

DIVISION III

CONSTRUCTION SPECIFICATIONS

PART 301 – RIGHT-OF-WAY CLEARING AND RESTORING

- 301.1 Work under this item shall include the removal and reconstruction or replacement of all obstructions affected by the construction of the project, including, but not limited to fences, retaining walls, patios, trash burners, signs, mailboxes, out-buildings, landscaping, etc. Any such obstructions that are not to be reconstructed are so designated on the drawings. Such shall be removed and disposed of by the contractor. All obstructions to be replaced or reconstructed shall be restored to substantially the same condition as existed prior to the construction except as otherwise noted. The Contractor shall remove and dispose of all debris, restore the grade of the surface of the earth as reasonably as may be done to the grade existing prior to construction, and upon completion of the work shall leave the site in as neat, clean, and orderly condition as nearly as it was prior to construction as may be reasonably done. Contractor shall document by photographing all concrete and asphalt driveway crossings and marking the location by street address on each photo. Photographs shall be filed with Engineering Services Department prior to commencing work. All costs of photography shall be included in Bid Item 301a, Right-of-Way clearing and restoring.
- 301.2 Passable surfaces across or along the construction vicinity shall be maintained at all times with gravel, steel mat or plate, or temporary bituminous surfacing material where a sidewalk, driveway, parking lot, street, or alley previously existed. Pavement damaged by the Contractor's equipment shall be replaced to original condition. Gravel surfaces shall be replaced with the same. Sodded surfaces shall be maintained in a neat and orderly fashion during construction. This shall include mowing within the Right-of-way, if directed during construction.
- 301.3 If an obstruction is of public ownership, the Contractor shall notify the appropriate agency, and obtain any necessary permit or license 48 hours before beginning any operations affecting the obstruction. All work shall conform to the current standards and specifications of that agency and shall be approved by the agency before completion of the project. At the Contractor's request, the Engineer will furnish information as to what licenses or permits are required.
- 301.4 Payment: Payment for this item shall be made at the unit price bid per square yard. The contractor shall restore all disturbed areas to a condition equal to or better than the existing improvements. Limits of disturbance shall not exceed 9' centered on the waterline (4-1/2' either side of the centerline). Any disturbances outside this area shall be restored at the contractor's expense. Bores, fittings, streets, driveways, or specials shall be paid under other items of work. No additional payment shall be made for alterations of utility mains, service lines, or appurtenances, unless specifically provided for elsewhere in the Contract Documents.

PART 302 – EXCAVATION AND BACKFILL, UNCLASSIFIED

- 302.1 The work under this item shall include all earth, shale, gravel, loose rock, solid rock, debris, junk, and/or other material excavated or otherwise removed in the preparation of the trench; all work in connection with the excavation, removal and subsequent handling and disposal of such material, regardless of its type, character, or condition; subgrade preparation, all sheeting, piling, shoring, bracing, and dewatering of trenches; protection of adjacent property; backfilling; sand cushion; grade base stabilization; all specified backfill consolidation; and other work necessary or required.
- 302.2 The trench shall be excavated so that the pipe can be laid to the alignment and grades shown on the drawings, or as directed by the Inspector. In dense or built-up areas or where unstable soils exist, the trench shall be excavated a maximum of 100' in advance of pipe laying. In open areas or where soil conditions permit, the trench excavation may be unlimited in advance of pipe laying, as approved by the Engineer. Opening of trenches in excess of the maximum requires specific approval of the Engineer. Trenches shall be dry when the trench bottom is prepared. The trench bottom shall be shaped so that even bearing is obtained for the barrel of the pipe with the bells unsupported. The standard trench width as shown on the attached Standard Detail, shall not be exceeded at any elevation below a point 12" above the top of the pipe. If for any reason this portion of the trench exceeds the permitted width and if the Inspector shall determine that cradling or encasement then is required, said concrete cradle or encasement shall be installed. Any part of the bottom of the trench excavated more than 4" below the specified grade shall be corrected with approved material thoroughly compacted as directed by the Inspector. In the event suitable material is not available, sand shall be used. When rock is encountered and concrete cradle is required, it shall be excavated 4" below the bottom of the pipe and the trench refilled to grade with sand. When quicksand or other unstable earth is encountered, the Contractor shall excavate to sufficient depth to permit backfilling with Class "A" crushed stone in order to provide a stable base for the pipe. Trench safety shall be in accordance with applicable OSHA, State, and local regulations.
- 302.3 Bedding of pipe shall be as shown on the attached Standard Details. Unless otherwise shown, bedding shall be placed in the trench simultaneously on both sides of the pipe to a minimum elevation of 4" above the top of the pipe, being carefully worked and hand-tamped around the pipe in order to consolidate and assure excellent bedding. Backfill material shall not be placed in the trench covering the bedding cushion without prior approval of the Inspector. To prevent damage to the pipe, do not use compaction equipment within 18 vertical inches directly over the top of the pipe.
- 302.4 For large diameter (18" and above) flexible water pipe, bedding shall be in accordance with the Bedding Detail for Large Diameter Flexible Pipe. The pipe shall be bedded in soil-cement, installed over a 6" sand cushion. The bedding shall be installed to the top of the pipe for the full width of the excavated trench. The soil-cement shall consist of a mixture of sand, portland cement, and water. Each cubic yard of soil cement shall contain 1-1/2 sacks of cement and approximately 70 gallons of water. Precautions shall be taken to prevent flotation. Movable trench supports shall not extend lower than the top of the pipe.

- 302.5 When the type of backfill material is not indicated on the Drawings or specified, the backfill may be made with the excavated material, provided that such material, in the opinion of the Inspector is suitable for backfilling. In the event that excavated material is not suitable, sand or other approved material shall be used. From 6" above the pipe to 18" above the pipe, the trench shall be backfilled by hand or by mechanical methods approved by the Inspector. Special care shall be used in placing this portion of the backfill to avoid damaging or moving the pipe. The remainder of the trench may be backfilled by mechanical methods. Backfilling operation shall be completed within 100' or less of the finished line at all times, as directed by the Inspector.
- 302.6 Unless otherwise directed by the Engineer, all trenches excavated across any sidewalk, driveway, parking lot or other paved area, across any traveled portion of unpaved streets or alleys, across any proposed roadways or proposed roadway fills, and as shown on the drawings shall be bedded and backfilled with 1-1/2" Type A Aggregate Base (see 213.2), placed in 8" maximum lifts and compacted to 95% Standard Proctor Density, as measured by the Nuclear Density Method. Compaction shall be done by a vibratory hand tamper. Trenches excavated across existing street or alley paving shall be backfilled in accordance with the standard detail for Pavement Removal and Replacement. For excavations where there is more than 6' of cover over the top of the pipe and where the trench width is sufficient for use of heavy compaction equipment, an engineered fill using a suitable compactable material may be used in lieu of aggregate base, if approved in writing by the Director of Engineering Services Department. If the backfilling has been completed and the backfill material does not meet the requirements for compaction, all the material shall be removed and hauled from the job site and the trenches refilled with material as specified above. Failure of backfill shall be corrected immediately, as directed by the Engineer.
- 302.7 Payments: Payment for this item shall be made at the unit price bid per cubic yard. Volume will be computed as follows: standard trench width as listed in Standard Detail No. 315; length of line, as the actual horizontal measurement along the centerline of the ditch; depth of excavation as the actual depth of ditch from the original ground surface to the flow line of the pipe as shown in the construction notes. Average end-area method of computing volume will be used. No payment for excavation will be made for material excavated outside the neat lines of the standard trench width. No additional payment will be made for: sand cushion; backfilling; compaction of backfill; crushed stone used for backfill under existing and/or proposed roadways, roadway fills, streets, alleys, driveways, sidewalks, parking lots, or as shown on the Drawings; removing and replacing top soils and obstruction, tunneling of trees, storm sewers or other obstructions; blasting; bracing and shoring; dewatering; pumping and draining; grade base stabilization; removal of excess excavated material; or restoration of the site. It is mutually understood that subterranean water, quicksand, or other unstable earth may be encountered, and the Contractor has taken such into consideration in making this bid. Where such is encountered, Contractor will be required to excavate to sufficient depth to permit backfilling with crushed stone in order to provide a stable base for the pipe. Extra payment will not be made because of such additional excavation or because it is necessary to excavate wider than the standard trench width; or for crushed stone.

PART 303 – MOBILIZATION/DEMobilIZATION

303.1 Mobilization/Demobilization shall be bid as Each and THE AMOUNT BID SHALL NOT EXCEED 10% OF THE SUM OF ALL BID ITEM EXTENSIONS EXCLUDING MOBILIZATION/DEMobilIZATION. This work shall consist of the performance of construction preparatory operations, including the movement of personnel and equipment to the project site and for the establishment of the Contractor's offices, buildings, and other facilities necessary to begin work on a substantial phase of the Contract. The Engineer's field office and laboratory is a separate pay item and is not included in this work.

303.2 PAYMENT

303.2.1 Payment shall be full compensation for performing the work specified and the furnishing of all materials, labor, tools, equipment, and incidentals necessary to mobilize and subsequently demobilize the construction preparatory operations.

303.2.2 Payment for this item will be made in two installments unless the first estimate submitted is also the final estimate, in which case the total will be paid. The first payment of 50% of the lump sum Contract price will be included in the pay estimate which reflects 50% completion of the work.

An additional 15% of the price bid for mobilization/demobilization may be included in the pay estimate which reflects 50% completion of the work.

303.2.3 The final 25% (35% – 50%) of the price bid for mobilization/demobilization may be included on the final pay estimate. No additional payment will be made for demobilization.

PART 304 – CONTRACTOR CONSTRUCTION STAKING

- 304.1 This work shall consist of furnishing, placing, and maintaining construction layout stakes necessary for the proper prosecution and inspection of the work under the contract.
- 304.1.1 Contractor shall exercise care in the preservation of stakes and benchmarks and have them reset when they are damaged, lost, displaced, or removed. Contractor shall use licensed land surveyor in the State of Oklahoma and suitable equipment for the layout work required.
- 304.1.2 Contractor shall set all additional stakes needed, such as offset stakes, reference point stakes, slope stakes, pavement, curb line and grade stakes, stakes for bridges, sewers, roadway drainage, pipe underdrains, paved gutter, fence, culverts, or other structures – and any other horizontal or vertical controls necessary to secure a correct layout of the work. Stake centerline/control line of temporary features, such as shoo-fly detours. Contractor shall make stakes for line and grade adequate to maintain the specified tolerances for the operation being performed and satisfactorily to Engineer. Mark the station number and the distance from the centerline of construction on all grade stakes.
- 304.1.3 Contractor shall furnish platforms and equipment necessary for proper and safe access for checking the staking, and when significant errors occur, resurvey to satisfaction of the Engineer.
- 304.1.4 Contractor shall notify Engineer immediately of plan errors. Special surveys necessary to determine corrective action shall be responsibility of Engineer.
- 304.2 **PAYMENT**
- 304.2.1 Payment shall be by Each for Contractor Construction Staking, and shall be full compensation for furnishing all materials, equipment, labor, and incidentals to complete the work as specified, including profile measurements of connecting features.
- 304.2.2 Payment for this item of work shall be on the following schedule:
- 25% on the first payment estimate.
 - 25% when 10% of the contract work is complete.
 - 25% when 50% of the contract work is complete.
 - 20% when 75% of the contract work is complete.
 - 5% when all construction features have been verified as properly placed and complete.

