

DETAIL SPECIFICATIONS

PART E - BID ITEMS

ITEM 1

E-1 DUCTILE IRON PIPE AND FITTINGS

1-1 WORK INCLUDED

- A. The Contractor, under Item 1, "Ductile Iron Pipe and Fittings," shall furnish all the materials, labor, tools, equipment, and incidentals for and shall properly construct and connect in place, as shown on the Contract Drawings and as specified herein, all Ductile Iron Pipe and Fittings, including providing all traffic maintenance; providing and maintaining traffic control and warning devices, including temporary and permanent pavement markings; pavement cutting (both for trench and for pavement removal and restoration); all excavations, including pavements, water main trench, and sewer and/or utility trenches; sheeting and shoring, including use of trench box; all shop drawing submittals; the furnishing and installing of all approved materials as herein specified and as required to complete the work; sand bedding backfill; backfill and/or premium backfill; hydrostatic pressure testing of the water main and all appurtenances and the repair and/or replacement of materials due leakage or defects; assisting in the chlorination and flushing procedures; pavement replacement, including base pavement replacement, berm replacement/repair and shoulder replacement/repair; final pavement restoration, including traffic markings, signs and traffic loop detectors; protection of trees, shrubbery and lawns and/or their removal and replacement; seeding and/or sodding; sidewalk removal and replacement; curb removal and replacement; underdrain removal and replacement; removal and replacement of mailboxes; removal and replacement of drainage culverts and/or piping; fence removal and replacement; guard rail removal and replacement; storm and sanitary sewer work; storm and sanitary sewer connection work; protecting and maintaining utilities and utility services; repair of site damage due to construction, including traffic maintenance; final site restoration; and the furnishing of shop drawings and final "as-built" drawings.
- B. Item 1, shall also include the cutting into and removal of existing pipe, removal of existing concrete thrust blocks, removal of existing plugs/caps, connecting, furnishing and installing restrained joints, victaulic joints and compression couplings, painting, special exterior coating, joint bonding, electrolysis test stations, removal and restoration of miscellaneous items, and the furnishing of all labor, materials, tools, equipment, and other incidentals required to complete the work shown on the Contract Drawings and as specified, or as ordered, all for the proper completion of the work included under this contract.
- C. Except as stipulated under Section D-24, "Changes in Sewers, Catch Basins, Etc." and Section D-25, "Changes in Water Pipe" all work herein contemplated, under Item 1, "Ductile Iron Pipe and Fittings," classified as to size and type, shall be deemed to be included in the price bid per lineal foot of water main furnished and installed under this contract.

PART E - DETAIL SPECIFICATIONS - BID ITEMS
CUY-West Sixth Street Streetscape, Part 1, PID 89722
CUY-Professor Street Intersections, Part 2, PID 90218

1-2 DEFINITIONS/STANDARDS

Whenever the word "iron" is used in reference to pipe and fittings it shall mean Ductile Iron pipe having the thickness class specified and Ductile Iron fittings having the pressure class specified with all pipe and fittings to be cement lined. Joint type on all pipe and fittings shall be noted on the Contract Drawings and as specified herein. Standards referenced herein shall be latest revision thereof, except as modified herein:

ANSI/AWWA C104/A21.4-95: CEMENT-MORTAR LINING FOR DUCTILE-IRON PIPE AND FITTINGS FOR WATER;

ANSI/AWWA C105/A21.5-93: POLYETHYLENE ENCASUREMENT FOR DUCTILE-IRON PIPE SYSTEMS;

ANSI/AWWA C110/A21.10-93: DUCTILE-IRON AND GRAY-IRON FITTINGS, 3-INCH THROUGH 48-INCH, FOR WATER AND OTHER LIQUIDS;

ANSI/AWWA C111/A21.11-90: RUBBER-GASKET JOINTS FOR DUCTILE-IRON PRESSURE PIPE AND FITTINGS;

ANSI/AWWA C151/A21.51-91: DUCTILE-IRON PIPE, CENTRIFUGALLY CAST, FOR WATER OR OTHER LIQUIDS;

ANSI/AWWA C153/A21.53-94: DUCTILE-IRON COMPACT FITTINGS, 3 IN. THROUGH 24 IN. AND 54 IN. THROUGH 64 IN., FOR WATER SERVICE;

ANSI/AWWA C600-87: INSTALLATION OF GRAY AND DUCTILE CAST IRON WATER MAINS AND APPURTENANCES;

ASTM A 36-93a: SPECIFICATION FOR STRUCTURAL STEEL;

ASTM A 47-89: SPECIFICATION FOR FERRITIC MALLEABLE IRON CASTINGS;

ASTM A 123-89a: SPECIFICATION FOR ZINC (HOT-DIP GALVANIZED) COATINGS ON IRON AND STEEL PRODUCTS;

ASTM A 193/A 193m-89: SPECIFICATION FOR ALLOY-STEEL AND STAINLESS STEEL BOLTING MATERIALS FOR HIGH TEMPERATURE SERVICE;

ASTM A 194/A 194m-88: SPECIFICATION FOR CARBON AND ALLOY STEEL NUTS FOR BOLTS FOR HIGH-PRESSURE AND HIGH-TEMPERATURE SERVICE;

1-2 DEFINITIONS/STANDARDS (Cont'd)

ASTM A 276-89a:	SPECIFICATION FOR STAINLESS AND HEAT-RESISTING STEEL BARS AND SHAPES;
ASTM A 536-84:	SPECIFICATION FOR DUCTILE-IRON CASTINGS;
ASTM B 98-84:	SPECIFICATION FOR COPPER-SILICON ALLOY ROD, BARS, AND SHAPES; and
DIRPA:	HANDBOOK OF DUCTILE IRON PIPE, Ductile Iron Pipe Research Association.

1-3 QUALIFICATIONS AND EXPERIENCE

Qualifications: All Ductile Iron Pipe and Fittings and pipe specials shall be furnished by a manufacturer who is fully experienced, reputable, and qualified in the manufacture of the ductile iron pipe, including the interior and exterior lining materials to be furnished as specified herein. The pipe, fittings and specials shall be designed, constructed and installed in accordance with the best practices and methods and shall comply in all respects with the Contract Drawings and with these specifications.

Experience: All bidders shall be required to show to the satisfaction of the Engineer/Design Engineer that the type and size of pipe and fittings he proposes to furnish, shall be made by a manufacturer whose pipe has been successfully used for like work for a period of not less than five (5) years. Such manufacturers shall only be deemed qualified where the interior cement mortar lining and the exterior coating system is applied at the same point of manufacture as the ductile iron pipe and fittings.

1-4 LAYOUT OF DUCTILE IRON PIPE AND FITTINGS FOR SUPPLY MAINS

A. General:

Under Item 1 the Contractor shall furnish Ductile Iron Cement Lined Pipe with Ductile Iron Cement Lined Fittings. Thickness class of pipe shall be minimum Class 52 and shall be increased as depth of pipe increases as specified under Section 1-4, "Layout of Ductile Iron Pipe and Fittings for Supply Mains," paragraph F, "Depth of Water Mains." Class of fittings shall be as specified under Section 1-6, "Ductile-Iron Pipe and Fittings," paragraph F, "Standard Thickness and Pipe Class Table." All valve assemblies, plain anchors, access manholes, drain assemblies, air relief/flushing outlets, pitometer outlets, supplemental connections, and other appurtenances, shall be constructed in accordance with Standard Detail Drawings and as specified herein. Ductile Iron Pipe and Fittings shall have a special exterior pipe coating as specified in Section 1-12, "Exterior Coatings/Painting," paragraph B. All pipe and fitting joints shall be as called for on the Contract Drawings and as specified herein.

1-4 LAYOUT OF DUCTILE IRON PIPE AND FITTINGS FOR SUPPLY MAINS (Cont'd)

B. Alignment:

Water main alignment shown on the Contract Drawings is based upon geometric design that permits installation of Ductile Iron Pipe and Fittings using "standard" fittings. In order to achieve the horizontal and vertical deflections shown on the Contract Drawings, standard bends of 11-1/4, 22-1/2, 45 degrees, or combination thereof, shall be used. Rotation of bends or use of compound bends shall not be permitted to combine horizontal and vertical alignment. When necessary, pipe joint or pipe/fitting joints may be "opened" for alignment to meet the horizontal and vertical deflections shown on the Contract Drawings. Joint openings shall not exceed the manufacturer's maximum suggested joint opening. The maximum nominal pipe length shall be 20'-0". In some cases due horizontal curve alignment, lengths less than 20'-0" may be used. These small lengths shall be included in the price bid per lineal foot of water main furnished under this contract. The Contractor shall maintain all horizontal points of intersection (HPI), and as close as possible, all vertical points of intersection (VPI), as shown on the Contract Drawings.

C. Restrained Distance:

Where "Restrained Distance" is shown on the Contract Drawings the Contractor shall furnish Ductile Iron Cement Lined Boltless Restrained Push-on Joint Pipe and Ductile Iron Cement Lined Boltless Restrained Push-on Joint Fittings of the pipe thickness class and fittings of the pressure class noted on the Contract Drawings to not less than the limits of the "Restrained Distance" shown on the Contract Drawings. All boltless restrained push-on joints shall be of the type specified under Section 1-8, "Joints," paragraph D, "Boltless Restrained Push-on Joints."

D. Valve Assemblies:

On all valve assemblies, all pipe joints, fitting joints, and adapter joints, between the two (2) access manholes and anchorages or plain anchors, except valve end joints, shall have boltless restrained push-on joints, whether within the "Restrained Distance" shown on the Contract Drawings or where no "Restrained Distance" is shown on the Contract Drawings. Valve end joints shall be of the type specified under E-4, "Valves," or as indicated in the Schedule of Bid Items.

E. Supplemental Connections:

Where shown on the Contract Drawings, supplemental connections shall be constructed. Branch of tee for supplemental connections on supply mains shall be furnished with "insulated" flanged outlet; see Section 1-8, "Joints," paragraph F(4), "Flanged Joints." Where a supplemental connection falls within the limits of the "Restrained Distance" shown on the Contract Drawings the tee shall be a boltless restrained push-on joint tee with an "insulated" flanged branch outlet or a boltless restrained push-on joint tee (all bell) with a boltless restrained push-on joint to "insulated" flanged adapter. Connection of the supplemental connection to the distribution water main shall be as shown on the Contract Drawings.

1-4 LAYOUT OF DUCTILE IRON PIPE AND FITTINGS FOR SUPPLY MAINS (Cont'd)

Where a supplemental connection falls outside the limits of the "Restrained Distance" shown on the Contract Drawings the tee shall be a retained mechanical push-on joint tee with an "insulated" flanged branch outlet or a retained mechanical joint push-on joint tee (all bell) with a retained mechanical joint push-on joint to "insulated" flanged adapter. Connection of the supplemental connection to the distribution water main shall be as shown on the Contract Drawings. Retained mechanical joints shall meet the requirements of Section 1-8, "Joints," paragraph B, "Mechanical Joints/Retained Mechanical Joints."

F. Depth of Water Mains:

Where depth of cover to top of 20-inch Ductile Iron Pipe exceeds twenty-six (26') feet, pipe thickness class shall be increased to minimum Class 54. Where depth of cover to top of 20-inch Ductile Iron Pipe exceeds thirty (30') feet, pipe thickness class shall be increased to minimum Class 56. No 20-inch Ductile Iron Water Main shall be installed where cover to top of pipe exceeds thirty-eight (38').

Where depth of cover to top of 24-inch Ductile Iron Pipe exceeds twenty-two (22') feet, pipe thickness class shall be increased to minimum Class 54. Where depth of cover to top of 24-inch Ductile Iron Pipe exceeds twenty-five (25') feet, pipe thickness class shall be increased to minimum Class 56. No 24-inch Ductile Iron Water Main shall be installed where cover to top of pipe exceeds thirty-two (32').

Where depth of cover for 30-inch, 36-inch, 42-inch and 48-inch Ductile Iron Pipe exceeds nineteen (19') feet, pipe thickness class shall be increased to minimum Class 54. Where depth of cover exceeds twenty-two (22') feet, pipe thickness class shall be increased to minimum Class 56. No 30-inch, 36-inch, 42-inch, or 48-inch Ductile Iron Water Main shall be installed where cover to top of pipe exceeds thirty (30').

1-5 CONNECTING TO EXISTING WATER MAINS

- A. The Contractor shall locate all pipe ends and/or all existing pipe joints where connections are to be made, including where existing mains are to be tapped, along with the next existing pipe joint to determine the exact location and elevation (line and grade) of the existing water main. The Contractor shall also expose the existing pipe joints adjacent to where connections are to be made to determine the type of the existing joints and the direction of the existing joints. No pipe fabrication drawing will be approved until this information is submitted to the Engineer/Design Engineer. All field data shall be obtained in the presence of the Inspector.
- B. It shall be the responsibility of the Contractor to verify all field dimensions and all design criteria, including design and pressure requirements, prior to preparing the various shop drawing submittals. At the time of each submission, the Contractor shall give the Engineer/Design Engineer specific written notice of each variation that the Shop Drawings may have from the requirements of the Contract Documents. In addition, the Contractor shall cause a specific notation to be made on each Shop Drawing submitted to the Engineer/Design Engineer for review of each such variation. The Engineer's/Design Engineer's review and approval of Shop Drawings shall not relieve the Contractor from

1-5 CONNECTING TO EXISTING WATER MAINS (Cont'd)

responsibility for any variation from the requirements of the Contract Documents. The Engineer's/Design Engineer's approval shall not extend to any such variation unless Contractor has, in writing, conspicuously called to the Engineer's/Design Engineer's attention each such variation at the time of the submittal, as required by this paragraph, and the Engineer/Design Engineer has given written approval of that particular variation by a specific written notation thereof incorporated in or accompanying the Shop Drawing review and/or approval.

- C. The field data shall be obtained by the Contractor, and submitted to the Engineer/Design Engineer, in sufficient time in advance of the proposed connection in order to determine if any adjustments to the line and grade of the proposed water main or adjustments to the existing water main is required due to the information obtained in the field data. The information obtained in the field data shall also be forwarded to the pipe fabricator with sufficient time to allow for the preparation of revised shop drawings and for fabrication of those pipe and fittings required to make the connection. No extra compensation to the Contractor will be made for any delays and/or for additional, pipe and fittings, or equipment, tools and incidentals, for failure to having properly obtained and forwarded to the Engineer/Design Engineer and/or to the pipe fabricator in a timely manner the required field information data.

1-6 DUCTILE-IRON PIPE AND FITTINGS

- A. All pipe and fittings shall be manufactured in accordance with and in all respects with the requirements of the latest standard of the "American National Standard" for the following: ANSI/AWWA C110/A21.10-93, "DUCTILE-IRON AND GRAY-IRON FITTINGS, 3-INCH THROUGH 48-INCH, FOR WATER AND OTHER LIQUIDS;" ANSI/AWWA C111/A21.11-90, "RUBBER-GASKET JOINTS FOR DUCTILE-IRON PRESSURE PIPE AND FITTINGS;" ANSI/AWWA C151/A21.51-91, "DUCTILE-IRON PIPE, CENTRIFUGALLY CAST, FOR WATER OR OTHER LIQUIDS;" and ANSI/AWWA C153/A21.53-94, "DUCTILE-IRON COMPACT FITTINGS, 3 IN. THROUGH 24 IN. AND 54 IN. THROUGH 64 IN., FOR WATER SERVICE," all as adopted by the American Water Works Association (AWWA), which standards, except as herein modified, are made a part of these specifications.

Unless otherwise called for on the Contract Drawings all fitting joints, and pipe connected to fittings, on water mains up to and including 16-inches in diameter, furnished and installed in this contract, shall have "Retained Mechanical Push-on Joints" in accordance with that specified in Section 1-8, "Joints," paragraph B, "Mechanical Joints/Retained Mechanical Joints."

On water mains 20-inch diameter and larger, where "Restrained Distance" is shown on the Contract Drawings, all fitting joints and pipe connected to fittings, furnished and installed in this contract, shall have "Boltless Restrained Push-on Joints" in accordance with that specified in Section 1-8, "Joints," paragraph D, "Boltless Restrained Push-on Joints." The Contractor's attention is herewith directed to Section 1-4, "Layout of Ductile Iron Pipe and Fittings for Supply Mains," paragraph D, "Valve Assemblies," and Section 1-4, paragraph E, "Supplemental Connections".

1-6 DUCTILE-IRON PIPE AND FITTINGS (Cont'd)

- B. All pipe shall be cement lined and shall be of the joint type, size and thickness class(es) noted on the Contract Drawings or as specified herein. The Contractor shall furnish centrifugal cast Ductile Iron Pipe of Grade 60-42-10, where the ductile iron metal shall have a minimum tensile strength of 60,000 psi, a minimum yield strength of 42,000 psi and a minimum elongation of ten (10) percent. The centrifugally cast Ductile shall conform to the American National Standard ANSI/AWWA C151/A21.51-91, "DUCTILE-IRON PIPE, CENTRIFUGALLY CAST, FOR WATER OR OTHER LIQUIDS," and all subsequent amendments thereto. Ductile Iron Pipe on straight runs shall have push-on single rubber-gasket compression joints, all in accordance with American National Standard, ANSI/AWWA C111/A21.11-90, "RUBBER-GASKET JOINTS FOR DUCTILE-IRON PRESSURE PIPE AND FITTINGS," and all subsequent amendments thereto. Pipe may be furnished in eighteen (18) foot or twenty (20) foot nominal laying lengths.
- C. All fittings shall be cement lined and shall be of the joint type, size and pressure class noted on the Contract Drawings or as specified herein. All Ductile Iron fittings shall be manufactured in accordance with American National Standard, ANSI/AWWA C110/A21.10-93, "DUCTILE-IRON AND GRAY-IRON FITTINGS, 3-INCH THROUGH 48-INCH, FOR WATER AND OTHER LIQUIDS," and all subsequent amendments thereto. The Contractor shall furnish Ductile Iron Fittings of Grade 70-50-05, where the ductile iron metal shall have a minimum tensile strength of 70,000 psi, a minimum yield strength of 50,000 psi and a minimum elongation of five (5) percent. Metal for fittings shall conform to American National Standard, ANSI/AWWA C110/A21.10-93, "DUCTILE-IRON AND GRAY-IRON FITTINGS, 3-INCH THROUGH 48-INCH, FOR WATER AND OTHER LIQUIDS," and all subsequent amendments thereto. Fittings on pipe size up to and including 16" may be of the short bodied type in accordance with ANSI/AWWA C153/A21.53-94, "DUCTILE-IRON COMPACT FITTINGS, 3 IN. THROUGH 24 IN. AND 54 IN. THROUGH 64 IN., FOR WATER SERVICE," and all subsequent amendments thereto.
- D. Where called for on the Contract Drawings, or where specified herein, pipe and fittings shall be furnished with flanged ends. Where flanged end pipe is required the Contractor shall furnish Ductile Iron Pipe having a minimum thickness class of 53. All flanged end pipe and fittings shall be manufactured in accordance with American Nation Standard, ANSI/AWWA C115/A21.15-94, "FLANGED DUCTILE-IRON PIPE WITH DUCTILE-IRON OR GRAY-IRON THREADED FLANGES," and all subsequent amendments thereto.
- E. Gaskets for push-on joint pipe and fittings and for mechanical joint pipe and fittings shall be of styrene butadiene rubber (SBR) and be of a size and shape to provide adequate compressive force after assembly of the joint in order to effect a positive seal. Gaskets shall be free of porous areas, foreign material and visible defects. Lubricant used for ease in assembly of the pipe/fitting joints shall be nontoxic and shall have no deteriorating effect on the gasket material.

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CUY-Professor Street Intersections, Part 2, PID 90218

1-6 DUCTILE-IRON PIPE AND FITTINGS (Cont'd)

F. STANDARD THICKNESS AND PIPE CLASS TABLE

The thickness of the centrifugally cast ductile iron pipe shall conform to the following table:

STANDARD THICKNESS OF CENTRIFUGALLY
CAST, DUCTILE IRON PIPE

Pipe Size	Working Pressure(PSI)	Standard Thickness				Fittings (PSI)
		52	53	54	56	
4"	350	0.29	0.32	0.35	0.41	350
6"	350	0.31	0.34	0.37	0.43	350
8"	350	0.33	0.36	0.39	0.45	350
10"	350	0.35	0.38	0.41	0.47	350
12"	350	0.37	0.40	0.43	0.49	350
16"	350	0.40	0.43	0.46	0.52	350
20"	350	0.42	0.45	0.48	0.54	350
24"	350	0.44	0.47	0.50	0.56	350
30"	350	0.47	0.51	0.55	0.63	250
36"	350	0.53	0.58	0.63	0.73	250
42"	350	0.59	0.65	0.71	0.83	250
48"	350	0.65	0.72	0.79	0.93	250

- G. Where fittings shown on the Contract Drawings are not covered by the above specifications, they in such particulars as are lacking thereon shall conform to the dimensions and otherwise meet the specifications for the respective type which are carried in the latest edition of the Ductile Iron Pipe Research Association (DIRPA), "Handbook of Ductile Iron Pipe," or which are otherwise detailed on the Standard Detail Drawings.
- H. Wherever changes in line and grades of the main as shown on the Contract Drawings are not standard fitting deflections, the Contractor will be permitted to submit details using combinations of standard fittings and small deflections (not to exceed the manufacturer's maximum suggested joint opening) in the adjoining lengths of pipe.
- I. On new or extended water mains, up to and including 16-inch diameter, where water mains end or terminate and are not connected to existing mains, retained mechanical bell joint plugs or caps are to be furnished and installed. On mains 20-inch and larger, an approved typed restrained plug or cap shall be furnished and installed. All plugs and caps shall be furnished with two (2) malleable iron plugged two (2")-inch iron pipe threaded taps for drain and air relief connections.

1-6 DUCTILE-IRON PIPE AND FITTINGS (Cont'd)

- J. Closure pieces shall be accurately measured and cut in the field and installed using solid sleeves (long pattern) having mechanical bell joints or compression couplings. Mechanical bell joint sleeves shall be of the retained type as specified in Section 1-8, "Joints," paragraph B, "Mechanical Joints/Retained Mechanical Joints." Compression couplings shall be as specified in Section 1-8, paragraph E, "Compression Couplings."
- K. The Contractor shall furnish the Engineer/Design Engineer with certified copies of all tests, inspection, reports and analyses of tests of samples for all materials furnished under Item 1 in accordance with Part C, Supplemental General Conditions, Section C-54, "Tests, Inspection and Reports," of these specifications.

1-7 PIPE LAYING

- A. The Contractor shall provide proper and suitable tools and appliances for the safe and convenient handling and laying of the pipe and fittings. Great care shall be taken to prevent the exterior coating of pipe and fittings from being damaged, and in particular, the interior cement mortar lining on the inside of the pipes and fittings. Any such damage shall be remedied by the Contractor, at his own expense, to the satisfaction of the Engineer/Design Engineer. All pipes and fittings shall be carefully examined by the Contractor for damage and defects just before laying and no pipe or fittings shall be laid which is known to be damaged or defective.
- B. All pipe, fittings and specials shall be inspected before lowering the pipe, fitting or special into the trench. The interior cement mortar lining and the exterior protective coatings also shall be inspected. Any damaged area shall be repaired in the field with material equal to the original and to the satisfaction of the Engineer/Design Engineer. If any damaged or defective pipe is discovered after having been laid in the trench, it shall be removed and replaced with a sound pipe or fitting by the Contractor, at his own expense, in a manner satisfactory to the Engineer/Design Engineer.
- C. All pipes and fittings shall be thoroughly cleaned before they are laid, shall be kept clean until they are used in the completed work. When pipe laying is not in progress all open ends of pipes shall be kept closed with a night plug, night cap, bulkhead or other approved means.
- D. All pipe and fittings when laid, shall conform to the lines and grades shown in the Contract Drawings. Pipe laid in trench shall be laid to a firm and even bearing for its full length. Precautions shall be taken against floating or water from entering into the trench.
- E. It is the intention of these specifications to secure first class workmanship in the placing of pipe and accessories. In such details as are not specifically mentioned herein or called for on the Contract Drawings, the Contractor shall be required to conform with the applicable sections of the latest American National Standard, ANSI/AWWA C600-87, "INSTALLATION OF GRAY AND DUCTILE CAST IRON WATER MAINS AND APPURTENANCES," and all subsequent amendments thereto, as adopted by the American Water Works Association.

