SECTION 100
GENERAL INFORMATION

PART 1 GENERAL

101 PURPOSE: The purpose of these Specifications is to establish, where applicable, minimum acceptable standards or a range of acceptable results for construction of utilities in the City of Broken Arrow.

102 INTENT: It is the intent of these Specifications that the Contractor be solely responsible for producing an acceptable end product. In producing this end product, the Contractor shall exercise control of the project. The City of Broken Arrow personnel, except as specifically provided for in these Specifications, will make inspections for the City to document that an acceptable product is being produced.

103 INTERPRETATION: These Specifications will be interpreted in such a manner as to allow the Contractor to control the project and produce an acceptable end product. These Specifications will not be interpreted in a manner that allows a Contractor to produce an unacceptable end product or endanger the public. When disputes arise over interpretation of the Specifications, the general provisions of the Contract will govern. Only projects in substantial conformance with Plans and Specifications will be accepted by the City of Broken Arrow.

104 ORGANIZATION/FORMAT: The Specifications are organized by topic. Section 100 provides general information for use of the Specifications. Section 200 through Section 500 are devoted to specific types of work. Section 600 provides minimum acceptable standards for materials. Section 700 provides required plan notes and approved standard details. Section 800 provides information necessary for vertical construction in the City of Broken Arrow.

104.01 WORK TYPE SPECIFICATION FORMAT:

a. **Street Construction:** The City of Broken Arrow has adopted the Oklahoma State Department of Transportation Standard Specifications for Highway Construction, with all approved supplements, for street construction. The ODOT format will be used for street construction. Requirements for street construction that are Broken Arrow specific, are found in Section 200 of these Specifications.

b. **Other Work Type Specifications:** The format for all other work types will be as follows:
   1. Description: A short description of the work covered under the specific specification.
   2. Materials: Description of the materials covered by the specification or a reference to the Section 600 specifications for the materials covered by the specification.
   3. Construction Methods: A description of acceptable methods for accomplishing the work covered by the specification. This description of methods is not all inclusive and contractors may use other methods as long as the required end product is produced.
   4. Special Requirements: A description of special actions required for this specification. For example, a specification for water lines may require that a Public Infrastructure Representative observe all tie-ins to the existing distribution system.
   5. Method of Measurement: A description of how the work will be measured. Plans shall govern over these Specifications.
   6. Basis of Payment: A description of the units for which the Contractor will be paid. Plans shall govern over these Specifications.
   7. Standard Drawings: A list of City of Broken Arrow Standard Drawings that apply to the specification.

104.02 MATERIAL SPECIFICATION FORMAT:

a. **Street Construction:** The City of Broken Arrow has adopted the Oklahoma State Department of Transportation Standard Specifications for Highway Construction for street construction. The ODOT format will be used for materials used in street construction.

b. **Other Material Specifications:** The format for material specifications is as follows:
   1. Description: A description of the materials covered by the specification.
   2. Criteria: A description of the criteria by which the material will be measured.
   3. Manufacturers: A list of manufacturers that provide acceptable materials of the type covered by the specification, is provided for information only. This is not a complete list and "or equal" manufactures are acceptable.

105 APPLICABILITY:

105.01 CONTRACTORS WORKING FOR THE CITY OF BROKEN ARROW: All applicable portions of these Specifications will apply to all contractors working for the City of Broken Arrow.

105.02 CITY OF BROKEN ARROW ENGINEERING AND CONSTRUCTION DEPARTMENT: All applicable portions of these Specifications will apply except for method of measurement and basis of payment to all projects constructed by the City of Broken Arrow.

105.03 PRIVATE CONTRACTORS CONSTRUCTING UTILITIES THAT WILL BE TRANSFERRED TO THE CITY OF BROKEN ARROW: All applicable portions of these Specifications will apply except for method of measurement and basis of payment to all projects constructed by a private contractor that will be transferred to the City of Broken Arrow. At the discretion of the Developer, the method of measurement and basis of payment may be used.

106 MATERIALS NOT LISTED IN THESE SPECIFICATIONS: Materials listed in these Specifications are those materials normally used by the City of Broken Arrow. This does not preclude the use of other materials by developers, engineers, or contractors. When a material not listed in these Specifications is to be used in a project, the engineer designing the project will provide to the Director of Engineering and Construction, a draft specification for approval. Once the draft specification is approved, the material may be used in the project.

