet on either side of the crossing, or other suitable protection as approved by the Water Department shall be provided. Where these conditions cannot be met, the Water Department shall be consulted as to the precautions to be taken to protect the public water supply.

WMS-4. **SEWER MANHOLES**: No water pipe shall pass through, or come into contact with, any part of a sewer or a sewer manhole.



City of Independence Water Department



WATER MAIN DISINFECTION

WD-1. **WATER MAIN DISINFECTION**: Flushing, disinfection, and sampling of the new pipe system will be done by the Independence Water Department. The new pipe shall remain isolated from the existing system until satisfactory laboratory results can be obtained.

Pipe during installation must be kept free of dirt, debris and contamination, as provided in AWWA Standard C600. Should the pipeline require excessive flushing, disinfection or other cleaning procedure necessary prior to satisfactory lab results, such work will be at the expense of the Developer or Contractor.

Developer or Contractor to provide HTH to give a 50 ppm solution when the water main is filled with water by the Independence Water Department.



City of Independence Water Department



CONCRETE SPECIFICATIONS

CS-1. **SCOPE**: These specifications are intended primarily for concrete to be used for thrust blocks. Concrete for all roadway pavement and/or curb and gutter replacement shall conform to the requirements of the appropriate authority having jurisdiction thereof.

CS-2. **CONCRETE**: The concrete shall be MCIB A618-1-4 as designated by the Mid-West Concrete Industry Board, Inc., Kansas City, Missouri.

CS-2.01. **Cement**: The cement shall be Portland Cement Type I unless high early strength is required in which instance Type III shall be used. All cement shall conform to the "Standard Specification for Portland Cement," ASTM Serial Designation C150.

CS-2.02. **Aggregate**: All aggregates shall conform to the appropriate bulletins and specifications of the Mid-West Concrete Industry Board, Inc.

CS-2.03. **Water**: Water for mixing and curing concrete shall be clean and free from injurious amounts of sewage, oil, acid, alkali, salt, or organic matters. (Only potable water will be acceptable without testing.)

CS-3. **MIXING**: Ready-mixed concrete shall be used unless otherwise prohibited by the Engineering Supervisor or Inspector.

Ready-mixed concrete shall be mixed and delivered in accordance with the requirements set forth in the "Standard Specifications for Ready-Mixed Concrete," ASTM Serial Designation C94.

CS-4. **FORMS**: Suitable and substantial forms shall be provided for all thrust blocks. All forms shall be constructed and maintained plumb and true, securely braced and shored, and tight enough to prevent leakage of mortar.

CS-4.01. Forms shall be constructed of sufficient size to permit the entire bearing area of thrust block to bear against undisturbed earth. There shall be no form material between the thrust area and undisturbed earth. See Construction Details CD-6, CD-7 and CD-7A.

CS-5. **PLACING OF CONCRETE**. Only those methods and arrangements of equipment shall be used which will reduce to a minimum any segregation of coarse aggregate from the concrete.

Concrete shall be deposited into the forms or on the grade as nearly as practicable in its final position and in such manner that the concrete will completely fill the forms.

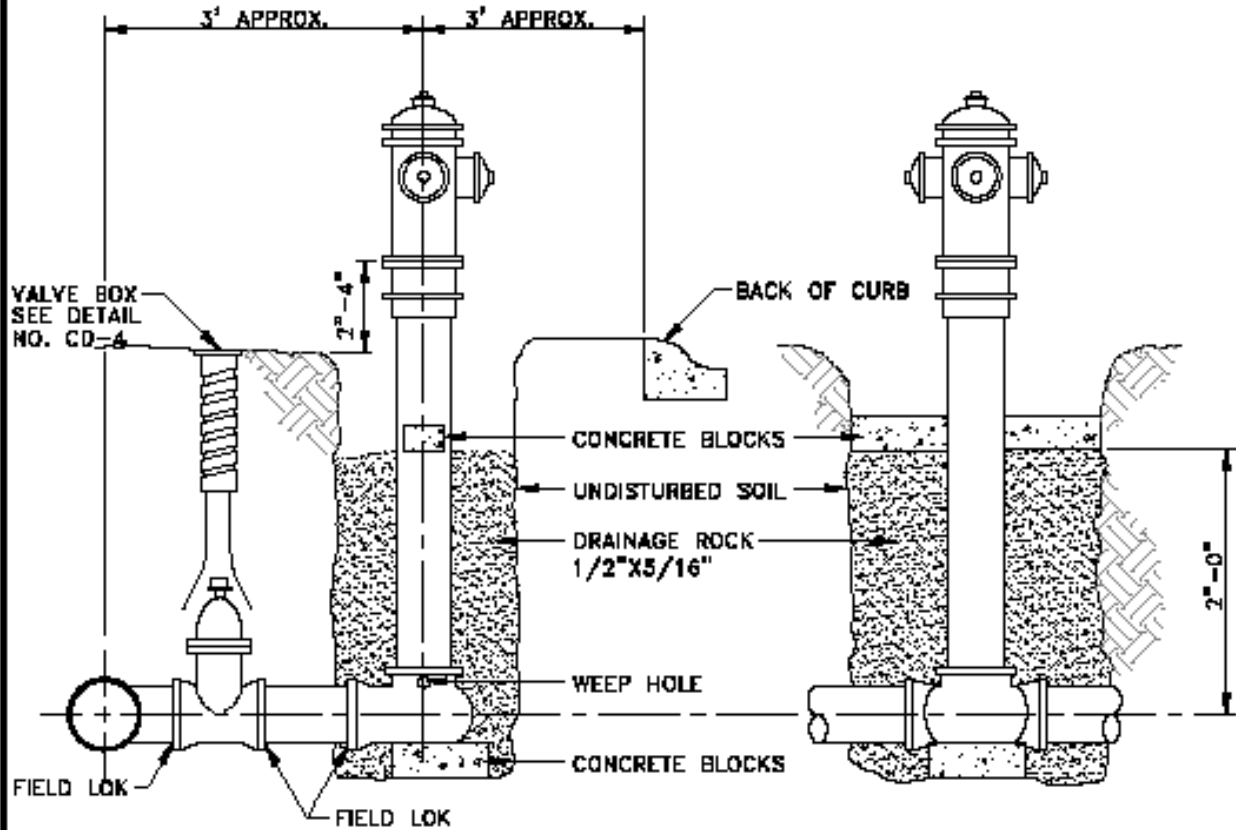
Concrete that has partially hardened or has been contaminated by foreign material shall not be used and shall be discarded.

Concrete shall not be placed on or come in contact with frozen subgrade or forms and equipment containing ice or snow.

Concrete, when placed, shall have a slump not to exceed four (4) inches for thrust blocks.

CS-6. CURING: All regular concrete shall be cured for a period of not less than seven (7) days, and concrete made with high early strength cement shall be cured not less than five (5) days unless otherwise directed or specified by the Inspector.

INDEPENDENCE WATER DEPARTMENT



NOTES:

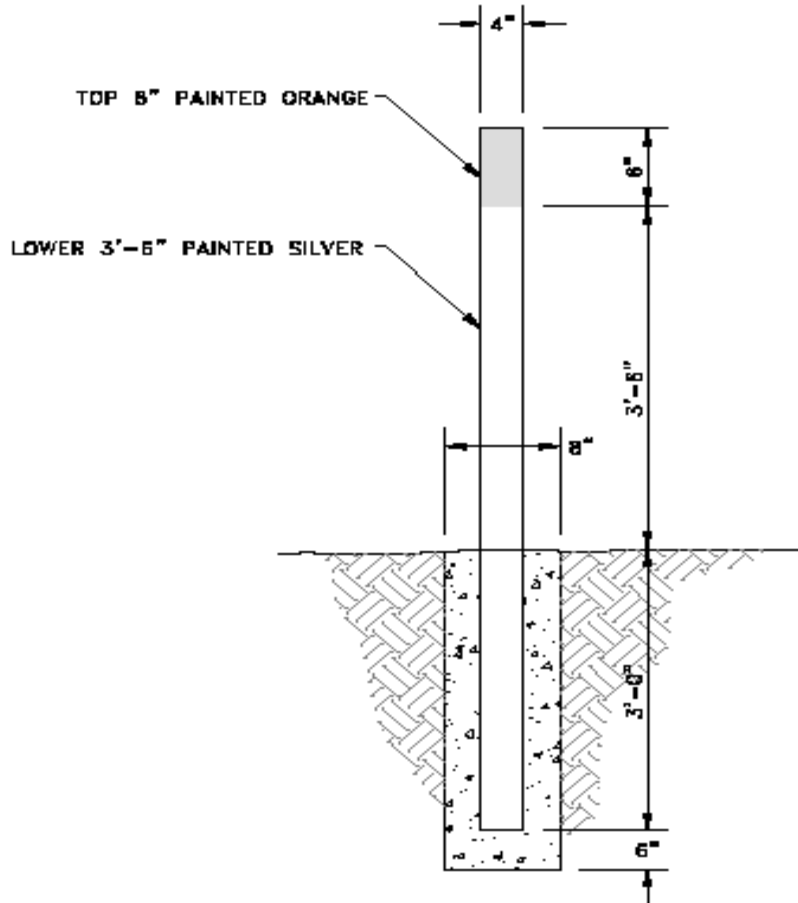
1. HYDRANT LEAD TO BE POLYETHYLENE ENCASED TO HYDRANT SHOE ONLY.

TYPICAL HYDRANT INSTALLATION: STRAIGHT SET

WATER DEPARTMENT CITY OF INDEPENDENCE, MISSOURI
 CONSTRUCTION DETAIL NUMBER 1
 APPROVED BY: RV
 DRAWN BY: SDH DATE: 2/20/89

CD-1

INDEPENDENCE WATER DEPARTMENT



4" STEEL MARKER POST

MARKER POST DETAIL

WATER DEPARTMENT CITY OF INDEPENDENCE, MISSOURI

CONSTRUCTION DETAIL NUMBER 23

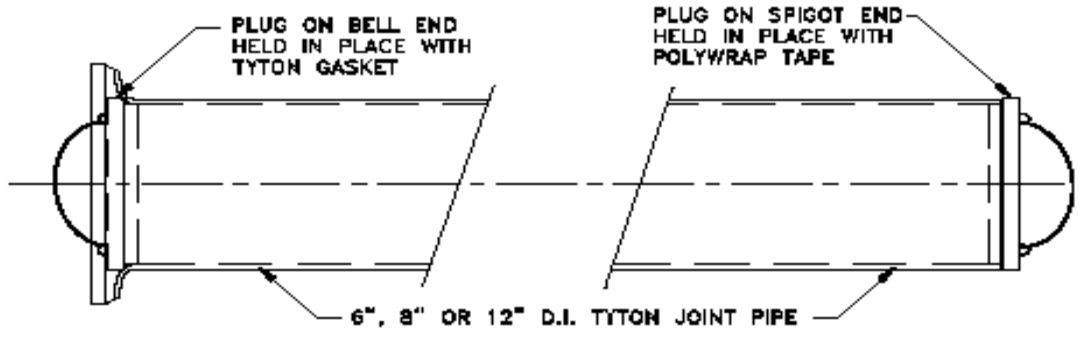
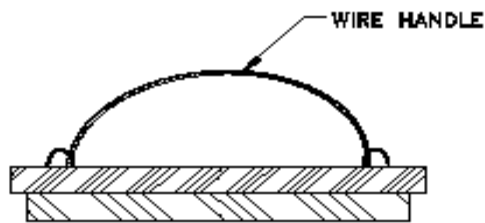
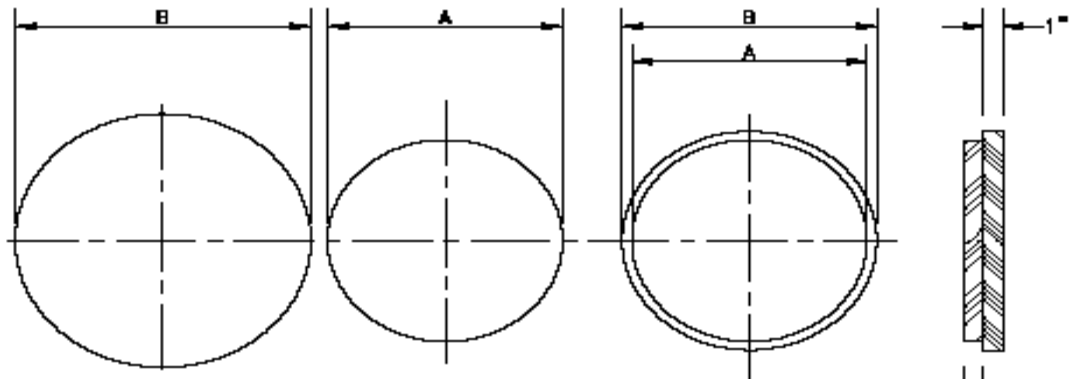
APPROVED BY: SH

DRAWN BY: C.J.

DATE: 12/16/04

CD-23

INDEPENDENCE WATER DEPARTMENT



	A	B
6"	5.5"	6.7"
8"	7.5"	8.8"
12"	11.5"	13"
20"	19.75"	21.5"
30"	30.5"	32"
36"	36.5"	38"

NIGHT PLUG FOR DUCTILE IRON PIPE

WATER DEPARTMENT CITY OF INDEPENDENCE, MISSOURI

CONSTRUCTION DETAIL NUMBER 22

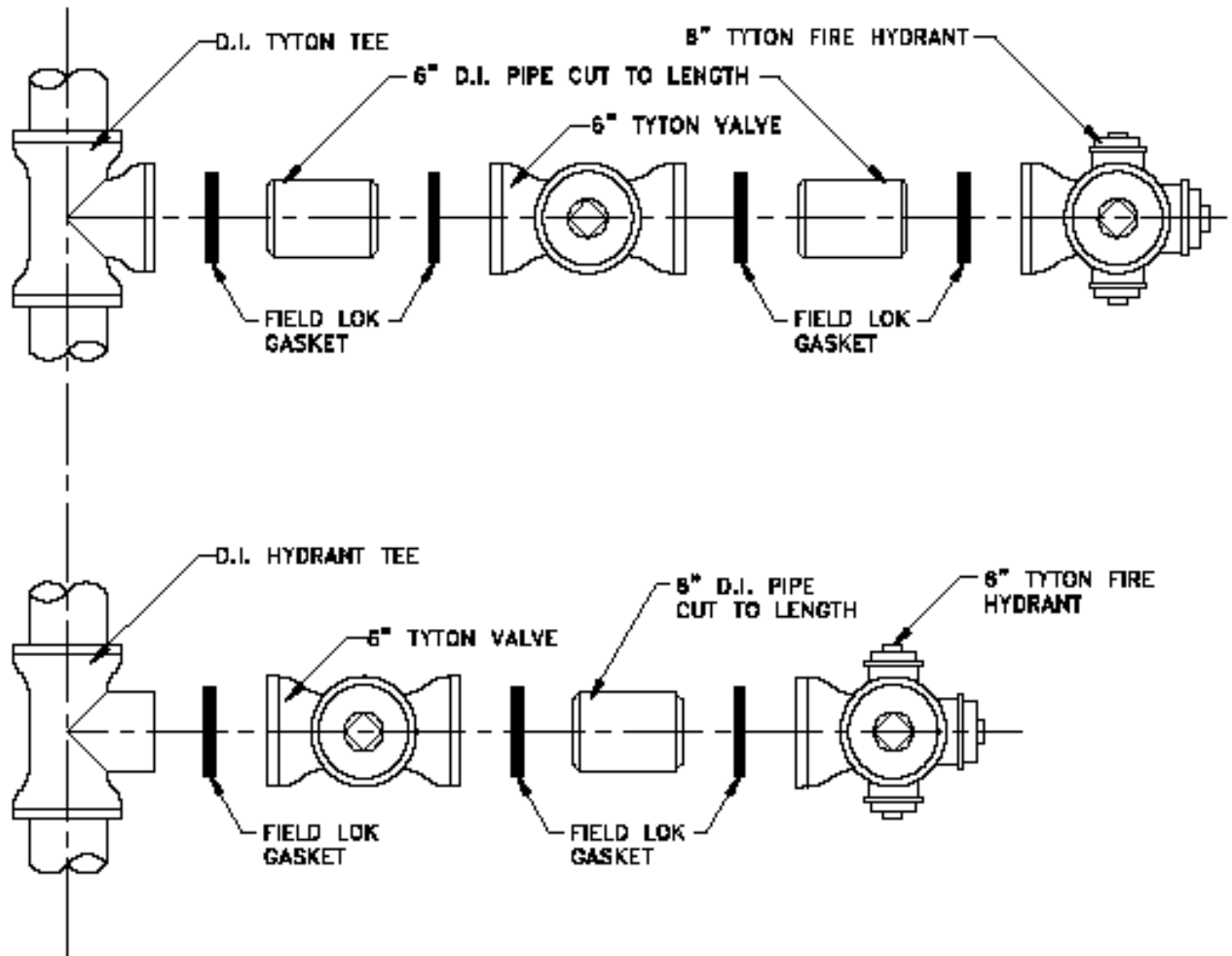
APPROVED BY: S.H.

DRAWN BY: C.J.

DATE: 4/26/01

CD-22

INDEPENDENCE WATER DEPARTMENT

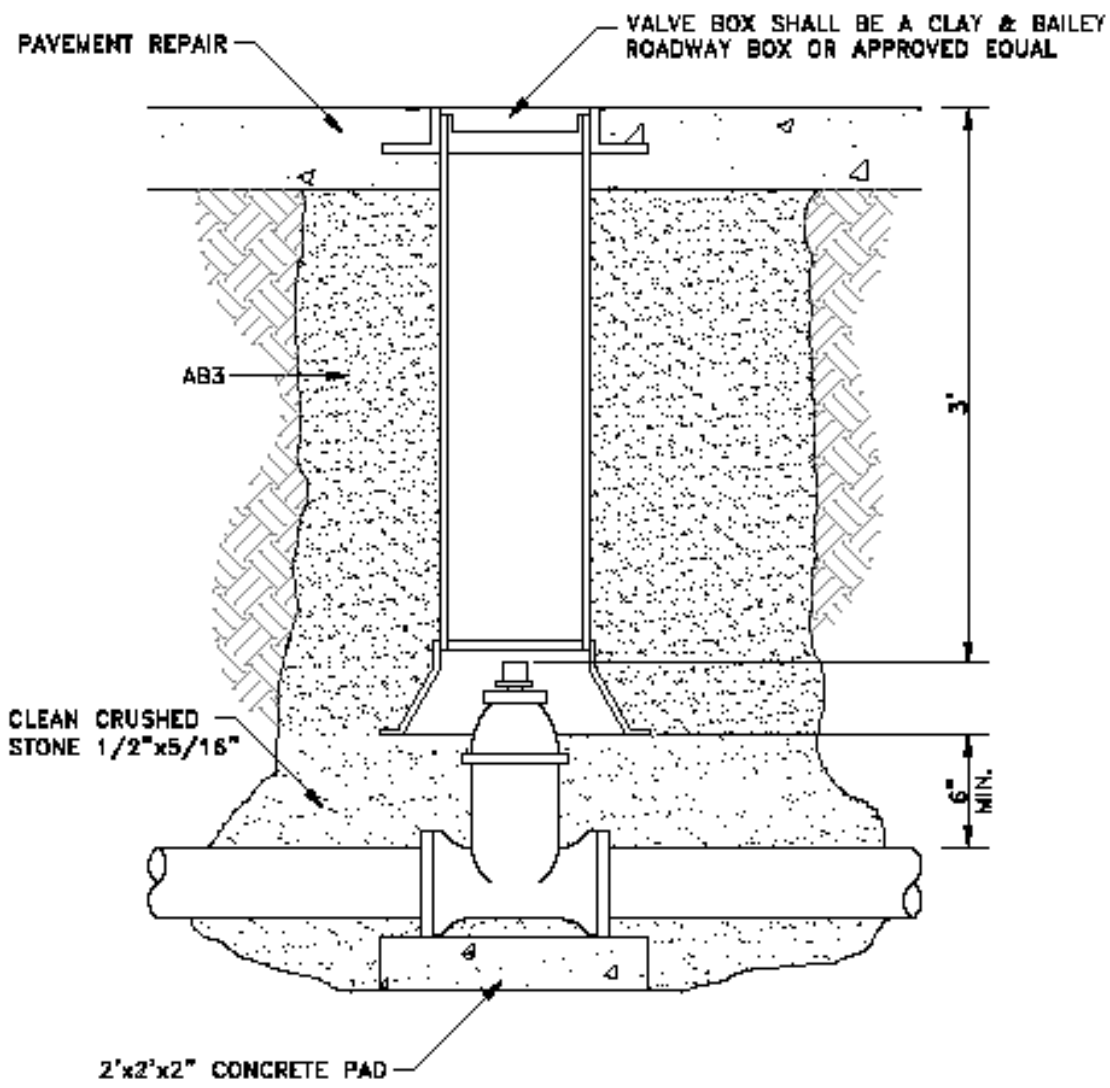


TYPICAL HYDRANT PIPING LAYOUT: STRAIGHT SET

WATER DEPARTMENT CITY OF INDEPENDENCE, MISSOURI
CONSTRUCTION DETAIL NUMBER 2
APPROVED BY: RV.
DRAWN BY: SDH. DATE: 3/20/89

CD-2

INDEPENDENCE WATER DEPARTMENT

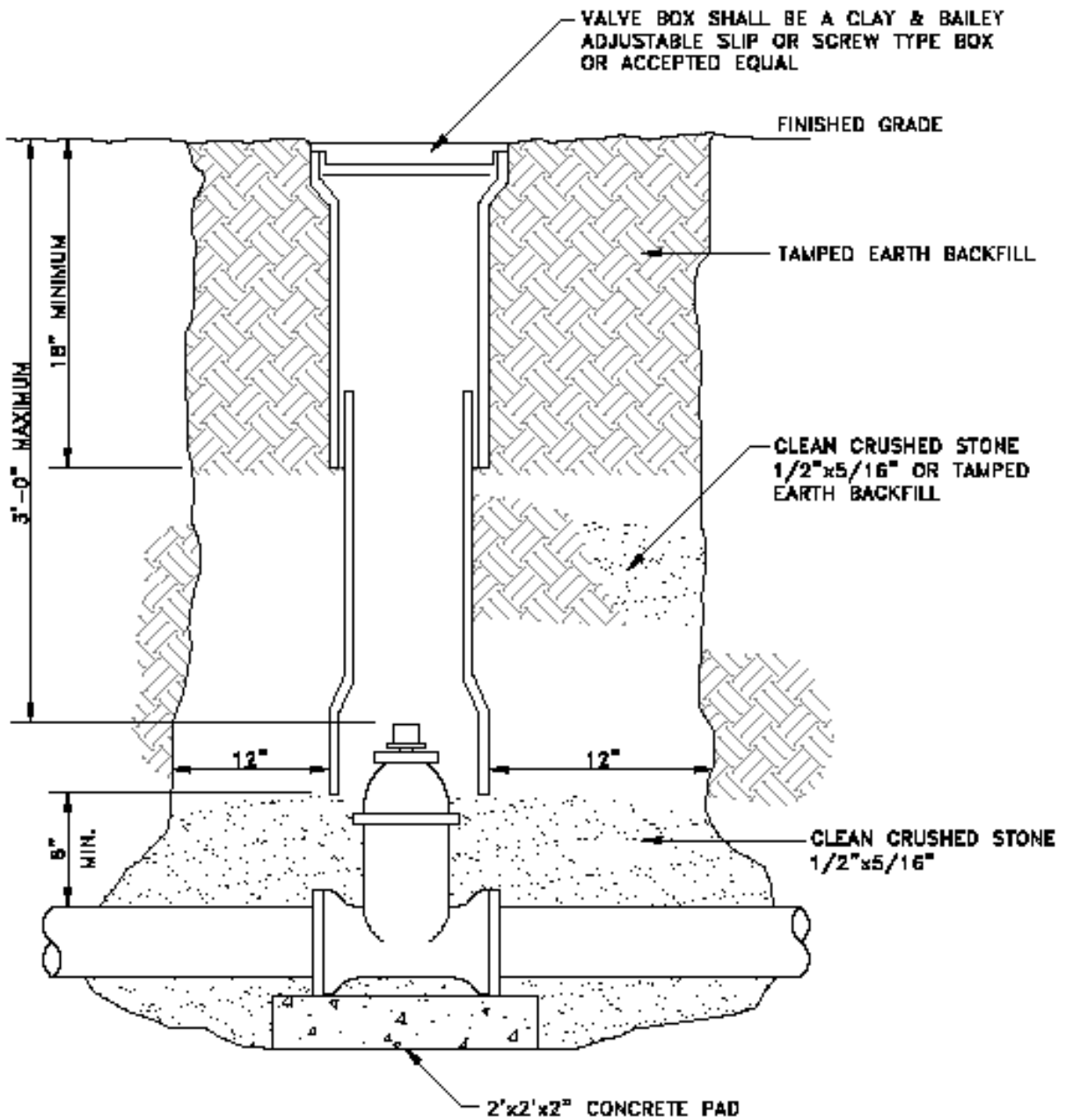


TYPICAL VALVE AND VALVE BOX INSTALLATION - ROADWAY

WATER DEPARTMENT CITY OF INDEPENDENCE, MISSOURI
CONSTRUCTION DETAIL NUMBER 3
APPROVED BY: SH
DRAWN BY: CJ DATE: 2/12/02

CD-3

INDEPENDENCE WATER DEPARTMENT



TYPICAL VALVE AND VALVE BOX INSTALLATION

WATER DEPARTMENT CITY OF INDEPENDENCE, MISSOURI

CONSTRUCTION DETAIL NUMBER 4

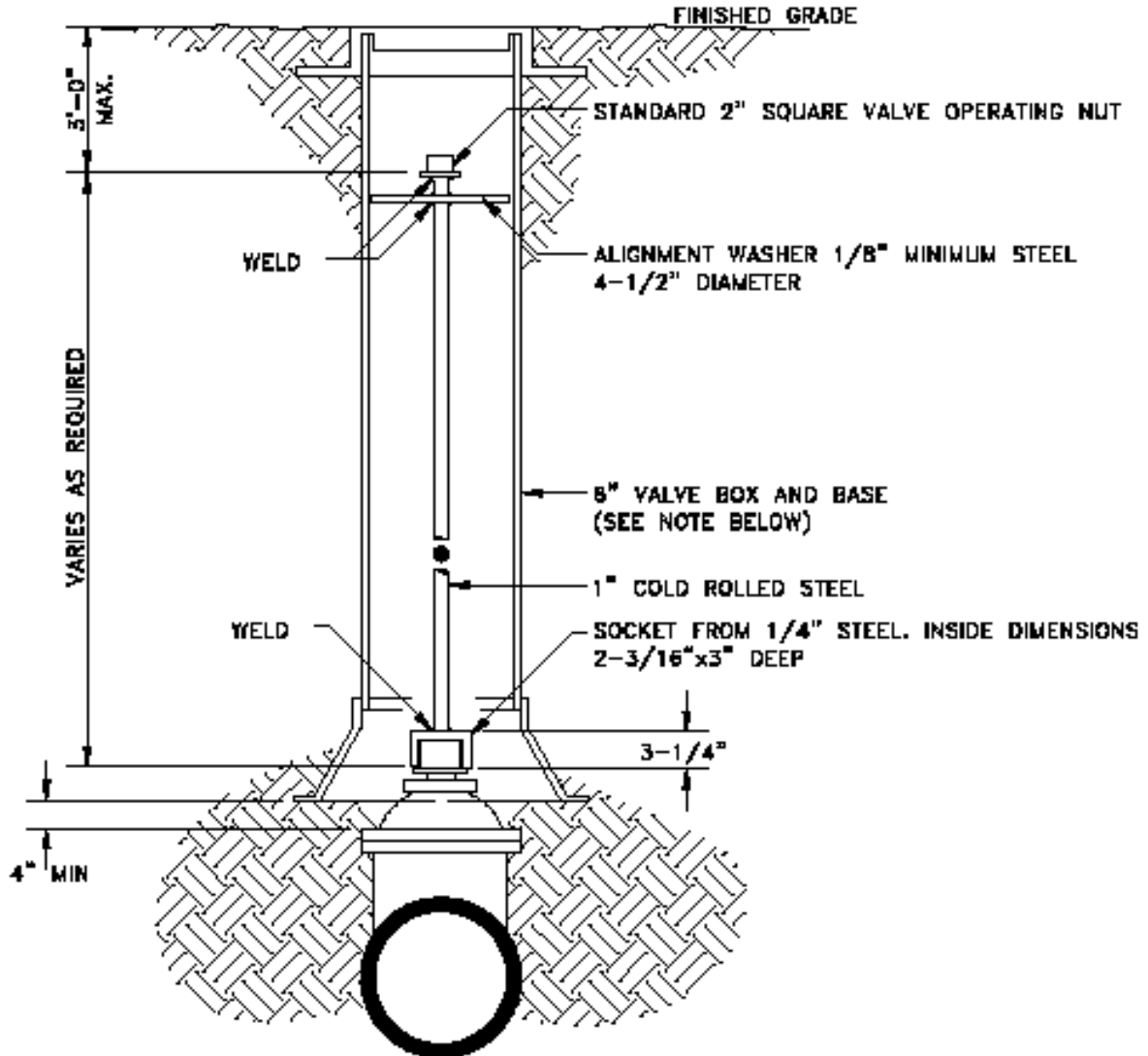
APPROVED BY: R.V.

DRAWN BY: SDH

DATE: 3/20/89

CD-4

INDEPENDENCE WATER DEPARTMENT



NOTE:

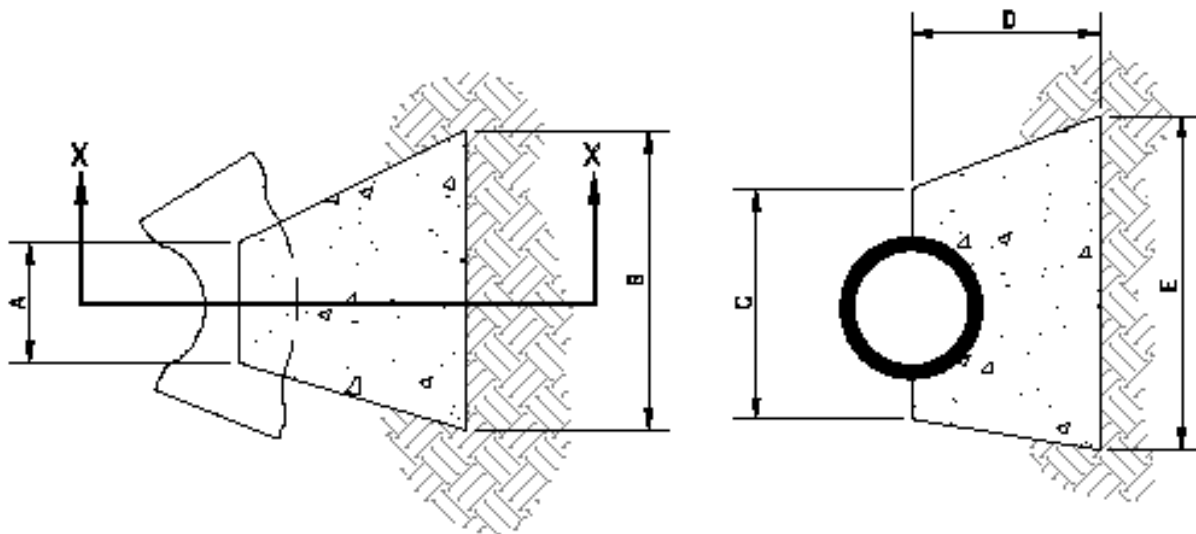
VALVE BOX AND BASE CAN BE ONE PIECE DUCTILE IRON PIPE, AS SPECIFIED IN PARAGRAPH PM-5.01 OR TWO PIECES AS SPECIFIED IN PARAGRAPHS PM-5.01

TYPICAL VALVE STEM EXTENSION

WATER DEPARTMENT CITY OF INDEPENDENCE, MISSOURI
 CONSTRUCTION DETAIL NUMBER 5
 APPROVED BY: R.V.
 DRAWN BY: S.D.H. DATE: 2/20/89

CD-5

INDEPENDENCE WATER DEPARTMENT



SECTION X-X

NOTES:

1. THRUST BLOCKING DESIGNED FOR A MINIMUM INTERNAL PIPE PRESSURE OF 175 P.S.I. PLUS 50% SURGE.
2. ALL THRUST BLOCKING SHALL BE POURED AGAINST UNDISTURBED EARTH
3. BEARING AREA FOR CONCRETE THRUST BLOCKS ARE ON SOIL HAVING ALLOWABLE SAFE LATERAL BEARING OF ONE (1) TON PER SQUARE FOOT. CALCULATED AREA MUST BE INCREASED FOR SOILS WITH LOWER BEARING CAPACITY

CUBIC YARD OF CONCRETE REQUIRED				
BEND	11-1/4"	22-1/2"	45°	90°
6"	0.2	0.2	0.4	0.7
8"	0.3	0.3	0.7	1.2
12"	0.7	0.7	1.5	2.7

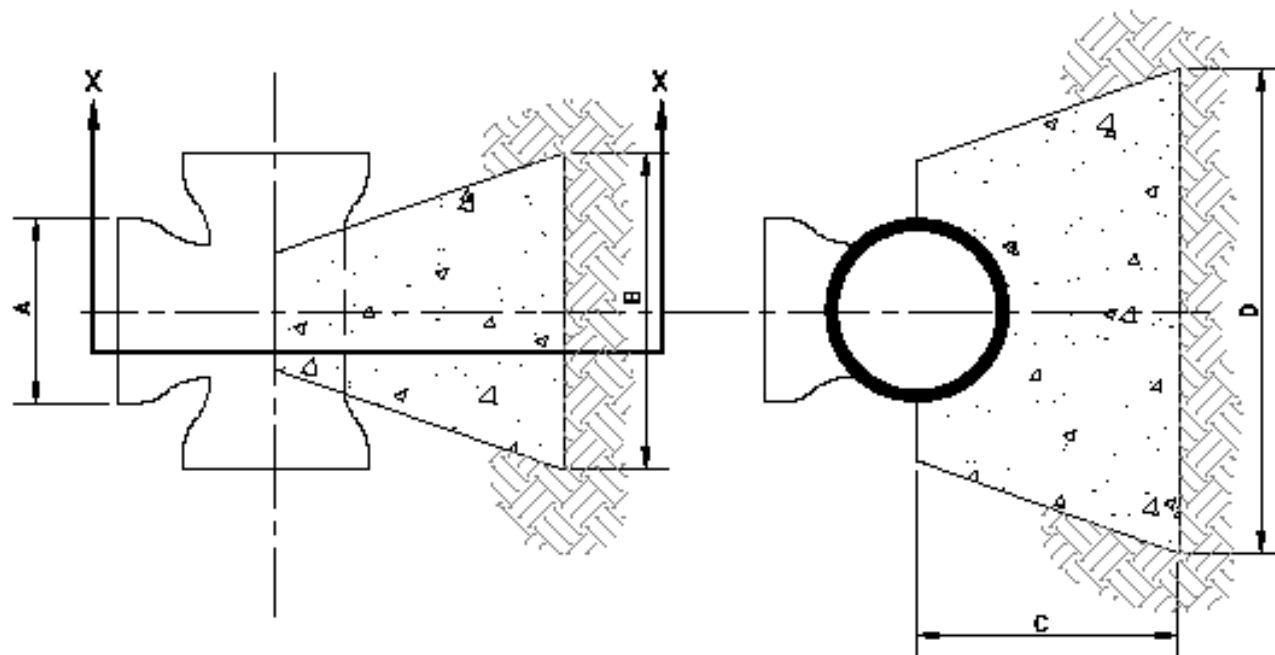
BEND	A	B	C	D	E
6" 11-1/4" & 22-1/2"	8"	18"	8"	24"	18"
6" 45°	8"	30"	8"	24"	30"
6" 90°	8"	36"	8"	24"	36"
8" 11-1/4" & 22-1/2"	10"	24"	10"	24"	24"
8" 45°	10"	36"	10"	24"	36"
8" 90°	10"	48"	10"	24"	48"
12" 11-1/4" & 22-1/2"	14"	36"	14"	24"	36"
12" 45°	14"	54"	14"	24"	54"
12" 90°	14"	72"	14"	24"	72"

TYPICAL THRUST BLOCKING FOR - BENDS

WATER DEPARTMENT CITY OF INDEPENDENCE, MISSOURI
 CONSTRUCTION DETAIL NUMBER B
 APPROVED BY: RV
 DRAWN BY: SDH DATE: 5/20/89

CD-5

INDEPENDENCE WATER DEPARTMENT



SECTION X-X

NOTES:

1. THRUST BLOCKING DESIGNED FOR A MINIMUM INTERNAL PIPE PRESSURE OF 175 P.S.I. PLUS 50% SURGE.
2. ALL THRUST BLOCKING SHALL BE POURED AGAINST UNDISTURBED EARTH
3. BEARING AREA FOR CONCRETE THRUST BLOCKS ARE ON SOIL HAVING ALLOWABLE SAFE LATERAL BEARING OF ONE (1) TON PER SQUARE FOOT. CALCULATED AREA MUST BE INCREASED FOR SOILS WITH LOWER BEARING CAPACITY

BRANCH SIZE	A	B	C	D
6"	6"	30"	24"	30"
8"	6"	40"	24"	40"
12"	12"	54"	30"	54"

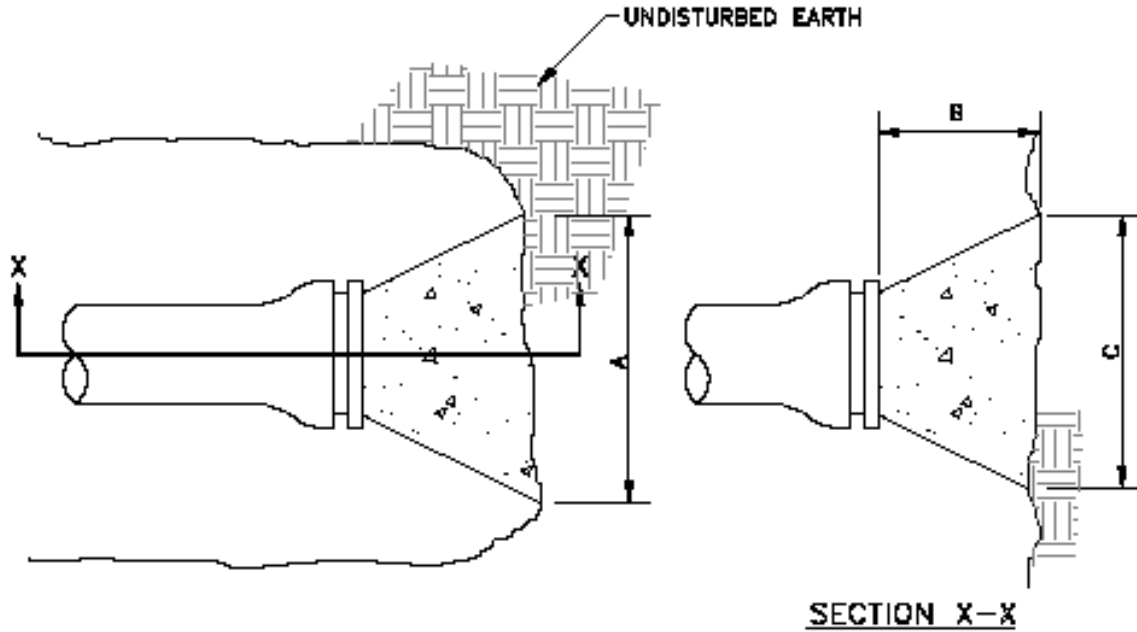
CUBIC YARD OF CONCRETE REQUIRED					
PLUG		TEE			
		RUN	BRANCH		
SIZE	CU. YD.		6"	8"	12"
6"	1	6"	1.0	---	---
8"	1.5	8"	1.5	1.5	---
12"	2	12"	2.0	2.0	2.7

TYPICAL THRUST BLOCKING FOR - TEES

WATER DEPARTMENT CITY OF INDEPENDENCE, MISSOURI
 CONSTRUCTION DETAIL NUMBER 7
 APPROVED BY: RV.
 DRAWN BY: SDM. DATE: 5/20/89

CD-7

INDEPENDENCE WATER DEPARTMENT



PLUGS	A	B	C
6"	36"	24"	36"
8"	48"	24"	48"
12"	72"	24"	72"
16"	72"	38"	72"

CU. YD OF CONG. REQUIRED	
6"	.7
8"	1.2
12"	2.7
16"	3.3

NOTES:

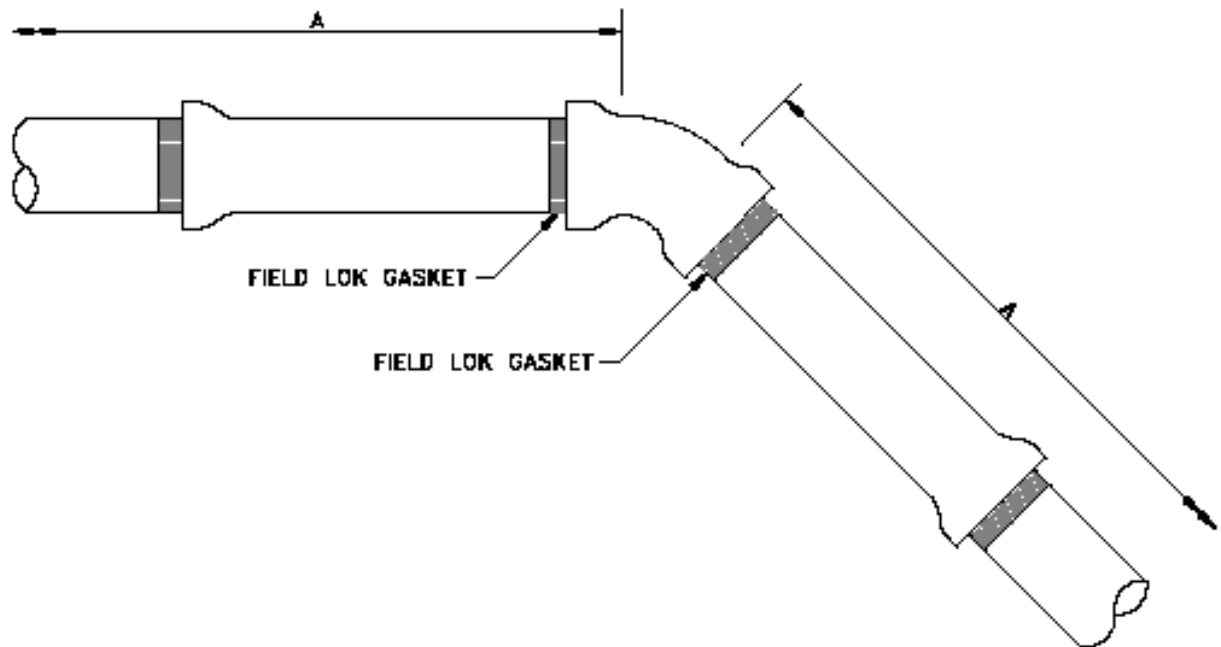
1. THRUST BLOCKING DESIGNED FOR A MINIMUM INTERNAL PIPE PRESSURE OF 175 P.S.I. PLUS 50% SURGE.
2. ALL THRUST BLOCKING SHALL BE POURED AGAINST UNDISTURBED EARTH
3. BEARING AREA FOR CONCRETE THRUST BLOCKS ARE ON SOIL HAVING ALLOWABLE SAFE LATERAL BEARING OF ONE (1) TON PER SQUARE FOOT. CALCULATED AREA MUST BE INCREASED FOR SOILS WITH LOWER BEARING CAPACITY

TYPICAL THRUST BLOCKING FOR - PLUGS

WATER DEPARTMENT CITY OF INDEPENDENCE, MISSOURI
 CONSTRUCTION DETAIL NUMBER 7A
 APPROVED BY: R.V.
 DRAWN BY: SDM DATE: 3/20/89

CD-7A

INDEPENDENCE WATER DEPARTMENT



FITTING SIZE	8"	8"	12"
BENDS	A	A	A
11-1/4'	11'	14'	21'
22-1/2'	22'	27'	42'
45'	46'	60'	87'
90'	111'	210'	210'

NOTE: RESTRAIN ON EACH SIDE OF FITTING

**TYPICAL FIELD LOK GASKET INSTALLATION FOR
DUCTILE IRON PIPE - 11-1/4', 22-1/2', 45' AND 90' (BENDS)**

WATER DEPARTMENT CITY OF INDEPENDENCE, MISSOURI
CONSTRUCTION DETAIL NUMBER 8

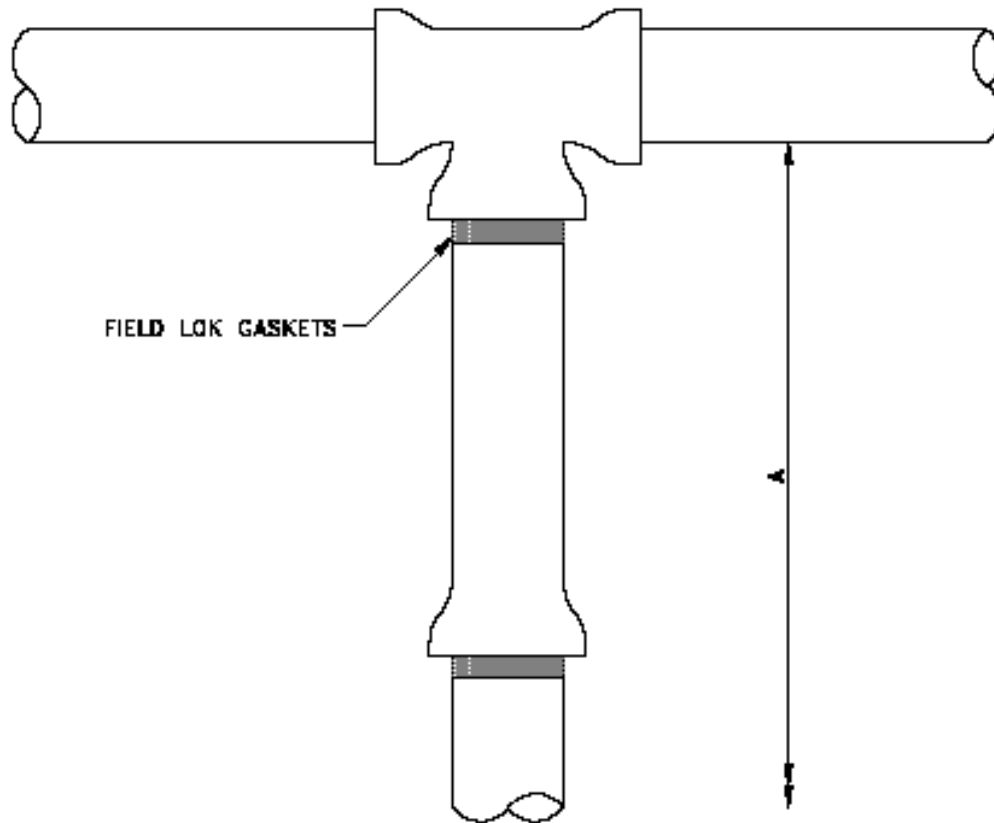
APPROVED BY: RJ.

DRAWN BY: SDH.

DATE: 3/20/89

CD-8

INDEPENDENCE WATER DEPARTMENT



TEE SIZE	BRANCH LINE SIZE		
	6"	8"	12"
6"	A	A	A
8"	79'	105'	
12"	76'	103'	156'

NOTE: TEES ARE TO BE RESTRAINED ON BRANCH ONLY

**TYPICAL FIELD LOK GASKET INSTALLATION FOR
DUCTILE IRON PIPE - TEES**

WATER DEPARTMENT CITY OF INDEPENDENCE, MISSOURI

CONSTRUCTION DETAIL NUMBER 8

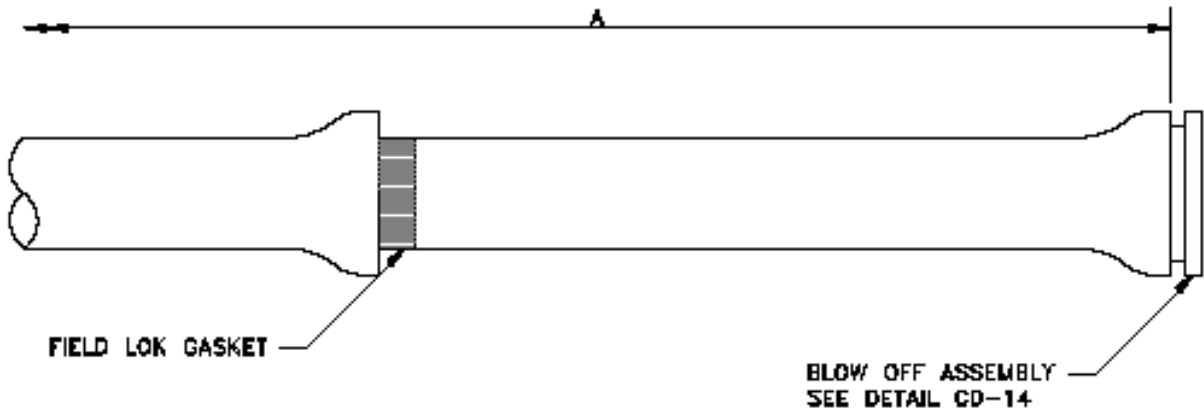
APPROVED BY: RV.

DRAWN BY: SDH

DATE: 3/20/89

CD-8

INDEPENDENCE WATER DEPARTMENT



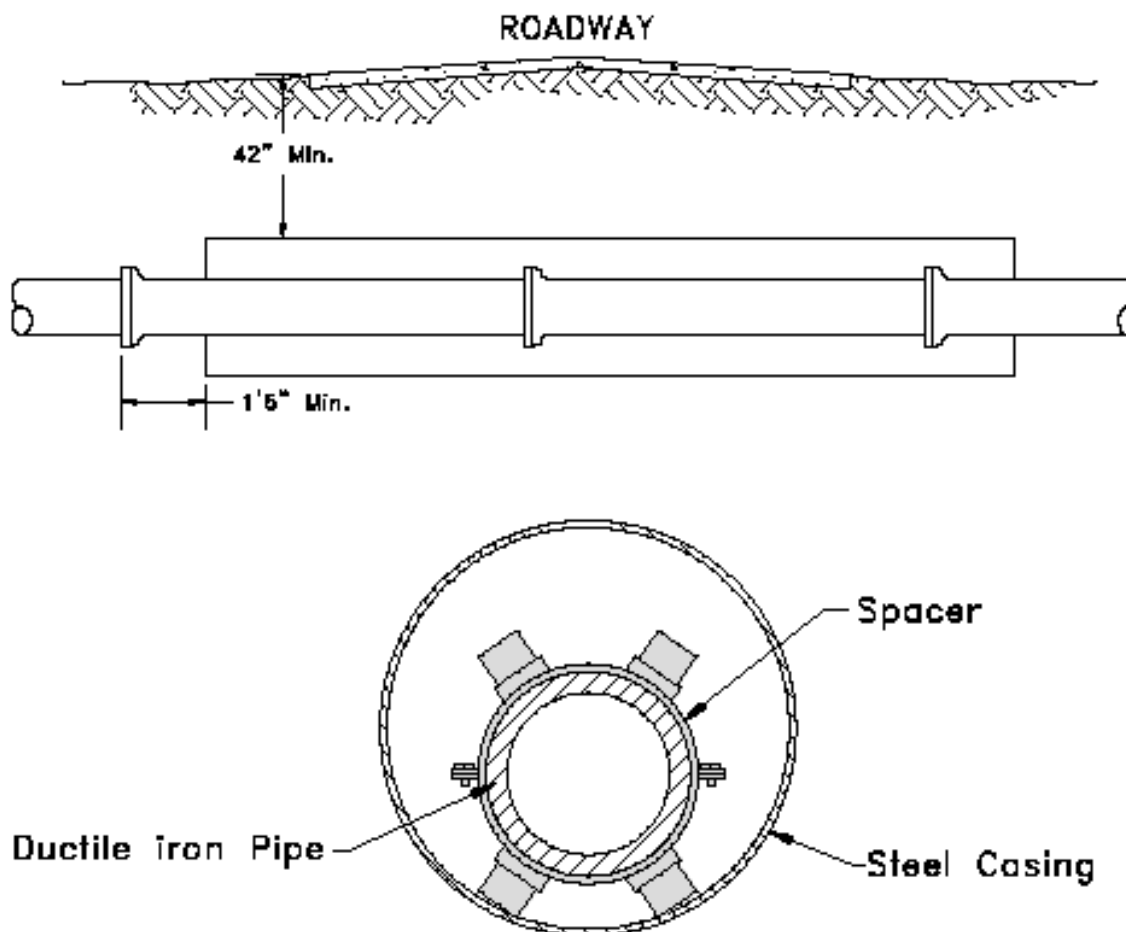
DEAD ENDS			
	A	A	A
6"	83'		
8"		105'	
12"			158'

**TYPICAL FIELD LOK GASKET INSTALLATION FOR
DUCTILE IRON PIPE - DEAD ENDS**

WATER DEPARTMENT CITY OF INDEPENDENCE, MISSOURI
 CONSTRUCTION DETAIL NUMBER 10
 APPROVED BY: RV.
 DRAWN BY: SDH. DATE: 3/20/89

CD-10

INDEPENDENCE WATER DEPARTMENT



NOTES:

1. POLYETHYLENE ENCASEMENT SHALL BE INSTALLED ON ALL DUCTILE IRON PIPE AND FITTINGS INCLUDING DUCTILE IRON PIPE WHICH IS IN ENCASEMENT.
2. ENCASEMENT SHALL BE INSTALLED PER RAILROAD AND/OR HIGHWAY SPECIFICATIONS.
3. ALL PIPE IN CASING WILL BE FIELD LOCKED.
4. SEE DETAIL CD-12A FOR ADDITIONAL DETAIL AND NOTES.

**TYPICAL ENCASEMENT UNDER ROADWAY FOR DUCTILE
IRON PIPE-6" THRU 36"**

WATER DEPARTMENT CITY OF INDEPENDENCE, MISSOURI
CONSTRUCTION DETAIL NUMBER 11

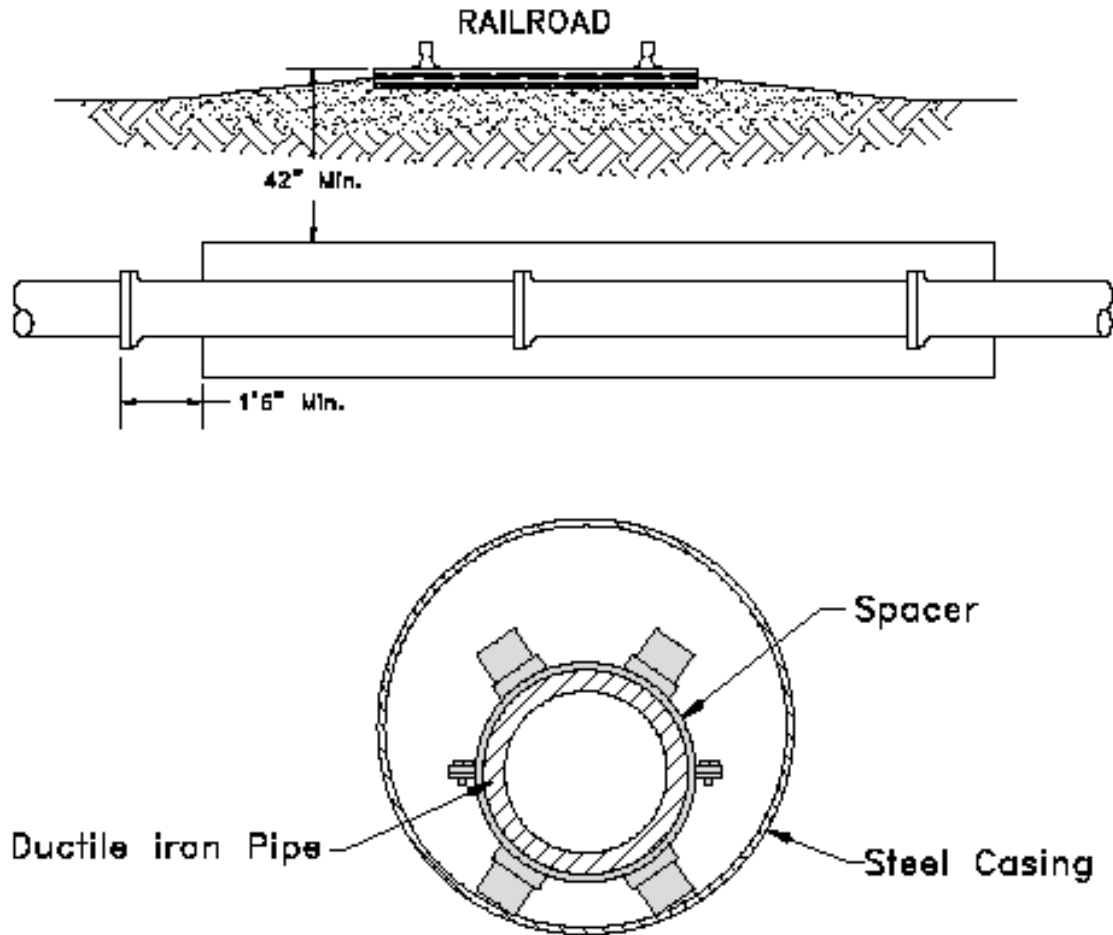
APPROVED BY: SDH

DRAWN BY: CJ

DATE: 9/21/11

CD-11

INDEPENDENCE WATER DEPARTMENT



NOTES:

1. POLYETHYLENE ENCASEMENT SHALL BE INSTALLED ON ALL DUCTILE IRON PIPE AND FITTINGS INCLUDING DUCTILE IRON PIPE WHICH IS IN ENCASEMENT.
2. ENCASEMENT SHALL BE INSTALLED PER RAILROAD AND/OR HIGHWAY SPECIFICATIONS.
3. ALL PIPE IN CASING WILL BE FIELD LOCKED.
4. SEE DETAIL CD-12A FOR ADDITIONAL DETAIL AND NOTES.

**TYPICAL ENCASEMENT UNDER RAILROAD FOR DUCTILE
IRON PIPE-6" THRU 36"**

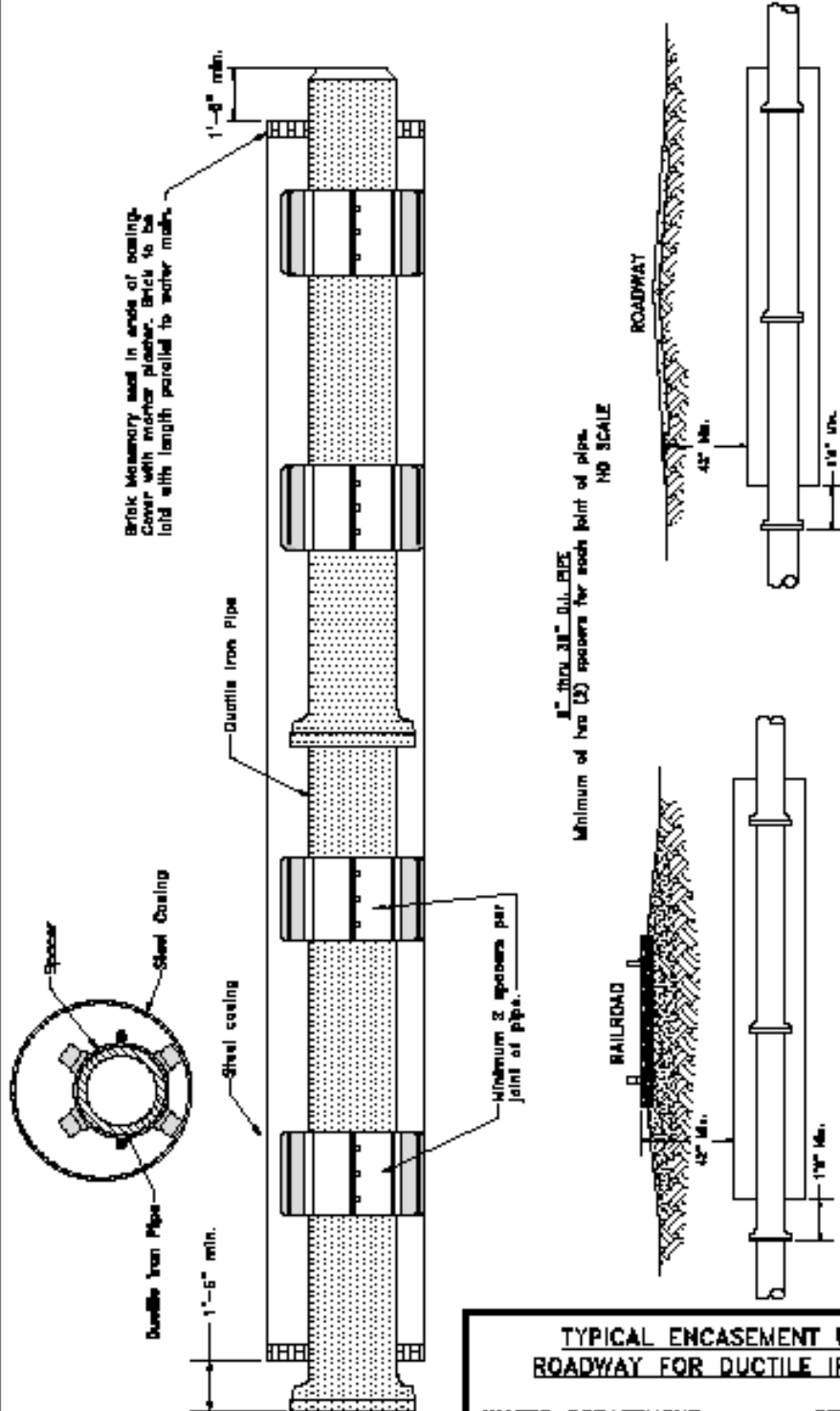
WATER DEPARTMENT CITY OF INDEPENDENCE, MISSOURI
CONSTRUCTION DETAIL NUMBER 12

APPROVED BY: SDH

DRAWN BY: CJ DATE: 9/21/11

CD-12

INDEPENDENCE WATER DEPARTMENT



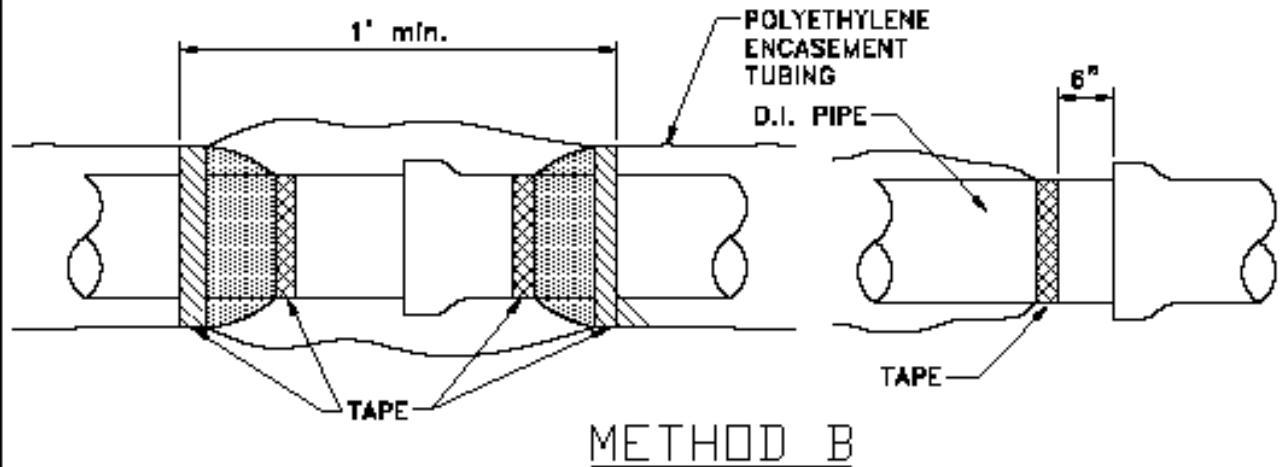
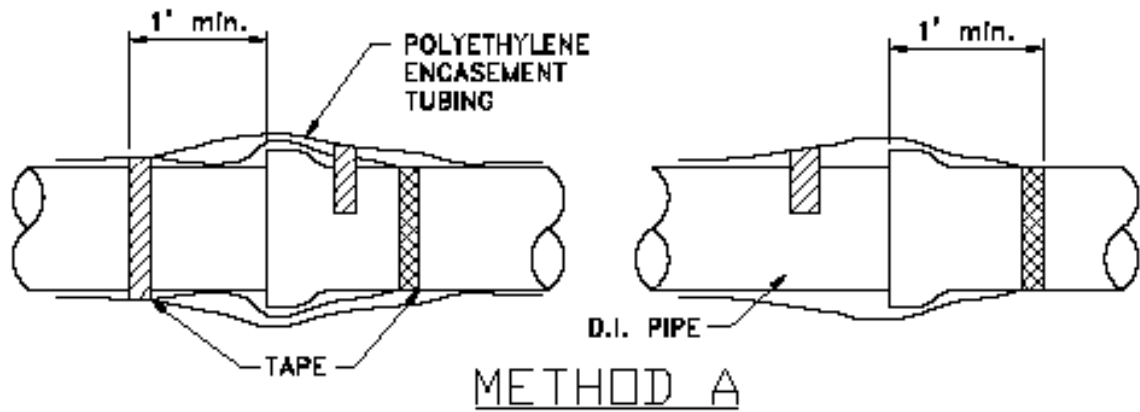
TYPICAL ENCASEMENT UNDER RAILROAD AND ROADWAY FOR DUCTILE IRON PIPE-6" THRU 36"

WATER DEPARTMENT CITY OF INDEPENDENCE, MISSOURI
 CONSTRUCTION DETAIL NUMBER 12A
 APPROVED BY: SDH
 DRAWN BY: CJ DATE: 9/21/11

Length and wall thickness of Encasement Pipe to be as shown on construction plans.

TYPICAL ENCASEMENT UNDER RAILROADS and ROADS FOR DUCTILE IRON PIPE 6" thru 36" PER RW2

CD-12A



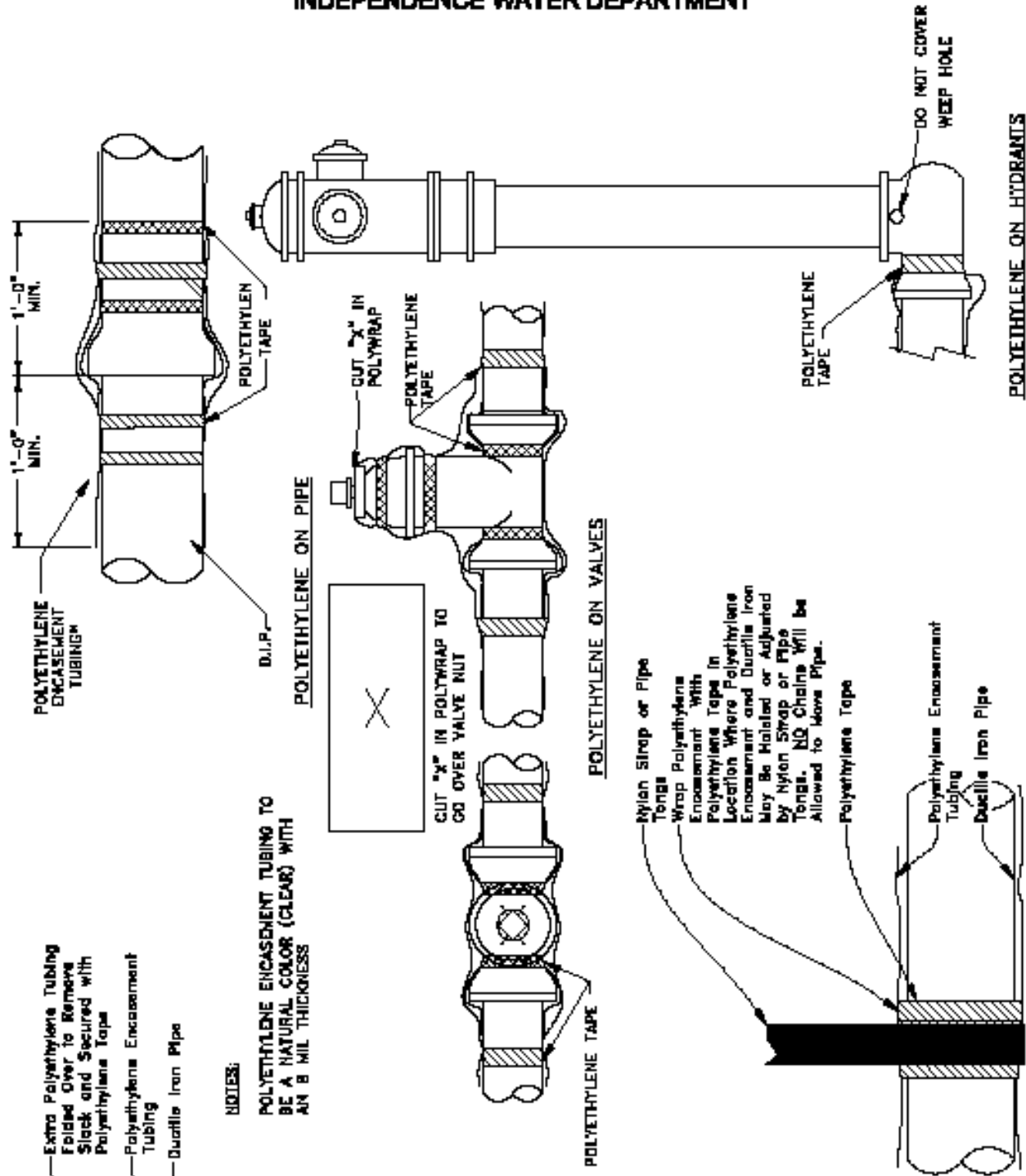
POLYETHYLENE ENCASEMENT TUBING TO BE A
 NATURAL COLOR (CLEAR) WITH AN 8 MIL
 THICKNESS.
POLYETHYLENE ENCASEMENT FOR DUCTILE IRON PIPE
 no scale

POLYETHYLENE ENCASEMENT FOR D.I. PIPE

WATER DEPARTMENT CITY OF INDEPENDENCE, MISSOURI
 CONSTRUCTION DETAIL NUMBER 13
 APPROVED BY: _____
 DRAWN BY: C.J. DATE: 12/16/04

CD-13

INDEPENDENCE WATER DEPARTMENT



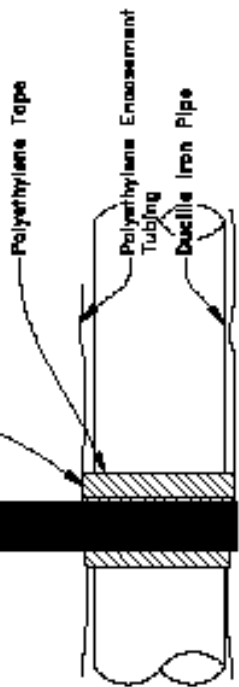
Extra Polyethylene Tubing Folded Over to Remove Slack and Secured with Polyethylene Tape
 Polyethylene Encasement Tubing
 Ductile Iron Pipe

NOTES:
 POLYETHYLENE ENCASEMENT TUBING TO BE A NATURAL COLOR (CLEAR) WITH AN 8 MIL THICKNESS



CUT "X" IN POLYWRAP TO GO OVER VALVE NUT

Nylon Strap or Pipe Tongs
 Wrap Polyethylene Encasement With Polyethylene Tape in Location Where Polyethylene Encasement and Ductile Iron May Be Hoisted or Adjusted by Nylon Strap or Pipe Tongs. NO Chains Will be Allowed to Move Pipe.

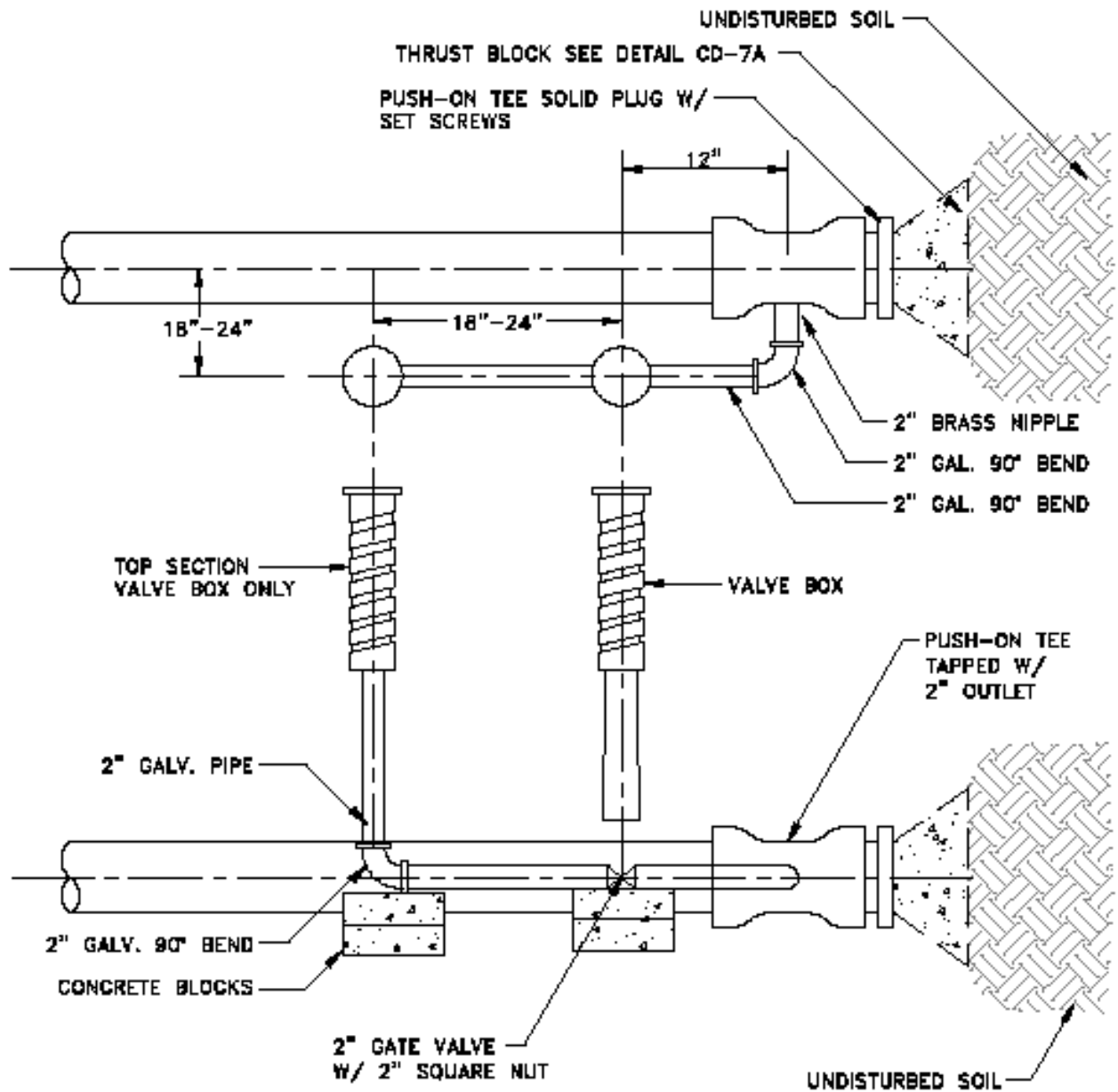


POLYETHYLENE ENCASEMENT FOR DUCTILE IRON PIPE

WATER DEPARTMENT CITY OF INDEPENDENCE, MISSOURI
 CONSTRUCTION DETAIL NUMBER **13A**
 APPROVED BY: SM
 DRAWN BY: M.J.F. DATE: 01/03/2001

CD-18A

INDEPENDENCE WATER DEPARTMENT



NOTE:
 THRUST BLOCK TO BE USED IF FIELD LOK GASKETS
 ARE NOT USED. SEE DETAILS FOR CONCRETE BLOCK
 AND FIELD LOK GASKETS

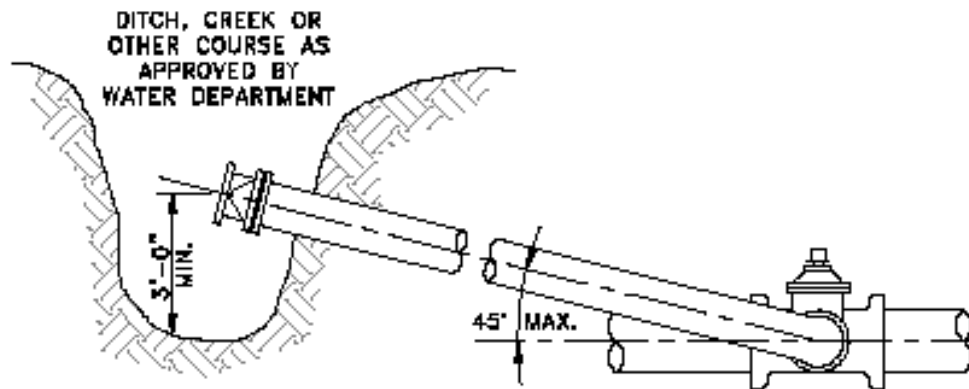
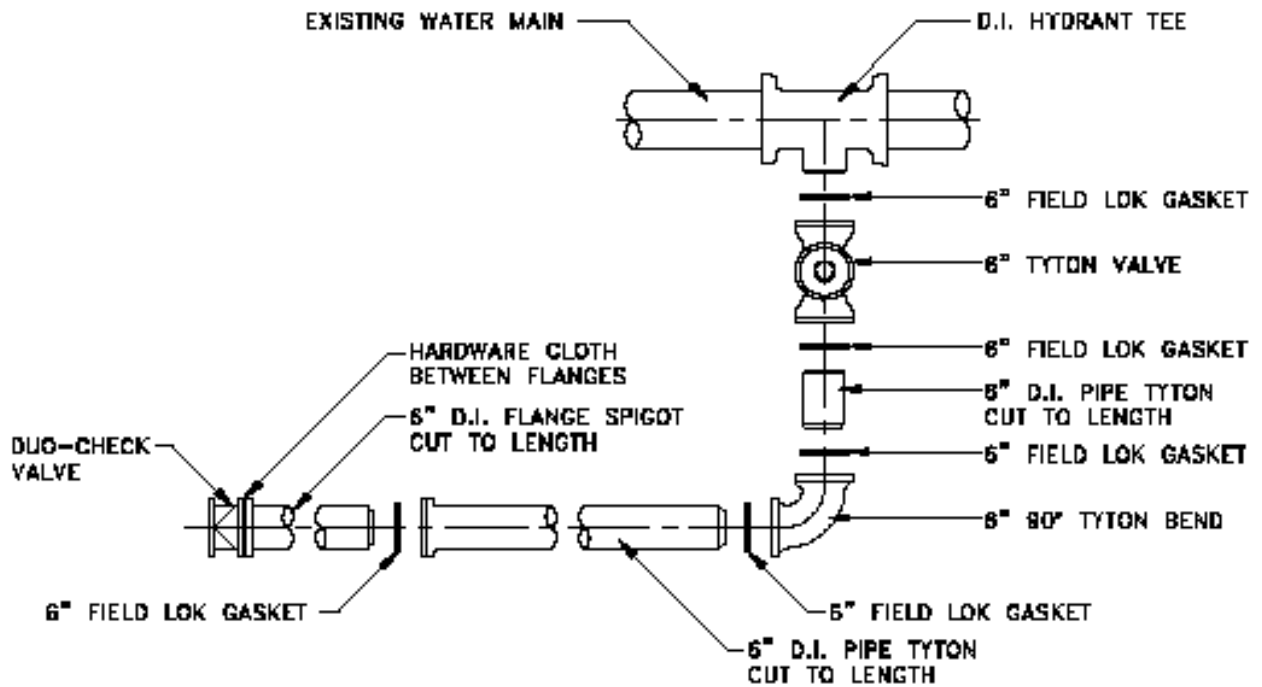
TYPICAL BLOW OFF ASSEMBLY - DEAD END

DO NOT CUT NOTCH IN 2" GALV.
90° BEND

WATER DEPARTMENT CITY OF INDEPENDENCE, MISSOURI
 CONSTRUCTION DETAIL NUMBER 14
 APPROVED BY: RV.
 DRAWN BY: SDH. DATE: 5/20/89

CD-14

INDEPENDENCE WATER DEPARTMENT

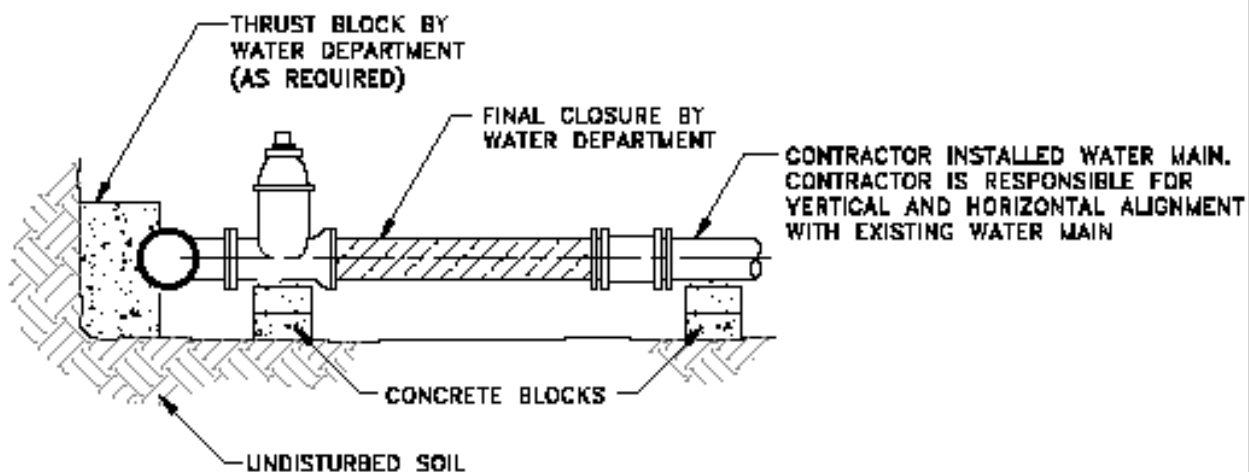
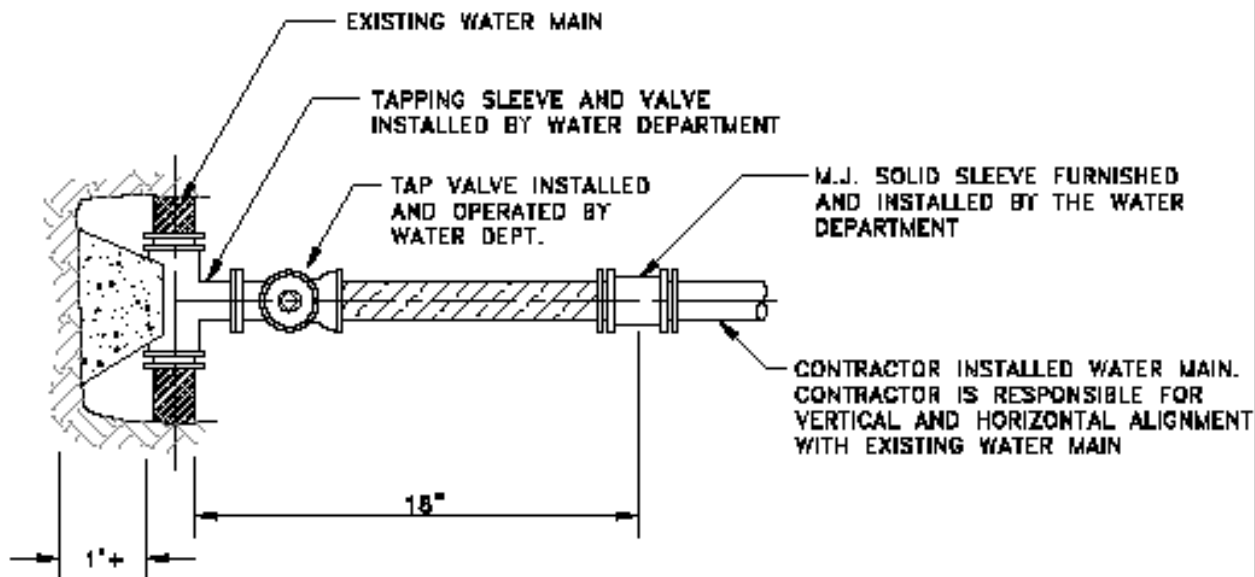


TYPICAL BLOW OFF DETAIL

WATER DEPARTMENT CITY OF INDEPENDENCE, MISSOURI
 CONSTRUCTION DETAIL NUMBER 15
 APPROVED BY: RV
 DRAWN BY: SDH DATE: 3/20/89

CD-15

INDEPENDENCE WATER DEPARTMENT



TYPICAL TAPPING SLEEVE CONNECTION

WATER DEPARTMENT CITY OF INDEPENDENCE, MISSOURI
CONSTRUCTION DETAIL NUMBER 10

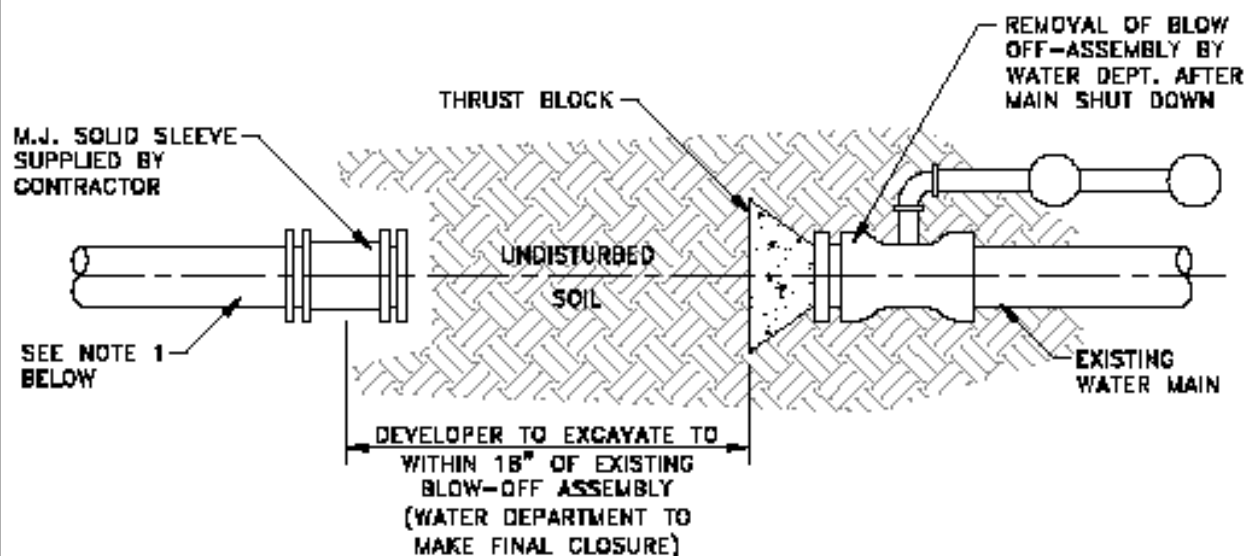
APPROVED BY: RS

DRAWN BY: SDH

DATE: 3/20/89

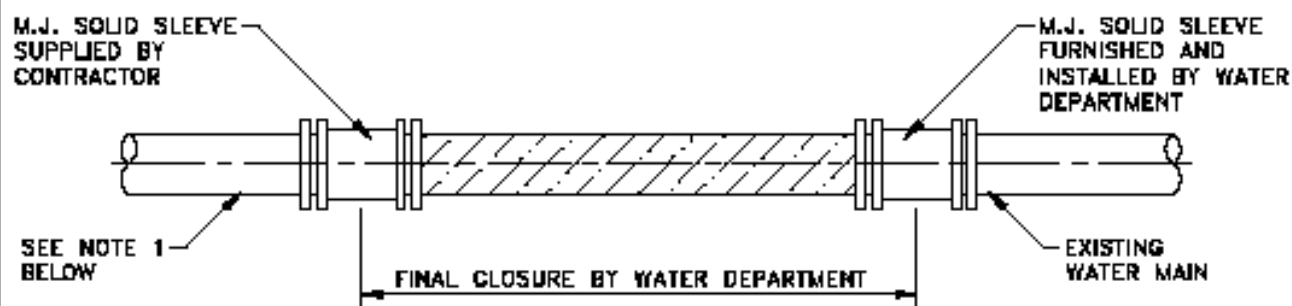
CD-16

INDEPENDENCE WATER DEPARTMENT



BEFORE REMOVAL OF BLOW-OFF ASSEMBLY

NOTE:
CONTRACTOR RESPONSIBLE FOR HORIZONTAL AND VERTICAL ALIGNMENT WITH EXISTING WATER MAIN



AFTER REMOVAL OF BLOW-OFF ASSEMBLY

NOTES:

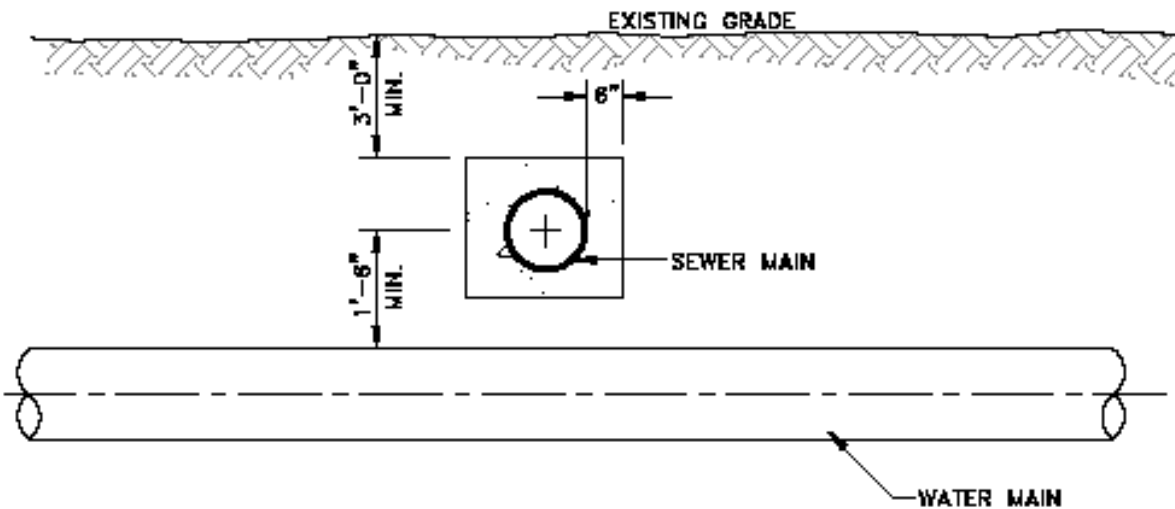
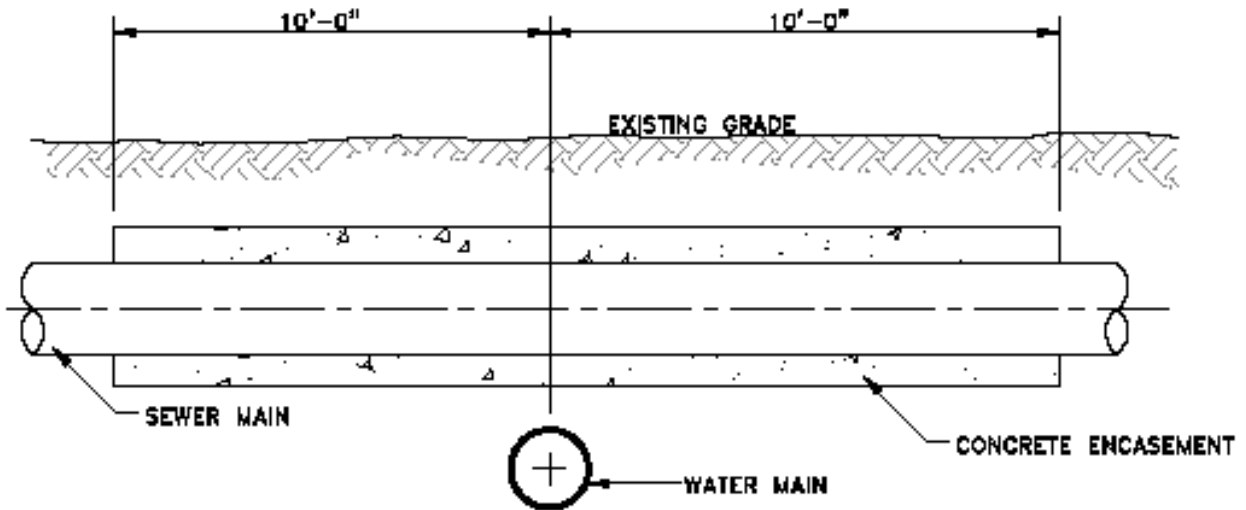
1. CONTRACTOR RESPONSIBLE FOR HORIZONTAL AND VERTICAL ALIGNMENT WITH EXISTING WATER MAIN.

TYPICAL BLOW-OFF CONNECTION

WATER DEPARTMENT CITY OF INDEPENDENCE, MISSOURI
CONSTRUCTION DETAIL NUMBER 17
APPROVED BY: RV
DRAWN BY: SDR DATE: 3/20/89

CD-17

INDEPENDENCE WATER DEPARTMENT



TYPICAL SANITARY SEWER MAIN CROSSING WATER MAIN

WATER DEPARTMENT CITY OF INDEPENDENCE, MISSOURI

CONSTRUCTION DETAIL NUMBER 18

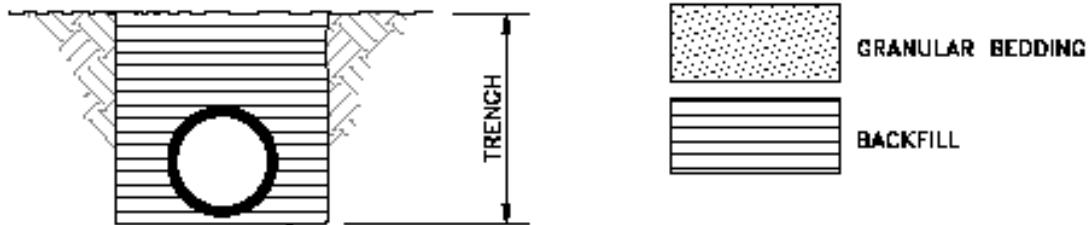
APPROVED BY: R.V.

DRAWN BY: SDH

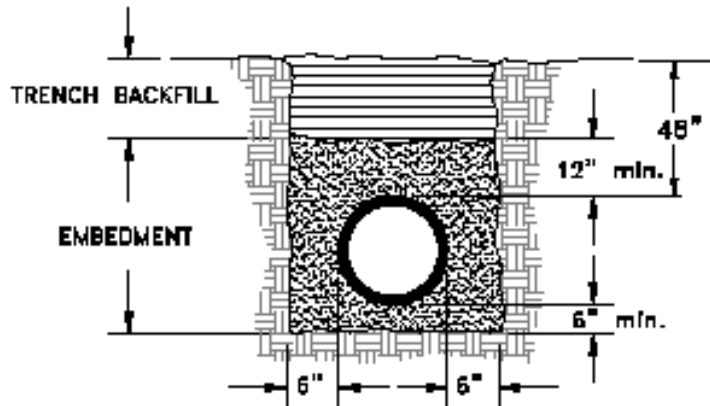
DATE: 3/20/89

CD-18

INDEPENDENCE WATER DEPARTMENT



**FLAT BOTTOM DITCH IN EARTH
NORMAL EMBEDMENT FOR 12"
OR SMALLER D.I.P.**



**FLAT BOTTOM IN ROCK
NORMAL EMBEDMENT FOR 12"
OR SMALLER D.I.P.**

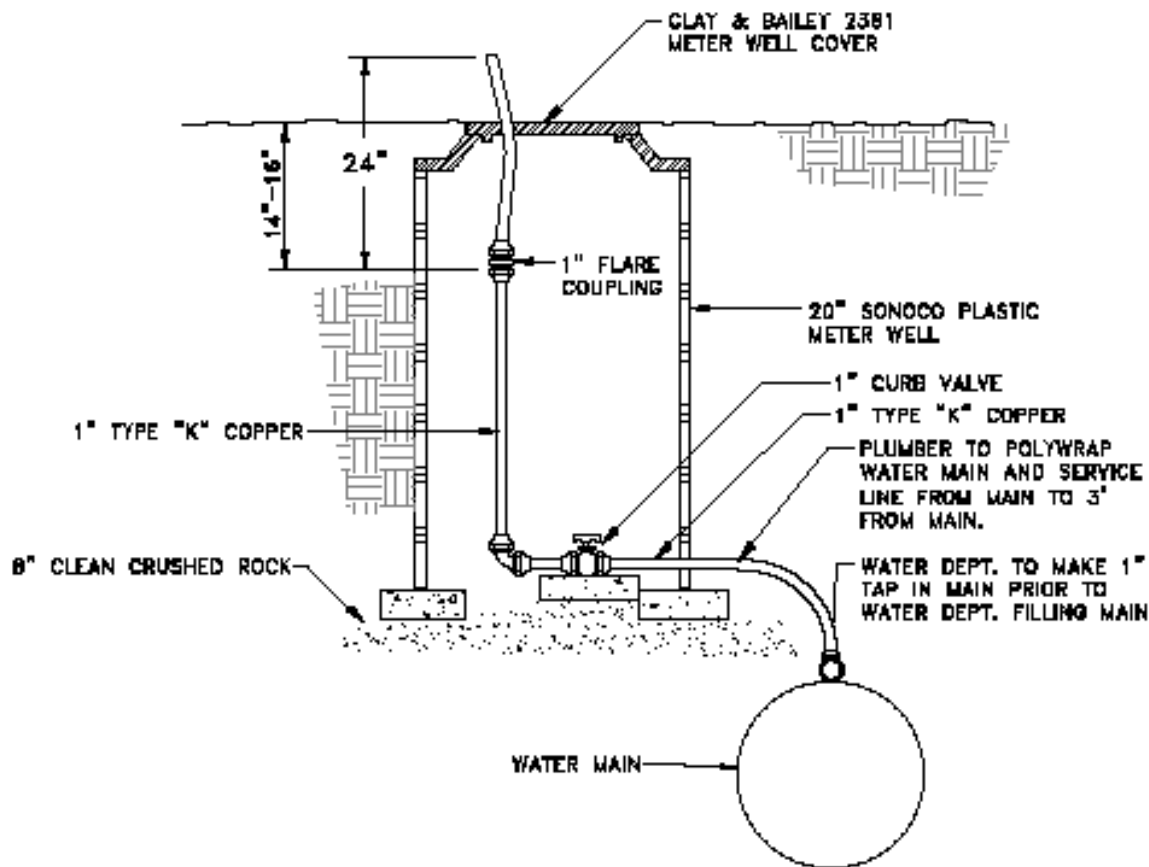
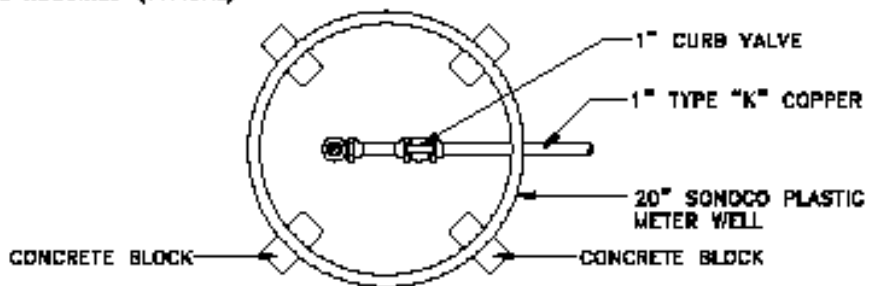
STANDARD LAYING CONDITIONS FOR DUCTILE IRON PIPE

WATER DEPARTMENT CITY OF INDEPENDENCE, MISSOURI
 CONSTRUCTION DETAIL NUMBER 19
 APPROVED BY: EV.
 DRAWN BY: GJ DATE: 01/20/2011

CD-19

INDEPENDENCE WATER DEPARTMENT

STEEL MARKER POST → ○
MAY BE REQUIRED (TYPICAL)



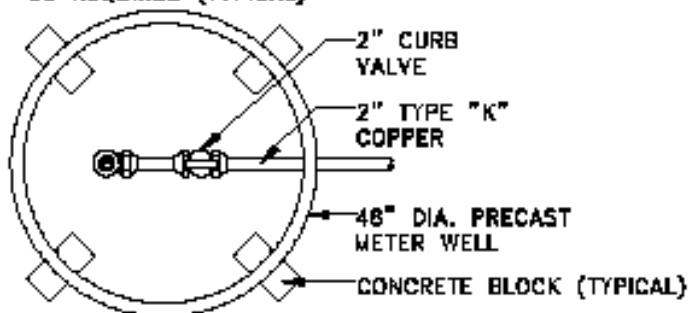
TYPICAL AIR RELEASE PIT

WATER DEPARTMENT CITY OF INDEPENDENCE, MISSOURI
 CONSTRUCTION DETAIL NUMBER 20
 APPROVED BY: DR.
 DRAWN BY: SDH. DATE: 01/09/2001

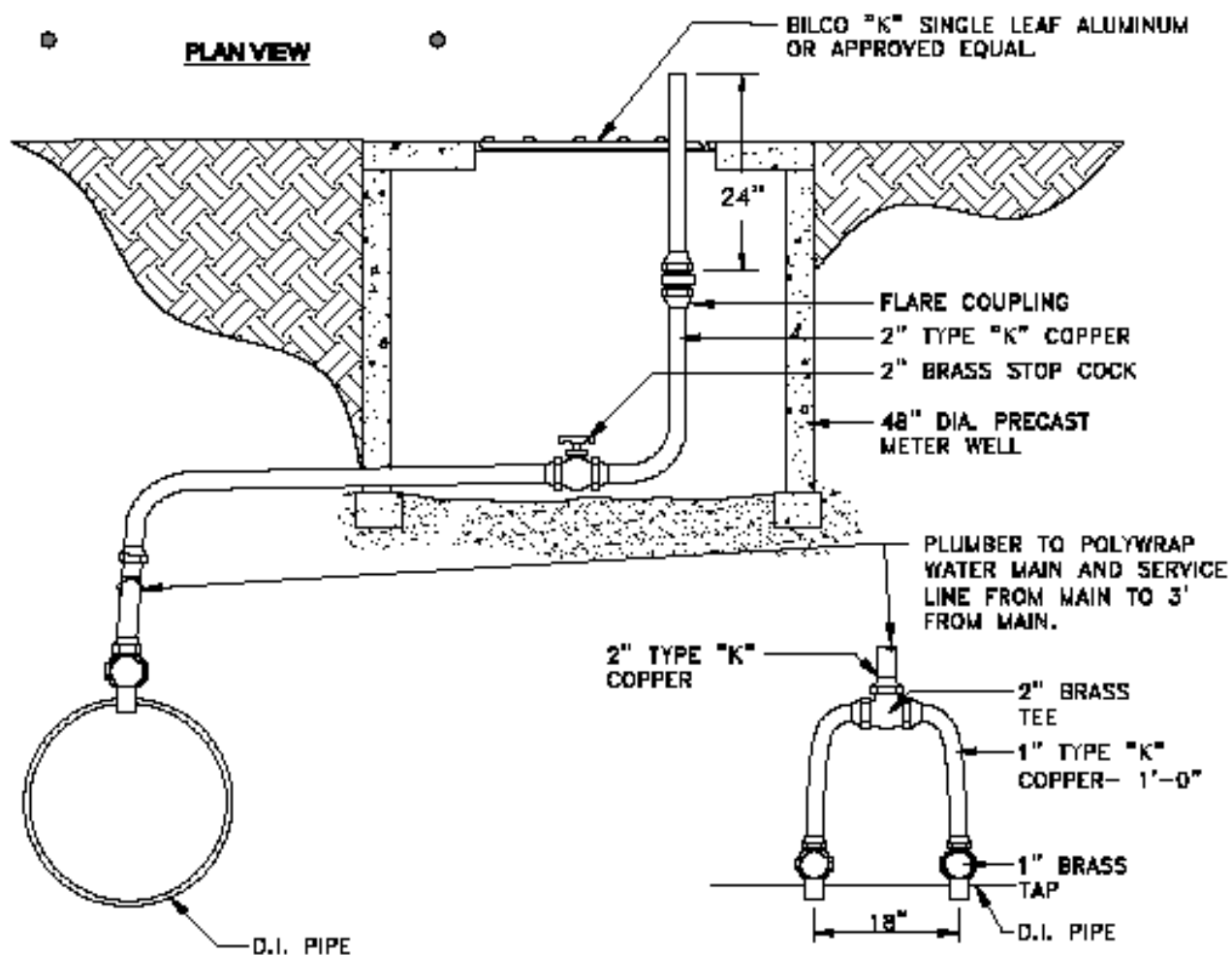
CD-20

INDEPENDENCE WATER DEPARTMENT

● — STEEL MARKER POST MAY BE REQUIRED (TYPICAL) ●



PLAN VIEW

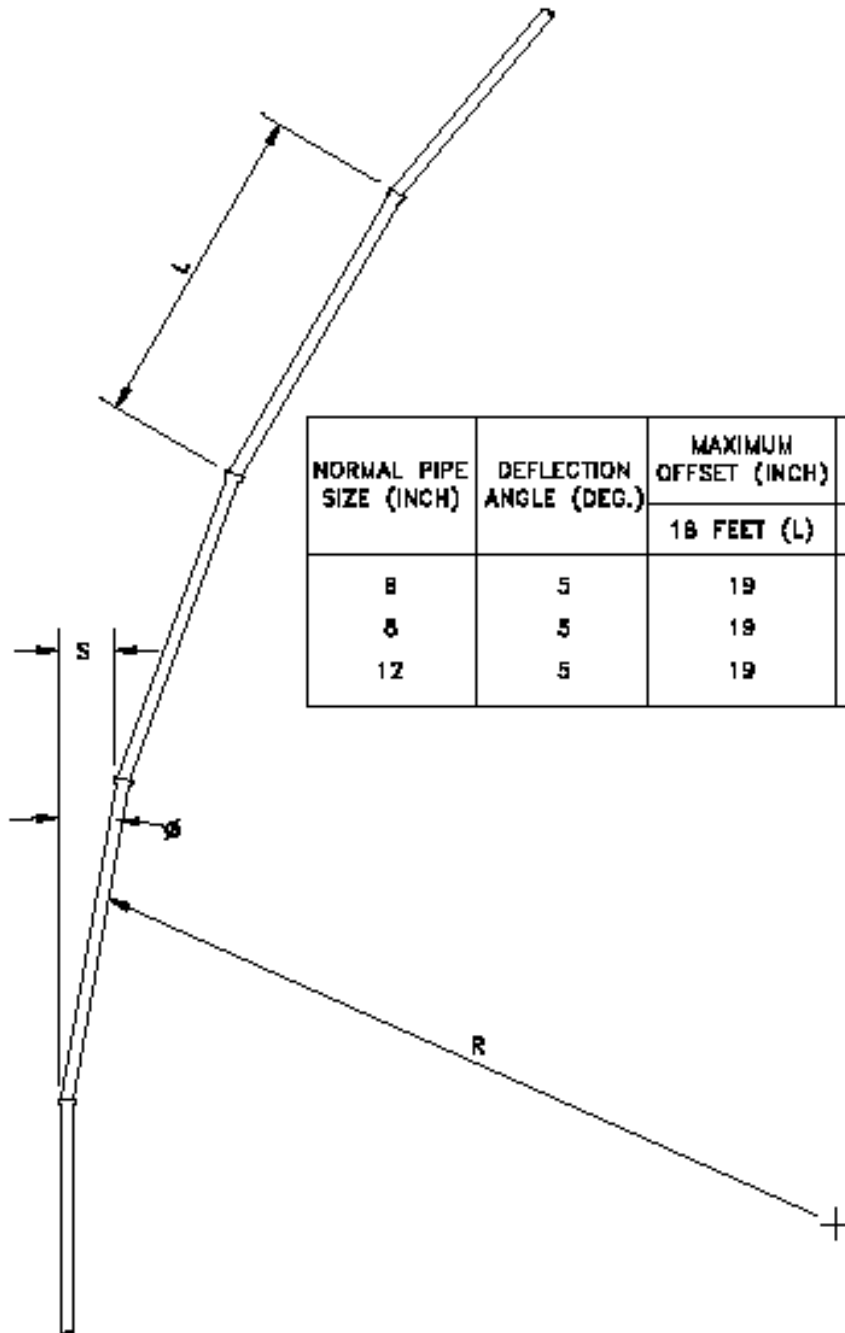


TYPICAL 2" AIR RELEASE PIT

WATER DEPARTMENT CITY OF INDEPENDENCE, MISSOURI
 CONSTRUCTION DETAIL NUMBER **20A**
 APPROVED BY: DR.
 DRAWN BY: SDH. DATE: 01/09/2001

CD-20A

INDEPENDENCE WATER DEPARTMENT



NORMAL PIPE SIZE (INCH)	DEFLECTION ANGLE (DEG.)	MAXIMUM OFFSET (INCH)	APPROX. RADIUS OF CURVE PRODUCT BY SUCCESSION OF JOINTS (FEET)
		18 FEET (L)	18 FEET (L)
8	5	19	205
8	5	19	205
12	5	19	205

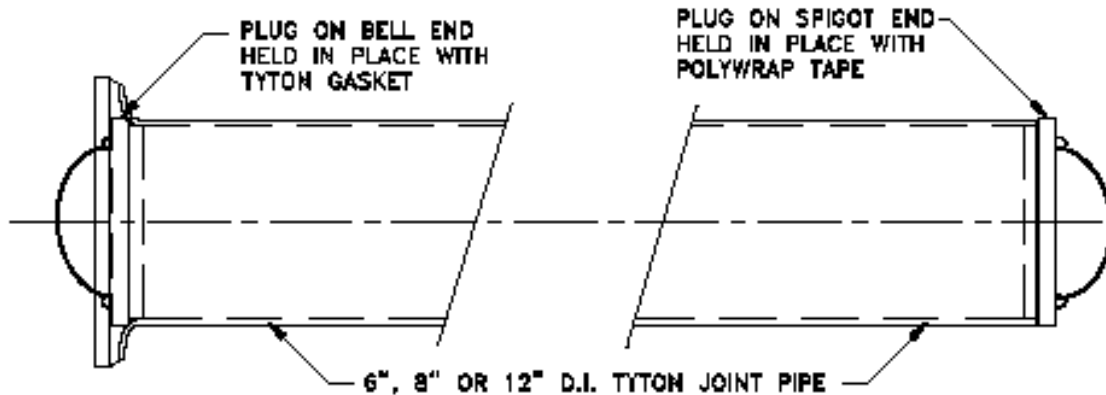
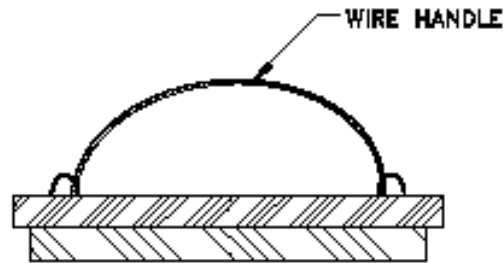
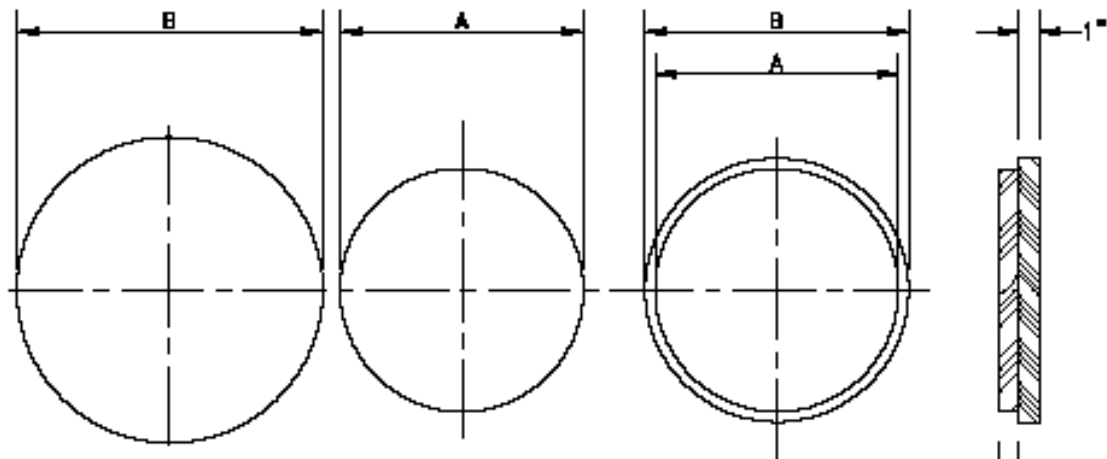
- φ = DEFLECTION ANGLE
- S = JOINT DEFLECTION OFFSET
- L = LAYING LENGTH
- R = RADIUS OF CURVE
- $R = \frac{L}{2 \tan \phi / 2}$

JOINT DEFLECTION FOR DUCTILE IRON PIPE

WATER DEPARTMENT CITY OF INDEPENDENCE, MISSOURI
 CONSTRUCTION DETAIL NUMBER 21
 APPROVED BY: RV
 DRAWN BY: SDM DATE: 3/20/89

CD-21

INDEPENDENCE WATER DEPARTMENT



	A	B
6"	5.5"	6.7"
8"	7.5"	8.8"
12"	11.5"	13"
20"	19.75"	21.5"
30"	30.5"	32"
36"	36.5"	38"

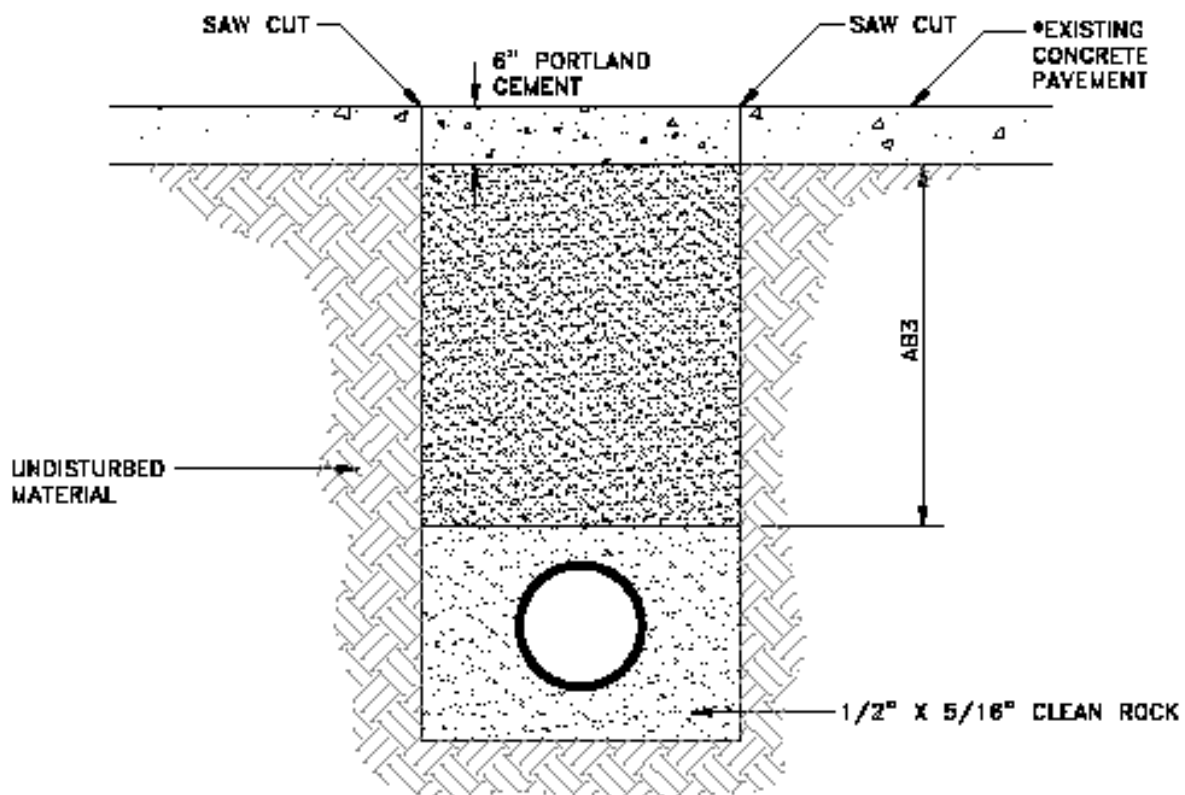
NIGHT PLUG FOR DUCTILE IRON PIPE

WATER DEPARTMENT CITY OF INDEPENDENCE, MISSOURI
 CONSTRUCTION DETAIL NUMBER 22

APPROVED BY: S.H.
 DRAWN BY: C.W. DATE: 4/26/01

CD-22

INDEPENDENCE WATER DEPARTMENT



*EXISTING CONCRETE DRIVE THICKNESS MAY VARY

CONCRETE DRIVE REPLACEMENT

WATER DEPARTMENT CITY OF INDEPENDENCE, MISSOURI

CONSTRUCTION DETAIL NUMBER 24

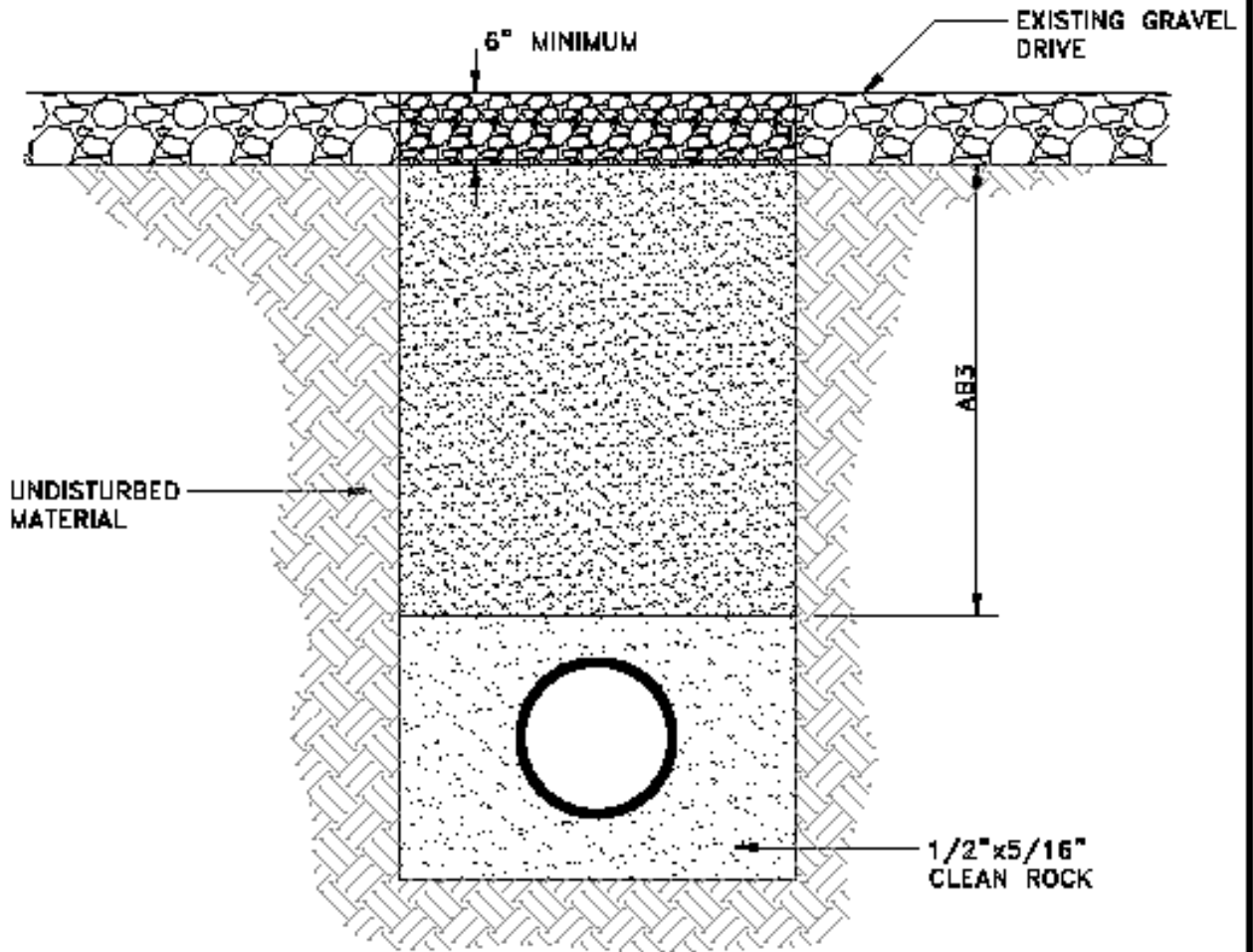
APPROVED BY: S.H.

DRAWN BY: C.J.

DATE: 12/16/09

CD-24

INDEPENDENCE WATER DEPARTMENT



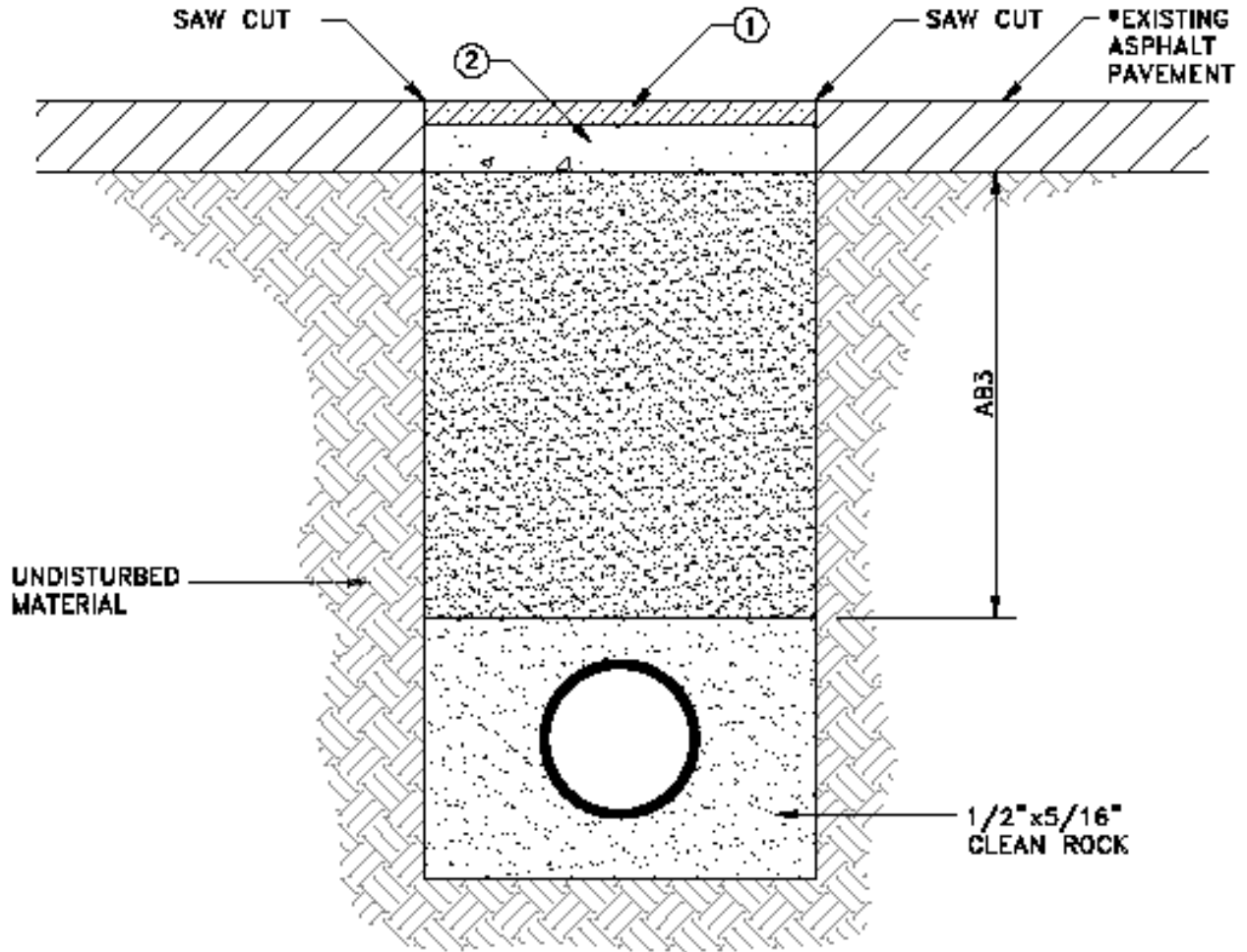
GRAVEL DRIVE REPLACEMENT

WATER DEPARTMENT CITY OF INDEPENDENCE, MISSOURI
CONSTRUCTION DETAIL NUMBER 25

DRAWN BY: G.J. APPROVED BY: SM
DATE: 12/16/04

CD-25

INDEPENDENCE WATER DEPARTMENT



- ① TWO (2) INCH ASPHALTIC CONCRETE SURFACE.
- ② FOUR (4) INCH MINIMUM PORTLAND CEMENT CONCRETE BASE

*EXISTING ASPHALT DRIVE THICKNESS MAY VARY

ASPHALT DRIVE REPLACEMENT

WATER DEPARTMENT CITY OF INDEPENDENCE, MISSOURI
CONSTRUCTION DETAIL NUMBER 26

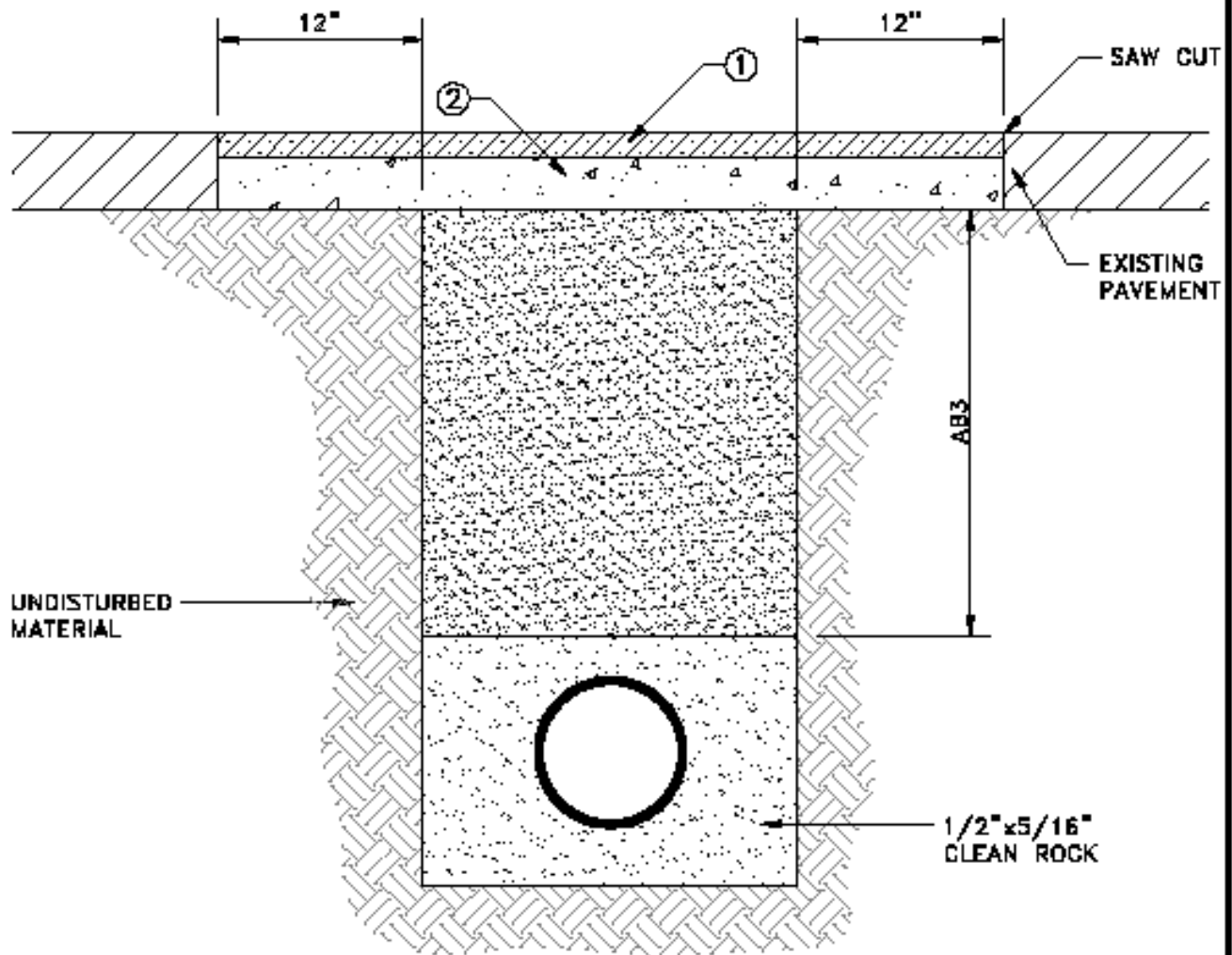
APPROVED BY: SH

DRAWN BY: GL

DATE: 12/16/04

CD-26

INDEPENDENCE WATER DEPARTMENT



- ① TWO (2) INCH ASPHALTIC CONCRETE SURFACE.
- ② EIGHT (8) INCH MINIMUM PORTLAND CEMENT CONCRETE BASE OR SIX (6) INCH MINIMUM ASPHALTIC CONCRETE BASE (FOR LARGE AREA PATCHING ONLY) IF APPROVED BY THE DIRECTOR OF PUBLIC WORKS. FOUR (4) INCH ASPHALTIC CONCRETE BASE WILL BE PERMITTED IN RESIDENTIAL ASPHALT DRIVEWAYS.

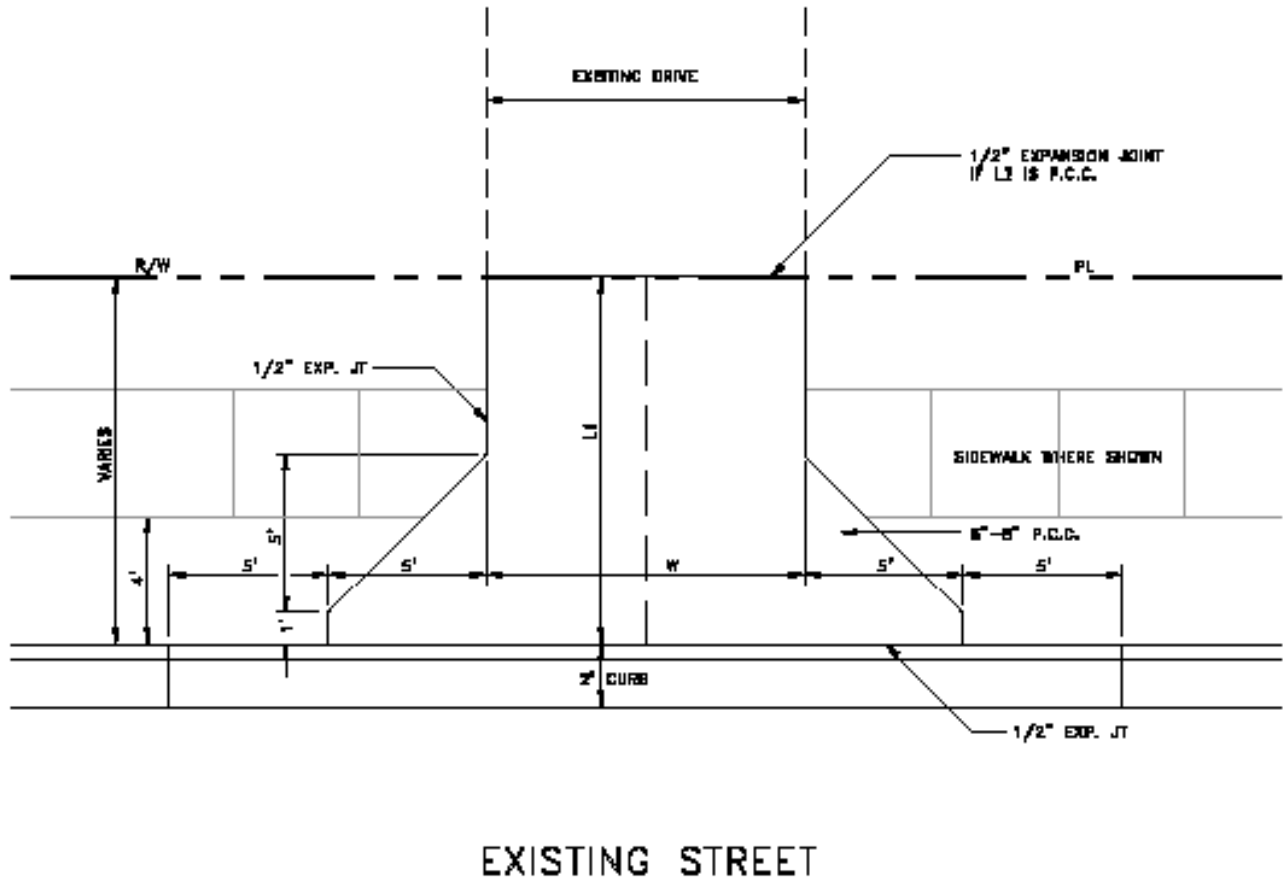
NOTE:
 THE TWELVE (12) INCH OVERCUT
 WILL NOT BE REQUIRED FOR CUTS
 NOT EXCEEDING EIGHT (8) INCHES
 IN WIDTH.

CITY STREET CUT REPLACEMENT

WATER DEPARTMENT CITY OF INDEPENDENCE, MISSOURI
 CONSTRUCTION DETAIL NUMBER 27
 APPROVED BY: SM
 DRAWN BY: C.J. DATE: 12/16/04

CD-27

INDEPENDENCE WATER DEPARTMENT



EXISTING STREET

NOTES:

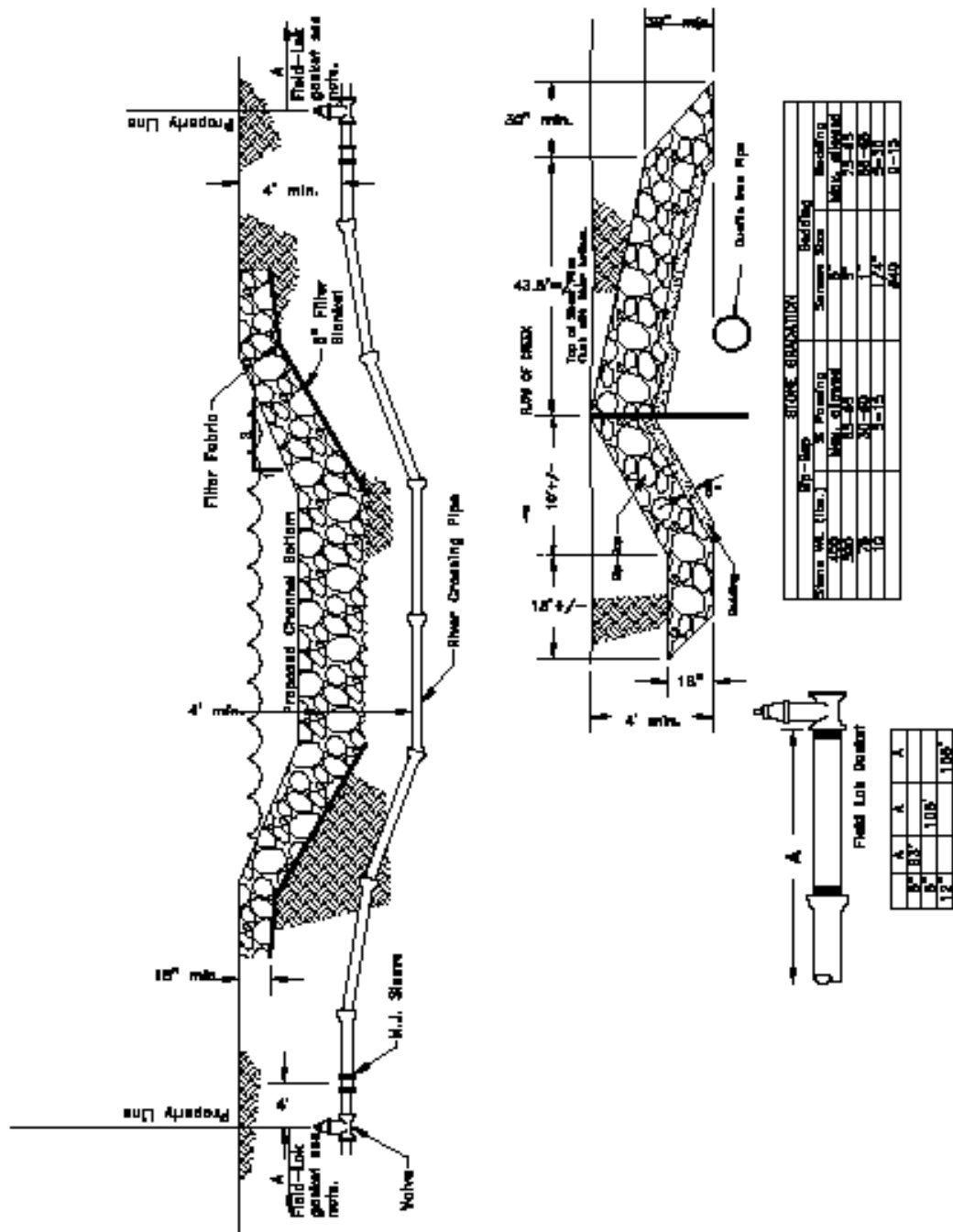
1. REPLACE EXISTING DRIVE WITH MATERIAL NOTED IN SCHEDULE.
2. WHERE "W" EXCEEDS 14', CONSTRUCT CONTRACTION JOINT AT CENTERLINE.

TYPICAL DRIVEWAY PLAN

WATER DEPARTMENT CITY OF INDEPENDENCE, MISSOURI
 CONSTRUCTION DETAIL NUMBER 28
 APPROVED BY: S.H.
 DRAWN BY: L.W. DATE: 4/18/02

CD-28

INDEPENDENCE WATER DEPARTMENT



STONE CHARACTERISTICS

STONE No. (100's)	Wt. (Lbs.)	Wet Density	Specific Gravity	Moisture Absorption (%)	Soundness (%)	Modulus of Elasticity (P.S.I.)	Modulus of Rupture (P.S.I.)	Compressive Strength (P.S.I.)
100	100	145	2.65	0.5	95	1,000,000	1,000	10,000
200	100	145	2.65	0.5	95	1,000,000	1,000	10,000
300	100	145	2.65	0.5	95	1,000,000	1,000	10,000
400	100	145	2.65	0.5	95	1,000,000	1,000	10,000
500	100	145	2.65	0.5	95	1,000,000	1,000	10,000
600	100	145	2.65	0.5	95	1,000,000	1,000	10,000
700	100	145	2.65	0.5	95	1,000,000	1,000	10,000
800	100	145	2.65	0.5	95	1,000,000	1,000	10,000
900	100	145	2.65	0.5	95	1,000,000	1,000	10,000
1000	100	145	2.65	0.5	95	1,000,000	1,000	10,000



Field Link Detail

Part	Quantity	Notes
A	1	Field Link Detail
B	1	Field Link Detail
C	1	Field Link Detail
D	1	Field Link Detail
E	1	Field Link Detail
F	1	Field Link Detail
G	1	Field Link Detail
H	1	Field Link Detail
I	1	Field Link Detail
J	1	Field Link Detail
K	1	Field Link Detail
L	1	Field Link Detail
M	1	Field Link Detail
N	1	Field Link Detail
O	1	Field Link Detail
P	1	Field Link Detail
Q	1	Field Link Detail
R	1	Field Link Detail
S	1	Field Link Detail
T	1	Field Link Detail
U	1	Field Link Detail
V	1	Field Link Detail
W	1	Field Link Detail
X	1	Field Link Detail
Y	1	Field Link Detail
Z	1	Field Link Detail

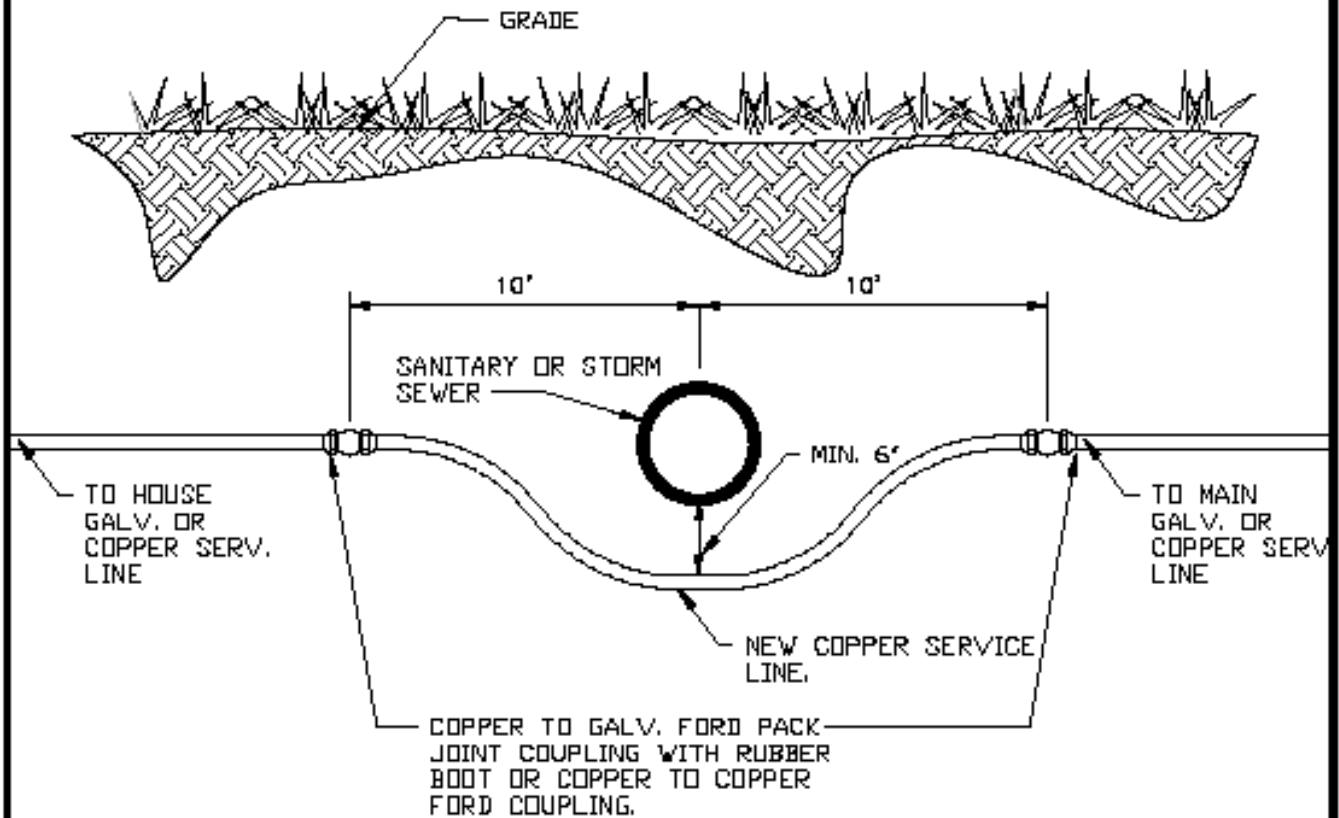
TYPICAL RIVER/CREEK CROSSING
 WATER DEPARTMENT
 CITY OF INDEPENDENCE, MISSOURI
 CONSTRUCTION DETAIL NUMBER 29

DRAWN BY: CJ DATE: 8/12/08 APPROVED: SH

CD-28

Subject to change without notice

INDEPENDENCE WATER DEPARTMENT



SERVICE UNDER STORM OR SANITARY SEWER

NO SCALE

NOTE:

IF SERVICE MUST GO UNDER SANITARY SEWER THE SANITARY SEWER MUST BE ENCASED IN CONCRETE.

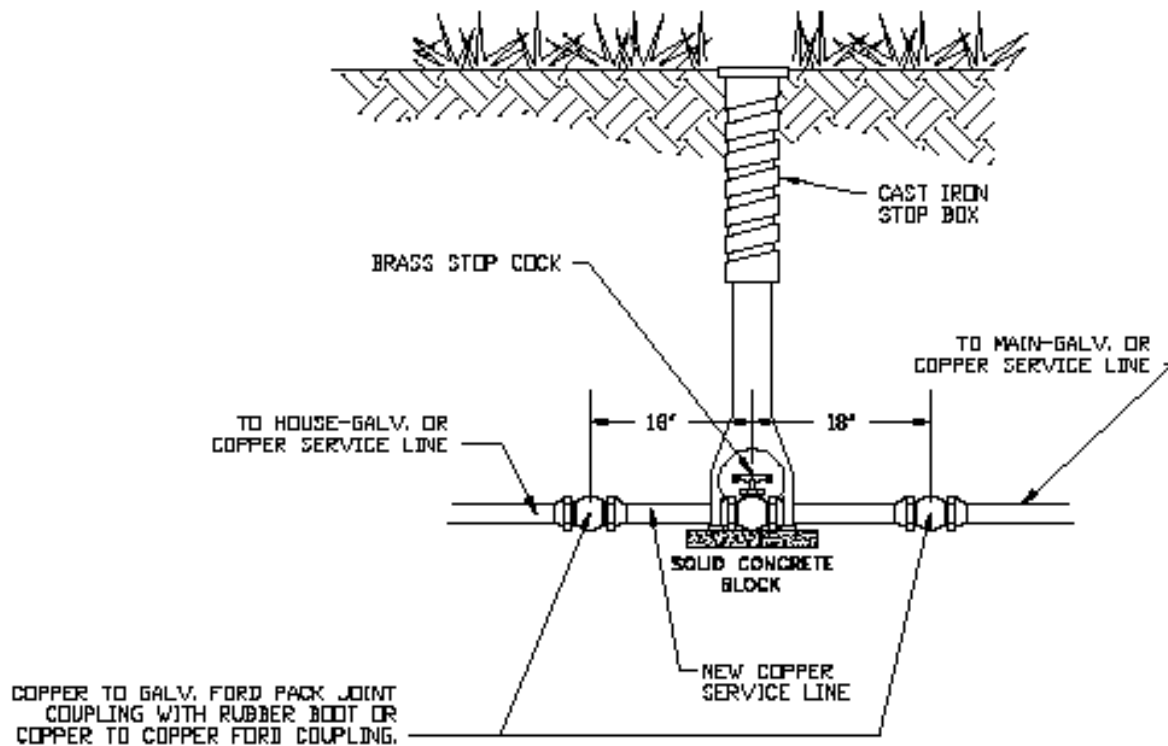
SERVICE UNDER STORM OR SANITARY SEWER

WATER DEPARTMENT CITY OF INDEPENDENCE, MISSOURI
CONSTRUCTION DETAIL NO. 30

Approved by SDH
Date 4-3-2007
Drawn by MJF

CD-30

INDEPENDENCE WATER DEPARTMENT



CUTTING IN A CURB VALVE

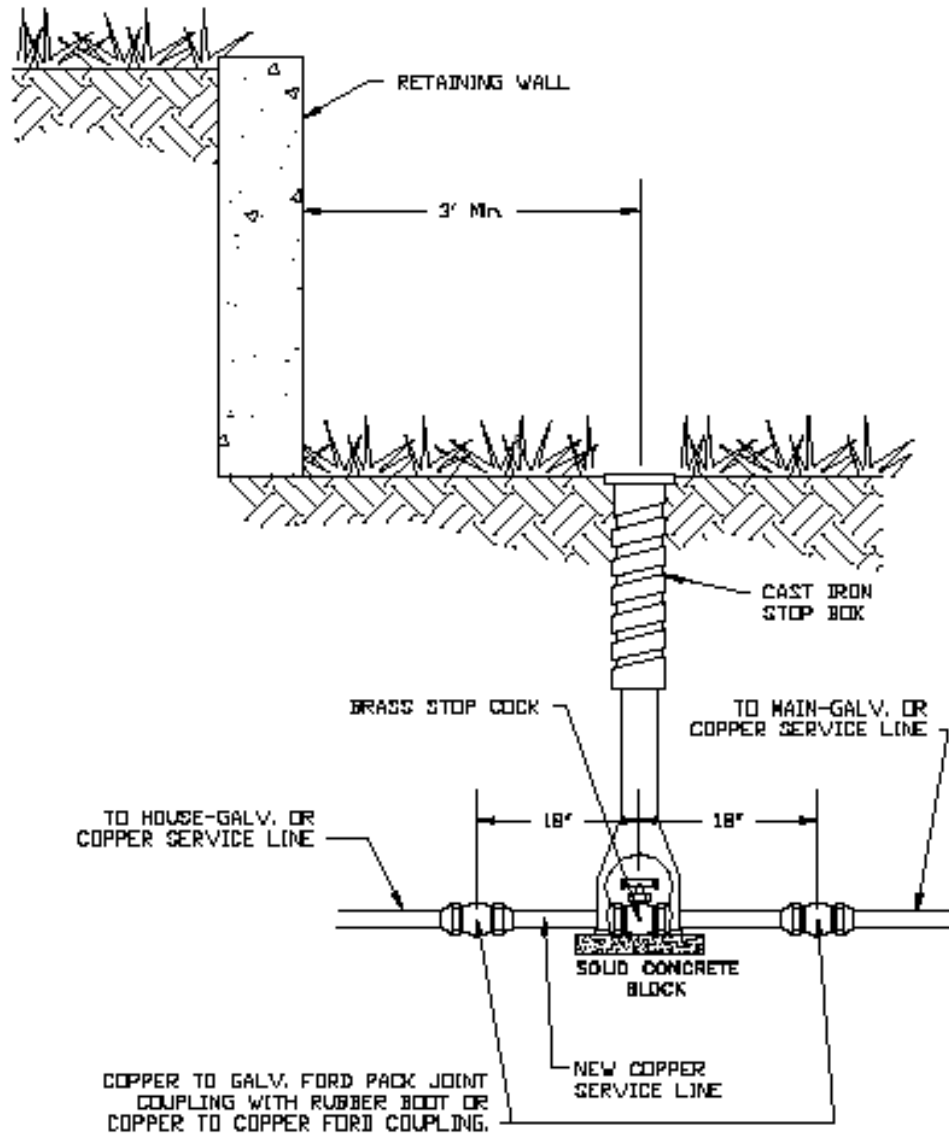
WATER DEPARTMENT CITY OF INDEPENDENCE, MISSOURI
CONSTRUCTION DETAIL NO. 32

Drawn by CJ

Approved by SDH
Date 4-28-2011

CD-31

INDEPENDENCE WATER DEPARTMENT



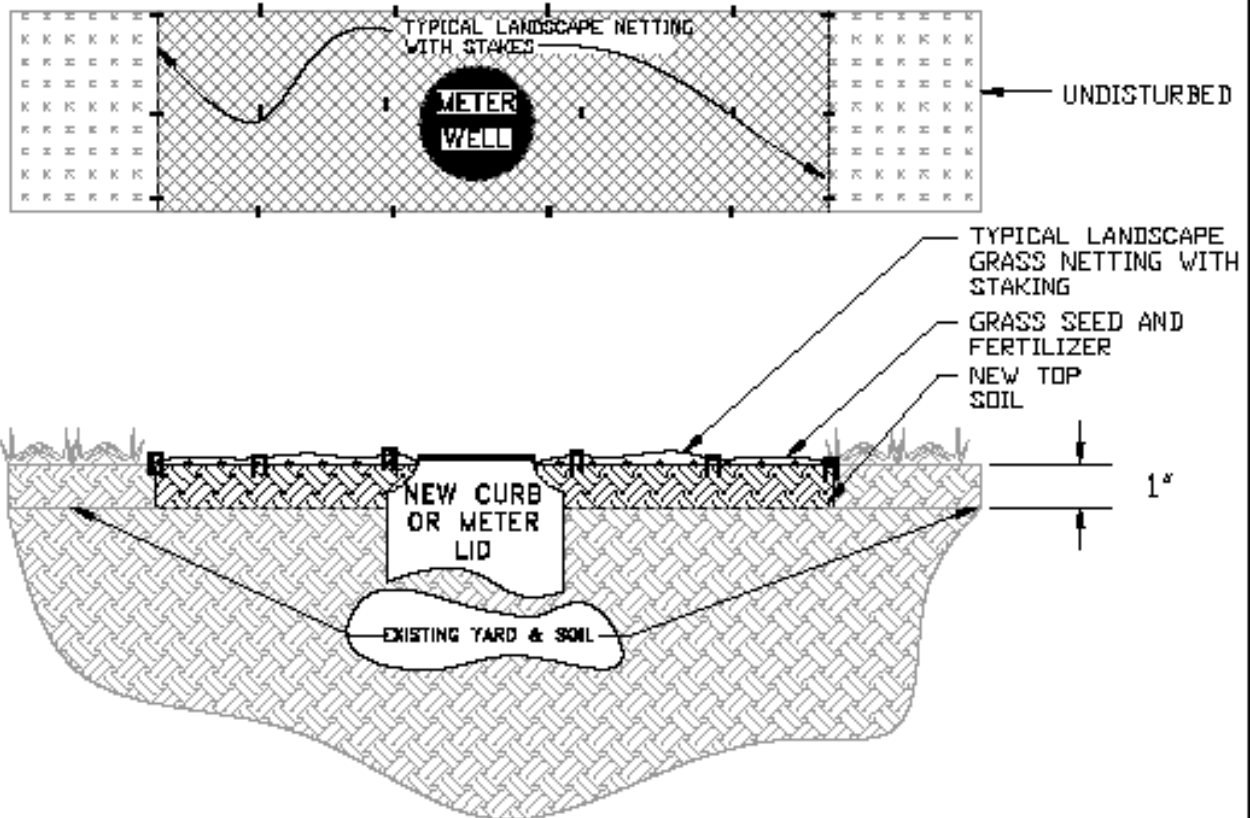
CUTTING IN A CURB VALVE

WATER DEPARTMENT CITY OF INDEPENDENCE, MISSOURI
CONSTRUCTION DETAIL NO. 32

Drawn by CJ

Approved by SDH
Date 4-28-2011

CD-31A



GRASS SEED PLACEMENT AND CARE

NOT TO SCALE

NOTES:

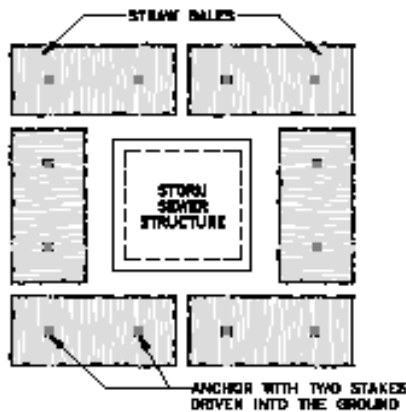
- 1) CONTRACTOR WILL CLEANLY CUT THE AREA TO BE SEEDED TO A DEPTH OF 1", REMOVE EXISTING DIRT AND REPLACE WITH TOP SOIL.
- 2) CONTRACTOR WILL SPREAD SEED AND STARTER FERTILIZER IN DISTURBED AREAS ONLY EITHER FROM CONSTRUCTION OR TRAFFIC AREA OF CONTRACTORS EQUIPMENT.
- 3) CONTRACTOR WILL CONTACT PROPERTY OWNERS FOR OWNERS APPROVAL.
- 4) TYPICAL LANDSCAPE GRASS NETTING WILL BE PLACED AND STAKED DOWN ON DISTURBED AREAS. THE STAKES SHALL BE PLACED THROUGH OUT THE NETTING EDGE AND MIDDLE. STAKE SPACING WILL VARY FROM AREA TO AREA.
- 5) ALL CURB AND METER LIDS IN SEEDED AREA ARE TO BE RAISED TO BE GROUND LEVEL. NO CURB OR METER LIDS ARE TO BE UNDER THE TOP SOIL.

TYPICAL GRASS SEED & FERTILIZER PLACEMENT & CARE
 WATER DEPARTMENT CITY OF INDEPENDENCE, MISSOURI
 CONSTRUCTION DETAIL NO. 28

Drawn by: MJF

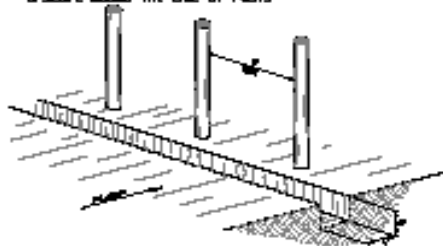
Approved by: SDH
 Date: 4-25-2007

CD-32

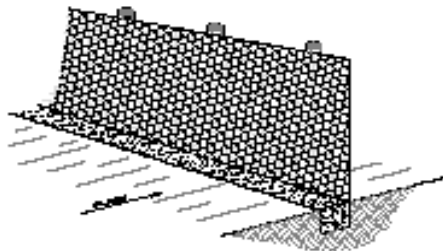


**SILT CONTROL
NO SCALE**

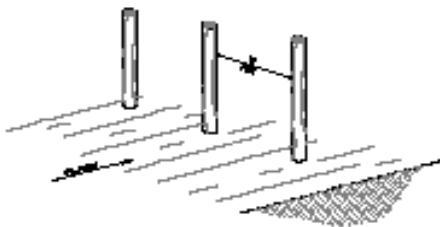
1. SET POSTS AND DREDGATE A 4" x 4" TRENCH UPSLOPE ALONG THE LINE OF POSTS



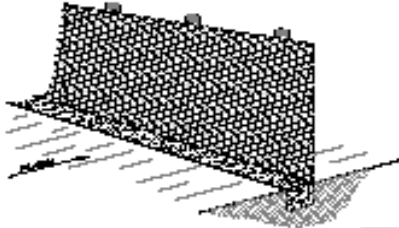
4. BACKFILL AND COMPACT THE DREDGATED SOIL



1. SET THE STAKES



4. BACKFILL AND COMPACT THE DREDGATED SOIL



CONSTRUCTION OF STRAW BALE BARRIER

1. DREDGATE THE TRENCH



2. PLACE AND STACK STRAW BALES



3. WEAVE LOOSE STRAW BETWEEN BALES

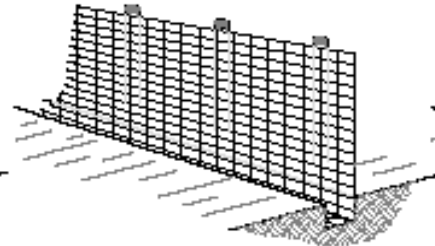


4. BACKFILL AND COMPACT THE DREDGATED SOIL

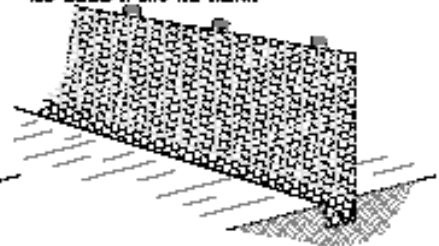


PROPERLY INSTALLED STRAW BALE (CROSS SECTION)

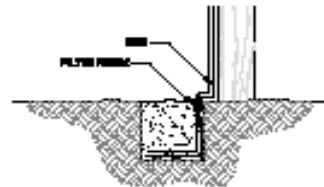
2. ATTACH WIRE FENCING TO POSTS



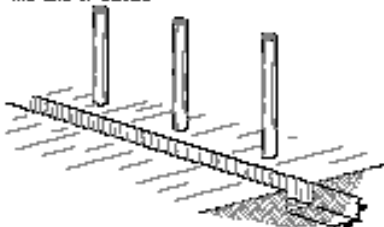
3. ATTACH THE FILTER FABRIC TO THE WIRE FENCE AND COVER IT INTO THE TRENCH



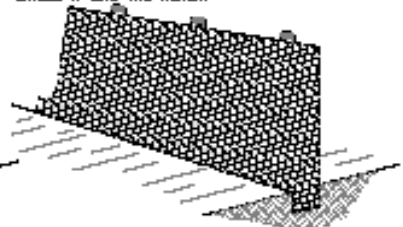
CROSSSECTION OF FABRIC AND WIRE INTO TRENCH



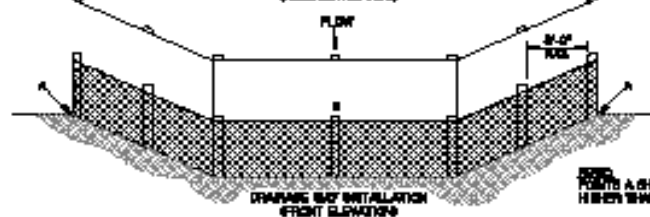
2. DREDGATE A 4" x 4" TRENCH UPSLOPE ALONG THE LINE OF STAKES



3. ATTACH FILTER MATERIAL TO STAKES AND EXTEND IT INTO THE TRENCH



WIRE FENCE INSTALLATION (FRONT VIEW)



EROSION CONTROL DEVICES