1-8 JOINTS

A. Push-on Joints:

All pipe, unless otherwise required, shown on Contract Drawings, directly specified, or connected to fittings, valves and hydrants, shall have socket by plain end rubber-gasket push-on joints with radially compressed locked in place rubber ring gaskets. Push-on compression joints shall conform to the regular and special requirements for push-on joints in the American National Standard, ANSI/AWWA C111/A21.11-90, "RUBBER-GASKET JOINTS FOR DUCTILE-IRON PRESSURE PIPE AND FITTINGS," and all subsequent amendments thereto.

B. Mechanical Joints/Retained Mechanical Joints:

1. Unless otherwise required, shown on the Contract Drawings, or directly specified, all fittings and all pipe ends connected to fittings, such as bends, tees, crosses, hydrant branches, etc., shall have bell or plain end joints of the Mechanical Bolted Stuffing-Box type with sealing gasket and bolted Ductile Iron follower gland and shall be of the specified retained type. Bolts and nuts for mechanical joints shall be corrosion resistant, high strength, low alloy steel. Mechanical joint pipe and fittings shall conform with the regular and special requirement that all glands shall be Ductile Iron with joint dimensions and tolerances, bolt holes and slots, gaskets, rubber, quality control, bolts and nuts, and marking, be manufactured in accordance with American National Standard, ANSI/AWWA C111/A21.11-90, "RUBBER-GASKET JOINTS FOR DUCTILE-IRON PRESSURE PIPE AND FITTINGS," and all subsequent amendments thereto.
2. For pipe diameter sizes up to and including 16-inches, retained mechanical joints shall be furnished and installed at all bends, tees, crosses, special fittings, and between vertical offsets or bends on hydrant branches, and such mechanical joints shall be "retained" as specified in Section 1-8, B, paragraph 3. Pipe and Fittings within "Restrained Distance" shown on the Contract Drawings, or where directly specified, shall be furnished with boltless restrained push-on joints as specified in Section 1-8, D: "Boltless Restrained Slip-On Joints."
3. Pipe and fitting bell joint and gaskets shall be furnished as specified. Glands for retained mechanical joints shall be bolted type of Ductile-Iron material conforming to American National Standard, ANSI/AWWA C111/A21.11-90, "RUBBER-GASKET JOINTS FOR DUCTILE-IRON PRESSURE PIPE AND FITTINGS," and conforming with ASTM A 536-84, "SPECIFICATION FOR DUCTILE-IRON CASTINGS." Retained mechanical joint follower glands shall be equal to the "Meg-a-Lug" as manufactured by EBAA Iron Sales, Inc.; the "One-Lok" as manufactured by the Sigma Corporation; or the Uni-Flange Series 1400 "Block Buster" as manufactured by the Ford Meter Company. Proper torque shall be that as recommended by the retainer gland manufacturer. Where joint deflection is necessary for alignment such deflection shall be limited to manufacturer's maximum joint opening. All retained joints shall be rated for minimum 350 psi working pressure. All retained joints shall be polyethylene encased as specified in Section 1-8, C, "Polyethylene Encasement," except where such retained

1-8 JOINTS (Cont'd)

mechanical joints are also bonded joints in which case no polyethylene encasement will be required.

4. Retainer glands using perpendicular set screws as a means of restraining the follower gland shall not be permitted.

C. Polyethylene Encasement:

1. Except those pipe and fitting joints which are bonded joints, all retained mechanical joints, flanges, victaulic and compression type bolted sleeved couplings, and all pipe and fittings having bolts or other type of fasteners in joint construction shall be polyethylene encased. Pipe, fittings and other joints that are bonded joints need not be polyethylene encased. Polyethylene Encasement for retained mechanical joints, or any joint requiring bolts and nuts, shall be wrapped in accordance with American National Standard, ANSI/AWWA C105/A21.5-93, "POLYETHYLENE ENCASEMENT FOR DUCTILE-IRON PIPE SYSTEMS," and all subsequent amendments thereto. Retained Mechanical Joints and all bolted joints shall have double Polyethylene Encasement of Class "C" (black) film, Method "C" doubling sheet and providing one foot (1') minimum overlap on pipe or fitting on both sides of joint.
2. When shown on the Contract Drawings, or where otherwise required, all pipe and fittings required to be polyethylene encased shall be encased using Class "C" film, Method "B". Polyethylene Encasement shall be securely taped snug around all pipe and fittings.
3. All bolts and nuts on all retained mechanical joints, flanges, victaulic and compression type bolted sleeved couplings, shall have field applied three (3) coats of bitumastic coating prior to polyethylene encasement.

D. Boltless Restrained Push-on Joints:

All Ductile Iron Pipe and Fittings within the limits shown on the Contract Drawings by "Restrained Distance" shall be of the Boltless Restrained Push-on Joint type. Valves within "restrained distances" shall be of the type noted on the Contract Drawings or as indicated in the Schedule of Bid Items. Boltless restrained push-on joints shall be of a design consisting of a shop welded retainer ring or segment on the spigot end of the pipe that when the joint is fully assembled "locks" into the bell of the adjacent pipe or fitting providing a positive restrained joint. No field welded restrained joints are permitted except on lengths of pipe less than nominal length where short lengths are required as closures. Boltless restrained joints shall be of a design that provides restraining action between the spigot and bell of the pipe or fitting independent of the gasket. Boltless restrained push-on joints shall be equal to: "Flex-Ring" as manufactured by American Cast Iron Pipe Company; "Super-Lock" as manufactured by Clow Corporation (McWane, Inc.); or "TR-Flex" as manufactured by U.S. Pipe and Foundry.

1-8 JOINTS (Cont'd)

E. Compression Couplings:

1. All pipe compression couplings shall be of a gasketed, sleeve type with diameters to properly fit plain end iron pipe. Each coupling shall consist of one (1) middle ring furnished without pipe stops; two (2) follower glands; two (2) rubber-compound, Buna-N Blend, wedge section gaskets; and sufficient trackhead stainless steel bolts and nuts to properly compress the gaskets. The bolts and nuts shall meet the requirements of ASTM A 276-89a, "SPECIFICATION FOR STAINLESS AND HEAT-RESISTING STEEL BARS AND SHAPES." Type 304, and of ASTM A 193/A 193m-89, "SPECIFICATION FOR ALLOY-STEEL AND STAINLESS STEEL BOLTING MATERIALS FOR HIGH TEMPERATURE SERVICE," Heavy Hex, and ASTM A 194/A 194m-88, "SPECIFICATION FOR CARBON AND ALLOY STEEL NUTS FOR BOLTS FOR HIGH-PRESSURE AND HIGH-TEMPERATURE SERVICE," Heavy Hex.

The middle ring shall have a thickness not less than 3/8". The middle ring and follower glands shall be of either steel conforming to ASTM A 36-93a, "SPECIFICATION FOR STRUCTURAL STEEL," or ductile iron conforming to ASTM A 536-84, "SPECIFICATION FOR DUCTILE-IRON CASTINGS." The compression coupling shall be furnished without pipe stops and be rated for a minimum working pressure of 250 psi and shall be equal to the Dresser Style Nos: 38, 138, or 162 (transition type), or Smith-Blair 441 Straight and Transition Couplings.

2. All compression couplings shall be coated in the shop with a factory coating compatible with field applied primer and enamel coatings. Compression couplings shall be cleaned and painted with three (3) field coats of Koppers Bitumastic Super Tank Solution or equivalent.

F. Flanged Joints:

1. Flanged joints shall be installed where shown on the Contract Drawings or where specified. Flanges shall be either cast iron, ductile iron, cast steel, forged or rolled steel, or properly welded and machined fabricated steel plates welded to ductile iron pipe with two (2) full and continuous welds for the full circumference of the pipe. All flanges shall be cast solid and faced accurately at right angles to the axis of the pipe. They shall have plain faces and shall be spot faced on the back.

All flanged pipe and fittings shall be faced and drilled to the proper drilling pattern. For connecting flanges 12-inch and smaller ANSI B16.1, 125 lb., unless special drilling is otherwise called for on the Contract Drawings. For connecting flanges 16-inch and larger ANSI B16.1, 125 lb. or ANSI B16.1, 250 lb., unless special drilling is otherwise called for on the Contract Drawings.

All flanges shall be shop coated with one (1) coat of coal tar epoxy. All machined steel surfaces at the ends of flanged pipe and fittings or pipe ends having steel flanges shall have face of flange shop coated with one (1) coat of an approved zinc rich primer at the shop immediately after they have been faced and drilled.

1-8 JOINTS (Cont'd)

All cast iron and ductile iron flanges shall be shop coated with one (1) coat of coal tar epoxy, except the face of the flange which shall receive one (1) coat of a zinc rich primer at the shop immediately after they have been faced and drilled.

2. Blind flanges shall be rated for minimum 250 psi working pressure and shall be of either cast iron or ductile iron and have bosses tapped at top and bottom for two (2) inch standard iron pipe, each furnished with malleable iron plugs.
3. All bolts and nuts used in the finished work for flanges shall be made of stainless steel conforming with the requirements of ASTM A 276-89a, "SPECIFICATION FOR STAINLESS AND HEAT-RESISTING STEEL BARS AND SHAPES," Type 304, and with ASTM A 193/A 193m-89, "SPECIFICATION FOR ALLOY-STEEL AND STAINLESS STEEL BOLTING MATERIALS FOR HIGH TEMPERATURE SERVICE," Heavy Hex, and ASTM A 194/A 194m-88, "SPECIFICATION FOR CARBON AND ALLOY STEEL NUTS FOR BOLTS FOR HIGH-PRESSURE AND HIGH-TEMPERATURE SERVICE," Heavy Hex. The ends of all bolts shall be finished to standard radius in acceptable manner. All screw threads shall be American Standard Coarse Thread (N.C.). Stud bolts double end (rod) shall be used to make the flanged joints on pipe. All dimensions to be according to American Standard Heavy. Bolts and nuts shall be delivered to the field free from grease, rust and dirt and shall be properly protected from moisture and dirt in the field.
4. Gaskets for flanged pipe and fittings shall be full-faced rubber one-eighth (1/8) inch thick equal to Rainbow Style 9 as manufactured by the U. S. Rubber Company; Ring gasket (per AWWA C207-94), one-eighth (1/8) inch thick, cloth-inserted rubber equal to Johns-Manville No. 109, John Crane Co. Style 777, or approved equal. Gaskets shall be suitable for a water pressure of 350 psi at a temperature of 180 degrees F.
5. Where flanged valve or flanged joint insulators are required as shown on the Contract Drawings, or where ordered, each of the flange bolt holes shall be increased by 1/16" to accept a bolt insulator sleeve. The Contractor's attention is herewith directed to Part E-4, Valves," Section 4-20, "Flanged Valve Insulators." In lieu of insulated flanged joint connections, the Contractor may furnish and install an insulated coupling equal to that manufactured by Smith-Blair Coupling No: 438.

G. Victaulic Type Joints:

1. Where shown on the Contract Drawings, or where specified or required, the Contractor shall furnish and install Victaulic type joints, including couplings, for connection of pipe ends to victaulic end valves. Pipe ends shall be shouldered joints, of either cast pipe or with welded end ring, adapted for installation of a Style 44 joint and coupling.

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1-8 JOINTS (Cont'd)

Victaulic Couplings shall be Style 44 and shall be composed of malleable iron housings held together with steel bolts heat treated and "Hot-Dip" galvanized according to ASTM A 123-89a, "SPECIFICATION FOR ZINC (HOT-DIP GALVANIZED) COATINGS ON IRON AND STEEL PRODUCTS," and with a continuous, hollow, molded rubber sealing ring of such type that the seal becomes tight as the pressure within the pipe increases. The joints shall be constructed and installed and be equal in all respects to those manufactured by the "Victaulic Company of America." Malleable housings shall conform to ASTM A 47-89, "SPECIFICATION FOR FERRITIC MALLEABLE IRON CASTINGS," or to the requirements of ASTM A 536-84, "SPECIFICATION FOR DUCTILE-IRON CASTINGS."

2. Bolts and nuts shall be manufactured by the coupling manufacturer and shall be stainless steel, complying in material with the requirements of ASTM A 276-89a, "SPECIFICATION FOR STAINLESS AND HEAT-RESISTING STEEL BARS AND SHAPES," Type 304, and with ASTM A 193/A 193m-89, "SPECIFICATION FOR ALLOY-STEEL AND STAINLESS STEEL BOLTING MATERIALS FOR HIGH TEMPERATURE SERVICE," Heavy Hex, and ASTM A 194/A 194m-88, "SPECIFICATION FOR CARBON AND ALLOY STEEL NUTS FOR BOLTS FOR HIGH-PRESSURE AND HIGH-TEMPERATURE SERVICE," Heavy Hex.
3. All machined steel surfaces at the ends of pipe to receive Victaulic type couplings shall be coated with one (1) shop coat of an approved zinc rich paint. All metal parts of the couplings shall be coated at the shop with one (1) coat of bituminous primer furnished by the same manufacturer who furnishes the coatings as specified under "D-15, Painting."

1-9 FIELD JOINTS/CUTTING PIPE

Whenever existing water mains require cutting, or newly installed pipes require cutting to fit into the lines, as required for closure pieces, the work shall be done in a satisfactory manner so as to leave a smooth end at right angles to the axis of the pipe. When a piece of pipe is cut to fit into the line, no payment will be made for the portion cut off and not used in the line. The Contractor's attention is herewith called to Section D-26, "Work to Be Done By the City," paragraph B. Connection of pipe ends and closure pieces shall be made using retained mechanical joint solid sleeves (long pattern) or approved type compression couplings.

1-10 BONDED JOINTS/ELECTROLYSIS

A. General:

When specified, Ductile Iron Pipe Joints and Pipe Fitting Joints shall have approved type bonded joints. The bonded type joints shall be of a type that can be used in conjunction

1-10 BONDED JOINTS/ELECTROLYSIS (Cont'd)

with a cathodic protection system to be furnished and installed under Item 11, "Cathodic Protection," and be of a type that provides positive electrical continuity across the joints of all Push-on Joint Pipe; all Retained Mechanical Joint Pipe and Fittings; all Boltless Restrained Joint Push-on Joint Pipe and Fittings; all Flanged Joints, except where "insulated" flanged joints are required or ordered; all compression type coupling joints, except where "insulated" compression couplings are required or ordered; all Victaulic type joints; and all other specials. Electrolysis test stations shall be furnished and installed where shown on the Contract Drawings and/or where required. The bonding wire, connectors, and test station assemblies shall be furnished and installed in accordance with the Standard Detail Drawings. On pipe sizes up to and including 24" in diameter one (1) set of bonding connectors shall be installed at the top of each pipe/fitting joint. On pipe sizes 30" and larger, two (2) sets of bonding connectors shall be installed, one (1) set each at twelve (12") inches clockwise and counterclockwise from top of each pipe/fitting joint. After the joint bonding has been installed the Contractor shall complete the exterior pipe/fitting joint in accordance with the Standard Detail Drawing(s), including exterior coating repair.

B. Electrolysis Test Stations:

Where shown on the Contract Drawings, and/or where ordered, the Contractor shall furnish and install Electrolysis Test Station Assemblies. All materials required for the Electrolysis Test Station Assemblies shall conform with the details shown on the Standard Detail Drawing(s) or as specified elsewhere in these specifications.

C. Payment:

Payment for furnishing and installing bonded joints and electrolysis test stations shall be deemed to be included in the price bid per lineal foot of Ductile Iron Pipe and Fittings furnished and installed under this contract. Additional joint bonding and test stations required as a result of Cathodic Protection requirements shall be furnished, installed and paid for under Item 11, "Cathodic Protection."

1-11 CEMENT LINING

At the point of manufacture a cement mortar lining shall be given to the inside of all pipe, fittings and specials. The lining shall be of standard thickness and shall conform to the American National Standard, ANSI/AWWA C104/A21.4-95, "CEMENT-MORTAR LINING FOR DUCTILE-IRON PIPE AND FITTINGS FOR WATER," and all subsequent amendments thereto.

1-12 EXTERIOR COATINGS/PAINTING

A. Unless otherwise specified herein, the exterior of all ductile iron pipe, fittings, and specials shall have shop applied a one (1) mil bitumastic coating applied in accordance with ANSI/AWWA C151/A21.51-91, "DUCTILE-IRON PIPE, CENTRIFUGALLY CAST, FOR WATER OR OTHER LIQUIDS."

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1-12 EXTERIOR COATINGS/PAINTING (Cont'd)

- B. Where called for in the Schedule of Bid Items, all ductile iron pipe, fittings and specials of water mains twenty (20") inch and larger shall have shop applied a minimum sixteen (16) mil thickness of an approved coal tar epoxy exterior coating. The coating shall be applied in two (2) coats in accordance with the manufacturer's instructions and shall have a dry film thickness (DFT) of 16 mils. Ductile iron pipe, fittings and specials up to and including 16" in diameter shall have the standard bitumastic coating noted in paragraph A.
- C. After installation and before Polyethylene Encasement any damaged coating shall be cleaned and repainted as specified herein. All bolts and nuts on retained mechanical joints, flanges, victaulic or compression type bolted sleeved couplings, and other bolted type pipe or fitting joints, shall be cleaned and painted with three (3) field coats of Koppers Bitumastic Super Tank Solution, or equivalent.

1-13 MARKING

All pipe shall be suitably marked, on or near the pipe bell, clear and legible, the manufacturer, nominal diameter, class, date of manufacture, weight, and other elements of identification. All fittings shall be marked, clear and legible, the manufacturer, nominal diameter, date of manufacture, weight, pressure rating, in the case of bends the degree of bend, and other elements of identification.

1-14 HYDROSTATIC TESTING

After valved sections of the pipe, fittings and appurtenances have been installed they shall be pressure tested by the Contractor to the test pressures and in the manner specified in Part D, Section D-29, "Testing Mains," of these specifications.

The tests shall be continued and repeated as often as necessary to ensure that all leaks have been made tight to the satisfaction of the Engineer/Design Engineer. The Contractor shall furnish and install all required test bulkheads, appliances, and other materials and taps as required to make the test.

1-15 DISINFECTION/CHLORINATION

The Contractor shall cooperate with the City in the disinfection of all ductile iron pipe, fittings and specials installed in the work. The disinfection procedure shall consist of the (a) the preliminary flushing; (b) the chlorination procedure; (c) final flushing; and (d) sampling, all as described in Part D, Section D-30, "Water Main Disinfection."

1-16 INSPECTION AND TESTING

All pipe shall be inspected and tested at the manufacturing facility. The Contractor shall furnish eight (8) copies of the manufacturer's certified inspection and testing reports for all pipe and fittings to be furnished and installed in the work.

1-16 INSPECTION AND TESTING (Cont'd)

All ductile iron pipe, fittings and specials shall be subject to inspection and approval by the Engineer/Design Engineer after delivery of material to the job site. No mis-shapen, imperfectly coated, or damaged pipe, fittings, or appurtenances shall be installed in the work.

The Contractor shall furnish to the Engineer/Design Engineer eight (8) sets of lists of all pipe and fittings and of all appurtenances in each shipment of materials delivered to the job site. The lists shall contain the serial or mark number, weight, size, and description of each item received at the job site.

The City reserves the right to test all materials furnished by the Contractor during the life of the proposed contract. The City may elect to randomly test materials or cause to have materials randomly tested. No compensation for delays will be made to the Contractor either during or as a result of these tests. The Contractor shall be responsible, at his sole expense, to remedy any deficiencies, to the satisfaction of the City, found as a result of these tests.

1-17 SHIPPING, HANDLING AND STORAGE

- A. The Contractor shall transport, deliver and distribute along the line of the work, the ductile iron pipe, specials and appurtenances thereof. Pipe shall be loaded for shipment upon suitable cars or trucks and secured thereto. In loading and unloading the pipe more than ordinary care shall be taken to prevent any injury to the pipe and fitting ends, linings and coatings. Such work shall be done slowly and under no circumstances shall the pipe be dropped.
- B. In distributing the pipe along the work, each pipe and fitting shall be placed as nearly as possible to the point where it is to be laid, and facing in the proper direction. Coated pipe shall be handled with wide belt slings. Iron chains, cables or other equipment likely to cause damage to the pipe wall or coatings shall not be used. Pipe which has been improperly distributed and which shall be moved longitudinally along the trench shall be reloaded on a suitable car or truck or lifted and swung by a derrick or moved by such means as may be satisfactory to the Engineer/Design Engineer.
- C. If in the process of manufacture, transportation, or handling, any ductile iron pipe, fitting or special receives any damage to the exterior coating, the interior cement mortar lining or the pipe wall, the repair of which will in any degree further injure it, such pipe, fitting or special shall be rejected and replaced at the Contractor's expense.
- D. Pipe which is placed in storage or on street treelawns shall be so arranged as not to cause undue interference or inconvenience to vehicle or pedestrian traffic. All pipe, fittings and specials shall be sufficiently protected to prevent any injury to such, including the interior and exterior coatings.

1-18 MATERIALS DATA WITH PROPOSAL

Each bidder shall submit with his proposal, and on the form provided, the information called for below:

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1-18 MATERIALS DATA WITH PROPOSAL (Cont'd)

- A. Name of Pipe Manufacturer and Location of Plant.
- B. Name of Coupling Manufacturer and Location of Plant.
- C. Name of Interior Pipe Coating Manufacturer and Exterior Pipe Coating Manufacturer and Location of Application of each.

Failure of the Bidder to complete all of the information in the Materials List Form provided in the Proposal may be cause for rejection of his bid.

1-19 SHOP DRAWINGS

- A. The Contractor shall submit to the Engineer/Design Engineer for review and/or approval eight (8) sets of prints of all shop drawings for pipe and fittings and miscellaneous or special details of pipe and fitting joints which are not standard construction or fully detailed in the regular catalogue of the company furnishing the pipe, fittings and specials. No work shall be done in the shop or in the field until after the shop drawings have been approved.
- B. The Contractor shall submit to the Engineer/Design Engineer for review and/or approval, a minimum of eight (8) complete sets of all detail drawings for fittings and specials, and miscellaneous details, such as air relief outlets and drain outlets, bonding of joints, anchors, pitometer outlets, restrained joint, access openings, drain pipe assembly, piping for gate valve assembly, etc.
- C. The Contractor shall also submit the Engineer/Design Engineer for review and/or approval, a minimum of eight (8) sets of a complete assembly plan for the entire length of the pipe line consisting of the horizontal pipe alignment, the pipe profile, and accompanied with a detailed tabulated laying schedule. This assembly plan and laying schedule shall show the correct plan location and elevation, by both survey and watermain stationing, of all fittings to be furnished, and shall include location of all air relief valves, drains assemblies, anchors, manholes, pitometer vaults, valve vaults, restrained joints, access manholes, electrolysis test stations, valves assemblies, etc. This water main assembly plan and profile shall be a double lined drawing, including pipe centerline, similar to that shown on the Contract Drawings, and shall show by survey and water main stationing all horizontal points of intersections (HPI), including degree of deflection. The water main assembly plan profile shall also include pipe centerline elevations, and shall show by survey and water main stationing all vertical points of intersections (VPI), including degree of deflection. The assembly plan and tabulated laying schedule shall show the limits of the restrained distances, class(es) of pipe and other pertinent information.
- D. Two (2) sets each of the detailed drawings, assembly plan and laying schedule submitted will be returned to the Contractor with the criticisms or approval of the Engineer/Design Engineer. In case the drawings are not approved, the Contractor shall again submit for review and/or approval, eight (8) complete sets of revised detail drawings, assembly plan, and laying schedule. After the shop drawings have been finally approved, the Contractor shall furnish to the Engineer/Design Engineer a sufficient number of additional sets of shop

1-19 SHOP DRAWINGS (Cont'd)

drawings, on paper, for his use and for the City's internal distribution. No work shall be done in the shop or in the field until all of the shop drawings have been finally approved.