107 SECTION OMITTED (2023)

107 TESTING REQUIREMENTS:

107.01 APPLICATION OF TEST REQUIREMENTS:

a. **General:** Unless otherwise specified, testing of projects constructed using these Specifications will be tested in accordance with this section. Unless otherwise specified, the Contractor will provide the equipment, materials, and labor necessary to conduct the required tests. The Contractor will coordinate with the Public Infrastructure Representative for appropriate test dates and the Representative will observe tests as required. Where tests are conducted off site or by a testing laboratory, the Contractor will provide the Public Infrastructure Representative with certified copies of the test results. If a project or portion of a project fails to meet the required test results, the Contractor will take appropriate corrective action and the test shall be conducted again on the corrected work. Corrections to work in place and additional testing shall be at the Contractor's expense.

b. **Testing Philosophy:** The City of Broken Arrow shall require only those tests necessary to ensure that the construction meets the minimum standards. To meet this goal the testing specifications have been established with a minimum testing requirement and a maximum testing requirement. The Public Infrastructure Representatives will start each project requiring the minimum number or frequency of tests established in this section. If site conditions, initial test results, or Contractor performance, warrants additional testing, the Representative at their discretion may require up to the maximum number or frequency of tests set forth in this section. If in the opinion of the Developer or Contractor the number of tests required, above the minimum number or frequency, is unreasonable, the Developer or Contractor may appeal the requirement to the Engineering and Construction Director. If the Developer or Contractor does not agree with the Engineering and Construction Director's decision the normal process for appealing City decisions will be followed.

c. **Normal Testing Requirements:**
   1. Concrete Streets: Sections 107.09, 107.10, and 107.12.
   2. Asphaltic Concrete Streets: Sections 107.09, 107.11, and 107.12.
   3. Storm Sewers: Sections 107.02, 107.03 (If the line crosses a street), 107.08, 107.10, and 107.14.
   4. Water Lines: Sections 107.02, 107.03 (If the line crosses a street), and 107.04.
   5. New Sanitary Sewer Lines: Sections 107.02, 107.03 (If the line crosses a street), 107.06, 107.07, 107.08, and 107.10.
   6. Replacement Sanitary Sewer Lines: Sections 107.02, 107.03 (If the line crosses a street), 107.06, 107.07, 107.08, and 107.10.
   7. Other Utility Lines: Sections 107.02, and 107.03 (If the line crosses a street).
   8. Concrete Structures: Sections 107.09 and 107.10.

107.02 TRENCH COMPACTION TESTING:

a. Required For:
   1. Initial Backfill: These standards will be met for construction of water lines, sewer lines, and storm sewers.
   2. Final Backfill: These standards will be met for construction of water lines, sewer lines, storm sewers, and other utility trenches when there is not sufficient time to allow for natural trench settlement before adjacent construction starts or the work is in an area that is already developed.

b. **Test Preparation:** The Contractor shall have the backfill materials tested in accordance with ASTM D1557, Method D. The Contractor shall then establish a backfilling procedure for the trench and use that procedure until the site conditions require a change to the procedure. Prior to requesting testing of compaction, the Contractor will have the Representative view backfill operations to ensure that they are being conducted in accordance with the established procedure.

c. **Minimum Frequency:**
   1. Initial Test: The initial compaction tests will be conducted in the first 300 feet of trench backfilled.
   2. Subsequent Tests: The Representative will call for one set of tests once every 4,000 feet of line for cross country pipelines and once every 2,000 feet for pipelines inside of built-up areas.

d. **Maximum Frequency:** Tests will be conducted each time the backfill material changes. The Representative will call for one set of tests once every 2,000 feet of line for cross country pipelines and once every 1,000 feet for pipelines inside of built-up areas.

e. **Test Procedure:** Tests may be conducted either during the compaction process or by spot excavating the trench and taking the tests. In place density tests will be conducted in accordance with ASTM D1556 or ASTM D2922. When ASTM D2922 is used, ASTM D3017 will be used to determine the moisture content of the soil. One compaction test will be taken at:
   1. Initial Backfill (Area from trench bottom to 1 foot over the top of the pipe is reached).
   2. One test for each 3 feet of depth of final backfill.

f. Required Test Results:
   1. Initial Backfill: 90 percent maximum standard proctor density for cohesionless soils.
   2. Final Backfill: 85 percent maximum standard proctor density for cohesive soils.

g. **Inspection Requirements:** The Public Infrastructure Representative will be on site to observe all testing. The Contractor's testing laboratory shall provide written copies of the testing results to the Public Infrastructure Representative within three working days after the tests are completed. The work will not be accepted until these results are received.

107.03 STREET CROSSING/PAVED AREA COMPACTION TESTING:

a. **Required For:** Water lines, Sewer Lines, Storm Sewers, and Other Utility Trenches crossing streets.

b. **Test Preparation:** The Contractor shall have the backfill materials tested in accordance with ASTM D1557, Method D. The Contractor shall then establish a backfilling procedure for the trench and use that procedure until the site conditions require a change to the procedure. Prior to requesting testing of compaction, the Contractor will have the Representative view backfill operations to ensure that they are being conducted in accordance with the established procedure.

c. **Minimum Frequency:** One (1) set of compaction tests at each cut and cover street crossing.

d. **Maximum Frequency:** One (1) set of compaction tests for each lane of traffic, at each cut and cover street crossing.

e. **Test Procedure:** Tests may be conducted either during the compaction process or by spot excavating the trench and taking the tests. In place density tests will be conducted in accordance with ASTM D1556 or ASTM D2922. When ASTM D2922 is used, ASTM D3017 will be used to determine the moisture content of the soil. One compaction test will be taken at:
   1. Initial Backfill (Area from trench bottom to 1 foot over the top of the pipe is reached).
   2. One test for each 3 feet of depth of final backfill.

f. **Required Test Results:**
   1. Initial Backfill: 95 percent maximum standard proctor density for cohesionless soils/90 percent maximum standard proctor density for cohesive soils.
   2. Final Backfill: 95 percent maximum standard proctor density for cohesionless soils.
   3. **NOTE: No compaction testing is required if flowable fill or washed rock is used to backfill street cuts.**

g. **Inspection Requirements:** The Public Infrastructure Representative will be on site to observe all testing. The Contractor's testing laboratory shall provide written copies of the testing results to the Public Infrastructure Representative within three working days after the tests are completed. The work will not be accepted until these results are received.