PART 305 – PIPE, VITRIFIED CLAY

- 305.1 The work under this item shall include furnishing, delivery, and placing and jointing of vitrified clay pipe (VCP) in the trench in specific conformity with the line and levels given.
- 305.2 The pipe shall be laid on a firm trench bottom, true to the lines and grades shown on the Drawings and/or as given in the field by the Inspector. Pipe shall be protected during handling against impact shocks and free fall. The laying of pipe in finished trenches shall be commenced at the lowest point, with the spigot ends pointing in the direction of flow. Pipe shall be laid continuously through new manholes if both inlet and outlet pipes are of the same size and in line. Upon completion of the manhole the invert shall be shaped. The ends of adjoining pipes shall butt against each other for their entire circumference in such a manner that there is no shoulder or unevenness of any kind. If Contractor uses batter boards instead of laser level, a top line shall be maintained over a span of three grade stakes when laying pipe. As each batter board is erected, the top line shall be sighted to assure the accuracy of the grade stakes and the batter boards' settings. Any errors, discrepancies, or displacement of grade stakes shall be called to the attention of the Inspector for correction.
- 305.3 Prior to making pipe joints, all surfaces of the portion of the pipe to be jointed shall be cleaned and dried. Jointing shall be done in strict accordance with the manufacturer's recommended procedure. Trenches shall be kept water-free during jointing and for a sufficient period thereafter to allow the joint to become fully set and completely resistant to water penetration. There shall be no realignment of the pipe after the joint is completed unless the pipe is removed and a completely new joint constructed.
- 305.4 Double joints of 8" pipe may be prepared and laid, provided the double joints are prepared by jointing the pipe in a vertical position using a straight edge inside the pipe to align the joint. Double joints shall not be placed in a horizontal position prior to laying unless suitably supported in racks. Double joints of pipe shall be supported at the middle joint, as well as the ends, when the pipes are lowered into the trench.
- 305.5 Payment: Payment for this item shall be made at the unit price bid per linear foot of the pipe specified in the Proposal and placed as shown on the Drawings. Total footage shall be the actual horizontal measurement along the centerline of the pipe. No additional payment shall be made for vertical pipe or fittings used with drop manholes.

PART 306 – PIPE, REINFORCED CONCRETE

- 306.1 The work under this item shall include furnishing, delivery, placing and jointing of reinforced concrete pipe (RCP) in the trench in specific conformity with the lines and levels given.
- 306.2 For water and storm sewer lines, the Reinforced Concrete Pressure Pipe, Steel Cylinder Type, AWWA C300, shall govern the installation as applicable. The method of bedding shall be as shown on the attached Standard Bedding Detail. Bedding for pretensioned concrete pipe shall be in accordance with Standard Bedding Detail for Pretensioned Concrete Pressure Pipe. The Drawings show the plan and grade for the pipeline. The Contractor shall submit detailed drawings to the Engineer for approval, showing the proposed method of laying the pipe to these grades. All pipelines to be crossed shall be located by the Contractor before these drawings are prepared. The ends of the pipes to be jointed shall be cleaned immediately prior to jointing and the rubber gasket thoroughly lubricated with vegetable soap before it is placed in position on the spigot end. Extreme care shall be taken in moving the spigot end of the pipe into the bell end of previously laid pipe. If the gasket is damaged or moved out of place, the new pipe shall be removed, and a new gasket applied before rejoining. Any soap remaining on the exposed concrete surfaces inside or outside the pipe shall be completely removed. Fittings or specials included as pipe shall be blocked in accordance with the attached Standard Detail.
- 306.3 For storm sewers, the methods of laying pipe, foundation, and grade specified under Pipe, Vitriified Clay, shall apply. All pipe shall be installed with the mark "C-76" visible on the top of the pipe. The ends of the pipes to be jointed shall be cleaned immediately prior to joining and the rubber gasket. Extreme care shall be taken in moving the spigot end of the pipe into the bell end of previously laid pipe. If the gasket is damaged or moved out of place, the new pipe shall be removed, and a new gasket applied before rejoining.
- 306.4 For all lines, after the pipe has been jointed, a band at least 5-1/2" wide shall be placed around the outside of the pipe at the joint. This band shall serve as a form for placing 1:1 cement mortar grout in the external recess formed by the face of the groove and the shoulder of the tongue. If a reinforced paper joint band is used, it shall be drawn up tight around the pipe and the backfill tamped against it up to the spring line before pouring the grout. If a cloth band is used, it shall be wired around the outside of the pipe, and the grout poured before backfilling. On all pipes, the joint space remaining on the inside of the pipe shall be filled with a stiff mixture of 1:1 cement mortar which shall be troweled in place to produce a continuous, smooth, flush surface across the joint.
- 306.5 Payment: Payment for this item shall be made at the unit price bid per lineal foot of pipe of the type specified in the Proposal and placed as shown on the Drawings. Total footage shall be the actual horizontal measurement along the centerline of the pipe. No additional payment shall be made for vertical pipe or fittings used with drop manholes, for fittings or specials included as pipe, or for concrete blocking or interior coatings.

PART 307 – PIPE, DUCTILE IRON

- 307.1 The work under this item shall include furnishing, delivery, placing, and jointing of Ductile Iron pipe in the trench in specific conformity with the lines and levels given. All Ductile Iron pipe shall be wrapped with a loose fitting, slip-on polyethylene film. The polyethylene film shall be slipped over the end of the pipe length that has been raised above the ground at the trench side. After the joint on the pipe is made up, the 1' length shall be slipped over the joint to form an over-or-under lap of the adjacent polyethylene tube at this point. The loosely fitting film shall then be neatly folded over the top of the joint and held in place with tape. The loosely fitting tube extending along the pipe shall be drawn up snugly and folded along the top and held in place by using short pieces of plastic tape at intervals not to exceed 4'. Fittings, valves, and corporation stops shall be wrapped with a section of polyethylene material split to form a flat sheet, using plastic tape to hold the material around the appurtenance. For all pipe, the American National Standard for Installation of Gray and Ductile Cast-Iron Water Mains and Appurtenances, AWWA C600 shall govern the installation as applicable. The method of bedding shall be as shown on the attached Standard Detail for Thrust Blocks and Trench Conditions, and Standard Detail for Pavement Removal and Replacements as applicable.
- 307.2 For water lines, all angled fittings, or specials included as pipe shall be restrained or blocked in accordance with the attached Standard Detail, the size to be determined by the Engineer.
- 307.3 Detectable Mylar marking tape for location of DIP water pipe shall be required. Detectable Mylar marking tape shall be 2" wide, blue in color with a continuous black lettered imprint stating, "Caution: Water Line Below". Tape shall be equal to Lineguard Tape III as manufactured by Lineguard, Inc. of Wheaton, Illinois.
- 307.4 Detectable Mylar tape shall be buried above DIP water lines at a depth of 10" below the surface.
- 307.5 Payment: Payment for this item shall be made at the unit price bid per linear foot of pipe of the type specified in the Proposal and placed as shown on the Drawings. Total footage shall be the actual horizontal measurement along the centerline of the pipe. No additional payment shall be made for vertical pipe or fittings used with drop manholes, for fittings or specials included as pipe, interior coatings, or for concrete blocking. Payment for any ductile iron pipe designated "restrained joint" shall include cost of all components necessary to restrain joints of pipe.

PART 308 – PIPE, STEEL

- 308.1 The work under this item shall include furnishing, delivery, placing, and jointing of steel pipe in the trench in specific conformity with the lines and levels given. For all lines, American National Standard for Installation of Gray and Ductile Cast-Iron Water Mains and Appurtenances, AWWA C200 shall govern the installation, as applicable. The method of bedding shall be as shown on the attached Standard Bedding Detail for Steel Pipe. The Drawings show the plan and grade for the pipeline. The Contractor shall submit detailed drawings to the Engineer for approval, showing his proposed method of laying the pipe to these grades. All pipelines to be crossed shall be located before these drawings are prepared. Fittings or specials included as pipe shall be blocked in accordance with the attached Standard Detail for Thrust Blocks and Trench Conditions.
- 308.2 If joints are field-welded, they shall develop the full strength of the pipe. The Contractor shall file with the Engineer a description of the method of welding which he proposes to use, the name of the individual or company who will do the welding, and a statement regarding the previous experience of such individual or company in this particular line of work. Testing shall be in accordance with Section 3.3 of AWWA C206. If requested, coupons shall be cut across the field welds and tested by a testing company approved by the Engineer and at the contractor's expense. The line may be welded continuously with provisions for slack in the line, or in sections to be lowered in the trench and connected by a position weld.
- 308.3 If joints are to be mechanically coupled, sections up to 240' may be coupled and lowered carefully into the ditch. Electrical continuity shall be provided at all joints. Preparation for, protection of, and repair of pipe coating and lining, and coating of mechanical couplings shall conform to the applicable section of these specifications.
- 308.4 Field replacement of the cement-mortar interior lining shall be in accordance with the AWWA Standard for Cement-Mortar Lining of Water Pipelines, 4" and Larger, In Place, AWWA C602.
- 308.5 Payment: Payment for this item shall be made at the unit price bid per linear foot of pipe of the type specified in the Proposal and placed as shown on the drawings. Total footage shall be the actual horizontal measurement along the centerline of the pipe. No additional payment shall be made for vertical pipe or fittings used with drop manholes, for fittings or specials included as pipe, or for concrete blocking. Payment for any steel pipe designated "restrained joint" shall include cost of all components to restrain joints of pipe.

PART 309 – POLYVINYL CHLORIDE (PVC) PIPE, WATER SERVICE

- 309.1 When PVC pipe is delivered to the jobsite it shall not be exposed to sunlight for more than three weeks. PVC pipe exposed to sunlight for more than three weeks shall be covered with an opaque protective covering. The pipe shall be left stacked and no more pipe than can be installed in one day shall be strung along the jobsite.
- 309.2 When a length of PVC pipe is cut, the plain end shall be beveled to the same configuration as the factory beveled end. The end shall be beveled using a pipe beveling tool, portable sander, or abrasive disc. After beveling, stop marks shall be applied to the plain end at a distance from the end corresponding to the original stop marks.
- 309.3 Both Bell End and Plain End of PVC pipe shall be thoroughly cleaned before connecting pipes.
- 309.4 Elastomeric Gaskets shall be placed into bell with colored side of the gasket to the outside.
- 309.5 Before connecting PVC pipes, the plain end shall be lubricated with an approved lubricant. The bell end of PVC pipe shall not be lubricated.
- 309.6 When connecting, the plain end pipe shall be inserted into the bell end pipe and then pushed until stop marks on plain end are flush with end of bell.
- 309.7 Payment: Payment for this item shall be made at the unit price bid per linear foot of pipe of the type specified in the Proposal and placed as shown on the Drawings. Total footage shall be the actual horizontal measurement along the centerline of the pipe. No additional payment shall be made for vertical pipe or fittings or specials included as pipe, or for concrete blocking.