- E. Finally, the Contractor shall furnish the City one (1) mylar or reproducible cloth tracing of each of the approved shop drawings. Mylar tracings shall be submitted as specified under Part E, Section 14-2, "Shop Drawings," paragraph E, "Final Mylar Tracings," and Section 14-3, "As-Built Drawings," paragraph C, "As-Built Shop Drawings." The pipe fabricator shall obtain the "as-built" data from the Contractor and shall revised the finally approved Laying Schedules and Line Assembly Drawings to reflect actual line and grade of the pipe including the actual stationing and elevation of the pipe, horizontal and vertical deflections, air relief/flushing outlet, drain assembly, valve assembly, and the actual placement of the various pipe, fittings, specials, extra fittings, joint type, etc. The "As-Built" Laying Schedules Line Assembly Drawings shall be furnished in the manner specified under Section 14-2, paragraph E and payment made as part of the final mylar submittals required under Item 14B, "Shop Drawings."
- F. The approval of the drawings by the Engineer/Design Engineer shall not relieve the Contractor of any of his obligations in connection with this contract, including the material and performance requirements thereof.

1-20 EXTRA DUCTILE IRON FITTINGS

- A. For any additional ductile iron pipe fittings ordered by the Engineer/Design Engineer or extra work due to revision of Contract Drawings, except as otherwise indicated herein, the Contractor shall furnish and install, all in accordance with that specified for ductile iron fittings, under Item 1, including all necessary labor, equipment tools and incidentals at the following unit prices:

6" - \$ 90.00	8" - \$140.00	10" - \$185.00
12" - \$235.00	16" - \$560.00	

- B. A quantity of XXXXXX (xx) XX" extra fittings, ductile iron Class 250/350, is provided in the Schedule of Bid Items. These extra fittings shall be of the various types as required by the Contractor to have on hand in order to compensate for field conditions. The type of fitting and fitting joint shall be determined by the Contractor, meeting the specifications for fittings as described under this item.
- C. The provisions of this item shall not relieve the Contractor of his responsibilities to investigate existing facilities as indicated in these specifications, nor to use less than normal diligence in excavating or laying pipe to anticipate possible difficulties.

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1-20 EXTRA DUCTILE IRON FITTINGS (Cont'd)

- D. The unit prices stipulated per each for the various sizes of extra ductile iron fittings under Item 1 shall be in full compensation for the furnishing and installing of such extra fittings as are ordered by the Engineer/Design Engineer and which are not shown on the Contract Drawings or approved shop drawings, and shall include extra excavation, sheeting and shoring, backfilling, sand and premium backfill, seeding and sodding, temporary and permanent repaving required therefore, and the furnishing of all labor, materials, tools and appliances necessary to complete the work as specified or as shown.
- E. No compensation for extra fittings used to furnish and install supplemental connections from the supply main to the distribution main will be entertained, but the cost thereof shall be deemed to be included in the price bid per lineal foot of ductile iron pipe and fittings, classified as to size and type, actually furnished and installed in the work as measured from the center of the supply main to the center of the distribution main. Likewise, no payment will be made under Item 1 for extra fittings which are installed for the convenience of the Contractor without specific orders or approvals from the Engineer/Design Engineer.

1-21 MEASUREMENT

The number of linear feet of water main to be paid for under Item 1, "Ductile Iron Pipe and Fittings," classified as to size and type, shall be that actually furnished and placed in accordance with that shown in the Contract Drawings and these specifications, as measured along the axis of the pipe, including fittings and valves connected up in place. For connections between new and existing mains, measurement shall be the distance from center line to center line of mains and the actual length of existing main ordered to be removed to make the connection.

1-22 PAYMENT

- A. Under Item 1, "Ductile Iron Pipe and Fittings," the unit price stipulated to be paid for each linear foot of ductile iron pipe and fittings shall include the furnishing of all the materials, labor, tools, equipment, and incidentals for and to properly construct and connect in place, as shown on the Contract Drawings and as specified herein, all Ductile Iron Pipe and Fittings, including providing all traffic maintenance; providing and maintaining traffic control and warning devices, including temporary and permanent pavement markings; pavement cutting (both for trench and for pavement removal and restoration); all excavations, including pavements, water main trench, and sewer and/or utility trenches; sheeting and shoring, including use of trench box; all shop drawing submittals; the furnishing and installing of all approved materials as herein specified and as required to complete the work; sand bedding backfill; backfill and/or premium backfill; hydrostatic pressure testing of the water main and all appurtenances and the repair and/or replacement of materials due leakage or defects; assisting in the chlorination and flushing procedures; pavement replacement, including base pavement replacement, berm replacement/repair and shoulder replacement/repair; final pavement restoration, including traffic markings, signs and traffic loop detectors; protection of trees, shrubbery and lawns and/or their removal and replacement; seeding and/or sodding; sidewalk removal and replacement; curb removal and replacement; underdrain removal and replacement; removal and replacement

1-22 PAYMENT (Cont'd)

of mailboxes; removal and replacement of drainage culverts and/or piping; fence removal and replacement; guard rail removal and replacement; storm and sanitary sewer work; storm and sanitary sewer connection work; protecting and maintaining utilities and utility services; repair of site damage due to construction, including traffic maintenance; final site restoration; and the furnishing of "as-built" drawings. Payment under Item 1, shall also include the cutting into and removal of existing pipe, removal of existing concrete thrust blocks, removal of existing plugs/caps, connecting, furnishing and installing restrained joints, victaulic joints and compression couplings, painting, special exterior coating, joint bonding, electrolysis test stations, removal and restoration of miscellaneous items, and the furnishing of all labor, materials, tools, equipment, and other incidentals required to complete the work shown on the Contract Drawings and as specified, or as ordered, all for the proper completion of the work included under this contract.

B. Labor and material required to complete the work covered under other items shall be paid for under the applicable items:

- 1) All 2-inch Brass and Galvanized Iron Pipe used for the 2" Air Relief/Flushing Outlet Assembly shall be paid for under Item 4A;
- 2) All Valves, including couplings and adapters, shall be paid for under the appropriate Item 4;
- 3) All Vitrified Pipe/Concrete Sewer Pipe and Specials or PVC Pipe and Specials shall be paid for under the appropriate Item 5;
- 4) All Brick Masonry shall be paid for under Item 6;
- 5) All Concrete Masonry shall be paid for under Item 7;
- 6) All Valve Box and Manhole/Vault Castings shall be included under the appropriate Item 4, Item 6, or Item 7.
- 7) Steel Casing Pipe shall be paid for under Item 10;
- 8) Cathodic Protection requirements including additional bonded joints and test stations where ordered shall be paid for under Item 11; and
- 9) Shop Drawings, including "as-built" shop drawings shall be paid for under Item 14B.

1-23 ADDITIONAL WORK

A. Due to changes determined necessary in the field to the depth of the water main in order to avoid unforeseen obstructions, or when otherwise required, and as approved by the Director, or the Engineer/Design Engineer, the Contractor shall perform the same, when ordered by the Director or the Engineer/Design Engineer, at unit prices stated as follows:

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1-23 ADDITIONAL WORK (Cont'd)

- 1) Additional excavation in excess of two (2) feet below bottom of trench as originally shown on the Contract Drawings, based on volume as measured by normal width of trench times the excess depth: in rock \$50.00 per cubic yard; in shale \$30.00 per cubic yard; in earth \$15.00 per cubic yard.
- 2) Additional sand backfill \$12.00 per cubic yard;
- 3) Additional premium backfill \$18.00 per cubic yard;
- 4) Additional permanent paving \$23.00 per square yard; and
- 5) Additional breaking and removal of pavement \$12.00 per lineal foot of trench.

Authorization for payment for work performed under paragraph (A) shall be requested in writing by the Contractor and approved by the Engineer/Design Engineer prior to any work being performed. Payment for such additional work performed under paragraph (A) shall be made in accordance with the requirements set forth under Item 15, "Underground Structures."

- B. The Contractor shall place temporary repaving where ordered by the Engineer/Design Engineer. The unit price to be paid for each square yard of temporary repaving where ordered by the Engineer/Design Engineer shall be \$6.00 and shall include the furnishing and removing, spreading and rolling of asphaltic concrete, complete and as specified under Section D-42, "Pavements, Road Surfaces, Berms, Sidewalks, Driveways, Curbing and Underdrains," paragraph I, and the furnishing of all labor, materials, tools and equipment to complete the work as specified, or ordered.
- C. In locations where temporary repaving is not sufficient to meet traffic requirements, the Contractor shall place repaving meeting the specifications of this paragraph, when ordered by the Engineer/Design Engineer. The unit price to be paid for each square yard of this repaving shall be \$15.00 and shall include the furnishing and placing of 7" concrete, complete as specified under Section D-42, "Pavements, Road Surfaces, Berms, Sidewalks, Driveways, Curbing and Underdrains," paragraph N, of these specifications and the furnishing of all labor, materials, tools and equipment to complete the work as ordered.
- D. Work performed under paragraphs (B) and (C) will be requested in writing by the City and only after an estimate for the requested work is provided by the Contractor and is approved by the Engineer/Design Engineer the work shall be performed. Payment for such additional work performed under this paragraphs (B) and (C) shall be requested by the Contractor and shall be made in accordance with the requirements set forth under Section B-34, "Changes or Modifications of Contract."

DETAIL SPECIFICATIONS

PART E - BID ITEMS

ITEM 4

E-4 VALVES

4-1 WORK INCLUDED

Under Item 4, the Contractor shall furnish all the materials for and shall properly set in place and connect at the locations shown on the Contract Drawings, or as directed, valves, all as required for the proper completion of the work included under this contract. In general, this work shall include the furnishing, shop testing, placing, field testing, and painting of valves of the various types, sizes and joint types as herein specified or as ordered, including air relief/flushing outlet valve assembly with valve boxes complete, drain valve with valve box complete, vertical gate valve with valve box complete, horizontal gate valve with bypass valve and valve box complete, pitometer tap assembly, cut-in-valve assembly with valve box complete, tapping sleeve for iron pipe and tapping valve with valve box complete, tapping saddle for concrete pipe and tapping valve with valve box complete, welded tapping hat flange for steel pipe and tapping valve with valve box complete. All valves shall have CWD standard sized operating nuts and all other accessories and appurtenances, including where required valve stem extension (in valve box) and/or valve rod extension (in valve vault) and the furnishing of all labor, tools and appliances necessary to complete the work as specified or as shown. The contractor's attention is herewith directed to Part D, Section D-26, "Work To Be Done By The City," of these specifications.

4-2 DEFINITIONS/STANDARDS

Valves furnished and set in place under this item shall be manufactured in accordance with the applicable AWWA minimum standards and in accordance with the supplemental requirements of these specifications. Size and type of valves shall be as noted on the Contract Drawings and as specified herein or indicated in the Schedule of Bid Items. Standards referenced herein shall be latest revision thereof, except as modified herein:

ANSI/AWWA C111/A21.11-90: RUBBER-GASKET JOINTS FOR DUCTILE-IRON PRESSURE PIPE AND FITTINGS;

ANSI/AWWA C203-91: COAL-TAR PROTECTIVE COATINGS AND LININGS FOR STEEL WATER PIPELINES - ENAMEL AND TAPE - HOT APPLIED;

ANSI/AWWA C500-93: METAL-SEATED GATE VALVES FOR WATER SERVICE SUPPLY;

ASTM A 126-84: SPECIFICATION FOR GRAY-IRON CASTINGS FOR VALVES, FLANGES, AND PIPE FITTINGS;

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4-2 DEFINITIONS/STANDARDS (Cont'd)

ASTM A 193/A 193m-89:	SPECIFICATION FOR ALLOY-STEEL AND STAINLESS STEEL BOLTING MATERIALS FOR HIGH TEMPERATURE SERVICE;
ASTM A 194/A 194m-88:	SPECIFICATION FOR CARBON AND ALLOY STEEL NUTS FOR BOLTS FOR HIGH-PRESSURE AND HIGH-TEMPERATURE SERVICE;
ASTM A 276-89a:	SPECIFICATION FOR STAINLESS AND HEAT-RESISTING STEEL BARS AND SHAPES;
ASTM A 536-84:	SPECIFICATION FOR DUCTILE-IRON CASTINGS;
ASTM B 62-86:	SPECIFICATION FOR COMPOSITION BRONZE OR OUNCE METAL CASTINGS;
ASTM B 98-84:	SPECIFICATION FOR COPPER-SILICON ALLOY ROD, BAR, AND SHAPES;
ASTM B 584-90:	SPECIFICATION FOR COPPER ALLOY SAND CASTINGS FOR GENERAL APPLICATIONS; and
ASTM D 2000-86:	CLASSIFICATION SYSTEM FOR RUBBER PRODUCTS IN AUTOMOTIVE APPLICATIONS;

4-3 GATE VALVES - GENERAL

A. Strength of Valves:

Gate valves, 3" to 12", shall be designed for minimum 200 psi working pressure and gate valves 16" and above for minimum 150 psi working pressure; and shall withstand an internally applied hydrostatic pressure at all points of at least twice the rated working pressure, except as specified in Section 4-6, Paragraph J, "Hydrostatic Tests at Shop". Should tests reveal any weakness, the valves from that design shall be rejected and a new design made.

B. Parts to be Interchangeable:

All parts of valves of the same size and manufacturer shall be perfectly interchangeable and all work shall be done in a thorough and workmanlike manner.

C. Valve Body:

The valve body shall be of short body design. The valve body shall have cast thereon in a conspicuous place the manufacturer's name or initials, rated working pressure, and the year of manufacture. These letters shall be 1/8-inch in relief and of an approved height.

4-3 GATE VALVES - GENERAL (Cont'd)

D. Castings:

All castings, whether of bronze, iron, or steel, shall be sound and smooth without cold shuts, swells, lumps, scabs, blisters, sand holes or other imperfections, and shall be made in accordance with the best modern foundry practice to obtain castings of the best quality and of uniform thickness. No welding, plugging or filling of holes or other defect shall be permitted. For parts whose thickness is less than one (1") inch, castings being thinner than the specified thickness by .06 inch or more shall be rejected; and for parts for whose thickness is one (1") inch or more, castings being thinner than specified by .08 inch or more shall be rejected.

E. Mechanical Joint Ends:

All valves requiring mechanical joint ends shall be furnished with Retained Mechanical Joint ends complete with gaskets and retainer type glands and shall fit the plain-end of all ductile iron pipe, manufactured in conformance with Specifications ANSI/AWWA C111/A21.11-90, "RUBBER-GASKET JOINTS FOR DUCTILE-IRON PRESSURE PIPE AND FITTINGS," including the plain-end of all makes of ductile iron pipe of the push-on joint type.

F. Victaulic Ends:

Victaulic Ends, when required, shall conform to the dimensions given on the Contract Drawings. Victaulic Couplings furnished and installed to connect the valve end to the pipe end shall be included and paid for under the appropriate victaulic end valve item.

G. Flanged Ends:

Flanges shall be faced and drilled. Bolt holes shall be spot faced on the back to secure an even bearing. Spot facing shall be required on the back of valve flanges where such is not parallel to the face of the flange within three (3) degrees as specified in ASME/ANSI B16.1. All spot facing, shall be in accordance with the Manufacturers Standardization Society (MSS) Standard Practices, SP-9. All bolt holes shall be accurately drilled from templates, spaced equal distances apart and shall straddle both the horizontal and vertical axis of the valve, unless special drilling pattern is called for on the detail drawings. Flanges shall be plain faced with a smooth finish. The dimensions and drilling of all end flanges shall conform to the proper drilling pattern. For connecting flanges 12-inch and smaller, ANSI B16.1, 125 lb., and for connecting flanges 16-inch and larger, ANSI B16.1, 125 lb. or ANSI B16.1, 250 lb. for Class 250 valves, unless special drilling is otherwise called for on the Contract Drawings.

Where flanged valve insulators are required at supplemental connections, connecting to existing mains, or where ordered, each of the flange bolt holes shall be increased by 1/16" to accept a bolt insulator sleeve. Contractor's attention is directed to Section E-4, Paragraph 4-20, "Flanged Valve Insulators," of these specifications. In lieu of insulated flanged connections, including the flanged end valve, at supplemental connections the contractor may furnish retained mechanical joint bell end gate valve and install an insulated coupling equal to that manufactured by Smith-Blair Coupling No: 438.

4-4 GATE VALVES - SUPPLEMENTAL REQUIREMENTS

A. Type of Valves:

The gate valves shall be manufactured in full compliance with the ANSI/AWWA C500-93, "METAL-SEATED GATE VALVES FOR WATER SERVICE SUPPLY," or latest revision thereof, and in addition shall comply with the supplementary requirements herein specified. All gate valves shall be of the double-disc parallel seat bottom wedge or side wedge type or double revolving disc parallel seat bottom wedge or side wedge type. All gate valves 20-inches and over in size shall include bypass valves attached thereto. In opening or closing the valve, the gates shall be forced to ascent or descent by reason of the thrust exerted upon the gates directly by the valve stem wrench nut, this thrust being generated by the rotation of the valve stem. In closing the valve, the discs, when opposite the ports, shall be pressed firmly against the body seats by wedges or some other device of equally suitable and approved means.

The design of the mechanical wedging action shall be such that seating force is applied equally to two or more contact points near the outer edge of each disc at or above and below the horizontal centerline of disc. The mechanism shall be designed so that all wedging members are activated at one time. It shall be of the type which will eliminate unbalanced seating pressure and minimize distortion of the discs.

B. Iron Parts:

The valve bodies, covers, discs, frames, etc., of all gate valves 3-inch and over, shall be of cast iron or ductile iron.

C. Vertical and Horizontal Valves:

All gate valves, 16-inch and under, shall be constructed to work vertically. Valves having 20-inch and over waterway shall be constructed to work horizontally.

D. Waterway Opening:

With the gate valve open, an unobstructed waterway shall be afforded; the diameter of which is not to be less than the full nominal diameter of the valve, except where lugs are provided for inserting or removing the body-seat rings. The lugs need not be removed after the valve is assembled.

E. Stuffing Boxes:

The stuffing box on each gate valve 3-inch or over, shall be separate from the dome and fastened to it by bolts. For 2-inch valves and under, the stuffing boxes may be formed in the dome of the valve. Valves 16-inch and smaller, shall be furnished with "O" Ring type seals. The seals shall be fitted with at least two (2) "O" Rings; the lower "O" Ring serving as the pressure seal and the upper "O" Ring as a combined dirt and moisture seal. The "O" Ring shall be compounded to meet ASTM D 2000-86, "CLASSIFICATION SYSTEM FOR RUBBER PRODUCTS IN AUTOMOTIVE APPLICATIONS," and have physical properties suitable for the application.

4-4 GATE VALVES - SUPPLEMENTAL REQUIREMENTS (Cont'd)

The dimensions of the stuffing box flanges shall be of a thickness and uniformity proportioned to fit the various externally applied torque and internal thrust pressure. Bolt holes shall be fitted and of a number such that leaves a sufficient cross sectional area of metal thereby providing satisfactory strength to the upper and lower stuffing box flange.

F. Valve Stem:

The stem shall be of sufficient length to allow the removal of packing without necessitating the removal of the operating nut. The stem opening and thrust bearing recess shall be bronze bushed with two (2) "O" Rings located above the thrust collar and one (1) "O" Ring below forming a lubricant chamber. The number of threads per inch shall be not less than that indicated in ANSI/AWWA C500-93.

G. Valves with Stationary Stems:

All gate valves, unless otherwise ordered, shall be made with single, non-rising stems (NRS).

H. Valves to Open Clockwise, Except 2-inch and Under:

All gate valves 3-inch and over, including bypass valves, shall be made to open by turning in a clockwise direction. Valves 2-inch and under shall be made to open by turning in a counterclockwise direction. All valves to be made so that they can be easily operated.

I. Wrench Caps:

The wrench caps (operating nuts) and retaining nuts on heads of valve stems and pinion shafts shall be of Bronze specification ASTM B 584-90, C.A. 867, "SPECIFICATION FOR COPPER ALLOY SAND CASTINGS FOR GENERAL APPLICATIONS," or Ductile Iron specification ASTM A 536-84, "SPECIFICATION FOR DUCTILE-IRON CASTINGS." On valves 24-inch and over, wrench caps shall be 2-inch square and 2-inch deep. On valves 3-inch thru 20-inch inclusive, they shall be 1-3/4 inch square on top, 1-7/8 inch square at base and 1-3/4 inch deep. On 2-inch valves and under, they shall be 1-1/4 inch square on top, 1-3/8 inch square at base and 1-1/2 inch deep. Machined wrench caps for valves 3-inch to 48-inch inclusive shall be fitted to a machined square stem or pinion shaft and held in place by a retaining nut of Bronze, ASTM B 584-90, C.A. 867. Wrench caps shall have a cut-away skirt to permit easy access to gland bolts. On 1-1/2 inch and 2-inch valves the wrench cap shall be secured to the shaft with a brass pin.

J. Facing of Gates:

All discs of gates and threads for seat rings in the body shall be machined true and any groove or grooves shall be machined in each disc or gate for the reception of the face ring. The rings are to be finished to a true surface. The disc and seat rings shall be securely and rigidly attached to the discs or body seats in a manner approved by the Engineer/Design Engineer.

4-4 GATE VALVES - SUPPLEMENTAL REQUIREMENTS (Cont'd)

K. Outside Screw and Yoke Valves:

Gate valves with outside screw and yokes, shall be made with single rising stems. All outside screw and yoke valves shall be equipped with wheels for operating same. Wheels are to be of cast iron or ductile iron. Wheels shall have cast on them an arrow indicating the direction of turning for opening the valve.

Outside screw and yoke gate valves 6-inch and larger in size shall be provided with two bosses on one side of the body, located on the horizontal centerline of gate valves, to permit the installation of bypass around the gate. Bosses are to be left solid and of ample size to permit drilling and tapping for bypasses.

L. Marking:

All gate valves 3-inch and over shall have the identity of the maker, size and year when made and also the letters "C.W.D." cast upon its body or dome in raised letters or have an permanent bronze tag of sufficient size affixed to the body of the valve with the identity of the maker, size and year when made and the letters "C.W.D." indicated thereon.

4-5 GATE VALVES - 20 INCH AND LARGER

A. Bypasses:

Bypasses on gate valves shall be provided on valves 20-inch and larger. The bypasses shall be located on or below the horizontal centerline of the valves. Bypass valves shall be of the same size as the bypass and shall be double-disc valves conforming to the requirements of these specifications for gate valves. The size requirements of bypasses shall be as follows: 20-inch valves shall be provided with 3-inch bypasses; valves 24-inch thru 30-inch inclusive, shall be provided with 4-inch bypasses; valves 36-inch and 42-inch shall be provided with 6-inch bypasses; and 48-inch valves shall be provided with 8-inch bypasses.

B. Indicators:

All valves 20-inches in diameter and over shall be equipped with indicators denoting the positions of the gate. The moving parts and bearings to be of bronze or bronze-lined.