107.04 WATER LINE PRESSURE, LEAKAGE, AND BACTERIA TESTING:

a. **Required For:** Water lines.

b. **Test Preparation:** The Contractor may pressure test the distribution line without the taps installed. If this option is selected, the line will be pressure tested again after the taps have been installed and flushed. To the maximum extent possible, sample points shall be service taps. Prior to starting the test, the Contractor will flush the line of all dirt and air. This will be coordinated with the Public Infrastructure Representative and the Utilities Division of the City of Broken Arrow. All sample points will be clean and marked to allow the Public Infrastructure Representative to take samples from them.

c. **Minimum Frequency:** One pressure and leakage test for a distribution system. Bacteria tests will be as required by State regulations. The first test will be paid for by the City. Any retests required because of a test failure will be at the Contractor's expense.

d. **Maximum Frequency:** Tests may be conducted on any section of the line that can be valved off from the portion of the line that has not been tested. The number of sections tested will be limited to the smallest number feasible to reduce testing costs. The number of sections to be tested will be coordinated with the Public Infrastructure Representative. Only lines that have passed the pressure test will be tested for bacteria.

e. **Test Procedure:**
   1. The Contractor shall flush, fill, and bring the line up to test pressure and the line must maintain that pressure for the required time period with less than the specified pressure drop.
   2. If the line does not make the pressure test, then the Contractor must repair the lines so that it will meet the test requirements.
   3. Upon passing the pressure test, the line will be leak tested by placing it at normal operating pressure and measuring the leakage for a 2-hour period.
   4. Following completion of the pressure and leak tests the Contractor shall add additional chlorine, if necessary, to sanitize the line.
   5. The Contractor will flush the chlorine out of the line.
   6. Once the line is flushed the Public Infrastructure Representative will check the chlorine count to ensure that it is in the range from 0 to 2.0 parts per million.
   7. The line will be allowed to set for a period of 48 hours without adding additional chlorine or flushing water through the system.
   8. The Representative will take water samples after the 48-hour period for 2 consecutive days and turn in the samples to the Department of Environmental Quality for testing.
   9. If the samples from the line do not pass the Contractor will flush the line and add additional chlorine. Once this is done, the process of checking the line will start again at Paragraph 107.04 e.4.
   10. If the samples in the line pass, then the Contractor will flush the line completely and make sure that all valves area open.
   11. The Contractor will then remove all sample points from the line and backfill it in preparation for acceptance.
   12. Test water shall be disposed of, by the Contractor, in accordance with State regulation.

f. **Required Test Results:** Refer to test procedures specified in the most recent revision of the AWWA C600 and AWWA C605 for ductile iron pipe and PVC respectively or most recent adopted methods prescribed by the Oklahoma Department of Environment rules and regulations.
   1. Pressure (Special Lines): Hold pressure specified by designer for 2 hours with a drop of 5 psi or less.
   2. Pressure (Normal): Hold 1.25 times the stated working pressure of the line measured at the highest elevation along the test section and not less than 1.5 times the states working pressure at the lowest elevation of the test section for 2 hours with a drop of 5 psi or less.

3. Bacteria: All samples must pass the required Department of Environmental Quality test.

g. **Inspection Requirements:** The Public Infrastructure Representative will be on site to observe all pressure testing. The Public Infrastructure Representative will take samples for Department of Environmental Quality testing. The cost of Department of Environmental Quality testing will be paid by the City.

107.05 SANITARY SEWER FORCE MAIN PRESSURE TESTING:

a. **Required For:** Sanitary Sewer Force Mains.
b. **Test Preparation:** Prior to starting the test the Contractor will flush the line of all dirt and air. This will be coordinated with the Public Infrastructure Representative and the Utilities Division of the City of Broken Arrow.
c. **Minimum Frequency:** One test will be conducted for the complete force main unless otherwise specified.
d. **Maximum Frequency:** Tests will be conducted for the complete force main until the line passes.
e. **Test Procedure:**
   1. The Contractor will bring the line up to hydraulic test pressure and the line must maintain that pressure for a period of 30 minutes with not more than a 5-psi drop.
   2. If the line does not pass the pressure test, then the Contractor must repair the lines so that it will meet the test requirements.
f. **Required Test Results:** Hold 1.5 times the working pressure of the line for 30 minutes with a drop of 5 psi or less.
g. **Inspection Requirements:** The Public Infrastructure Representative will be on site to observe all pressure testing. Methods prescribed by Oklahoma Department of Environmental Quality rules and regulations shall govern.

