# INOLA

# OKLAHOMA

## *ENGINEERING DESIGN CRITERIA MANUAL*

***October 1, 2019***

# TOWN OF INOLA
# OKLAHOMA

**TOWN OF INOLA BOARD OF TRUSTIES**

**ACCEPTED by the Town of Inola Board of Trustees on this _____ day of _____ 2019**

**ATTEST:**

_____ _____

Town of Inola Clerk Mayor

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# PREFACE

The Town of Inola intends for the criteria set forth herein to serve as the requirements for the engineering and design of all public improvements and private development improvements which shall be donated to the Town unless otherwise noted, that occurs within the jurisdiction specified within this manual. In addition, these requirements are to supplement all local, state, and federal building codes and regulations with respect to the engineering and design aspect associated with said development.

By setting forth these minimum standards, neither the Town as an entity nor any of its appointed staff members is making any representations, warranties or assurances that these minimum engineering design criteria are sufficient to ensure the proper design and subsequent construction of the proposed improvements. To the contrary, the Town of Inola is merely setting forth certain minimum engineering design standards necessary to promote the proper construction of the proposed improvements. Any person or entity owning land within the jurisdiction specified herein and developing improvements upon said land shall be solely responsible to rely upon their own properly licensed and/or certified design professionals to accurately engineer and design the proposed improvements, whether public or private, which are capable of providing the services required of said improvements and which are adequate under all reasonably foreseeable circumstances for the purposes intended.

When the Town, as represented by its staff, reviews and examines proposed improvement documents, including but not limited to design calculations and construction plans, for conformity to these criteria, such action is conducted and performed by the Town merely to determine whether or not the minimum requirements set forth will be met. The acceptance of said documents does not imply, represent, warrant, or assure any person that the proposed improvements are adequate for the intended purposes nor does it alleviate, relieve, or reduce the responsibility and/or liability of the required design professional.

# Section 100 General Provisions

## 101 General

### 101.1 Title:

a) This Manual shall hereafter be know, cited and referred to as the Engineering Design Criteria Manual (EDCM) for the Town of Inola.

### 101.2 Scope:

a) The criteria established and set forth in this manual are the minimum acceptable standards of engineering and design for any and all public and/or private (unless otherwise noted) development that occurs within the Town of Inola. All parties developing and constructing improvements within the Town shall meet these minimum standards and are encourage to exceed them where it is considered to be in the best interest of all parties.

### 101.3 Authority:

a) This Manual is herby adopted under the authority granted by Oklahoma State Statues.

### 101.4 Implementation:

a) The Town shall prepare engineering and design criteria for the implementation in the course of the design of a construction improvement project. These criteria shall apply to all construction, where public improvements and private improvements that will be donated to the public, started within the jurisdiction.

### 101.5 Amendments:

a) For the purpose of providing to the public improved health, safety and general welfare requirements, the appointed Town Engineer may make a recommendation to the Mayor and may from time to time amend the provision imposed by these criteria without public hearing or notices being made. Amendment shall be effective as of the date of publication for its insertion into this manual.

### 101.6 Variances:

b) Whenever the application of one of these criteria results in an unusual hardship or creates an unordinary confliction with the application of one ore more criterion, the appointed Town Engineer may present a grant variance request to the Mayor or designee. The May or designee may at his/her discretion grant a variance or waive all or part of said criterion in order to proceed a sound and resorb able design that is consistent with standard practice within the engineering and construction profession. The developer shall prepare a Variance of Waiver Request and submit the document to the appointed Town Engineer for appropriate action.

# Section 200 Engineering Design Requirements

## 201 General

### 201.1 Easements

b) Utility Easements

i. A minimum of twenty (20) feet wide utility easement shall be provided adjacent to public right-of-way dedication.

ii. A perimeter utility easement, along the boundary line of the subdivision, of seventeen and a half (17.5) feet wide shall be provided.

iii. A minimum of ten (10) feet wide utility easement shall be provided on all rear lot lines, or additional width if so required by utility providers.

iv. A minimum of five (5) feet wide utility easement and/or additional width, shall be provided on all side lot lines if so required by the utility providers.

v. Easements shall be maintained free of buildings, appurtenances, or other structures or improvements, which would prevent access for maintenance and service of utilities.

c) Drainage Easements

i. Suitable width drainage easements shall be provided for all overland drainage ways to wholly contain the 1% chance (100 year) storm event.

ii. Drainage easements shall be maintained free of buildings, fences, appurtenances or structures. Subdivision covenants shall also contain these requirements.

iii. Public drainage easements shall be provided for all detention facilities and drainage ways. The covenants shall explicitly state who shall be responsible for the maintenance of the detention facilities. Town of Inola will not be responsible for the maintenance of any detention facilities. All detention facilities shall be adequately maintained by the owner(s) thereof. Failure to maintain such detention facilities and/or drainage ways shall be deemed a violation of these Regulations, enforceable by citation from a Code Enforcement Officer, and shall carry a fine not to exceed $200, the passage of each day constituting a separate offense. Town of Inola may, in addition to all other remedies available, upon 15 days' notice by certified mail, return receipt requested, to the owner, hold a public hearing on the issue of whether or not the failure of maintenance should be abated and remedied, and may after a public hearing order the person to abate and remedy the failure; provided, however, if such person fails or refuses within 30 days to so abate or remedy the failure to maintain such facilities, the Town/County may order the abatement and remedy and may file a lien and/or lawsuit to seek reimbursement for funds expended by the Town/County. If the owner cannot be determined the Town/County may fulfill its notice requirements by posting a notice on the property at least 15 days prior to the public hearing.

**201.2 Driveways**

Driveways shall conform to the following:

b) Residential lots zoned smaller than RE shall have an asphalt or concrete driveway.

c) Commercial driveways, industrial driveways, and customer/public parking areas shall be asphalt or concrete.

d) All existing improvements including sidewalks, curb, gutter and streets damaged or removed by the driveway construction shall be repaired or replaced to existing alignments and grades. All concrete or asphalt removal shall be saw cut.

e) Driveways on the same property shall have a minimum separation of twenty five (25) feet.

f) All driveway location and separation requirements are measured from the end of the radius returns.

g) Residential driveways shall have a minimum width of twelve (12) feet and a maximum width of thirty (30) feet.

h) No portion of a driveway shall be closer than two (2) feet to a property line for residential use or nine (9) feet for commercial use.

i) Maximum industrial and commercial driveway width is forty (40) feet.

j) Minimum driveway return radius is ten (10) feet for residential and fifteen (15) feet for commercial or industrial.

k) In relation to nearby intersections, residential driveways shall have no portion of the driveway within twenty (20) feet of a residential or collector street or fifty (50) of an arterial street.

l) In relation to nearby intersections, commercial and industrial driveways have no portion of a driveway within twenty-five (25) feet of a residential or collector street or seventy-five (75) feet of an arterial street.

m) The edge of the driving lane of a driveway shall be no closer than five (5) feet from a utility pole, fire hydrant, and drainage inlet or any other above ground utility structure and shall be outside any water and sewer lines and appurtenances.

n) One driveway may serve two (2) properties if the required joint access easement has been recorded and the property is zoned for RM Zoned Residential Multifamily or a Planned Unit Development. The minimum driveway width in this case is eighteen (18) feet.

**201.3 Alleys**

Alleys, if required, shall conform to the following:

b) Unless provisions are made for utility easements, emergency access and service access, alleys shall be provided in commercial and industrial districts at the rear of all lots regardless of frontage on a major street.

c) Alleys serving commercial and industrial areas shall not be less than thirty (30) feet in width and shall be paved the full width.

d) Alleys may be required in RM Zoned Multi-Family Districts by the Planning Commission after review and recommendation by the Planning Director or County Engineer for efficient solid waste collection, more effective police and fire protection or for more efficient provision of service access and maintenance of utilities. Alleys serving RM Zoned Multi-Family Districts shall not be less than twenty (20) feet in width and paved for the full width.

e) Alleys are not required in RS Zoned Districts, but when provided shall not be less than twenty (20) feet in width and paved for the full width.

f) Alley intersections and sharp changes in alignment shall be avoided, but where necessary, corners shall have a radius sufficient to permit safe vehicular movements.

g) Dead-end alleys shall be avoided where possible, but if unavoidable shall be provided with adequate turnaround facilities at the dead-end.

**201.4 Sidewalks**

b) Sidewalks shall be installed along both sides of all streets in all zoning categories for industrial and residential subdivisions zoned for lots of 10,000 square feet in size or less.

c) Sidewalks within residential developments shall be installed prior to occupancy of the respective lot under construction. Wheelchair ramps at all intersections and sidewalks within reserve areas or any area not abutting a lot shall be

installed by the developer prior to final acceptance of the infrastructure improvements of the County.

### 201.5 Street Lighting

c) Standard street lights, procured from local utility provided, shall be installed by the developer at all street intersections and at a spacing not more than one thousand (1,000) feet apart in all industrial, commercial, and residential zoning categories zoned for lots of 30,000 square feet in size or less.

d) Ownership and maintenance of street lights shall be the responsibility of the owner or the property/home owners association.

## 202 Street Design Criteria

### 202.1 General

The general alignment of the streets shall discourage the use of local streets, excluding collectors, to through traffic. Streets shall be looped whenever possible.

The street alignments shall provide for the appropriate connection to existing streets and shall stub-out or project to surrounding undeveloped tracts of property. Stub outs shall be required, at the discretion of the Planning Commission and/or Board of Commissioners.

A subdivision shall have two routes of access to a section line road, or one route of access with additional planned route(s) of access through future development shall be required, at the discretion of the Planning Commission and/or Board of Commissioners.

### 202.2 Street and Subdivision Names

a) No street name shall be used which will duplicate or be confused with the name of existing streets.

b) Street names and addresses shall be referred to the Town of Inola 911 Addressing for recommendations and are subject to the approval of the Board of Commissioners.

c) Subdivision names shall not duplicate existing subdivisions of record and shall be reviewed by the Planning Director and are subject to the approval of the Board of Commissioners.

d) Signs indicating street names must be in place at all intersections prior to approval of the final plat.

### 202.3 Access and Limits of No Access

a) The centerline of proposed roads and major driveways (driveways servicing property over five (5) acres) on an arterial street or collector street shall be located as far as the lot width permits from the street intersections, and at least one hundred fifty feet (150') away from the centerline of the intersecting street.

b) In commercial and industrial subdivisions, specifically designated "one-way turn only" access may be required in the direction of the adjacent lane at a minimum distance of three hundred (300) feet between major street

intersections or a minimum distance of three hundred (300) feet between each access point.

c) Commercial and industrial subdivisions should have access to a major or commercial street, and may have access to a collector street, if traffic conditions as determined by the Planning Commission warrant, but shall not have access to a residential street.

d) To assure traffic safety, appropriate non-access provisions shall be designated and dimensioned along all abutting streets in all commercial and industrial subdivisions, and along all major streets in residential subdivisions. A description of such non-access provisions shall appear in the plat.

e) Access to property occurring within the minimum distance prescribed for major street access, six hundred (600) feet, shall only be by the closest service or frontage road entrance onto the major street.

f) In residential subdivisions, individual driveways will be located on each lot to avoid direct vehicular access to or from any expressway, thoroughfare, or major street. Driveways should be located to enable direct access primarily to or from a minor street, or, if necessary, to the collector streets which serve as feeders to or distributors from the major streets. Limits of non-access shall be designated on the plat.

g) Additional Limits of No Access must be provided if requested by the County.

h) Multiple points of access are encouraged and shall be achieved if possible.

### 202.4 Roadway Drainage System Determination

a) Curb and Gutter

Subdivisions in which the smallest lot width, excluding cul-de-sac lots or lots on a curve meeting the lot width requirements as set forth herein, is less than one hundred and thirty (130) feet shall utilize curb and gutter streets.

b) Borrow Ditch

Subdivisions with the lot widths equal to or in excess of one hundred and thirty (130) feet may utilize streets with borrow ditch drainage systems.

### 202.5 Right of Way Widths Dedication

The minimum street right-of-way requirements are as follows, and shall be dedicated as follows:

Principal Arterial . . . . . 120 feet minimum
Major Collector/Minor Arterial . . . . . 100 feet minimum
Minor Collector/Section Line Road . . . . . 100 feet minimum
Commercial/Industrial Collector . . . . . 80 feet minimum
Commercial/Industrial Street . . . . . 80 feet minimum*

Residential Collector . . . . . 60 feet minimum

Residential Local (Internal within Development) . . . . . 60 feet minimum**

*Right-of-way may be reduced to sixty (60) feet for Commercial/Industrial Streets that have curb and gutter streets.

**Right-of-way may be reduced to fifty (50) feet for Residential Local roads that have curb and gutter streets.

The right-of-way dedications shall include full width dedication for all streets with the exception of Primary and Secondary Arterials in which case half-width dedication to the Section Line is required when the development lies only within one particular Section of land.

If a Reserve Area falls within a right-of-way (e.g. Entrance Island), the Reserve Area must be contained in a roadway easement. The governing body shall have no liability for any damage to any private improvements occasioned by the maintenance or reconstruction of utilities or infrastructure located in the Reserve Area.

### 202.6 Design Speed

Speed shall be twenty five (25) miles per hour on all residential streets and thirty (30) miles per hour on all collector streets, or as otherwise approved by the Planning Commission or Board of Commissioners.

### 202.7 Street Geometry

a) Minimum Centerline Radius

| Street Classification | Min. Centerline Radius |
|---|---|
| Arterial | 500 feet |
| Commercial/Industrial | 500 feet |
| Residential Collector | 270 feet |
| Local Residential | 150 feet |

b) Minimum Centerline Tangent

| Street Classification | Min. Centerline Tangent |
|---|---|
| Arterial | 200 feet |
| Commercial/Industrial | 200 feet |
| Residential Collector | 100 feet |
| Local Residential | 100 feet |

c) Minimum Intersection Return Radius

| Street Classification | Min. Intersection Return Radius |
|---|---|
| Arterial | 40 feet |
| Commercial/Industrial | 40 feet |
| Residential Collector | 30 feet |
| Local Residential | 25 feet |

### 202.8 Cul-De-Sacs

The entrance to the cul-de-sac shall be considered the intersection leading into the cul-de-sac from an existing through street or planned through street as approved by the Planning Commission and Board of Commissioners. For zoning of RE and above the cul-de-sacs shall not exceed one thousand (1,000) feet in length, for zoning less than RE the maximum length shall not exceed six hundred (600) feet, as measured from the entrance to the center of the cul-de-sac. A cul-de-sac with borrow ditches shall have a minimum right-of-way radius at the property line of not less than sixty (60) feet, a cul-de-sac with curb and gutter shall have a minimum right-of-way radius at the property line of not less than fifty five (55) feet, and either type of cul-de-sac shall have a minimum paving radius not less than forty five (45) feet.

With a reserve island in the center of the cul-de sac, the paving radius shall be thirty (30) feet plus the radius of the island or the minimum paving radius as stated above, whichever is greater and the right-of-way radius shall be fifteen (15) feet plus the radius of the pavement

### 202.9 Intersections

a) Streets shall be designed to intersect at right angles as permitted by topography or other limiting factors.

b) Street intersections shall be as nearly at right angles as possible, and no intersection shall be at an angle of less than eighty (< 80) degrees. Detailed designs of intersections may be required. Street jogs with centerline offsets of less than one hundred fifty (150) feet shall not be permitted.

c) Sight Distance Triangles shall be considered and maintained in accordance with the Zoning Ordinance.

d) No more than two (2) streets shall intersect at any one point.

### 202.10 Street Grades

a) The minimum street grade for all streets shall be five tenths percent (0.5%) and the maximum street grade shall not exceed the following:

| Street Type | Grade |
|---|---|
| Primary Arterial | 5% |
| Secondary Arterial | 7% |
| Local Residential | 10% |

b) The maximum driveway grade, from the street right-of-way to the building line shall not exceed fourteen percent (14%).

c) If the algebraic difference between two intersecting grades is greater than five tenths percent (0.5%), the change in grade shall be connected by vertical curves and designed for safe stopping sight distances as determined by the County Engineer.

d) The grade of a residential street when intersecting an arterial street shall not exceed three percent (3%) within a distance of fifty (50) feet measured from the

radius points. The maximum grade of residential streets at intersections shall be four percent (4%) within a distance of fifty (50) feet measured from the radius points.

e) Street grades shall be established in such a manner to avoid excessive grading or removal of tree growth, and shall otherwise be in accordance with these engineering design requirements.

f) In those cases where topography or other physical features dictate, a modification of required street grades may be approved by the County.

### 202.11 Paving Materials and Street Design

A geotechnical report is required to determine the subgrade treatment requirements and to evaluate the pavement section requirements. The minimum compaction of the subgrade and base shall be ninety five percent (95%) standard proctor density. The subgrade shall have a minimum Plasticity Index (P.I.) greater than six (P.I. > 6) and a maximum Plasticity Index less than thirteen (P.I. < 13) or be modified as approved by the County.

The street cross-section shall meet the minimum requirements shown in the Standard Drawings. An alternate paving section may be required, or would be considered upon request, based on a geotechnical engineering report of representative areas in the subdivision. Alternative paving section must be submitted as part of the construction plans, reviewed, and approved by the County prior to installation.

## 203 Street Drainage and Storm Sewer Criteria

### 203.1 General

For the ten (10) year frequency storm with curb and gutter streets:

a) Arterial Streets - shall have two driving lanes of traffic open and clear of water.

b) Collector Streets - shall have one driving lane open and clear of water.

c) Residential Streets - the depth of flow shall not exceed curb height and may spread to the crown of the street.

Where no curb exists, stormwater encroachment from the one hundred (100) year storm shall not extend past the street right-of-way or adjacent drainage easement.

### 203.2 Paving Sump Locations

The water depth shall not extend twelve (12) inches above the top of the grate for the one hundred (100) year frequency storm. But in no case shall the one hundred (100) year flow extend past the right-of-way or adjacent drainage easement.

Where sump locations are used, a permanent overflow route shall be contained in a dedicated drainage easement providing an emergency bypass in case of blockage or overflow of the sump inlets.

### 203.3 Underground Storm Sewers

a) The plans shall show the systems in plan and profile view. The plans must include flow-lines, pipe size and material, existing and proposed grade, pipe

slope, energy grade line, hydraulic grade line, discharge and velocity for each segment of pipe.

b) Storm sewers shall be constructed from reinforced concrete pipe (RCP), high-density polyethylene (HDPE) or coated metal alloy as approved by the County. HDPE shall have a minimum of twenty four (24) inches of cover under streets.

c) The minimum storm sewer size shall be fifteen (15) inches diameter.

d) No storm sewer pipe shall be installed downstream having a diameter smaller than the storm sewer pipe it is receiving water from.

e) The maximum inlet spacing shall be six hundred (600) feet.

f) Storm sewer construction shall meet the latest edition of Oklahoma Department of Transportation (ODOT) specifications subject to the approval of the County Engineer.

Structures (manholes, inlets, etc.) must be of concrete construction; masonry shall not be allowed.

# 204 Culverts and Borrow Ditches

## 204.1 Roadway Culverts

Material shall be smooth steel pipe, reinforced concrete pipe (RCP), reinforced concrete box (RCB) or High Density Polyethylene (HDPE). HDPE culverts may be used if there is at least twenty four (24) inches of cover.