C. Grease Cases:

All valves 20-inches in diameter and larger shall have watertight grease cases installed. The grease cases shall be of the extended type and shall be made of cast iron conforming to ASTM A 126-84, Class B, "SPECIFICATION FOR GRAY-IRON CASTINGS FOR VALVES, FLANGES, AND PIPE FITTINGS," or any subsequent amendments thereto. Bearing surfaces for valve stem and pinion shaft shall be bronzed bushed with Bronze, Copper ALLOY UNS No: C83600, conforming to ASTM B 62-86, "SPECIFICATION FOR COMPOSITION BRONZE OR OUNCE METAL CASTINGS". The grease cases shall be securely bolted to the valve bonnet through a heavy cast iron yoke. The yoke shall

4-5 GATE VALVES - 20 INCH AND LARGER (Cont'd)

be of sufficient length to provide space for repacking valve and grease case stuffing boxes. All grease cases shall be provided with a removable cover securely bolted in place to allow easy access to the gears. There shall also be provided convenient filling and draining plugs and sufficient oil to fully submerge the pinion gear. The valves shall be furnished and delivered with the grease cases filled with the proper oil as recommended by the manufacturer.

D. Rollers and Scrapers:

In all valves 20-inches in diameter and larger, designed to lie horizontally, each gate or disc shall be provided with two (2) bronze rollers travelling on bronze tracks and provided with suitable bronze scraper; or two stainless steel rollers travelling on stainless steel faced tracks and provided with suitable stainless steel scrapers.

E. Gearing:

All valves 20-inches in diameter and larger shall be equipped with enclosed cut-tooth steel gears. Gears, shafts and bearings shall be such as to produce easy operating without bending or twisting.

4-6 MATERIAL SPECIFICATIONS

A. Bolts and Nuts:

All bolts and nuts on the external valve bodies, valve flanges and tapping flanges shall be made of stainless steel meeting the requirements of ASTM A 276-89a, "SPECIFICATION FOR STAINLESS AND HEAT-RESISTING STEEL BARS AND SHAPES," Type 304 and ASTM A 193/A 193m-89, "SPECIFICATION FOR ALLOY-STEEL AND STAINLESS STEEL BOLTING MATERIALS FOR HIGH TEMPERATURE SERVICE," Heavy Hex, and ASTM A 194/A 194m-88, "SPECIFICATION FOR CARBON AND ALLOY STEEL NUTS FOR BOLTS FOR HIGH-PRESSURE AND HIGH-TEMPERATURE SERVICE," Heavy Hex.

B. Bronze Parts:

All grades of bronze shall be in accordance with ANSI/AWWA C500-93, "METAL-SEATED GATE VALVES FOR WATER SERVICE SUPPLY," unless otherwise specified herein.

C. Cast Iron:

Cast iron shall conform to ASTM specification A 126-84, Class B, "SPECIFICATION FOR GRAY IRON CASTINGS FOR VALVES, FLANGES, AND PIPE FITTINGS," or latest revision thereof. All iron castings shall be tough and without brittleness, such as may be cut, drilled and chipped by hand with due ease. A blow from a hammer shall produce an indentation on the edge of the casting without flaking the metal.

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4-6 MATERIAL SPECIFICATIONS (Cont'd)

D. Ductile Iron:

Ductile Iron shall conform to ASTM specification A 536-84, "SPECIFICATION FOR DUCTILE-IRON CASTINGS," or latest revision thereof. All iron castings shall be tough and without brittleness, such as may be cut, drilled and chipped by hand with due ease. A blow from a hammer shall produce an indentation on the edge of the casting without flaking the metal.

E. Silicon Bronze:

Bronze shall conform to ASTM specification B 98-84, Alloy 655, "SPECIFICATION FOR COPPER-SILICON ALLOY ROD, BAR, AND SHAPES."

F. Stainless Steel:

Stainless steel shall conform to ASTM specification A 276-89a, Type 304 and Type 316, "SPECIFICATION FOR STAINLESS AND HEAT-RESISTING STEEL BARS AND SHAPES."

G. Other Materials:

All other materials used in the manufacture of these valves and not specified in the specifications, shall be of the best quality of their respective kinds, and subject to inspection, tests, and approval by the Engineer/Design Engineer.

H. Chemical Analysis:

Chemical analysis of the material used shall be furnished by the Contractor to the Engineer/Design Engineer whenever required.

I. Cleaning of Castings:

All iron castings shall be thoroughly cleaned on the outside and inside surfaces and protected from rain or moisture until they are painted.

J. Hydrostatic Tests at Shop:

All gate valves shall be tested in the shop by hydrostatic pressure, by closing the valve and applying the required test pressure in the body and dome of the valve as specified below:

3" thru 12"	400 psi. -	No time requirement;
14" thru 20"	300 psi. -	for 15 minutes, drop pressure to 150 psi, then elevate again to 300 psi for 15 minutes, a total of 1/2 hour;
24" thru 48"	300 psi -	for 1/2 hour, drop pressure to 150 psi, then elevate again to 300 psi for 30 minutes, a total of 1 hour.

4-6 MATERIAL SPECIFICATIONS (Cont'd)

This is modification of Section 5.1.2.1 and Section 5.1.2.2 of the Standard, ANSI/AWWA C 500-93. All leaks, flaws or other defects developed in making these tests shall be corrected to the satisfaction of the Engineer/Design Engineer or the entire piece shall be rejected. After testing, all valves shall be thoroughly drained. All equipment for testing and all tests shall be made at the Contractor's expense.

The Contractor shall include with each valve three (3) certified copies of reports showing the results of all shop tests, and a brief description of how the tests were performed.

K. Performance Tests:

To demonstrate the free and perfect functioning of all parts of the valves in their intended manner, prior their installation, the Contractor shall make a performance test by operating each valve, in the position that the valve will assume in service, and for the full length of gate travel in both directions. Any defects of workmanship of the valves and/or with functioning parts thereof shall be corrected by the Contractor at his expense, to the satisfaction of the Engineer/Design Engineer, and the test repeated until satisfactory performance is demonstrated.

4-7 AIR RELIEF/FLUSHING OUTLET VALVE ASSEMBLY WITH VALVE BOXES COMPLETE

Each "2" Air Relief/Flushing Outlet Valve Assembly Complete" shall consist of a 2-inch bronze ball angle meter valve (F.I.P. x Meter Flange), 2-inch iron pipe threaded meter companion flange, and a 2-inch extra heavy brass "Close" (2-inch long) nipple, tapered at each end. The bronze 2-inch air relief ball angle meter valve shall be rated for minimum 300 psi working pressure and be equal in all respects to the 2-inch ball angle meter valve manufactured by Ford Meter Box Co. No: BFA13-777W; A.Y. McDonald Mfg. Co. No: 4604B; or Mueller Co. No: B-24286. The threaded meter companion flange shall also be rated for minimum 300 psi working pressure. The Air Relief/Flushing Outlet Valve Assembly shall also include all 2" Galvanized Black Iron Pipe and Brass Pipe as required and specified in Section E-9, "2-INCH GALVANIZED BLACK IRON AND BRASS PIPE" and all Valve Boxes as required and specified in Section E-8, "MISCELLANEOUS METAL." The Air Relief/Flushing Outlet Valve Assembly with Valve Boxes Complete shall conform with the details shown on the Contract Drawings.

Payment for each "2" Air Relief/Flushing Outlet Valve Assembly Complete" shall be made under Item 4 and shall include: a 2-inch bronze ball angle meter valve (F.I.P. x Meter Flange); a 2-inch iron pipe threaded meter companion flange; a 2-inch extra heavy brass "Close" (2-inch long) nipple, tapered at each end; all 2" Galvanized Black Iron Pipe and Brass Pipe, including all fittings; and a Double Valve Box Assembly.

4-8 DRAIN VALVE WITH VALVE BOX COMPLETE

Contractor shall furnish and install "Drain Valve with Valve Box Complete" at the locations shown on the Contract Drawings or where ordered. Drain valve shall be double-disc gate valve conforming with these specifications for vertical gate valves, including the supplemental requirements thereof as specified herein.

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4-8 DRAIN VALVE WITH VALVE BOX COMPLETE (Cont'd)

For Ductile Iron Pipe and Fittings, furnished under Item 1, the double-disc gate drain valve shall have Retained Mechanical Joint Bell Ends connected to the supply main piping in accordance with the drain assembly detail for ductile iron pipe shown on the Standard Detail Drawings. For Prestressed Concrete Cylinder Pipe and Fittings, furnished under Item 2, or Steel Pipe and Fittings, furnished under Item 3, the double-disc gate drain valve shall have either Flanged by Flanged Ends or Flanged by Retained Mechanical Joint Bell End, connected to the supply main piping in accordance with the drain assembly details for concrete and steel pipe shown on the Standard Detail Drawings.

Drain Valve shall be of the size shown on the Standard Detail Drawings for the various size water main installed and shall be furnished and installed with valve box complete, properly set in place. All drain valves shall be furnished and installed with a valve stem extension of the proper length conforming to the detail shown on the Standard Detail Drawings.

Payment for each "Drain Valve with Valve Box Complete" shall be made under Item 4 and shall include a vertical gate valve; a valve box complete; and a valve stem extension of the proper length. Payment for the drain vault shall be made under Item 6, "Brick Masonry and Vault/Manhole Structures."

4-9 VERTICAL GATE VALVE WITH VALVE BOX COMPLETE

Contractor shall furnish and install "Gate Valve with Valve Box Complete" at the locations shown on the Contract Drawings or where ordered. Gate valve shall be a double-disc valve conforming with these specifications for vertical gate valves, including the supplemental requirements thereof as specified herein.

Gate Valves shall be of the size and joint type shown on the Contract Drawings and noted in the Schedule of Bid Items and shall be furnished and installed with valve box complete, properly set in place. Where depth of water main is such where top of the valve operating nut exceeds four (4) foot depth the gate valve shall be furnished and installed with a valve stem extension of the proper length conforming to the detail shown on the Standard Detail Drawings.

Payment for each "Valve with Valve Box Complete," classified as to size and joint type, shall be made under Item 4 and shall include a vertical gate valve; a valve box complete; and, if so required, a valve stem extension of the proper length.

4-10 HORIZONTAL GATE VALVE WITH BYPASS VALVE AND VALVE BOX COMPLETE

Contractor shall furnish and install "Horizontal Gate Valve with Bypass Valve and Valve Box Complete" at the locations shown on the Contract Drawings or where ordered. Horizontal Gate valve shall be double-disc gate valve conforming with these specifications for horizontal gate valves, including the supplemental requirements thereof as specified herein.

On Ductile Iron Pipe and Fittings, furnished under Item 1, where the working pressure does not exceed 150 psi, the double-disc horizontal gate valve shall have Retained Mechanical Joint Bell

4-10 HORIZONTAL GATE VALVE WITH BYPASS VALVE AND VALVE BOX COMPLETE
(Cont'd)

Ends with shorts and mechanical joint solid sleeves to connect to the water supply main piping. In lieu of retained mechanical bell end valves, Contractor may furnish Victaulic End Valves with shouldered pipe ends or victaulic adapters; or Flanged End Valves with flanged adapters, to connect to the supply main piping in accordance with the valve assembly detail for ductile iron pipe shown on the Standard Detail Drawings. On Prestressed Concrete Cylinder Pipe and Fittings, furnished under Item 2, or Steel Pipe and Fittings, furnished under Item 3, where the working pressure does not exceed 150 psi, the double-disc horizontal gate valve shall have Victaulic Ends with victaulic adapters or, in lieu thereof, be furnished with Flanged Ends with flanged adapters, connected to the supply main piping in accordance with the valve assembly details for concrete and steel pipe shown on the Standard Detail Drawings. Where working pressure exceeds 150 psi all horizontal gate valves on ductile iron pipe, prestressed concrete cylinder pipe and steel pipe shall be furnished with flanged ends.

Horizontal Gate Valves shall be of the size shown on the Contract Drawings and noted in the Schedule of Bid Items and shall be furnished and installed with valve box complete, properly set in place over the bypass valve. Where depth of water main is such where top of the valve operating nuts exceeds four (4) foot depth the horizontal gate valve shall be furnished and installed with a valve stem/rod extension, secured to the valve vault walls, of the proper length and as shown on the Standard Detail Drawings, and the bypass gate valve shall be furnished and installed with a valve stem extension, of the proper length conforming to the detail shown on the Standard Detail Drawings.

Payment for each "Horizontal Gate Valve with Bypass Valve and Valve Box Complete," classified as to size, shall be made under Item 4 and shall include a horizontal gate valve; couplings and/or adapters; a bypass valve with valve box complete; and, if so required, a valve stem/rod extensions of the proper length. Payment for the valve vault shall be made under Item 6, "Brick Masonry and Vault/Manhole Structures."

4-11 PITOMETER TAP ASSEMBLY COMPLETE

Where shown on the Contract Drawings, or where ordered, the Contractor shall furnish and install "2" Pitometer Tap Assembly Complete." Pitometer taps shall be installed out of 2" iron pipe threaded (NPT) outlets furnished with and paid for as part of the appropriate pipe item. Pitometer Tap Assembly Complete shall consist of a 2" to 1" bronze bushing and a 1" bronze corporation valve.

Payment for furnishing and installing each "2" Pitometer Tap Assembly Complete" shall be made under Item 4 and shall include a 2" to 1" bronze bushing and a 1" bronze corporation valve. Payment for furnishing and installing the pitometer vault shall be made under Item 7, "Concrete Masonry and Vault/Manhole Structures."

4-12 CUT-IN-VALVE ASSEMBLY WITH VALVE BOX COMPLETE

Where shown on the Contract Drawings, or where ordered, the Contractor shall install under supervision of the Division of Water, "Cut-in-Valve Assembly Complete with Valve Box Complete." The Division of Water will determine the time of installation. The Contractor shall furnish all materials in accordance with these specifications and shall do all pipe cutting as required.

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4-12 CUT-IN-VALVE ASSEMBLY WITH VALVE BOX COMPLETE (Cont'd)

The Contractor's attention is herewith directed to Part D, Section D-26, "Work to be Done By the City," paragraph B, pertaining to cutting pipe. The Contractor shall furnish and install a retained mechanical joint bell end gate valve, valve box complete, either retained mechanical joint solid sleeves (long pattern) or compression couplings equal to Dresser Style No. 38, 138 or 162 or Smith-Blair No. 441, having stainless steel bolts and nuts (ASTM A276/ASTM A193/ASTM A194, Type 304, Heavy Hex), ductile iron pipe shorts and, if required, a valve stem extension. The compression couplings shall be furnished without pipe stops and be rated for a minimum working pressure of 250 psi. The Contractor shall perform all excavation, provide sheeting and bracing as required, perform all backfilling as specified, seeding and sodding, sidewalk replacement, pavement replacement (both temporary and permanent) or other incidentals necessary to complete the work.

Payment for each "Cut-in-Valve Assembly Complete with Valve Box Complete," classified as to size, shall be made under Item 4 and shall include a vertical gate valve; a valve box complete; a valve stem extension of the proper length, if so required; ductile iron class 52 cement lined pipe; and retained mechanical joint solid sleeves (long pattern) or compression couplings.

4-13 TAPPING SLEEVE FOR IRON PIPE & TAPPING VALVE W/VALVE BOX COMPLETE

- A. Tapping Sleeve: Tapping sleeve shall be properly sized to fit the existing cast/ductile iron pipe to be tapped. The outside diameter of the existing pipe shall be determined by the field measurements made by the Contractor.
1. Compression Type Tapping Sleeve: Tapping sleeves for cast/ductile iron pipe sizes to 16-inches shall be of a two (2) part Ductile-iron Bolted Compression Seal type with sealing gasket of rubber compressed by outlet half of bolted sleeve and internal pipe pressure. Maximum outlet size shall be one (1) nominal pipe diameter less than pipe to be tapped. Back half of bolted tapping sleeve shall be one (1) piece section and have provision for support and locking action.
 2. Mechanical Joint Type Tapping Sleeve: Tapping sleeves for cast/ductile pipe shall be of Gray or Ductile Cast Iron two (2) part bolted type having Ductile-Iron Split-Gland Mechanical Joint Ends. Bolts and nuts used for the tapping sleeve shall be copper bearing ductile iron or equivalent high-strength, low-alloy corrosion resistant steel.
 3. Tapping Sleeve Outlet: Outlet of tapping sleeve shall be flanged to receive flanged end of the tapping valve and shall be designed to safely withstand a minimum working pressure of 150 psi and a minimum test pressure of 250 psi. Outlet of tapping sleeve shall be furnished with a drilled and tapped iron pipe thread and plugged in the shop with Gray or Ductile-Iron threaded plug, before shipment. Iron pipe threaded outlet shall be for tapping sleeve installation pressure test before tapping. Tapping sleeve assembly shall be tested using a blind flange to the pressures noted in Part D, Section D-3, "General Notes," before tapping valve is installed. Bolting material for tapping sleeve shall meet the requirements for valves.

4-13 TAPPING SLEEVE FOR IRON PIPE & TAPPING VALVE W/VALVE BOX COMPLETE
(Cont'd)

B. Tapping Valve:

Tapping valve shall meet the specifications for Gate Valves (see Section 4-3 and Section 4-4) except that oversized seat rings shall be provided to permit the use of full sized cutters through the valve. One end of the tapping valve shall be flanged to mate with the tapping sleeve. The outlet end of the tapping valve shall be provided with special provisions for bolting onto the tapping machine. Outlet end of tapping valve shall be as shown on the Contract Drawings or as indicated in the Schedule of Bid Items.

All bolts and nuts on the external valve bodies of all tapping valves, including those mating the sleeve to the tapping valve flange, shall be made of Stainless Steel: ASTM A 276-89a, Type 304, "SPECIFICATION FOR STAINLESS AND HEAT-RESISTING SHEET BARS AND SHAPES" and ASTM A 193/A 193m-89, "ALLOY-STEEL and STAINLESS STEEL BOLTING MATERIALS FOR HIGH TEMPERATURE SERVICE," Heavy Hex, and ASTM A 194/A 194m-88, "SPECIFICATION FOR CARBON AND ALLOY STEEL NUTS FOR BOLTS FOR HIGH-PRESSURE AND HIGH-TEMPERATURE SERVICE," Heavy Hex.

C. Installation:

1. The existing cast/ductile iron pipe to be tapped shall be thoroughly cleaned in the area to be covered by the tapping sleeve. The sleeve shall be properly installed in position and the bolts tightened.
2. All exposed ferrous metal surfaces of buried tapping sleeves and valves, shall, after installation, be cleaned and painted with two (2) field coats of coal tar pitch paint equal to Koppers Bitumastic Super Tank Solution. Painting shall be according to Sec. 4-17, "Painting." Mechanical joint type tapping sleeve and mechanical joint valve bell ends shall be polyethylene encased.
3. See Part D, Detail Specifications, Section D-26, "Work To Be Done By the City".
4. Where depth of water main is such where top of the valve operating nut exceeds four (4) foot depth the installation of the tapping gate valve shall include the furnishing and installing of a valve stem extension of the proper length conforming to the detail shown on the Standard Detail Drawings.

D. Payment:

Payment for each "Tapping Sleeve and Tapping Gate Valve with Valve Box Complete," classified as to size, shall be made under Item 4 and shall include a ductile iron mechanical joint tapping sleeve; a vertical gate tapping valve; a valve box complete; a valve stem extension of the proper length, if so required; and all arrangements required for the tapping of the water main.

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4-14 TAPPING SADDLE/SLEEVE FOR CONCRETE/IRON PIPE & TAPPING VALVE FOR SUPPLY MAINS

A. Tapping Saddle/Sleeve:

1. On water supply mains, 20-inch and larger the tapping saddle/sleeve shall be properly sized to fit the existing concrete/iron pipe to be tapped. The outside diameter of the existing pipe shall be determined by the field measurements made by the Contractor.
2. Tapping Saddle/Sleeve Outlet: Outlet of tapping sleeve shall be flanged to receive flange end of tapping valve and shall be designed to safely withstand a working pressure of 150 psi and test pressure of 250 psi. Outlet of tapping saddle/sleeve shall be furnished with a drilled and tapped iron pipe thread and plugged in the shop with Gray or Ductile-Iron threaded plug, before shipment. Iron pipe threaded outlet shall be for tapping sleeve installation pressure test before tapping. Tapping saddle/sleeve assembly shall be tested using a blind flange to the pressures noted in Part D, Section D-3, "General Notes," before tapping valve is installed. All bolting material and saddle straps used in assembly of the tapping saddle/sleeve shall be made of Stainless Steel: ASTM A 276-89a, Type 304, "SPECIFICATION FOR STAINLESS AND HEAT-RESISTING SHEET BARS AND SHAPES." Bolts and nuts shall also conform with ASTM A 193/A 193m-89, "ALLOY-STEEL and STAINLESS STEEL BOLTING MATERIALS FOR HIGH TEMPERATURE SERVICE," Heavy Hex, and ASTM A 194/A 194m-88, "SPECIFICATION FOR CARBON AND ALLOY STEEL NUTS FOR BOLTS FOR HIGH-PRESSURE AND HIGH-TEMPERATURE SERVICE," Heavy Hex.

B. Tapping Valves:

Tapping valves on pipe sizes 20-inch and larger shall meet the specifications (including pressure rating) for Gate Valves except that oversized seat rings shall be provided to permit the use of full sized cutters through the valve. One end of the tapping valve shall be flanged to mate with the tapping saddle. The outlet end of the tapping valve shall be provided with special provisions for bolting onto the tapping machine. Outlet end of tapping valve shall be as shown on the Contract Drawings or indicated in the Schedule of Bid Items.

All bolts and nuts on the external valve bodies of all tapping valves, including those mating the sleeve to the tapping valve flange, shall be made of stainless steel: ASTM A 276-89a, Type 304, "SPECIFICATION FOR STAINLESS AND HEAT-RESISTING SHEET BARS AND SHAPES," and ASTM A 193/A 193m-89, "ALLOY-STEEL and STAINLESS STEEL BOLTING MATERIALS FOR HIGH TEMPERATURE SERVICE," Heavy Hex, and ASTM A 194/A 194m-88, "SPECIFICATION FOR CARBON AND ALLOY STEEL NUTS FOR BOLTS FOR HIGH-PRESSURE AND HIGH-TEMPERATURE SERVICE."

C. Installation:

1. The existing concrete/iron pipe to be tapped shall be thoroughly cleaned in the area to be covered by the tapping saddle/sleeve. The saddle/sleeve shall be properly installed in position and the bolts tightened.

4-14 TAPPING SADDLE/SLEEVE FOR CONCRETE/IRON PIPE & TAPPING VALVE FOR SUPPLY MAINS (Cont'd)

2. All exposed ferrous metal surfaces of buried tapping saddles/sleeves on concrete/iron pipe shall be coated with a minimum of two (2) inches of a non-shrinking grout provided and installed by the contractor; valves, shall, after installation, be cleaned and painted with two (2) field coats of coal tar pitch paint equal to Koppers Bitumastic Super Tank Solution. Painting shall be according to Sec. 4-17, "Painting."
3. See Part D, Detail Specifications, Section D-26, "Work To Be Done By the City".
4. Where depth of water main is such where top of the valve operating nut exceeds four (4) foot depth the installation of the tapping gate valve shall include the furnishing and installing of a valve stem extension of the proper length conforming to the detail shown on the Standard Detail Drawings.

D. Payment:

Payment for each "Tapping Saddle/Sleeve and Tapping Gate Valve Complete," classified as to size, shall be made under Item 4 and shall include a tapping saddle for concrete pipe or a ductile iron mechanical joint tapping sleeve for iron pipe; a vertical or horizontal gate tapping valve; bypass gate valve with a valve box complete, if so required; a valve stem extension of the proper length, if so required; and all arrangements required for the tapping of the water main. Valve vaults shall be of the type and size shown on the Standard Detail Drawings and shall include Manhole Frame and Cover Complete, steps and other necessary incidentals. Valve Vault shall be paid for under Item 6, "Brick Masonry and Vault/Manhole Structures."

