

CITY OF MIDWEST CITY

WATER MAIN INSTALLATION SPECIFICATIONS

ORDINANCE NO. 1666

ADOPTED BY CITY COUNCIL

FEBRUARY 10, 1981

Revised

August 11, 1982

March 27, 1984

WATER MAIN INSTALLATION SPECIFICATIONS

SCOPE

Work included under these specifications shall include the furnishing and installation of all pipes, valves, fittings, specials, fire hydrants and other incidental work and materials in connection with conveying water from the source of supply to the water mains and to each fire hydrant including furnishing and installation of all the water mains and appurtenances in accordance with the plans and these specifications. All work shall be performed in accordance with these specifications and with recommendations and regulations of the state health department.

TRENCHING GENERALLY

- (a) The location of the water mains, hydrants, valves, etc., are shown on the plans. Trenches shall be of sufficient width to provide ample room for workmen and making joints. In no case shall the trench inside of sheeting and bracing lines be less than twelve (12) inches greater than the external diameter of the pipe bell. Trenches shall be cut to depth which shall provide a minimum cover of three (3) feet. The cover shall be measured from the top of the barrel of the pipe to the finished surface of the ground or street. The grade of the invert of all waterlines shall, in general, be parallel to the street grade, except that the engineer may require a greater depth, not to exceed two (2) feet at the point where there is a sharp break in the street grade, or, where necessary, to provide clearance for existing or proposed pipelines or drainage structures. Bottoms of the trenches shall be accurately graded to provide uniform bearing and support for the pipe.
- (b) Ledge rock, boulders and large stones shall be removed to provide a clearance of at least six (6) inches on each side of all pipes and appurtenances. Adequate clearance for properly jointing pipe laid in rock trenches shall be provided at bell holes.

PROTECTION OF EXCAVATION

The contractor shall adequately protect all excavations from caving in by providing suitable sheeting, shoring and bracing.

BACKFILLING TRENCHES

- (a) After water mains have been tested and approved, the trenches shall be backfilled.
- (b) Where water mains are laid in rock, shale or clay, four (4) to six (6) inches of sand shall be placed in the trench between bell holes to provide a uniform and continuous bearing and support for the pipe. When the water main is in place and the joint has been completed, the trench shall be backfilled with sand to the top of the pipe. Where mains are constructed in the parking area or parallel

to a road where there would normally be no traffic, the remainder of the trench shall be filled in such a manner as not to impose excessive concentration or unbalanced loads, shock, or impact on or cause displacement of the pipe, allowing six (6) inches for top dressing, after which the entire trench shall be settled with water. After settlement, the top dressing shall be applied, but in no case shall the top dressing be applied where pools of water are standing. Where the trench is excavated in front of developed property, the top dressing must be, in general, of as good soil as the original ground, and in the event there is a lawn, trees or decorative shrubbery, the growth shall be protected and restored to its original condition.

(c) Where the water main crosses roadways or rights-of-way, etc.:

- (1) Where the water main crosses any unpaved roadway, gravel or oil surfaced road, driveway of any kind, or railroad tracks, four (4) to six (6) inches of sand shall be placed in the trench below the grade of the pipe invert. After the pipe is laid to grade, sand shall be used for backfill to the top of the pipe, the sand to be flooded with water to prevent settlement. Then the backfill from the top of the sand to the top of the trench shall be compacted in six-inch layers to a density of at least equal to that of the top six (6) to twelve (12) inches of the surrounding earth, using water is required to get proper compaction.
- (2) In case the excavation fails to furnish suitable material for the bottom of the trench or backfill, the contractor shall supply such material as will be suitable and satisfactory to the engineer, moving same from another locality or part of work as necessary.
- (3) Where compaction is required or ordered, it shall be done in layers of six (6) inches or less, and shall be compacted to a density equal to that of the adjacent soil.
- (4) Where the water mains are constructed under proposed paving or paving which has been cut, in or across roads and highways, driveways, sidewalks, under fences, foundations or other such structures, four (4) to six (6) inches of sand shall be placed in the trench below the grade of the pipe invert, and after the pipe is laid to grade the entire trench shall be backfilled with sand from the bottom to the top of the trench, and then thoroughly settled with water by flooding or jetting, being certain that the sand around and under the pipe is sufficiently wetted to attain maximum compaction.

CUTTING AND REPLACING PAVING

- (a) Where concrete, asphaltic concrete or asphaltic concrete base paving has been cut, the contractor shall dispose of the broken materials, and after the sand backfill has been completed, shall apply a temporary patch of asphaltic surface course (hot mixed-cold laid). The contractor shall maintain these patches for a period of sixty (60) days.

or to the time the permanent repair has been made. A permit fee and repair fee shall be paid to the city before any paving cut is made, and evidence of payment of these fees shall be shown to the utility department inspector for the job on which the cut or cuts occur.

- (b) Where water mains are to be installed across an existing paved street by boring, the excess hole bored to accommodate the bell of the pipe shall be pumped completely full of mud jack or mud pump.

PIPE AND FITTINGS

All water pipe and fittings used for the construction of the water mains and distribution system shall conform to the following requirements:

- (a) Ductile iron pipe shall be manufactured in accordance with AWWA C151-76 (ANSI A21.51). Thicknesses shall be as follows:

<u>Size</u>	<u>Thickness</u>	<u>Class</u>
6"	0.25"	50
8"	0.27"	50
12"	0.31"	50
16"	0.34"	50
20"	0.36"	50
24"	0.38"	50

Ductile iron fittings shall be Class 350 and meet all requirements of AWWA Standards

- (b) Cast-iron fittings shall meet all requirements of AWWA C110a-72 (ANSI A21.10a) and shall be class 250 for 12-inch and smaller sizes and class 150 for 16-inch through 24-inch sizes. Joints shall be mechanical conforming to the requirements of AWWA C111-71 (ANSI A21.11). Tee head bolts shall be Corten alloy steel.
- (c) Specifications for Tyton and Fastite joint pipe or equal shall be the same as for mechanical joint pipe in all respects except for the details of the joint. The joint shall be of a type which employs a single gasket to effect the joints. Details of the joint shall conform to AWWA C111-71 (ANSI C111).
- (d) Each length of water pipe shall be hydrostatically shop tested to a minimum of five hundred (500) psi. Certifications will be furnished to the city engineer certifying the hydrostatic proof test.
- (e) All sizes of ductile iron pipe and cast iron fittings used in water main extensions to the city water system shall be cement mortar lined and seal coated in accordance with AWWA C104-71, (ANSI A21.4). All pipe shall be straight, accurately circular in section, with all inner and other surfaces concentric. Except where shorter lengths are required for connections with valves, fittings or changes in design requirements where such connections must be made at specific

locations, all pipe shall be furnished in laying lengths of not less than eighteen (18) feet and the length or lengths to be furnished shall be stipulated in the proposal.

