

SECTION 2400

STREETS AND DRAINAGE

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SECTION 2400**STREETS AND DRAINAGE**

2401 GENERAL REQUIREMENTS**2401.1 Scope**

The latest edition of the Oklahoma Standard Specifications for Highway Construction, as published by the Oklahoma Department of Transportation (ODOT), are hereby adopted as the standard specifications for grading, street, road and drainage construction for the City, except as amended herein. Should a conflict between the provisions of the ODOT specifications and the specific provisions set forth herein, the specific provisions set forth herein shall control.

2401.2 Abbreviations

Wherever the words, forms, or phrases herein defined or pronouns used in their stead occur in these specifications, in the contract or in the Advertisement of any document or instrument herein contemplated or to which these specifications apply, the intent and mean shall be interpreted as defined in the General Conditions of the Construction Contract.

2401.3 Revisions, Amendments and Clarifications

Revisions, amendments, and clarifications to ODOT standard specifications (Standard Units) shall be included in any Special Conditions of the contract. The ODOT section shall be referenced by number and description, followed by the required information.

2401.4 Submittals

- A. Before construction, the Contractor shall submit to the Engineer for review drawings showing construction and installation details.
- B. All material furnished shall be in accordance with the drawings and these standards.

2401.5 Special City Testing Requirements

- A. Materials testing: Materials testing shall be as specified in the ODOT Standard Specifications and Subsection 2404.
- B. Construction testing: Testing of completed construction shall be as specified in the ODOT Standard Specifications and Subsection 2404 of these standards.
- C. Tolerances: Shall conform to ODOT Standard Specifications except as modified herein.

2401.6 Stormwater Management

- A. During construction; Developers, property owners, builders, and Contractors shall be required to keep streets, gutters, inlets, drainage pipes, swales, ditches, drainage channels, emergency drainage swales and all drainage devices and structures clean and free from debris, sedimentation, soil, and any deleterious materials. Any failure to meet this requirement shall, upon sufficient notice and failure to immediately correct the

notified condition, constitute grounds for initiation of enforcement action, including, but not limited to, stopping all work until correction is completed.

- B. Developers, builders, property owners, or their legal agents, upon receipt of notice by the City of Owasso that repair or maintenance is required within a channel lying within their property, shall be responsible for effecting such repair or maintenance within the time specified, or the City shall have repair and maintenance performed at the expense of the property owner unless it can be proven that the damage was caused by another entity.

2402 MATERIALS

2402.1 General

This section shall govern the performance of all work necessary for construction of street bases and traffic courses, curbs and gutters, sidewalks and stormwater drainage piping and structures.

2402.2 Concrete Mixes

- A. Concrete shall conform to the requirements of ODOT Section 701.01 (a). Class A and Class AA concrete with a 28-day compressive strengths of 3,000 and 4,000 psi shall be used. The air content shall be 4-8 percent. The exact proportions of the ingredients shall be determined by trial batches, to secure a maximum density plastic mix of satisfactory work ability acceptable to the Engineer. The slump shall be not less than one (1) nor more than three (3) inches for vibrated concrete.
 - 1. Cement: All cement used in the work shall conform to ODOT Specification 701.02. The cement shall be Type I or Type III.
 - 2. Admixtures:
 - a. Air-entraining agents: Air-entrained concrete, conforming to ODOT Specification 701.03(a), shall be used in all concrete work at the option of the Contractor, subject to the approval of the Engineer.
 - b. Set-control admixture: Set controlling agents shall conform to ODOT Specification 701.03(b) and ASTM C 494, and their use subject to review by the Engineer.
 - c. Water: Water used in mixing concrete shall conform to ODOT Specification 701.04
 - d. Fine aggregate: Fine aggregate for concrete shall conform to ODOT Specification 701.05 and The aggregate shall be well graded from coarse to fine and shall conform to the following laboratory sieve analysis:

<u>Sieve Size</u>	<u>Percent Passing</u>
3/8 Inch	100%
No. 4	95 - 100%
No. 16	45 - 85%
No. 50	5 - 30%
No. 100	0 - 10%

- e. Coarse aggregate: Coarse aggregate for concrete shall conform to ODOT Specification 701.06 and shall be No. 57, meeting the following sieve analysis:

<u>Sieve Size</u>	<u>Percent Passing</u>
1-1/2 Inch	100%
1 Inch	90 -100%
1/2 Inch	25 - 60%
No. 4	0 - 10%

- f. Fly ash: Concrete materials shall conform to ODOT Specification Section 702, except that fly ash shall not be used to replace cement in the mix design.

2402.3 Concrete Curing Compounds

Curing compounds shall conform to ODOT Specification 701.07.