4-15 WELDED TAPPING HAT FLANGE FOR STEEL PIPE AND TAPPING VALVE WITH VALVE BOX COMPLETE

A. Hat Flange and Tapping Saddle:

Where connecting or tapping to existing steel pipe is required the Contractor shall furnish and install a welded hat flange with tapping saddle. The tapping saddle shall be properly sized to fit the existing steel pipe to be tapped. The outside diameter of the existing pipe shall be determined by field measurements made by the Contractor. The tapping hat flange shall have an outlet flange sized to receive the tapping valve and shall conform with the details provided in the Contract Drawing. The welded hat flange shall be of steel, and shall be rated for 250 test pressure and a minimum working pressure of 150 psi. Tapping hat flange assembly shall be tested using a blind flange to the pressures noted in Part D, Section D-3, "General Notes," before tapping valve is installed.

All exposed ferrous metal surfaces of existing pipe, tapping hat flange and valve, shall, after installation, be cleaned and painted with two (2) field coats of coal tar pitch paint equal to Koppers Bitumastic Supertank Solution in accordance with ANSI/AWWA C203-91, "COAL-TAR PROTECTIVE COATINGS AND LININGS FOR STEEL WATER PIPELINES - ENAMEL AND TAPE - HOT APPLIED."

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4-15 WELDED TAPPING HAT FLANGE FOR STEEL PIPE AND TAPPING VALVE WITH VALVE BOX COMPLETE (Cont'd)

B. Tapping Valves:

Tapping valves on pipe sizes 20-inch and larger shall meet the specifications for Gate Valves except that oversized seat rings shall be provided to permit the use of full sized cutters through the valve. One end of the tapping valve shall be flanged to mate with the tapping saddle. The outlet end of the tapping valve shall be provided with special provisions for bolting onto the tapping machine. Outlet end of tapping valve shall be as shown on the Contract Drawings or as specified.

All bolts and nuts on the external valve bodies of all tapping valves, including those mating the sleeve to the tapping valve flange, shall be made of Stainless Steel: ASTM A 276-89a, Type 304, "SPECIFICATION FOR STAINLESS AND HEAT-RESISTING SHEET BARS AND SHAPES," and ASTM A 193/A 193m-89, "ALLOY-STEEL and STAINLESS STEEL BOLTING MATERIALS FOR HIGH TEMPERATURE SERVICE," Heavy Hex, and ASTM A 194/A 194m-88, "SPECIFICATION FOR CARBON AND ALLOY STEEL NUTS FOR BOLTS FOR HIGH-PRESSURE AND HIGH-TEMPERATURE SERVICE," Heavy Hex.

C. Installation:

1. The existing steel pipe to be tapped shall be thoroughly cleaned in the area to be covered by the tapping hat flange. The saddle shall be properly installed in position and the bolts tightened.
2. All exposed ferrous metal surfaces of buried hat flange, tapping saddle, and tapping valve and bypass valve, shall, after installation, be cleaned and painted with two (2) field coats of coal tar pitch paint equal to Koppers Bitumastic Super Tank Solution. Painting shall be according to Section 4-17, "Painting".
3. See Part D, Detail Specifications, Section D-16, "Work to be Done by the City".
4. Where depth of water main is such where top of the valve operating nut exceeds four (4) foot depth the installation of the tapping gate valve shall include the furnishing and installing of a valve stem extension of the proper length conforming to the detail shown on the Standard Detail Drawings.

D. Payment:

Payment for each "Welded Tapping Hat Flange and Tapping Gate Valve Complete", classified as to size, shall be made under Item 4 and shall include a welded tapping hat flange for steel pipe; a vertical or horizontal gate tapping valve; bypass gate valve with a valve box complete, if so required; a valve stem extension of the proper length, if so required; and all arrangements required for the tapping of the water main. Valve vaults shall be of the type and size shown on the Standard Detail Drawings and shall include Manhole Frame and Cover Complete, steps and other necessary incidentals. Valve Vault shall be paid for under Item 6, "Brick Masonry and Vault/Manhole Structures."

4-16 PLACING AND TESTING

- A. All valves shall be tested accurately and carefully placed to the lines and grades given. All connections to pipe shall have the necessary mechanical joint, victaulic, or flanged ends as required.
- B. After the valves are set in place and ready to operate, the Contractor shall pressure test them under the test pressure and conditions specified under paragraph D-3, "General Conditions." Any valve found to leak shall be made watertight and, if found to be of faulty design, shall be satisfactorily repaired or replaced, to the satisfaction of the Engineer/Design Engineer, by the Contractor at his expense.
- C. All buried gate valves shall be furnished complete with valve boxes vertically set plumb and set to grade.

4-17 PAINTING

- A. The body of all iron valves shall either be dipped in coal tar rich paint and all bronze internal parts cleaned, or after passing the hydraulic test, the iron bodied valves shall be given at least two (2) coats of approved paint.
- B. All interior or exterior ferrous metal surfaces, except machine surfaces, shall be thoroughly cleaned of all rust, wire brushed and washed with benzene before painting or coating.
- C. After installation, all exposed metal surfaces of valves except brass or bronze shall be painted with two (2) field coats of coal tar pitch paint equal to Koppers Bitumastic Super Tank Solution.

4-18 INSPECTION

The Engineer/Design Engineer, or his authorized designate, will inspect the material and work done, as the interest of the City may require. Such officer shall have unrestricted access to the Contractor's plant, and to all parts of the work and other places at which the preparation of the material and the construction of the different parts of the work to be done under these specifications are carried on, and he shall receive all facilities and assistance to carry out his work of inspection and testing, in a manner satisfactory to the Engineer/Design Engineer. Such inspection shall not relieve the Contractor from any obligation to perform said work strictly in accordance with the specifications, or any modifications thereof, as herein provided, and work not so constructed shall be removed and made good by the Contractor, at his own expense.

4-19 DATA WITH PROPOSALS

Proposals shall be accompanied by drawings furnished by the manufacturer, fully and distinctly illustrating, describing and giving the weight of each of the valves proposed to be furnished. Valve drawings previously approved and on file with Division of Water need not be furnished in proposal but shall be required as submittal for approval as describe in Section 4-21 "Drawings".

4-20 FLANGED VALVE INSULATORS

The Contractor shall furnish, where required, flanged valve insulators. All of the flanged bolt holes on each of the two (2) flanges of the valve shall be increased by 1/16 inch in diameter to accept the bolt insulator sleeves. The bolt insulator sleeve shall extend for the full thickness of the two (2) mating flanges. The drilling of the enlarged flange bolt holes shall be done by the valve manufacturer in the shop.

Flange insulating materials for each flange shall be provided at each of the supplemental connections, and/or where ordered, and shall include the following:

- 1) Two (2) full faced insulating flange gaskets of Pyrox 1E glass reinforced epoxy, 1/8 inch thick;
- 2) One full length mylar bolt insulating sleeve, 1/32 inch thick, for each flange bolt on each of the two (2) valve flanges;
- 3) Two (2) flat phenolic laminate insulating washers, 1/8 inch thick, for each flange bolt on each of the two (2) valve flanges;
- 4) Two (2) flat steel washers, 1/8 inch thick, for each flange bolt on each of the two (2) valve flanges. The outside diameter of the insulating washer shall not be less than the outside diameter of the steel washer.

Flange insulator sizes shall be as required for the type and size flanges specified herein or as shown on the detail drawings for each of the insulated flange locations required.

Test to verify the integrity of the insulated flanged valve installations shall be performed by the Contractor. The Contractor shall provide all necessary equipment, materials, and labor for the performance of the tests. If the tests indicate that an insulating flanged connection is not providing satisfactory isolation of connecting piping, the Contractor shall perform additional tests and work as required to locate and correct any such deficiencies that may exist.

Payment for the furnishing and installation of the flanged valve insulators shall be included, under Item 4, with the appropriate insulated flanged valve to be bid as indicated in the Schedule of Bid Items. Payment for the performance and all necessary equipment, materials and labor for the testing for the acceptability of the insulated flanged valve connections shall be included in the appropriate testing made under Item 11, "Cathodic Protection."

4-21 DRAWINGS

- A. The Contractor shall submit to the Engineer/Design Engineer for review and/or approval eight (8) sets of prints of all shop drawings for valves. These shop drawings shall be manufacturer's generated complete working, detail, and fully dimensioned drawings showing thicknesses, weight, direction of turning, type and specification of materials, and of similar information. No work shall be done in the shop or in the field until after the shop drawings have been approved.

4-21 DRAWINGS (Cont'd)

- B. Two (2) sets each of the valve shop drawings submitted will be returned to the Contractor with the criticisms or approval of the Engineer/Design Engineer. In case the drawings are not approved, the Contractor shall again submit for review and/or approval, eight (8) complete sets of revised valve shop drawings. After the shop drawings have been finally approved, the Contractor shall furnish to the Engineer/Design Engineer a sufficient number of additional sets of shop drawings, on paper, for his use and for the City's internal distribution. No work shall be done in the shop or in the field until all of the shop drawings have been finally approved.
- C. Finally, the Contractor shall furnish the City one (1) mylar or reproducible cloth tracing of each of the approved valve shop drawings. Mylar tracings shall be submitted as specified under Part E, Section 14-2, "Shop Drawings," paragraph E.
- D. The approval of the valve shop drawings by the Engineer/Design Engineer shall not relieve the Contractor of any of his obligations in connection with this contract, including the material and performance requirements thereof.

4-22 PAYMENT

The unit price stipulated to be paid for Item 4, "Valves," classified as to size and type, shall include the furnishing, shop testing, placing, field testing and painting of the valves of the various sizes and joint types herein specified or as ordered, including air relief/flushing outlet valve assembly with valve boxes complete, drain valve with valve box complete, vertical gate valve with valve box complete, horizontal gate valve with bypass valve and valve box complete, pitometer tap assembly, cut-in-valve assembly with valve box complete, tapping sleeve for iron pipe and tapping valve with valve box complete, tapping saddle for concrete pipe and tapping valve with valve box complete, welded tapping hat flange for steel pipe and tapping valve with valve box complete, flanged valve insulator, operating nuts, valve stem extension when required and other accessories and appurtenances and the furnishing of all labor, tools and appliances necessary to complete the work as specified or as shown. Payment for the furnishing and placing of valves under this item shall also include providing all traffic maintenance; providing and maintaining traffic control and warning devices, including temporary and permanent pavement markings; pavement cutting (both for trench and for pavement removal and restoration); all excavations, including pavements, water main trench, and sewer and/or utility trenches; sheeting and shoring, including use of trench box; all shop drawing submittals; the furnishing and installing of all approved materials as herein specified and as required to complete the work; sand bedding backfill; backfill and/or premium backfill; hydrostatic pressure testing of the water main and all appurtenances and the repair and/or replacement of materials due leakage or defects; assisting in the chlorination and flushing procedures; pavement replacement, including base pavement replacement, berm replacement/repair and shoulder replacement/repair; final pavement restoration, including traffic markings, signs and traffic loop detectors; protection of trees, shrubbery and lawns and/or their removal and replacement; seeding and/or sodding; sidewalk removal and replacement; curb removal and replacement; underdrain removal and replacement; removal and replacement of mailboxes; removal and replacement of drainage culverts and/or piping; fence removal and replacement; guard rail removal and replacement; storm and sanitary sewer work; storm and sanitary sewer

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4-22 PAYMENT (Cont'd)

connection work; protecting and maintaining utilities and utility services; repair of site damage due to construction, including traffic maintenance; final site restoration. The furnishing for review and approval of shop drawings shall be paid for under Item 14-2, "Shop Drawings," and the furnishing of the mylar "as-built" drawings shall be paid for under Item 14-3, "As-Built Drawings." Furnishing and installation of Valve Vaults shall be paid for under Item 6, "Brick Masonry and Vault/Manhole Structures."

DETAIL SPECIFICATIONS

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ITEM 8

E-8 MISCELLANEOUS METAL WORK

8-1 WORK INCLUDED

- A. The Contractor shall, under Item 8, furnish and install all miscellaneous metal work which is required for the proper completion of the work included under this contract and is not specifically included under other items of these specifications.
- B. In general, Miscellaneous Metal, furnished and installed under Item 8, or furnished and installed in conjunction with other items of work, shall include manhole steps, valve boxes, extension stems and brace, manhole/vault castings, structural members, bolting material, reinforcing steel and other similar metal items required for the proper completion of the work. All miscellaneous metal work furnished and installed shall be in accordance with this specification.

8-2 CASTINGS

- A. Manhole Frames and Covers shall be of gray iron castings, be smooth and free from blow holes and other defects, and shall conform to the dimensions given on the Standard Detail Drawings, and meet the requirements of ASTM A 48-83, "SPECIFICATION FOR GRAY IRON CASTINGS," Class 30C. All castings shall be true and where required shall fit properly together. The contact surfaces of the frames and covers for manholes and openings shall be chipped and machined if necessary, in order to give an even bearing for the cover on the frame, and to render them tight. Where required, the surfaces of plates and covers shall be cast with suitable checkered or other raised pattern.
- B. Cast Iron Valves Boxes and Covers shall be of gray iron castings, in which appearance and dimension tolerances are primary considerations and strength is not a primary or major consideration. Castings shall meet the requirements of ASTM A 48-83, "SPECIFICATION FOR GRAY IRON CASTINGS," with no specific requirement as to Class. Chemical composition shall not be considered, but the material shall be of good quality and of such character as shall make the metal of the castings strong, tough and of even grain. The metal shall be made without any admixture of cinder iron or other inferior metal.
- C. Workmanship and finish shall conform substantially to the dimensions and weights shown on the Standard Detail Drawings. The castings or moldings shall be free from injurious defects, cracks, gas holes, flaws, and excessive shrinkage. Additional inspection shall be made at the work site. Inspection shall be visual inspection for appearance and surface smoothness in comparison with samples accepted as standard.

8-2 CASTINGS (Cont'd)

Sample castings or moldings from each pattern, when required by the Engineer/Design Engineer, shall be submitted by the manufacturer for the purpose of establishing standards of appearance and dimensional tolerances. The manufacturer shall certify that his product conforms to these specifications. Each certification so furnished shall be signed by an authorized agent of the manufacturer.

8-3 MATERIALS

- A. Steel: Unless specified otherwise, all steel furnished and installed shall meet the requirements ASTM A-36-93a, "SPECIFICATION FOR STRUCTURAL STEEL."
- B. Galvanized Coatings: Where iron or steel is shown galvanized, cadmium plated, parkerized or otherwise treated, or where such is so ordered, no additional allowance will be made for such treatment, but the cost thereof shall be deemed to be included in the price bid per the appropriate item of work or bid per pound of Miscellaneous Metal Work furnished and installed under this item. All metal to be galvanized shall be thoroughly cleaned, by immersion in pickling liquors. Galvanizing shall be performed by dipping in a hot zinc bath and keeping the metal immersed until the temperature of the metal has obtained the same temperature as that of the bath. Galvanizing shall meet the requirements of ASTM A 123-89a, "SPECIFICATION FOR ZINC (HOT-DIP GALVANIZED) COATINGS ON IRON AND STEEL PRODUCTS." Cadmium plating shall be done by an approved process and plating shall be from 0.0003 inch to 0.0005 inch in thickness.
- C. Aluminum: Aluminum, except as otherwise required, shall be Alloy 6063 meeting the requirements of ASTM B 221-90, "SPECIFICATION FOR ALUMINUM AND ALUMINUM-ALLOY EXTRUDED BARS, RODS, WIRE, SHAPES AND TUBES;" for extruded shapes shall be Alloy 6063-T5 meeting the requirements of ASTM B 241/B 241M-90, "SPECIFICATION FOR ALUMINUM AND ALUMINUM-ALLOY SEAMLESS PIPE AND SEAMLESS EXTRUDED AND TUBE;" for aluminum plate and structural shapes shall meet the requirements of ASTM B 308/B 308M-90a, "SPECIFICATION FOR ALUMINUM-ALLOY 6061-T6 STANDARD STRUCTURAL SHAPES;" and for rivets and screws shall be Alloy 2017 meeting the requirements of ASTM B 316-90, "SPECIFICATION FOR ALUMINUM AND ALUMINUM-ALLOY RIVET AND COLD-HEADING WIRE AND RODS."
- D. Brass: Unless otherwise specified, brass shall be of a commercial grade meeting the requirements of ASTM B 36-89, "SPECIFICATION FOR BRASS PLATE, SHEET, STRIP AND ROLLED BAR," Alloy No. 3.
- E. Bronze: Bronze for bolts, nuts and anchor bolts shall be manganese bronze meeting the requirements of ASTM B 584-90, "SPECIFICATION FOR COPPER ALLOY SAND CASTINGS FOR GENERAL APPLICATIONS."
- F. Copper-Silicon: Copper-Silicon Alloy shall meet the requirements of ASTM B 96-86, "SPECIFICATION FOR COPPER-SILICON ALLOY PLATE SHEET, STRIP, AND ROLLED BAR FOR GENERAL PURPOSES AND PRESSURE VESSELS," (formerly B 97-70, Type B).

8-3 MATERIALS (Cont'd)

- G. Stainless Steel: Stainless steel bolts, nuts, rods and fasteners shall conform to the requirements of ASTM A 276-89a, "SPECIFICATION FOR STAINLESS AND HEAT-RESISTING STEEL BARS AND SHAPES," Type 304, and to ASTM A 193/A 193m-89, "SPECIFICATION FOR ALLOY-STEEL AND STAINLESS STEEL BOLTING MATERIALS FOR HIGH TEMPERATURE SERVICE," Heavy Hex, and ASTM A 194/A 194m-88, "SPECIFICATION FOR CARBON AND ALLOY STEEL NUTS FOR BOLTS FOR HIGH-PRESSURE AND HIGH-TEMPERATURE SERVICE," Heavy Hex.
- H. Wrought Iron: Wrought iron shall meet the requirements of ASTM A 860-89, "SPECIFICATION FOR HIGH STRENGTH BUTT WELDING FITTINGS OF WROUGHT HIGH STRENGTH FOR ALLOY STEEL."

8-4 CLEANING AND TESTING

All castings shall be thoroughly cleaned and subjected to a careful hammer test. No castings shall be coated unless clean and free from rust, and approved in these respects by the Engineer/Design Engineer, or his authorized Inspector, immediately before being coated.

8-5 SHOP COATING

Each casting shall be sprayed or brushed inside and out with one (1) shop coat of asphaltic compound varnish. The varnish shall be made of high grade asphalt, fluxed and blended with properly treated drying oils and thinned to a proper consistency with a volatile solvent. The varnish shall be equal to Black Asphalt Varnish as manufactured by the Excelsior Varnish and Chemicals, Cleveland, Ohio 44104. Other methods of coating and types of coating materials shall be subject to the approval of the Engineer/Design Engineer. Each casting shall also receive at the shop one (1) coat of an approved bitumastic coating before the metal has rusted and after the grease, dirt and scale has been removed. In addition to this shop coat, the castings shall receive two (2) field coats of an approved paint as specified under Section 8-12, "Painting".

8-6 INSPECTION

The Engineer/Design Engineer, or his authorized designee, shall have the right to inspect the material and work done, as the interest of the City may require. Such inspection shall not relieve the Contractor from any obligation to furnish and perform said work strictly in accordance with the specifications, or any modifications thereof, as herein provided, and work not so constructed shall be removed and made good by the Contractor, at his own expense. All manhole frames and covers, valve boxes, and other castings and miscellaneous metal shall be sound and shall conform to these specifications, and any defective castings or other metals which may have passed inspection at the place of manufacture, or elsewhere, shall be at all times liable to rejection when discovered, until the date of final payment under this contract.

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8-7 STEPS AND LADDERS

Steps and ladders built into the brick vault/manhole structures and concrete masonry vault/manhole structures shall be galvanized wrought iron steps or ductile iron steps of the size and shape shown on the Contract Drawings or approved type polypropylene plastic steps.

8-8 VALVE BOXES AND COVERS

- A. The Contractor shall furnish and install, over each vertical gate valve, horizontal gate bypass valve, air relief/flushing outlet assembly, cut-in-valve, etc., at the locations shown on the Contract Drawings, or where required, valve boxes with covers complete, of the assembled types, sizes and weights shown on the Standard Detail Drawings. Assembled type valve boxes and covers shall extend from the valve bonnet to the finished grade or the elevation required, being carefully and vertically set over the valve operating nut and shall be set plumb and true as required.
- B. Valve boxes and cover assemblies shall be complete and their parts shall comply with those shown on Standard Detail Drawings.

8-9 VAULT/MANHOLE FRAME AND COVERS

- A. The Contractor shall furnish and install, at locations shown on the Contract Drawings and as required, together with all gate valve vaults (chambers), drain manholes, access manhole and anchorage assemblies, and pitometer vaults, and where otherwise required, manhole frame and cover complete, of the assembled types and sizes shown on Standard Detail Reference Drawing SM-31. Assembly and placement of the manhole frame and covers shall be made in accordance with the configurations shown on the various details shown on the Standard Detail Drawings.
- A. All cast iron manhole frames and covers shall be of the forms, dimensions, weights and details as shown on the Contract Drawings, furnished and installed as directed.
- C. The frames shall be properly set in place in a full bed of mortar or poured monolithic in the masonry, at such elevation as to make the top of the rim of the frames conform to the finished grade as shown on the Contract Drawings or as otherwise directed.
- D. Required manhole frame and cover assemblies shall be complete as follows:
 - 1) 20" thru 48" Gate Valve Vaults (Chambers) - (Included with applicable Item 6):

Manhole Frame and Cover Mark SM-31B: Cast iron round double-cover styled casting consisting of Manhole Frame, Pattern SM-31-B1; Top Cover, Pattern SM-31-B2; and Inside Cover, Pattern SM-31-B3;
 - 2) 4"/6" Drain Manhole - (Included with applicable Item 6):

Manhole Frame and Cover Mark No: 3: Cast iron round single-cover styled casting consisting of Manhole Frame, Pattern SM-31-C1; and Top Cover, Pattern SM-31-B2;

8-9 VAULT/MANHOLE FRAME AND COVERS (Cont'd)

- 3) Access Manhole and Anchorage, Type "A" - (Included with applicable Item 7):

Manhole Frame and Cover Mark SM-31A: Cast iron rectangular double-cover styled casting consisting of Manhole Frame, Pattern SM-31-A1; Top Cover, Pattern SM-31-A2; and Inside Cover, Pattern SM-31-A3;

- 4) Access Manhole and Anchorage, Type "B" - (Included with applicable Item 7):

Manhole Frame and Cover Mark SM-31B: Cast iron round double-cover styled casting consisting of Manhole Frame, Pattern SM-31-B1; Top Cover, Pattern SM-31-B2; and Inside Cover, Pattern SM-31-B3;

- 5) Access Manhole and Anchorage, Type "C" - (Included with applicable Item 7):

Manhole Frame and Cover Mark SM-31A: Cast iron rectangular double-cover styled casting consisting of Manhole Frame, Pattern SM-31-A1; Top Cover, Pattern SM-31-A2; and Inside Cover, Pattern SM-31-A3;

- 6) Pitometer Vaults - (Included with applicable Item 7):

Manhole Frame and Cover Mark SM-31B: Cast iron round double-cover styled casting consisting of Manhole Frame, Pattern SM-31-B1; Top Cover, Pattern SM-31-B2; and Inside Cover, Pattern SM-31-B3.

8-10 VALVE STEM EXTENSION/BRACING

Where depth of water main is such where top of the valve operating nut exceeds four (4) foot depth the vertical gate valve shall be furnished and installed with a valve stem extension. Where depth of water main is such where top of the valve operating nut exceeds four (4) foot depth the horizontal gate valve in vault shall be furnished and installed with a valve stem extension with bracing to the vault to secure the valve stem extension. The valve stem extension and valve stem extension/bracing shall be of the proper length conforming to the details shown on the Standard Detail Drawings.

8-11 SHOP DRAWINGS

Complete detailed shop drawings showing all dimensions, thicknesses, weights, and material specifications of all manhole frames and covers, valve boxes and covers, other castings, and of all other miscellaneous metal, work shall be submitted to the Engineer/Design Engineer for review and approval prior to the manufacture of any work to be furnished under this item, or in conjunction with other items, in accordance with that called for under Item 14-2, "Shop Drawings," of these specifications.