All culverts shall have ODOT Standard Sloped Concrete End Sections or ODOT Standard Headwalls. Alternative headwalls and/or end sections must be submitted as part of the construction plans, reviewed, and approved by County the prior to installation. All roadway culverts shall be a minimum of fifteen (15) inch diameter. Energy dissipaters shall be provided as required.

The minimum design frequency storm for all culverts shall be the 1% chance (100 year) storm event.

## 204.2 Driveway Culverts

Culverts shall consist of smooth steel pipes, RCP, or corrugated metal pipe (CGMP). Driveway culverts may be HDPE or PVC only with at least twelve (12) inches of cover or if the driveway is concrete and is at least four (4) inches thick. All driveway culverts shall be a minimum of twelve (12) inch diameter. All culverts shall have headwalls. Headwalls must be submitted as part of the construction plans, reviewed, and approved by the County prior to installation.

The minimum design frequency storm for all driveway culverts shall be the 1% chance (100 year) storm event.

## 204.3 Borrow Ditches

Borrow ditches shall meet the following standards:

a) Be a minimum of two (2) feet in depth measured from the top of the street subgrade to the bottom of the ditch.

b) All borrow ditches shall be designed for wholly contain the 1% chance (100 year) storm event. Typical borrow ditch sections, special borrow ditch sections, and borrow ditch capacity calculations shall be provided as part construction plans.

c) The velocity of the water in the ditch shall not exceed six (6) feet per second, if the velocity of the water in the ditch exceeds six (6) feet per second, the ditch shall be lined with concrete or other such materials to prevent erosion.

d) Unlined ditches shall utilize the appropriate erosion and sediment control measures per these subdivision regulations.

e) Where a private drive crosses a borrow ditch, the subdivider's engineer shall determine the minimum required diameter of the culvert which shall be shown on the face of the Preliminary Plat and recorded on the face of the Final Plat drawing. A minimum of a twelve (12) inch diameter culvert pipe shall be required for each such drive.

f) Borrow ditches shall have a minimum fore-slope and back-slope of 4:1, shall be backfilled with a minimum of four (4) inches of topsoil, seeded or slab sodded. At a minimum, the bottom of the bar ditch must be contained in the right-of way dedication.

### 204.4 Reserve Islands

Islands shall be wholly contained within a reserve area or an easement and the County may require such islands be dedicated as a roadway easement. Islands shall be designed limit the amount of surface runoff from the island to the adjoining street. The County may require a "French Drain" system or a storm drain system within a island to mitigate surface runoff from island to the adjoin street.

## 205 Drainage Design Requirements

### 205.1 General

a) The storm water drainage system shall be designed to receive and pass the runoff from a one hundred (100) year frequency rainstorm within dedicated easements or public rights-of-way under full urbanization. The entire flow shall be contained in an approved storm water drainage system. The storm water drainage system shall consist of street flow, storm sewers, ditches, channels, drainage ways and detention facilities.

b) The building pad elevation on every lot shall be a minimum of one foot above the one hundred year (100) year floodplain elevation or the flood elevation due to any localized drainage or localized flooding. This elevation shall be the minimum elevation for the finished floor of any structure on the lot and this elevation shall be noted and labeled on each lot on the face of the subdivision drainage plans.

c) Floodplain development must be in accordance with the Floodplain Development Permit as issued by the Floodplain Manager and required by the Zoning Regulations.

d) The development shall not increase the one hundred (100) year flood plain elevation or modify the existing flood plain boundaries that exist on the latest publication of the Flood Insurance Rate Map (FIRM) unless the appropriate map revisions/amendments are approved by FEMA (e.g. Letter of Map Revision LOMR, or Letter of Map Amendment, LOMA). The subdivider shall have full responsibility for obtaining any such map revisions/amendments.

e) The runoff rate and velocity from any development shall not exceed the pre-development condition which shall be demonstrated by analyzing the runoff from the two (2) year, five (5) year, ten (10) year, fifty (50) year and the one hundred (100) year rainfall frequency events. The post-development runoff shall incorporate detention facilities and drainage patterns in the calculations.

f) The development shall not adversely impact adjacent properties in the modification of drainage patterns to and from adjacent properties. Protection of unprotected or adjacent property from incremental flows, changes in drainage patterns or point discharges shall be provided. Such flows shall not be directed across unprotected or adjacent properties unless the appropriate easements and proper storm water drainage systems are provided to convey flows to an adequate drainage conveyance system as approved by the County Engineer.

### 205.2 Construction in the Regulatory Floodplain

a) Any construction in the floodplain shall not increase the base flood elevation in the regulatory floodplain as per current Town of Inola Floodplain Ordinance.

b) The one hundred (100) year Base Flood Elevation (BFE) must be determined through backwater analysis. HEC-RAS or other FEMA approved model shall be utilized for the backwater analysis.

c) The simulation results shall be submitted to the County to document the BFE and demonstrate the project has no adverse impact.

d) Any floodplain modifications shall require approval by the County and the appropriate FEMA Letter of Map Change.

### 205.3 Stormwater Runoff Calculations

Approved methods of stormwater runoff analysis are shown in Table 505.03-1. Methods of analysis other than the ones listed here may be utilized with approval by the County Engineer.

**Table 505.031 Approved Methods of Hydrologic Analysis**

| Method of Analysis | Application | | Minimum Drainage Area | Maximum Drainage Area |
|---|---|---|---|---|
| | Peak Q | Volume Calculations | | |
| Rational Method | Yes | No | ~0 | 60 |
| NRCS (SCS) Method | Yes | Yes | ~0 | 2000 |

a) Rational Method

Rational Method may be used to determine required design flows for culverts or channels with drainage areas less than the maximum drainage area allowed in Section 505.03.

The recommended ranges of C values are shown in Table 505.03-2. Coefficient values selected from the range available shall be consistent with the urbanized percent imperviousness (i.e. minimum percent imperviousness requires minimum runoff coefficient value). Also, for flat slopes and permeable soils, use the lower values. For steep slopes and impermeable soils use the higher values.

**Table 505.032 Runoff Coefficients**

| Land Use of Surface Characteristic | Percent Impervious | Runoff Coefficients |
|---|---|---|
| BUSINESS: | | |
| Commercial Areas | 70 to 95 | 0.70 to 0.95 |
| Neighborhood Areas | 60 to 80 | 0.60 to 0.80 |
| RESIDENTIAL: | | |
| Single Family | 35 to 50 | 0.30 to 0.50 |
| Multi-Unit (detached) | 45 to 55 | 0.40 to 0.60 |
| Multi-Unit (attached) | 65 to 75 | 0.60 to 0.75 |
| 1/2 Acres or larger lot | 30 to 45 | 0.25 to 0.40 |
| Apartments | 65 to 75 | 0.50 to 0.70 |
| INDUSTRIAL: | | |
| Light Uses | 70 to 80 | 0.50 to 0.80 |
| Heavy Uses | 80 to 90 | 0.60 to 0.90 |
| PARKS, CEMETERIES | 4 to 8 | 0.10 to 0.25 |
| PLAYGROUNDS | 40 to 60 | 0.50 to 0.60 |
| RAILROAD YARDS | 35 to 45 | 0.20 to 0.35 |
| UNDEVELOPED AREAS: | | |
| Cultivated | 30 to 70 | 0.35 to 0.60 |
| Pasture | 20 to 60 | 0.25 to 0.50 |
| Woodland | 5 to 40 | 0.10 to 0.40 |
| Offsite flow analysis (land use not defined) | 35 to 55 | 0.45 to 0.65 |
| STREETS: | | |
| Paved | 90 to 100 | 0.80 to 0.90 |
| Gravel | 50 to 70 | 0.55 to 0.65 |
| DRIVES AND WALKS | 90 to 100 | 0.80 to 0.90 |
| ROOFS | 85 to 95 | 0.80 to 0.90 |
| LAWNS: | | |
| Sandy Soils | 5 to 10 | 0.10 to 0.20 |
| Clayey Soils | 10 to 30 | 0.13 to 0.35 |

The intensity (I) is the average rainfall rate in inches per hour for the period of maximum rainfall of a given frequency having duration equal to the time of concentration. For a given time of concentration (Tc) in minutes, and design storm frequency and using parameters d, e, and f as defined in Table 505.03-3, the rainfall intensity can be obtained using the following equation:

$$Intensity\left(\frac{In}{hr}\right) = \frac{d}{(T_c + e)^f}$$

**Table 505.033 Rainfall Intensity Parameters**
**(Source: Drainage Design Manual, ODOT, February, 1988)**

| Design Storm | d | e | f |
|---|---|---|---|
| 2 Year | 53.43 | 11.5 | 0.81 |
| 5 Year | 72 | 15 | 0.80 |
| 10 Year | 82 | 15 | 0.80 |
| 25 Year | 95 | 15 | 0.80 |
| 50 Year | 108 | 15 | 0.80 |
| 100 Year | 120 | 15 | 0.80 |

b) NRCS (SCS) Unit Hydrograph Method

All drainage areas over sixty (60) acres and calculations for detention volume require a hydrograph method to determine peak runoff rates. The NRCS (SCS) Unit Hydrograph method is the preferred. Other hydrograph techniques can be utilized upon approval from the County Engineer.

The Natural Resources Conservation Service (NRCS), formerly the Soil Conservation Service (SCS) method is presented in detail in Part 630 of the *United States Department of Agriculture (USDA), National Resource Conservation Service (NRCS) National Engineering Handbook,* American Association of State Highway and Transportation Officials, 1991. The SCS computer program TR-2O or the U.S. Army Corps of Engineers computer program HEC-HMS are acceptable ways of utilizing the SCS methodology.

The NRCS/SCS publication Technical Release 55 (TR-55) *Urban Hydrology for Small Watersheds* should be used to establish the required precipitation runoff and time parameters. This includes the NRCS/SCS Runoff Curve Number and the Time of Concentration and Lag Time calculations.

Rainfall data to be used for projects in Town of Inola is listed in Table 505.03-4. This data was compiled from the *U.S. Weather Bureau Technical Paper N0. 40* and *HYDRO-35*.

**Table 505.034 Town of Inola Rainfall Data**

| DURATION | Frequency (Return Period) | | | | | | |
|---|---|---|---|---|---|---|---|
| | 1-Year | 2-Year | 5-Year | 10-Year | 50-Year | 100-Year | 500-Year (Reference Use only) |
| 5-Minute | 0.40 | 0.48 | 0.56 | 0.62 | 0.79 | 0.86 | 1.01 |
| 10-Minute | 0.71 | 0.84 | 0.99 | 1.11 | 1.41 | 1.54 | 1.83 |
| 15-Minute | 0.84 | 1.01 | 1.20 | 1.34 | 1.70 | 1.86 | 2.23 |
| 30-Minute | 1.14 | 1.40 | 1.73 | 1.96 | 2.55 | 2.81 | 3.39 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 1-Hour | 1.44 | 1.81 | 2.28 | 2.60 | 3.44 | 3.80 | 4.58 |
| 2-Hour | 1.70 | 2.13 | 2.80 | 3.30 | 4.44 | 5.00 | 6.12 |
| 3-Hour | 1.87 | 2.28 | 3.13 | 3.63 | 4.83 | 5.43 | 6.60 |
| 6-Hour | 2.19 | 2.71 | 3.64 | 4.30 | 5.71 | 6.4 | 7.80 |
| 12-Hour | 2.63 | 3.23 | 4.31 | 5.10 | 6.71 | 7.55 | 9.20 |
| 24-Hour | 3.00 | 3.75 | 5.15 | 5.88 | 7.78 | 8.75 | 10.68 |

# 206 Storm Water Detention Facilities

## 206.1 General

The runoff from any development shall not exceed the pre-development condition which shall be demonstrated by analyzing the runoff from the two (2) year, five (5) year, ten (10) year, fifty (50) year and the one hundred (100) year rainfall frequency events.

The pre-development condition is the runoff pattern, rate, and velocity prior to the construction of the development. The pre-development curve number is generally less than the post development curve number. Soil covers that produce a curve number that is higher in the pre-development condition must be approved by the County Engineer. The post-development condition with detention is the runoff pattern, rate, and velocity after construction of the development, which includes incorporating any stormwater detention facilities into the development.

## 206.2 Storm Water Detention Report

The report shall be submitted to the County to explain and support how each item in these Criteria are met. The report shall be formatted to sequentially answer each Criteria item. Any deviation from the Criteria shall be noted on the plans and explained in the report.

All calculations for detention facilities shall be submitted for review by the County. Submittals shall include hydrographs, outflow rate and velocity, and stage-discharge relationship through the facility. Detention facilities may not be located in the regulatory floodplain.

## 206.3 Hydrologic Analysis Criteria

a) Precipitation - The precipitation model utilized should be based on the cumulative depths listed in Table 505.03-4. Alternatively, the total cumulative precipitation may be incrementally arranged using the NRCS Type II Rainfall Distribution Patten with rainfall depths in accordance with Table 505.03-4.

b) Infiltration/Excess Runoff - The excess precipitation/runoff will be calculated using the NRCS Curve Number Technique as described in the NRCS TR-55 Publication.

c) Hydrograph Construction - The Hydrograph may be constructed using the NRCS Unit Hydrograph Method. Other methods may be utilized upon approval of the County Engineer.

d) Routing - Flows through detention ponds, both existing and proposed, should be routed using level pool or Modified Puls routing. Channel routing should

generally be accomplished with Lag Routing or Kinematic Wave Routing. If there is sufficient floodplain storage to warrant, a diffusive routing technique may be utilized upon approval of the County Engineer.

e) Simulation – The Hydrologic Model must be simulated for a twenty four (24) hour storm duration event. The maximum time step is five (5) minutes or thirty percent (30%) of the shortest lag time in the model, whichever is less.

### 206.4 Additional Detention for Downstream Development

a) Additional detention storage, in excess of the required storage for the development, can be provided to satisfy the detention requirements for a tract of land downstream of the detention facility.

b) This detention will be allowed provided the detention facility is constructed prior to the development of the downstream tract.

c) A map showing the specified tract of land included in the detention facility volume shall be submitted. This shall be clearly documented in the Strom Water Detention Report.

### 206.5 Access to Detention Facilities

An access way, a minimum of fifteen (15) feet wide, shall be provided to and into all detention facilities from a public right-of-way. Access may be provided by frontage on a right-of-way or by an access easement to the detention facility. The access road shall have a maximum grade of fifteen percent (15%).

### 206.6 Slope and Depth Requirements for Detention Facilities

a) Side slopes on detention facilities shall not be steeper than four to one (4:1), horizontal run to vertical rise.

b) The bottom slope of a dry detention facility shall have a minimum slope of one percent (1%) across grass surfaces and a minimum slope of five tenths percent (0.5%) across paved surfaces.

c) The standing water depth of the permanent pool of a wet detention facility shall be a minimum of four (4) feet deep.

### 206.7 Outlet Structure

All detention facilities, except for small parking lot detention facilities, shall have a defined spillway. The spillway shall be designed to pass the five hundred (500) year flood event with a minimum of one (1) foot of freeboard.

The plan shall show the spillway elevation, the one hundred (100) year and five (500) year water surface elevation, and the minimum top of embankment.

### 206.8 Parking Lot Detention Facilities

Hard surfaced (concrete or asphalt) parking lot detention facilities may be allowed if so approved by the County. Such parking lot detention facilities shall have a maximum storage depth of eighteen (18”) inches and shall be not larger or provide for more than one (1.0) acre feet of storage per facility. Spillway and one (1) foot of freeboard requirements for the five hundred (500) year flood event is not required for parking lot detention facilities.

### 206.9 Energy Dissipaters

Energy dissipation devices shall be installed at the outlet of the detention facility, and shall be detailed in the plans.

### 206.10 Erosion Protection and Sediment Control

All disturbed earth surfaces, including the detention facility, shall require the appropriate soil stabilization, erosion and sediment control methods in accordance with these subdivision regulations. These methods shall provide for the establishment or re-establishment of permanent vegetation on the detention facility.

### 206.11 Maintenance

Maintenance of the detention facility shall remain with the owner of the property as required by these subdivision regulations. The covenants shall explicitly state who shall be responsible to maintain detention facilities. Town of Inola will not maintain any detention facilities.

## 207 Open Channel Design Criteria

### 207.1 General

Channels shall be designed in accordance with sound engineering principles. The design water surface elevation shall be contained in the channel bank section. All open channels shall be provided with a minimum of one (1) foot of freeboard above normal depth from a one hundred (100) year frequency rainstorm.

### 207.2 Lined Channels

a) All engineered channels shall be lined. The lining may be grass, riprap or concreted.

b) Trapezoidal channels shall have a minimum bottom width of two (2) feet. For sodded or grass lined sections the side slopes shall not be steeper than 4 to 1. For concrete or rock lined sections a side slope of 2:1 is acceptable.

c) Rectangular channels require approval of the County Engineer. All rectangular channels will be concrete lined.

d) Low flow or “trickle” channels will be provided when required or at the request of the County Engineer.

e) Concrete channels shall have a minimum longitudinal slope of two tenths percent (0.2%), and grass lined channels shall have a minimum longitudinal slope of five tenths percent (0.5%). The minimum velocity to avoid sedimentation must be considered as part of channel slope design. Concrete channels must maintain a minimum velocity of two and five tenths (2.5) feet per second.

f) The velocity of the water in the channel shall not exceed six (6) feet per second. If the velocity of the water in the ditch exceeds six (6) feet per second, the channel shall be lined with concrete or other such materials to prevent erosion.

g) Proper erosion and sediment control methods shall be used for all disturbed areas in accordance with these subdivision regulations. These methods shall provide for the establishment of permanent vegetation.

### 207.3 Manning's Friction Factor Values

Manning's equation for the calculations of channel characteristics is acceptable. The fiction factor (N) utilized for channel design is summarized in Tables 507.03. The source for this table is *Open Channel Hydraulics*, by V.T Chow, published by McGraw-Hill Book Company in 1959. This reference provide picture to aid in the determination of the N value for natural channels.

For lined channels a high end value should be used for capacity determination. To estimate flow velocity, a low end Manning's Value should be utilized. Additionally, the future growth, vegetation and natural maturation process of the channel should be anticipated.

**Table 507.031 Manning's Fiction Factor for Natural Streams – Main Channels**

| Type of Channel and Description | Minimum | Normal | Maximum |
|---|---|---|---|
| **Natural Streams** | | | |
| **1. Main Channels** | | | |
| a. Clean, straight, full, no rifts or deep pools | 0.025 | 0.030 | 0.033 |
| b. Same as above, but more stones and weeds | 0.030 | 0.035 | 0.040 |
| c. Clean, winding, some pools and shoals | 0.033 | 0.040 | 0.045 |
| d. Same as above, but some weeds and stones | 0.035 | 0.045 | 0.050 |
| e. Same as above, lower stages, more ineffective slopes and sections | 0.040 | 0.048 | 0.055 |
| f. Same as "d" but more stones | 0.045 | 0.050 | 0.060 |
| g. Sluggish reaches, weedy. deep pools | 0.050 | 0.070 | 0.080 |
| h. Very weedy reaches, deep pools, or floodways with heavy stands of timber and brush | 0.070 | 0.100 | 0.150 |

**Table 507.032 Manning's Friction Factor for Natural Streams - Floodplains**

| | | | |
|---|---|---|---|
| **2. Flood Plains** | | | |
| a. Pasture no brush | | | |
| 1. Short grass | 0.025 | 0.030 | 0.035 |
| 2. High grass | 0.030 | 0.035 | 0.050 |
| b. Cultivated areas | | | |
| 1. No crop | 0.020 | 0.030 | 0.040 |
| 2. Mature row crops | 0.025 | 0.035 | 0.045 |
| 3. Mature field crops | 0.030 | 0.040 | 0.050 |
| c. Brush | | | |
| 1. Scattered brush, heavy weeds | 0.035 | 0.050 | 0.070 |
| 3. Light brush and trees | 0.040 | 0.060 | 0.080 |
| 5. Medium to dense brush | 0.070 | 0.100 | 0.160 |
| d. Trees | | | |
| 1. Cleared land with tree stumps, no sprouts | 0.030 | 0.040 | 0.050 |
| 2. Heavy stand of timber, few down trees, little undergrowth, flow below branches | 0.080 | 0.100 | 0.120 |

| | | | |
|---|---|---|---|
| 3. Same as above, but with flow into branches | 0.100 | 0.120 | 0.160 |
| 4. Dense willows, summer, straight | 0.110 | 0.150 | 0.200 |

**Table 507.033 Manning's Friction Factor for Lined Channels**

| Type of Channel and Description | Minimum | Normal | Maximum |
|---|---|---|---|
| **Lined or Built-Up Channels** | | | |
| **1. Concrete** | | | |
| a. Trowel finish | 0.011 | 0.013 | 0.015 |
| b. Float Finish | 0.013 | 0.015 | 0.016 |
| c. Finished, with gravel bottom | 0.015 | 0.017 | 0.020 |
| d. Unfinished | 0.014 | 0.017 | 0.020 |
| e. Gunite, good section | 0.016 | 0.019 | 0.023 |
| f. Gunite, wavy section | 0.018 | 0.022 | 0.025 |
| g. On good excavated rock | 0.017 | 0.020 | |
| h. On irregular excavated rock | 0.022 | 0.027 | |
| **2. Concrete bottom float finished with sides of:** | | | |
| a. Dressed stone in mortar | 0.015 | 0.017 | 0.020 |
| b. Random stone in mortar | 0.017 | 0.020 | 0.024 |
| c. Cement rubble masonry, plastered | 0.016 | 0.020 | 0.024 |
| d. Cement rubble masonry | 0.020 | 0.025 | 0.030 |
| e. Dry rubble on riprap | 0.020 | 0.030 | 0.035 |

### 207.4 Natural Channels

Natural channels shall be privately maintained and contained in a drainage easement or reserve area.

## 208 Erosion Protection and Sediment Control

### 208.1 General

In order to minimize erosion and sedimentation damage to properties, drainage facilities, or other improvements, the subdivider shall provide appropriate soil stabilization and sediment control measures.

These measures shall allow for permanent vegetation to become established and shall prevent sediment deposition on adjacent properties or within the stormwater drainage system.

The subdivider shall be responsible to install and maintain all soil stabilization, erosion control and sedimentation control measures and shall remove and dispose of any deposited sediment or repair erosion damage as required by the County.

Building permits for a portion or the entirety of a subdivision may be suspended for the enforcement and correction of erosion and sediment control measures.

The subdivider is responsible for all applicable stormwater discharge and wetlands permitting.

### 208.2 Storm Water Pollution Prevention Plan

The Storm Water Pollution Prevention Plan (SWPPP) and report shall be included in the submission of the construction plans. The Report shall include a copy of the Notice of Intent and General Permit OKR10 – "*Stormwater Discharges from Construction Activities Within the State of Oklahoma"* as issued by the Oklahoma Department of Environmental Quality. Additionally, the report should address all aspects of pollution control as outlined in the OKR10 document. The specific soil stabilization, erosion control and sediment control methods to be utilized are inter-dependent and shall be approved by the County Engineer on a project-specific basis.

### 208.3 Soil Stabilization Methods

Approved methods include sod placement, seeding, hydomulching, hydroseeding, geotextiles, erosion control blankets/mats or other methods as approved by the County Engineer.

### 208.4 Sediment Control Methods

Approved methods include silt fence, sediment basin/trap, check dam, fiber rolls, gravel/sand bags, stabilized construction entrances, truck wash-down areas or other methods as approved by the County Engineer.

### 208.5 Clean Water Act 404 Permits

Applicants are responsible to contact the U.S. Army Corps of Engineers regarding Section 404 of the Clean Waters Act.

## 209 Water Supply and Fire Protection

### 209.1 General

Water Supply systems shall be approved by ODEQ and the water provider. Where applicable, water systems should meet the requirements of ODEQ standards for "systems that provide fire protection". Proposed residential and commercial plats should address fire protection for the proposed development.

## 210 Sewage and Wastewater Disposal

### 210.1 General

Sewage and wastewater disposal systems shall be approved by ODEQ and the utility provider if applicable.

Public, Private, and/or individual on-site disposal systems must be approved by ODEQ.

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# Section 300 Requirements for Improvements

## 301 Installation, Inspection and Testing of Improvements

### 301.1 General

Following the approval of the final construction plans, and prior to the final plat approval, the subdivider shall complete all required improvements in a manner satisfactory to the County, and said improvements shall be free and clear of all liens, claims and encumbrances.

### 301.2 Construction of Improvements

All construction shall be in accordance with the details provided in the construction plans, with the Town of Inola Standards and Specifications and with the Oklahoma Department of Transportation Standard Details and Specifications.

Should any deviations be encountered in the existing materials, conditions or other basis of the approved design, modifications of the approved design may be required.

### 301.3 Inspection of Improvements

All roadway, drainage and other County improvements are subject to inspection during construction at any time. The contractor shall be responsible to provide adequate notification to the Inspector to allow for inspection of the improvements. Failure to provide adequate notice for inspection or failure to meet the Standards in these Subdivision Regulations may result in rejection of the improvements by the County.

Installation of all utility crossings across County roadways shall be coordinated with and inspected by a County Inspector prior to acceptance of the roadway.

### 301.4 Material Testing Requirements

The roadway contractor is responsible for testing costs and shall provide the County with compaction test results and PlastiTown Index (P.I.) testing and locations to be determined by the County Road Foreman and/or County Engineer. The contractor shall utilize an approved testing lab and coordinate all testing.

a) All roadways shall be compacted to a minimum of ninety five percent (95%) standard proctor density.

b) Sub-grade shall be constructed of material with a P.I. of greater than six (6) and less than thirteen (13). Sub-grade with a P.I. greater than thirteen (13) shall be modified with lime or in accordance with the project's geotechnical report, refer to section 502.11 Paving Materials and Street Design. Sub-grade shall be inspected, have acceptable P.I. results, and accepted density reports submitted and approved by the County prior to placement of any base or sub-base materials.

c) Base and sub-base materials shall have acceptable P.I and compaction testing results prior to the placement of further paving materials.

d) Other material testing may be required as determined by the County.

e) Testing frequency shall meet the following at a minimum, or as directed by the County Engineer, County Inspector, and/or the County Road Foreman:

i. Compaction – One (1) every two hundred (200) linear feet of street for sub-grade and aggregate base. Fill and trench backfill shall have compaction testing per specifications or as required by inspector to ensure compaction greater than (>) ninety five percent (95%) standard proctor density.

ii. PlastiTown Index (P.I). – Test shall be conducted at locations not separated by a distance greater than five hundred (500) feet, or as required by inspector for sub-grade to ensure P.I. is greater than six (6) and less than thirteen (13).

iii. Asphalt – Minimum of three (3) cut cored specimens of placed materials to determine final thickness and density testing. Target density is ninety four percent (94%) of Maximum Theoretical Specific Gravity and the acceptable density range is eighty eight point one to ninety seven percent (88.1% - 97%.). Temperature of asphalt may be required to be monitored to insure conformance with specification requirements.

## 302 Maintenance Guarantee

Prior to acceptance of the subdivision improvements by the Board of Commissioners, the subdivider shall obtain a maintenance surety for the improvements. The guarantee shall cover roadway improvements (including but not limited to sub-grade, sub-base, base, surface material, barrow ditches, roadway culverts and end treatments), detention and drainage facilities

The surety shall be in the form the following:

a) A maintenance bond from a surety bonding company authorized to do business in the State of Oklahoma.

b) Upon approval by the District Attorney and Board of County Commissioners, an irrevocable letter of credit from a financial institution regulated by the State Banking Department or United States Treasury Department.

The maintenance guarantee shall be effective on the date of acceptance of the improvements by the County in the amount of fifty percent (50%) of the actual cost of the roadway improvements (including but not limited to sub-grade, sub-base, base, surface material, barrow ditches, culverts and end treatments), detention and drainage facilities. The duration of the bond shall be for a period not less than two (2) years.

## 303 Completion and Acceptance of Public Improvements

At such time as the subdivider has completed the installation and construction of all required public utilities and improvements, the subdivider may apply for acceptance of all such improvements by the County or appropriate utility provider.

The individual or legal entity responsible for causing a public improvement to be constructed shall make written request through the Planning Commission of all such public improvements to be accepted by the County. Upon receipt of such notice, the Planning Commission, County Engineer, and the County Commissioners or their designee shall make a final inspection to determine whether or not the work is completed in compliance with the approved plans and specifications.

Upon receipt of the written recommendations and findings of the Planning Commission and County Engineer, the Board of Commissioners may accept such improvements upon the finding that said improvements meet the requirements of these Regulations and all other conditions of approval have been satisfied (submission of maintenance bonds, etc.).

## 304 Maintenance of Improvements

Public improvements to be maintained by the County must be accepted as required by these subdivision regulations.

When the subdivision contains sewers, sewage treatment plants, water supply systems, park areas or other physical facilities necessary or desirable for the welfare of the area or that are of common use or benefit which are not or cannot be satisfactorily maintained by any existing public agency, provision shall be made by trust agreement made a part of the deed restrictions, acceptable to any agency having jurisdiction over the location and improvements of such facilities, for the proper and continuous maintenance and supervision of such facilities.

All unoccupied lots, reserve areas and detention facilities shall be maintained (mowing and necessary maintenance) by the Subdivider of the respective subdivision. A Home owners Association shall be formed to assume the maintenance responsibilities of the public detention facilities, reserve and common areas at a later date. Grass height within said facilities shall not exceed twelve (12) inches. Noncompliance shall be considered a violation of the Town of Inola Ordinances and shall be enforced by Code Enforcement.

## 305 Time Limit

All improvements shall be completed and the final plat approved within a period of time not to exceed two (2) year from the date of approval of the preliminary plat by the Board of County Commissioners. The Board of County Commissioners shall have the power to extend that deadline one when necessary, and where the subdivider can present valid reason for such extension.

## 306 Vacated Plats

Vacation of the plat as provided by Oklahoma State Statutes shall remove the obligation to construct such improvements.

## Section 400 Private Streets & Gated Developments

### 401 General

a) Private streets and roads, if permitted by the County, shall be allowed only in a Planned Unit Development (PUD) and shall be designed, reviewed, constructed, and inspected in accordance with the Town of Inola Subdivision Regulations, Development Guidelines, Design Criteria and Construction Standards

b) All roadways, paving, curb & gutter, borrow ditches, sidewalks, signage, lighting, storm drain, detention facilities, culverts, and appurtenances that are privately maintained and/or behind a gated entrance shall be considered and deemed as a privately owned and shall not be maintained by the County. All said infrastructure improvements must be designed, reviewed, approved, installed, constructed, inspected and "As-Builts" provided in accordance with these Subdivision Regulations.

c) All developments that are to be private, privately maintained and/or gated shall be in accordance with these Subdivision Regulation including, but not limited to, the following:

   i. Zoning, Preliminary Plat, and Final Plat process.

   ii. Roadway, Drainage, and Detention design.

   iii. Construction plan review process.

   iv. Roadway, drainage, and detention installation and construction.

   v. County inspection and approval of all improvements.

   vi. Testing of all improvements.

   vii. All other regulations governing developments.

d) Platting requirements shall be in accordance with these Subdivision Regulation including but not limited to the following:

   i. Standard right-of-way widths.

   ii. Utility and drainage easements.

   iii. Lot and block configuration, cul-de-sac criteria, setbacks, and building.

   iv. All other regulations governing the platting of a development.

e) Roadway Right-of-ways shall be created as a Reserve Area and platted accordingly granting access to, but not limited to, the following:

   i. Town of Inola and their agents.

   ii. Lot owners and their agents

   iii. Developer and their agents.

   iv. Utility providers and their agents.

v. Emergency personnel; fire and ambulance providers and their agents.

vi. Mail and delivery services and their agents.

vii. School and public transportation services and their agents.

viii. Sanitation Services and their agents.

ix. Any Local, Municipal, County, State, and Federal regulatory agencies and their agents.

x. Any other entities or personnel deemed necessary by the Developer and/or Town of Inola.

f) Utility Easements and Drainage Easements shall be created and platted as "Public Easements".

g) All private roads shall comply with the currently adopted requirements for roadway construction and no reduction in the Town of Inola standards shall be permitted.

h) All private roads shall be self-contained within the subdivision it serves and shall not serve as a through street.

i) Private street or road subdivisions shall not be permitted if adjacent subdivision or undeveloped land have or require access to and from these streets. Private streets or roads shall not be permitted if access to an existing or future collector street is impeded or rendered impossible.

j) The following notice shall be placed, clearly conspicuous, on the face of the Final Plat:

"The streets and driveways within this subdivision have not been dedicated to the public, and said streets shall be maintained by private property owners within the subdivision, but said streets shall always be open to police, fire, utility providers, and other vehicles of all local, municipal, county, state, and federal agencies."

k) Every deed shall also clearly acknowledge and include the following statement on the face of the Final Plat:

"Roadways within this development are private and shall not be maintained by Town of Inola."

l) All proposed streets shown on the face of the Final Plat shall be labeled as "Privately Maintained" underneath or near the proposed street name.

m) Prior to the sale of any parcel within said subdivision, a conspicuous sign shall be posted and maintained at all entrances to the said subdivision stating the following:

"Private roadway not maintained by Town of Inola."

n) All applicable building setback lines shall be calculated from the property line abutting said reserve area containing the private street or road and shall be contiguous thereto.

o) Dedication or creation of said reserve area shall not be dedicated to the public but may be reserved for future dedications. Until such future dedication, all private streets and drainage infrastructure shall be maintained by an owners association composed of all property owners within the subdivision.

p) The Developer of a private or gated subdivision shall establish a property owners association at the onset of the development for the purpose of maintaining all private infrastructures. The Deed of Dedication of the Final Plat shall clearly state the responsibilities of the property owners association, the yearly mandatory association fees, and provisions for the association to enforce and collect such fees e.g. liens, assessments, etc. Yearly mandatory association fees shall be adequate to provide proper maintenance for all infrastructures, said fees and maintenance records shall be available to the County upon request.

q) Property owners association maintenance responsibilities shall include, but not limited, to the following:

   i. Roadway; paving, curb & gutter, striping, signage, and lighting.

   ii. Drainage; borrow ditches, storm drains, culverts, headwalls, overland swales, and detention facilities.

   iii. Ice and snow removal.

   iv. Storm debris removal.

   v. Mowing and general upkeep of all reserve areas and drainage ways.

   vi. Any other maintenance items deemed necessary by the developer and/or the County.

r) Property owner's association shall establish provisions for accruing and maintaining sufficient funds for major infrastructure improvements, e.g. overlays, stripping, catastrophic emergency repairs, etc.

## 402 Gated Entrance Requirements

a) All private street entrances shall be on an arterial or collector streets only.

b) All private street exits onto arterial streets shall have two lanes for outbound traffic and one lane for inbound traffic.

c) All pedestrian access shall be provided near the main entrance and be part of the site plan.

d) If private street entrances have a structure (or cover) over the driving lane, the vertical clearance shall be a minimum of fourteen (14) feet.

e) Private streets intersecting with any public street shall have a turnaround before the gate entrance that provides a minimum of forty (40) feet from the entrance edge of pavement (or face of curb) at the control panel island to the edge of pavement (or face of curb) on the outside of the exit lane. The turnaround shall provide space between the control panel island and gate or gate island for at

least a ‘P’ design vehicle (full size passenger vehicle) to make the turnaround in one fluid motion.

f) Access to all emergency, service delivery, and utility providers vehicles shall be guaranteed at all entrances at all times by the property owners association. All current security codes, passwords/numbers, and devices necessary to allow instant access shall be provided to these vehicles including, but not limited to, the following agencies: police, fire, ambulance, Town of Inola, utility providers (electric, gas, water, sewer, cable TV, telephone, etc.), refuse pickup, mail delivery, and other vehicles of all local, municipal, county, state, and federal agencies.

g) Guidelines for operational gates on private streets:

vii. Gates or any control device shall be allowed only on private streets and private streets shall only be permitted in a PUD subdivision.

viii. Maintenance of the gate shall be the responsibility of the property owners association and shall be established in the Deed of Dedication on the Final Plat.

ix. Maintenance contracts, to service and repair the gates, by a private contractor or a property owners association, shall require periodic inspections by private companies. These contracts and maintenance records shall be available to the County upon request.

x. The PUD and the Deed of Dedication shall specify that the property owners association shall provide an access code number of all gates to Verdigris and all utility providers. Names of maintenance companies, groups or individuals involve in contracts shall be provided to the County on an annual basis.

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# Section 500 Definitions and References

## 501 Definitions

For the purposes of these regulations, the words below shall be used hereafter defined.

Abutting: For the purposes of providing notice, abutting shall mean contiguous or separated there from only by a non-arterial street.

Access Easement: A privately owned strip of land, dedicated as an easement, to provide vehicular access to the public right-of-way. Access easements shall not be named.

Alley: A minor right-of-way dedicated for public use which gives a secondary or inferior means of vehicular access to the back or side properties otherwise abutting a street, and which may be used for public utility purposes but is not intended for general traffic circulation.

All-weather Material: A hard surface, dust-free material capable during ordinary use of withstanding normal weather conditions without substantial deterioration. Gravel, or screenings alone, without the use of a petroleum or cement binder, does not meet the definition of an all-weather dust-free material.

As-built Plans: See "Record Drawings".

Base Course: The layer or layers of specified or selected materials of design thickness placed on a sub-base or a sub-grade to support a surface course.

Block: A tract of land bounded by streets, or by a combination of streets and public parks, cemeteries, a railroad right-of-way, shoreline of a waterway, or boundary line of a subdivision, county or municipality.

Board or Board of Commissioners: The Board of County Commissioners of Town of Inola, Oklahoma.

Borrow Ditch: A constructed open excavation or ditch constructed for the purpose of carrying off surface water.

Bridge: A structure, including supports, erected over a depression or obstruction such as water, highway, or railway, having a track or passageway carrying traffic, and having an opening measured along the center of the roadway of more than twenty feet between abutments or springline of arches or extreme ends of openings for multiple boxes.

Channel: A natural or artificial water course.

Collector Street: A street intended to move traffic from local streets to arterial streets.

Comprehensive Plan: A master plan for the physical development of the County prepared and adopted by the Planning Commission and approved by the Board of commissioners pursuant to applicable state statutes and subsequent amendments thereto, and includes any part of such plan.

Construction: Any act of placing, configuring or installing materials or the demolition of existing structures or features for the purpose of creating new structures, features, utilities, or other infrastructure.

County Engineer: A state licensed engineer hired or appointed by the Board of County Commissioners.

Culvert: Any structure not classified as a bridge that provides an opening under the roadway.

Deed of Dedication: Each final plat submitted to the County for approval shall carry a deed of dedication consisting of all of the following, but not limited to; a designation of the subdivision name as an addition to Town of Inola, a legal description of the tract to be subdivided, dedication of right-of-way and easements, provisions and protections as desired by suppliers shall be defined for electric, telephone, natural gas and cable television services, supplier of water and sanitary sewer services shall be stated as necessary and provisions and protections as desired by said suppliers shall be defined, all drainage ways and reserve areas shall be defined and dedicated to appropriate ownership, driveway culvert types shall be defined and finish floors and culvert sizes shall be described as depicted on the plat. The Deed of Dedication cannot be changed by the Developer, Subdivider or Home Owners Association without re-platting the subject property.

Easement: Authorization to use and access a defined area of a property for a specific purpose; with the property owner generally utilizing and maintaining said area subject to the easement area remaining unencumbered for the specified easement use.

Engineering Design Criteria: The criteria for engineering design and construction of infrastructure and other improvements related to the development of subdivisions adopted and included in these Subdivision Regulations and the Standard Drawings; and any additions thereto.

Flood or Flooding: A general and temporary condition of partial or complete inundation of normally dry land areas from: the overflow of inland or tidal waters; or the unusual and rapid accumulation or runoff of surface waters from any source.

Floodplain or Flood-Prone Area: Any land area susceptible to being inundated by water from any source. See “Flood or Flooding”.

Frontage: The linear measurement of a lot boundary which abuts a public street.

Governing Body: The Board of commissioners of Town of Inola, Oklahoma.

Grade: The slope of a road, street or other public way, specified in percent (%) of vertical to horizontal measurements.

Half-Mile-Line: The north-south or east-west line, which bisects a one square mile section of land.

Health Department: The County-County Health Department of Inola-Town of Inola, Oklahoma, or the Oklahoma Department of Environmental Quality (ODEQ).

Jurisdiction: See “Territorial Jurisdiction.”

Lot, Double Frontage: A lot which runs through a block from street to street and has frontage on two (2) or more streets, as distinguished from a corner lot.

Lot, Flag: A square parcel of land (flag) that is accessible only by a very long narrow strip leading from a main right of way (pole).

Lot, Key: A lot having a side lot line abutting the rear lot line of another lot.

Lot, Lot of Record: A lot which is part of a subdivision, the plat of which has been recorded in the office of the County Clerk of the County in which the lot is located or a parcel of land, the deed of which is recorded in the office of the County Clerk of the County in which the parcel is located.

Lot, Reverse Frontage: A corner lot of such size and shape that a building erected on it might logically be designed to face on either adjoining street, thus causing it to rear on the side lot line of an abutting lot.

Lot-Split: Any subdivision containing not more than three (3) lots and fronting on an existing street, not involving any new street or road and not adversely affecting the remainder of the parcel or adjoining property, and not in conflict with any provision or portion of the Comprehensive Plan, Major Street Plan, Zoning Ordinance, or these Subdivision Regulations.

Major Street: See "Street, Major".

Major Street Plan: The part of the Comprehensive Plan which relates to major streets and highways.

Minor Street: See "Street, Minor".

Minor Subdivision Plat: Subdivision Plat requiring no new streets and minimal infrastructure extension that is processed through an abbreviated process.

Open Space: Space on the ground, which is not built upon or otherwise improved to an impervious state (such as for buildings, drives or walkways) and which is maintained for active or passive recreational or buffer type uses.

Planning Commission or Commission: The Town of Inola Planning Commission.

Planned Unit Development (PUD): A discretionary type of development for a tract of land under single ownership or control, based upon an approved development plan and Sketch Plat permitting flexibility of principal land uses, lot sizes and accessory uses not otherwise available under conventional zoning and the related development standards.

Planned Unit Development Minor Amendment: Any modification deemed to be minor and that does not involve an increase in the height, area, bulk, or intensity of land uses; the designation of additional permitted uses or the elimination of permitted uses; the reduction in perimeter yards for the Planned Unit Development; the addition of driveways or access points to the Planned Unit Development; the reduction in the amount of required parking for any use located within the Planned Unit Development; or the kind of building materials and styles of architecture within the Planned Unit Development District. Minor amendments must go before the Planning Commission for approval.

Plat, Final: A map or chart of land subdivision prepared in accordance with these Subdivision Regulations in a form suitable for filing in the office of the County Clerk, including necessary affidavits, dedications, and acceptances, and containing a complete engineering description including references to field markers sufficient to locate on the ground all streets, alleys, blocks, lots, and other elements of the subdivision.

Plat, Preliminary: A map or chart of a proposed land subdivision prepared in accordance with these Subdivision Regulations showing the concept, character, and general details of the proposed development.

Plat, Sketch: A map or chart of a proposed land division prepared after a pre-application conference in accordance with these Subdivision Regulations showing the general layout of streets and reservations of land, street improvements, drainage, water and sewerage, floodplains, the availability of existing utilities and other related information.

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

Quarter-Mile Line: A north-south or east-west line that bisects the north, south, east or west half of the section.

Record Drawings: The drawings as issued for construction on which the subdivider's engineer, upon completion of the work, has shown changes due to addenda or change orders and other information which said engineer considers significant based on record documents furnished by the contractor and/or inspector to said engineer and which were annotated by the contractor to show changes made during construction.

Restrictive Covenants: An agreement of public record that restricts the use or occupancy of real property and sets forth a formal binding agreement that runs with such land and binds future land owners, his or her successors, or assigns to such agreements.

Right-of-way: A tract of land purchased, sold, granted, and/or conveyed to the public by means of "fee simple" in that public holds title to said tract of land. A public strip of land occupied or intended to be occupied by a street, crosswalk, railroad, road, electrical and communication services, oil or gas pipeline, water main, sanitary or storm sewer main, or for other special use. The usage of the term "right-of-way" for purposes of other than the platting of land shall mean that every right-of-way thereafter established and shown on the final plat is to be separate and distinct from the lots or parcels adjoining such right-of-way and not included within the dimensions or areas of such lots or parcels. Right-of-way intended for streets, crosswalks, water mains, sanitary sewers, storm drains, or otherwise involving construction or maintenance by a public agency shall be dedicated to the public use by the maker of the plat on which such right-of-way is established. All such dedications are subject to the final approval by the County.

Roadway: see Street.

Registered Engineer: A professional engineer registered and licensed to practice in the State of Oklahoma.

Registered Land Surveyor: A land surveyor registered and licensed to practice in the State of Oklahoma.

Required Improvement: An improvement required by the Planning Commission in accordance with these Subdivision Regulations as a condition for approval of the plat.

Reserve Area: An area or part of a plat identified on the face of the plat and set aside for park land, stormwater detention or similar purposes which are specified on the face of the plat..

Reserve Strip: A strip of land typically created to by the owner to be privately retained to prevent, restrict or otherwise control access to public utilities or streets. Such strips are not permitted under these Subdivision Regulations.

Secretary: The Secretary of the Planning Commission being the designee of the Planning Commission or the Director.

Section Line Road: A thoroughfare existing or constructed along a statutory section line.

Setback: The distance, existing or planned, between a building and the nearest property line or a street right-of-way.

Shoulder: The portion of the roadway contiguous with the traveled way for accommodation of stopped vehicles, for emergency use, for the lateral support of base and surface courses.

Standard Specifications for Construction: The specifications acting in conjunction with the Design Criteria adopted by the County for regulating the nature, extent, dimensions, construction, and financing of improvements in subdivisions. Where the County has elected to exercise extraterritorial subdivision jurisdiction, such specifications shall include a map showing the extent of such jurisdiction. These Specifications may also be referred to as the Construction Standards.

Street: A public right-of-way that affords the primary means of access to abutting property or serves as a thoroughfare for vehicular traffic or both, but excludes alleys. The following types of streets are recognized by the Comprehensive Plan and these Subdivision Regulations:

> Street, Arterial: A thoroughfare designated on the Major Street Plan that carries a significant portion of interurban vehicle traffic at moderate speeds with some traffic stops. See also “Street, Primary/Major Arterial”, “Street Secondary/Minor Arterial”, “Street/Minor Arterial Alternate,” or “Street, Collector” in this section.
>
> Street, Border: A street located adjacent to a railroad, drainage way, park, open space area or limited access highway.

Street, Collector: A thoroughfare designated on the Major Street Plan that is intended to move traffic from minor streets to arterial streets, including the principal entrance and circulation street or streets of a development.

Street, Commercial Collector/Industrial Collector: A category of trafficway that provides circulation to and from commercial and industrial areas to connect to major streets or highways.

Street, Commercial Business District: A category of trafficway that provides circulation within the Central Business District.

Street, Commercial/Industrial: A category of trafficway that provides circulation within commercial and industrial areas.

Street, Cul-de-sac: A minor street with only one outlet and having a terminus for the safe and convenient reversal of traffic movement including all emergency and service vehicles.

Street, Frontage or Service: A minor street auxiliary to and located on the side of a major street for service to abutting properties and adjacent areas and for control of access.

Street, Major: Highways, Arterials (primary/principal and secondary/minor), and Collector streets shown on the Major Street Plan.

Street, Minor (Local): Any trafficway of limited length not classified on the Major Street Plan that provides direct access to abutting tracts of land and access to more heavily traveled streets, and that is designed in such a manner to discourage its use by through traffic.

Street, Primary/Principal Arterial: A thoroughfare designated on the Major Street Plan that carries a significant portion of interurban vehicular traffic at a moderate rate of speed.

Street, Secondary/Minor Arterial: A thoroughfare designated on the Major Street Plan that carries a significant portion of interurban vehicular traffic having some traffic stops.

Street, Through: A street with access in two directions to a primary or secondary arterial street; or such access existing in one direction and a planned access in a second direction as approved by the Planning Commission and Board of Commissioners.

Subbase: The layer or layers of specified or selected material of designed thicknesses placed on a subgrade to support a base course.

Subdivider (or Developer): Any person, firm, partnership, corporation, or other entity, acting as a unit, subdividing or proposing to subdivide land as herein defined.

Subdividing: The dividing of land into two (2) or more lots, parcels, tracts, or areas, any one (1) of which when divided has an area of less than ten (10) acres, or any dividing of land involving the vacating or dedicating of right-of-way or the alignment of an existing or proposed street or highway or public utility easement,

or the re-subdividing of land heretofore divided into lots, sites, or parcels, whether such dividing or re-subdividing is by means of a map or plat or metes-and-bounds descriptions.

Subdivision: A tract of land that has been subdivided or is proposed to be subdivided.

Subdivision Regulations: The Subdivision Regulations of Town of Inola.

Subgrade: The top surface of a road bed upon which the pavement structure and shoulders are constructed.

Territorial Jurisdiction: The area within which the Planning Commission has jurisdiction over the subdividing of land, as provided by 19 O.S., Section 866, as amended. Said area consists of those parts of Town of Inola for which the Planning Commission has adopted a Comprehensive Plan (including a Major Street Plan), and/or zoning districts and classifications.

Warranty Period: The title ownership and responsibility for maintenance of Reserve Areas shall remain with the Subdivider until or unless conveyed to a home owners association or accepted by the governing body. The Subdivider or owner shall grant to the governing body perpetual easements for drainage, utilities and other public purposes as specified in the covenants or deeds of dedication. If a Reserve Area falls within a right-of-way (e.g. Entrance Island), the Reserve Area must be contained in a roadway easement. The governing body shall have no liability for any damage to any private improvements occasioned by the maintenance or reconstruction of utilities or infrastructure located in the Reserve Area.

Way: Any street, avenue, parkway, highway, boulevard, road, or alley reserved and/or dedicated for public or private use chiefly by vehicular or pedestrian traffic.

## 502 References


Town of Inola, "Engineering Design Criteria Manual"

Federal Highway Administration, "Manual on Uniform Traffic Control Devices (MUTCD) 2003 Edition with Revisions Number 1 and 2 Incorporated." FHWA, December 2007.

Natural Resourced Conservation Service (NRCS), "Urban Hydrology for Small Watersheds, TR-55." United States Department of Agriculture Technical Release 55, June 1986.

United States Department of Agricultural, Natural Resource Conservation Service, "National Engineering Handbook",

Oklahoma Department of Transportation, "State of Oklahoma County Roads Design Guidelines Manual." ODOT, June 1991.

Oklahoma Department of Transportation and the Association of County Commissioners of Oklahoma "State of Oklahoma County Highway System Design Guidelines Manual 2013"

Oklahoma Department of Transportation, “1999 Standard Specifications for Highway Construction” ODOT, June 1999.

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# Section 600 Appendices

## 601 Subdivision Approval Procedure FlowchartStandard Drawings

### 101.1 General Notes

# GENERAL ROADWAY & DRAINAGE NOTES TO INCLUDE IN ALL PLANS

ROADWAY & DRAINAGE GENERAL SPECIFICATIONS:

1. RIGHT OF WAY: SIXTY (60) MINIMUM WIDTH.

2. ROADWAYS SHALL BE DESIGNED TO PROVIDE A MINIMUM DITCH OF TWO FEET IN DEPTH AND TO BE MEASURED FROM THE TOP OF THE STREET SUB-GRADE TO THE BOTTOM OF THE DITCH.

3. BORROW DITCHES DESIGN AS FOLLOWS:
   A. 4:1 FORE-SLOPE AND 4:1 BACK-SLOPE.
   B. 3:1 MAXIMUM FORE-SLOPE AND 3:1 MAXIMUM BACK-SLOPE FOR FILLS OVER 3 FEET.
   C. BACKFILLED WITH 4" MIN. TOPSOIL AND SEEDED.

4. EARTH WORK: ALL EARTH WORK SHALL BE PERFORMED IN ACCORDANCE WITH STANDARD ODOT SPECIFICATIONS FOR HIGHWAY CONSTRUCTION.

5. COMPACTION: UPPER TWELVE (12) INCHES OF DIRT BASE OF THE ROAD SURFACE MUST MEET 95% STANDARD PROCTOR DENSITY TEST PERFORMED AND CERTIFIED.

6. SUB-BASE: ROAD SURFACE SHALL BE CROWNED IN THE CENTER WITH DRAINAGE TO BOTH SIDES AND ROAD SUB-BASE SHALL ODOT TYPE 'A' AGGREGATE BASE, AS PER DETAIL, OR APPROVED EQUAL AND COMPACTED TO 95% STANDARD PROCTOR DENSITY. AGGREGATE BASE SHALL BE PLACED AND COMPACTED IN 4" MAXIMUM LIFTS.

7. ROAD SURFACE: DRIVING SURFACE WILL BE A MINIMUM OF TWENTY FOUR (24) FEET WIDE ASPHALT AS PER DETAIL.

8. SHOULDERS: TWO (2) FEET ON EITHER SIDE OF ROAD SURFACE.

9. CUL-DE-SAC: WHEREVER A TURN AROUND IS REQUIRED BY THE PLANNING COMMISSION A CIRCULAR TURN AROUND HAVING A MAXIMUM INSIDE RADIUS OF FORTY FIVE (45) FEET AND A MINIMUM OUTSIDE RADIUS OF SIXTY (60) FEET SHALL BE PROVIDED.

10. ALL CONSTRUCTION, MATERIALS AND TESTING SHALL BE IN ACCORDANCE WITH THE ROGERS COUNTY SUBDIVISION REGULATIONS AND ODOT SPECIFICATIONS.

11. ALL ROADWAY CULVERTS AND STORM DRAINS SHALL BE ONE OF THE FOLLOWING: SMOOTH STEEL PIPE, RCP, RCB, CGMP, AND HDPE. HDPE CULVERTS MAY BE USED IF THERE IS AT LEAST 24-INCHES OF COVER. ALL CULVERTS SHALL HAVE ODOT STANDARD SLOPED CONCRETE END SECTIONS OR ODOT STANDARD HEADWALLS. ALL ROADWAY CULVERTS SHALL BE A MINIMUM OF FIFTEEN INCH (15") IN DIAMETER AND SHALL BE A MINIMUM OF FORTY FEET (40') LONG.

12. DRIVEWAY CULVERTS SHALL CONSIST OF SMOOTH STEEL PIPES, REINFORCED CONCRETE PIPE (RCP), OR CORRUGATED METAL PIPE (CGMP). DRIVEWAY CULVERTS MAY BE HDPE OR PVC ONLY IF THE DRIVEWAY IS CONCRETE AND AT LEAST SIX INCHES (6") THICK. ALL DRIVEWAY CULVERTS SHALL HAVE ODOT STANDARD SLOPED CONCRETE END SECTIONS ANY OTHER TYPE MUST BE APPROVED BY THE COUNTY.ALL CULVERT SPECIFICATIONS SHALL BE IN ACCORDANCE THE ROGERS COUNTY STANDARDS.

13. HEADWALLS: ALL DRAIN PIPE OR TILE WILL BE FURNISHED WITH A POURED IN PLACE CONCRETE HEADWALL ON BOTH ENDS OR AS APPROVED BY ROGERS COUNTY.

14. A STORM WATER POLLUTION PREVENTION PLAN (SWPPP) SHALL BE PROVIDED TO THE COUNTY ALONG WITH CONSTRUCTION PLANS IN ACCORDANCE THE CURRENT ODEQ RULES AND REGULATIONS REGARDING STORM WATER DISCHARGE.

CONSTRUCTION TESTING:

1. THE ROADWAY CONTRACTOR SHALL PROVIDE THE COUNTY WITH COMPACTION TEST AND PLASTICITY INDEX (P.I.) TESTING AND LOCATIONS TO BE DETERMINED BY THE COUNTY ROADWAY FOREMAN AND OR THE COUNTY ENGINEER.
   A. ALL ROADWAYS SHALL BE COMPACTED A MINIMUM OF 95% STD. PROCTOR DENSITY.
   B. SUB-GRADE SHALL BE CONSTRUCTED OF MATERIAL WITH A P.I. OF LESS THAN THIRTEEN (13) AND GREATER THAN SIX (6) OR SHALL BE MODIFIED WITH LIME OR FLY ASH. SUB-GRADE SHALL BE INSPECTED, HAVE ACCEPTABLE P.I. RESULTS, AND ACCEPTED DENSITY REPORTS, SUBMITTED AND APPROVED BY THE COUNTY PRIOR TO ANY PLACEMENT OF SUB-BASE MATERIAL.

2. INSTALLATION OF ALL UTILITY CROSSINGS ACROSS COUNTY ROADWAYS SHALL BE COORDINATED WITH AND INSPECTED BY A COUNTY INSPECTOR PRIOR TO ACCEPTANCE OF THE ROADWAY.

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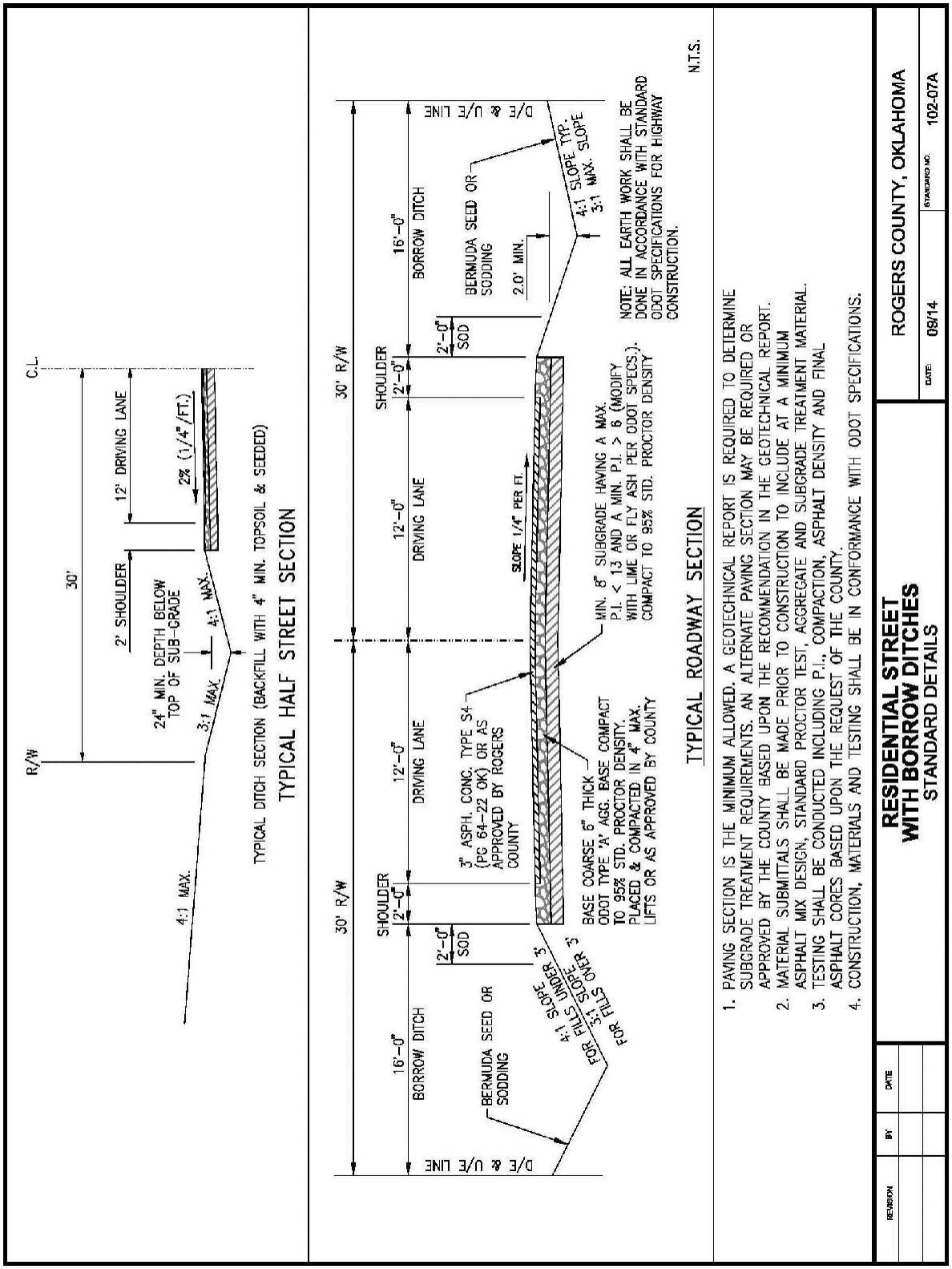
**ROADWAY & DRAINAGE GENERAL NOTES**
STANDARD DETAILS

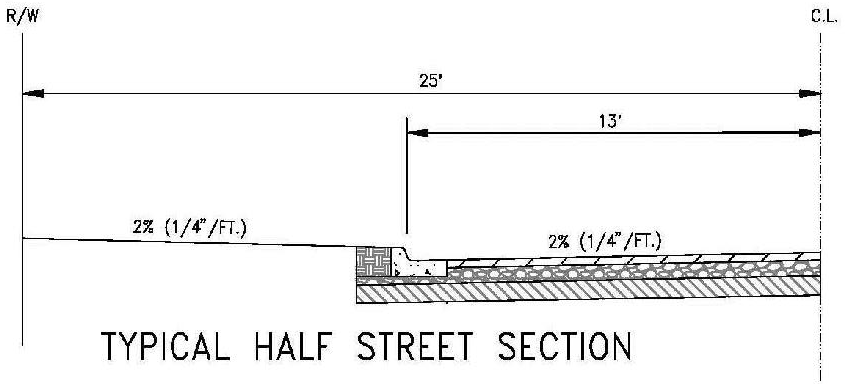
ROGERS COUNTY, OKLAHOMA

DATE: 09/14

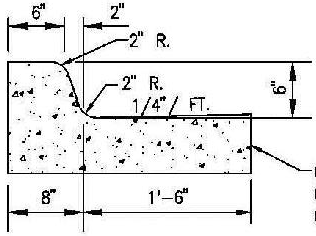
STANDARD NO. 101-07

## 101.2 Residential Streets (A-w/Borrow Ditch, B-w/Curb and Gutter)



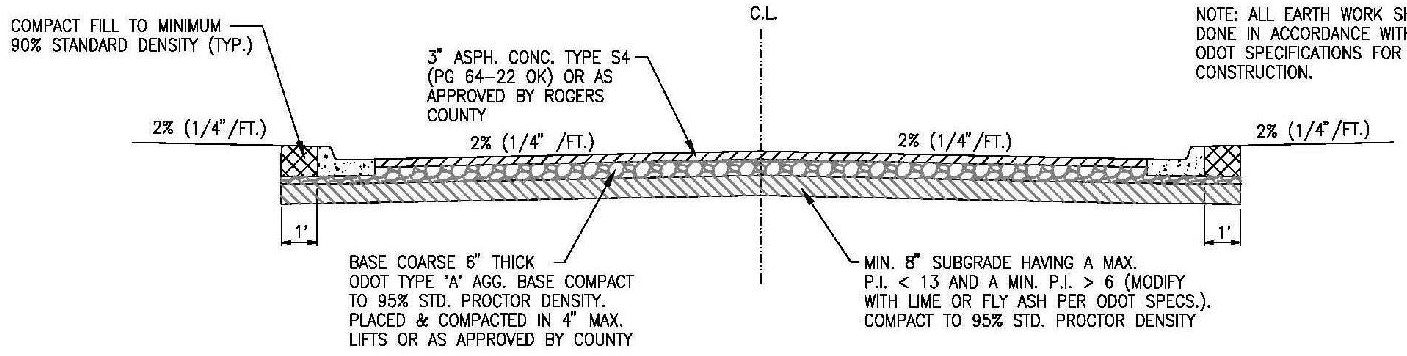



TYPICAL HALF STREET SECTION




NOTE: ALL CONCRETE SHALL BE 4,000 PSI AIR ENTRAINED PORTLAND CEMENT CONCRETE.

6" BARRIER CURB & GUTTER




CURBED STREET SECTION

1. PAVING SECTION IS THE MINIMUM ALLOWED. A GEOTECHNICAL REPORT IS REQUIRED TO DETERMINE SUBGRADE TREATMENT REQUIREMENTS. AN ALTERNATE PAVING SECTION MAY BE REQUIRED OR APPROVED BY THE COUNTY BASED UPON THE RECOMMENDATION IN THE GEOTECHNICAL REPORT.
2. MATERIAL SUBMITTALS SHALL BE MADE PRIOR TO CONSTRUCTION TO INCLUDE AT A MINIMUM ASPHALT MIX DESIGN, STANDARD PROCTOR TEST, AGGREGATE AND SUBGRADE TREATMENT MATERIAL.
3. TESTING SHALL BE CONDUCTED INCLUDING P.I., COMPACTION, ASPHALT DENSITY AND FINAL ASPHALT CORES BASED UPON THE REQUEST OF THE COUNTY.
4. CONSTRUCTION, MATERIALS AND TESTING SHALL BE IN CONFORMANCE WITH ODOT SPECIFICATIONS.

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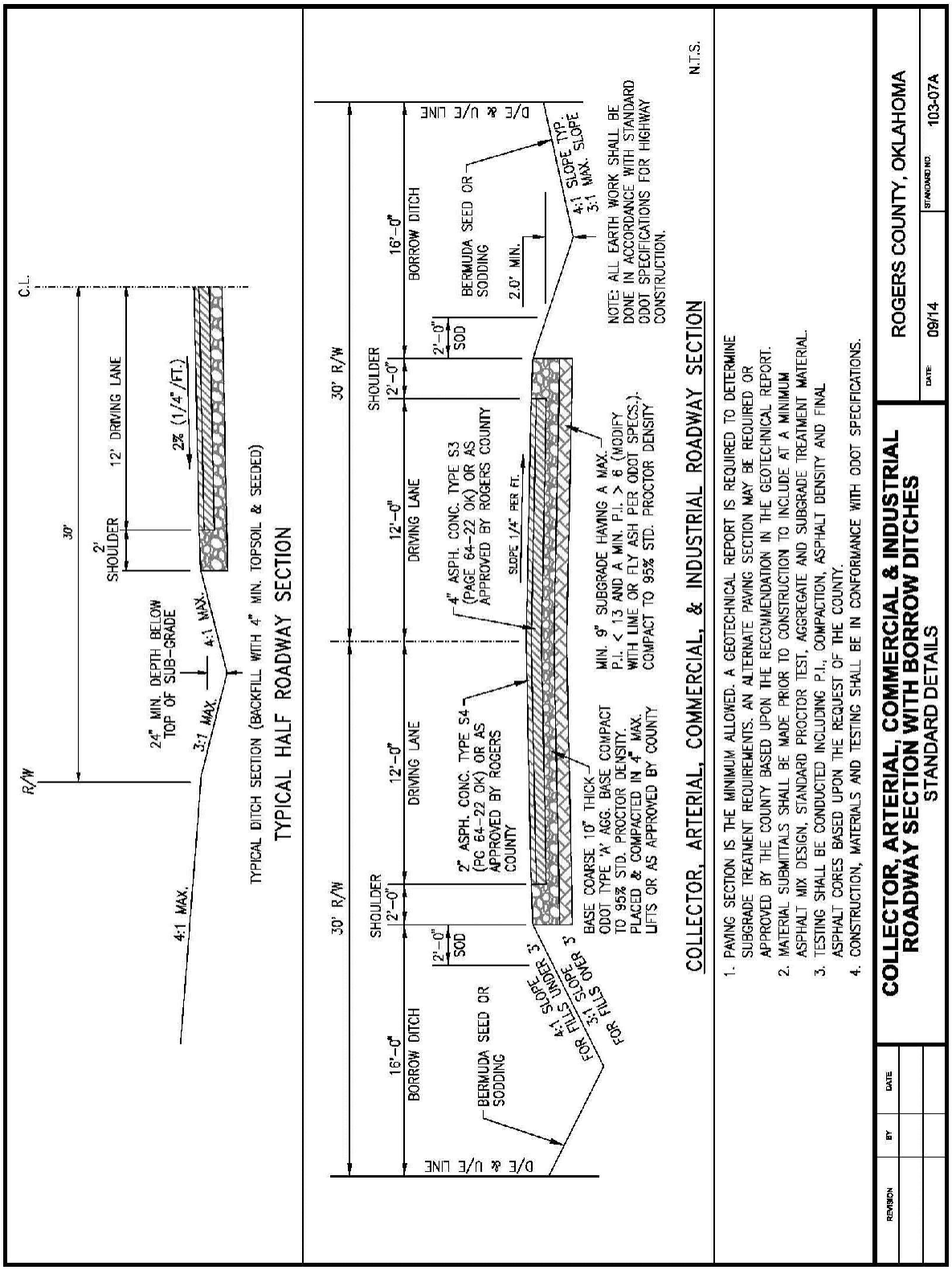
**RESIDENTIAL STREET**
**WITH CONCRETE CURB & GUTTER**
STANDARD DETAILS

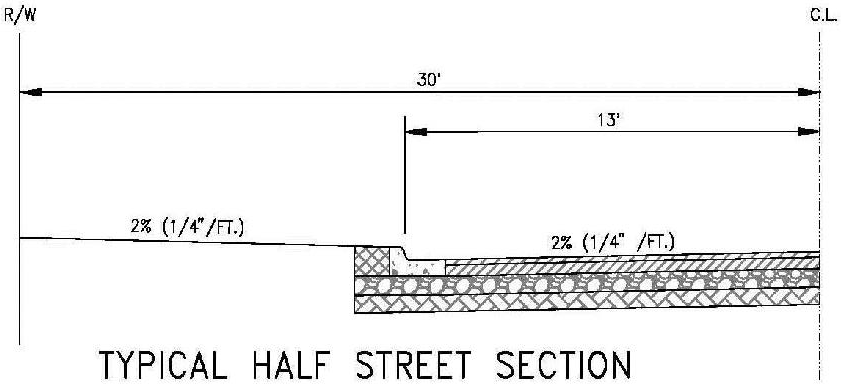
ROGERS COUNTY, OKLAHOMA

DATE: 09/14

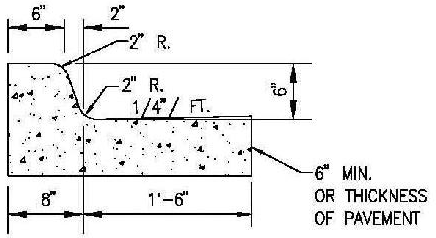
STANDARD NO. 102-07B

## 101.3 Commercial Streets (A-Borrow Ditch, B-Curb and Gutter)



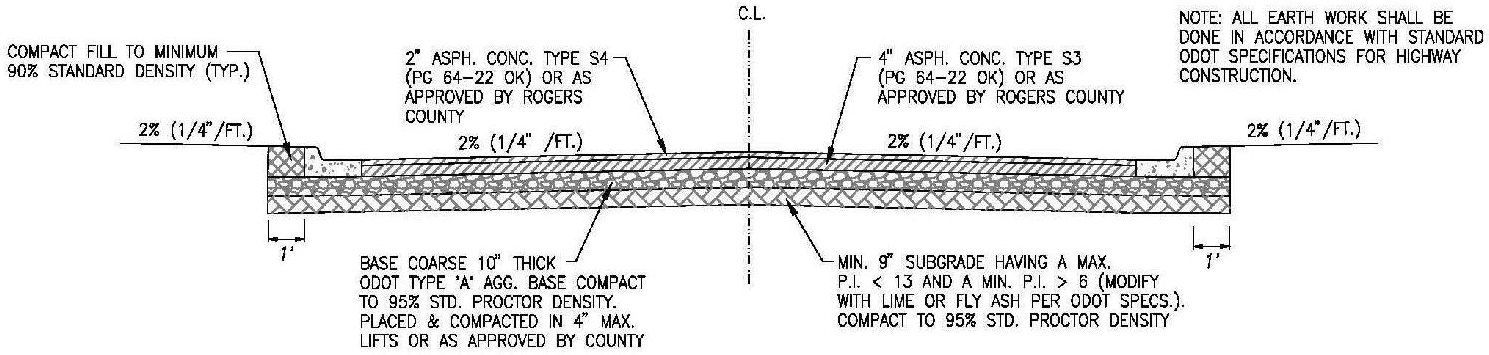



TYPICAL HALF STREET SECTION




NOTE: ALL CONCRETE SHALL BE 4,000 PSI AIR ENTRAINED PORTLAND CEMENT CONCRETE.

6" BARRIER CURB & GUTTER




COLLECTOR, ARTERIAL, COMMERCIAL, & INDUSTRIAL CURBED STREET SECTION

1. PAVING SECTION IS THE MINIMUM ALLOWED. A GEOTECHNICAL REPORT IS REQUIRED TO DETERMINE SUBGRADE TREATMENT REQUIREMENTS. AN ALTERNATE PAVING SECTION MAY BE REQUIRED OR APPROVED BY THE COUNTY BASED UPON THE RECOMMENDATION IN THE GEOTECHNICAL REPORT.
2. MATERIAL SUBMITTALS SHALL BE MADE PRIOR TO CONSTRUCTION TO INCLUDE AT A MINIMUM ASPHALT MIX DESIGN, STANDARD PROCTOR TEST, AGGREGATE AND SUBGRADE TREATMENT MATERIAL.
3. TESTING SHALL BE CONDUCTED INCLUDING P.I., COMPACTION, ASPHALT DENSITY AND FINAL ASPHALT CORES BASED UPON THE REQUEST OF THE COUNTY.
4. CONSTRUCTION, MATERIALS AND TESTING SHALL BE IN CONFORMANCE WITH ODOT SPECIFICATIONS.

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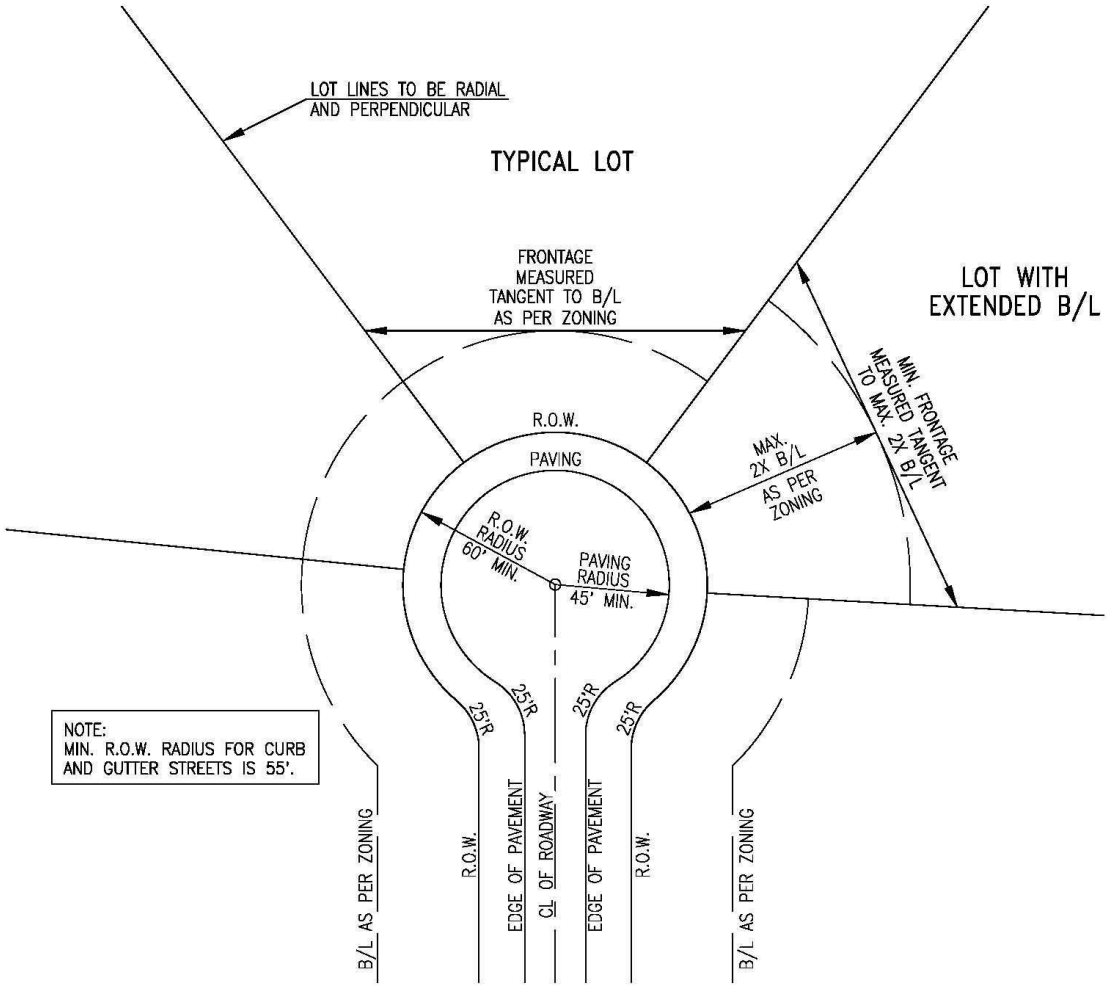
**COLLECTOR, ARTERIAL, COMMERCIAL & INDUSTRIAL ROADWAY SECTION WITH CONCRETE CURB & GUTTER**
STANDARD DETAILS

ROGERS COUNTY, OKLAHOMA

DATE: 09/14 | STANDARD NO. 103-07B

## 101.4 Cul-De-Sacs




CUL-DE-SAC DESIGN REQUIREMENTS:

1. MINIMUM RIGHT-OF-WAY REQUIREMENT IS SIXTY (60) FOOT RADIUS.
   FIFTY-FIVE (55) FOOT MINIMUM RIGHT-OF-WAY FOR CURB AND GUTTER STREETS.
2. MINIMUM PAVING REQUIREMENT IS FORTY-FIVE (45) FOOT PAVED RADIUS.
3. MINIMUM RETURN RADIUS AT POINT WHERE STREET ENTERS CUL-DE-SAC IS TWENTY-FIVE (25) FOOT RADIUS.
4. WITH RESERVE ISLAND IN CENTER, THE PAVING RADIUS SHALL BE THIRTY (30) FEET PLUS THE RADIUS OF THE ISLAND OR THE MINIMUM PAVING RADIUS AS STATED ABOVE. WHICHEVER IS GREATER.
5. WITH RESERVE ISLAND IN CENTER, THE RIGHT-OF-WAY RADIUS SHALL BE FIFTEEN (15) FEET PLUS THE RADIUS OF THE PAVEMENT OR THE MINIMUM RIGHT-OF-WAY RADIUS AS STATED ABOVE. WHICHEVER IS GREATER.
6. THE MINIMUM LOT FRONTAGE OF A CUL-DE-SAC LOT SHALL BE THIRTY FIVE (35) FEET AT THE CUL-DE-SAC RIGHT-OF-WAY.
7. THE MINIMUM LOT FRONTAGE OF A CUL-DE-SAC LOT, AS REQUIRED BY THE RESPECTIVE ZONING CLASSIFICATION, SHALL BE MEASURED, DEFINED, AND/OR ACHIEVED BY THE LENGTH OF THE TANGENT LINE DRAWN AT THE MIDPOINT OF THE FRONT BUILDING LINE/SETBACK ARC. SAID MINIMUM FRONTAGE REQUIREMENT SHALL BE MET AT A FRONT BUILDING LINE/SETBACK THAT IS NO MORE THAN TWO (2) TIMES THE STANDARD FRONT BUILDING LINE/SETBACK REQUIREMENT AS REQUIRED BY THE RESPECTIVE ZONING CLASSIFICATION..
8. THE FRONT BUILDING LINE/SETBACK OF A CUL-DE-SAC LOT SHALL BE ESTABLISHED AND SHALL NOT EXTEND MORE THAN TWO (2) TIMES THE STANDARD FRONT BUILDING LINE/SETBACK REQUIREMENT AS REQUIRED BY THE RESPECTIVE ZONING CLASSIFICATION IF SO ADJUSTED TO ACHIEVE THE LOT FRONTAGE REQUIREMENT.

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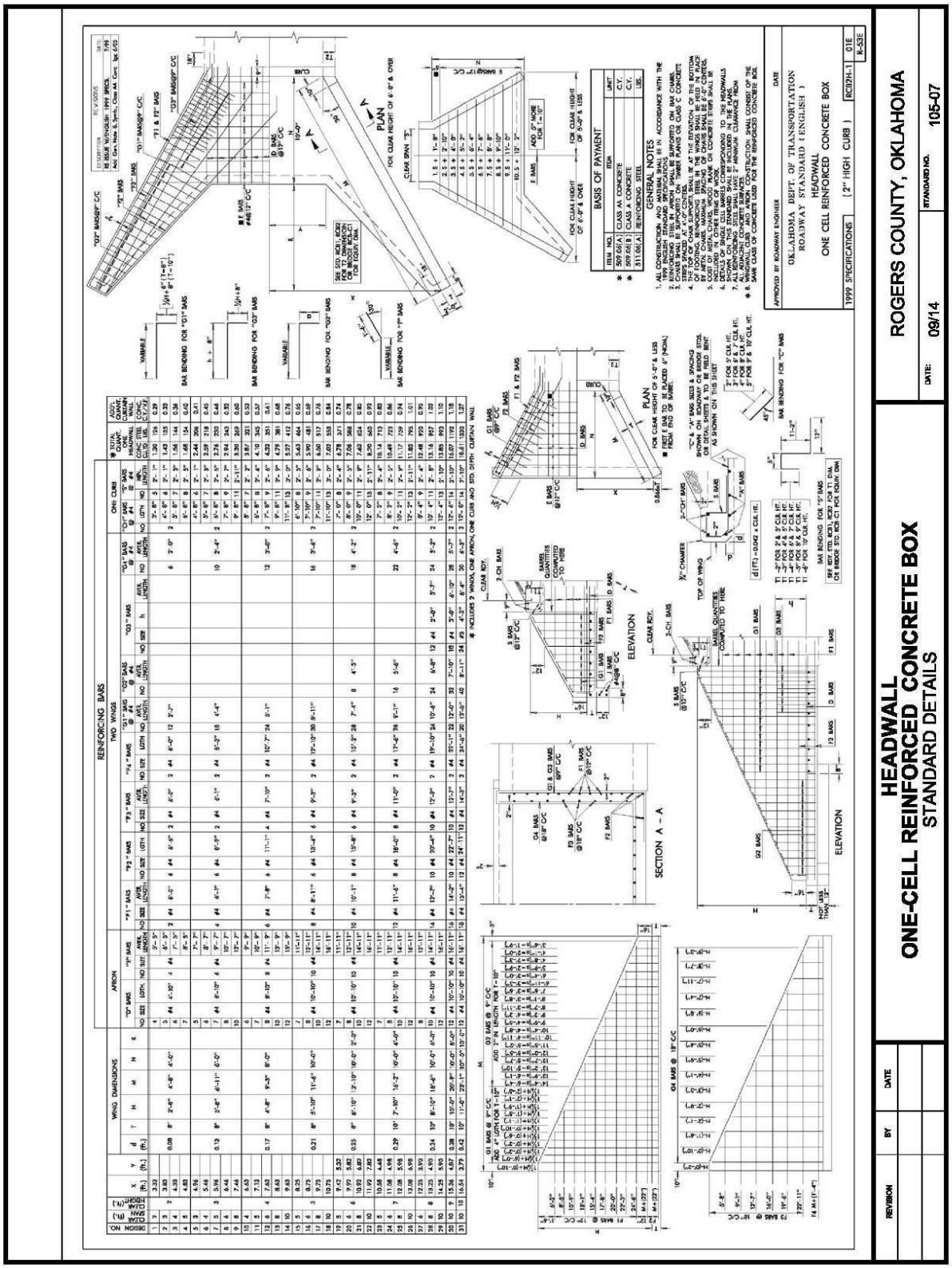
**CUL-DE-SAC REQUIREMENTS**
**LAYOUT & MIN. LOT WIDTH**
**STANDARD DETAILS**

ROGERS COUNTY, OKLAHOMA

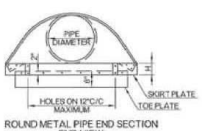
DATE: 09/14

STANDARD NO. 104-07

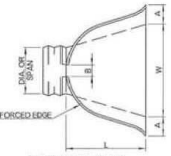
## 101.5 Headwall for Single Cell RCB



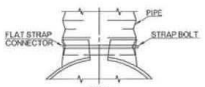
| DIMENSIONS OF END SECTIONS FOR ROUND METAL PIPE | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| PIPE DIA. | GA. | A | B | H | L | W | APPROX. SLOPE | BODY TYPE |
| 12" | 16 | 6" | 6" | 6" | 21" | 24" | 1:2 ½ | 1 PC. |
| 15" | 16 | 7" | 8" | 6" | 26" | 30" | 1:2 ½ | 1 PC. |
| 18" | 16 | 8" | 10" | 6" | 31" | 36" | 1:2 ½ | 1 PC. |
| 21" | 16 | 9" | 12" | 6" | 36" | 42" | 1:2 ½ | 1 PC. |
| 24" | 16 | 10" | 13" | 6" | 41" | 48" | 1:2 ½ | 1 PC. |
| 30" | 14 | 12" | 16" | 8" | 51" | 60" | 1:2 ½ | 1 PC. |
| 36" | 14 | 14" | 19" | 9" | 60" | 72" | 1:2 ½ | 2 PC. |
| 42" | 12 | 16" | 22" | 11" | 69" | 84" | 1:2 ½ | 2 PC. |
| 48" | 12 | 18" | 27" | 12" | 78" | 90" | 1:2 ½ | 2 PC. |
| 54" | 12 | 18" | 30" | 12" | 84" | 102" | 1:2 | 2 PC. |
| 60" | 12 | 18" | 33" | 12" | 87" | 114" | 1:1 ½ | 3 PC. |
| 66" | 12 | 18" | 36" | 12" | 87" | 120" | 1:1 ½ | 3 PC. |
| 72" | 12 | 18" | 39" | 12" | 87" | 126" | 1:1 ½ | 3 PC. |
| 78" | 12 | 18" | 42" | 12" | 87" | 132" | 1:1 ½ | 3 PC. |
| 84" | 12 | 18" | 45" | 12" | 87" | 138" | 1:1 ½ | 3 PC. |



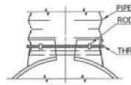
ROUND METAL PIPE END SECTION END VIEW



METAL END SECTION PLAN VIEW

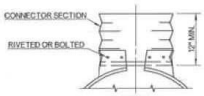


TYPE 1
FOR 12" TO 24" ROUND AND EQUIVALENT ROUND PIPE ARCH SIZES.

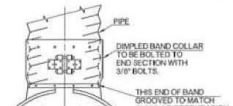


TYPE 2
FOR 30" TO 36" ROUND AND 36" TO 48" EQUIVALENT ROUND PIPE - ARCH SIZES.

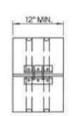
COUPLING BAND
STANDARD COUPLING BAND



TYPE 3
FOR 42" TO 84" ROUND AND 54" TO 72" EQUIVALENT ROUND PIPE - ARCH SIZES.



TYPE 4
FOR USE WITH ALL ROUND AND PIPE ARCH SIZES.



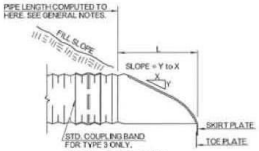
DIMPLED COUPLING BAND

TYPICAL METAL END SECTION CONNECTIONS

| DIMENSIONS OF END SECTIONS FOR METAL PIPE - ARCH | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| SPAN x RISE | EQUIV. ROUND | GA. | A | B | H | L | W | APPROX. SLOPE | BODY TYPE |
| 17" x 13" | 15" | 16 | 7" | 9" | 6" | 19" | 30" | 1:2 ½ | 1 PC. |
| 21" x 15" | 18" | 16 | 7" | 10" | 6" | 23" | 36" | 1:2 ½ | 1 PC. |
| 24" x 18" | 21" | 16 | 8" | 12" | 6" | 28" | 42" | 1:2 ½ | 1 PC. |
| 28" x 20" | 24" | #16 | 9" | 14" | 6" | 32" | 48" | 1:2 ½ | 1 PC. |
| 35" x 24" | 30" | 14 | 10" | 16" | 6" | 39" | 60" | 1:2 ½ | 1 PC. |
| 42" x 29" | 36" | #14 | 12" | 18" | 6" | 46" | 73" | 1:2 ½ | 1 PC. |
| 49" x 33" | 42" | 12 | 13" | 21" | 9" | 53" | 85" | 1:2 ½ | 2 PC. |
| 57" x 38" | 48" | 12 | 18" | 26" | 12" | 63" | 90" | 1:2 ½ | 2 PC. |
| 64" x 43" | 54" | 12 | 18" | 30" | 12" | 70" | 102" | 1:2 ½ | 2 PC. |
| 71" x 47" | 60" | 12 | 18" | 33" | 12" | 77" | 114" | 1:2 ¼ | 3 PC. |
| 77" x 52" | 66" | 12 | 18" | 36" | 12" | 77" | 126" | 1:2 | 3 PC. |
| 83" x 57" | 72" | 12 | 18" | 39" | 12" | 77" | 138" | 1:2 | 3 PC. |

# FOR ALUMINUM END SECTIONS THE 28" x 20" SHALL BE 14 GAGE AND THE 42" x 29" SHALL BE 12 GAGE.

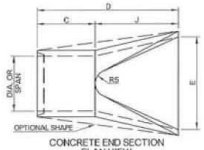
ARCH METAL PIPE END SECTION END VIEW



METAL END SECTION SIDE VIEW

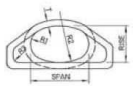
| DIMENSIONS OF PRECAST END SECTIONS FOR ROUND PIPE | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| DIAMETER | R3 | R4 | R5 | T | K | J | C | D | E | SLOPE |
| 18" | 3" | 3" | 6" | 2 ½" | 9" | 2.25' | 3.83' | 6.08' | 3.00' | 1:3 |
| 24" | 3" | 3" | 7" | 3" | 9 ½" | 3.63' | 2.50' | 6.17' | 4.00' | 1:3 |
| 30" | 3" | 3" | 8" | 3 ½" | 12" | 4.50' | 1.65' | 6.18' | 5.00' | 1:3 |
| 36" | 3" | 3" | 10 ½" | 4" | 15" | 5.25' | 2.90" | 8.15' | 6.00' | 1:3 |
| 42" | 3" | 3" | 10 ½" | 4 ½" | 21" | 5.25' | 2.92" | 8.17' | 6.50' | 1:3 |
| 48" | 6" | 6" | 14" | 5" | 24" | 6.00' | 2.17' | 8.17' | 7.00' | 1:3 |
| 54" | 6" | 6" | - | 5 ½" | 27" | 5.42' | 2.92" | 8.33' | 7.50' | 1:2 ½ |
| 60" | 6" | 6" | - | 6" | 30" | 5.00' | 3.25' | 8.25' | 8.00' | 1:2 |
| 66" | 6" | 6" | - | 6 ½" | 24" | 6.50' | 1.75' | 8.25' | 8.50' | 1:2 |
| 72" | 6" | 6" | - | 7" | 24" | 6.50' | 1.75' | 8.25' | 9.00' | 1:2 |

ROUND CONCRETE PIPE END SECTION END VIEW

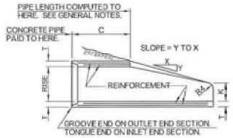


CONCRETE END SECTION PLAN VIEW

| APPROX. EQUIV. DIAMETER | DIMENSIONS OF PRECAST END SECTIONS FOR ELLIPTICAL PIPE | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | RISE | SPAN | R1 | R2 | R3 | R4 | R5 | T | K | J | C | D | E | SLOPE |
| 18" | 14" | 23" | 6" | 20" | 3" | 3" | 6" | 2 ⅜" | 8" | 2.25' | 3.75' | 6.00' | 3.00' | 1:3 |
| 24" | 19" | 30" | 8 ½" | 26 ¼" | 3" | 3" | 7" | 3 ¼" | 8 ½" | 3.25' | 2.75' | 6.00' | 4.00' | 1:3 |
| 30" | 24" | 38" | 10 ¼" | 32 ¾" | 3" | 3" | 9" | 3 ⅝" | 9 ½" | 4.50' | 1.50' | 6.00' | 5.00' | 1:3 |
| 36" | 29" | 45" | 12 ¼" | 39 ¼" | 3" | 3" | 12" | 4 ½" | 11 ¼" | 5.00' | 3.00' | 8.00' | 6.00' | 1:3 |
| 42" | 34" | 53" | 14 ½" | 46" | 6" | 6" | 13" | 5" | 15 ¾" | 5.00' | 3.00' | 9.00' | 6.50' | 1:3 |
| 48" | 38" | 60" | 15 ½" | 51 ½" | 6" | 6" | 14" | 5 ½" | 21" | 5.00' | 3.00' | 8.00' | 7.00' | 1:3 |
| 54" | 43" | 68" | 19 ¾" | 58 ½" | 6" | 6" | 16" | 6" | 25 ½" | 5.00' | 3.00' | 8.00' | 7.50' | 1:3 |
| 60" | 48" | 76" | 20 ¾" | 65" | 6" | 6" | 36" / 18" | 6 ½" | 30" | 5.00' | 3.25' | 8.25' | 8.00' | 1:2 |
| 66" | 53" | 83" | 22 ¾" | 71 ½" | 6" | 6" | 36" / 18" | 7 ½" | 24" | 6.50' | 1.75' | 8.25' | 8.50' | 1:2 |
| 72" | 58" | 91" | 24 ⅝" | 78" | 6" | 6" | 36" | 7 ½" | 24" | 6.50' | 1.75' | 8.25' | 9.00' | 1:2 |

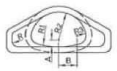


ELLIPTICAL CONCRETE PIPE END SECTION END VIEW



CONCRETE END SECTION SIDE VIEW

| APPROX. EQUIV. DIAMETER | DIMENSIONS OF PRECAST END SECTIONS FOR ARCH PIPE | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | SPAN | RISE | A | B | R | R1 | R2 | R3 | R4 | R5 | T | K | J | C | D | E | SLOPE |
| 18" | 22" | 13" | - 1/4" | 5 ¾" | 2" | 27 ½" | 13 ¾" | 5 ¼" | 3" | 13" | 2½" | 7" | 2.25' | 3.75' | 6.08' | 3.00' | 1:3 |
| 24" | 28" | 18" | 3 ⅞" | 9 ⅞" | 3" | 40 ⅛" | 14 ⅜" | 4 ⅜" | 3" | 16 ⅛" | 3" | 9 ½" | 3.58' | 2.50' | 6.08' | 4.00' | 1:3 |
| 30" | 36" | 22" | 3 ¾" | 12 ⅝" | 3" | 51" | 18 ⅜" | 6 ½" | 3" | 18 ½" | 3½" | 12" | 4.50' | 1.58' | 6.08' | 5.00' | 1:3 |
| 36" | 43" | 26" | 4 ⅛" | 15 ⅓" | 6" | 62" | 22 ½" | 6 ⅞" | 3" | 24 ⅛" | 4" | 15" | 5.25' | 2.90" | 8.15' | 6.00' | 1:3 |
| 42" | 51" | 31" | 5 ⅛" | 18" | 6" | 73" | 26 ¼" | 7 ⅝" | 3" | 27 ½" | 4½" | 21" | 5.25' | 2.92" | 8.17' | 6.50' | 1:3 |
| 48" | 58" | 36" | 6" | 20 ½" | 6" | 84" | 30" | 8 ¾" | 3" | 26 ½" | 5" | 24" | 6.00' | 2.17' | 8.17' | 7.00' | 1:3 |
| 54" | 65" | 40" | 6 ⅝" | 22 ⅝" | 6" | 92 ½" | 33 ⅛" | 9 ⅝" | 6" | 33 ½" | 5½" | 27" | 5.42' | 2.92" | 8.34" | 7.50' | 1:2.4 |
| 60" | 73" | 45" | 7 ½" | 25 ⅝" | 6" | 105" | 37 ½" | 11 ⅛" | 6" | 33 ½" | 6" | 30" | 5.00' | 3.25" | 8.25' | 8.00' | 1:2 |
| 72" | 88" | 54" | 9" | 31 ⅞" | 6" | 126" | 45" | 12 ⅞" | 6" | 38 ½" | 7" | 24" | 6.50' | 1.75' | 8.25' | 9.00' | 1:2 |



ARCH CONCRETE PIPE END SECTION END VIEW

## GENERAL NOTES

1. ALL CONSTRUCTION AND MATERIAL REQUIREMENTS SHALL BE IN ACCORDANCE WITH THE 2009 ODOT STANDARD SPECIFICATIONS.
2. CULVERT END SECTIONS SHALL BE OF THE SAME MATERIAL AND SHAPE (ROUND, ARCH, OR ELLIPTICAL) AS THE PIPE ON WHICH THEY ARE INSTALLED.
3. DIMENSIONS SHOWN FOR END SECTIONS ARE SUBJECT TO MANUFACTURER TOLERANCES.
4. TOE PLATE WILL BE REQUIRED ON ALL METAL END SECTIONS UNLESS SOLID ROCK IS ENCOUNTERED. HOLES IN TOE PLATE TO BE PUNCHED TO MATCH HOLES IN SKIRT PLATE, 3/8" BOLTS TO BE FURNISHED. LENGTH OF TOE PLATES FOR ROUND PIPE END SECTIONS SHALL BE W=10" FOR 12" TO 30" DIAMETER PIPE, W=20" FOR 36" TO 84" DIAMETER PIPE. LENGTH OF TOE PLATES FOR ARCH PIPE END SECTIONS SHALL BE W=10" FOR A RISE OF 13" TO 29" AND W=20" FOR A RISE OF 33" TO 51".
5. CONNECTOR SECTION, SKIRT PLATE, AND TOE PLATE ON METAL END SECTIONS SHALL BE THE SAME GAGE AND MATERIAL AS THE SKIRT AND SHALL BE INCLUDED IN PRICE BID FOR END SECTION.
6. IF TYPE 3 METAL END SECTION IS USED AS OPTIONAL PIPE, THE LENGTH OF PIPE TO BE REDUCED BY 12" FOR EACH END SECTION. IF CONCRETE PIPE OPTION IS USED, THE LENGTH OF PIPE TO BE REDUCED BY THE C DIMENSION FOR EACH END SECTION.

| BASIS OF PAYMENT | | |
|---|---|---|
| ITEM NO. | ITEM | UNIT |
| 613 ( L ) | ▼ PREFAB. CULVERT END SECTION, ROUND | EA. |
| 613 ( L ) | ▼ PREFAB. CULVERT END SECTION, ARCH | EA. |
| 613 ( L ) | ▼ PREFAB. CULVERT END SECTION, ELLIPTICAL | EA. |

▼ END SECTION DIMENSION( S ) SHALL BE SPECIFIED.

APPROVED BY ROADWAY ENGINEER Calvin A DATE 8/25/14

ROADWAY STANDARD

PREFABRICATED CULVERT END SECTIONS

2009 SPECIFICATIONS | PCES-4 | 1 | R-30

| REVISION | BY | DATE |
|---|---|---|
| | | |
| | | |

**PREFABRICATED CULVERT END SECTIONS**
STANDARD DETAILS

ROGERS COUNTY, OKLAHOMA

DATE: 12/07 | STANDARD NO. 106-07

## TABLE OF TRENCHING AND STANDARD BEDDING MATERIAL QUANTITIES

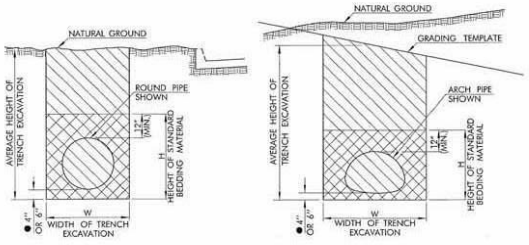
| | PIPE DIAM. OR DESIGN EQUIV. | H ■ | SINGLE PIPE INSTALLATION W | SINGLE PIPE INSTALLATION STANDARD BEDDING MATERIAL ■ | DOUBLE PIPE INSTALLATION W | DOUBLE PIPE INSTALLATION STANDARD BEDDING MATERIAL ■ | TRIPLE PIPE INSTALLATION W | TRIPLE PIPE INSTALLATION STANDARD BEDDING MATERIAL ■ | CLEAR SPACE BETWEEN PIPES |
|---|---|---|---|---|---|---|---|---|---|
| | | FT. | FT. | C.Y./L.F. | FT. | C.Y./L.F. | FT. | C.Y./L.F. | INCHES |
| ✱ ROUND PIPE | 18" | 3.10 | 3.20 | 0.28 | 6.10 | 0.52 | 9.00 | 1.00 | 14 |
| | 24" | 3.60 | 4.00 | 0.39 | 7.70 | 0.73 | 11.40 | 1.50 | 17 |
| | 30" | 4.20 | 4.80 | 0.51 | 9.30 | 0.97 | 13.80 | 2.15 | 20 |
| | 36" | 4.75 | 5.50 | 0.63 | 10.80 | 1.23 | 16.20 | 2.85 | 23 |
| | 42" | 5.30 | 7.00 | 0.92 | 13.20 | 1.67 | 19.30 | 3.80 | 26 |
| | 48" | 6.20 | 7.50 | 1.03 | 14.75 | 2.00 | 21.70 | 4.70 | 29 |
| | 54" | 6.20 | 8.00 | 1.20 | 15.30 | 2.20 | 22.70 | 5.10 | 32 |
| | 60" | 6.75 | 9.50 | 1.60 | 17.60 | 2.75 | 25.90 | 6.30 | 35 |
| | 66" | 7.20 | 10.00 | 1.70 | 18.80 | 3.10 | 27.70 | 7.35 | 38 |
| METAL ARCH PIPE | 18" | 2.80 | 3.20 | 0.27 | 6.20 | 0.52 | 9.20 | 0.77 | 14 |
| | 24" | 3.25 | 4.00 | 0.38 | 7.83 | 0.74 | 11.67 | 1.09 | 17 |
| | 30" | 3.60 | 5.50 | 0.57 | 10.20 | 1.03 | 14.87 | 1.49 | 20 |
| | 36" | 4.00 | 6.25 | 0.69 | 11.75 | 1.27 | 17.25 | 1.84 | 23 |
| | 42" | 4.40 | 7.00 | 0.82 | 13.33 | 1.53 | 19.66 | 2.24 | 26 |
| | 48" | 4.80 | 8.10 | 1.02 | 15.35 | 1.88 | 22.60 | 2.75 | 29 |
| | 54" | 5.25 | 9.50 | 1.32 | 17.58 | 2.36 | 25.66 | 3.40 | 32 |
| | 60" | 5.60 | 10.00 | 1.40 | 18.92 | 2.62 | 27.84 | 3.82 | 35 |
| | 66" | 6.00 | 10.90 | 1.63 | 20.65 | 3.00 | 30.40 | 4.39 | 38 |

■ FOR PIPES UNDER PAVEMENT, THE H DIMENSION AND THE STANDARD BEDDING MATERIAL QUANTITY, SHALL BE INCREASED TO GO TO THE TOP OF THE TRENCH.

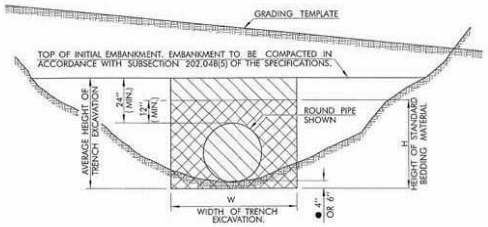
## TABLE OF FILL HEIGHTS

| | PIPE SIZE: POLYETH ROUND | PIPE SIZE: EQUIVALENT METAL ARCH | MINIMUM COVER OVER TOP OF PIPE BUOYANCY | MAXIMUM COVER: POLYETHYLENE | MAXIMUM COVER: METAL | MINIMUM METAL PIPE GAGE REQUIREMENT: UNDER PAVEMENT | MINIMUM METAL PIPE GAGE REQUIREMENT: ALL OTHERS |
|---|---|---|---|---|---|---|---|
| ROUND PIPE | 18" | 21" x 15" | 15" | 10' | REFER TO RDY. STANDARD FHTMP-5 | 14 ◒ | REFER TO RDY. STANDARD FHTMP-5 |
| | 24" | 28" x 20" | 20" | 10' | | 14 ◒ | |
| | 30" | 35" x 24" | 25" | 10' | | 14 ◒ | |
| | 36" | 42" x 29" | 30" | 10' | | 14 | |
| | 42" | 49" x 33" | 35" | 10' | | 12 | |
| | 48" | 57" x 38" | 40" | 10' | | 12 | |
| | 54" | 64" x 43" | 45" | 10' | | 12 | |
| | 60" | 71" x 47" | 50" | 10' | | 10 | |
| | 66" | 77" x 52" | 55" | N/A | | 10 | |

◒ UNDER PAVEMENT IS DEFINED TO INCLUDE ALL P.C. OR A.C. SURFACING UNDER MAINLINE TRAFFIC AND MAJOR STREET RETURNS. A MINIMUM PIPE GAGE OF 16 MAY BE USED FOR INSTALLATIONS REQUIRING 30 INCH EQUIVALENT ROUND CONDUITS (MAX.) AND LIMITED TO LOW VOLUME COUNTY OR OFF-SYSTEM ROADS, MINOR STREET RETURNS, DRIVEWAYS OR TEMPORARY DETOURS, AS APPROVED BY THE ENGINEER.




TRENCH EXCAVATION IN CUT SECTIONS




TRENCH EXCAVATION IN EMBANKMENT SECTIONS

LIMITS OF STANDARD BEDDING MATERIAL. QUANTITIES FOR BEDDING MATERIAL DO NOT INCLUDE THE SFACE WITHIN AND BOUNDED BY THE OUTER SURFACE OF THE PIPE CONDUIT.

LIMITS OF TRENCH EXCAVATION.

## GENERAL NOTES

1. ALL CONSTRUCTION AND MATERIAL REQUIREMENTS SHALL BE IN ACCORDANCE WITH THE 2009 ODOT STANDARD SPECIFICATIONS.
2. TRENCH EXCAVATION & STANDARD BEDDING WILL NOT BE REQUIRED FOR PIPE INSTALLATIONS ON SIDE DRAINS UNLESS OTHERWISE SPECIFIED ON THE PLANS.
3. TRENCH EXCAVATION WILL BE PAID FOR ON PIPE UNDERDRAIN. SEE ROADWAY STANDARD PUD-3.
4. TRENCHING REQUIREMENTS FOR DEPTHS OVER 5 FEET SHALL BE IN ACCORDANCE WITH, & DEFINED BY, O.S.H.A. REGS., TITLE 29 CFR, STANDARDS 1926.650, 1926.651 & 1926.652.
5. NORMAL BACKFILLING OPERATIONS SHALL FOLLOW BEDDING AND PIPE INSTALLATION AS CLOSELY AS PRACTICAL. IN NO CASE SHALL A PIPE INSTALLATION SUBJECT TO SUDDEN FLOW DEVELOPMENT BE LEFT WITHOUT SUFFICIENT BACKFILL TO RESTRAIN THE CONDUIT AND PREVENT JOINT SEPARATION AND/OR PIPING SCOUR. PHYSICALLY RESTRAINING THE CONDUIT MAY BE USED TO AUGMENT OR REPLACE THIS IMMEDIATE BACKFILL REQUIREMENT.
6. ANY EXCESS EXCAVATION NOT USED FOR BACKFILL WILL BECOME THE PROPERTY OF THE CONTRACTOR AND DISPOSED OF, BY HIM, IN A MANNER APPROVED BY THE ENGINEER.
7. INSTALLATION OF FLEXIBLE PIPE SHALL CONFORM TO SECTION 26 – DIVISION II OF AASHTO STANDARD SPECIFICATIONS FOR HIGHWAY BRIDGES.
8. JOINTS IN METAL PIPES SHALL CONFORM TO SECTION 26.4.2.4 OF AASHTO STANDARD SPECIFICATIONS FOR HIGHWAY BRIDGES. IF A WATERTIGHT JOINT IS SPECIFIED ON THE PLANS, A 12" WIDE BY 3/4" THICK NEOPRENE SLEEVE GASKET MEETING ASTM D1056 REQUIREMENT SHALL BE USED.
9. JOINTS IN CORRUGATED POLETHYLENE PIPES SHALL CONSIST OF A GASKETED SYSTEM WHICH CAN PASS MINIMUM OF 2 PSI HYDROSTATIC TEST WITHOUT LEAKAGE AND CONFORM TO AASHTO M 294▲ & SECTION 26.4.2.4 OF AASHTO STANDARD SPECIFICATION FOR HIGHWAY BRIDGES. GASKET MATERIAL SHALL CONFORM TO EITHER ASTM D1056 OR ASTM F477 REQUIREMENTS. SIDE DRAINS ARE EXCLUDED FROM THE LEAKAGE RESISTANCE REQUIREMENTS UNLESS OTHERWISE SPECIFIED.
10. TYPE C POLYETHYLENE PIPE SHALL BE USED ONLY IN SIDE-DRAIN & SLIPLINING APPLICATIONS.
- ✱11. STANDARD BEDDING MATERIAL QUANTITIES ARE BASED ON THE TRENCH WIDTH (W), TRENCH HEIGHT (H) AND EFFECTIVE DIAMETER (D) OF ROUND CORRUGATED POLYETHYLENE PIPE MEETING THE REQUIREMENTS OF AASHTO M 294 (18"-60").
- ▲12. SPLIT COLLAR COUPLERS ARE NOT APPROVED FOR USE IN ALL CORRUGATED POLYETHYLENE PIPE INSTALLATIONS.
- ●13. EQUIVALENT PIPE SIZES 66 INCHES AND LARGER REQUIRE 6 INCHES OF BEDDING MATERIAL BELOW PIPE CONDUIT.

## BASIS OF PAYMENT

| ITEM NO. | ITEM | UNIT |
|---|---|---|
| 613 (R) | STANDARD BEDDING MATERIAL, CLASS A | C.Y. |
| 613 (S) | STANDARD BEDDING MATERIAL, CLASS B | C.Y. |
| 613 (T) | STANDARD BEDDING MATERIAL, CLASS C | C.Y. |
| 613 (V) | TRENCH EXCAVATION | C.Y. |
| | | |

APPROVED BY ROADWAY ENGINEER: Kathy A Digeler DATE 01/28/13

ROADWAY STANDARD

FLEXIBLE PIPE INSTALLATION

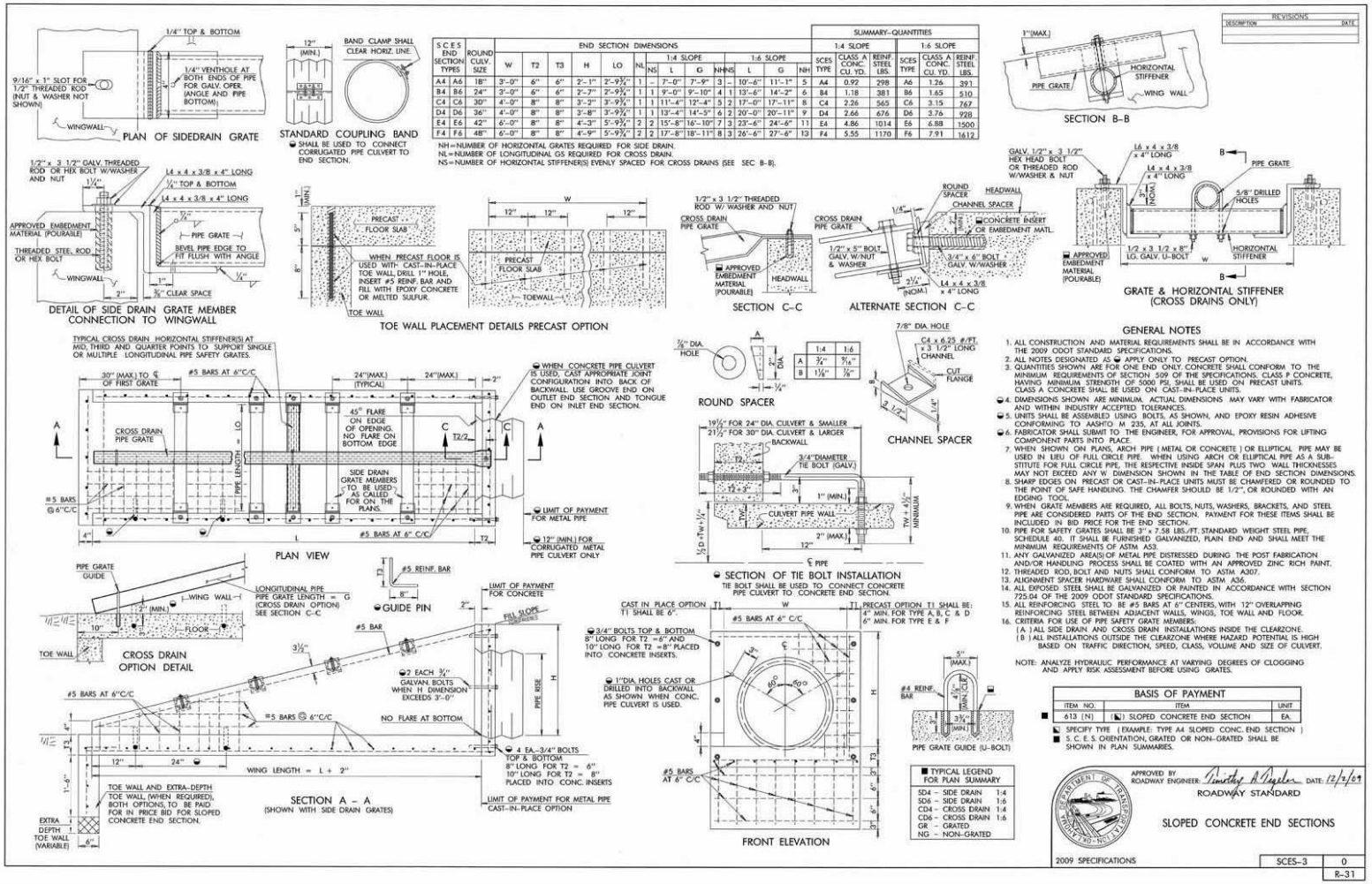
2009 SPECIFICATIONS | FPI-3 | 2 | R-48

| REVISION | BY | DATE |
|---|---|---|
| | | |
| | | |

# FLEXIBLE PIPE INSTALLATION
## STANDARD DETAILS

ROGERS COUNTY, OKLAHOMA

DATE: 09/14 | STANDARD NO. 107-07




| SCES END SECTION TYPES | | ROUND CULV. SIZE | END SECTION DIMENSIONS W | T2 | T3 | H | LO | 1:4 SLOPE NS | L | G | NH | 1:6 SLOPE NS | L | G | NH | SUMMARY–QUANTITIES 1:4 SLOPE SCES TYPE | CLASS A CONC. CU. YD. | REINF. STEEL LBS. | 1:6 SLOPE SCES TYPE | CLASS A CONC. CU. YD. | REINF. STEEL LBS. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| A4 | A6 | 18" | 3'–0" | 6" | 6" | 2'–1" | 2'–9¾" | 1 | – | 7'–0" | 7'–9" | 3 | – | 10'–6" | 11'–1" | 5 | A4 | 0.92 | 298 | A6 | 1.26 | 391 |
| B4 | B6 | 24" | 3'–0" | 6" | 6" | 2'–7" | 2'–9¾" | 1 | 1 | 9'–0" | 9'–10" | 4 | 1 | 13'–6" | 14'–2" | 6 | B4 | 1.18 | 381 | B6 | 1.65 | 510 |
| C4 | C6 | 30" | 4'–0" | 8" | 8" | 3'–2" | 3'–9¾" | 1 | 1 | 11'–4" | 12'–4" | 5 | 2 | 17'–0" | 17'–11" | 8 | C4 | 2.26 | 565 | C6 | 3.15 | 767 |
| D4 | D6 | 36" | 4'–0" | 8" | 8" | 3'–8" | 3'–9¾" | 1 | 1 | 13'–4" | 14'–5" | 6 | 2 | 20'–0" | 20'–11" | 9 | D4 | 2.66 | 676 | D6 | 3.76 | 928 |
| E4 | E6 | 42" | 6'–0" | 8" | 8" | 4'–3" | 5'–9¾" | 2 | 2 | 15'–8" | 16'–10" | 7 | 3 | 23'–6" | 24'–6" | 11 | E4 | 4.86 | 1014 | E6 | 6.88 | 1500 |
| F4 | F6 | 48" | 6'–0" | 8" | 8" | 4'–9" | 5'–9¾" | 2 | 2 | 17'–8" | 18'–11" | 8 | 3 | 26'–6" | 27'–6" | 13 | F4 | 5.55 | 1170 | F6 | 7.91 | 1612 |

NH = NUMBER OF HORIZONTAL GRATES REQUIRED FOR SIDE DRAIN.
NL = NUMBER OF LONGITUDINAL GS REQUIRED FOR CROSS DRAIN.
NS = NUMBER OF HORIZONTAL STIFFENER(S) EVENLY SPACED FOR CROSS DRAINS (SEE SEC B–B).

| REVISIONS DESCRIPTION | DATE |
|---|---|
| | |

### GENERAL NOTES

1. ALL CONSTRUCTION AND MATERIAL REQUIREMENTS SHALL BE IN ACCORDANCE WITH THE 2009 ODOT STANDARD SPECIFICATIONS.
2. ALL NOTES DESIGNATED AS ◒ APPLY ONLY TO PRECAST OPTION.
3. QUANTITIES SHOWN ARE FOR ONE END ONLY. CONCRETE SHALL CONFORM TO THE MINIMUM REQUIREMENTS OF SECTION 509 OF THE SPECIFICATIONS, CLASS P CONCRETE, HAVING MINIMUM STRENGTH OF 5000 PSI, SHALL BE USED ON PRECAST UNITS. CLASS A CONCRETE SHALL BE USED ON CAST–IN–PLACE UNITS.
4. ◒ DIMENSIONS SHOWN ARE MINIMUM. ACTUAL DIMENSIONS MAY VARY WITH FABRICATOR AND WITHIN INDUSTRY ACCEPTED TOLERANCES.
5. ◒ UNITS SHALL BE ASSEMBLED USING BOLTS, AS SHOWN, AND EPOXY RESIN ADHESIVE CONFORMING TO AASHTO M 235, AT ALL JOINTS.
6. ◒ FABRICATOR SHALL SUBMIT TO THE ENGINEER, FOR APPROVAL, PROVISIONS FOR LIFTING COMPONENT PARTS INTO PLACE.
7. WHEN SHOWN ON PLANS, ARCH PIPE ( METAL OR CONCRETE ) OR ELLIPTICAL PIPE MAY BE USED IN LIEU OF FULL CIRCLE PIPE. WHEN USING ARCH OR ELLIPTICAL PIPE AS A SUBSTITUTE FOR FULL CIRCLE PIPE, THE RESPECTIVE INSIDE SPAN PLUS TWO WALL THICKNESSES MAY NOT EXCEED ANY W DIMENSION SHOWN IN THE TABLE OF END SECTION DIMENSIONS.
8. SHARP EDGES ON PRECAST OR CAST–IN–PLACE UNITS MUST BE CHAMFERED OR ROUNDED TO THE POINT OF SAFE HANDLING. THE CHAMFER SHOULD BE 1/2", OR ROUNDED WITH AN EDGING TOOL.
9. WHEN GRATE MEMBERS ARE REQUIRED, ALL BOLTS, NUTS, WASHERS, BRACKETS, AND STEEL PIPE ARE CONSIDERED PARTS OF THE END SECTION. PAYMENT FOR THESE ITEMS SHALL BE INCLUDED IN BID PRICE FOR THE END SECTION.
10. PIPE FOR SAFETY GRATES SHALL BE 3" x 7.58 LBS./FT. STANDARD WEIGHT STEEL PIPE, SCHEDULE 40. IT SHALL BE FURNISHED GALVANIZED, PLAIN END AND SHALL MEET THE MINIMUM REQUIREMENTS OF ASTM A53.
11. ANY GALVANIZED AREA(S) OF METAL PIPE DISTRESSED DURING THE POST FABRICATION AND/OR HANDLING PROCESS SHALL BE COATED WITH AN APPROVED ZINC RICH PAINT.
12. THREADED ROD, BOLT AND NUTS SHALL CONFORM TO ASTM A307.
13. ALIGNMENT SPACER HARDWARE SHALL CONFORM TO ASTM A36.
14. ALL EXPOSED STEEL SHALL BE GALVANIZED OR PAINTED IN ACCORDANCE WITH SECTION 725.04 OF THE 2009 ODOT STANDARD SPECIFICATIONS.
15. ALL REINFORCING STEEL TO BE #5 BARS AT 6" CENTERS, WITH 12" OVERLAPPING REINFORCING STEEL BETWEEN ADJACENT WALLS, WINGS, TOE WALL AND FLOOR.
16. CRITERIA FOR USE OF PIPE SAFETY GRATE MEMBERS:
    ( A ) ALL SIDE DRAIN AND CROSS DRAIN INSTALLATIONS INSIDE THE CLEARZONE.
    ( B ) ALL INSTALLATIONS OUTSIDE THE CLEARZONE WHERE HAZARD POTENTIAL IS HIGH BASED ON TRAFFIC DIRECTION, SPEED, CLASS, VOLUME AND SIZE OF CULVERT.

NOTE: ANALYZE HYDRAULIC PERFORMANCE AT VARYING DEGREES OF CLOGGING AND APPLY RISK ASSESSMENT BEFORE USING GRATES.

| BASIS OF PAYMENT | | |
|---|---|---|
| ITEM NO. | ITEM | UNIT |
| 613 (N) | ( ) SLOPED CONCRETE END SECTION | EA. |

■ SPECIFY TYPE ( EXAMPLE: TYPE A4 SLOPED CONC. END SECTION )
■ S. C. E. S. ORIENTATION, GRATED OR NON–GRATED SHALL BE SHOWN IN PLAN SUMMARIES.

■ TYPICAL LEGEND FOR PLAN SUMMARY

| | |
|---|---|
| SD4 – SIDE DRAIN | 1:4 |
| SD6 – SIDE DRAIN | 1:6 |
| CD4 – CROSS DRAIN | 1:4 |
| CD6 – CROSS DRAIN | 1:6 |
| GR – GRATED | |
| NG – NON–GRATED | |

| REVISION | BY | DATE |
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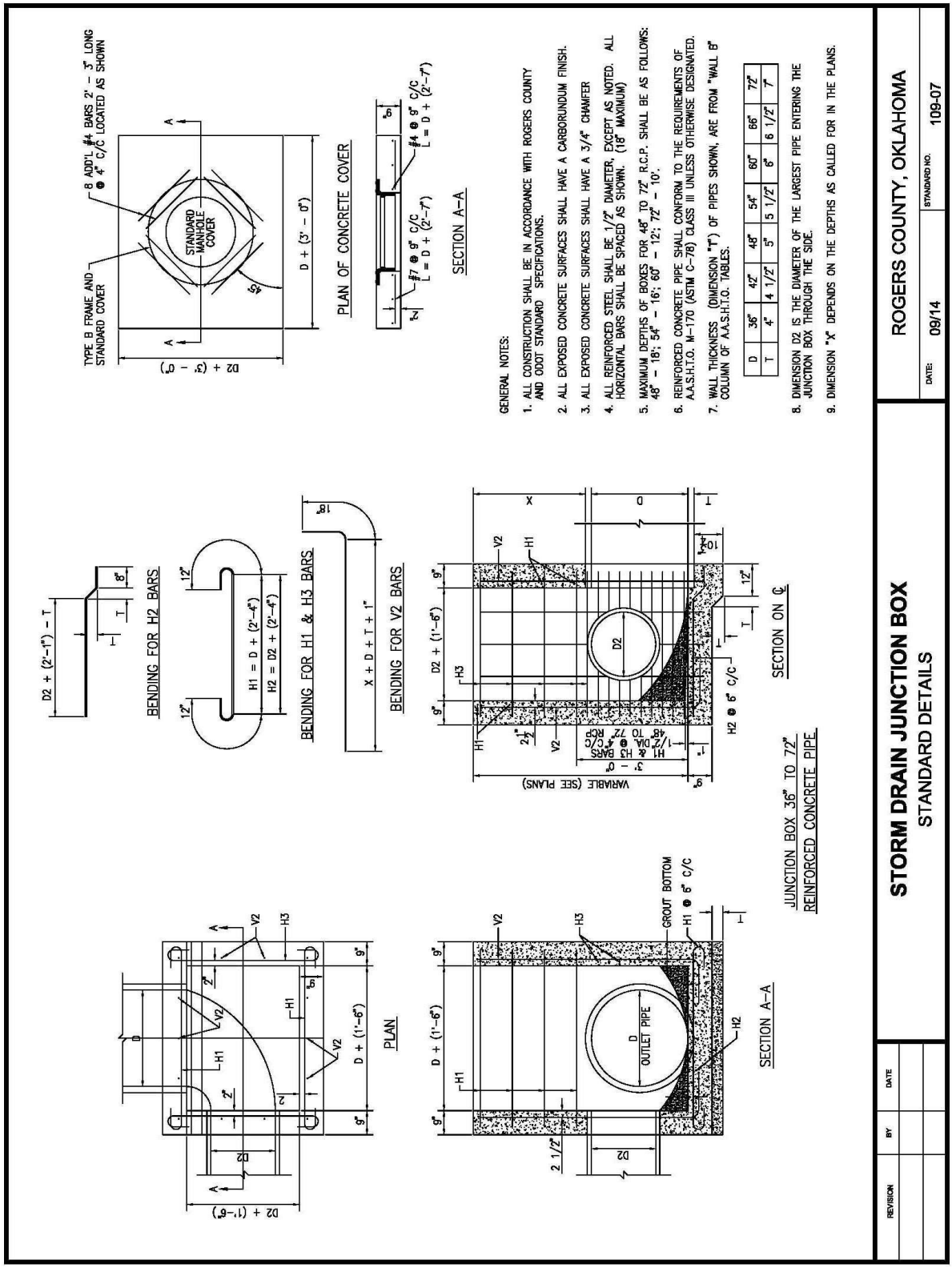
# SLOPED CONCRETE END SECTIONS
## STANDARD DETAILS

ROGERS COUNTY, OKLAHOMA

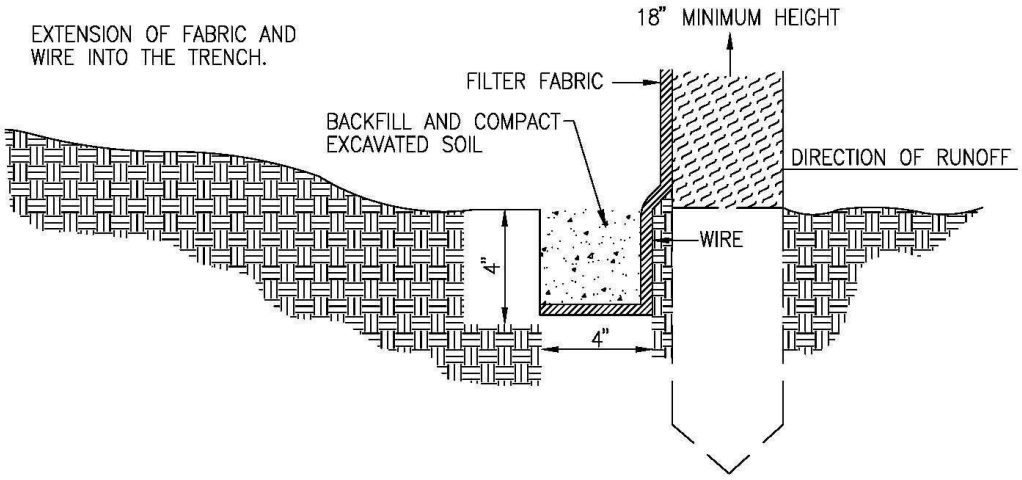
DATE: 09/14

STANDARD NO. 108-07

## 101.9 Junction Box



## 101.10 Silt Fence




INSTALLATION

1. SET POSTS AND EXCAVATE A 4" x 4" TRENCH UPSLOPE ALONG THE LINE OF POSTS.
2. ATTACH THE FILTER FABRIC TO POSTS AND/OR THE WIRE FENCE AND EXTEND IT INTO THE TRENCH. AND EXTEND IT INTO THE TRENCH. BACKFILL AND COMPACT THE EXCAVATED SOIL.
3. SPLICES IN THE FILTER FABRIC ARE NOT RECOMMENDED. WHEN JOINTS ARE UNAVOIDABLE, FILTER FABRIC SHALL BE SPLICED TOGETHER AT A SUPPORT POST, WITH A MINIMUM 6-INCH OVERLAP.
4. IF A WIRE MESH SUPPORT FENCE IS USED, IT SHALL BE FASTENED SECURELY TO THE UPSLOPE SIDE OF THE POSTS USING HEAVY DUTY WIRE STAPLES AT LEAST 1 INCH LONG, TIE WIRES OR HOG RINGS. THE WIRE SHALL EXTEND INTO THE TRENCH A MINIMUM OF 2 INCHES AND SHALL NOT EXTEND MORE THAN 18 INCHES ABOVE THE ORIGINAL GROUND SURFACE.
5. THE STANDARD STRENGTH FILTER FABRIC SHALL BE STAPLED OR WIRED TO THE FENCE, AND 8 INCHES OF THE FABRIC SHALL BE EXTENDED INTO THE TRENCH. THE FABRIC SHALL NOT EXTEND MORE THAN 18 INCHES ABOVE THE ORIGINAL GROUND SURFACE.
6. THE TRENCH SHALL BE BACKFILLED AND THE SOIL COMPACTED OVER THE FILTER FABRIC.

MAINTENANCE

1. SEDIMENT FENCES AND SEDIMENT BARRIERS SHALL BE INSPECTED IMMEDIATELY AFTER EACH RAINFALL AND AT LEAST DAILY DURING PROLONGED RAINFALL. ANY REQUIRED REPAIRS SHALL BE MADE IMMEDIATELY.
2. SHOULD THE FABRIC ON A SEDIMENT FENCE OR SEDIMENT BARRIER DECOMPOSE OR BECOME INEFFECTIVE PRIOR TO THE OF THE EXPECTED USABLE LIFE, THE FABRIC SHALL BE REPLACED PROMPTLY.
3. SILT DEPOSITS SHOULD BE REMOVED AFTER EACH STORM EVENT. THEY MUST BE REMOVED WHEN DEPOSITS REACH APPROXIMATELY ONE-HALF THE HEIGHT OF THE BARRIER.
4. ANY SILT DEPOSITS REMAINING IN PLACE AFTER THE SEDIMENT FENCE OR SEDIMENT BARRIER IS NO LONGER REQUIRED SHALL BE DRESSED TO CONFORM WITH THE EXISTING GRADE, AND SEEDED IN CONFORMANCE WITH APPLICABLE VEGETATIVE SPECIFICATION.

| REVISION | BY | DATE |
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**SILT FENCE**
**STANDARD DETAILS**

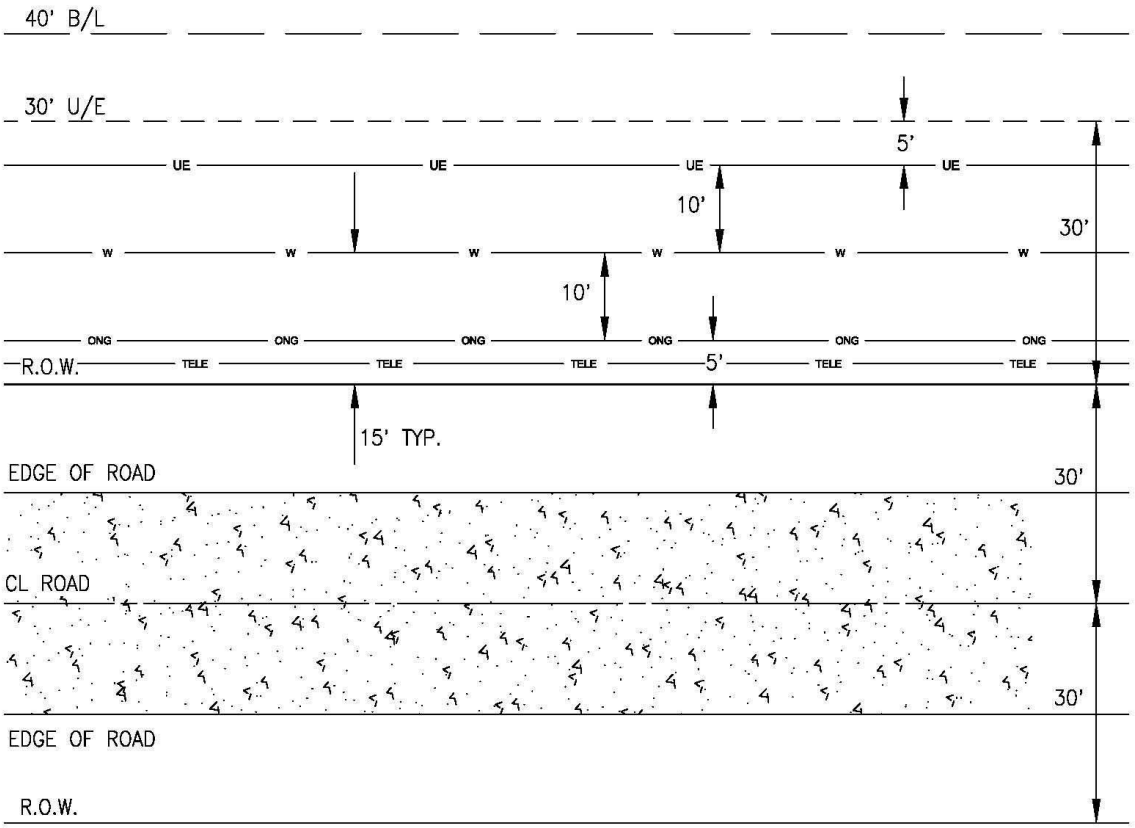
ROGERS COUNTY, OKLAHOMA

DATE: 09/14

STANDARD NO. 111-07

## 101.11 Utility Locations

ALL BURIED UNTILITIES SHALL BE INSTALLED
WITH A MIN. OF 10' HORIZONTAL SEPERATION
ON BOTH SIDES OF A PROPOSED WATER LINE.




# RECOMMENDED UTILITY LOCATION DETAIL
## (FOR UTILITIES ON SAME SIDE OF ROAD)
## N.T.S.

| REVISION | BY | DATE | TYPICAL UTILITY LOCATIONS<br>STANDARD DETAILS | ROGERS COUNTY, OKLAHOMA | |
|---|---|---|---|---|---|
| | | | | DATE: 09/14 | STANDARD NO. 112-07 |
| | | | | | |