Payment for any PVC pipe designated “restrained joint” shall include cost of all components to restrain joints of pipe.

PART 309A – HIGH DENSITY POLYETHYLENE (HDPE) PIPE, WATER SERVICE

309A.1 When HDPE pipe is delivered to the jobsite it shall not be exposed to sunlight for more than three weeks. HDPE pipe exposed to sunlight for more than three weeks shall be covered with an opaque protective covering. The pipe shall be left stacked and no more pipe than can be installed in one day shall be strung along the jobsite.

309A.2 Pipe and fittings shall be joined by one of the following types of thermal fusion per the Manufacturer's recommended procedures: Butt fusion, Saddle fusion or Socket Fusion. Butt fusions performed between pipe ends or pipe ends and fitting outlets shall be within the following allowable wall mismatches:

309A.2.1 Two DR difference between pipe and fitting diameters 6" and smaller.

309A.2.2 One DR difference for above a 6" and through 18".

309A.2.3 No difference for diameters above 18".

The difference in DR is determined from the following DR values: 7.3, 9, and 11.

309A.3 Polyethylene pipe and fittings may be joined together or to other materials through the use of electrofusion fittings, flange adapters with back-up rings, mechanical couplings designed for connecting polyethylene pipe and fittings to itself or to another material, or MJ adapters. The Manufacturer of the joining device shall be consulted for proper installation procedures.

309A.4 Polyethylene pipe and fittings joined together through the use of a hydraulically operated heat butt fusion machine, shall utilize data recording device per ASTM F3124 – STANDARD PRACTICE FOR DATA RECORDING THE PROCEDURE USED TO PRODUCE HEAT BUTT FUSION JOINTS IN PLASTIC PIPING SYSTEMS OR FITTINGS. Each HDPE joint shall be traceable to the fusion operator and equipment. Electrofusion reports of each weld shall be appropriately identified and provided to City of Tulsa Inspector. The reports shall include, as a minimum, the fusion date, time, ambient temperature, fitting type and size, user ID, and the manufacturer of the part.

309A.5 The contractor shall be responsible for ensuring all personnel operating heat fusion equipment are qualified Heat Fusion Equipment Operators in accordance with ASTM F3190-16 – STANDARD PRACTICE FOR HEAT FUSION EQUIPMENT (HFE) OPERATOR QUALIFICATION ON POLYETHYLENE (PE) AND POLYAMIDE (PA) PIPE AND FITTINGS. All polyethylene joints shall be thermally butt fused by an HFE Operator. The HFE Operators Card shall be submitted at the Pre-Construction Conference and provided at the request of the Engineer. Certification by a distributor shall not be an acceptable substitute.

309A.6

Payment: Payment for this item shall be made at the unit price bid per linear foot of pipe of the type specified in the Proposal and placed as shown on the Drawings. Total footage shall be the actual horizontal measurement along the centerline of the pipe. No additional payment shall be made for vertical pipe or fittings or specials included as pipe, or for concrete blocking. Payment for any HDPE pipe designated "restrained joint" shall include cost of all components to restrain joints of pipe.

PART 310 – LOCATOR WIRE AND DETECTABLE MARKING TAPE

- 310.1 A Number 8 bare copper conductor wire or Number 12 copper-clad steel (CCS) wire, 21% conductivity, for the purpose of locating PVC water pipe shall be buried along the top of the pipe, and connected at each end to a fire hydrant by Cadweld Brazing just above the ground.
- 310.2 Detectable Mylar marking tape for location of PVC water pipe shall be required in areas as designated by the Engineer, more generally in commercial zones and open areas. Detectable Mylar marking tape shall be 2" wide, blue in color with a continuous black lettered imprint stating "Caution: Water Line Below". Tape shall be equal to Lineguard Tape III as manufactured by Lineguard, Inc. of Wheaton, Illinois.
- 310.3 Detectable Mylar marking tape for location of PVC sewer pipe shall be required in areas as designated by the Engineer, more generally in commercial zones and open areas. Detectable Mylar marking tape shall be 3" wide, green in color with a continuous black lettered imprint stating "Caution: Sewer Line Below". Tape shall be equal to Lineguard Tape III as manufactured by Lineguard, Inc. of Wheaton, Illinois.
- 310.4 Detectable Mylar Tape shall be buried above PVC water and sewer lines at a depth of 10" below the surface.
- 310.5 Non-detectable 4 mil plastic marking tape for location of PVC sewer pipe shall be required in all areas. Non-detectable plastic marking tape shall be 3" wide, green in color with a continuous black lettered imprint stating "Caution: Sewer Line Below". Tape shall be buried 18" above sewer line.
- 310.6 Payment for tape and wire shall be included with unit price payment for PVC pipe.

PART 311 – TAPPING OF PVC PIPE FOR SERVICE CONNECTIONS

- 311.1 Standard water service connections shall be made by using bronze service clamps as per standard drawings. The couplings shall be provided with factory installed brass bushings which conform to ASTM B62 and AWWA C800 for standard corporation stop threads. Bushings must match the corporation stops. Direct tapping of PVC water pipe will not be allowed.

PART 312 – FITTINGS

- 312.1 The work under this item shall include all of the requirements specified under the item of pipe, in that "pipe" is understood to also mean "bends, tees, crosses, sleeves, outlet assemblies and other specified fittings." Unless otherwise specified, outlet assemblies shall consist of a flanged or mechanized (MJ) outlet constructed into the wall of steel or concrete pipe. If ductile iron pipe is used, the outlet shall consist of a tee with the outlet flanged. If a gate valve is shown on the Drawings to be attached to the outlet, the line side end shall be flanged, and the opposite end shall be bell or mechanical joint according to the item for valves. All bends, tees, crosses, outlet assemblies, and plugs shall be blocked with concrete as shown on the attached Standard Detail, except where the fittings have flanged, welded, or harnessed joints, the Inspector may, under certain conditions, delete the blocking. Concrete blocking shall be placed so that joints are accessible for repair.
- 312.2 Diameter of taps on all waterlines shall not exceed one-third the diameter of the parent pipe. Tees shall be used in instances in which the diameter exceeds the one-third maximum size constraint.
- 312.3 Payment: Payment for this item shall be made at the unit price bid per fitting, of the type specified in the Proposal, and placed as shown on the drawings. Only fittings specifically noted in the Proposal are included in this item. No additional payment shall be made for excavation, backfilling, or concrete blocking.

Payment for any fittings designated "restrained" shall include cost of all components to restrain joints of fittings.

PART 313 – POLYVINYL CHLORIDE (PVC) PIPE, SEWER SERVICE

- 313.1 The work under this item shall include furnishing, delivery, placing, and jointing PVC sewer pipe in the trench in specific conformity with the line and levels given. Installation shall be in accordance with ASTM D2321, Underground Installation of Flexible Thermoplastic Sewer Pipe, except as modified by these specifications.
- 313.2 Pipe shall be protected during unloading and installation against impact shocks and free fall. After unloading and before installation, pipe shall be stored on flat level ground with no rocks or other objects under the pipe. PVC pipe that appears to be faded as a result of ultraviolet aging shall not be allowed. PVC pipe exposed to sunlight for more than three weeks shall be covered with an opaque protective covering. The pipe shall be left stacked and no more pipe than can be installed in one day shall be strung along the jobsite.
- 313.3 The pipe shall be laid on a firm trench bottom, true to the lines and grades shown on the drawings and/or as given in the field by the Inspector. Pipe shall be protected during handling against impact shocks and free fall. The laying of pipe in finished trenches shall be commenced at the lowest point, with the spigot ends pointing in the direction of flow. Pipe shall be laid continuously through new manholes if both inlet and outlet pipes are of the same size and in line. Upon completion of the manhole, the invert shall be shaped. The ends of adjoining pipes shall butt against each other for their entire circumference in such manner that there is no shoulder or unevenness of any kind. The pipe grade shall be obtained by using laser or batter boards and a "top line". A top line shall be maintained over a span of three grade stakes when laying pipe. As each batter board is erected, the top and the batter boards settings. Any error, discrepancies, or displacement of grade stakes shall be called to the attention of the Inspector for correction.
- 313.4 Prior to making pipe joints, all surfaces of the portion of the pipe to be jointed shall be cleaned and dried. Jointing shall be done in strict accordance with the manufacturer's recommended procedure.
- 313.5 At connections to manholes or other concrete structures, where the pipe is to be grouted or cast into the wall, a tight-fitting rubber water stop gasket shall be installed around the pipe. The outer sealing surface of the pipe shall be planed smooth. The pipe section with the gasket shall be grouted or cast into the manhole wall. Only pipe with a smooth outer wall or concentric ribs shall be used for cast or grouted in place connections. Where A-Lock type gaskets are used, only smooth outer wall pipe shall be used.
- 313.6 Approximately 30 days after backfilling the contractor shall measure vertical ring deflection for all pipe. The deflection testing shall be performed in the presence of the Engineer or his designated representative. Maximum ring deflection of the installed pipe shall be limited to 5% of the base inside diameter. All pipe which exceeds the allowable deflection shall be replaced or corrected by the contractor at no additional cost to City. The Contractor shall provide all mandrels and necessary equipment to perform the tests. Tests must be performed without mechanical pulling devices.

Deflection shall be tested using a Go/No-Go Deflection Test Gauge conforming to the standard detail or as manufactured by Cherne Industries, Inc., or equal in accordance with the manufacturer's instructions.

- 313.7 Any flushing of PVC sewer lines will be performed by the City, but the Contractor will lend assistance as may be required. Any infiltration of flushing water or other leaks into the sewer shall not be acceptable, and the contractor shall immediately correct the cause of the leak in a manner acceptable to the Engineer.
- 313.8 All sewers shall be tested for excessive leakage above ten gallons per day per inch of pipe diameter per mile per day for any section of installed system. Where low pressure air testing of PVC pipe is specified, it shall be air tested in accordance with the City of Tulsa standard air test procedure. The air testing for all new gravity pipe alignments will be performed by the City. All pipe which exceeds the allowable leakage rate shall be replaced or corrected by the contractor at no additional cost to City.
- 313.9 Payment: Payment for this item shall be made at the unit price bid per linear foot of the pipe specified in the Proposal and placed as shown on the Drawings. Total footage shall be the actual horizontal measurement along the centerline of the pipe. No additional payment shall be made for vertical pipe or fittings used with drop manholes.

PART 314 – MANHOLE

- 314.1 The work under this item shall include all excavation, furnishing all materials required, construction, pipe connection thereto, finishing and backfilling of new standard or drop manholes. Construction of manholes shall progress as rapidly as installation of the line permits, and as directed by the Inspector. Brick manholes are not intended for new construction and shall be allowed only as approved by Engineer.
- 314.2 Excavation for manholes shall be made with vertical sides and minimum dimensions permitting construction of the manhole in accordance with the attached Standard Details. Manholes are to be built to an elevation not less than that of the existing ground surface, or as shown on the drawings.
- 314.3 New manholes shall be constructed around existing lines without disturbance to the line. When the manhole is completed, the existing pipe shall be removed from the invert of the manhole. Care shall be taken in removing the pipe to prevent any stoppage. Immediately upon completion of the manhole, all waste mortar and debris shall be removed from the bottom and invert. When the walls are completed, a standard manhole frame and cover shall be set in place. Above the base, manhole inverts shall be carefully constructed of solid concrete to maintain proper velocities. Changes in pipe grade, alignment or size shall be made by transition sections of the invert, determined by the lower half of the inlet and outlet pipes, but not greater than that of the outlet pipe. All inverts shall be plastered, troweled, and brushed to a smooth, clean surface. Inlet and outlet pipes shall not project beyond the interior wall of the manhole and shall be free from all sharp masonry.
- 314.4 During construction, each manhole step shall be set in place on the inside of the manhole, beginning 18" above the bottom and placed not more than 15" apart. No steps shall be placed closer than 18" to the manhole top or farther than 27" to the manhole top. If concrete masonry units are used for the walls, special cut step blocks shall be installed to receive the steps. Steps shall be built firmly into the wall, allowing the steps to project 5" inside the manhole. If 5" concrete masonry units are used, the ends of the steps projecting beyond the outside wall shall be cut off flush with the wall and plastered over. The centerline of the steps shall be as shown on the attached Standard Detail for Manholes. Four-and-one-half-inch steps shall be used for brick manholes and 12" steps for precast manholes.
- 314.5 The use of concrete masonry units shall not be allowed in connection with pipes larger than 8" in diameter. If concrete masonry units 5" thick are used, the manhole shall not be located within any dedicated street or alley, or any other location subject to vehicular traffic; and shall not exceed 12' in depth. The foregoing restrictions as to location and depth shall not apply if 8" concrete masonry units, brick, or precast manholes are used.
- 314.6 For brick manholes, a single rowlock course shall be turned over each pipe. Every unit shall have a full mortar joint on the bottom and sides, which shall be formed in one operation by placing sufficient mortar on the bed and forcing the unit into it. Horizontal joints shall not exceed 3/8" and vertical joints on the inside of the manhole shall not exceed 1/4" in thickness. All joints on the inside are to be rubbed full and struck as the

manholes are built up. Walls shall be constructed in horizontal courses with vertical joints staggered. When the manhole top is above the proposed graded elevation, the taper shall be drawn in the manhole top to 24" I.D. at a point 1' below said proposed elevation and the remainder constructed with brick as a 24" cylinder. The inside and outside walls of the manholes are to be plastered with 1/4" of mortar to give a smooth and regular finish.

314.6.1 Testing of Manholes shall be done in accordance with Part 109.2 of the City of Tulsa Specifications.

314.7 PRE-CAST MANHOLES

314.7.1 Pre-cast manholes with cast-in-place base slabs will be permitted for all standard and drop manhole installations. Cast-in-place base slab shall be placed on a minimum of 6" of compacted Class A crushed stone.

314.7.2 Pre-cast manholes with integral pre-cast floors will be permitted for standard and drop manhole installations. Pre-cast manholes of 12' depth or greater shall have an extended base. Pre-cast floors shall be placed on a minimum of 18" of compacted Class A crushed stone.

314.7.3 A drop manhole is required when the difference in elevation between an inlet pipe's crown and the outlet pipe's crown is 2' or greater. The drop leg of a manhole shall be constructed such that the crown of the drop pipe matches the crown of the outlet pipe at the manhole. The drop will not be required if the crown of the drop leg cannot be constructed to match the crown of the outlet pipe.

314.7.4 Pre-cast manholes shall conform to the specifications for Pre-Cast Reinforced Concrete Manhole Sections, ASTM C478. Joint construction shall be in accordance with the standard specification for Reinforced Concrete Pipe except that no exterior grout band is required. No more than 8" of concentric rings shall be used to bring the manhole to finished grade. Each concrete concentric ring shall have a bitumastic sealer joint, not exceeding 3/8" in thickness. Inside joints shall be rubbed full and struck.

314.7.5 Cost of sealed manhole rims and lids shall be included in cost of manhole.

314.8 Payment: Payment for this item shall be made at the unit price bid per manhole of the type specified in the Proposal and placed as shown on the drawings. If the manhole depth, measured from the invert to the top of the cover, exceeds 6', the additional depth shall be paid for at the unit price bid per vertical foot of manhole depth over 6'. No additional payment will be made for excavation, backfilling, pipe or concrete bottoms or interior coatings. Separate payment will be made for each drop manhole. No additional payment will be made for multiple drops at a manhole. Separate payment will be made at the unit price bid per vertical foot of drop manhole depth over 6'.

PART 315 – CONNECTION

- 315.1 The work under this item shall include all excavation, furnishing all materials required, construction, finishing, and backfilling of connections to existing mains, valves, manholes, special connections, service line re-connections, plugs, or in-line tees for future connections, as indicated on the Drawings or as directed by the Inspector.
- 315.2 The drawing shows details of the various connections and they shall be made in accordance with the details or as directed by the Engineer. On water mains, Contractor shall make the pressure and wet connections to existing mains, as shown on the drawing, unless specifically noted otherwise.
- 315.3 Connections to existing manholes shall be made by cutting into the manhole at the specified grade and inserting the pipe. Pipe installation shall be done in accordance with Standard Detail No. 405 using A-LOK or Z-LOK rubber gasket, or the pipe may be grouted in place with hydrophilic waterstop formed around the pipe and the cold joint. Acceptable hydrophilic compound is ADEKA P-201 or approved equal. Joint shall be watertight. Contractor shall not break into any existing sewer unless the Inspector is present, and the work done shall be under the direction of the Inspector. Inlet and outlet pipes at the invert shall not project beyond the interior walls of the manholes. The manhole base shall be cut and reconstructed in such a manner that a proper invert section is maintained. All waste mortar, debris, and sharp edges shall be removed from the joints, bottom, and invert. Contractor shall remove and replace the manhole steps in the proper location and in accordance with Part 314.4 and Note #9 of Standard Detail No. 357 if they are not properly located after the connection is made. Any and all diversion or pumping of water or sewerage in a wet connection is included in this Item.
- 315.4 Methods of construction shall be the same for house line reconnections as for main sewers. All reconnections shall be constructed in conformance with the Plumbing Code of the City of Tulsa, unless modified herein. New pipe used shall be of the same diameter as the existing line.
- 315.5 Plugs shall be constructed of manhole brick and mortar, extending at least 1' into the line plugged from the manhole. The plug shall be watertight and troweled to a smooth finish on the interior of the manhole.
- 315.6 In-line tee fittings shall be installed for future service connections, as shown on the plans, in accordance with the Standard Detail for in-line tees. The tee shall be capped with a screw plug of either bronze, brass or a detectable plastic, marked by a non-magnetic, mylar tape, and stapled to both sides of a nominal 2" x 4" marker, 8' long, 4' buried, and 4' exposed, directly above fitting plug. The mylar tape shall be minimum 2-1/2" width, green in color, marked "Caution, Sanitary Sewer Below," as manufactured by Terra Tape or Line Guard.
- 315.7 After new water mains have been tested and chlorinated, the Contractor shall excavate around the new main for the service transfer. The existing mains and new mains shall remain in service during the transfer of services. The Contractor shall tap the new main

and install a new corporation stop, service clamp, bend, copper tubing, and required fittings. The new service shall be connected to the existing meter after the service has been tested for leakage. The excavated area shall be backfilled and restored to original condition. Where galvanized service lines are encountered, they shall be replaced with copper. Where long services are replaced, they shall be bored under existing pavement. Open cutting will not be permitted unless approved by the Engineer. Copper tubing shall be Type K soft annealed conforming to ASTM B88.

315.8

Payment: Payment for this item shall be made at the unit price bid for each type of connection constructed, or in-line tee for future connection, as specified on the Proposal, or as directed by the Engineer. No additional payment will be made for excavation, backfilling, furnishing and placing of concrete, flowable fill, removing and replacing of manhole steps, if necessary, or for the diversion or pumping of water or sewerage necessary to make the connection. Payment for water service transfers shall be made at the unit price bid for pipe and fittings under the appropriate connection bid item and shall include all necessary excavation, backfill, Right-of-Way clearing and restoring, materials, and labor.

PART 316 – LAMPHOLE

- 316.1 The work under this Item shall include all excavation, furnishing all materials required, construction, pipe connection thereto, finishing and backfilling of new lampholes. Lampholes shall be located and constructed as shown on the Drawings, or as directed by the Inspector. When the concrete lamphole frame base is completed, a standard lamphole frame is to be set in place and closed with a lamphole cover.
- 316.2 Payment: Payment for this item shall be made at the unit price bid per lamphole constructed as specified on the Proposal. No additional payment will be made for excavation, backfilling, or pipe.

PART 317 – VALVE

- 317.1 The work under this item shall include furnishing, delivery, and installation of valves at the locations shown on the Drawings, and in accordance with the attached Standard Details. The American National Standard for Installation of Gray and Ductile Cast-Iron Water Mains and Appurtenances, AWWA C600 shall govern the installation, as applicable. If the paint is damaged, the valve shall be cleaned by wire brushing and given two coats of black asphalt paint.
- 317.2 Gate valves shall be set with the stems plumb. Ball valves shall be set with the handwheels horizontal. Air relief valves shall be set so that the square operating nut on the 2" valve can be operated from the top. Check valves shall be set horizontally. Construction standards for air relief and check valve vaults shall be the same as for manholes.
- 317.3 Fire hydrants shall be set so that the bottom of the steamer nozzle is not less than 18" nor more than 21" above the finish grade of the ground. Breakable bolts damaged in the installation shall be replaced in kind. If the Mueller hydrant is used, the oil reservoirs shall be filled before the hydrant is set. Concrete blocking shall be placed so that the drain and joints are accessible. Restraining glands may be used in lieu of concrete blocking for fire hydrants. Fire hydrant and stem extensions shall be provided and installed as necessary, in accordance with the manufacturer's recommendations.
- 317.4 Payment: Payment for this item shall be made at the unit price bid per valve, of the type specified on the Proposal, and placed as shown on the Drawings. If fire hydrant and stem extension are required, they shall be paid for at the unit price bid for each different length of extension used. The unit price bid for air relief and check valves shall include the valve vault. No additional payment shall be made for: excavation; backfilling; concrete blocking; the pipe length between the line and the fire hydrant, except where the pipe is shown on the Drawings in a separate profile; crushed rock for drains; air relief valve piping vaults; or restraining glands on fire hydrants in lieu of cement blocking.
- Payment for any valve designated "restrained joint" shall include cost of restraining glands.

PART 318 – VALVE BOX

- 318.1 The work under this item shall include furnishing, transporting, and installation of valve boxes at the locations shown on the Drawings. The American National Standard for Installation of Gray and Ductile Cast-Iron Water Mains and Appurtenances, AWWA C600, shall govern the installation, as applicable.
- 318.2 Valve box shall include SW services' Debris Cap or equal.
- 318.3 Payment: Payment for this item shall be made at the unit bid price per valve box and debris cap and placed as shown on plans. Any valve box extension shall be paid under separate bid time. No additional payment shall be made.

PART 319 – ENCASEMENT, CONCRETE

- 319.1 The work under this item shall include the installation of concrete encasement as shown on the Drawings or as directed by the Inspector, in accordance with the attached Standard Detail. Care shall be taken to assure that placing of encasement does not deflect the pipe from the proper grade and alignment.
- 319.2 Sanitary sewers shall be encased when the depth of cut from the original ground elevation to the flow line of the pipe is 4' or less. Concrete encasement necessitated by trench widths more than the maximum as shown on the attached Standard Detail for Thrust Blocks and Trench Conditions shall be placed as directed by the Inspector.
- 319.3 Payment: Payment for this item shall be made at the unit price bid per cubic yard of concrete placed as encasement. All concrete encasement required because of excessive trench width shall be placed at the expense of the Contractor. No payment will be made for concrete used as fill or in excess of the theoretical quantity computation based on the attached Standard Detail for Thrust Blocks and Trench Conditions.

PART 320 – CRADLE, CONCRETE

- 320.1 The work under this item shall include the installation of concrete cradle as shown on the Drawings or as directed by the Inspector, in accordance with the attached Standard Detail for Thrust Blocks and Trench Conditions. Care shall be taken to assure that placing of cradle does not deflect the pipe from the proper grade and alignment.
- 320.2 Payment: Payment for this item shall be made at the unit price bid per cubic yard of concrete placed as cradle. All concrete cradle required because of excessive trench width shall be placed at the expense of the Contractor. No payment will be made for concrete used as fill or in excess of the theoretical quantity computation based on the attached Standard Detail for Thrust Blocks and Trench Conditions.

PART 321 – PIERS, REINFORCED CONCRETE

- 321.1 The work under this item shall include all materials, forming, construction and finishing of reinforced concrete piers, and necessary pipe anchorage. Piers shall be located and constructed as shown on the Drawings. Forms shall be made to conform to the shape of the pier and securely braced. Reinforcing steel shall be bent as detailed and securely tied in place. Bearing area for the pipe shall be made to fit the outside diameter of the pipe and shall support the pipe at the proper grade. Steel strapping and bolts shall be installed and painted with one heavy coat of coal tar or asphalt paint after bolting in place. Any honeycomb or other unevenness in the concrete shall be patched with cement mortar immediately after form removal.
- 321.2 Payment: Payment for this item shall be made at the unit price bid per cubic yard of concrete placed as reinforced concrete piers in accordance with the attached Standard Details, at the location shown on the Drawings, or as directed by the Engineer. No additional payment will be made for excavation, forming, bracing, dewatering, backfilling, or pipe anchorage.

PART 322 – CONDUIT, BORED

- 322.1 The work under this item shall include the installation of railroad, street, or other crossings by boring utilizing steel conduit as shown on the Drawings. The conduit pipe shall be installed to the line and grades given.
- 322.2 Payment: Payment for this item shall be made at the unit price bid per lineal foot of steel conduit, of the size specified in the Proposal, and placed as shown on the Drawings. All carrier pipe shall be paid for under other items. No additional payment shall be made for excavation, backfilling, boring, tunneling, dewatering, bulkheads, end seals, spacers, bore pits, or vent pipes where required.

PART 323 – STRUCTURE, SPECIAL

- 323.1 The work under this item shall include the furnishing of all materials and performing all work necessary to complete any special structures shown on the Drawings.
- 323.2 Payment: Payment for this item shall be made at the unit price bid for each structure as specified in the Proposal and constructed as shown on the Drawings. Pipe, fittings, valves, and other appurtenances will be paid for under other items. No additional payment will be made for excavation, backfill, foundations, or any particular element of construction or interior coatings.

PART 324 – MATERIALS FURNISHED BY CONTRACTOR AND INSTALLED BY CITY

- 324.1 The work under this item shall include furnishing and hauling of materials to the site of work. All necessary clearing, excavation, other site preparation, backfill and restoration, shall be performed by the contractor so that the City may install the materials in place with a minimum amount of delay. The Contractor shall furnish assistance to the City in installing the materials so that they may be readily installed. The City's responsibility shall be only for the actual installation of the materials. All other work shall be performed by the Contractor.
- 324.2 Payment: Payment for this item shall be made at the unit price bid per material item of the type specified in the Proposal and actually installed per Drawings. Only materials specifically noted in the Proposal are included in this item. All necessary clearing, excavation, other site preparation, backfill, and restoration will be paid for under other bid items.

PART 325 – SODDING AND SEEDING

- 325.1 Where the installation of water, sanitary, or storm sewer mains traverse developed areas, residential or commercial, the Contractor shall restore all damaged sod turf using same type and variety. The restoration of sod turf shall be by either Sod Replacement or Hydromulch Seeding, as directed by the Engineer. Replacement sod shall match existing sod in type and variety.
- 325.1.1 Only that turf in one residential block may be removed at any time. Where residential blocks are not involved, only that turf in approximately 500 linear feet of trench excavation may be removed at any time. The Contractor shall restore all turf damaged by the construction. Payment for turf restoration will be per square yard, based on the length of main installed through an area.
- 325.2 Sod Replacement: Remove the sod turf with approved cutting equipment. Store the turf in an area where construction operations will not damage it and apply sufficient water to preserve the root system. Replace the sod turf after the trench has been backfilled and compacted. As an alternate to this method, the Contractor may furnish and install new solid slab grass sod of the same type as that which was removed. The new sod shall be moist when excavated from the source and kept moist until planted. Sod shall consist of vegetative parts (rhizomes, stolons, and roots) with an appreciable quantity of adhering soil. Sod that becomes dry shall be discarded. Sodded areas shall be thoroughly watered after placement.
- 325.3 Hydromulch Seeding: Remove, store, and replace topsoil. Apply seed, fertilizer, and mulch together in homogeneously mixed slurry. Fertilizer shall be 10-20-10 and shall be applied at a rate of 10 lbs. per 1,000 sq. ft. Mulch shall be wood fiber and applied at a rate of 46 lbs. per 1,000 sq. ft. Grass seed shall be either hulled Bermuda applied at a rate of 2 lbs. per 1,000 sq. ft. or K-31 fescue applied at a rate of 8 lbs. per 1,000 sq. ft. as directed. Mulch shall be kept moist for a minimum of ten days or until seeds have germinated and rooted. Watering shall be provided as required to maintain the grass.
- 325.4 The Contractor shall obtain a construction meter from the Connection Control Division and pay all required fees for any watering. The Contractor shall maintain all sodded or seeded areas until acceptance of the contract.
- 325.5 Payment: Payment for Sod Replacement or Hydromulch Seeding will be made at the unit price bid per square yard and shall include all necessary topsoil replacement, fertilizing, watering, and maintenance. The square yard pay quantity will be measured parallel to the pipe through the area being restored.

PART 326 – STREET WASH DOWN

- 326.1 The Contractor shall, at the written direction of the engineer, wash down streets to control dust and clean the streets in the area of construction. Contractor shall obtain a construction meter from the Connection Control Division of the Water and Sewer Department and shall pay all required fees for obtaining and using the meter.
- 326.2 Payment: Payment for street wash down shall be made at the unit price bid per linear foot of street. No payment will be made for street washing without prior written instructions from the Engineer.

PART 327 – TRAFFIC CONTROL DEVICES

- 327.1 The Contractor shall furnish and install traffic control devices when construction is performed upon or adjacent to any street, alley, sidewalk, residence, public ground, or other location that is subject to pedestrian or vehicular traffic. Traffic control devices shall include safety fencing, barricades, signs, barrels, warning lights, arrow panels, flagmen, high level devices, etc.
- 327.2 Traffic Control Devices shall conform to the latest edition of the Manual on Uniform Traffic Control Devices.
- 327.3 Safety fence shall be an open mesh type, high-density plastic material, 48” in height, and colored International Safety Orange. Fence shall be supported by fence posts spaced at no more than 10’.
- 327.4 Payment: Payment for safety fence shall be at the unit price bid per linear foot based on the total footage used for the duration of the project. No additional payment will be made for moving the fence as the job site changes. Payment for Type I, II, and III Barricades with flashing light; warning signs with flashing lights, 16 sq. ft. and over, and below 16 sq. ft.; barrels with steady burn light; advance warning arrow panels; and high level warning devices shall be made at the unit price bid per sign day. One sign day is one traffic control device in place for one day. Flagmen shall be paid for at the unit price bid per man-day. One man-day is one man flagging for one full eight-hour period. No payment will be made for cones.

PART 328 – BORE

- 328.1 Waterline installed under existing concrete or asphalt driveways shall be bored. The diameter of the bore shall be a maximum of 2" larger than the outside diameter of the pipe bell. If the carrier pipe is ductile iron, it shall be polyethylene wrapped and taped at 1' intervals through the entire length of the bore. If the Engineer determines that boring is not possible, the driveway shall be open cut and the pavement replaced as directed by the Engineer.
- 328.2 Payment: Payment for crossings by boring shall be at the unit price bid per linear foot as measured from edge to edge of the driveway. All carrier pipe shall be paid for under other items. No additional payment shall be made for excavation, backfilling, boring, tunneling, dewatering or sand fill, or bore pits.

PART 329 – PAVEMENT REMOVAL AND REPLACEMENT

- 329.1 Work under this item includes removal and replacement of concrete or asphalt for sidewalks, driveways, parking lots, curbs, streets, alleys, and the like. Pavement crossed at right angles shall be saw-cut, removed, and replaced as shown on the standard drawings or as directed by the Engineer for the type of pavement indicated on the proposal. Pavement crossed diagonally shall be squared by saw-cutting at right angles to the paved area. If a construction joint is within 3' of a proposed saw line, the pavement shall be replaced to the joint as directed by the Engineer. New concrete pavement shall bridge the top of the trench by a minimum of 1' on each side. All paving shall conform to the standards and specifications of the Tulsa Office of the City Engineer and ODOT. All street cuts shall be approved by the Office of the City Engineer and a Permit shall be obtained before work may begin.
- 329.2 All concrete pavement removal shall be a minimum of 3' x 3'. Concrete shall be High Early Strength Class P5 as per ODOT Section 701A with a minimum 28-day compressive strength of 5,000 psi.
- 329.3 Concrete shall meet the existing concrete depth with a minimum depth of 8" for streets, 6" for commercial Driveways, 6" for residential driveways, and 4" for sidewalks. Edges of cut shall be saw-cut full depth. No traffic shall be allowed on the street replacement for 24 hours after placing of concrete. Twenty-four hours after placing of concrete, all butt joints must be sawed a minimum of 2", cleaned and sealed with joint sealer, ODOT Section 701A.08(e). If curb and gutter are removed, they shall be replaced to the standards and specifications of the typical existing curb and gutter. When one or more longitudinal construction joints are removed, the joints shall be re-established in accordance with the City of Tulsa standards for concrete pavement. When a pavement section is removed along an existing longitudinal construction joint, the pavement shall be dowelled to the adjacent pavement.
- 329.4 All asphalt shall be Type S4 as per ODOT Section 708. The asphalt shall be compacted to a 92% maximum density as determined by AASHTO T 209 method. Spreading and finishing of asphalt shall meet ODOT Section 411.04(l). Edges of cut shall be saw-cut full depth. Prior to placement of asphalt in cut, a tack coat shall be uniformly applied. Tack coat shall be an asphalt rubber, meeting the specifications of ASTM D1190. Optional tack coat meeting ODOT requirements. All surface edge joints of cut/overlay shall be sealed with an asphalt rubber meeting minimum specifications of ASTM D1190. Asphalt rubber shall be squeegeed into edge joints. Optional edge seal shall meet ODOT requirements. Emulsion shall be squeegeed into edge joint and blotted with dry concrete screenings. If curb and gutter are removed, they shall be replaced to the standards and specifications of the typical existing curb and gutter. Macadamized or oiled surfaces shall be replaced with asphalt.
- 329.5 Materials for asphalt shall meet the following ODOT requirements:
- 329.6 Payment: Payment for removal and replacement of concrete or asphalt pavement shall be at the unit price bid per square yard. The pay quantity of square yards will be computed using the standard pay width for the type of pavement replaced and the

length of the pavement cut along the centerline of the pipe. The pay quantity will include pavement replaced due to the proximity of a construction joint if the specified criteria is meet. For diagonal crossings, the pay quantity will include the areas replaced due to squaring. Payment for saw cut shall be at the unit price bid per linear foot. Payment for curb and gutter shall be at the unit price bid per linear foot. Payment for dowels shall be at the unit price bid per each. No payment will be made for disposal of broken pavement, temporary surfaces, excavation, preparation of subgrade, forms, or reinforcing. No payment will be made for removal or replacement of gravel. No payment will be made for the replacement of pavement damaged by the Contractor's equipment movement. No payment will be made for joint sealer, tack coats, or edge sealing.

PART 330 – EROSION CONTROL MEASURES

- 330.1 The contractor is responsible to ensure that measures are taken to minimize erosion and sedimentation problems. Measures include straw bale dikes, silt fence, silt dikes, and inlet protection including but not limited to the following:
- A) Place straw bale dikes in bar ditches at 500' intervals on relatively flat grades and 200' intervals on grades over 5%.
 - B) Place sediment sumps upstream of straw bales. Remove sediment on a regular basis.
 - C) Keep excavation and silt off streets.
 - D) In areas where water lines are being constructed adjacent to improved streets, measures shall be taken which will minimize siltation and excavation inlets. Precautions should be taken during heavy rains to assure that a flooding condition is not created.
 - E) Straw mulch can be used as an effective means of erosion control.
 - F) Erosion control measures shall be placed at the toe of slope of all cut and fill areas.
- 330.2 Straw bales shall be standard rectangular size, approximately 18" x 20" x 36", and shall be securely bound with wire. Bales shall be firmly anchored with wood or metal stakes approximately 3' long. A sediment sump shall be placed immediately upstream of each bale. Contractor shall clean and maintain sediment sumps throughout the maintenance period.
- 330.3 The contractor shall furnish and install straw mulch as directed. Mulch shall be applied at a rate of 1-1/2 tons per acre. Mulch shall be securely anchored in place.
- 330.4 Payment: Payment for straw bales or other erosion control measures will be at the unit price bid and shall include the cost of sediment sumps and anchoring. Payment for straw mulch will be at the unit price bid per square yard and shall include the cost of anchoring.

PART 331 – WATER TABLE CRADLE

- 331.1 The work under this item shall include furnishing and installing Water Table Cradle as shown on the drawings or as directed by the Engineer and in accordance with the Standard Detail for Water Table Cradle.
- 331.2 The trench excavation shall be completely dewatered to provide a dry and stable trench bottom. The trench shall be excavated to a minimum of 18" below the bottom of the pipe. If additional base stabilization is required crushed stone, 3-1/2" to 1-1/2" (Gradation No. 1), shall be installed on the trench bottom, prior to the installation of water table cradle. Minimum trench widths for flexible pipe installations shall be as shown in the Standard Detail No. 367.
- 331.3 Geotextile filter fabric shall be installed on the trench bottom and walls. Crushed stone shall be installed in the trench directly on the filter fabric to a height of 12" above the top of the pipe. The crushed stone bedding material shall be carefully worked and compacted around the pipe. The filter fabric shall be placed over the top of the crushed stone with a minimum 24" lap. All fabric joints shall be lapped a minimum of 18". Water Table Cradle shall be installed for the full excavated width of the trench.
- 331.4 Crushed stone for Water Table Cradle shall be Gradation No. 57, 1" to No. 4. The Geotextile Filter Fabric shall be a nonwoven, needle punch constructed fabric inert. The fabric unit weight shall be not less than 13 ounces per square yard with a Mullen Burst Strength (ASTM D3786) of not less than 600 psi.
- 331.5 Payment: Payment for Water Table Cradle will be made at the unit price bid per linear foot for the specified diameter of pipe. The unit price shall include the cost of all labor, equipment, and materials required. No additional payment will be made for dewatering or crushed stone required for additional base stabilization.

PART 332 – CONDUIT, OPEN CUT

- 332.1 The work under this item shall include the installation of railroad, street, or other crossings by open cut utilizing conduit as shown on the Drawings. The conduit pipe shall be installed to the line and grades given and shall be installed in accordance with standard bedding detail for semi-rigid pipe.
- 332.2 The carrier pipe shall be installed with spacers, and end seals or bulkheads as shown in Standard No. 307.
- 332.3 Payment: Payment for this item shall be made at the unit price bid per lineal foot of conduit, of the size specified in the Proposal, and placed as shown on the Drawings. All carrier pipe shall be paid for under other items. No additional payment shall be made for excavation, dewatering, backfill, spacers, bulkheads, end seals, or vent pipes where required.

PART 333 – REMOVAL, SALVAGE, ABANDONMENT OF EXISTING FACILITIES

333.1 GENERAL

Any removal, salvaging, and/or abandonment of existing facilities will be required as shown on the Drawings, and/or as described in this Section, in addition to those located in the field and identified by the Engineer. The proposed methods and materials for bulkheads, pumping, venting, cutting, plugging, filling, and blocking structures and linear assets to be abandoned shall be submitted for approval to the Engineer. Abandonment of all pipe shall be performed after accepted construction of all new mains on the Project.

333.2 MATERIALS – SPECIFIED BELOW

333.3 EXECUTION

333.3.1 Abandonment of Manholes: Manholes to be demolished in place shall have all pipes entering or exiting the structure plugged with a minimum length of 2' of lean concrete or non-shrink grout. Manhole tops or cone section shall be removed to the top of the full barrel diameter section or to a point not less than 36" below final grade. All storm sewer and sanitary sewer castings shall remain the property of the City and shall be salvaged and delivered by the Contractor to the Sewer Operations & Maintenance Base Stockyard at 9319 East 42nd Street North. Contractor will coordinate the return of such items with the Stockyard personnel at 918-669-6130. All other debris and materials removed shall become the property of the Contractor and shall be disposed of in accordance with local regulations. The structure shall then be backfilled and compacted in accordance with Sections 333.3.5 or 333.3.6 below. Backfill material may be either clean-washed sand, cellular concrete, flowable fill, or clean, suitable excavated material approved by the Engineer. Surface restoration shall be compatible with existing surrounding surface.

333.3.2 Removal of Manholes: Manholes to be removed shall have all pipes entering or exiting the structure abandoned as described in this Section. The complete manhole, including top, or corbel (cone) section, all full barrel diameter sections and base section shall be removed. All storm sewer and sanitary sewer castings shall remain the property of the City and shall be salvaged and delivered by the Contractor to the Sewer Operations & Maintenance Base Stockyard at 9319 East 42nd Street North. Contractor will coordinate the return of such items with the Stockyard personnel at 918-669-6130. All other debris and materials removed shall become the property of the Contractor and shall be disposed of in accordance with local regulations. The excavation shall then be backfilled and compacted in accordance with Sections 333.3.5 or 333.3.6 below. Surface restoration shall be compatible with surrounding surface.

333.3.3 Cut, Plug, and Abandon Storm or Sanitary Sewer: Gravity sewer mains to be abandoned shall have the pipe entering or exiting the manhole structures cut and plugged at each end with a minimum length of 2' of lean concrete or non-shrink grout. All sewer mains to be abandoned shall also be filled to 100% of the abandoned pipe volume. Fill material may be either cellular concrete, or flowable fill as approved by the

Engineer. Standing water, especially in low spots, must be removed prior to using cellular concrete material.

A) Contractor shall CCTV (closed circuit television inspection) all sanitary sewer mains prior to abandonment to determine location of existing service connections. Service connections shall be reconnected to proposed sanitary sewer located in immediate vicinity of the abandoned main. Engineer shall be notified immediately if there is no proposed sewer to collect the service.

333.3.4 Plug and Abandon Water or Force Mains: Pressurized mains to be abandoned shall have both ends cut and plugged with a minimum length of 2' of lean concrete or non-shrink grout. All water or force mains to be abandoned shall also be filled to 100% of the abandoned pipe volume. Fill material may be either cellular concrete or flowable fill as approved by the Engineer. Standing water, especially in low spots, must be removed prior to using cellular concrete material. All hydrants, valves, and other fittings from abandoned water mains shall remain the property of the City and shall be salvaged and delivered by the Contractor to the South Yard at 2317 S. Jackson Avenue. Contractor will coordinate the return of such items with the South Yard personnel at 918-596-9401. All other debris and materials removed shall become the property of the Contractor and shall be disposed of in accordance with local regulations.

333.3.5 Backfilling in Areas Other Than Street Right-of-Way and Pavement Areas:

Backfill abandoned assets using acceptable materials per this Specification Section as approved by the Engineer.

Backfill in layers of 18" maximum and mechanically compact to 95% of maximum density as defined by AASHTO T 99 (Modified Proctor Test).

333.3.6 Backfilling in Street Right-of-Way and Pavement Areas:

Backfill abandoned assets under and within 2' of all existing and proposed pavement, driveway pavement, sidewalk, and curb and gutter using only ODOT Type A aggregate base or flowable fill.

Compaction Method:

Granular backfill shall be mechanically compacted in vertical layers of 8" loose measure. Each layer shall be firmly compacted to 95% of Standard Proctor Density as determined by AASHTO T 99. Material may be compacted by tamping or by using surface vibrators in such a manner as not to disturb or injure surrounding facilities. Adequate cover over adjacent pipe or utilities shall be provided before using mobile trench compactors of the hydro-hammer or impactor type.

333.4 MEASUREMENT AND PAYMENT

Payment for all work and materials involved in abandoning sewer manholes, regardless of location, shall be included in the bid item and paid for at the unit price of EACH by inside diameter.

Payment for all work and material involved in removal of sewer manholes, in areas outside of excavated trench width required for construction of new pipe and/or manholes, shall be included in the bid item and paid for at the unit price of EACH manhole. No separate payment shall be made for removing pipe or sewer manholes when working in the same trench width required for construction of new pipe and/or manholes. Pipe and/or manholes replaced in place, along with all appurtenances, shall be included in other items of work.

Payment for cutting, plugging, and abandoning water and sewer mains shall be paid for at the unit price of LINEAR FEET by inside pipe diameter per bid item.

Measured fill volume shall be verified with material tickets and compared to calculated volume of pipe to be abandoned.

Payment for all work and materials involved in CCTV inspection of sanitary sewer mains to be abandoned shall be included in the bid item and paid for at the unit price of LINEAR FEET.

All restoration, and all other appurtenances associated with these bid items, shall be included in their respective bid item, and not paid for separately.

PART 334 – CONSTRUCTION AS-BUILTS

334.1 This work maintaining an accurate set of as-built documents on site.

334.2 CONSTRUCTION METHODS

At the end of each day work accomplished shall be updated on the as-built plans. The Contractor shall dimension from two permanent points of reference, building corners, sidewalk, or road intersections, etc., the location of the following:

- A) Changes to the horizontal and vertical alignments as shown on the original Contract Plans.
- B) Stations or equations that have been introduced or revised during construction.
- C) Intersection and crossover details that have been modified or relocated.
- D) Inlets, manholes, box culverts, and end walls that were added, relocated, revised, or deleted.
- E) All sidewalk that was modified, all curb and gutter, and shoulder gutter that was added, revised, or deleted.
- F) All driveways that were not shown on the original Contract Plans, or were shown but are no longer in existence, or were otherwise modified.
- G) All ditch locations and grades that were adjusted during construction.
- H) Changes in fencing items, including gate location.
- I) Sign locations changed and pavement markings that were modified.
- J) All signal details that changed during construction.
- K) All bridge, approach slab, and lighting details that are different from the actual construction.
- L) Benchmarks (BM) and their descriptions that were set during construction shall be added to the profile portion of the Plan Sheets.
- M) All utility relocations and/or conflicts shall be reflected on the Contract Plans, complete with station/offset/elevation and/or Northing/Easting/elevation on:
 - 1) Water: Spot elevations on the main water line relative to finished grade shall be provided at each 100' interval and at all valves, fittings, fire hydrants (top of nut), and other appurtenant items. Spot elevations on water meter cans, vaults shall be shown with proper description (meter type, meter size, meter number, service material, service size).

- 2) Wastewater: Spot elevations on the main sewer line relative to finished grade shall be provided at each 100' interval and at all rim, flowline inverts (in/out), and service connections.
- 3) Stormwater: Spot elevations on the main stormwater line relative to finished grade shall be provided at each 100' interval and at all rim, flowline inverts (in/out), curb inlets, and grates.

Before the final inspection, the Contractor shall deliver to the Engineer one copy of the as-built documents to review. Delivery of this set of documents does not relieve the Contractor of the responsibility of furnishing required information that may be requested by the Engineer. The Contractor shall make corrections noted and submit final as-built documents to the Engineer for approval and acceptance. The Engineer will not certify payment requests or make final payment if as-built documents are not current or complete.

334.3 MEASUREMENT AND PAYMENT

Payment for construction as-builts in accordance with the following:

- A) 20% when 25% of the contract work is completed.
- B) 20% when 50% of the contract work is completed.
- C) 20% when 75% of the contract work is completed.
- D) 40% when the Resident Engineer verifies that all construction features have been properly as-built and redlines received from the Contractor, and the Engineer has accepted the as-built documentation.

PART 335 – ACCEPTANCE SAMPLING/TESTING REQUIREMENTS

335.1 DESCRIPTION

Furnish Quality Control of materials and construction in accordance with the Standard Specifications, Plans and Special Provisions. This includes but is not limited to preparing and following a Quality Control Plan (See Part 335 Tables 1–7). Obtain samples and perform tests for Quality Control, provide inspection, and exercise management control to produce materials and workmanship that conforms to contract requirements. Unless otherwise noted in the plans, all pavements and bridges will be subject to requirements of any or all the Provisions which are included in this specification. City of Tulsa will provide Quality Assurance testing at their discretion.

335.2 MATERIALS

Meet materials quality requirements.

335.3 EQUIPMENT

Provide equipment at own expense, unless otherwise specified. All equipment and supplies shall conform with Standards and applicable Specifications. Certify the calibration of all equipment.

335.4 CONSTRUCTION

- A) General: Provide quality of all construction covered in the project.
- B) Quality Control Personnel Qualifications: All personnel directly involved in sampling and/or testing materials for either control or acceptance purposes shall be certified in the appropriate area(s) by the Oklahoma Highway Construction Materials Technician Certification Board. Manager certification for material sampling and testing is not required unless he or she is directly involved in sampling and/or testing materials.
- C) Contractor's Quality Control Plan: Submit a written Quality Control Plan at least one week prior to the pre-work conference. Include the following in the plan:
 - 1) Sources of principal materials including names of suppliers and locations.
 - 2) Names and resumes of key Quality Control personnel.
 - 3) Duties, responsibilities, and authorities (to suspend production, alter mixtures, etc.) granted to key Quality Control personnel.
 - 4) Description of testing laboratories, including qualifications, key equipment, and locations.
 - 5) Description of start-up operations, including but not limited to:

- a) Review of submittal requirements and all other Contract requirements with the performance of the work.
 - b) Examine the work area to ascertain that all preliminary work has been completed.
 - c) Verify all field dimensions and advise the Engineer of any discrepancies.
- 6) Detailed testing schedule based on production.
- 7) Control, verification, and acceptance testing procedures for each specific test to include the test name, specification requiring the test, feature of work to be tested, and person responsible for each test.
- 8) Procedures for tracking construction deficiencies from identification through acceptable corrective action. These procedures will establish verification that identified deficiencies have been corrected.
- a) Sampling and Testing: Perform sampling and testing according to the accepted Quality Control plan using personnel certified in appropriate areas and laboratories approved by the Engineer. Keep laboratory facilities clean and maintain all equipment in proper working condition.
 - b) Inspection: Provide inspection necessary to ensure compliance with applicable standards and specifications.
 - c) Records: Maintain complete testing and inspection records and make them accessible to the Engineer.
 - 1. Test Results: Maintain control charts that identify the project number, contract item, test number, each test parameter, the upper and/or lower specification limit applicable to each test parameter, and the test results. Use the control charts as part of the Quality Control system to document process variability, to identify production and equipment problems, to make necessary corrections, and to identify potential pay factor adjustments.
 - i. Post control charts in an accessible location, keep them up to date, and make them available to the Engineer upon request. Make corrections to the process when problems are evident, including ceasing production if necessary.
 - 2. Inspection Results: For each day of work, prepare an "Inspector's Daily Record of Construction Operations" on an approved form. Include the following certification signed by the person with overall responsibility for the inspection system:

- i. "It is hereby certified that the information contained in this record is accurate, and that all work documented herein complies with the requirements of the contract. Any exceptions to this certification are documented as a part of this record."
3. Submit the record and certification to the Engineer within two working days of the work being performed. If the record is incomplete, in error, or otherwise misleading, a copy of the record will be returned with corrections noted. When chronic errors or omissions occur, correct the procedures by which the records are produced.

D) Use of Contractor Test Results for Acceptance Purposes: Abbreviated test procedures are allowed for Contractor use. The Quality Control Plan shall list all abbreviated test procedures, describe all deviations from standard procedures for each, and note their intended purpose. Test results from abbreviated procedures will not be used for any purpose by the City of Tulsa. It is the Engineer's discretion to use or not use any of the Contractor's test results for acceptance purposes.

E) Changes: Submit, in writing, all proposed changes in key Quality Control personnel, equipment or procedures from those previously approved by the Engineer. Submit written changes at least one week prior to the proposed action.

335.5 METHOD OF MEASUREMENT

Payment for Contractor's Quality Control will be measured on a lump sum basis.

335.6 BASIS OF PAYMENT

Accepted Contractor's Quality Control measured for payment as prescribed above will be paid for at the Contract unit price for:

CONTRACTOR'S QUALITY CONTROL.....LUMP SUM

This payment will be full compensation for furnishing all materials, facilities, equipment, labor, and incidentals to complete the work.

Subject to acceptable performance, payment for Contractor's Quality Control will be made in accordance with the following schedule:

- A) 25% on the next estimate after the Engineer's approval of the Contractor's Quality Control Plan and other required initial documentation.
- B) 25% when 50% of the contract work is completed.
- C) 25% when 75% of the contract work is completed.
- D) 25% when all test results and records related to Quality Control work have been furnished to and accepted in writing by the Engineer.

As stated above, this payment is based upon acceptable performance. Payment will be reduced for unacceptable portions of the Quality Control work. Serious deficiencies in Quality Control work may result in the project being shut down.

PART 335 TABLE 1 BITUMINOUS MIXTURES				
ODOT/COT SUPPLEMENTS	MATERIAL	TYPE OF TEST(S) REQUIRED	SAMPLING POINT	MINIMUM SAMPLING/TESTING FREQUENCY
411, 708	Asphalt Concrete Pavement	Volumetric, Marshall, Rice, & Air Voids	Hot Plant or Roadway	One Per Day's Production.
		Oil Content (Nuclear/Ignition)	Hot Plant or Roadway	One Per 350 Tons or Fraction Thereof. Minimum One Sample Per Day.
	Cold Feed	Compaction (Core)	Roadway	One Per 300 Linear Feet for Each Lift and Lane Pass or Fraction Thereof.
		Gradation	Hot Plant	When Days Production Exceeds 300 Tons: One Prior to First Day of Production and One Per 500 Tons Thereafter.
<p>Remarks: Asphalt deficient in oil content and/or density shall be cored 50' maximum on both sides of failed section when deemed necessary by the City of Tulsa. The results of the two cores shall be averaged with the previous test results. Minimum sampling and testing are required for each mix and supplier. City of Tulsa reserves the right to modify sampling and testing requirements as needed to ensure quality of materials.</p>				

**PART 335 TABLE 2
CEMENTITIOUS MIXTURES**

ODOT/COT SUPPLEMENTS	MATERIAL	TYPE OF TEST(S) REQUIRED	SAMPLING POINT	MINIMUM SAMPLING/TESTING FREQUENCY
414, 701	Portland Cement Concrete (Flatwork)	Compressive Strength	At Discharge	One Set of Six Cylinders Per 50 Cubic Yards or Fraction Thereof.
		Slump, Time, & Temperature	At Discharge	One Per Set of Cylinders.
509, 701	Portland Cement Concrete (Structures)	Compressive Strength	At Discharge	One Set of Six Cylinders Per Type of Structure, Per 50 Cubic Yards, or Days Production.
		Slump, Time, & Temperature	At Discharge	One Per Set of Cylinders.
501, 701, 703	Controlled Low Strength Material	Compressive Strength	At Discharge	One Set of Two Cylinders Per Shift.
425, 623, 701, 733	Grout	Compressive Strength	At Discharge	One Set of Four Prisms When Required by Engineer or Their Representative.
		Slump, Time, & Temperature	At Discharge	One Per Set of Prisms.
521, 701 733, 737	Mortar	Compressive Strength	At Batch Site	One Set of Four Cylinders When Required by Engineer or Their Representative.
Project Plans & Specifications	Shotcrete	Compressive Strength	At Discharge	One Panel Per 50 Cubic Yards or One Per Mixture, Nozzleman and Shift (Whichever is Greater).

Remarks:

Concrete specifications: Time is **90 minutes max** from time concrete is batched; Concrete is from **50 °F to 90 °F** [10 °C to 32 °C] during mixing, delivery, and placement.

If, in the opinion of the Engineer or his/her representative, there is sufficient cause to question the quality of the mortar or grout being utilized, random field sampling and testing may be required.

Shotcrete test panel forms should be wood or steal and a minimum of 24" x 24" x 4", generally shot in a vertical position.

Minimum sampling and testing are required for each mix design and supplier.

City of Tulsa reserves the right to modify sampling and testing requirements as needed to ensure quality of materials.

**PART 335 TABLE 3
SOIL**

ODOT/COT SUPPLEMENTS	MATERIAL	TYPE OF TEST(S) REQUIRED	SAMPLING POINT	MINIMUM SAMPLING FREQUENCY
202, 613	Trench Backfill (including lateral trenches)	Proctor Density, Gradation & P.I.	In-Place	One Per Soil Type.
		Compaction & Moisture Content	In-Place	One Per 8" Lift for Every 100 Linear Feet, Per Pipe Run, or Day's Production.
310	Subgrade	Proctor Density, Gradation & P.I.	In-Place	One Per Soil Type.
		Compaction & Moisture Content	In-Place	Every 100 Linear Feet or Day's Production.
202, 501	Structure Backfill	Proctor Density, Gradation & P.I.	In-Place	One Per Soil Type.
		Compaction & Moisture Content	In-Place	One Per 8" Lift Per Structure
202	Roadway Fill & Embankments	Proctor Density, Gradation & P.I.	In-Place	One Per Soil Type.
		Compaction & Moisture Content	In-Place	One Per 8" Lift for Every 100 Linear Feet or Day's Production.
202	Import	Proctor Density, Gradation & P.I.	Import Site or On-Site Stockpile	One Per Soil Type.
		Compaction & Moisture Content	In-Place	One Per 8" Lift for Every 100 Linear Feet or Day's Production.

Remarks:

For Infrastructure Development Projects (IDP) only. Testing Frequencies as follows:

Sewer & Water Services (30%) Driveways, Aprons, and ADA ramps (50%) Valley Gutters (100%)

Dry Utility, Fire Hydrant, Fire Line, and Storm Drain (100%)

Import material shall be Select Borrow in accordance with Section 202 and 705. All fill materials shall be placed at ± 2% of the optimum moisture content.

The nuclear density gauge is to be correlated with a sand cone for every ten tests taken, or one per day, whichever is greater.

City of Tulsa reserves the right to modify sampling and testing requirements as needed to ensure quality of materials.

**PART 335 TABLE 4
AGGREGATE BASE**

ODOT/COT SUPPLEMENTS	MATERIAL	TYPE OF TEST(S) REQUIRED	SAMPLING POINT	MINIMUM SAMPLING FREQUENCY
303, 703, 708	Aggregate Base (AB)	Proctor Density	Stockpile, Windrow, Roadway	At Start of Production and as Material Changes per Supplier and/or Plant.
		Compaction & Moisture Content	Roadway, Pipe Bedding, Initial Backfill	One per 100' per Lift or One per Lane Pass or Days Production.
		Gradation, PI (Wet Prep)	Stockpile, Windrow, Roadway	One per Project, or One per 1000 Tons or Fraction Thereof.
		Specific Gravity	Stockpile, Windrow, Roadway	At Start of Production and as Material Changes per Supplier and/or Plant.

Remarks:

If asphalt millings are used for bedding, they shall meet the requirements of virgin Aggregate Base per ODOT. Millings must meet all ASTM C33 requirements.
 Millings cannot be placed until the material has been certified by ODOT/COT approved testing lab.
 City of Tulsa reserves the right to modify sampling and testing requirements as needed to ensure quality of materials.

**PART 335 TABLE 5
REINFORCEMENT**

ODOT/COT SUPPLEMENTS	MATERIAL	TYPE OF TEST(S) REQUIRED	SAMPLING POINT	MINIMUM SAMPLING FREQUENCY
724	Steel Reinforcement	Certificate and/or Tests	Project	One Sample for Each Size, Grade & Heat Number Per Shipment & Manufacturer. Certificate Required.
517, Project Plans & Specifications	Post-Tensioned Steel	Certificate and/or Tests	Project	One Sample for Each Size, Grade & Heat Number Per Shipment & Manufacturer. Certificate Required.
503, Project Plans & Specifications	Pre-Stressed Steel	Certificate and/or Tests	Project or Fabrication Plant	One Sample for Each Size, Grade & Heat Number Per Shipment & Manufacturer. Certificate Required.

Remarks:

All steel and iron incorporated into Federal-Aid projects must conform to requirements of "Buy America" per 23 CFR 635.410. City of Tulsa reserves the right to modify sampling and testing requirements as needed to ensure quality of materials.

**PART 335 TABLE 6
ELASTOMERIC BEARING PADS**

ODOT/COT SUPPLEMENTS	MATERIAL	TYPE OF TEST(S) REQUIRED	SAMPLING POINT	MINIMUM SAMPLING FREQUENCY
733.06	Elastomeric Bearing Pad (Grade 2)	AASHTO M 251	Project	Two Sample Bearing Pads Selected at Random by Engineer from every 100 Bearing Pads or Portion Thereof. Minimum of One Sample per Lot.

Remarks:

Two sample bearing pads may be needed to complete the specified testing for smaller bearing pads. Bearing pads will be selected at random by the Engineer at the project site for testing. Bearing pads marked or otherwise presented as test bearing pads will not be tested. Bearing pads must be made available for testing at least four weeks in advance of intended use. Each bearing pad is to be marked in indelible ink or flexible paint. The marking shall consist of the order number, lot number, bearing identification number, and elastomer type and grade number. The marking shall be on the face that is visible after erection of the bridge. City of Tulsa reserves the right to modify sampling and testing requirements as needed to ensure quality of materials.

**PART 335 TABLE 7A
MINIMUM TEST SCHEDULE & FINAL REPORT**

Minimum Testing Schedule:

A Minimum Testing Schedule is to be created and submitted to the City of Tulsa Field Engineering within ten business days of project assignment. Testing frequencies are to be calculated using an approved set of plans in conjunction with the bid tab items to create an accurate representation of the minimum testing needed for the project. Any notes, comments, special circumstances, and/or assumptions made for quantity calculations should be listed at the bottom of the page.

Final Report Should Include the Following:

All laboratories must submit a Final Report after the completion of each project. Laboratories will be notified by the City of Tulsa Field Engineering, via email, that the project is complete and all lab results for soils, concrete and asphalt will be attached. A CD and a hard copy of the Final Report must be delivered to the City of Tulsa Field Engineering within five business days from the date of this email.

Final Reports are to include all field and lab tests/results, daily reports, and samples taken for the entire project.

All Final Reports must be stamped and signed by a registered professional engineer and shall verify that all materials, sampled and tested, were found to be in compliance with the latest City of Tulsa Standards and Specifications. Construction materials that fail to meet specification requirements, but were incorporated in the project, must be summarized in the final report with a detailed explanation listing corrective actions or justification for acceptance.

**PART 335 TABLE 7B
INFRASTRUCTURE DEVELOPMENT PROJECTS (IDP) ONLY
MINIMUM TEST SCHEDULE & FINAL REPORT**

Minimum Testing Schedule:

A Minimum Testing Schedule shall be created and submitted to the City of Tulsa IPD Inspector, during the pre-construction meeting. Testing frequencies are to be calculated using an approved set of plans, in conjunction with the bid tab items, to create an accurate representation of the minimum testing needed for the project. Any notes, comments, special circumstances, and/or assumptions made for quantity calculations, should be listed at the bottom of the page.

Final Report:

All laboratories must submit a Final Report at the completion of each project. A spiral bound copy of the Final Report must be delivered to the City of Tulsa IDP Inspector along with final record drawings of the project.

Final Reports shall include all field and lab tests/results (including any acceptance/deficiency test results), daily reports, and samples taken for the entire project.

All Final Reports must be stamped and signed by a registered professional engineer and shall verify that all materials, sampled and tested, were found to be in compliance with the latest City of Tulsa Standards and Specifications. Construction materials that fail to meet specification requirements, but were incorporated in the project, must be summarized in the final report with a detailed explanation listing corrective actions or justification for acceptance.

INSPECTION/TESTING SCHEDULE

SERVICE	MINIMUM NOTICE (HOURS)	NOTES
Aggregate Base:	48	Density testing must be complete prior to string line. Obtain samples for proctor/acceptance testing prior to scheduling density.
Aggregate Base Thickness:	48	Per Plans and Specifications.
Aggregate Base Sampling:	48	Material must be from a City of Tulsa approved plant.
Asphalt:	48	Contractor/Inspector must call the City of Tulsa Field Engineering for scheduling. Material must be from an ODOT approved plant.
Backfill:	48	Obtain samples for proctor/acceptance prior to scheduling density testing.
Concrete:	48	Material must be from an ODOT approved plant.
Coring:	48	Allow time to schedule and set up traffic control if required.
Crack Seal:	48	
Footing Inspection:	24	
Grout:	24	
Import:	24	Material must be approved by the City of Field Engineering prior to placement.
Mortar:	24	
Post Tension Pre-Pour Inspection:	48	
Post Tension Stressing Inspection:	48	
Post Tension Sampling:	48	
Reinforcing Steel (Inspection):	48	
Reinforcing Steel (Sampling):	48	
Shotcrete:	48	Contractor shall provide 16" x 16" x 4" sampling panel.
Sidewalk Slope Inspection:	24	
Slurry (CLSM):	24	
Slurry Seal:	48	
Soil Sampling:	24	
String Line:	24	
Subgrade:	24	Density testing must be complete prior to string line. Obtain samples for proctor/acceptance testing prior to scheduling density.
Weld Inspection:	48	

Inspection/Testing schedule time listed above has been considered in contract time. No additional time will be given.

SECTION END