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8-12 PAINTING

All miscellaneous metal work not galvanized shall be thoroughly cleaned and given two (2) field coats of coal tar pitch equal to Koppers Bitumastic Super Tank Solution or equivalent. Bolts and nuts shall not be shop coated, but shall receive three (3) coats or approved paint after installation.

8-13 MEASUREMENT

The miscellaneous metal work to be paid for under Item 8, "Miscellaneous Metal Work," shall be that metal work actually furnished and placed in accordance with these specifications and the Standard Detail Drawings. In the computing of weights, if not determined by weighing, one (1) cubic foot of cast iron shall be assumed to weigh four hundred and fifty (450) pounds; and one (1) cubic foot of steel shall be assumed to weigh four hundred and ninety (490) pounds. The weight of cast iron shall be used for cast iron valve boxes and covers, any cast iron sections of valve boxes and covers, and manhole frame and covers.

8-14 PAYMENT

Payment for "Miscellaneous Metal Work" specified under Item 8, and not included under other items of work, shall include the furnishing, installation, machining, fitting, adjusting, bolting, cleaning, galvanizing, shop coating and field painting of all iron castings and other miscellaneous metal work, and shall include the furnishing of all labor, materials, tools and appliances necessary to complete the work as specified or as shown.

Payment for valve box with cover complete and manhole frame and cover complete, manhole steps, reinforcing steel or other miscellaneous metal, furnished under Item 4, "Valves", Item 6, "Brick Masonry and Vault/Manhole Structures," and Item 7, "Concrete Masonry and Vault/Manhole Structures," shall be paid for under those respective items and shall include the furnishing, installation, machining, fitting, adjusting, bolting, cleaning, galvanizing, shop coating and field painting of all iron castings and other miscellaneous metal work, and shall include the furnishing of all labor, materials, tools and appliances necessary to complete the work as specified or as shown.

DETAIL SPECIFICATIONS

PART E - BID ITEMS

ITEM 12

E-12 REMOVAL OF HYDRANTS, PLUGGING MAINS, ETC.

12-1 WORK INCLUDED

The Contractor, under Item 12, "Removal of Hydrants, Plugging Mains, Etc.," shall furnish all the materials, labor, tools, and equipment required for the various work items described herein and where shown on the Contract Drawings, or where ordered. The work shall include all traffic maintenance; providing and maintaining traffic control and warning devices, including temporary and permanent pavement markings; pavement cutting (both for trench and for pavement removal and restoration); all excavations, including pavements, water main trench, and sewer and/or utility trenches; sheeting and shoring, including use of trench box; the furnishing and installing of all approved materials as herein specified and as required to complete the work; sand bedding backfill; backfill and/or premium backfill; the repair and/or replacement of materials due leakage or defects; pavement replacement, including base pavement replacement, berm replacement/repair and shoulder replacement/repair; final pavement restoration, including traffic markings, signs and traffic loop detectors; protection of trees, shrubbery and lawns and/or their removal and replacement; seeding and/or sodding; sidewalk removal and replacement; curb removal and replacement; underdrain removal and replacement; removal and replacement of mailboxes; removal and replacement of drainage culverts and/or piping; fence removal and replacement; guard rail removal and replacement; storm and sanitary sewer work; storm and sanitary sewer connection work; protecting and maintaining utilities and utility services; repair of site damage due to construction, including traffic maintenance; final site restoration; and the furnishing of "as-built" drawings, all as required for the proper completion of the work included under this contract.

In general, the work under Item 12 shall be stipulated and designated on the Contract Drawings as follows:

Item Description

12A Hydrants:

12A1	Remove Existing Hydrant
12A2a	Remove Existing Hydrant, Extend Hydrant Branch and Reset Existing Hydrant
12A2b	Remove Existing Hydrant, Shorten Hydrant Branch and Reset Existing Hydrant
12A3	Remove Existing Hydrant, and Relocate and Reset Existing Hydrant
12A4	Lower/Raise Existing Hydrant Branch and Adjust Hydrant to Grade

12B Remove Castings:

12B1	Remove Existing Valve and/or Valve Box
12B2	Remove Existing Curb Shut-Off Valve Box
12B3	Remove Existing Vault/Manhole Frame and Cover

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12-1 WORK INCLUDED (Cont'd)

12C Adjust Castings:

- 12C1 Adjust Existing Valve Box to Grade
- 12C2 Adjust Existing Curb Shut-Off Valve Box to Grade
- 12C3 Adjust Existing Vault/Manhole Frame and Cover to Grade

12D Plugging Watermains and Service Connections:

- 12D1 Plug Existing Water Main End
- 12D2a Plug Existing Service/Fire Line Connection (Caulk Type)
- 12D2b Plug Existing Service/Fire Line Connection

12E Abandoned Castings/Structures:

- 12E1 Filling Abandoned Valve Box
- 12E2 Removing Existing Vault/Manhole and Backfill

12-2 REMOVE EXISTING HYDRANT (ITEM 12A1)

The Contractor, under Item 12A1, "Remove Existing Hydrant," shall remove existing hydrants, perform all work necessary at the locations shown on the Contract Drawings, or where ordered; plug or cap existing mains, tees, or crosses; deliver the removed material to Harvard Yards; excavate, provide sheeting and shoring, backfill, seeding and sodding, sidewalk replacement and paving (both temporary and permanent), and all other work as required. Payment for removal and delivery of existing hydrants shall be made under Item 12A1, "Remove Existing Hydrant;" payment for removing existing valves and/or valve boxes shall be made under Item 12B1, "Remove Existing Valve and/or Valve Box;" payment for plugging/capping existing mains tees or crosses shall be made under Item 12D1, "Plug Existing Water Main End."

12-3 REMOVE EXISTING HYDRANT, EXTEND HYDRANT BRANCH AND RESET EXISTING HYDRANT (ITEM 12A2a);
REMOVE EXISTING HYDRANT, SHORTEN HYDRANT BRANCH AND RESET EXISTING HYDRANT (ITEM 12A2b);
REMOVE EXISTING HYDRANT, AND RELOCATE AND RESET EXISTING HYDRANT (ITEM 12A3)

- A. The Contractor, under Item 12A2a, "Remove Existing Hydrant, Extend Hydrant Branch and Reset Existing Hydrant;" under Item 12A2b, "Remove Existing Hydrant, Shorten Hydrant Branch and Reset Existing Hydrant;" or under Item 12A3, "Remove Existing Hydrant, and Relocate and Reset Existing Hydrant," shall remove existing hydrants, perform all work necessary at the locations shown on the Contract Drawings, including inspecting and cleaning hydrants, to extend or shorten existing hydrant branch as called for; and to relocate and reset existing hydrants to the locations shown on the Contract Drawings or where ordered; excavate, provide sheeting and shoring, backfill, seeding and sodding, sidewalk replacement and paving (both temporary and permanent) and all other work as required. All setting of hydrants shall conform with Section 12-5, "Setting Hydrants."

12-3 REMOVE EXISTING HYDRANT, EXTEND HYDRANT BRANCH AND RESET EXISTING HYDRANT (ITEM 12A2a);
REMOVE EXISTING HYDRANT, SHORTEN HYDRANT BRANCH AND RESET EXISTING HYDRANT (ITEM 12A2b);
REMOVE EXISTING HYDRANT, AND RELOCATE AND RESET EXISTING HYDRANT (ITEM 12A3) (Cont'd)

- B. Where existing hydrant is to be removed and relocated and reset, by extending hydrant branch or by shortening hydrant branch, or with horizontal offset, and the existing hydrant assembly is of lead joint type construction, the existing hydrant branch may be cut between the branch valve and the hydrant at either 18-inches from hydrant bell joint or 18-inches from branch valve bell. The existing hydrant shall be relocated and reset with reconnection made with new ductile iron cement lined pipe and fittings, ductile iron retained mechanical joint solid sleeves, or approved compression type couplings as required. Where existing hydrant assembly is of the mechanical joint or swivel type joints, the pipe and joints may be disassembled and the existing hydrant shall be relocated and reset with reconnection made with new ductile iron cement lined pipe and fittings and new gaskets. Payment for this work shall be made under Item 12A2a, "Remove Existing Hydrant, Extend Hydrant Branch and Reset Existing Hydrant;" Item 12A2b, "Remove Existing Hydrant, Shorten Hydrant Branch and Reset Existing Hydrant;" or Item 12A3, "Remove Existing Hydrant, and Relocate and Reset Existing Hydrant." Payment for furnishing and installing ductile iron pipe and fittings, including special fittings, shall be made under Item 1, "Ductile Iron Pipe and Fittings."
- C. Where existing hydrant is to be removed and relocated and reset, and the existing hydrant branch cannot be cut between the existing lead joint branch valve and the hydrant to facilitate the hydrant relocation the entire hydrant assembly shall be replaced including new retained mechanical joint tee (all bell), new ductile iron cement lined branch pipe and fittings, new branch gate valve with valve box complete, and new CWD standard hydrant. The new 6-inch hydrant assembly shall be "sleeved" into existing waterline with ductile iron retained mechanical joint solid sleeves and ductile iron shorts or with approved type compression type couplings and shorts, as required. Payment for this work shall be made under Item 12A2a, "Remove Existing Hydrant, Extend Hydrant Branch and Reset Existing Hydrant;" Item 12A2b, "Remove Existing Hydrant, Shorten Hydrant Branch and Reset Existing Hydrant;" or Item 12A3, "Remove Existing Hydrant, and Relocate and Reset Existing Hydrant." Payment for furnishing and installing ductile iron pipe and fittings, including special fittings, shall be made under Item 1, "Ductile Iron Pipe and Fittings." Payment for furnishing and setting 6-inch hydrant shall be made under Item 17, "Furnishing and Setting 6-inch Hydrant." Payment for furnishing and installing 6" retained mechanical joint bell end gate valve with valve box complete shall be made under Item 4, "Valves."

12-4 LOWER/RAISE EXISTING HYDRANT BRANCH AND ADJUST HYDRANT TO GRADE (ITEM 12A4)

The Contractor, under Item 12A4, "Lower/Raise Existing Hydrant Branch and Adjust Hydrant to Grade," shall furnish all material, labor, tools, and equipment required to lower or raise existing hydrant branch piping to clear obstacles and to vertically adjust existing hydrant to grade. A minimum of eighteen (18) inches clearance is required when crossing over or under sanitary sewers;

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12-4 LOWER/RAISE EXISTING HYDRANT BRANCH AND ADJUST HYDRANT TO GRADE (ITEM 12A4) (Cont'd)

a minimum of twelve (12) inches clearance is required when crossing over or under and storm sewers; a minimum of twelve (12) inches clearance required between lowered or raised hydrant branches and other water mains and other utilities and structures. Depth of cover over raised hydrant branch shall in no case be less than five (5) feet to top of pipe. The lowering or raising of the existing branch piping shall extend from the existing branch valve to a point beyond the obstruction to permit reconnection to the existing hydrant. All pipe, fittings and specials used for the branch lowering/raising shall conform with Item 1, "Ductile Iron Pipe and Fittings." Payment for lowering or raising hydrant branches to clear obstacles shall be made under Item 12A4, "Lower/Raise Existing Hydrant Branch and Adjust Hydrant to Grade." Payment for furnishing and installing ductile iron cement lined pipe, fittings, including specials, shall be made under Item 1, "Ductile Iron Pipe and Fittings."

12-5 SETTING HYDRANTS

A. General Location:

Hydrants shall be horizontally located a minimum of ten (10) feet away from sanitary sewers and five (5) feet away from storm sewers and in a manner to provide complete accessibility, and in such a manner that the possibility of damage from vehicles or injury to pedestrians is minimized. Unless otherwise directed, the setting of any hydrant shall conform to the following:

B. Location Regarding Curb Lines:

When placed behind the curb, the hydrant barrel shall be set so that the center of the barrel shall be no less than three (3) feet from the gutter face of the curb, or deviate from such location or deviate from the location indicated on the Contract Drawings, except by consent of the Engineer/Design Engineer.

C. Location Regarding Sidewalks:

When set in the lawn space between the curb and the sidewalk, or between the sidewalk and the property line, no portion of the nozzle or hydrant cap shall be within six (6) inches of the sidewalk.

D. Position of Nozzles:

The hydrant shall stand plumb with the 4-inch steamer nozzle pointing toward the curb. Where hydrant branch piping is parallel with, or not at right angles to the curb, the Contractor shall release the swivel head bolts and adjust hydrant 4-inch steamer nozzle to face the curb at the proper angle. Hydrant without swivel heads will be adjusted by the City where necessary to correct the position of the steamer nozzle. Height of hydrant shall conform to the established grade with tops of frost casing at least four (4) inches above grade.

12-5 SETTING HYDRANTS (Cont'd)

E. Connection to Main:

The hydrant shall be connected to the distribution water main with a ductile iron pipe branch controlled by an independent gate valve of the same size as the hydrant, except as otherwise directed.

F. Drainage of Hydrant:

Drainage shall be provide at the base of the hydrant by filling around the elbow with coarse gravel or crushed stone to at least six (6) inches above the waste opening. Wherever the hydrant is set in rock, clay, or other impervious soil, the trench shall be widened and deepened on each side of the hydrant base, which space shall be filled compactly with coarse gravel, crushed stone, or broken stone and mixed with coarse sand of sufficient quantity to absorb all water to be drained from the hydrant when branch valve is closed.

G. Anchorage for Hydrant:

The hydrant shall be set on a stone slab or similar foundation and the base of the hydrant shall be well braced against unexcavated earth to the end of the trench with concrete backing, and it shall be restrained to the branch piping with swivel joints or retained mechanical joint or tied to the branch piping with suitable rods, clamps, or other approved restraint as approved or directed by the Engineer/Design Engineer.

H. Cleaning:

The interior of the hydrant shall be thoroughly cleaned of all dirt and foreign matter before setting.

12-6 REMOVE EXISTING VALVE AND/OR VALVE BOX (ITEM 12B1)
REMOVE EXISTING CURB SHUT-OFF VALVE BOX (ITEM 12B2)
REMOVE EXISTING VAULT/MANHOLE FRAME AND COVER (ITEM 12B3)

Where shown on the Contract Drawings, or as ordered, the Contractor, under Item 12B1, "Remove Existing Valve and/or Valve Box"; Item 12B2, "Remove Existing Curb Shut-off Valve Box;" or Item 12B3, "Remove Existing Vault/Manhole Frame and Cover," shall deliver the same to Harvard Yards. The Contractor shall perform all work necessary at the locations shown on the Contract Drawings, or where ordered, including all excavating, sheeting and shoring, backfilling, seeding and sodding, and repaving, and all other work as required.

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- 12-7 ADJUST EXISTING VALVE BOX TO GRADE (ITEM 12C1)
ADJUST EXISTING CURB SHUT-OFF VALVE BOX TO GRADE (ITEM 12C2)
ADJUST EXISTING VAULT/MANHOLE FRAME AND COVER TO GRADE (ITEM 12C3)

Where shown on the Contract Drawings, or where ordered, the Contractor under, Item 12C1, "Adjust Existing Valve Box to Grade;" under Item 12C2, "Adjust Existing Curb Shut-off Valve Box to Grade;" or under Item 12C3, "Adjust Existing Vault/Manhole Frame and Cover to Grade," shall reset existing valve box, existing curb shut-off valve box, or existing vault/manhole frame and cover to established grade by raising or lowering the existing castings or by adding the appropriate stem sections. In raising of the castings, no inserts shall be permitted. Any valve boxes, curb shut-off valve boxes and/or vault/manhole frame and cover found to be damaged or unsuitable for reuse shall be replaced by the Contractor. All replacement valve boxes, castings and appropriate stem sections shall conform with Item 8, "Miscellaneous Metal Work." Payment for replacement for damaged or unsuitable castings shall be included under Item 8, "Miscellaneous Metal."

The Contractor shall provide all labor, materials, tools and equipment necessary to perform the work at the locations shown or where ordered including all excavating, sheeting and shoring, backfilling, seeding and sodding, and repaving, and all other work as required.

- 12-8 PLUGGING EXISTING WATER MAIN END (ITEM 12D1)

Where shown on the Contract Drawings, or where ordered, the Contractor, under Item 12D1, "Plugging Existing Water Main End," shall furnish all materials for and shall cap or plug existing water main ends including tees or crosses. The Contractor shall do all the excavation, backfilling, seeding and sodding, and repaving, and all other work as required. The cap or plug shall be a restrained fitting and shall be furnished with rods and clamps complete, backed with a concrete pier to undisturbed earth. Plug and/or caps to be installed as part of new or relocated installations shall be furnished, installed and paid for under Item 1, "Ductile Iron Pipe and Fittings."

Where existing water main end, tee, or cross to be plugged is a lead joint fitting, the Contractor shall cut out the lead joint fitting and sleeve-in a ductile iron spool piece. The spool piece shall be sleeved-in using retained mechanical joint solid sleeves (long pattern) or approved compression couplings equal to Dresser Style Nos: 38, 138, or 162 (transition type), or Smith-Blair 441 Straight and Transition Couplings with trackhead stainless steel bolts and nuts (ASTM A276-89a, Type 304, and ASTM A193-89/ASTM A194-88, Heavy Hex). The compression coupling shall be furnished without pipe stops and be rated for a minimum working pressure of 250 psi.

Payment for furnishing material for and to cap or plug existing water main ends shall be made under Item 12D1, "Plugging Existing Water Main End." Payment for furnishing and placing concrete pier shall be made under Item 7A, "Plain Concrete Masonry." The Contractor shall provide all labor, materials, tools and equipment necessary to perform the work at the locations shown, or where ordered, including all excavating, sheeting and shoring, backfilling, seeding and sodding, and repaving, and all other work as required.

12-9 PLUG EXISTING SERVICE/FIRE LINE CONNECTION, CAULK TYPE (ITEM 12D2a);
PLUG EXISTING SERVICE/FIRE LINE CONNECTION (ITEM 12D2b)

- A. Existing Mains: On existing water mains to remain in service, where shown on the Contract Drawings, or where ordered, the Contractor, under Item 12D2a, "Plug Existing Service/Fire Line Connection, Caulk Type;" and Item 12D2b, "Plug Existing Service/Fire Line Connection" shall plug the water service connection or fire line connection at the main, and do all the necessary excavation, sheeting and shoring, backfilling, seeding and sodding, and repaving and all other work as required therefor. All water service connections and fire line connections shall be plugged at the main, but all lead type fittings shall be cut out of the mains by sleeving-in a ductile iron spool piece connected to existing main with retained mechanical joint solid sleeves (long pattern) or with approved type compression couplings equal to Dresser Style Nos: 38, 138, or 162 (transition type), or Smith-Blair 441 Straight and Transition Couplings with trackhead stainless steel bolts and nuts (ASTM A276-89a, Type 304, and ASTM A193-89/ASTM A194-88, Heavy Hex). The compression coupling shall be furnished without pipe stops and be rated for a minimum working pressure of 250 psi.
1. Connections 2" and Smaller Having Corporation Valve: The Contractor shall turn off the corporation valve and shall cut and crimp the copper tubing ends, or in the case of lead or galvanized piping, shall cut and crimp or fill with concrete the ends of all water service connections designated to be plugged on the Contract Drawings, or where ordered. The "plugging" shall include the placement of a one (1) foot long poured in place concrete block fully encompassing the corporation and copper tubing or lead/galvanized pipe, poured from vertical centerline of the pipe to the trench wall.
 2. Ferrule Type Connections (1/2" or 5/8"): The Contractor shall install an approved type 18-8 stainless steel two (2) section, double range, repair clamp centered over the pipe opening drilled for the connection.
 3. Connections 3" and Larger (Lead Joint Type Branch Sleeves): Where service connections indicated to be "plugged" on the Contract Drawings, or where ordered, are found to be lead type branch sleeves, the Contractor shall cut out the lead joint type branch sleeve and/or fitting(s) and sleeve-in a ductile iron spool piece. The spool piece shall be sleeved-in using retained mechanical joint solid sleeves (long pattern) or approved compression couplings equal to Dresser Style Nos: 38, 138, or 162 (transition type), or Smith-Blair 441 Straight and Transition Couplings with trackhead stainless steel bolts and nuts (ASTM A276-89a, Type 304 and ASTM A193-89/ASTM A194-88, Heavy Hex). The compression coupling shall be furnished without pipe stops and be rated for a minimum working pressure of 250 psi.
 4. Connections 3" and Larger: The Contractor, where connections 3-inch and larger are designated to be plugged on the Contract Drawings, or where ordered, shall close all connections valves at the main, plug the valve with a restrained plug with rods and clamps and concrete pier, remove valve box casting, and fill with concrete the ends of all abandoned water service connections. The "plugging" shall be done in the relocated water main trench after the connections have been transferred, or if such connection is not to be transferred is to be plugged at the time the relocated water installation.

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**12-9 PLUG EXISTING SERVICE/FIRE LINE CONNECTION, CAULK TYPE (ITEM 12D2a);
PLUG EXISTING SERVICE/FIRE LINE CONNECTION (ITEM 12D2b) (Cont'd)**

- B. Abandoned Mains: On abandoned water mains to be taken out of service the contractor shall plug the water service connection or fire line connection as follows:
1. Connections 2" and Smaller: The Contractor shall cut and crimp the copper tubing ends, or in the case of lead or galvanized piping, shall crimp or fill with concrete the ends of all water service connections designated to be plugged on the Contract Drawings, or where ordered. The "plugging" shall be done in the relocated water main trench after the connections have been transferred, or if such connection is not to be transferred is to be plugged at the time the relocated water installation.
 2. Connections 3" and Larger: The Contractor, where connections 3-inch and larger are designated to be plugged on the Contract Drawings, or where ordered, shall close all connections valves at the main, fill abandoned lower valve box casting with concrete, and fill with concrete the ends of all water service connections. The "plugging" shall be done in the relocated water main trench after the connections have been transferred, or if such connection is not to be transferred is to be plugged at the time the relocated water installation.
- C. The Contractor shall provide all labor, materials, tools and equipment necessary to perform the work at the locations shown or where ordered including all excavating, sheeting and shoring, concrete, backfilling, seeding and sodding, and repaving, and all other work as required. Payment to plug existing service/fire line connection, caulk type, shall be made under Item 12D2a, "Plug Existing Service/Fire Line Connection, Caulk Type," classified as to size. Payment to plug existing service/fire line connection (non-caulk type) shall be made under Item 12D2b, "Plug Existing Service/Fire Line Connection," classified as to size. Payment for removal of existing valve boxes on connections shall paid for under Item 12B1, "Remove Existing Valve and/or Valve Box." Payment for removal of existing curb shut-off valve boxes shall paid for under Item 12B2, "Remove Existing Curb Shut-off Valve Box." Payment for removal of existing manhole frame and cover shall paid for under Item 12B3, "Remove Existing Vault/Manhole Frame and Cover."

12-10 FILL ABANDONED VALVE BOX (ITEM 12E1)

Where shown on the Contract Drawings, or where ordered, the Contractor, under Item 12E1, "Fill Abandoned Valve Box," shall remove the existing valve box top and cover, fill the abandoned valve box bottom and sectional extensions thereof with concrete, and replace the rim of the removed valve box top/cover with surface material corresponding to the pavement requirements for repairing the type of existing pavement.

12-11 REMOVE EXISTING VAULT/MANHOLE AND BACKFILL (ITEM 12E2)

Where shown on the Contract Drawings, or where ordered, the Contractor, under Item 12E2, "Remove Existing Vault/Manhole and Backfill," shall remove the existing vault structures and/or manhole structures and backfill same. The Contractor shall provide all labor, materials, tools and equipment necessary to perform the work at the locations shown, or where ordered, including all excavating, sheeting and shoring, backfilling, seeding and sodding, and repaving, and all other work as required. The Contractor shall include suitable backfill material in the price bid, under Item 12E2, "Remove Existing Vault/Manhole and Backfill," classified as to size and type.