107.06 SANITARY SEWER LINES LAMPING, MANDREL, AND PRESSURE TESTING:

a. **Required For:** New installations of gravity sanitary sewer lines.
b. **Test Preparation:** The Contractor will ensure that the line is clean, and all debris has been removed from manholes. The Contractor will coordinate with the Public Infrastructure Representative to have the lines lamped and tested with a mandrel prior to pressure testing.
c. **Minimum Frequency:** Each line from manhole to manhole will be lamped, tested with a mandrel and pressure tested.
d. **Maximum Frequency:** Each line from manhole to manhole will be lamped, tested with a mandrel and pressure tested until the line passes.
e. **Test Procedure:**
   1. Lamping: The Contractor will provide the necessary personnel to assist the Public Infrastructure Representative in lamping the line. Lamping will consist of shinning a light source from one end of the line while the Public Infrastructure Representative observes from the other end.
   2. Mandrel Test (Required on PVC lines only): The Contractor will have personnel pull the required size mandrel through the line while the Public Infrastructure Representative Observes. The mandrel shall be constructed according to ASTM D3034 specifications (5 percent tolerance). This test will be conducted 30 days or longer after the line has been installed unless otherwise coordinated with the Public Infrastructure Representative.
   3. Pressure Test: Reference ASTM F1417.
      a) The Contractor will plug both ends of the line and pressure the line to 3.5 psi.

b) When the line is at pressure the Public Infrastructure Representative will observe the pressure gage for the specified period.
c) If the line does not meet test requirements, the Contractor will make necessary repairs and retest.
d) When the test is completed, the Contractor will remove all plugs and ensure the line is clear.

f. **Required Test Results:**
1. Lamping must show a clear circle of light with no dips or obstructions.
2. The mandrel must pass through the line.
3. The pressure in the line must not drop below 2.5 psi for the time specified in the ASTM F1417.

g. **Inspection Requirements:** The Public Infrastructure Representative will be on site to observe all lamp, mandrel, and pressure testing. Methods prescribed by Oklahoma Department of Environmental Quality rules and regulations shall govern.

h. **Alternative Inspections:** In special circumstances and with the prior approval of the Engineering and Construction Director, the following alternative tests may be substituted for the pressure test detailed above.
1. Exfiltration Test: Conducted in accordance with standard industry practices.
2. Infiltration Test: Conducted in accordance with standard industry practices.
3. The Contractor may substitute having the line inspected with a camera for lamping and mandrel testing. The Contractor will provide the Representative with a copy of the video file of the line.

107.07 VACUUM TESTING OF MANHOLES:

a. **Required For:** Any manhole that, in the opinion of the Representative, requires more extensive testing than is provided in Section 107.08.

b. **Test Preparation:** The Contractor will ensure that the manhole is clean, and all debris has been removed.

c. **Minimum Frequency:** 25 percent of manholes in a specific project.

d. **Maximum Frequency:** Each manhole as required by the Public Infrastructure Representative.

e. **Test Procedure:**
1. The Contractor will plug the lines in the manhole and induce a vacuum of 10 inches Hg in the manhole.
2. When the manhole is at vacuum the Public Infrastructure Representative will observe the pressure gage for the specified period.
3. If the manhole does not meet test requirements, the Contractor will make necessary repairs and retest.
4. When the test is completed, the Contractor will remove all plugs and ensure the manhole is clear.

f. **Required Test Results:** The vacuum in the manhole must not drop below 9 inches Hg over the time specified below.

Depth of Manhole (feet)	Diameter of Manhole (inches)			
	48	60	72	96
	Time (seconds)			
4	10	13	16	24
8	20	26	32	47
12	30	39	48	70
16	40	52	64	94
20	50	65	80	117
24	60	78	96	141

*Times may be interpolated for manhole sizes not provided.
Values extrapolated from ASTM C924.

g. **Inspection Requirements:** The Public Infrastructure Representative will be on site to observe all pressure testing.

107.08 MANHOLE INSPECTION/TESTING:

a. **Required For:** Sanitary sewer and storm sewer manholes.
b. **Test Preparation:** The Contractor will ensure that the manholes to be inspected are clean, properly grouted, and that the appropriate rings and lids have been installed.
c. **Minimum Frequency:** All manholes will be visually inspected for compliance with Specifications.
d. **Maximum Frequency:** The Public Infrastructure Representative may request that a manhole that does not appear to meet specifications be tested by either vacuum testing for new installations or dye testing for replacement projects.
e. **Test Procedure:**
   1. The Representative will visually inspect each manhole for compliance with the Specifications.
   2. If a vacuum test is required, it will be conducted in accordance with industry standard practices.
   3. If a dye test is required, it will be prepared in the same manner as a line test except:
      a) The dye injection will be at 4 equally spaced locations around the manhole.
      b) Dye will be injected until, in the opinion of the Public Infrastructure Representative, the area is saturated.
      c) The Public Infrastructure Representative will observe the manhole for 30 minutes and if dye appears on the walls of the manhole, the manhole has failed the test. If the manhole fails the test, the Contractor will make necessary repairs and retest.
f. **Required Test Results:**
   1. The manhole must pass the visual inspection.
   2. If required, the manhole must pass the vacuum test.
   3. If a dye test is required, no dye shall appear on the sides of the manhole in 30 minutes.

g. **Inspection Requirements:** The Public Infrastructure Representative will be on site to observe all testing.