2402.4 Joint Fillers and Sealers

- A. Fillers: Joint fillers shall be one of the following:
1. Joint sealer for new construction or rehabilitation of asphaltic concrete streets shall be of the rubber-asphalt hot-poured type conforming to ODOT Specification 701.08(d)4.
 2. Joint sealer for portland cement concrete (PCC) streets, curb and gutter and sidewalks shall be low modulus silicone joint sealant conforming to ODOT Specification 701.08(f).
- B. Primers: The use of primers when recommended by the manufacturer of the proposed sealant, and accepted by the Engineer, shall be applied in accordance with the manufacturer's instructions.
- C. Backer rod: Backer rod shall be compressible, closed-cell polyethylene foam type and shall be compatible with the joint sealant.
- D. Joint sandblasting equipment: The equipment shall include an air compressor, hose and long-wearing 1/4 inch, venturi-type nozzles of proper size, shape and opening. The air compressor shall be portable and shall be capable of furnishing not less than 150 cfm and maintaining a line pressure of not less than 90 psi at the nozzle while in use. Compressor shall be equipped with traps that will maintain the compressed air free of oil and water. The nozzle or nozzles shall have an adjustable guide that will hold the nozzle(s) aligned with the joint about 1 inch above the pavement surface. The height, angle of inclination and size of the nozzle(s) shall be adjusted as necessary to secure satisfactory results.
- E. Concrete saw: A self-propelled power saw with water-cooled diamond or abrasive saw blades shall be provided for cutting joints to the widths and depths specified, or for refacing joints where surface films of old sealants cannot be readily removed by sandblasting.

- F. Routing tools: The routing tool to be used for removing old sealant from the joints shall be of such dimensions that it will not damage the sides of the joints and can be adjusted to remove the old materials to varying depths as specified or shown on the plans. **The use of V-shaped tools or rotary impact routing devices will not be permitted.** The use of vertical spindle routers is permitted. All tools and related equipment shall be reviewed and accepted by the Engineer prior to start of removal of old joint sealant.
- G. Hand tools: Use of hand tools for small repairs may be approved for removing defective sealant from joints and repairing and/or cleaning the joint faces.
- H. Sealing equipment: The unit applicators used for heating and installing hot-poured sealing material shall be mobile and shall be equipped with a double-boiler agitator-type kettle with an oil medium in the outer space for heat transfer, and a direct-connected pressure-type extruding device with nozzle or nozzles shaped for insertion in the joints to be filled, positive temperature devices for controlling the temperature of the oil and sealant, and a recording type thermometer for indicating the temperature of the sealer. The applicator unit shall be so designed that the sealant will circulate through the delivery hose and return to the inner kettle when not sealing joint.

2402.5 Aggregate for Aggregate Base

Aggregate for aggregate base shall be Type A conforming to ODOT Specification 703.01.

2402.6 Lime/Flyash for Soil Stabilization

Hydrated lime or flyash shall be used for the stabilization of roadway subgrade. Hydrated lime shall meet ODOT Specification 706.01. Flyash shall conform to ODOT Section 702.

2402.7 Emulsified Asphalt

Prime and tack coats shall conform to ODOT Specification 708.03.

2402.8 Asphaltic Concrete

- A. Asphaltic concrete shall conform to ODOT Specification 708.
- B. The surface asphalt course shall be placed using a machine designed to remix the material to prevent aggregate segregation.
- C. Reference *Surface Tolerance for Asphalt Pavements* for final inspection standards.

2402.9 Traffic Striping

Permanent traffic striping shall consist of thermoplastic compounds conforming to ODOT Specification 711.01. Temporary striping shall be consist of removable marking tape conforming to ODOT Specification 711.04. Striping paint shall be used only with special approval of the Engineer.

2402.10 Riprap and Filter Blanket

Riprap shall be installed with a filter fabric or aggregate filter blanket in accordance with ODOT Specification 713.

2402.11 Signage

Signs shall be reflectorized extruded sheet aluminum conforming to ODOT Specification 719.

2402.12 Sign Posts

Galvanized Steel sign posts shall conform to ODOT Specification 721.

2402.13 Reinforcing Steel

- A. All reinforcing steel shall conform to ODOT Specification 723.
- B. Reinforcing bars (rebar): All reinforcing bars shall be rolled from new billets and shall conform to the ASTM A615 Specifications for Billet-Steel Bars for Concrete Reinforcement, and shall be of the Grade 60 unless otherwise specified. Unless otherwise shown, all reinforcing bars shall be deformed and shall conform to the requirements of the ASTM A615 specifications for minimum reinforcement. The deformed bars used shall have a net sectional area at all points equivalent to that of plain bars of equal nominal size. Twisted steel bars shall not be used.
- C. Supports for reinforcement: Reinforcement supports shall be bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcements in place.
- D. Tie wire: Tie wire sixteen (16) gauge minimum and in sufficient quantity to hold reinforcement accurately in place during concrete placement operations is required.
- E. Welded wire fabric: Welded steel wire fabric shall conform to ODOT Section 723.03.

2402.14 Storm Sewer

- A. The following pipe is allowed for storm drainage:

<u>Description</u>	<u>AASHTO</u>	<u>ASTM</u>
Reinforced concrete culvert, storm drain and sewer pipe	M170	C76
Reinforced concrete arch culvert, storm drain, and sewer pipe	M206	C506
Reinforced concrete elliptical culvert, storm drain	M207	C507
Reinforced concrete low-head pressure pipe	M242	C361
Metallic (zinc or aluminum) coated, corrugated steel culverts and underdrains	M36	
Corrugated aluminum alloy culverts and underdrain	M196	
High Density Polyethylene (HDPE)	M252	D3350

2402.15 Concrete Storm Sewer Pipe Joint Seals

- A. For zero internal head storm applications use AASHTO M170, M206, or M207 concrete products with Omni-Flex seals or butyl rope (Ram-neck), installed according to the manufacturer's recommended external joint openings. Use manufacturer's gap sheet.
- B. For concrete storm sewers with low internal head [up to 30 feet], use AASHTO M242 concrete products with ASTM C443 confined O-ring or Forsheda gaskets.