- (f) All pipes shall be delivered in A-1 respects sound and conformable to these specifications. Inspection by the city or its representative shall not relieve the contractor of any of his obligations in this respect, and any defective pipe which may be passed by the city or its representative at the works or elsewhere, shall be at all times liable to rejection when discovered until the final completion and adjustment of the contract. Care shall be taken in handling the pipe not to injure the lining or coating, and pipe damaged during transportation or at any time after it has received the coating or lining shall not be used.
- (g) Poly Vinyl Chloride (PVC-1120) bell and spigot pressure pipe shall be manufactured in accordance with current AWWA standards C-900 and shall be for the construction of underground water distribution systems with cast iron pipe equivalent outside diameter (O.D.'s). Their thickness shall be as follows:

<u>SIZE</u>	<u>MINIMUM THICKNESS</u>	<u>PRESSURE CLASS</u>	<u>DR</u>
6	.522	200	14
8	.685	200	14
10	.793	200	14
12	.943	200	14

- (h) All Poly Vinyl Chloride (PVC-1120) pipe shall be suitable for use as a pressure potable water pipe, provisions must be made for expansion and construction at each joint with an elastameric ring. The bell shall consist of an integral wall section with a solid cross-section elastameric ring which meets the requirements of ASTM D-1869 and E 477. The bell section shall be designed to be at least as strong as the pipe wall. Each length of pipe shall be tested to four (4) times the class pressure of the pipe for a minimum of five (5) seconds. The integral bell shall be tested with the pipe.
- (i) The pipe shall be made from Class 12454-A or Class 12454-D virgin compounds as defined in A.S.T.M. D-1784.
- (j) The Poly Vinyl Chloride compounds used to make the pipe shall contain no ingredient that is in an amount that has been demonstrated to migrate into the water in quantities that are considered to be toxic. The PVC compounds shall be tested and certified as suitable for potable water products by the National Sanitation Foundation (SNF) testing laboratory standard No. 14.
- (k) Gaskets and lubricants intended for use with PVC pipe shall be made from materials that are compatible with the plastic material and with

each other when used together, from materials that will not support the growth of bacteria and will not adversely affect the potable qualities of the water.

- (l) The Poly Vinyl Chloride pipe shall be furnished in standard laying lengths of 20 feet with a variation of +/- 1 inch. (20' ± 1")
- (m) The elastameric gasket seal joint shall be adequate to withstand internal pressure not less than the pressure class rating of the pipe with which they are designed to be used.
- (n) The pipe shall bear identification markings that will remain legible during handling, storage and installation, in accordance with AWWA specifications. The pipe shall be so identified to distinguish it from other liquid carrying PVC pipe as being a potable water supply pipe in ground.
- (o) The bedding requirement for P.V.C. pipe shall be changed to reflect a minimum sand encasement of six inches (6") on the top, sides and bottom. This sand bedding/encasement shall meet Oklahoma Department of Transportation Specifications 703.04(b). The minimum depth and width of encasement for various pipe sizes are as shown below:

<u>PIPE SIZE</u>	<u>D & W</u>
6"	21"
8"	24"
10"	26"
12"	29"

The installation of the pipe shall conform with detail in ASTM Manual No. 37. When Poly Vinyl Chloride pipe is used under the provisions of this section, there shall be a two (2) inch wide blue plastic tape buried not less than twelve (12) inches and no more than eighteen (18) inches below the final grade of the ground. The tape shall be of such material that it can be easily detected by the use of a standard metal detector.

- (p) All Poly Vinyl Chloride pipe installed pursuant to this section shall be installed in accordance with manufacturer's installation specifications.
- (r) Service connections shall be made using a service clamp or saddle. The service clamps or saddles should provide full support around the circumference of the pipe and provide a bearing area of sufficient width along the axis of the pipe, two-inch (2") minimum, to prevent distortion of the pipe. Service connections for PVC pipe shall be one of the following:
Romac (101N) , Ford (101N) or Clow Vega (3407).

GATE VALVES

Valves shall be iron body, brass mounted, conforming to the latest specifications adopted by the American Water Works Association. Valves shall be hub-end, flanged, mechanical joint or inside pipe thread to fit the pipe for which they are used. All gate valves shall be opened by turning to the left and the operating nut or wheel shall have cast thereon an arrow indicating the direction of opening. Each valve shall have the maker's initials, pressure rating and year in which it was cast upon the body. All gate valves shall be designed for a minimum working pressure of not less than one hundred fifty (150) pounds per square inch. Prior to shipment from the factory, each valve shall be tested by hydraulic pressure equal to twice the specified water working pressure. Valves may be Double Disc Parallel Seat or Resilient Seat.

Gate valves shall be as manufactured by the Mueller Company, M&H Dresser, or American-Darling.

HYDRANTS

All fire hydrants shall have a six-inch mechanical connection and shall have two (2) two and one-half-inch and one four and one-half-inch steamer connection designed for one hundred fifty (150) pounds working pressure or three hundred (300) pounds hydrostatic pressure, and shall conform to the latest specifications of the American Water Works Association for a traffic model hydrant with breakable coupling at ground level, with a five and one-fourth-inch valve opening. All working parts shall be bronze. All hose threads shall conform to the standard threads of the city. Design, materials and workmanship shall be similar and equal to the latest stock pattern ordinarily produced by the manufacturer. Hydrants shall be painted one coat of red lead paint and two (2) finishing coats of an approved paint of the color directed. The hydrants purchased under this specification shall meet the approval of the engineer or his authorized representative.

Supplier shall furnish certification that hydrant meets City of Midwest City specifications.

Hydrants shall be as manufactured by Mueller Company (Centurion), Kennedy Valve (Guardian), Dresser M&H (Style 929), U.S. Pipe and Foundry Company (Metropolitan) or American Cast Iron Pipe Company (American-Darling B-84-B).

VALVE BOXES

Valve boxes shall consist of a cast-iron base, center section and top section with a cover which shall be marked "water." The top section shall be adjustable for elevation and shall be set to allow equal movement above and below finished grade. The base shall be centered over the valve and shall rest on compacted backfill. The top of the base section shall be approximately on line with the nut at the top of the valve stem, and the entire assembly shall be plumb.

TAPS ON EXISTING LINES

Taps on all existing lines shall be made using one of the following tapping sleeves: JCM (No. 412), Mueller (H-613), Romac (SST), Ford (FTS), Rockwell (622) or any standard cast iron mechanical joint-split-sleeve type.

After the tapping sleeve is placed on the existing line the contractor shall pressure test the sleeve and valve before tapping. Such pressure test shall be witnessed by the inspector.

SETTING HYDRANTS AND VALVES

Hydrants and valves installed in trenches shall be placed where shown on the drawings unless otherwise directed by the engineer. Hydrants, valves and valve boxes shall all be plumb, with valve boxes placed directly over the valves. After being correctly positioned, earth fill shall be carefully tamped around the valve box for a distance of four (4) feet on all sides of the box. Hydrants shall be set at such elevations that the connection pipe and distributing mains shall have the same depth of cover. Each hydrant shall be placed upon a slab of stone or concrete not less than four (4) inches thick and fifteen (15) inches square. The backside of the hydrant, opposite the pipe connections, shall have reaction or thrust blocking installed between the hydrant and the vertical face of the trench to prevent the hydrant from blowing off the line. Around the base of each hydrant shall be placed not less than seven (7) cubic feet of three-fourths-inch crushed rock to insure the complete drainage of the hydrant when closed. All backfill around hydrants shall be thoroughly compacted to the surface of the ground. Before installing any hydrant or valve, care shall be taken to see that all foreign material is removed from the interior of the barrel. Stuffing boxes shall be tightened and the hydrant or valve opened or closed to see that all parts are in working condition.

REACTION ANCHORAGE AND BLOCKING

All unlugged bell and spigot or all-bell trees, Y-branches, bends, deflecting twenty-two and one-half ($22\frac{1}{2}$) degrees or more, and plugs which are installed shall be provided with suitable reaction blocking, struts, anchors, clamps, joint harness, or other adequate means for preventing any movement of the pipe caused by unbalanced internal pressure as shown on standard sheet.

TESTS

After the pipe is laid, and the trench backfilled, the newly laid piping or any valved section of piping shall be tested in the following manner:

Leakage shall not exceed ten (10) gallons-per-inch of pipe diameter per mile of pipe per twenty-four (24) hours. Provide for system testing as follows:

- a. Fill pipe with water until all air is exhausted.
- b. Raise pressure to a hydrostatic pressure of one hundred fifty (150) pounds by means of pumping from a container.

- c. Refill container and maintain pressure for four (4) hours.
- d. Measure water required to refill container to previous test level.

With failure of a test, the repairs shall be made and the testing procedure repeated until an acceptable result is obtained.

INSTALLATION OF MAINS

- a. Diameter. Distribution lines shall not be less than six (6) inch nominal diameter.
- b. Pipe and accessories. All pipe and accessories, unless otherwise specifically stipulated in the proposal, shall be new materials which have at no time previously been used for any purpose whatsoever.
- c. Placing pipe in trenches. The interior of all pipe shall be thoroughly cleaned of all foreign matter before being lowered into the trench and shall be kept clean during laying operations by means of plugs or other approved methods. No trench water shall be allowed to enter the pipe or fittings. At all times when work is not in progress, all open ends of pipes and fittings shall be securely closed to the satisfaction of the engineer.
- d. Inspection of pipe. Before lowering, and while suspended, the pipe shall be inspected for defects and rung with a light hammer to detect cracks. Any defective, damaged or unsound pipe shall be rejected.
- e. Alignment of bell-and-spigot pipe. Pipelines or runs intended to be straight shall be so laid. Deflections from a straight line or grade, made necessary by vertical curves or horizontal curves of offsets, shall not exceed $6/D$ inches per linear foot of pipe (where D represents the nominal internal diameter of the pipe expressed in inches) between the center lines, extended, of any two (2) connecting pipes. If the specified or required alignment requires deflections in excess of those stipulated above, the contractor shall either provide, at his own expense, special bends as approved by the engineer, or pipes in shorter lengths in such length and number that the angular deflection at any joint, as represented by the specified maximum deflections, is not exceeded.
- f. Laying Pipe. Pipe shall be protected from lateral displacement by means of pipe embedment material installed as provided for trench backfill in this section.

Under no circumstances shall pipe be laid in water and no pipe shall be laid under unsuitable weather or trench conditions.

Pipe shall be laid with the bell ends facing the direction of laying except when making closures.

Whenever pipe laying is stopped, the open end of the line shall be sealed with a watertight plug. All water that may have entered the trench shall be removed prior to removing the plug. It is essential that no mud, trench water, or other foreign matter be permitted to enter the pipe at any time.

- g. Suspension of work. The work, or any portion of the work, under construction shall be suspended immediately on written order of the city engineer or the city council for any good cause or causes, among others of which reference is made to the following:
1. Failure of the contractor to provide sufficient and proper equipment and properly executing the work.
 2. Deliberate failure on the part of the contractor to observe any requirements of these specifications or to comply with any orders given by the city engineer as provided for in these specifications.
 3. Failure of the contractor promptly to make good any defects in materials or workmanship or any defects of any other nature, the correction of which has been directed in writing by the city engineer.

PIPE JOINTS

- a. Mechanical joints shall be carefully assembled in accordance with the manufacturer's recommendations. If effective sealing is not obtained, the joint shall be disassembled, thoroughly cleaned, and reassembled. Overtightening bolts to compensate for poor installation practice will not be permitted.

The holes in mechanical joints for double bell anchors shall be carefully aligned to permit installation of the harness bolts. In flange and mechanical joint pieces, the holes in the mechanical joint bell, as well as the flange, shall straddle the top (or side for vertical piping) centerline. The top (or side) centerline shall be marked on each flange and mechanical joint piece at the foundry.

- b. Push-on joints shall be carefully assembled in accordance with the manufacturer's recommendations relative to gasket installation and other jointing operations. All joint surfaces shall be lubricated with heavy vegetable soap solution immediately before the joint is completed. Each spigot end shall be suitably leveled to facilitate assembly.

STERILIZATION OF MAINS

Upon completion of the waterlines, arrange for their sterilization in a manner satisfactory to the city. As a minimum, the contractor shall provide the material and do the work necessary to sterilize all the pipes, valves, hydrants and other surfaces, which water provided by the system will come in contact with, in the following manner: A solution containing not less than

fifty (50) parts per million of chlorine shall be prepared by the addition of either liquid chlorine or dry calcium hypochlorite to water introduced into all parts of the system. This solution shall remain in the parts for at least five (5) hours and the sterilization shall be done before any part of the system is put in operation. The contractor shall have laboratory tests made and shall re-sterilize lines as necessary before they are placed in service. Payment for this item shall be included in the price bid for the construction of the items to be sterilized.

SERVICE CONNECTIONS

- a. The contractor shall tap the main and provide a service connection for each lot consisting of a three-fourths-inch straight corporation stop, three-fourths-inch copper pipe, and a three-fourths-inch angle curb stop. The service connection shall end one foot from the lot line with a three-fourths-inch angle curb stop. The service connections shall be installed in accordance with the plans and these specifications. Materials shall conform to the following requirements:
 1. Services lines shall be American-made copper AWWA C-800 or ASTM B-88 or water work plastic (PE)ASTM 3406: D2739-SDR9.
 2. Corporation stop shall be Mueller H 15000 or 15006 (Institute) and/or Ford 1000 with pack-joint or equal.
 3. Curb stop shall be Mueller H14250 or H14262 (Institute) and/or Ford Angle Ball Valve BA43-331 with pack-joint or equal.
 4. All service shall be continuous without splicing.
- b. The developer is responsible for marking a "W" into the concrete of the curb to delineate the location of water services along the street, and to mark a "V" into the concrete of the curb to delineate location of water main valves.