107.09 STREET SUBGRADE AND BASE COMPACTION TESTING:

a. **Required For:** All street construction involving subgrade and/or base work.
b. **Test Preparation:** The Contractor shall have the subgrade/base materials tested in accordance with ASTM D1557, Method D. The Contractor shall prepare the subgrade and/or base in accordance with the Plans and Specifications. Prior to testing the Contractor shall coordinate with the Public Infrastructure Representative for the Representative to observe the testing. Tests shall be conducted at the locations designated by the Representative.
c. **Minimum Frequency:**
    1. One test every 1,000 feet of 13-foot-wide lane for subgrade.
    2. One test every 1,000 feet of 13-foot-wide lane for base.
d. **Maximum Frequency:**
    1. One test every 350 feet of 13-foot-wide lane for subgrade.
    2. One test every 350 feet of 13-foot-wide lane for base.
e. **Test Procedure:** In place density tests will be conducted in accordance with ASTM D1556 or ASTM D2922. When ASTM D2922 is used, ASTM D3017 will be used to determine the moisture content of the soil. The Contractor's testing laboratory shall conduct a test in each area at the location specified by the Representative. If the Representative is concerned about the stability of the subgrade and/or base, he/she may require the Contractor to proof roll the subgrade with a legally loaded, tandem axle dump truck or other suitably loaded piece of equipment, that is approved by the Public Infrastructure Representative.
f. **Required Test Results:** The subgrade and/or base must meet the density and moisture content required in the Plans and Specifications. The subgrade and/or base must also be stable and show no sign of pumping under proof rolling.
g. **Inspection Requirements:** The Public Infrastructure Representative will be on site to observe all testing. The Contractor's testing laboratory shall provide written copies of the testing results to the Public Infrastructure Representative within three working days after the tests are completed. The work will not be accepted until these results are received.

107.10 CONCRETE TESTING:

a. **Required For:** Curb and Gutter, Paving, Drainage Structures, and Structural Concrete.
b. **Test Preparation:** Prior to placing concrete the Contractor shall have the base tested and accepted, required forms constructed, and required reinforcing steel installed and approved. The Contractor shall coordinate with the Public Infrastructure Representative for the Representative to be on site to observe the concrete placement and testing.
c. **Minimum Frequency:**
    1. Slump Test: The Contractor shall have a slump test conducted on one of the first five loads of concrete delivered to the site.
    2. The Contractor shall have a minimum of three test cylinders taken for each day that concrete is placed. Normal requirement will be three test cylinders per 100 cubic yards.
d. **Maximum Frequency:**
    1. Slump Test: The Public Infrastructure Representative may require a slump test be conducted on any load of concrete that appears to not meet the Specifications.
    2. The Public Infrastructure Representative may require up to six test cylinders be taken for every 100 cubic yards of concrete placed.

e. **Test Procedure:**
   1. Slump Test: Slump tests shall be conducted by a lab in accordance with ASTM C1077 Standard Practice for Agencies Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Testing Agency Evaluation.
   2. Test Cylinders: Each set of three test cylinders shall be made and stored in accordance with the "Standard Method of Making and Curing Concrete Compression and Flexure Test Specimens in the Field", ASTM C31, and shall be tested in accordance with the requirements relating to making compression tests on concrete test specimens as given in the "Method of Test for Compressive Strength of Molded Concrete Cylinders", ASTM C39. All test specimens shall be kept as near to the point of sampling as possible and yet receive the same protection from the elements as is given to portions of the structure being built. Specimens shall be protected from injury. They shall be sent to a testing laboratory approved by the City not more than seven days prior to the time of the test and while in the laboratory shall be kept in the ordinary air at a temperature of approximately 70 degrees F until tested. One of the cylinders from each set shall be subjected to compression testing at 7 days and the written results forwarded to the Public Infrastructure Representative. A second test cylinders shall be subjected to compression testing at 28 days and the written results forwarded to the Public Infrastructure Representative. Based on the results of the first two tests, the Public Infrastructure Representative may or may not elect to have the remaining cylinder tested. The Contractor shall furnish to the Public Infrastructure Representative certified reports on these tests and shall pay all expense of making the tests and of furnishing the concrete for preparing and testing the cylinders.

f. **Required Test Results:** The test results must meet or exceed the specified slump and strength requirements.

g. **Inspection Requirements:** The Public Infrastructure Representative will be on site to observe all testing. The Contractor's testing laboratory shall provide written copies of the testing results to the Public Infrastructure Representative within three working days after the tests are completed. The work will not be accepted until these results are received.