2402.16 Concrete Curb Inlet

Concrete curb inlet, used in lieu of cast iron curb inlet, shall be in accordance with ODOT Standard SSCD-1-15 on approval by the Engineer.

2403 EXECUTION

2403.1 General

Execution of the roadway construction shall conform to ODOT specifications, latest revision, except for Measurement and Payment. Items addressed below are City of Owasso preferences that supercede the ODOT specifications. Standard cross-sections for portland cement concrete and asphaltic concrete streets are shown on Standard Details STRT-01 through STRT-04A.

2403.2 Concrete Paving

- A. Concrete streets, General: Concrete paving designs for arterial streets are based on geotechnical reports developed by the design engineer. Paving may be reinforced or plain concrete. Any reinforcement required shall be shown on the contract plans. Concrete paving designed for residential or commercial streets shall be plain concrete (without reinforcement) unless minimum temperature steel is required in special circumstances.
 - 1. Curb and gutter may be placed separate of the pavement but must be doveled to the pavement section.
 - 2. Concrete shall be cured with white curing compound, wet mats or fog spray. If fog spray is used, the surface shall be kept moist for 36 hours following placement. Over spraying will not be allowed.
 - 3. Joint layouts shall be reviewed by the Engineer prior to placement of paving. If possible, longitudinal contraction and construction joints shall present logical traffic lanes to the driver. Joint layout shall generally follow the configuration shown on Standard Details STRT-11, STRT-12 and STRT-13.
 - 4. Dowels are required at all longitudinal and transverse contraction joints in concrete pavement which is 6 inches thick or greater. Dowels shall be 18 inches long spaced at 24 to 30 inches maximum center to center. Dowel size shall be as follows:

<u>Paving Thickness</u>	<u>Dowel Diameter</u>
6" / 8"	1/2" / 3/4"
9"	7/8"
10"	1"

B. Longitudinal joints:

1. Longitudinal cracking joints shall be placed at intervals equaling two (2) times the pavement thickness in inches converted to feet (i.e. 2 X 6" = 12") which converts to a 12-foot spacing of longitudinal cracking joints, but not to exceed every 15 feet.
2. Longitudinal construction joints on residential and residential collector streets may, at the option of the design engineer, be butt type joints with a tiebar or keyway type without a tiebar.
3. Longitudinal construction joints on all other streets shall be keyway type with a tiebar.

C. Transverse joints:

1. Transverse contraction joints shall be placed at intervals equaling two (2) times the pavement thickness in inches converted to feet (i.e. 2 X 6" = 12") which converts to a 12-foot spacing of transverse contraction joints but, not to exceed every 15 feet.
2. Transverse construction joints on residential collector streets may, at the option of the design engineer, be butt type joints with a tiebar or keyway type with a tiebar.
3. Transverse construction joints on arterial streets shall be keyway type with a tiebar.

D. Expansion joints:

1. Expansion joints shall be placed at all street intersection radius and at the last joint before a cul-de-sac. Expansion joints shall not exceed 100-foot spacing.
2. Expansion joints shall have a tiebar when the street being constructed required a tiebar or keyway for a construction joint.

2403.3 Joint Sealing

A. Preparation of joints:

1. New paving: Immediately before installation of the backer rod, the joints shall be thoroughly cleaned until all laitance, curing compound, fill and protrusion of hardened concrete are removed from the sides and upper edges of the joint space. The following sequence of operations shall be used to clean the joints. A power driven concrete-saw blade shall be used to saw through all sawed and filler type joints to loosen and remove material until the joint groove is clear and open to the full specified width and depth. All loosened materials shall be blown from the joint by compressed air. The exposed concrete joint faces and the pavement surfaces extending about 2 inches from the edges of joints shall then be sandblasted using a multiple-pass technique, until the surfaces are free of dust, dirt, curing compound,

filler and any other material that might prevent bonding of the sealant to the concrete. Sand of proper size and quality shall be used in the sandblasting operation. A minimum of 150 cfm of air at a nozzle pressure of 90 psi shall be used in sandblasting and for final cleaning the joints. After cleaning and immediately prior to placing of the backer rod, the joints shall be blown out with compressed air and left completely free of sand and water.

2. Existing paving:

- a. Existing sealant shall be removed from the joint faces using the routing tool specified in Paragraph 2402.4F. After cutting the existing sealant free from both joint faces, the sealant shall be removed to a minimum depth equal to the width of the joint. Removal of sealant shall be to a depth required to accommodate the backer rod and to maintain the specific depth for the new sealant to be installed. Prior to refacing of the joint surfaces, all loose old sealant remaining in the joint opening shall be completely removed using compressed air.
- b. Refacing of joints shall be accomplished using a power-driven concrete-saw with diamond or abrasive blades to remove all residual old sealant and a minimum of concrete from the joint faces to provide exposure of newly clean concrete and, if required, to widen the joint space to the width and depth necessary to accommodate the backer rod and new sealant as indicated below. Immediately following the sawing operation, the joint faces shall be thoroughly cleaned using compressed air to remove all saw cuttings or debris remaining on the faces or in the joint opening. The joint specifications are the following:

<u>Joint Width,</u> <u>(inches)</u>	<u>Joint Depth,</u> <u>Min.</u> <u>(inches)</u>	<u>Sealant</u> <u>Bead</u> <u>Thickness</u> <u>(inches)*</u>	<u>Backer Rod</u> <u>Depth</u> <u>(inches)</u>
(1/4)	1-1/2	3/4	3/4
3/8	1-5/8	3/4	3/4
1/2	1 3/4	3/4	3/4
5/8	1-3/4	3/4	3/4
3/4	2	3/4	3/4
7/8	2-1/8	1	1
1	2 1/4	1	1
1-1/8	2-3/8	1	1

* Top of sealant to be 1/4 inch below pavement surface

- c. Newly exposed concrete joint faces and pavement surface, extending about 2 inches from the joint edges, shall be sandblast cleaned. A multiple-pass technique shall be used until the surface is free of traces of old sealant and free of saw-cutting fines that prevent bonding of the sealant to the concrete. After final cleaning and immediately prior to placing of the backer rod, the joint shall be blown out with compressed air and left completely free of sand and water.

- d. This specification shall also apply to cracks. Hairline cracks shall not be routed and sealed. The construction inspector shall define a hairline crack on the job site.

- B. Work progress: The work required for the sealing or resealing of joints shall proceed at an appropriate rate of progress determined acceptable to the Engineer. The final stages of joint preparation, including sandblasting of the joint faces, air pressure cleaning of joints and placement of backer rod shall be limited to only that lineal footage of joint that can be resealed during the same workday.

- C. Backer rod installation: Backer rod shall be installed at the depth recommended by the sealant manufacturer. The rod shall be installed by hand using a blunt tool or a roller device. The size of the backer rod for each joint shall be in accordance with those specified below.

<u>Joint Width</u> <u>inches</u>	<u>Rod Diameter</u> <u>inches</u>
3/16	1/4
1/4	3/8
3/8	1/2
1/2	5/8
5/8	5/8
3/4	7/8
7/8	7/8
1	1-1/8
1-1/8	1-1/4
1-5/8	2

- D. Sealant preparation: Hot-poured sealing material shall not be heated in excess of the safe heating temperature recommended by the manufacturer as shown on sealant containers. Sealant that has been overheated or subjected to heating for over three hours or that has remained in the applicator at the end of the day's operation shall be removed and disposed of. Material may be added to the melter as the sealant is withdrawn during the sealing operation.

- E. Sealant installation:
 - 1. New paving: Joints shall be sealed immediately following the concrete-curing period or as soon thereafter as weather conditions permit. The concrete walls of the joint shall be surface dry, and atmospheric and pavement temperatures shall be above 40° F at the time of application of the sealant. Open joints that cannot be sealed under the conditions specified herein shall be sealed with an approved temporary seal to prevent infiltration of foreign particles. When rain interrupts sealing operations joints shall be re-cleaned prior to installing sealant.

 - 2. Existing joints: Joints shall be sealed immediately following the sandblast cleaning of the joint walls and following placement of the backer rod. The walls of the joint shall be surface dry, and the atmospheric and pavement temperatures shall be above 40°F at the time of application of the sealant. Open joints ready for resealing which cannot be sealed under the conditions specified herein, or when rains interrupt sealing operations, shall be re-cleaned prior to installing sealant.

3. Seal joints: Joint sealant shall not be installed until the cleaned joints have been inspected and accepted by the project inspector. Joints shall be completely filled from the backer rod up to the surface of the pavement. [NOTE: at Contractor's option backer rod may be omitted and joint completely filled with sealant] Excess or spilled sealant shall be removed from the pavement and discarded. In no cases shall the sealant extend above the surface. When a primer is supplied by the manufacturer, it shall be applied evenly to the joint faces in accordance with the manufacturer's recommendations. The joint shall be checked frequently to insure that the newly installed sealant is cured to a tack-free condition with 24 hours.
4. Final acceptance: In-place sealant which is not completely bonded to the concrete surfaces of the joint walls, or which develops cohesive failures within the sealant, or which contains voids or entrapped air, or which fails to cure to a tack-free condition within 24 hours will be rejected. Sealant may be rejected at any time prior to final acceptance of the project. Sealant, which is rejected, shall be removed from the joint, disposed of and replaced in a manner satisfactory to the Engineer.
5. Curb and gutter joints shall be sealed in accordance with Paragraph 2402.4.

2403.4 Asphaltic Concrete (Bituminous) Paving

- A. Unless otherwise shown on the drawings, the minimum section (excluding the subbase) of any bituminous pavement shall be a minimum 8 inches of modified subgrade or compacted aggregate, 4.5 inches of ODOT Type A (insoluble) hot-mix and 2 inches of ODOT Type B (insoluble) hot-mix traffic course.
- B. Asphaltic concrete paving courses shall not be placed until the curb and gutter sections are in place and have attained design strength.

2403.5 Curb and Gutter

- A. General:
 1. Curb and gutter may be placed separate of the pavement but must be doweled to the concrete pavement section.
 2. The construction of curbs, combination curb and gutter, and integral curb and gutter shall be in accordance with these specifications and as shown on the plans and shall be in reasonably close conformance with the lines and grades shown on the plans or as directed by the Engineer.
 3. Excavation for curbs shall be made to the required depth and the subgrade or base upon which the curb is constructed shall be compacted to a firm, even surface to not less than 95% of standard density as determined in accordance with AASHTO T-99.
 4. Concrete for curbs shall be Class AA, as specified previously for concrete pavement.
 5. The curbs shall be constructed by the use of wood or metal forms; or if accepted by the Engineer, the curb may be constructed using a curb slipform machine. Forms, if used, shall be straight, free from warped or bent sections, and shall extend for the entire depth of the curb and shall be securely held in place so that no deviation from

alignment and grade will occur during placement of concrete. The concrete shall be consolidated by vibration or other acceptable methods. The top of the curb shall be floated smooth and the top outer corner rounded to a ¼-inch radius.

6. The face, top, and gutter of curbs shall not have deviations or irregularities of more than ¼-inch when checked with a 10-foot straightedge.
7. Concrete shall be cured with white curing compound, wet mats, or fog spray. If fog spray is used, the surface shall be kept moist for 36 hours following placement. Over spraying will not be allowed.
8. Six (6)-inch curbs shall be installed on residential streets. Eight (8)-inch curbs are required on arterial streets and commercial collector streets.

B. Transverse joints:

1. Transverse contraction joints shall be placed at intervals equaling the spacing used for concrete streets.
2. Transverse construction joints on curb and gutter shall match the type of joint required for the type of street being constructed.

C. Expansion joints:

1. Expansion joints shall align with concrete pavement expansion joints and be placed at all street intersection radius and at the last joint before a cul-de-sac. Joints for asphaltic concrete paving shall be spaced between 80' and 120' and shall be uniform ½-inch in width, full depth. The joint shall be a straight joint at right angles to the length of curb. Joints shall be filled with specified preformed bituminous joint filler material. Expansion joints shall be formed around all abutting structures such as inlets and shall be as specified previously.
2. Expansion joints shall have a tiebar when the street being constructed requires a tiebar or keyway for a construction joint.

D. Joint sealing:

1. The joints in the gutter up to 1 inch above the flow line will be sealed with low-modulus silicon sealant conforming to ODOT Section 701.08f.
2. Vertical face of curb joints shall be cleaned and sealed with silicone conforming to ODOT 701.08(f) or polyurethane sealant conforming to ASTM C-920, Type M, Grade NS, Class 25.

2403.5 Valley Gutters

Valley gutters shall be constructed with ODOT Class AA Portland cement concrete in compliance with Standard Detail STRT-07A. The minimum width shall be three feet. The valley gutter trough shall match the alignment and grade of the adjacent gutter lines.

2403.6 Sidewalks

All sidewalk construction shall conform to the American's with Disabilities Act (ADA).

A. Sidewalk construction shall conform to the following:

1. Sidewalks shall consist of a 3-inch sand base and a minimum 4-inch thick concrete section. Concrete shall be Class "A" (3,000 psi) concrete.
2. The sidewalk section at driveways shall be 6 inches thick and reinforced with welded wire mesh. Sidewalk cross slopes at driveways shall not exceed 2%.
1. Compact subbase to not less than 95% of maximum dry density, as determined in accordance with AASHTO T-99.
2. Proportion, mix, and place concrete as specified. Walks shall have a broom surface finish. Edge all outside edges of walk and all joints with a 1/4-inch radius edging tool.
3. Sidewalks shall be divided into sections not more than 5 feet in length by dummy joints formed by saw cutting or a jointing tool with 1/4-inch radius.
4. Expansion joints shall be placed around all abutting structures and appurtenances such as driveways, manhole, utility poles, hatches, and hydrants. Install 1/2-inch thick premolded expansion joint filler in the joints, full joint depth.

B. Finish and joints:

1. Sidewalks shall have a non-slip broomed surface, cured per concrete requirements.
2. Expansion joints shall be placed at all intersections with curbs.
3. Transverse cracking joints will normally be tooled or sawed into the finished sidewalk to a depth of 1 inch.
4. Transverse cracking joints shall be placed at intervals not to exceed every 5 feet and filled with low modulus silicon sealant per Paragraph 2403.3 .
5. The cross slope shall be 2% or less at all locations. Sidewalk cross slopes at driveways shall not exceed 2%.

2403.7 Pavement, Curb and Gutter and Sidewalk Removal and Replacement

A. General: This section governs all work involved in the repair and replacement of existing streets, roads, highways, drives, parking areas, curbs, gutters, sidewalks, and other paved areas either damaged/destroyed during construction or scheduled for repair. Intermittent (piecemeal) paving patching done conforming to Standard Detail STRT-19.

B. Preparation for paving and surfacing:

1. Areas to be paved or surfaced shall be clean with temporary pavement materials which are not a part of the permanent pavement, cold-mix asphalt, deleterious or unsuitable materials removed and disposed of.
 2. Any existing pavement, surfaces, or walks against which new pavement is to be placed shall be saw cut along straight lines prior to pavement or sidewalk replacement.
- C. Subgrade preparation: A subgrade of a minimum 8 inches thick shall be provided in locations where pavement is to be placed. All subgrades with plasticity indexes (PI) of 10 or greater shall be replaced with material with less than a PI of 10, replaced with compacted aggregate or modified to meet the requirements of ODOT Section 307 or Section 317.
- D. Pavement replacement:
1. All pavements encountered with respect to base courses, surface courses, and thicknesses shall be replaced in conformance with current minimum requirements for new paving. Finish elevations, lines, and grades of replacement pavement shall be the same as elevations, lines, and grades of pavement removed, unless otherwise shown on the drawings.
 2. Concrete base and asphalt surface: Unless otherwise shown on the drawings, for a street with a concrete base and an asphalt surface, the replacement section shall be a new concrete base (not less than 6 inches thick of high-early concrete) placed to within 2 inches of the existing grade and then 2 inches of asphaltic concrete surface, Type B.
 3. Chip and seal pavement (bituminous surface treatment): Unless otherwise shown on the drawings, chip and seal pavements shall have 8 inches of compacted aggregate base and a processed bituminous coated aggregate pavement placed and rolled as specified in ODOT Section 402.
- E. Sidewalks:
1. Replacement shall conform to new construction per Paragraph 2403.6 and shall match lines and grades of existing features.
 2. If existing sidewalk is to be removed and replaced with new sidewalk or new sidewalk extended from existing sidewalk, the existing sidewalk shall be removed to the nearest joint of suitable quality or as directed by the Engineer. The new section shall meet the lines and grades of existing features.
- F. Curbs and gutters:
1. Replacement shall conform to new construction per Paragraph 2403.5 and shall match the lines and grades where the replacement meets existing features.

2. If existing curb is to be removed and replaced with new curb or new curb extended from existing curb, the existing curb shall be removed to the nearest joint of suitable existing curb or as directed by the Engineer.
- G. Lane striping: Contractor shall stripe new paving with standard white or yellow removable marking tape for temporary markings and thermosetting plastic or other specified material for permanent markings. Stripe width and spacing to match that of paving restored or replaced.
- H. Protection:
1. The treated or compacted aggregate subgrade surface shall be compacted true to line and grade and required density. The subgrade shall be maintained until the paving is placed.
 2. Vehicular traffic of any kind shall not be permitted on any bituminous course until the bituminous mixture has hardened sufficiently not to be distorted beyond specified tolerances. Foreign material which is on the surface of any course shall be removed before the course is rolled or any subsequent course is placed.
 3. Traffic on concrete pavement or sidewalks shall not be permitted until concrete has developed sufficient strength not to be marked or damaged. Vehicular traffic shall not be permitted on concrete until it has reached a compressive strength of 3,000 psi.
 4. Damaged pavement and sidewalks shall be repaired or replaced.
- I. Clean-up: Job site shall be cleaned up following pavement and surfacing restoration. All rubbish, excess materials, temporary structures, and equipment shall be removed and the work left in a neat and presentable condition.

2403.8 Riprap

- A. Dumped Riprap:
1. Dumped riprap shall be placed at locations shown on the plans or as directed.
 2. Material shall be placed to produce a surface of approximate regularity but need not necessarily be hand placed.
 3. The finished surface shall vary no more than nine inches from true plane. The thickness perpendicular to its surface shall be no more than two feet nor less than one foot, unless otherwise directed.
 4. Riprap shall be placed on a geofabric filter material or a compacted aggregate filter blanket conforming to ODOT Section 713.
- B. Revetment Riprap: Revetment riprap may be placed by dumping and shall be placed to the required thickness at the locations shown on the plans or at such other designated locations.

C. Hand-laid riprap:

1. Hand-laid rip-rap shall be placed by hand and shall be no less than the thickness shown on the plans or as specified. For 6-inch hand-laid riprap, the thickness shall be no less than 12 inches and for 12-inch, no less than 18 inches.
2. The slope upon which hand-laid riprap is to be placed shall conform with the cross section shown on the plans. Laying shall begin in a trench below the toe of the slope. It shall progress upward with each piece being laid by hand perpendicular to the slope. It shall be firmly embedded against the slope and the adjoining piece with the sides in contact with well broken joints. The spaces between the larger pieces shall be filled with spalls of suitable size which shall be thoroughly rammed into place.
3. The finished surface shall present an even, tight surface true to line and grade.

2404 TESTING

2404.1 Pavement Testing

A. Concrete:

1. Concrete testing: One test for concrete cylinders shall be construed to mean that at least four test specimens shall be taken in accordance with the schedule below:

<u>Description</u>	<u>Test Method</u>	<u>Quantity Represented One Test for Each</u>
Concrete Cylinder	AASHTO T-23	50 CY Concrete
Entrained Air Content	AASHTO T-152	50 CY Concrete
Slump	AASHTO T-119	50 CY Concrete

2. Two (2) shall be tested at an age of seven (7) days, and two (2) shall be tested at an age of twenty-eight (28) days, and the strength determined from the average of these pairs of test specimens. A minimum of one test (four specimens) shall be taken for each day of work. Beam and cylinder specimens taken in the field shall be made and cured in accordance with AASHTO T-23. One test for entrained air content and slump shall be made for each set of four concrete cylinder specimens taken.
3. Job-mix design: The Contractor shall provide the City with a complete job-mix design performed by an Oklahoma Department of Transportation (ODOT) approved laboratory. A design need not be performed for each project, but the design for each project must have been accomplished not longer than six months before the commencement of the project. The Contractor will be responsible for the cost of this testing, unless otherwise stated in any Special Conditions. A new job-mix design will be performed if materials sources are changed during the project.

B. Asphalt testing

1. General: The testing described herein will be required on asphalt mixes.

2. Job-Mix design: The Contractor shall provide the City/Authority with a complete job-mix design performed by an ODOT approved laboratory. A design for each project must have been accomplished not longer than six months before the commencement of the project. The Contractor shall be responsible for the cost of this testing, unless otherwise stated in any Special Conditions. A new job-mix design shall be performed if materials sources are changed during the project.
3. Aggregates: The Contractor shall provide the City/Authority with copies of the tests required by ODOT specification 708.06 for each aggregate to be used on this project.
4. Asphalt: The Contractor shall obtain from this asphalt supplier, and furnish the City/Authority with a Certificate of Analysis of each different type and grade of asphalt used on the project. All asphalt products will be required to meet the provisions of Section 708 of the latest edition of Standard Specifications for Highway Construction of the Oklahoma Department of Transportation (ODOT).
5. Schedule:

<u>Description</u>	<u>Method of Test</u>	<u>Quantity of Item Represented by One Test</u>
Field Density	ASTM D1556 or ASTM D2922	1 test every 1,000 SY or 250T
Extraction & Gradation	ASTM D2177 and ASTM D5445	Certification by the A/C plant
HVEEM Stability Test	ASTM D150	Certification by the A/C plant

2404.2 Compaction Tests

A. Test schedules:

1. Subgrade test schedule:

<u>Description</u>	<u>Method of Test</u>	<u>Quantity of Item Represented by One Test</u>
Standard Proctor Density	AASHTO T-99	As required by differing soil conditions
Field Density: Subgrade and/or sand bedding	AASHTO T-191 AASHTO T-204 AASHTO T-205	575 SY of subgrade or 200 LF of 26 LF wide street

2. Trench backfill test schedule:

<u>Description</u>	<u>Method of Test</u>	<u>Quantity of Item Represented by One Test</u>
Standard Proctor Density	AASHTO T-99	As required by differing soil conditions
Field Density	AASHTO T-191	1 test every 300 LF trench for

AASHTO T-204 each lift. One test every 200 LF
AASHTO T-205 of bedding material

3. Surface coring (if required):

a. Schedule:

<u>Classification</u>	<u>Interval</u>
Residential	300LF
Collector	230LF
Arterial	
- Full Width	150LF
- Half Width	300LF

b. Core hole shall be patched immediately with material as follows:

Concrete Paving: PCC grout, Class A

Asphalt Paving: Hot mix, cold laid asphalt per ODOT 708.04,
Table 3b, or approved equal

B. Compaction under structures:

1. Cohesionless soils:

- a. Each lift of fills, embankments and backfills supporting equipment slabs, building slabs-on-grade and other structures shall be compacted to not less than 95 percent relative density.
- b. Poorly graded gravel (GP) and sands (SW or SP) shall be placed fully saturated to prevent bulking.
- c. Well graded gravel (GW) shall be placed at the optimum moisture content.

2. Other soils:

- a. Each lift of fills, embankment and backfills and the top six (6) inches of soil in cuts supporting equipment slabs, building slabs-on-grade, and other structures shall be compacted to not less than 105 percent of maximum dry density.
- b. Each lift shall be compacted at a moisture content one (1) percent to three (3) percent above optimum moisture.

C. Trench compaction:

1. Cohesionless soils:

- a. Each lift of fills, embankments and backfills supporting equipment slabs, building slabs-on-grade and other structures shall be compacted to not less than 75 percent relative density.

- b. Poorly graded gravel (GP) and sands (SW or SP) shall be placed fully saturated to prevent bulking.
- c. Well graded gravels (GW) shall be placed at the optimum moisture content.

2. Other soils:

- a. Each lift of fills, embankment and backfills and the top six (6) inches of soil in cuts supporting equipment slabs, building slabs-on-grade, and other structures shall be compacted to not less than 105 percent of maximum dry density.
- b. Each lift shall be compacted at a moisture content one (1) percent to three (3) percent above optimum moisture.
- c. Under pavements, driveways, curbs, gutters, steps, sidewalks, and similar use areas (including adjacent shoulder areas): Each lift shall be compacted to not less than 95 percent of standard proctor dry density up to the elevations at which the requirements for pavement subgrade compaction control.
- d. Under grassed or landscaped areas: Each lift shall be compacted to not less than 90 percent of standard density.
- e. Each lift shall be compacted at a moisture content one (1) percent to three (3) percent above optimum moisture.

D. Over-all compaction:

1. Cohesionless Soils:

- a. Each lift of fills, embankments and backfills supporting equipment slabs, building slabs-on-grade and other structures shall be compacted to not less than 95 percent relative density.
- b. Poorly graded gravel (GP) and sands (SW or SP) shall be placed fully saturated to prevent bulking.
- c. Well graded gravels (GW) shall be placed at the optimum moisture content.

2. Other soils:

- a. Under pavements, driveways, curbs, gutters, steps, sidewalks, and similar use areas (including adjacent shoulder areas): Each lift shall be compacted to not less than 95 percent of standard proctor density up to the elevations at which the requirements for pavement subgrade compaction control.
- b. Under grassed or landscaped areas: Each lift (except topsoil) shall be compacted to not less than 90 percent of standard density.
- c. Each lift shall be compacted at a moisture content one (1) percent below to three (3) percent above optimum moisture.

- E. Pavement subgrade compaction:
1. Cohesionless soils:
 - a. Each lift of fills, embankments and backfills supporting equipment slabs, building slabs-on-grade and other structures shall be compacted to not less than 75 percent relative density.
 - b. Poorly graded gravel (GP) and sands (SW or SP) shall be placed fully saturated to prevent bulking.
 - c. Well graded gravels (GW) shall be placed at the optimum moisture content.
 2. Other soils:
 - a. The top twelve (12) inches of subgrade in fill areas and the top six (6) inches of subgrade in cut areas under pavements, driveways, sidewalks, curbs, gutters, steps and similar use areas (including adjacent shoulder areas): Each lift shall be compacted to not less than 95 percent of standard proctor density.
 - b. The top six (6) inches of subgrade under sidewalks and similar use areas: Each lift shall be compacted to not less than 95 percent of standard density.
 - c. Each lift shall be compacted at a moisture content one (1) percent to three (3) percent above optimum moisture.
- F. Compaction deficiencies:
1. The Engineer shall be the final judge of suitability of all compaction.
 2. Apparent negligence or carelessness during any portion of the earthwork operations will require that additional tests be performed on that portion of the work.
 3. Fills, embankments, backfills or subgrades which do not meet the specification requirements shall be removed or recompacted until the requirements are satisfied.

2404.3 Storm Sewer Pipe Inspection/Testing

- A. Preparation: The Contractor shall ensure that the line is clean and all debris has been removed from manholes and drop inlets.
- B. Frequency: Each line from manhole to manhole or drop inlet shall be tested. If the inspector suspects a portion of the line was not properly installed, a dye test of that portion of the line may be required.
- C. Procedure: A dye test, if required, shall be prepared in the same manner as a sanitary sewer line test except:
 1. The dye injection shall be at equally spaced locations around the section in question.

2. Dye shall be injected until, in the opinion of the project inspector, the area is saturated.
 3. The project inspector shall 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 shall make necessary repairs and retest.
- D. Inspection requirement: The project inspector shall be on site to observe all mandrel, pressure and dye testing, if required.

2404.4 Storm Sewer Drop Inlets and Junction Boxes Inspection/Testing

- A. Preparation: The Contractor shall 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.
- B. Frequency: The project Inspector may request that a drop inlet or junction box that does not appear to meet specifications be tested by dye testing.
- C. Procedure:
1. The inspector shall visually inspect each drop inlet and junction box for compliance with the specifications.
 2. A dye test, if required, shall be prepared in the same manner as a sanitary sewer line test except:
 - a. The dye injection shall be a four (4) equally spaced locations around the drop inlet or junction box.
 - b. Dye shall be injected until, in the opinion of the project inspector, the area is saturated.
 - c. The project inspector shall 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 shall make necessary repairs and retest.
- D. Required results: The drop inlet or junction box shall meet specifications. If dye testing is required, then no dye shall enter the drop inlet or junction box.
- E. Inspection requirements: The project inspector shall be given sufficient notification in order to be on-site to observe all testing.

2405 APPLICABLE STANDARD DETAILS

STRT-01	Residential Minor Street
STRT-02	Residential Collector Street
STRT-03	Secondary/Primary Arterial Street
STRT-04	Residential Collector Intersection with Arterial
STRT-04A	Commercial/Industrial Collector Street

STRT-05	Residential Driveway and Curb Cut
STRT-06	Commercial Driveway
STRT-07	Curb and Gutter
STRT-07A	Valley Gutter
STRT-08	Asphalt Paving Tolerance
STRT-09	Acceleration/Deceleration Lanes
STRT-10	Acceleration/Deceleration with Passing Lane
STRT-11	Street Intersection Layout
STRT-12	Concrete Pavement Joint Plan (Cul-de-Sac)
STRT-13	Concrete Pavement Joint Plan (Intersections & Lanes)
STRT-14	Concrete Pavement Joint Details
STRT-15	Residential Cul-de-Sac (Asphalt Paving)
STRT-16	Curb Ramp (H/C), Type A
STRT-17	Curb Ramp (H/C), Type B
STRT-18	Curb Ramp, Arterial Street
STRT-19	Type I (PCC) & Type II (AC) Pavement Patch
STRT-20	Street Replacement for Utilities
STRT-21	Pavement Cuts for Utilities
STRT-22	Manhole and Valve Box in Streets
STRT-23	Paving Base Drainage
STRT-24	Stop Sign & Barricade
STRT-25	Utility Locations at Streets
STRT-26	Right-of-Way Grading
STRT-28	High Pressure Pipeline Marker

END OF SECTION

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