12-12 PAYMENT

The unit prices stipulated for each of the various items of work indicated herein shall include the furnishing of all labor, material and incidentals, including all traffic maintenance; providing and maintaining traffic control and warning devices, including temporary and permanent pavement markings; pavement cutting (both for trench and for pavement removal and restoration); all excavations, including pavements, water main trench, and sewer and/or utility trenches; sheeting and shoring, including use of trench box; the furnishing and installing of all approved materials as herein specified and as required to complete the work; sand bedding backfill; backfill and/or premium backfill; the repair and/or replacement of materials due leakage or defects; pavement replacement, including base pavement replacement, berm replacement/repair and shoulder replacement/repair; final pavement restoration, including traffic markings, signs and traffic loop detectors; protection of trees, shrubbery and lawns and/or their removal and replacement; seeding and/or sodding; sidewalk removal and replacement; curb removal and replacement; underdrain removal and replacement; removal and replacement of mailboxes; removal and replacement of drainage culverts and/or piping; fence removal and replacement; guard rail removal and replacement; storm and sanitary sewer work; storm and sanitary sewer connection work; protecting and maintaining utilities and utility services; repair of site damage due to construction, including traffic maintenance; final site restoration; and the furnishing of shop drawings and the final mylar "as-built" drawings, all as required for the proper completion of the work included under this contract.

DETAIL SPECIFICATIONS

PART E - BID ITEMS

ITEM 13

E-13 WATER SERVICE CONNECTIONS

Item 13A: General Supply Connection

Item 13B: Fire Service Connection

13-1 WORK INCLUDED

The Contractor, under Item 13A, "General Supply Connection," and Item 13B, "Fire Service Connection," shall furnish all materials for and shall arrange with the Division of Water for work required for general supply connection work or fire service connection work at the locations shown on the Contract Drawings, or where ordered. In addition, the Contractor shall replace all lead and galvanized pipe service connections disturbed by him for his convenience with copper service connections, in accordance with these specifications, at his expense.

The Contractor shall be responsible for providing and installing all material for the work to be performed herein. All work, material, and arrangements shall be subject to the inspection and approval of the Division of Water. The Division of Water reserves the right to determine the configuration of all water service connection installation. The Contractor shall furnish all material, labor, equipment and do all work including providing all traffic maintenance; providing and maintaining traffic control and warning devices, including temporary and permanent pavement markings; pavement cutting (both for trench and for pavement removal and restoration); all excavations, including pavements, water main trench, and sewer and/or utility trenches; tunneling and boring and/or jacking; sheeting and shoring, including use of trench box; all shop drawing submittals; the furnishing and installing of all approved materials as herein specified and as required to complete the work; sand bedding backfill; backfill and/or premium backfill; testing and the repair and/or replacement of materials due leakage or defects; pavement replacement, including base pavement replacement, berm replacement/repair and shoulder replacement/repair; final pavement restoration, including traffic markings, signs and traffic loop detectors; protection of trees, shrubbery and lawns and/or their removal and replacement; seeding and/or sodding; sidewalk removal and replacement; curb removal and replacement; underdrain removal and replacement; removal and replacement of mailboxes; removal and replacement of drainage culverts and/or piping; fence removal and replacement; guard rail removal and replacement; storm and sanitary sewer work; storm and sanitary sewer connection work; protecting and maintaining utilities and utility services; repair of site damage due to construction, including traffic maintenance; and final site restoration; all as required for the proper completion of the work included under this contract. The Division of Water will install the pressure tap in accordance with Sec. D-26, "Work to be Done by the City," assemble and install meter setting, and install meter assembly furnished by the Contractor. All meters furnished by Contractor shall be approved by the Division of Water. Where additional materials are required for installation of the meter assembly, or as ordered, the Contractor shall furnish same. The work of boring and/or jacking and excavation for service connections shall be as herein specified to complete the work under the various Items 13A, "General Supply Connection," and Items 13B, "Fire Service Connection."

13-1 WORK INCLUDED (Cont'd)

In general, the work under Items 13A and 13B shall be stipulated and designated as follows:

Item 13A: General Supply Connection:

<u>Item</u>	<u>Description</u>
13A1-3	General Supply Connection Lowered/Raised and/or Extended or Replaced
13A2	Water Meter New, Removed and Reset
13A3	Meter Vault New, Relocated and/or Rebuilt Complete

Item 13B: Fire Service Connection:

<u>Item</u>	<u>Description</u>
13B1-3	Fire Service Connection, Lowered/Raised and/or Extended or Replaced
13B2	Outside Screw & Yoke (O.S.& Y.) and Check Valves, New, Removed & Reset
13B3	Fire Service Vault New, Relocated and/or Rebuilt Complete

13-2 GENERAL REQUIREMENTS FOR GENERAL SERVICE/FIRE SERVICE CONNECTIONS

The Contractor shall furnish all new and unused materials, provide all labor, tools, equipment and other incidentals to perform the various service connection work described herein and, in addition, adhere to the following general requirements:

- A. Where a general supply or fire service connection damaged or is disturbed for lowering, raising, extending, or relocating between the water main at the "Corporation Shutoff Valve" and the "Curb Shutoff Valve", it shall be totally replaced with new and unused materials from the "Corporation Shutoff Valve" to "Curb Shutoff Valve."
- B. Where an existing connection requires total replacement and is found to have a ferrule type "tap" the connection shall be reinstalled by the contractor with a bronze double strap tap saddle. Replacement of existing 5/8" and 3/4" service connections shall include all fittings, adapters, corporations and strap saddles as required to install a 3/4" copper water service connection complete. Existing one (1") inch service connections, when required to be totally replaced, shall be replaced as a one (1") inch copper water service connection complete including all fittings, corporations and adapters. When replacing existing lead or galvanized 5/8" water service connections the replacement shall also include a new curb shut-off valve and curb valve box complete.
- C. Where an existing copper general supply or fire service connection is damaged or is disturbed for lowering, raising, extending between the "Corporation Shutoff Valve" and the "Curb Shutoff Valve", it may be reconnected using approved compression coupling. No more than two (2) such compression couplings shall be used on one (1) water service connection.

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13-2 GENERAL REQUIREMENTS FOR GENERAL SERVICE/FIRE SERVICE CONNECTIONS
(Cont'd)

- D. Where a general supply or fire service connection is disturbed on the "Property Side" of the curb shut-off valve, for lowering, raising and/or extending, or needs replacement because it is of lead or galvanized piping material, the piping materials and fittings shall be totally replaced with new and unused materials from the existing curb shut-off valve to the new curb shut-off valve required as a result of the extension lowering, raising or replacement.
- E. Where a general supply or fire service connection is disturbed for lowering, raising and/or extending, it shall be extended in a straight prolongation of the existing connection. Where the "Property Side" connection piping is not immediately contiguous to the extended connection curb shutoff, all labor, materials and equipment required to reconnect shall be included in the work. All reconnection on the "Property Side" of the curb shut-off shall be parallel to the street centerline or right-of-way from the curb shut-off. If upon inspection of the "Property Side" piping it is found unsuitable for such reconnection, the connection shall not be disturbed until such time as the Engineer/Design Engineer has arranged for replacement.
- F. Where a copper connection is advertently damaged or broken which was not to be disturbed, only the damaged portion needs to be replaced. Where a lead/galvanized connection is advertently damaged or broken which was not to be disturbed, the connection shall be replaced as noted in paragraph A at the Contractor's expense. If the extent of damage to the connection cannot be fully assessed, the connection shall be replaced as noted in paragraph A at the Contractor's expense.
- G. Valve Boxes, Curb Shut-off Valve Boxes or other castings damaged during construction or found unsuitable for reuse shall be replaced with new and unused material in accordance with Item 8, "Miscellaneous Metal Work." Payment for replacement for any required Valve Boxes, Curb Shut-off Valve Boxes or other castings shall be made under Item 8, "Miscellaneous Metal Work."
- H. All general supply and fire service connections shall be laid not less than six (6) feet below established street grade and not less than five and one-half (5-1/2) feet below ground surface.

13-3 GENERAL SUPPLY CONNECTION LOWERED/RAISED AND/OR EXTENDED
OR REPLACED (ITEM 13A1-3)
FIRE SERVICE CONNECTION LOWERED/RAISED AND/OR EXTENDED OR REPLACED
(ITEM 13B1-3)

Where shown on the Contract Drawings, or where ordered, the Contractor, under Item 13A1-3, "General Supply Connection Lowered/Raised and/or Extended or Replaced," and under Item 13B1-3, "Fire Service Connection Lowered/Raised and/or Extended or Replaced," shall furnish all materials and provide all labor and equipment required to lower, raise and/or extend or replace general supply and fire service connections as required in accordance with the general requirement specified in Section 13-2.

13-4 METER SETTING INSTALLATION REQUIREMENTS

A. General:

Where shown on the Contract Drawings, or where ordered, the Contractor shall furnish and install all new and unused materials required for the proper completion of the work. The Contractor shall make all arrangements with the Division of Water.

Copper Meter Setter: Also referred to as a copper meter yoke, is used to connect 1" (or under) meters to a water service connection. A copper meter setter with all required piping and fittings and with a 1" (or under) meter installed completes a 1" (or under) meter setting.

Bypass Piping Assembly: All materials, piping, valves and fittings, but without a meter, required to install a meter setting on a 1-1/2" thru 12" water service connection.

Meter Setting: All materials, piping, valves, fittings and meter required to install a complete meter setting on a 1-1/2" thru 12" water service connection.

B. Procedures for installation of an 1-inch or under meter setting where new meter vault is to be installed or where existing meter vault is to be relocated with new meter vault the following water work is required.

- 1) Install 1" (or under) meter vault complete: Contractor shall install new meter vault complete including new manhole frame and cover complete at the location(s) shown on the Contract Drawings, or where ordered.
- 2) Install 1" (or under) copper setter complete: Contractor shall furnish all materials for and shall install new copper meter setter (less meter) in new meter vault or new relocated vault. For existing 5/8" or 3/4" water service connections contractor shall furnish and install new 3/4" copper setter. For existing 1" or new 1" water service connections contractor shall furnish and install new 1" copper setter.
- 3) Install new 1" (or under) meter: Division of Water will install new 3/4" or 1" meter in new copper setter installed by the Contractor in new meter vault or in relocated vault.
- 4) Remove existing 1" (or under) meter: Contractor shall remove existing meter under Division of Water inspection. The existing meter shall be given to the Inspector. The existing copper/galvanized meter setter shall become property of the Contractor.
- 5) Remove existing 1" (or under) meter vault and backfill: The existing meter vault shall be removed by the Contractor to one (1) foot below grade and backfilled. Existing meter manhole ring and cover shall be delivered to Harvard Yards.

13-4 METER SETTING INSTALLATION REQUIREMENTS (Cont'd)

- C. Procedures for 1-1/2" or 2" meter setting (bypass piping assembly) installation: Where new meter vault is to be installed or where existing meter vault is to be relocated the following water work is required.
- 1) Install 1-1/2" or 2" meter vault complete: The Contractor shall install new meter vault complete including new manhole frame and cover complete of the size(s) noted and at the location(s) shown on the Contract Drawings, or where ordered.
 - 2) Assemble 1-1/2 " or 2" bypass piping assembly (without meter): The Contractor shall furnish and deliver all new materials to Harvard Yards required for bypass piping assembly (less meter) for Division of Water to assemble meter setting without the meter. Contractor shall then pick up the bypass piping assembly at Harvard Yards and install the meter setting (with spacer in lieu of meter) in new vault or new relocated vault. All 1- 1/2" and 2" bypass piping assemblies will be provided to the Contractor with spacers in lieu of meters. See "Special Note."
 - 3) Install 1-1/2" or 2" meter: After the bypass piping assembly is installed by the Contractor the Division of Water will then remove the spacer and install a new meter in the new meter vault or new relocated meter vault.
 - 4) Remove existing 1-1/2" or 2" meter setting complete: All existing 1-1/2" and 2" meter settings will remain in the existing meter vaults. When installing new meters the Division of Water will record the meter reading and forward the reading to customer account services. The Division of Water will then remove existing meter from existing meter vault. Existing meter shall remain the property of the Division of Water. The existing bypass piping assembly shall become property of Contractor.
 - 5) Remove existing 1-1/2" or 2" meter vault and backfill: The existing meter vault shall be removed to one (1) foot below grade and backfilled by the Contractor. Existing meter manhole ring and cover shall be delivered to Harvard Yards.

Special Note: All meters 1-1/2" and 2" will only be given out in quantities of one (1) or two (2). Only when the Inspector determines that more water service connections are ready for setting will any additional meter settings (bypass piping assemblies) be released. Note that spacers in 1-1/2" and 2" bypass piping assemblies will be installed in place of the meter. With limiting the number of meter installations to one (1) or two (2) and having meters set by the Division of Water, the correct meter will therefore be assigned to the correct location.

- D. Procedures for 3" thru 12" meter setting (bypass piping assembly) installation: Where new meter vault is to be installed or where existing meter vault is to be relocated by installing new meter vault in new location:
- 1) Install (x") meter vault complete: The Contractor shall install new meter vault complete and new manhole frame and cover complete of the size(s) noted and at the locations shown on the Contract Drawings, or where ordered.

13-4 METER SETTING INSTALLATION REQUIREMENTS (Cont'd)

- 2) Assemble (x") bypass piping and install meter setting complete: The Contractor shall furnish and deliver all new and unused materials to Harvard Yards required for 3" thru 12" bypass piping assemblies (less meter) for the Division of Water to assemble meter setting with meter. Meter will be furnished by the Division of Water. All 3" thru 12" meter settings will be sent out with meter installed in the bypass piping assembly. Contractor shall install meter setting complete under the supervision of the Inspector of the Division of Water.
- 3) Remove existing (x") meter: The Division of Water will remove the existing meter which will remain property of the City, record the old meter reading and forward all pertinent information to customer service accounts. Where possible the old meter shall be rebuilt and reused. The Contractor shall remove the existing bypass piping assembly (less meter). The existing bypass piping assembly (less meter) shall become property of the Contractor.
- 4) Remove existing (x)" meter vault and backfill: The existing meter vault shall be removed by Contractor to one (1) foot below grade and backfilled. Existing meter manhole ring and cover to be delivered to Harvard Yards.

13-5 WATER METER NEW, REMOVED AND RESET COMPLETE (ITEM 13A2)

The Contractor, under Item 13A2, "Water Meter New, Removed and Reset Complete," shall furnish all materials for and shall arrange with the Division of Water for work required for general supply connection work or fire service connection work at the locations shown on the Contract Drawings, or where ordered. Contractor shall furnish all materials and perform all work in accordance with the requirements set forth under Section 13-4, "Meter Setting Installation Requirements."

13-6 FIRE SERVICE CONNECTION, OUTSIDE SCREW AND YOKE (O.S. & Y.) AND CHECK VALVES NEW, REMOVED, AND RESET (ITEM 13B2)

The Contractor, under Item 13B2, "Fire Service Connection, Outside Screw and Yoke (O.S. & Y.) and Check Valves New, Removed, and Reset," shall be required to furnish all materials including Outside Screw and Yoke (O.S. & Y.) and check valves in accordance with that specified in the list of materials required for installation specified herein. The Division of Water shall determine the suitability of existing O.S. & Y. and check valves for removal and resetting. The Contractor shall furnish all materials required in the removal and resetting including bolts, nuts, washers and gaskets. Only those settings less than one (1) year old shall be considered for removal and resetting.

PART E - DETAIL SPECIFICATIONS - BID ITEMS
CUY-West Sixth Street Streetscape, Part 1, PID 89722
CUY-Professor Street Intersections, Part 2, PID 90218

**13-7 METER VAULT NEW, RELOCATED AND/OR REBUILT COMPLETE (ITEM 13A3);
FIRE SERVICE VAULT NEW, RELOCATED AND/OR REBUILT COMPLETE (ITEM 13B3)**

The Contractor, under Item 13A3, "Meter Vault New, Relocated and/or Rebuilt Complete," and Item 13B3, "Fire Service Vault New, Relocated and/or Rebuilt Complete," shall furnish and install all material, labor and equipment necessary for meter and/or fire service vault new, relocated and/or rebuilt, all in conformance with Rules and Regulations of the Department of Public Utilities. Vaults shall be in accordance with those approved by the Department of Public Utilities as to size and use designation as on file in the Permits and Sales Section of the Division of Water. Special vaults shall be constructed only after approval by the Department of Public Utilities. Relocated and/or rebuilt vaults shall conform to requirements of approved vaults with all relocations and/or rebuilding subject to approval of the Commissioner of Water. The Contractor shall do all related work including all the necessary excavation, sheeting and shoring, bedding preparation, handling, setting, backfilling, seeding and/or sodding, repaving and replacement of sidewalk required to complete the work. Vaults to be removed or abandoned shall be performed as work under Item 12.

13-8 BORING AND/OR JACKING FOR SERVICE CONNECTIONS

Wherever the distance between the new or relocated main and the existing main exceeds three (3) feet, or where service connection reinstallation is required, the Contractor shall furnish all labor, tools and equipment for and shall bore or jack openings of sufficient size to permit the installation, transfer and extension of service connections. If borings or jacking is found to be impossible, he shall make the necessary trench excavation, backfilling, sand and premium backfill, temporary and permanent repaving required for the installation, transfer, extension and plugging of service connections. Payment for the boring and/or jacking for service connection shall be deemed to be included in the price bid for the various Items 13A and 13B, classified as to size and type.

13-9 WIDTH OF TRENCH

The trench width may vary with and depend upon the depth of trench and the nature of the excavated material encountered; but in any case shall be of ample width to permit the pipe to be laid and jointed properly and the backfill to be placed and compacted properly. The maximum width of unsheeted trench for service connection work shall be twenty-four (24) inches. When sheeting and bracing is used, the trench shall be increased accordingly.

13-10 PAYMENT

The unit prices stipulated, under the various Items 13A and Items 13B, shall include the cost of each service connection work, classified as to size and type, required to be performed. The unit price shall include the cost for work as herein specified and shall include all materials, tools, labor and equipment required. The Contractor, in addition to furnishing all of the foregoing, shall include providing all traffic maintenance; providing and maintaining traffic control and warning devices, including temporary and permanent pavement markings; pavement cutting (both for trench and for pavement removal and restoration); all excavations, including pavements, water main trench, and sewer and/or utility trenches; tunneling and boring and/or jacking; sheeting and shoring, including

13-10 PAYMENT (Cont'd)

use of trench box; all shop drawing submittals; the furnishing and installing of all approved materials as herein specified and as required to complete the work; sand bedding backfill; backfill and/or premium backfill; testing and the repair and/or replacement of materials due leakage or defects; pavement replacement, including base pavement replacement, berm replacement/repair and shoulder replacement/repair; final pavement restoration, including traffic markings, signs and traffic loop detectors; protection of trees, shrubbery and lawns and/or their removal and replacement; seeding and/or sodding; sidewalk removal and replacement; curb removal and replacement; underdrain removal and replacement; removal and replacement of mailboxes; removal and replacement of drainage culverts and/or piping; fence removal and replacement; guard rail removal and replacement; storm and sanitary sewer work; storm and sanitary sewer connection work; protecting and maintaining utilities and utility services; repair of site damage due to construction, including traffic maintenance; and final site restoration; all as required for the proper completion of the work included under this contract.

DETAIL SPECIFICATIONS

PART E - BID ITEMS

ITEM 14

E-14 FIELD SERVICES

14-1 PRECONSTRUCTION PHOTOGRAPHY

A. General:

Prior to the delivery of any materials or supplies to the site of any work, or to the beginning of any of the construction work, the Contractor, under Item 14A, "Preconstruction Photography," shall provide, in the manner specified herein for the purpose of establishing the surface conditions existing in all of the areas to be affected by the work contemplated under this contract.

The preconstruction photography shall be performed by an independent company having experience in similar type work. The name of the company shall be submitted to the Engineer/Design Engineer for approval prior to engaging in the work.

B. Ground Photography:

1. **Scope of Work - Ground Photography** shall consist of color video taping of surface features in all the areas of work shown on the Contract Drawings. Prior to audio-video taping of the project, all areas to be inventoried shall be investigated visually with notation made to items not readily visible by taping methods.
2. **Purpose of Video Taping** - The purpose of the color audio-video taping of the project is to provide necessary information for restoration of surface features after completion of the project. This audio-video taping is to assist in the repairing, replacing and restoration of those areas affected by construction to their original condition with as little controversy as possible.
3. **Qualifications** - Color audio-video taping shall be compiled by a professional electographer actively engaged in color audio-video tape recordings of similar type projects for municipal agencies. The name of the company shall be submitted to the Engineer/Design Engineer for approval prior to engaging in the work.
4. **Coverage of Taping** - Such coverage shall include, but not be limited to, all existing pavements, curbs, driveways, sidewalks, treelawn areas, signs, poles, mailboxes, fences, guardrails, drainage ditches, rocks, trees, shrubbery, special landscape features, buildings, and visible utilities located within the area of the proposed work. Of particular concern are any existing faults, fractures, defects, or other imperfections exhibited by the above mentioned surface features. Audio description shall be made simultaneously with and support the video coverage.

14-1 PRECONSTRUCTION PHOTOGRAPHY (Cont'd)

5. Electronic Requirements - Audio-video tape shall be VHS format, T120, and shall be interchangeable with a 3/4 inch color video VHS format cassette player/recorder, EIAJ Standard NTSC Color Signal. Video output from camera(s) shall be capable of producing NTSC-525 lines/60 fields. Resolution in the Y channel shall be minimum 500 TV lines at center, utilizing a bias lit beam split prism, in combination with Plumbicon pick-up tubes, for optimum color imagery and minimum lag through ten (10) foot candles, with Geometric Distortion not to exceed 1.5% Picture Height at any point in picture area.
6. Location Information - All tapes (cassettes and cases) shall be properly identified by project name, tape number and location in a manner acceptable to the Engineer/Design Engineer. A printed record of the contents of each tape shall be furnished along with the audio-video tapes shall be furnished identifying each segment in the tape by location, i.e., street or easement, viewing side, traveling direction, engineering stationing as shown on the Contract Drawings, all referenced by tape counter numbers.

A brief report and inventory of all tapes completed and furnished, referenced by tape number and location shall be furnished to the Engineer/Design Engineer upon completion of the work and delivery of the tapes. This report shall bring to the Engineer's/Design Engineer's attention any defects in the area of the work that may give rise to controversy.

All video recordings shall begin with the date and time of recording, the project name, the sheet numbers of engineering stationing as shown on the Contract Drawings, the name of the street or easement being taped, the direction of travel, and the viewing side (left or right of station).

Houses and buildings shall be identified visually by house or building number, when possible, in such a manner that the progress of the taping may be located by reference to the houses and buildings.

The engineering stationing numbers shall be continuous and shall correspond to the project stationing shown on the contract Drawings and include the standard engineering symbols (for example: 37+38). This information shall appear in the lower half or lower corner of the viewing screen. Below the engineering stationing shall appear the name of the project, name of the area covered, direction of travel, viewing side, etc.

7. Entering Property - If it becomes necessary to enter onto private property, the Contractor shall notify the owner of such property at least 24 hours in advance of the planned entry to obtain his permission to do so. Should the owner of the property refuse to give his permission for said entry the contractor shall notify the Engineer/Design Engineer.

The Contractor is advised that he shall not enter any private property before permission is granted to do so or before the Engineer/Design Engineer notifies the Contractor that legal right to do so has been obtained. The Contractor shall be held liable for entry made other than that stated herein.

14-1 PRECONSTRUCTION PHOTOGRAPHY (Cont'd)

8. Ownership of Tapes - All tapes produced shall become the permanent property of the City of Cleveland, Division of Water. The Contractor shall deliver all tapes to the Engineer/Design Engineer prior to the beginning of any construction work. Tapes furnished to those listed in, Part C, Section C-34, of the Supplemental General Conditions, shall become the permanent property of those listed.

Any portion of the tape coverage deemed unacceptable by the Engineer/Design Engineer shall be retaped by the Contractor at his expense.

9. Site Recording Conditions - All taping shall be done during times of good visibility. No outside taping shall be done during periods of visible precipitation or when the ground area is covered with snow, leaves, or debris unless otherwise authorized by the Engineer/Design Engineer.

In order to produce the proper detail and perspective, adequate auxiliary lighting shall be required to fill in shadow areas caused by trees, utility poles, road signs and other such objects, as well as other conditions requiring artificial illumination.

The average rate of speed in the general direction of travel of the conveyance used during taping shall not exceed 48 feet per minute. Panning rates and zoom-in and zoom-out rates shall be controlled sufficiently such that play back produces adequate clarity of the objects being viewed.

When conventional wheeled vehicles are used as conveyances for the taping, the distance from the camera lens to the ground shall not be less than eight (8) feet to insure proper perspective. In instances where tape coverage is required in areas not accessible to conventional wheeled vehicles, such coverage shall be obtained by walking or by special conveyance approved by the Engineer/Design Engineer, but with the same requirements for tape quality and content as specified herein, except as may be specifically exempted by the Engineer/Design Engineer.

C. Number of Copies:

The Contractor shall provide one complete (1) copy of the preconstruction photography for the sections of work herein specified to each of those listed in Part C, Section C-34. The cost of this work shall be included in the Lump Sum Price bid for Item 14A, "Preconstruction Photography."

D. Basis of Payment:

The full cost of furnishing all labor, material and equipment to perform the required audio-video taping as described herein, including any required re-taping, shall be included for payment in the Lump Sum Price bid for Item 14A, "Preconstruction Photography."

14-2 SHOP DRAWINGS

A. Submittals:

As soon as possible after the execution of the Contract, the Contractor shall cause to be prepared and shall submit to the Engineer/Design Engineer for review and approval, fully dimensioned, manufacturer or fabricator generated detailed working drawings or detailed shop drawings of all piping, valves and miscellaneous details. All working and shop drawing submittals shall be full sized drawings, true to scale. No reduced copies or previously used drawings from other contracts shall be accepted. No work shall be done in the shop or in the field until after the shop drawings have been finally approved by the Engineer/Design Engineer.

B. Reviews and Approvals:

Shop drawings, until approved, shall be submitted in a minimum of eight (8) sets or copies, corrected as directed by the Engineer/Design Engineer and resubmitted as often as necessary for final approval. All such drawings shall be accompanied with a Contractor's "Letter of Transmittal" listing the drawings, their contents, the item number for which the submittal is made, and the project for which they are intended. After such approval, the Contractor shall furnish not less than eight (8) sets or copies for the Engineer's/Design Engineer's use. The Contractor shall distribute a sufficient number of additional sets as may be required for the work, including at least one (1) set for the field office, all bearing the Engineer's/Design Engineer's "Approval" stamp or other written documentation indicating approval.

C. Contractor's Responsibility:

The Engineer/Design Engineer will not release final approved shop drawings until the Contractor furnishes field data, in writing, on his company stationary, addressed to the Engineer/Design Engineer, explicitly stating that the Contractor has made throughout the full limits of the work contemplated herein, thorough field investigations and field verifications of all utilities and utility service connections, both public and private, including all sewers, all sewer service connections, and appurtenances thereof, and of any other obstruction that may be encountered in the work, and that according to his field investigations and field verifications, no known utilities, utility service connections or obstructions will affect the pipelaying as shown on the Contract Drawings. Where the Contractor finds variations will be required to the proposed pipeline alignment and/or profile as shown on the Contract Drawings, he shall document those variations in accordance with paragraph.

In addition, it shall the responsibility of the Contractor to verify all field dimensions and all design criteria, including design and pressure requirements, prior to preparing the various shop drawing submittals in order to ascertain that all materials to be furnished meet or exceed the requirements of this contract. At the time of each submission, the Contractor shall give the Engineer/Design Engineer specific written notice of each variation that the Shop Drawings may have from the requirements of the Contract Documents. The Contractor shall cause a specific notation to be made on each Shop Drawing submitted to the Engineer/Design Engineer for review of each such variation.

14-2 SHOP DRAWINGS (Cont'd)

The Engineer's/Design Engineer's review and approval of Shop Drawings shall not relieve the Contractor from responsibility for any variation from the requirements of the Contract Documents. The Engineer's/Design Engineer's approval shall not extend to any such variation unless Contractor has, in writing, conspicuously called to the Engineer's/Design Engineer's attention each such variation at the time of the submittal, as required by this paragraph, and the Engineer/Design Engineer has given written approval of that particular variation by a specific written notation thereof incorporated in or accompanying the Shop Drawing review and/or approval.

The field data shall be obtained by the Contractor, and submitted to the Engineer/Design Engineer, in sufficient time in advance of the proposed work in order to determine if any adjustments to the line and grade of the proposed water main or adjustments to the existing water main is required due to the information obtained in the field data. The information obtained in the field data shall also be forwarded to the pipe fabricator with sufficient time to allow for the preparation of revised shop drawings and for fabrication of those pipe and fittings required to make the connection. No extra compensation to the Contractor shall be made for any delays and/or additional, pipe, fittings, and specials, or equipment, tools and incidentals, for failure to having properly obtained and forwarded in a timely manner to the Engineer/Design Engineer the required field information data for review and approval and the same to the pipe fabricator.

D. Accuracy/Completeness:

The data shown on the Shop Drawings shall be complete with respect to quantities, dimensions, specified performance and design criteria, materials and similar data to enable the Engineer/Design Engineer to review the information as required. It is, among other things, the responsibility of the Contractor to verify all field dimensions prior to preparing the various shop drawing submittals.

Shop drawings shall be checked by the Contractor for accuracy of information prior to submission. Whenever it is evident that such checking has not been done, review of the shop drawings by the Engineer/Design Engineer will not be considered further and will be returned to the Contractor for checking and resubmission.

At the time of each submission, the Contractor shall give the Engineer/Design Engineer specific written notice of each variation that the Shop Drawings may have from the requirements of the Contract Documents. In addition, the Contractor shall cause a specific notation to be made on each Shop Drawing submitted to the Engineer/Design Engineer for review and approval of each such variation.

The Engineer's/Design Engineer's review and approval of Shop Drawings shall not relieve the Contractor from responsibility for any variation from the requirements of the Contract Documents. The Engineer's/Design Engineer's approval shall not extend to any such variation unless Contractor has, in writing, conspicuously called the Engineer's/Design Engineer's attention to each such variation at the time of submittal, as required by this paragraph and in paragraph C, "Contractor's Responsibility," and the Engineer/Design Engineer has given written approval of that particular variation by a specific written notation thereof incorporated in or accompanying the Shop Drawing approval.

14-2 SHOP DRAWINGS (Cont'd)

The Engineer/Design Engineer will review and approve with reasonable promptness Shop Drawings submitted by the Contractor. However, the Engineer/Design Engineer's review and approval will be only for conformance with the design concept of the work and for compliance with the requirements set forth in the Contract Documents. Such review and approval do not extend to:

1. Means, methods, techniques, sequences or procedures of construction, except where a specific means, method, technique, sequence or procedure of construction is specified in or required by the Contract Documents due to its effect on the conformance of the completed work with the design requirements, or to safety precautions or programs incident thereto.
2. Design data reflected in the Shop Drawing submittal which is within the special expertise of the manufacturer/designer of that equipment, upon which the City and the Engineer/Design Engineer have a right to rely.
3. Safety aspects of the equipment to be installed, including, but not limited to, OSHA requirements and installation procedures.
4. Approval of a separate and specific item of work, for which such approval is given and, therefore, governs.
5. The approval by the Engineer/Design Engineer of any Shop Drawing shall not relieve the Contractor from its responsibility to the City and others for errors or omissions in the Shop Drawings or the resulting installation.
6. Where a Shop Drawing is required by the specifications, any related work performed prior to the Engineer's/Design Engineer's review and approval of the pertinent submission will be the sole expense and responsibility of Contractor.

E. Final Mylar Tracings:

After the drawings have been finally approved, the Contractor shall furnish the Engineer/Design Engineer with reproducible tracings on Mylar of each of the final shop drawings. Laying Schedules and Line Assembly Drawings shall be revised by the pipe fabricator to reflect "As-Built" data furnished by the Contractor; see Section 14-3, "As-Built Drawings," paragraph C, "As-Built Shop Drawings." Mylar shall be of minimum 4-mil thickness, shall be of a single base stock with an etched surface to provide a matte finish on the front and shall be of a permanent non-erasable, "wash-off" type, of which the image on the mylar medium cannot be removed by erasure. All shop drawings shall be reproduced from their full sized original tracings and not as reduced sizes as may have been submitted during the review process. Small full scale sized drawings pertaining to a given item shall be grouped for reproduction so that all tracings shall be 24" x 36" overall. Tracings not 24" X 36" in size will not be accepted. All mylar tracings of all working and shop drawing submittals shall be of full sized drawings, true to scale. No mylar tracings of reduced copies or previously used drawings from other contracts will be accepted.

14-2 SHOP DRAWINGS (Cont'd)

F. Drawing Identification:

All drawings submitted for approval shall be identified as follows:

CITY OF CLEVELAND - DIVISION OF WATER
(NAME) WATER SUPPLY MAIN
ITEM NUMBER and DESCRIPTION OF ITEM

G: As-Built Shop Drawings :

After the "As-Built Drawings have been completed by the Contractor and his engineer/surveyor and such has been reviewed by the Inspector the Contractor shall submit the original set of "as-built" prints and the original field book to the City for its permanent files. One (1) copy of the "As-Built" drawings and other pertinent field data shall be forwarded to the pipe fabricator so that the finally approved Laying Schedules and Line Assembly Drawings shall be revised to reflect actual line and grade of the pipe including the actual stationing and elevation of the pipe, horizontal and vertical deflections, air relief/flushing outlets, drain assemblies, valve assemblies, and the actual placement of the various pipe, fittings, specials, extra fittings, restrained distances, joint type(s), etc.

H. Basis of Payment:

The full cost of furnishing all labor, material and equipment to provide the required shop drawing submittals, including the final mylar submittals, as described herein shall be included for payment in the Fixed Lump Sum Price stipulated by the City, for Item 14B, "Shop Drawings," and as indicated in the Schedule of Bid Items.

Payment of the Fixed Lump Sum Price stipulated by the City, for Item 14B, "Shop Drawings," shall be as follows: 50%, less retainage, of the fixed lump sum for Item 14B shall be paid only after all of the paper shop drawings for all pertinent items have been submitted by the Contractor and reviewed and approved by the Engineer/Design Engineer. The remaining 50%, less retainage, shall be paid after all of the mylar shop drawings have been submitted, in the manner herein specified, by the Contractor, including "As-Built" shop drawings of the Laying Schedule and Line Assembly Drawings by the pipe fabricator, and same is accepted and approved by the Engineer/Design Engineer.

Payment for the preparation and furnishing of the "As-Built" Laying Schedules and Line Assembly Drawings in the manner herein specified as described under Section 14-2, "Shop Drawings," paragraph E, "Final Mylar Tracings," shall be made as part of the final mylar submittals required under Item 14B, "Shop Drawings."

DETAIL SPECIFICATIONS

PART E - BID ITEMS

ITEM 15

E-15 UNDERGROUND STRUCTURES

15-1 WORK INCLUDED

Work, under Item 15, "Underground Structures," shall include changes required to the watermain installation from that shown on the Contract Drawings but within the scope of this contract and payment therefor, where additional work is required due to conflicts or interference with underground structures, necessitating additional excavation, additional backfill, additional paving, utility conflicts, repair of existing underground structures, sheeting ordered left in place. Work under this item shall be confined to the normal lines of excavation. Not included under Item 15 are those changes or modifications to the scope of work to that shown in the Contract Documents, or that specified in these specifications, in which case the Contractor shall follow and adhere to the procedures set forth under Part B, Section B-34, "Changes or Modifications of Work."

Notwithstanding the requirements of Part C, Section C-60, "Underground Structures Encountered," particularly those structures unforeseen and/or not shown on the Contract Drawings, or that which may have been installed, modified, and/or relocated since the Contract Documents have been executed, and where such unforeseen structures encountered interferes or conflicts with the proper prosecution of this contract and deemed within the scope of work under this contract, the Contractor shall relocate, support, protect, repair, reinstall, or as otherwise required, any underground structure, or where necessary, make required field adjustments to the proposed water main work contemplated herein, all in accordance with these specifications.

The Contractor shall not proceed with or perform any work under Item 15 without first having provided written notification to the Engineer/Design Engineer in accordance with Part C, Section C-5, "Contract Drawings and Specifications - Part of Contract," of these specifications, detailing the nature of the interference or conflict, his proposed method of remedy, and his proposed costs to rectify the interference or conflict, and the Engineer's/Design Engineer's written approval of the work and notice to proceed. Where work required under Item 15 includes work for which there are bid items in this contract or where fixed unit prices for "Additional Work" are provided in this contract, the Contractor shall include in his cost for the work, under Item 15, those bid prices and unit prices of all applicable contract items.

15-2 INTERFERENCES OR CONFLICTS INCLUDED

Where it becomes necessary to remove, relocate, support, protect, repair, reinstall, or as otherwise required, any underground structure, either unforeseen or not shown on the Contract Drawings, or make required field adjustments to the water main installation, in order to resolve interferences or conflicts with the proposed work the Contractor shall prepare and submit to the Engineer/Design Engineer for approval a cost estimate for the work, under Item 15, limited to the following:

PART E - DETAIL SPECIFICATIONS - BID ITEMS
CUY-West Sixth Street Streetscape, Part 1, PID 89722
CUY-Professor Street Intersections, Part 2, PID 90218

15-2 INTERFERENCES OR CONFLICTS INCLUDED (Cont'd)

- A. Adjustments to the proposed water main line and/or grade necessitating the installation of additional footage of pipe or additional pipe joint restraint per Contract Item 1, "Ductile Iron Pipe and Fittings," Contract Item 2, "Prestressed Concrete Pressure Pipe and Fittings," or Contract Item 3, "Steel Pipe and Fittings;" Air Relief/Flushing Outlet Valve Assembly with Valve Boxes Complete per Contract Item 4, "Valves;" Drain Valve with Valve Box Complete per Contract Item 4, "Valves;" Drain Vault Complete per Contract Item 6, "Brick Masonry and Vault/Manhole Structures;" Steel Pipe Casings per Contract Item 10, "Steel Pipe Casing"; or any other applicable Contract Item, all as required for the proper completion of the work shown on the Contract Drawings and in accordance with these specifications.
- B. Additional excavation:
- Additional excavation in excess of two (2) feet below bottom of trench as originally shown on the Contract Drawings, based on volume as measured by normal width of trench times the excess depth:
- 1) Additional excavation in rock \$50.00 per cubic yard;
 - 2) Additional excavation in shale \$30.00 per cubic yard; and
 - 3) Additional excavation in earth \$15.00 per cubic yard.
- C. Additional backfill:
- 1) Additional sand backfill \$12.00 per cubic yard; and
 - 2) Additional premium backfill \$18.00 per cubic yard.
- D. Additional Paving:
- 1) Additional permanent paving \$23.00 per square yard; and
 - 2) Additional breaking and removal of pavement \$12.00 per lineal foot of trench.
- E. Utility/traffic poles not shown on the Contract Drawings, but falling within the normal lines of excavation.
- F. Repair of existing culverts to repair damaged culvert or integrity of culvert as result of excavation.
- G. Unforeseen underground structures, or those not shown on the Contract Drawings, such as gas lines, electric ducts, phone ducts, traffic loops, and water service connections, required to be removed, relocated, supported, and/or replaced.

15-2 INTERFERENCES OR CONFLICTS INCLUDED (Cont'd)

- H. Sheeting or that portion of the sheeting ordered to be left in place will be paid for at the rate of Three Hundred and Fifty Dollars (\$350.00) per thousand feet board measure. No payment will be made for wasted ends. Sheeting furnished and installed by the Contractor and either not called to be removed or that sheeting not ordered left in place shall be at the expense of the Contractor.

15-3 INTERFERENCES OR CONFLICTS EXCLUDED

Interferences or conflicts encountered that shall be excluded under Item 15 but may be included per Part C, Section C-60, "Underground Structures Encountered", or under other bid items are as follows:

- A. Sewer laterals, catch basin replacement, etc., - covered under Part D, Section D-24, "Changes in Sewers, Catch Basins, Etc.," and to be paid for under Item 5, "Vitrified/PVC/Concrete Sewer Pipe and Specials," classified as to size and type.
- B. Utilities, culverts, drainage pipes, mailboxes, guardrails, support posts, etc., shown on the Contract Drawings, but may or may not specifically be called for their removal, relocation, support, and/or replacement, that fall within the normal lines of excavation. Such utilities, culverts, drainage pipes, mailboxes, guardrails, support posts, etc., falling within the normal limits of excavation that are required to be removed, relocated, supported, and/or replaced shall be deemed to be included in the price bid per lineal foot of water main furnished and installed under this contract. In off pavement areas, normal lines of excavation shall mean the width of the trench, which is maximum two (2) feet plus outside diameter of the pipe when pipe is laid at six (6) depth to top of pipe. In paved areas the normal lines of excavation shall include, where applicable, the concrete base cutbacks and the wearing surface cutbacks. Normal lines of excavation, or normal width of trench, may be increased by one (1) foot for every additional three (3) foot depth as measured to top of the pipe. No compensation will made to the Contractor for trench width excavations in excess of that specified herein but the cost thereof shall be deemed to be included in the price bid per lineal foot of water main furnished and installed under this contract.

15-4 CHANGES OR MODIFICATIONS TO WORK

Where a major deviation in the plan location or profile of the water main from the original scope requires a design change, or where additional mainline sewers must be laid or additional permanent pavement is required when such is not part of the original Modifications or scope of work or where other work is required or determined necessary by the Engineer/Design Engineer and such is not part of the original scope of work, the Contractor's attention is herewith directed to Part B, Section B-34, "Changes or Modifications of Contract."

PART E - DETAIL SPECIFICATIONS - BID ITEMS
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15-5 PAYMENT

The full cost of furnishing additional labor, material and equipment to perform work required under Item 15, "Underground Structures," shall include additional excavation, additional sheeting and/or shoring, additional backfill, additional seeding and sodding, additional pavement (permanent only) and any additional site restoration required for the removal, relocation, support, protection, repair, reinstallation, or as otherwise required, of any underground structure, either unforeseen or not shown on the Contract Drawings, that interferes with the proper prosecution of the work required under this contract and as shown on the Contract Drawings or as specified in these specifications, or where required to make necessary field adjustments to the water main installation, all within the scope of this contract.

The Contractor shall provide written notification to the Engineer/Design Engineer detailing the nature of the interference, proposed method of remedy, and his proposed costs to rectify the interference, and the Engineer's/Design Engineer written approval of the work and notice to proceed. Where work is required under Item 15 includes work under bid items in this contract, the applicable bid items shall be used.

A Fixed Lump Sum Price is stipulated by the City on the Schedule of Bid Items for payment for work to be performed under Item 15, "Underground Structures." The Contractor shall not assume that this Fixed Lump Sum amount will be made part of the Contract Price nor shall he assume that payment will be made for unauthorized work under this item.

DETAIL SPECIFICATIONS

PART E - BID ITEMS

ITEM 17

E-17 FURNISHING AND SETTING 6-INCH HYDRANT

17-1 WORK INCLUDED

The Contractor, under Item 17, "Furnishing and Setting 6-inch Hydrant," shall furnish all hydrants, materials, labor, tools and equipment for and shall properly connect at the locations shown on the Contract Drawings 6" hydrants, complete as required, for the proper completion of the work included under this contract.

In general, this work shall include the furnishing, setting, testing, painting, the excavation, sheeting, shoring, backfilling, seeding and/or sodding, sidewalk and pavement replacement (both temporary and permanent) and the furnishing of all labor, materials, tools, and appliances necessary to complete the work as specified or as shown.

17-2 HYDRANTS

The 6" hydrants shall be City of Cleveland Standard and shall conform with the Division of Water's specifications and approved hydrant drawings on file with the Division of Water at the Carl B. Stokes, Public Utilities Building, 1201 Lakeside Avenue, Cleveland, Ohio 44114. See hydrant assembly detail following this section.

17-3 SETTING

A. General Location:

Hydrants shall be horizontally located a minimum of ten (10) feet away from sanitary sewers and five (5) feet away from storm sewers and in a manner to provide complete accessibility, and in such a manner that the possibility of damage from vehicles or injury to pedestrians is minimized. Unless otherwise directed, the setting of any hydrant shall conform to the following:

B. Location Regarding Curb Lines:

When placed behind the curb, the hydrant barrel shall be set so that the center of the barrel shall be no less than three (3) feet from the gutter face of the curb, or deviate from such location or deviate from the location indicated on the Contract Drawings, except by consent of the Engineer/Design Engineer.

C. Location Regarding Sidewalks:

When set in the lawn space between the curb and the sidewalk, or between the sidewalk and the property line, no portion of the nozzle or hydrant cap shall be within six (6) inches of the sidewalk.

PART E - DETAIL SPECIFICATIONS - BID ITEMS
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17-3 SETTING (Cont'd)

D. Position of Nozzles:

The hydrant shall stand plumb, with the 4-inch steamer nozzle pointing toward the curb. Where hydrant branch piping is parallel with, or not at right angles to the curb, the Contractor shall release the swivel head bolts and adjust hydrant 4-inch steamer nozzle to face the curb at the proper angle. Hydrant without swivel heads will be adjusted by the City where necessary to correct the position of the 4-inch steamer nozzle to face the curb. Height of hydrant shall conform to the established grade with tops of frost casing at least four (4) inches above grade.

E. Connection to Main:

The hydrant shall be connected to the distribution water main with a ductile iron pipe branch controlled by an independent gate valve of the same size as the hydrant, except as otherwise directed.

F. Drainage of Hydrant:

Drainage shall be provide at the base of the hydrant by filling around the elbow with coarse gravel or crushed stone to at least six (6) inches above the waste opening. Wherever the hydrant is set in rock, clay, or other impervious soil, the trench shall be widened and deepened on each side of the hydrant base, which space shall be filled compactly with coarse gravel, crushed stone, or broken stone and mixed with coarse sand of sufficient quantity to absorb all water to be drained from the hydrant when branch valve is closed.

G. Anchorage for Hydrant:

The hydrant shall be set on a stone slab or similar foundation and the base of the hydrant shall be well braced against unexcavated earth to the end of the trench with concrete backing, and it shall restrained to the branch piping with swivel joints or retained mechanical joints or be tied to the branch pipe with suitable rods, clamps, or other approved restraint as approved or directed by the Engineer/Design Engineer.

H. Cleaning:

The interior of the hydrant shall be thoroughly cleaned of all dirt and foreign matter before setting.

17-4 PAYMENT

- A. The unit price, under Item 17, "Furnishing and Setting 6-inch Hydrant," stipulated to be paid for each hydrant setting, shall include the furnishing, setting, testing, painting, the excavation, sheeting and shoring, backfilling, seeding and/or sodding, sidewalk and pavement replacement (both temporary and permanent); and shall include the furnishing of all labor, materials, tools and appliances necessary to complete the work as specified or as shown or as directed.

17-4 PAYMENT (Cont'd)

- B. The ductile iron pipe, fittings and specials furnished and installed in the hydrant branch shall be paid under Item 1, "Ductile Iron Pipe and Fittings."
- C. The hydrant branch gate valve and valve box complete shall be paid for under Item 4, "Valves."
- D. The concrete piers or thrust blocks shall be paid for under Item 7A, "Plain concrete Masonry."