107.11 ASPHALTIC CONCRETE TESTING:

a. **ODOT Specifications:** Where ODOT Specifications for Highway Construction requirements are more stringent, the ODOT specification shall govern this section.

b. **Required For:** Asphaltic Concrete Paving.

c. **Test Preparation:** Prior to placing asphaltic concrete the Contractor shall have the base tested and accepted. Contractor shall coordinate with the Public Infrastructure Representative for the Representative to be on site during paving operations.

d. **Minimum Frequency:**
   1. Temperature: The Public Infrastructure Representative shall take the temperature of at least one of the first ten loads to be placed.
   2. Density: The Contractor shall have a compaction test conducted for every 1,000 feet of 13-foot-wide lane of asphaltic concrete placed.
   3. Hveem Stability Test: The Contractor shall have a minimum of one Hveem stability test conducted for each day asphaltic concrete is placed. Normal requirement shall be one Hveem Stability test taken for every 400 tons of asphaltic concrete placed.

e. **Maximum Frequency:**
   1. Temperature: The Public Infrastructure Representative may take the temperature of all loads to be placed.
   2. Density: The Public Infrastructure Representative may require a compaction test be conducted for every 350 feet of 13-foot-wide lane of asphaltic concrete placed.

3. Hveem Stability Test: The Public Infrastructure Representative may require two Hveem Stability tests taken for every 400 tons of asphaltic concrete placed.

f. **Test Procedure:**
   1. Temperature Testing: The Public Infrastructure Representative shall take the temperature of the asphalt just behind the laydown machine.
   2. Density Testing: In place density tests will be conducted in accordance with ASTM D1556 or ASTM D2922.
   3. Hveem Stability Testing: During placement operations the Contractor's testing laboratory or supplier shall pull sufficient asphaltic concrete to conduct the Hveem Stability test from two separate loads at least 30 minutes apart.

g. **Required Test Results:**
   1. Temperature: The asphaltic concrete must meet the temperature parameters in the appropriate ODOT specification.
   2. Density: The asphaltic concrete must have a density of not less than 92 percent and not more than 98 percent.
   3. Hveem Stability: The Hveem stability must be not less than 40 percent. Pay adjustments for lot density will not be accepted. Minimum density will be required.

h. **Inspection Requirements:** The Public Infrastructure Representative will be on site to observe all testing. The Contractor's testing laboratory and/or supplier shall provide written copies of the testing results to the Public Infrastructure Representative within three working days after the tests are completed. The work will not be accepted until these results are received.

107.12 CORE SAMPLES:

a. **Required For:** Asphaltic Concrete and Concrete Streets.

b. **Test Preparation:** Preparation for taking and repairing core sample sites shall be in accordance with ODOT Specification Section 411.04 for asphaltic concrete and ODOT Specification Section 414.04 for concrete.

c. **Minimum Frequency:** One core sample every 26,000 square feet. The Contractor shall coordinate exact sample locations with the Public Infrastructure Representative.

d. **Maximum Frequency:** One core sample every 10 feet to determine the extent of a deficiency.

e. **Test Procedure:**
   1. Core samples shall be taken on the completed roadway.
   2. The Contractor and Public Infrastructure Representative shall mark the locations for coring.
   3. The Contractor's testing laboratory shall core each area at the location specified by the Representative. The laboratory shall evaluate the core samples and provide the samples and a written report that includes photographs of the evaluation to the Public Infrastructure Representative.
   4. The Contractor shall repair the roadway after samples have been removed.

f. **Required Test Results:** The core samples must meet the requirements of the Plans and Specifications. If the samples do not meet the Specifications, then the ODOT specifications will govern on action to be taken.

g. **Inspection Requirements:** The Public Infrastructure Representative will be on site to observe all testing. The Contractor's testing laboratory shall provide written copies of the testing results to the Public Infrastructure Representative within 3 working days after the tests are completed. The work will not be accepted until these results are received.

107.13 STORM SEWER PIPE INSPECTION/TESTING:

a. **Required For:** Storm sewer pipe.
b. **Test Preparation:** The Contractor will ensure that the line is clean and all debris has been removed from manholes and drop inlets. The Contractor will coordinate with the Public Infrastructure Representative to have the lines lamped and tested with a mandrel prior to pressure testing.
c. **Minimum Frequency:** Each line from manhole to manhole or drop inlet will be lamped and tested with a mandrel if PVC, HDPE, or HIGH-DENSITY POLYPROPYLENE is used.
d. **Maximum Frequency:** Each line from manhole to manhole or drop inlet will be lamped and tested with a mandrel if PVC, HDPE, or HIGH-DENSITY POLYPROPYLENE is used. If the Representative suspects a portion of the line was not properly installed, a dye test of that portion of the line may be required.
e. **Test Procedure:**
    1. Lamping: The Contractor will provide the necessary personnel to assist the Public Infrastructure Representative in lamping the line. Lamping will consist of shinning a light source from one end of the line while the Public Infrastructure Representative observes from the other end.
    2. Mandrel Test (Required on PVC, HDPE, and HIGH-DENSITY POLYPROPYLENE): Shall be performed at Public Infrastructure Representative discretion. If a dye test is required, it will be prepared in the same manner as a sewer line test except:
        a) The dye injection will be at equally spaced locations around the section in question.
        b) Dye will be injected until, in the opinion of the Public Infrastructure Representative, the area is saturated.
        c) The Public Infrastructure Representative will observe the line for 30 minutes and if dye appears in the line, the line has failed the test. If the line fails the test, the Contractor will make necessary repairs and retest.
f. **Required Test Results:** Lamping must show a clear circle of light with no dips or obstructions.
g. **Inspection Requirements:** The Public Infrastructure Representative will be on site to observe all lamp and dye testing, if required.