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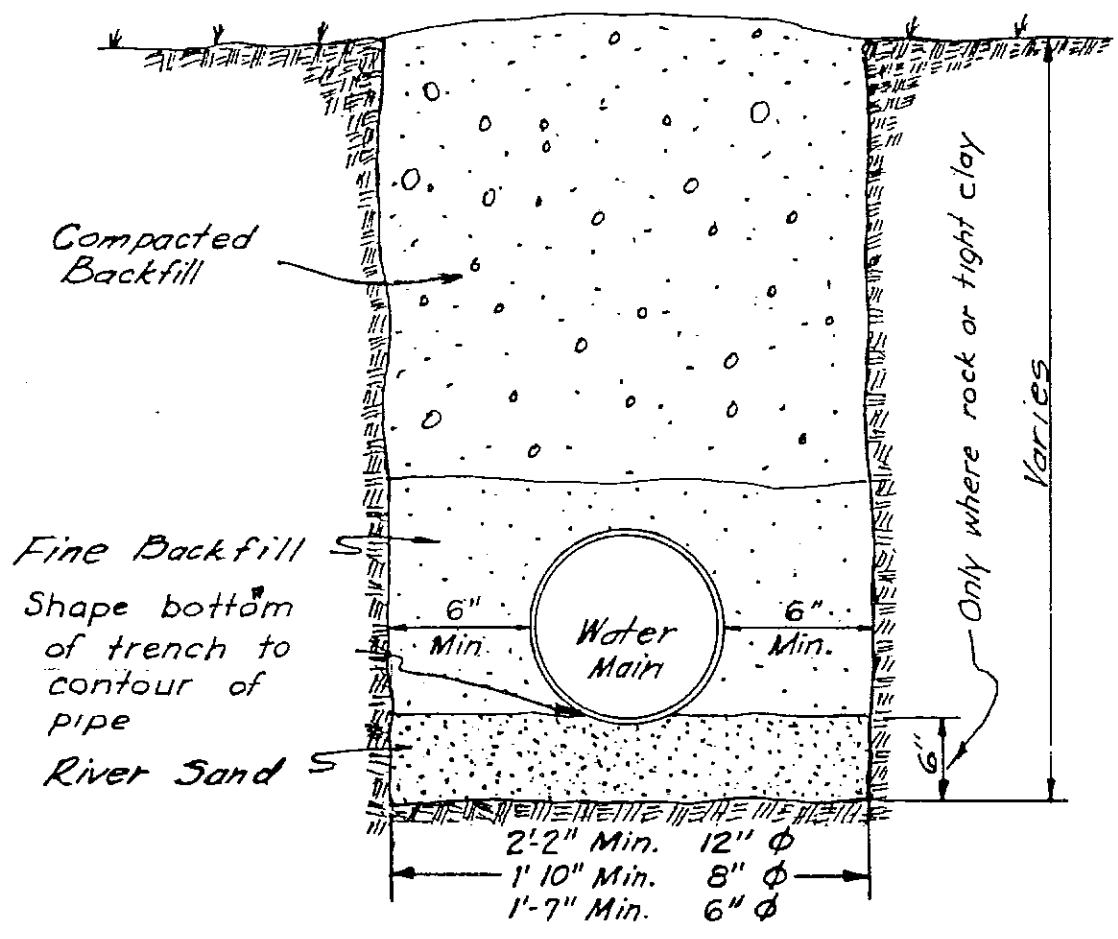
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The City of Midwest City
 100 N. UNIVERSITY BLVD. • P.O. BOX 1000
 MIDWEST CITY, OK 73110

STANDARD DETAIL W-1



STANDARD WATER LINE DETAILS

TYPICAL TRENCH SECTION

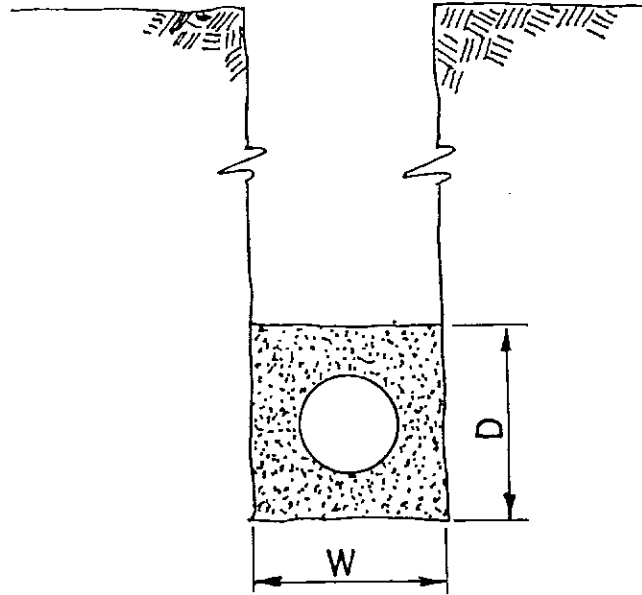
SCALE AS NOTED



STANDARD DETAIL W-2.

The City of Midwest City

300 N. MIDWEST CITY BLVD., P.O. BOX 10200
MIDWEST CITY, OK 73110



All PVC Pipe shall have a minimum sand encasement of Six inches on top, sides, and bottom. This sand encasement shall meet Okla. Department of Transportation Specs. 703.04(b). The minimum D and W dimensions for various pipe sizes are as shown below.

6"	=	21"
8"	=	24"
10"	=	26"
12"	=	29"

STANDARD WATER LINE DETAILS

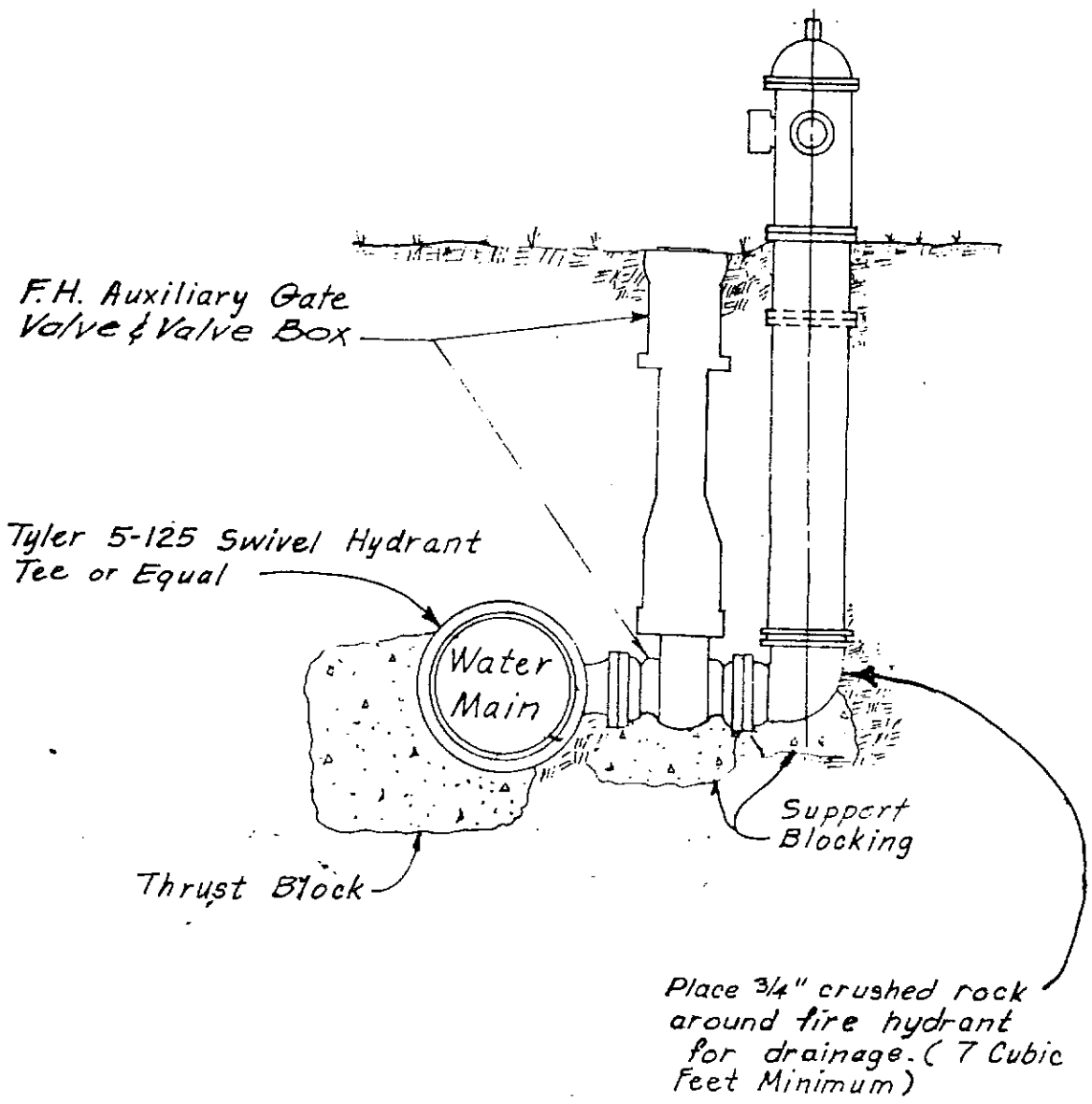
SAND BEDDING DETAIL FOR PVC PIPE

SCALE
AS NOTED



STANDARD DETAIL W-3

The City of Midwest City
100 N. MIDWEST BLVD. P.O. BOX 1000
MIDWEST CITY, OK 73110



STANDARD WATER LINE DETAILS

TYPICAL HYDRANT INSTALLATION

SCALE AS NOTED

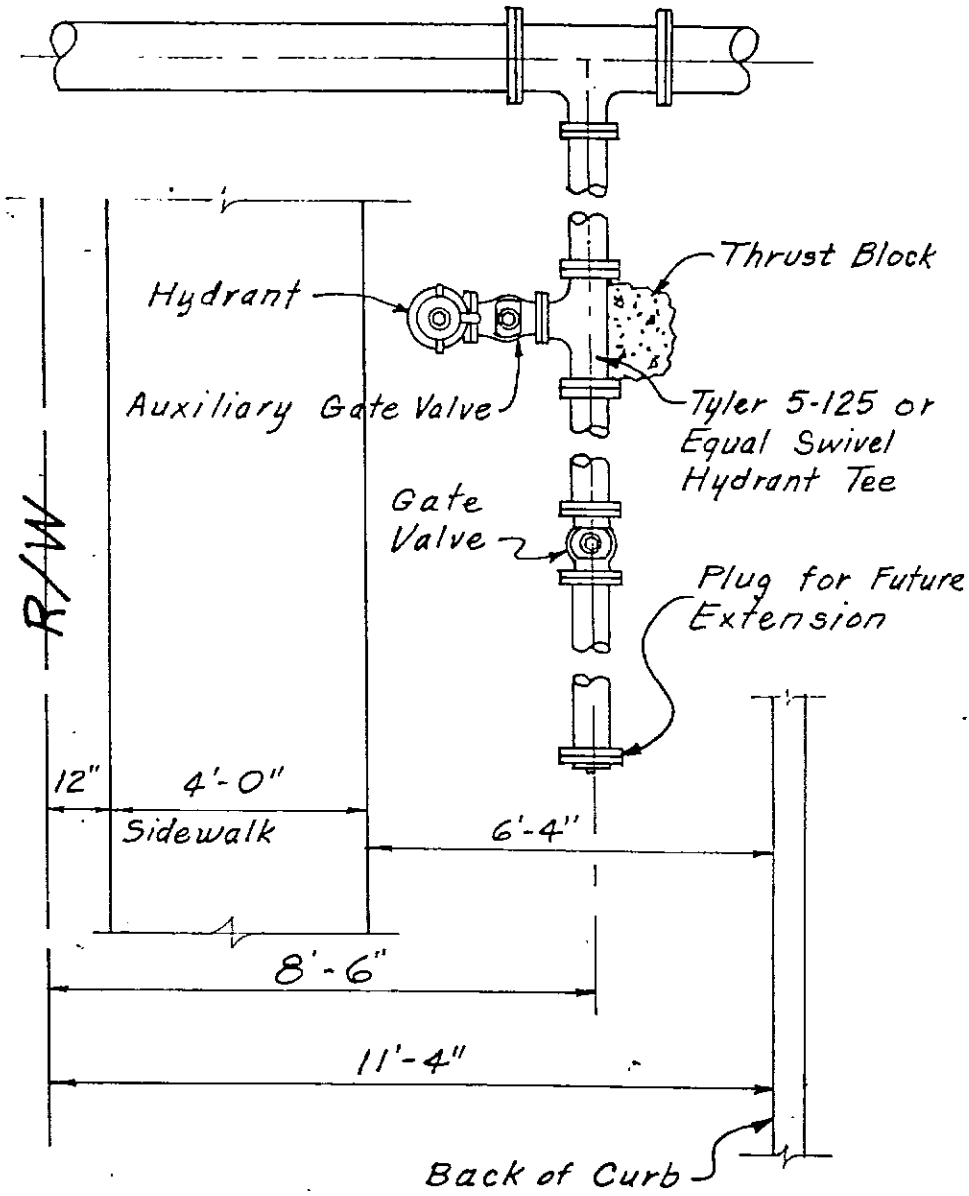


The City of Midwest City

101 N. UNIVERSITY BLVD. - P.O. BOX 10000
MIDWEST CITY, OK 73110-1000

STANDARD DETAIL W-4

STANDARD WATER LINE DETAILS



SWIVEL HYDRANT TEE

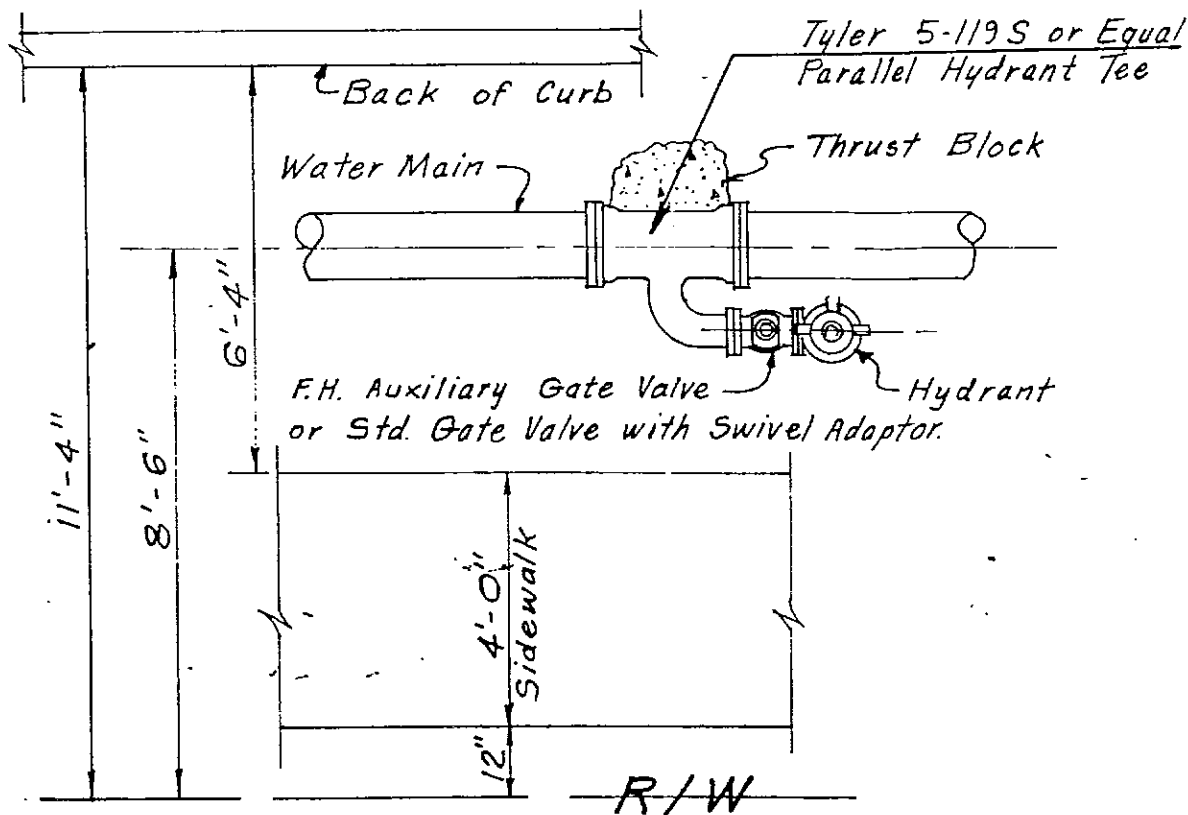
SCALE AS NOTED



The City of Midwest City

100 N. MIDWEST BLVD. • P.O. BOX 10070
MIDWEST CITY, OK 73114 • (405) 412-1111

STANDARD DETAIL W - 5



STANDARD WATER LINE DETAILS

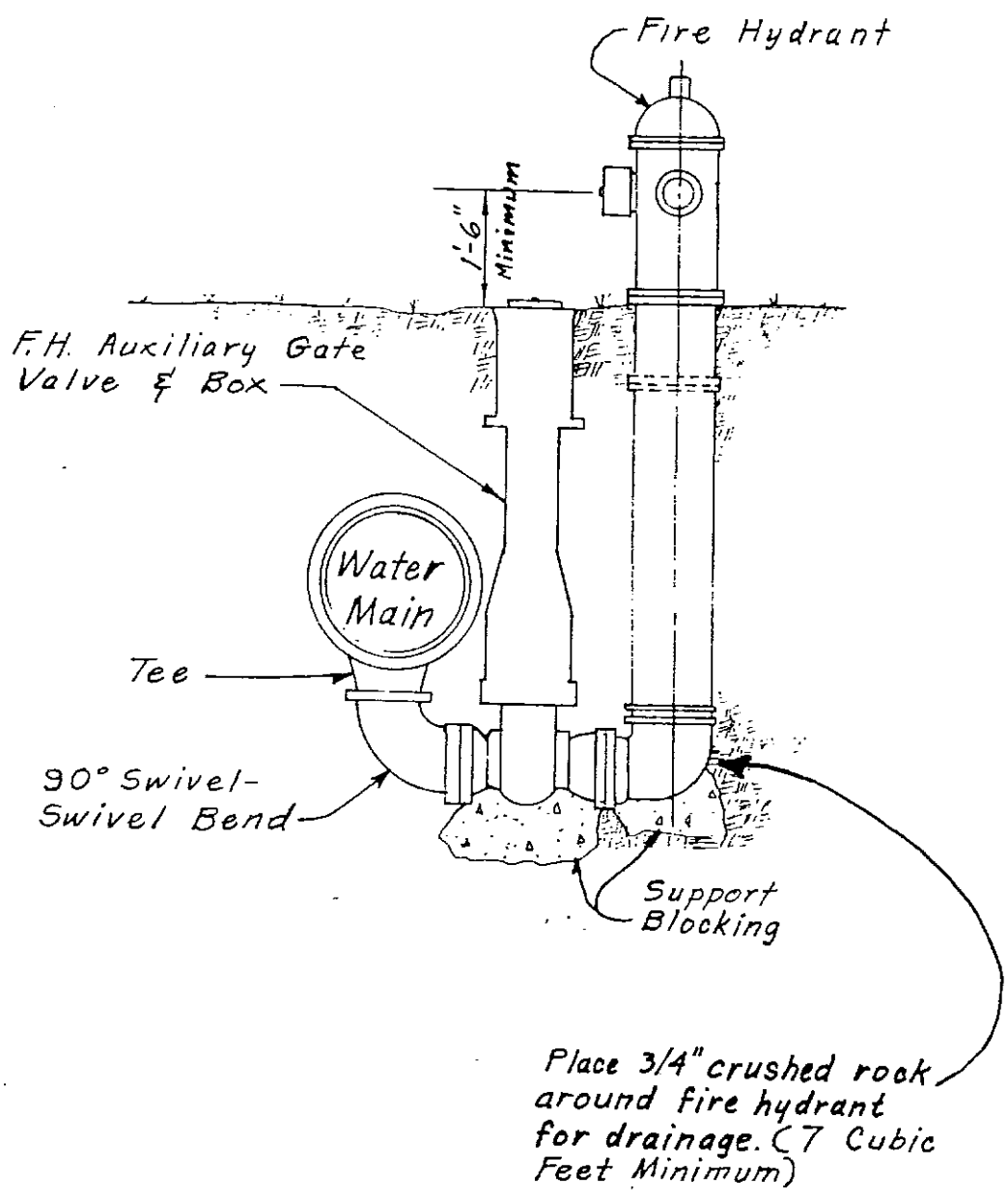
PARALLEL HYDRANT TEE

SCALE AS NOTED



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MIDWEST CITY, OK 73110 • (405) 712-2100

STANDARD DETAIL W-6



TYPICAL BLOW OFF HYDRANT INSTALLATION

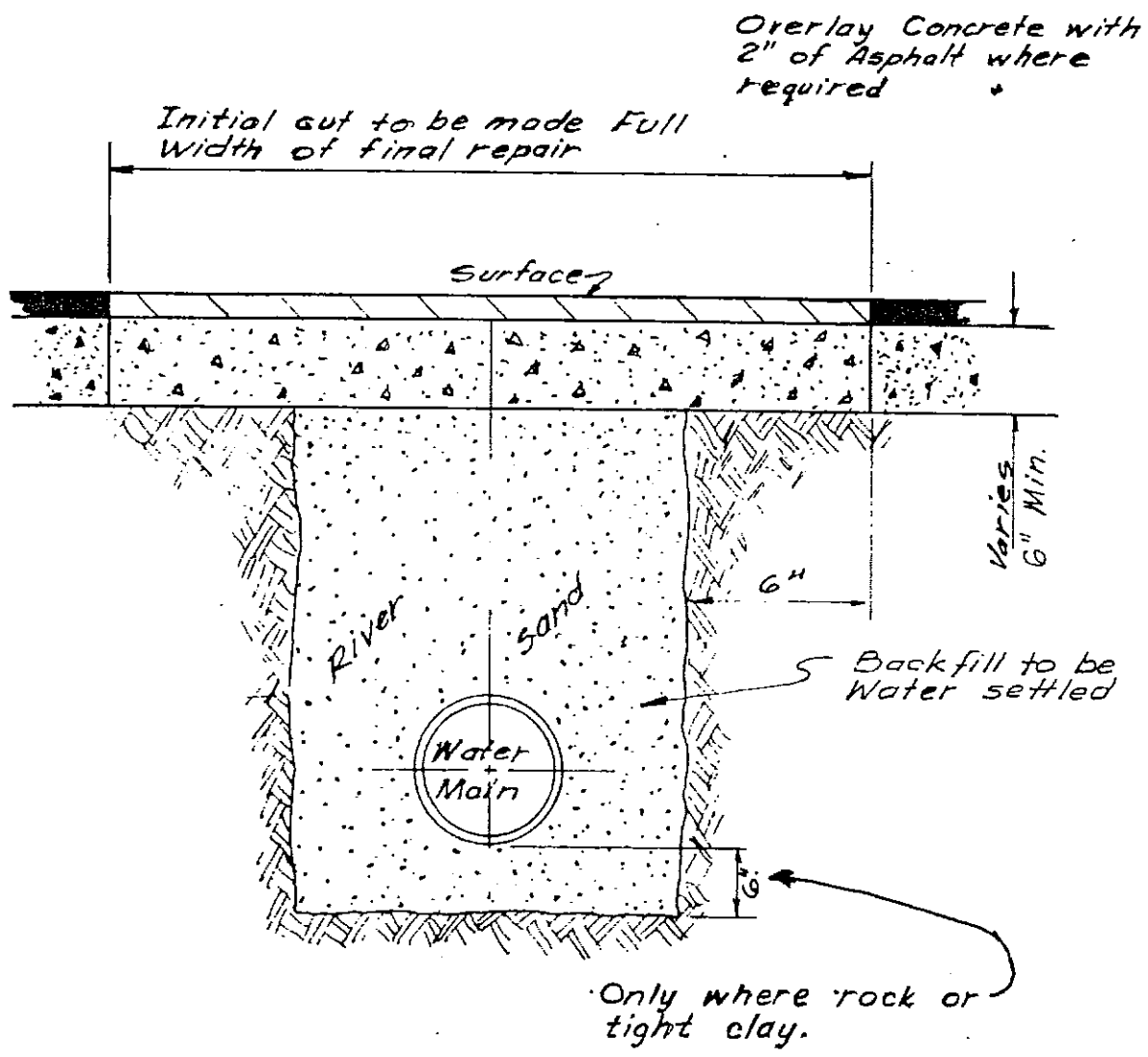
STANDARD WATER LINE DETAILS

SCALE
AS NOTED



The City of Midwest City
1001 N. MIDWEST BLVD. • P.O. BOX 10070
MIDWEST CITY, OK 73116 • (405) 732-2200

STANDARD DETAIL W-7



if existing concrete has no Asphalt covering, then the full repair is to be concrete (3500 P.S.I.)

Note: Police, Fire and Street Departments shall be notified Before any paving cuts are made.

STREET CROSSING

STANDARD WATER LINE DETAILS

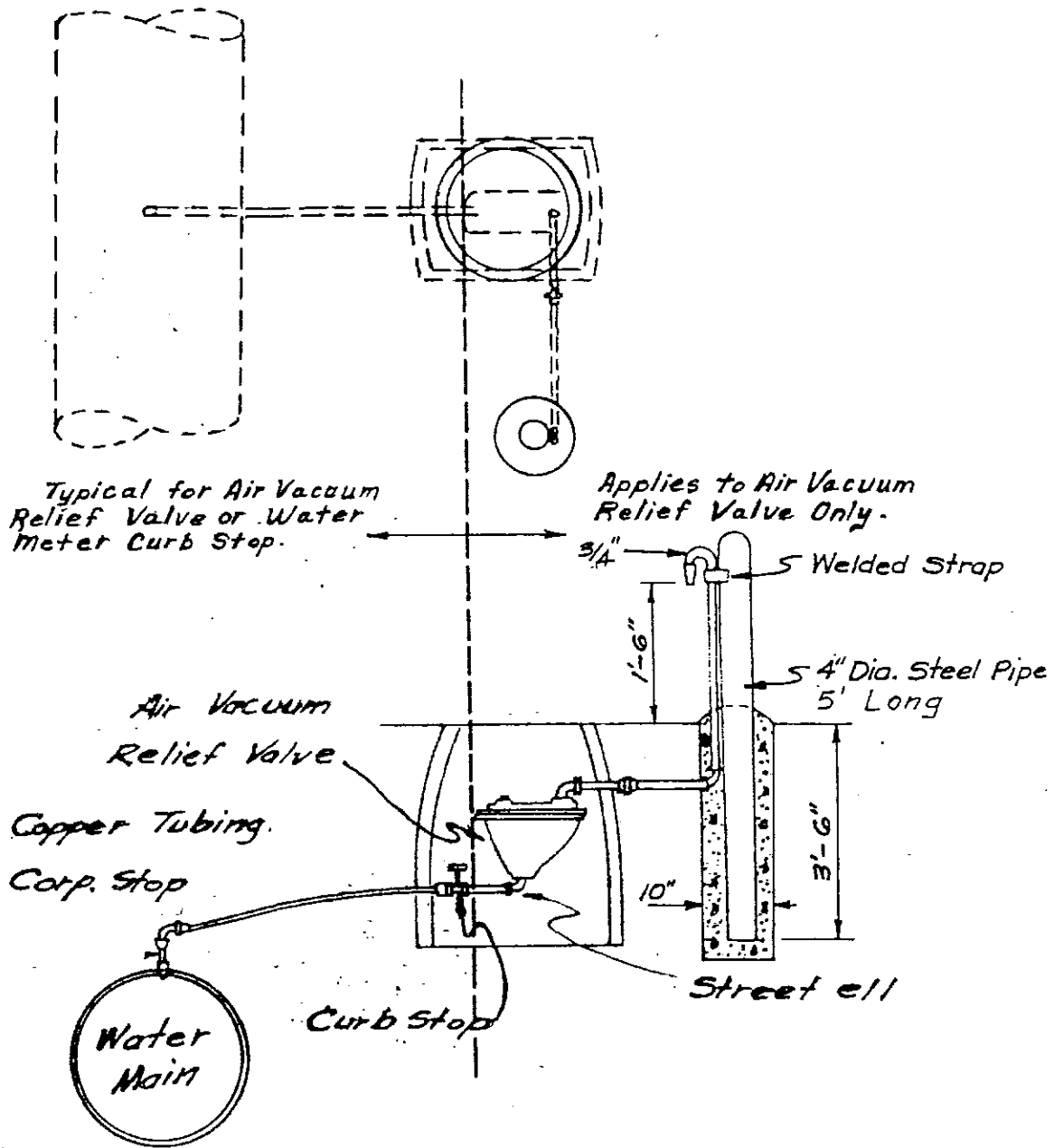
SCALE AS NOTED



STANDARD DETAIL W-8

The City of Midwest City

120 N. MIDWEST BLVD. • P.O. BOX 1070
MIDWEST CITY, OK 73110 • (405) 711-1111



STANDARD WATER LINE DETAILS

AIR VACUUM RELIEF VALVE & WATER METER CURB STOP

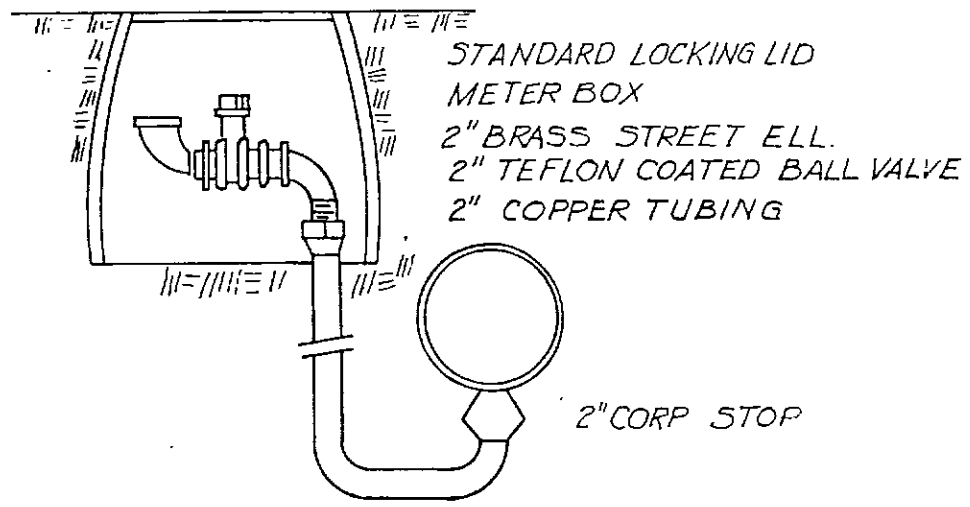
SCALE AS NOTED



STANDARD DETAIL W-9

The City of Midwest City
100 N. MIDWEST BLVD. • P.O. BOX 1000
MIDWEST CITY, OK 73101 • (405) 413-2200

STANDARD WATER LINE DETAILS



2" BLOW OFF

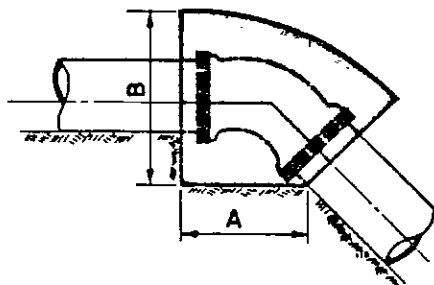
SCALE AS NOTED



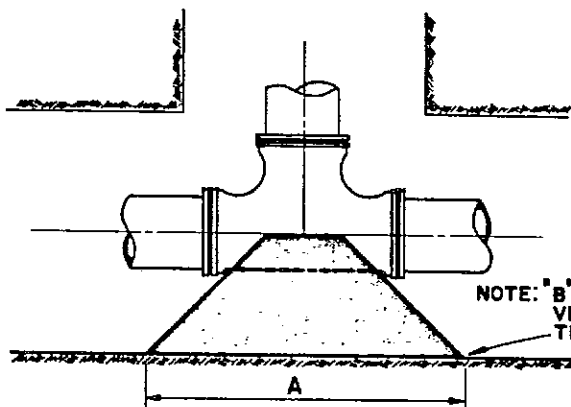
STANDARD DETAIL W-10

The City of Midwest City

101 N. MIDWEST BLVD. • P.O. BOX 1070
MIDWEST CITY, OK 73101 • (405) 471-3100

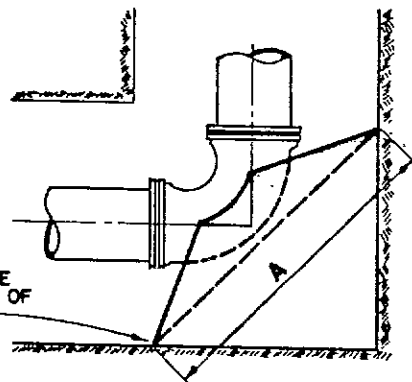


VERTICAL BENDS



TEE

NOTE: "B" DIMENSION IS THE VERTICAL HEIGHT OF THRUST BLOCK



HORIZONTAL BEND

PIPE SIZE	TEES		BENDS							
	A	B	90°		45°		22 1/2°		VERT.	
			A	B	A	B	A	B	A	B
6"	24"	21"	24"	24"	18"	12"	12"	12"	18"	21"
8"	39"	24"	24"	26"	21"	15"	15"	15"	18"	24"
10"	48"	30"	30"	32"	26"	24"	18"	18"	18"	24"
12"	48"	30"	32"	34"	28"	30"	18"	18"	20"	28"
14"	54"	36"	36"	39"	30"	30"	21"	21"	20"	28"
16"	54"	38"	38"	41"	32"	32"	24"	24"	21"	30"

TYPICAL THRUST BLOCK DETAILS

SCALE AS NOTED

STANDARD WATER LINE DETAILS