107.14 STORM SEWER DROP INLETS AND JUNCTION BOXES INSPECTION/TESTING:

a. **Required For:** Storm sewer Drop Inlets and Junction Boxes.
b. **Test Preparation:** The Contractor will ensure that the drop inlets and junction boxes to be inspected are clean, properly grouted, and that the grates or rings and lids have been installed.
c. **Minimum Frequency:** All drop inlets and junction boxes will be visually inspected for compliance with Specifications.
d. **Maximum Frequency:** The Public Infrastructure Representative may request that a drop inlet or junction box that does not appear to meet Specifications be tested by dye testing.
e. **Test Procedure:**
    1. The Representative will visually inspect each drop inlet and junction box for compliance with the Specifications.
    2. If a dye test is required, it will be prepared in the same manner as a line test except:
        a) The dye injection will be at 4 equally spaced locations around the drop inlet or junction box.
        b) Dye will be injected until, in the opinion of the Public Infrastructure Representative, the area is saturated.

c) The Public Infrastructure Representative will observe the drop inlet or junction box for 30 minutes and if dye appears on the walls of the drop inlet or junction box, the drop inlet or junction box has failed the test. If the drop inlet or junction box fails the test, the Contractor will make necessary repairs and retest.

f. **Required Test Results:** The drop inlet or junction box must meet Specifications and if dye testing is required then no dye shall enter the drop inlet or junction box.

g. **Inspection Requirements:** The Public Infrastructure Representative will be on site to observe all testing.

107.15 MATERIALS:

a. **Test Preparation and Frequency:** As required by the materials specifications.
b. **Test Procedure:** As required by the materials specifications.
c. **Required Test Results:** As required by the materials specifications.
d. **Inspection Requirements:** Certified copies of materials tests will be provided to the Public Infrastructure Representative before the material is used on the project. Concrete strength tests are the exception to this requirement. They will be provided to the Representative as required by Section 330.

108 SUBMITTALS: Submittals will be provided to the Contract Administrator or Public Infrastructure Representative as required by the Specifications or during the pre-construction conference. The submittals will be reviewed and approved or returned for additional information within two weeks after receipt. The following guidelines will apply unless the Contractor is notified otherwise:

108.01 MATERIALS: Material submittals will be made before the material is installed.

108.02 WORKING DRAWINGS: Prior to starting work on the items covered by the Drawings.

108.03 COMPACTION AND CONCRETE: Test results within 3 days after testing is completed.

109 ABBREVIATIONS: Wherever the following abbreviations are used in Contracts, Proposals, these Specifications or on Plans, they are to be construed the same as the respective expressions represented:

AASHTO	American Association of State Highway and Transportation Officials
ACI	American Concrete Institute
AIA	American Institute of Architects
ANSI	American National Standards Institute (United States of America Standards Institute)
ASA	American Standards Association
ASCE	American Society of Civil Engineers
ASTM	American Society of Testing and Materials
AWPA	American Wood Preservers Association
AWWA	American Water Works Association
AWS	American Welding Society
NEC	Nations Electrical Code
NEMA	National Electrical Manufacturers Association
ODOT	Oklahoma Department of Transportation

ODEQ	Oklahoma Department of Environmental Quality
UL	Underwriter's Laboratory

110 DEFINITIONS:

110.01 AS-BUILT DRAWINGS: Plans that are marked-up and maintained by the Contractor showing actual field installed facilities that deviate from the original design. Plans will be converted to Record Drawings as required.

110.02 BASE COURSE: The layers of selected material of a designated thickness placed on a subbase or a subgrade to support a surface course.

110.03 CALENDAR DAY: Any day shown on the calendar beginning and ending at midnight.

110.04 CHANGE ORDER: A written order issued by the City to the Contractor, covering changes within the scope of the Contract and establishing the basis of payment and time adjustments for the work affected by the changes.

110.05 CHANNEL: A natural or artificial water course.

110.06 CONTRACT: The written agreement between the City and the Contractor setting forth the obligations of the parties thereunder, including, but not limited to, the performance of the work, the furnishing of labor and materials, and the basis of payment. The Contract includes the Invitation for Bids, Proposal, Contract Form, all Contract Bonds, Specifications, Supplemental Specifications, Special Provisions, all Plans, and the Work Order, also any Change Orders and Supplemental Agreements that are required to complete the construction of the work in an acceptable manner, including authorized extensions.

110.07 CONTRACT ADMINISTRATOR: The Contract administrator is the City representative assigned responsibility for coordination with the Contractor and administration of the Contract. May be synonymous with Public Infrastructure Representative.

110.08 COMPLETION DATE: The date on which the Contract work is completed.

110.09 CONTRACT ITEM (PAY ITEM): A specifically described unit of work for which a price is provided in the Contract.

110.10 CONTRACT TIME: The number of workdays or calendar days allowed for completion of the Contract, including authorized time extensions.

110.11 CONTRACTOR: The individual, partnership, joint venture, firm, or corporation contracting with the City for performance of prescribed work.

110.12 CULVERT: Any structure under the roadway with a clear opening of twenty (20) feet or less measured along the center of the roadway.

110.13 DRAINAGE DITCH: An open excavation or ditch constructed for the purpose of carrying off surface water.

110.14 EASEMENT: A grant of the right of use of property of an owner for a certain purpose at the will of the grantee.

110.15 ENGINEER: Synonymous with Director of Engineering and Construction. The City Engineer and such Assistants or Representatives as authorized by the City Manager while acting within the scope of their assigned duties or vested authority.

110.16 EQUIPMENT: All machinery, tools, and apparatus necessary for the proper construction and acceptable completion of work.

110.17 FINAL ACCEPTANCE DATE: The date upon which the completed work is accepted by the City without exception or reservation.

110.18 HOLIDAYS: Any day proclaimed a holiday by the City.

110.19 HVEEM STABILITY TEST: Asphaltic concrete test that measures the asphaltic concrete mix's resistance to lateral displacement under vertical loading.

110.20 LABORATORY: The official testing laboratory of the City or any other testing laboratory which may be designated by the City Engineer.

110.21 MATERIALS: Any substances used in the construction of the project and its appurtenances.

110.22 NOTICE TO PROCEED: Written notice to the Contractor to proceed with the Contract work not later than the date specified.

110.23 PAVEMENT STRUCTURE: The combined subbase, base and surface courses placed on the subgrade to support the traffic load and distribute it to the roadbed.

110.24 PIPE BEDDING: Material placed in the bottom of the excavation which serves as the base for the pipeline.

110.25 PLANS: The approved Plans, profiles, typical sections, cross sections, working drawings and supplemental drawings, or exact reproductions thereof, which show the location, character, dimensions, and details of the work to be done.

110.26 PUBLIC INFRASTRUCTURE REPRESENTATIVE: An authorized Representative of the City assigned to make detailed observations of private utilities and other infrastructure that will be transferred to the City. May be synonymous with Contract Administrator.

110.27 PROJECT: The specific pipelines, facilities, and all appurtenances and construction to be performed under the Contract.

110.28 RIGHT-OF-WAY: A general term denoting land, property, or an interest therein, acquired for highway purposes.

110.29 SELECT BACKFILL: The material placed around a pipeline from the top of the bedding material to 18 inches over the top of the pipe.

110.30 SIDEWALK: That portion of the Right-of-Way constructed for the use of pedestrians.

110.31 SPECIAL PROVISIONS: Additions and revisions to the Standard and Supplemental Specifications.

110.32 SPECIFICATIONS: The compilation of provisions and requirements for the performance of prescribed work.

110.33 STANDARD SPECIFICATIONS: The book of Specifications approved for general application and repetitive use.

110.34 STRUCTURE: Bridge, culvert, catch basin, drop inlet, retaining wall, cribbing, manhole, end wall, headwall, building, sewer, service pipe, underdrain, and foundation drain and other features which may be encountered in the work and not otherwise Classified.

110.35 SUBBASE: The layer or layers of selected material of a designed thickness placed on a subgrade to support a base course.

110.36 SUBGRADE: The top surface of a roadbed upon which the pavement structure and shoulders are constructed.

110.37 SUBMITTALS: Those items which must be submitted and approved by the City prior to work on an item or during work on an item. This may include working drawings, supplier certifications, test results, and other types of information.

110.38 SUPERINTENDENT: The representative of the Contractor present at all times during progress of the work, capable of supervising the work effectively and authorized to make binding decisions for the Contractor.

110.39 SURFACE COURSE: One or more layers of a pavement structure designed to accommodate the traffic load, the top layer of which resists skidding, traffic abrasion, and the disintegrating effects of climate. The top layer is sometimes called the "Wearing Course."

110.40 WATER LINES (DISTRIBUTION): The water lines used to transport water from one area of the City to another area. These lines are normally larger than 12 inches and are normally tapped only to main water lines.

110.41 WATER LINES (MAIN): The water lines sized 6 inches to 12 inches that are used to distribute water to various users in the City.

110.42 WORK: Work shall mean the furnishing of all labor, materials, equipment, and other incidentals necessary to the successful completion of the project and the carrying out of all the duties and obligations imposed by the Contract.

110.43 WORKING DRAWINGS: Stress sheets, shop drawings, erection plans, false-work plans, framework plans, cofferdam plans, bending diagrams for reinforcing steel, or any other supplementary plans or similar data which the Contractor is required to submit to the Engineer for approval.

111 CORRECTIONS AND UPDATES: The City of Broken Arrow will update these Specifications as necessary. If you have a suggested improvement or addition to these Specifications, please forward them to the Engineering and Construction Director, P.O. Box 610, Broken Arrow, Oklahoma 74013. All proposed changes will either be included in the next scheduled update or the person submitting the proposed change will be informed, in writing, of the reasons the change was not made.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION