
**STREET CONSTRUCTION
AND
SURFACING REQUIREMENTS
FOR THE
CITY OF WAGONER
OKLAHOMA**

Larry Morgan – City Superintendent

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CITY OF WAGONER

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INSURANCE AND BONDS

STREET CONSTRUCTION AND SURFACING REQUIREMENTS

GENERAL

Streets shall include earthwork, proper subgrade, base course(s), wearing surface, concrete curb and gutters, proper backfill, and proper drainage structures, including storm sewers and inlets.

A Maintenance Bond shall be posted in an amount equal to one hundred percent (100%) of the determined amount of construction costs for a one-year period.

Bonds must be executed by a company licensed to do business in the State of Oklahoma, and must be acceptable to the City.

The Provisions hereof shall not apply to public street rehabilitation, overlay and patching project layouts and design.

All materials and construction shall conform to the requirements of the latest edition of the Oklahoma Department of Transportation Standard Specifications for Highway Construction and Standard Drawings.

The Developer shall deposit with the City monies that are equal to the estimated costs of all testing and inspection. The remaining balance after all construction and testing is complete will be refunded to the Developer. If all of the deposited monies are used prior to the completion of the project, the Developer will deposit additional monies that are sufficient to pay for the remainder of all testing and inspections.

All testing of materials and construction shall conform to the attached Frequency Guide Schedule for Sampling and Testing Acceptance.

PLAN SHEETS AND PROFILES

1. All intersections, cul-de-sacs, and other critical locations shall be shown in plan detail at a minimum scale of 1" = 20', including direction of drainage, top of curb elevation at PC's, PT's and high or low points. All curve information and drainage structures shall be shown in detail.
2. All drainage areas shall be clearly marked on the drainage area plan sheet, showing acreage, runoff and offsite pickup points.
3. A site plan showing proposed locations and elevations of all utilities shall accompany the street and storm sewer plans.
4. The profile sheet shall show both property lines, and the pavement centerline profile. Stationing shall be along the pavement centerline.
5. All fill areas within the street right of way shall be cross-hatched on the profile and notation shall be made that the fill area shall be compacted to a minimum of 95 percent standard proctor density. When storm sewer pipes are located in fill area, the fill shall be made and compacted to finish grade, then trenched for storm drain excavation.

6. Curb returns with elevations shall be clearly labeled on profile.
7. Vertical curves in profile shall give the top of curb elevation at the PC, PI, PT, high or low points, and at a minimum of 50 feet intervals.
8. Storm sewers shall be located along centerline of streets or as approved by the City's Engineer.

STREETS

1. Minimum street widths.

Width of streets shall be according to the classifications as provided for by the City. Width shall be measured from curb face to curb face or from edge of design strength pavement.

RESIDENTIAL (LOCAL)	26 FEET
RESIDENTIAL COLLECTOR	36 FEET
COMMERCIAL AND INDUSTRIAL (LOCAL)	32 FEET
COMMERCIAL AND INDUSTRIAL COLLECTOR	40 FEET

2. All secondary and primary arterial street designs shall be furnished by the City.
3. Where Residential Estate (RE) zoning has been allowed the typical pavement section may be a minimum width of 26 feet with four (4) foot turf shoulders on each side. When allowed additional right-of-way shall be dedicated such that the borrow ditch, including the back slope, can be maintained from within the street right-of-way. Borrow ditches shall not exceed 4 feet in depth.
4. All streets shall be constructed with concrete curbs, except as provided for in No. 3 above.
5. The centerline of paving shall be the centerline of right-of-way where dedication has been made according to the major street plan. All other cases shall be determined by the City.
6. The minimum grade set along the curb shall be 0.5 percent. The maximum desirable grade for non-arterial streets shall be limited to 8 percent. For situations where the topography is unusually hilly, grades will be permitted up to a maximum of 12 percent providing they do not exceed 500 feet in length from PT to PC.
7. The grade of the curb returns will continue for the full arc on all intersections where a midway opposing break is not provided.
8. Sag and crest vertical curves shall be designed according to the current ODOT County Roads Design Guidelines Manual.
9. Design speed shall be 25 miles per hour on all residential streets and 30 miles per hour on all collector streets.

10. The minimum centerline radius on street alignment shall be 125 feet.
11. The minimum radius on returns at residential intersections shall be 25 feet. At intersections of a residential and arterial street, the minimum radius on returns shall be 30 feet. At intersections of arterial streets, the minimum radius on returns shall be 40 feet. The minimum radius on the returns for industrial districts shall be 40 feet.
12. The maximum grade of a residential street when intersecting an arterial shall be 2 percent for a minimum of 25 feet from the curb line of the arterial. No vertical curve shall begin any closer than 25 feet from the curb line of the arterial. The maximum grade of residential streets at intersections shall be 4 percent.
13. A proposed and existing profile shall be shown beyond the end of all dead end streets for a minimum of 200 feet to determine a satisfactory grade for future development.
14. Cross slope may be 1/4-inch or 3/8-inch per foot; however, crown will be flattened off so that crown never exceeds curb height.
15. Proposed streets shall intersect one another as nearly at right angles as topography and other limiting design factors permit.

TYPICAL SECTIONS

1. Typical sections shall show dimensions, type of materials, layer details, topsoil, temporary and permanent erosion control, compacted thickness, etc.
2. All typical sections or notes that are necessary to clearly reflect the design shall be included.
3. The developer shall provide soil tests for all areas to be paved. Soil tests will be submitted to the City for approval. If soil tests indicate that the soil has a plasticity index of 12 or greater, a minimum of 6 inches of subgrade shall be modified with a minimum of 5 percent hydrated lime by weight Class III fly ash or kiln dust. If the soil tests indicate that the soil is granular and unstable, the method of stabilization shall be approved by the City. If desired, subgrade may be built of an approved borrow material. The subgrade and/or base material shall be compacted to 95% of Standard Density.
4. Industrial and commercial pavement sections shall be a minimum of 10-inch asphaltic concrete or 8-inch Portland cement concrete. Residential pavement sections shall be a minimum of 6-1/2-inch asphaltic concrete (4 1/2-inches Type A and 2-inches Type B) or 6-inch Portland cement concrete. Tack shall be applied at a rate of 0.05 gallons per square yard, undiluted.
5. Pavement sections for secondary and primary arterial streets shall be furnished by the City.
6. Portland cement concrete streets shall have an integrally placed curb of the same mix design as for street paving. The curb shall be a minimum of 6 inches wide at the top and curb face shall be a minimum of 6 inches in height exclusive of bottom fillet.

7. Joints in Portland cement paving, curbs and gutters shall be placed in accordance with the City's recommendation.
8. Asphaltic concrete streets shall have a Portland cement concrete curb and gutter. The curb shall not be less than 6 inches wide at the top with a 6-inch face in height exclusive of bottom fillet and the gutter shall be a minimum of 12 inches in width.
9. All curb sections shall be barrier type curb. No mountable type curbs will be allowed.
10. Asphaltic Concrete shall be Types A, B and C per Oklahoma Department of Transportation Standard Specifications for Highway Construction.
11. Concrete shall be Class "A" Paving Concrete with 5-7% entrained air, with cement content determined by AASHTO T121 standard.
12. Where Residential Estate (RE) zoning has been allowed the typical roadway section may be a minimum of 6 inches of stabilized aggregate base on compacted subgrade with 6 1/2 inches of asphaltic concrete. The stabilized aggregate base on compacted subgrade shall extend to the outside edge of shoulder.

CROSS SECTIONS

1. Cross sections may be required by the City as a part of the construction plans when necessary to reflect more clearly the intent of the design.
2. All cross sections for street rights of way shall be drawn to scale showing existing ground and proposed construction from building line to building line.
3. Typical cross sections shall be shown for each street if the slope to the property line exceeds one-quarter inch per foot.
4. Each section shall be stationed clearly.
5. The beginning and ending points of a project shall be stationed and cross sections for both the stations shall be drawn.
6. Maximum distance between cross section stations shall be 100 feet.
7. Sufficient information shall be furnished to show that water is not ponded behind curbs or in ditches.
8. Scale for cross sections shall not be less than:

Channels 1" = 10' Horizontal 1" = 5' Vertical

Streets 1" = 5' Horizontal 1" = 5' Vertical

STRUCTURES AND SPECIFIC DETAILS

1. All special structures will be detailed.
2. Special structures shall be drawn to scale unless noted otherwise.
3. Sufficient details, dimensions and related notes shall be provided for all structures.
4. All structures subject to vehicular traffic shall be designed for H-20 loading.
5. All bridge design shall meet the requirements in the latest edition of Standard Specifications for Highway Bridges prepared by AASHTO.
6. ODOT Standard Drawings shall be used where practical.

SIDEWALKS

1. All sidewalk layouts and designs for the central business district and other commercial and industrial areas shall be furnished by the City.
2. Sidewalks may be required on both sides of local and collector streets serving a residential subdivision, except where Residential Estate (RE) zoning has been allowed.
3. All sidewalks shall be of Portland cement concrete. Sidewalks shall include pedestrian bridges across creeks and streams where applicable.
4. The finished thickness of Portland cement concrete sidewalks shall not be less than 3-1/2-Inches and the width shall be not less than 4 feet.
5. In general, sidewalks shall be constructed within the dedicated right-of-way at a distance no less than one foot from the abutting property lines, and except at intersections or as approved by the City, shall be no less than 3 feet from the outside curb line of the street pavements.
6. Sidewalks must provide access for the safe and convenient movement across curbs of physically handicapped persons, including those persons in wheelchairs. Wheelchair ramps shall be constructed in accordance with standard details provided by the City.

EASEMENT AND RIGHT-OF-WAY

1. Easements and rights-of-way shall be clearly dimensioned on the plans.
2. All overland restricted drainage easements will be shown detailed on the "Plans" and "Final Plat", as well as described in the conditions and restrictions of the plat.
3. An unimproved drainage way left in a natural state shall be dedicated to the public, either by title or easement, and platted with a minimum width equal to the floodplain width required to pass the regulatory flood. Dedicated drainageway shall be provided

with adequate vehicular ingress and egress for maintenance purposes. If said drainageway width is less than 150 feet the minimum width required will be the floodplain plus an additional width of 15 feet on each side of the floodplain. Said dedication may have an ownership reverter provision.

4. The City may accept dedication of the entire floodplain area for an unimproved channel.
5. Adequate restrictive easements for dedicated right of way must be provided for access and maintenance.
6. The minimum width for all storm sewer easements shall be the outside diameter of pipe plus 10 feet, and the pipe shall be laid in the center of easement.

LIGHTING

1. Installation of street lights by the Developer, as approved by the City, will be for the purpose of traffic safety only.
2. The City will not assume maintenance and operation costs of street lights installed as a part of the original subdivision for security purposes, should status change occur (i.e. annexation).
3. The City will plan the location of street lights in all new subdivisions upon receiving an official "preliminary" plat of the subdivision for review.

STORMWATER DRAINAGE REQUIREMENTS

RUNOFF

1. All stormwater runoff shall be subject to review and approval by the City with regard to analysis, design and construction of drainage way facilities. The appropriate public authority shall have the right to maintain or to cause to be maintained the drainageway system for its intended purposes. If a stormwater master drainage plan is adopted for the area under consideration, then the provisions of the plan shall be adhered to.

The drainage system, both public and private, may consist of storm sewers (which are closed conduits); improved channels constructed in conformity with adopted City Standards; unimproved drainageways left in their natural condition; the areas covered by restricted drainageway easements for the purpose of providing overland flow, and all appurtenances to the above including inlet manholes, junction boxes, headwalls, dissipators, culverts, etc. All portions of the drainage system that exist on dedicated rights-of-way or restricted drainage easements shall be owned and maintained by the City, unless provided otherwise by agreement or covenant.

The drainage system plans shall show both plan and profile views of the proposed improvements. Any manhole or access point to the system that is buried out of sight shall be dimensioned to permanent objects in the vicinity.

2. The stormwater drainage system shall be designed to receive and pass the runoff from a 100-year frequency rainstorm under full urbanization. Full urbanization is defined as the total development in an area that is anticipated. The entire flow shall be confined within the said stormwater drainage system.

3. The stormwater collection system shall be designed either:
 - A. To pass a minimum of the runoff from a 5-year frequency rainstorm in a pipe network with overland flow capacities so that the combination of any two will pass the runoff from a 100-year frequency rainstorm under fully urbanized conditions.
 - B. Or, to pass the entire runoff from a 100-year frequency rainstorm in the pipe network. Should the entire runoff from a 100-year frequency rainstorm be conveyed in a pipe network, a nominal frequency rainstorm shall be designed to carry flow in the event of inlet blockage or bypass.

The Overland flow portion of the collector system shall be confined to dedicated rights-of-way, or restricted drainage easements to assure that stormwater can pass through the development without inundating the lowest level of any building, dwelling, or structure. Restricted drainage easements shall be shown on the plan. The main channel of the drainage system shall not be bound to carrying the 5-year frequency rainstorm in a pipe network.

4. The rational method of runoff analysis may be used for the design of the closed pipe networks of the storm sewer system up to drainage areas of 640 acres. For drainage areas over 640 acres, a hydrograph method shall be used.

5. The Rainfall Intensity Curves prepared from TP-40 and National Weather Service HYDRO-35 (June 1977 or latest edition) shall be used for design in determining the rainfall.

6. The Oklahoma Department of Transportation Technical Manual (latest edition) shall be used for determining the basic "C" values.

A weighted "C" value shall be determined with minimum values of 0.45 for residential (RS and RD), 0.65 for multifamily (RM) and 0.90 for industrial and commercial areas. Unplatted areas with 300 feet either side of an arterial shall be either considered commercial or shall be in accordance with the comprehensive plan in estimating runoff coefficients.

7. The distance between inlets, as well as the distance to the first inlet, shall be determined by the following, whichever is less:

A. For the 5-year frequency rainstorm two driving lanes must remain open for streets on grade.

B. For the 100-year frequency rainstorm, one driving lane must remain open for streets on grade.

Further, the depth of flow shall not exceed curb depth.

C. A maximum time of concentration of 10 minutes to the first inlet shall be used for single or multifamily residential areas.

D. A maximum time of concentration of 10 minutes to the first inlet shall be used for commercial and industrial areas.

E. 600 feet.

8. At sump locations, the water depth shall not exceed 12 inches above the top of the curb, or 18 inches above the top of the grate, whichever is less, for the 100-year frequency rainstorm.

9. Where sump collection systems are used, an overflow route shall be established in the event of complete blockage of the sump.

10. Runoff from areas greater than one half (1/2) acre outside the roadway shall be collected before it reaches the roadway. Parking lots shall have internal drainage systems so as to reduce concentrated flow into streets. This item does not apply to single-family residential lots.

11. Inlets shall be located at intersections to collect the flow from crossing the intersection. Inlets at intersections shall be located so they do not encroach upon the curb return. No drainage structure shall be permitted at a wheelchair ramp.

12. Drainage areas, runoff from 5-year and 100-year frequency rainstorms, time of concentration, and inlet design for each inlet shall be summarized and tabulated on the plans. This summary table shall also be a part of the drainage calculations.

The flows and velocities for each pipe and open channel shall be summarized and tabulated as above.

If a tract of land under development has a floodplain area within its boundary, then a hydraulic (backwater) analysis of the existing and proposed drainage system shall be provided to show any impact the proposed development has on the floodplain area and elevation.

13. Trapezoidal channels shall be designed with a concrete lined low flow channel. The low flow channel shall branch off to pick up any storm sewers discharging into the channel. The top of the sides of the low flow channel shall be a minimum of 6 inches lower than the adjacent main channel bottom. This is to insure that the drainage runs over and into the low flow channel and not erodes around it. The minimum cross slope on the bottom of the trapezoidal channel shall be 2 percent. The easement for the trapezoidal channel shall include 10 feet additional width along the top of the bank for an access road.
14. Roughness coefficients for drainage design will be as listed in tables 5-5 and 5-6, figure 5-5, pages 109 through 123, of "Open Channel Hydraulics" by Yen Te Chow (published by McGraw-Hill Book Company, 1959, or latest edition).
15. The minimum velocity in any drainage system shall be 2.5 feet per second for all events of 5-year frequency and greater. The maximum velocity in a pipe shall be 30 feet per second and the maximum velocity in an unlined ditch shall be 6 feet per second.
16. Culverts shall be sized using either Kutters or Mannings charts and the Federal Highway Administration's inlet control charts for the design flow. The slope used for design shall be the slope of the invert of the culvert.
17. No pipe shall be installed downstream having a diameter smaller than the pipe from which it is receiving water.
18. Concrete pipe shall not be less than C-7.5 Class III. Corrugated metal pipes shall meet Oklahoma Department of Transportation gauge requirements for fill heights, and bituminous coated and lined. Concrete pipe shall be used at all street crossings. HDPE pipe may be used if approved by the Engineer at other locations.
19. Junctions between different pipe sizes shall be made with the top inside of the downstream pipe no higher than the top inside of the upstream pipe.
20. A manhole or junction box shall be required at all changes of grade, changes in alignment, and junctions between two or more different size pipes.
21. The horizontal distance between pipes being placed in the same trench shall be a minimum of two feet or one-third the diameter of the larger pipe, whichever is greater. This would include multiple pipe crossings for culvert purposes.
22. The minimum storm sewer pipe size shall be 15 inches (18 inches under pavement). Use of smaller pipes, such as for detention pond out-lets, shall require prior approval by the City.

23. Radius pipes will not be used on storm sewers having a diameter of 36 inches or less. Radius pipes may be used on storm sewers larger than 36 inches. The radius of the curve shall be no less than 5 times the diameter of the pipe. The degree of deflection shall be no more than 7 1/2 degrees per joint of radius pipe, or the pipe manufacturer's recommendation, whichever is less. The City is allowed to require radius pipe, should the energy loss be excessive and thereby detrimental to the system.
24. A minimum of 6 inches cover shall be provided over pipes and box culverts to the bottom of the subgrade in paved areas except when the box culverts are built with the top at grade.
25. All storm sewers shall be shown in profile, showing flow-line, size, type and grade. Profiles shall show the natural and proposed ground line at the centerline of the storm sewer. Stationing shall be continuous through manholes, along the main (longest) line, to the top of the system. Branch lines shall be stationed, starting from 0+00, from their connection with the main line. Lines shall be stationed on the profile drawing from left to right increasing upstream.
26. The radius of curve for a box structure shall be a minimum of 3 times the maximum width of the box structure, but not less than 50 feet.
27. New box culverts and bridges shall have adequate capacity to pass 100-year fully urbanized flows. A backwater analysis may be required to illustrate compliance with this requirement.
28. Pipes discharging at a steep gradient into drainageways and detention facilities shall be provided with a head wall and energy dissipators. A steep gradient is defined as an energy grade line whose outlet velocity is greater than six feet per second.
29. The centerline radius of a curve on an improved open channel shall be a minimum of 3 times the top width at the design flow or 100 feet, whichever is greater.
30. All improved channels shall be provided with a minimum of one foot of freeboard above normal depth of the runoff from a 100-year frequency rainstorm.

At all bends in improved channels, the amount of freeboard shall be increased by the following equation:

$$H = \frac{V^2 \cdot b}{64.4 \cdot r}$$

Where: H is Height of freeboard in feet.

V is the average Velocity in feet per second.

b is the Width of the channel at the design water surface in feet.

r is the Radius of curvature of the channel centerline in feet.

The increased freeboard height shall be maintained a minimum of one channel width upstream and downstream of the bend.

31. When storm sewers are constructed in fill areas, all materials in fill areas shall be compacted to a 95 percent standard proctor density prior to the trenching and laying of the pipe.

32. Maximum spacing between manholes or junction boxes shall not exceed 400 feet for pipes of 15 inches and 500 feet for pipes greater than 15 inches.
33. All junction boxes and manholes shall be built with the Standard Manhole Ring and Cover at grade.
34. A manhole or junction box shall be constructed at the P.C. or P.T. of all curves in sewers.
35. Borrow ditches, when allowed, shall not exceed 4 feet in depth. Driveway culverts shall be sized to handle the 5-year or larger storm (minimum 15" diameter). The side slope on the bank next to the road shall be a maximum of 3 feet horizontal to 1 foot vertical, or flatter. The side slope on the opposite bank shall be a maximum of 3 feet horizontal to 1 foot vertical.
36. A Maintenance Bond shall be posted in an amount equal to 100% of the determined amount of construction costs for a one-year period.

STORAGE

1. The detention storage requirements shall be the excess runoff from a 100-year frequency storm.

The excess runoff is that runoff generated due to urbanization which is greater than the runoff historically generated under existing conditions, for a given frequency storm.

Peak release rates from developments shall not exceed the existing runoff that occurred before development for all storm frequencies up to and including the 100-year frequency storm. As a minimum, the 5-year and 100-year storms shall be investigated.

If a stormwater master drainage plan is adopted in the area under consideration, then the provisions of the plan shall be adhered to. The City's Engineer will determine where detention will be required.

2. For the design of storm water storage facilities, the following methods are approved for the use:

<u>Method</u>	<u>Drainage Area</u>
HEC-1 SCS Method	Up to 2000 acres
Modified Rational Approach with volume factors	Less than 10 acres
Graphical method	Less than 2 acres

3. U S Weather Bureau Technical Paper No. 40 and National Weather Service HYDRO-35 (June, 1977) shall be used for rainfall information.
4. The rainfall pattern shall be used in accordance with the modeling technique selected.

5. For SCS synthetic unit hydrograph method, the loss rates in determining the runoff/hydrograph shall be an initial loss of 0.5 inches and a uniform loss of 0.08 inches per hour for the subsequent hours once the initial losses are satisfied.

6. All calculations for detention facilities shall be submitted for review by the City.

The submittal shall include hydrographs for both existing and developed conditions, detention facility stage-area-volume relationships, outlet structure details, and a stage versus time analysis through the facility.

7. The intent of the stormwater detention requirements shall be identified at the preliminary plat stage of the project review. The 100-year frequency rainstorm floodplain areas and stormwater detention site locations shall be shown on the preliminary plat to illustrate how these areas will be managed during and after construction.

The 100-year-frequency rainstorm floodplain is defined as the area of land that the runoff from the 100-year frequency rainstorm inundates.

8. Detention facilities should be located in areas which require a minimum of maintenance.

9. Detention facilities may be located in the floodplain area or flood hazard area, providing the floodplain area and the flood hazard area are determined with the facility in place and that no rise in the water surface offsite of the development results from the installation of the facility except that permitted by City Ordinance.

10. Additional detention storage, in excess of the required storage for a drainage area, can be provided to satisfy the detention requirements for a tract of land downstream of the detention facility, providing the detention facility is constructed prior to the development of the downstream tract.

11. All detention facilities shall be designed "dry" unless a special maintenance agreement, in writing, has been approved by the City.

12. A minimum number of detention facilities is encouraged for each development.

13. If runoff has a natural tendency to drain in several directions for a given development tract of land where detention is required, then detention storage shall be provided for the biggest drainage area. Additionally detention storage may be provided, at the same facility, to satisfy detention requirements for a separate drainage area on the same development, provided that:

A. The whole developmental tract of land is in the same watershed.

B. The smaller drainage area(s) that, has/have been compensated for does/do not, either singly or in combination, adversely impact the health, welfare and safety of the general public downstream.

14. Detention facilities may be used for compensatory storage when encroaching into the floodplain area provided that the overall drainage system does not:

- A. Cause a rise in the water surface elevation beyond the extent of the developmental tract of land.
- B. Adversely impact adjacent properties by an increase in velocity.
15. All dikes and spillways on detention facilities shall have typical cross sections shown on the plans.
16. Side slopes on detention facilities shall not be steeper than 4:1 (Horizontal: Vertical). Steeper side slope may be allowed should the site conditions necessitate; however, methods for proper erosion control must be established and illustrated, and the procedures for maintaining these steeper side slopes must be established and shown on the plan.
17. Detention facilities shall be provided with a low flow channel from the inlet to the outlet structure to transmit low flows and the low flow channel shall be approved by the City, the low flow channel shall be concrete lined and of sufficient width and geometry to allow for proper maintenance.
18. The easements for the storm sewers and detention ponds shall appear on the plat.
19. An accessway at least 20 feet wide shall be provided to any detention area. Access may be provided by frontage on a dedicated public street or by an access easement from a dedicated public street to the detention area. The access road shall have a maximum grade of 10 percent. The access road shall be paved, 12 feet wide, from the top of the bank to the bottom of the detention pond and in the bottom of the detention pond to locations of high maintenance.
20. If the detention facility is approved by the City to serve areas outside the subdivision in which it is located, such additional areas shall be specifically identified in the provision for detention.
21. Spillways on detention facility dams shall be constructed to pass the 100-year flood event with a minimum of one (1) foot of freeboard on the earth dam structure. All detention facilities shall meet the Oklahoma Water Resources Board's requirements.
22. All earth slopes and areas subject to erosion, such as, adjacent to trickle channels, inlet structures, and outlet structures, shall be slab sodded with bermuda sod or protected with other erosion control measures. All other earth surfaces, with the area designated for detention pond site, shall have an established growth of bermuda grass or other approved species. All grass-covered areas shall be fertilized to current recommendations, watered and in an established growing condition prior to completion and approval of the detention pond.
23. Detention facilities shall be environmentally sound and compatible with the area (neighborhood). Where feasible, multiple uses for the facilities should be established.
24. The maintenance responsibility for on site detention facilities shall be determined during the Platting process. A written agreement between the development and the City defining the maintenance responsibility shall be made prior to the development's acceptance by the City.

25. A Maintenance Bond shall be posted in an amount equal to 100 percent of the determined amount of construction costs for a one-year period.

DETENTION FACILITIES

1. Definition

- A. A regional detention facility is a storm water detention facility and collection system which provides stormwater detention capacity for all new development in a defined drainage area.
- B. An on-site detention facility is a storm water detention facility built on the site of the development to provide detention storage for that development.
- C. Major developments are defined as any development which is planned to have greater than 1/2 acre of impervious surfaces. For single-family residential lot development, the impervious surface is assumed to include 2700 square feet per building lot, unless better information is available. An impervious surface shall include all surfaces which do not allow an appreciable amount of infiltration. This includes, but not limited to roads, driveways, roofs and parking lots both paved and gravel.
- D. Minor development is a development which is less than a major development.
- E. An existing problem is defined as stormwater runoff from the 100-year frequency rainfall event which flows out of the drainage easement. If there is no drainage easement covering the watercourse, then a problem is when the runoff flows out of its channel banks in developed areas. In undeveloped areas without a drainage easement, a problem is when the runoff flows out of its channel banks and overtops roads and/or impacts structures.

2. Regional Detention Facility in Place or Planned

When there is a regional detention facility in place in the drainage area where development is planned, or one is planned in the near future, then all new development may incorporate the regional detention facility into the design of the drainage system for the development.

3. No Regional Detention Facility

When there is no regional detention facility constructed or planned in the near future for a particular drainage area where development is planned, then the following shall apply:

- A. When there is an existing drainage problem downstream of the development, then new major development is required to provide on-site detention. The method of maintenance shall be set forth in the deed restrictions.

The only exception to on-site detention is new construction of a single family home on an existing lot, tract or parcel, which has not complied with the storm drainage detention requirements of this ordinance.

- B. When there is no drainage problem downstream of the development, then new development shall build on-site detention facilities, unless the development can show that the development will not produce a problem downstream.

4. Maintenance Responsibility

- A. The property owners in the development shall be responsible for maintenance of its detention facility in a residential, commercial or industrial development. If the detention facility is privately maintained, then the maintenance requirements shall be set forth in the deed restriction and the City shall be party to these deed restrictions.

- B. The City shall be responsible for the maintenance of other detention facilities. If the detention facility is to be publicly maintained then the detention facility and access to it shall be deeded to the City.

SOIL EROSION AND SEDIMENTATION CONTROL

GENERAL

Soil erosion and sedimentation is greatly accelerated during construction activities. In order to control these natural processes the following practices shall be adhered to:

1. A temporary barrier consisting of a straw bale dike shall be placed around all storm sewer inlets to prevent sediment from entering the storm sewer system.
2. Straw bale dikes shall also be placed along streets adjacent to areas of land exposed or stripped of vegetation due to grading or construction activities.
3. A diversion or perimeter dike shall be constructed where concentrated flow of surface runoff is to be conveyed down slope onto adjacent properties.
4. A stabilized construction entrance shall be built to reduce or eliminate the tracking or flowing of sediment onto public right-of-ways.
5. Immediately upon completing construction, all exposed areas of land shall be properly seeded in accordance with adopted standards.

STANDARD FORM

GOOD FAITH ESTIMATE OF TESTING AND INSPECTION COSTS

WAGONER, OKLAHOMA

PROJECT: _____ DATE: _____

SCOPE: GRADING, DRAINAGE, SURFACING, ETC.

A. TESTING

	<u>ESTIMATED NUMBER OF TESTS</u>	<u>UNIT COST</u>	<u>TOTAL COST</u>
1. ATTERBERG LIMITS	_____	_____	_____
2. DENSITIES:			
a. PAVEMENT SUBGRADE	_____	_____	_____
b. AGGREGATE BASE	_____	_____	_____
c. ASPHALT PAVEMENT	_____	_____	_____
d. PIPE TRENCH BACKFILL	_____	_____	_____
3. EXTRACTIONS (ASPHALT PAVEMENT) ..	_____	_____	_____
4. CORES (ASPHALT PAVEMENT)	_____	_____	_____
5. CYLINDER BREAKS (P.C. PAVEMENT)	_____	_____	_____
6. OTHER	_____	_____	_____

B. INSPECTION

	<u>ESTIMATED NUMBER NUMBER OF HOLES</u>	<u>RATE</u>	<u>TOTAL COST</u>
1. GRADING	_____	_____	_____
2. DRAINAGE	_____	_____	_____
3. SURFACING	_____	_____	_____
4. MISCELLANEOUS STRUCTURES	_____	_____	_____
5. OTHER	_____	_____	_____

C. MISCELLANEOUS COSTS

TOTAL ESTIMATED COSTS \$ _____

APPENDIX 700A

APPENDIX 700A

FREQUENCY GUIDE SCHEDULE FOR SAMPLING AND TESTING ACCEPTANCE

This guide has been developed to provide project personnel with information necessary to conduct adequate sampling and testing of materials and construction serials. This frequency should be considered to be a minimum. All acceptance sampling and testing is to be performed by the Contractor to determine the quality and acceptability of materials and workmanship which have been or are being incorporated in a project.

SPEC. SECTION	ITEM	MATERIALS	TESTS	TEST METHOD	SAMPLING FREQUENCY	SAMPLING LOCATION	SIZE OF SAMPLE
SECTION 300 - EARTHWORK AND ROADSIDE DEVELOPMENT							
202	EXCAVATION & EMBANKMENT		STD DENSITY	T-99*	1 PER SOIL TYPE OR AS NEED IS INDICATED	RDY LIMITS OR BORROW PIT	10-40 LBS.
			IN-PLACE DENSITY & MOISTURE CONTENT	T-238, T-239*	2 PER DAY OR AS REQUIRED	ROADWAY	
SECTION 300 - BASE							
303	AGGREGATE BASE	703.01	QUALITY		NEW SOURCE OR ANNUAL REQUALIFICATION WITH ADDITIONAL SAMPLES AS NECESSARY	STOCKPILE OR ROADWAY	200-250 LBS.
			GRADATION, U.C. & P.L.	T-27, T-89 & T-90	1 PER SOURCE AND EACH 800 CU. YDS. IN PLACE	ROADWAY	75-100 LBS.
			STANDARD DENSITY	T-180	1 EACH SOURCE USED IN PROJECT AND 1 PER 18,000 SQ. YDS.	ROADWAY	200-250 LBS.
			IN-PLACE	T-238, T-239	1 PER 1000 UNITS PER LANE	ROADWAY	
306	SUBBASE	704.01	GRADATION, U.C. & P.L.	T-89 (MOD.) T-89 & T-90	1 PER 200 CU. YDS. IN PLACE	ROADWAY	10-40 LBS.
			STANDARD DENSITY	T-99	EACH SOURCE OR BLEND USED ON PROJECT, MINIMUM 1 PER 150,000 SQ. YDS.	ROADWAY	10-40 LBS.
			IN-PLACE DENSITY	T-238, T-239	1 PER 1000 UNITS PER LANE	ROADWAY	
307	LIME TREATED SUBGRADE		QUALITY	LAB	1 SAMPLE PER 1000 UNITS	TRANSPORT	5 LBS.
		708.01	LIME REQUIREMENT	LAB	1 EACH SOIL EXTENT TO LAB FOR LIME REQUIREMENT	ROADWAY	50 LBS.
			TARGET DENSITY & OPTIMUM MOISTURE	T-99 (MOD.)	1 EACH SOIL TYPE EXTENT	ROADWAY	
			IN-PLACE DENSITY & MOISTURE	T-238, T-239, T-285	1 PER 1000 UNITS PER LANE	ROADWAY	
309	ROLLING AND SPRINKLING		VISUAL	DIARY			
			STANDARD DENSITY & OPTIMUM MOISTURE	AS SPECIFIED OR SHOWN ON MEANS		ROADWAY	
			IN-PLACE DENSITY & MOISTURE	T-238, T-239, T-285	1 PER SOIL TYPE OR 2 PER DAY	ROADWAY	
310	SUBGRADE METHOD B		STANDARD DENSITY & OPTIMUM MOISTURE	T-99	EACH SOIL TYPE EXTENT	ROADWAY	
			IN-PLACE DENSITY & MOISTURE	T-238, T-239, T-285	1 PER 1000 SQ. YDS. OR 1,000 LIN. FT. PER LANES	ROADWAY	
312	P. CEMENT TREATED BASE		LAB	CERTIFICATION	CHECK IDENTIFICATION OF SHIPMENT AS FROM APPROVED SOURCE		
		701.02	LAB		COMPOSITE SAMPLES FOR APPROVAL AND CEMENT REQUIREMENT	PIT OR ROADWAY	75-100 LBS.
		704.04	GRADATION, U.C. & P.L.	T-89, T-89 & T-90	FIELD TEST OF RAW SOIL TO CHECK UNIFORMITY AND SPECIFICATION REQUIREMENT PER 1000 CU. YDS.	ROADWAY	
			TARGET DENSITY	T-99 (MOD.)	DETERMINE MAXIMUM DENSITY AND OPTIMUM MOISTURE AT TIME OF LAYING	ROADWAY	
			IN-PLACE DENSITY	T-238, T-239	EACH SOIL TYPE EXTENT	ROADWAY	

* ALTERNATE TEST METHOD T-191 OR T-206

** FAMILY OF CURVES METHOD MAY BE USED TO ESTABLISH STANDARDS WHERE APPLICABLE

1 & 2 WHEN APPLICABLE OIL CONTENT MAY BE DETERMINED WITH OIL CONTENT GAGE AND AGGREGATE GRADATION BY BELT SAMPLE

SPEC. SECTION	ITEM	MAT'L	TESTS	TEST METHOD	SAMPLING FREQUENCY	SAMPLING LOCATION	SIZE OF SAMPLE
317	FLYASH MODIFIED SUBGRADE	702-3	CERTIFICATION		IDENTIFY AS BEING FROM AN APPROVED SOURCE		
	HYDRANT TIE	708107	SEE SECTION 307				
	QUICKLIME	708107	SEE SECTION 307				
	BY PRODUCT LIME	708107	SEE SECTION 307				
	WATER	70104	SEE SECTION 414				
	SUBGRADE						
	SOIL-FLYASH MIXTURE		SEE SECTION 307				
325	SEPARATOR FABRIC FOR BASES	708	CERTIFICATION		IDENTIFY AS BEING FROM AN APPROVED SOURCE		1 SQ. YD.
407	TRACK COAT						
	BITUMINOUS MATERIALS	708103	LAB	CERTIFICATION	IDENTIFY AS BEING FROM AN APPROVED SOURCE		
408	PRIME COAT						
		708103	LAB	CERTIFICATION	IDENTIFY AS BEING FROM AN APPROVED SOURCE		
411	PLANT MIX ASPHALT CONCRETE PAVEMENT						
	BITUMINOUS MATERIALS	708103	LAB	CERTIFICATION	IDENTIFY AS BEING FROM AN APPROVED SOURCE		
	AGGREGATE	708	QUANTITY MIX DESIGN	CERTIFICATION	IDENTIFY AS BEING FROM AN APPROVED SOURCE		
			SAND EQUIVALENT	T-17B	1 PER 5,000 TONS PRODUCTION	HOT BIN OR COLD FEED BELT	
	MIXTURE	708	ASPHALT CONTENT & SIEVE ANALYSIS	T-26, T-27, T-30, T-41	1 PER 1,000 TONS	TRUCK	15-20 LBS.
414	PORTLAND CEMENT CONCRETE PAVEMENT						
	PORTLAND CEMENT AND FLYASH	70102		CERTIFICATION	IDENTIFY AS BEING FROM AN APPROVED SOURCE	ROADWAY; RANDOM LOCATIONS	6" CORE OR SQUARE
	AIR ENTRAINING AD MIXTURES	70103	LAB	CERTIFICATION	IDENTIFY AS BEING FROM AN APPROVED SOURCE		AVERAGE OF 4 TWO-MINUTE COUNTS
	CHEMICAL MIXTURES	70104	LAB	CERTIFICATION	IDENTIFY AS BEING FROM AN APPROVED SOURCE		
	WATER	70104	LAB	CERTIFICATION	IDENTIFY AS BEING FROM AN APPROVED SOURCE		
	FINE AGGREGATE						
			SEVEN ANALYSIS: FINENESS, MODULUS	T-27	3 PER 1,000 TONS	STOCKPILE AT MIXING PLANT	20 LBS.
			COAT LUMES (ETC)	T-27	NOTE: FOR PAVING PROJECTS OVER 20,000 SQ. YD. PER DAY WHEN STOCKPILING OVER 10,000 TONS PER DAY, STOCKPILING OVER 10,000 TONS PER DAY	SAME	SAME
	COARSE AGGREGATE						
			SEVEN ANALYSIS: AMOUNT OF MATERIAL FINER THAN 200 SIEVE	T-27	3 PER 1,000 TONS	STOCKPILE AT MIXING PLANT	50 LBS.
	REFORMED EXPANSION JOINT FILLER (BITUMINOUS TYPE)	70108		CERTIFICATION	IDENTIFY AS BEING FROM AN APPROVED SOURCE		
	REFORMED EXPANSION JOINT FILLER (NON-EXTRUDING AND RESIDENT TYPES)	70108		CERTIFICATION	IDENTIFY AS BEING FROM AN APPROVED SOURCE		
	READY MIXED COLD APPLIED JOINT SEALER	70108		CERTIFICATION	IDENTIFY AS BEING FROM AN APPROVED SOURCE		

* ALTERNATE TEST METHODS T-118 FOR T-208

1 & 2 WHEN APPLICABLE OIL CONTENT MAY BE DETERMINED WITH OIL CONTENT GAGE AND AGGREGATE GRADATION BY BELT SAMPLE

SPEC. SECTION	ITEM	MAT'L	TESTS	TEST METHOD	SAMPLING FREQUENCY	SAMPLING LOCATION	SIZE OF SAMPLE
420	FABRIC REINFORCEMENT FOR ASPHALT/CONCRETE PAVEMENTS						
	REINFORCEMENT FABRIC	701.02	LAB	CERTIFICATION	1 PER RIPMENT FROM APPROVED SOURCE TO CITY		
	REINFORCEMENT FABRIC	701.03	LAB	CERTIFICATION	IDENTIFY AS BEING FROM AN APPROVED SOURCE		
				SECTION 500 STRUCTURES			
500	STRUCTURAL CONCRETE						
	PORTLAND CEMENT AND FLY ASH	701.02	LAB		SECTION C CONCRETE PAVEMENT SECTION 414		
	FINE AGGREGATE	701.05	QUALITY SIEVE ANALYSIS FINENESS MODULUS	LAB T-27 T-27	QUALIFICATION NAME EACH SOURCE NUMBER OF TONS	STOCKPILE STOCKPILE AT MIXING PLANT	20 LBS. 20 LBS.
	COARSE AGGREGATE	701.06	QUALITY	LAB	QUALIFICATION SAMPLE EACH SOURCE	STOCKPILE	1ST SAMPLE 75 LBS. MIN. 2ND SAMPLE 50 LBS. MIN. 50 LBS.
			SIEVE ANALYSIS & AMOUNT OF MATERIAL FINER THAN #200 SIEVE	T-27, T-11	1 PER 500 TONS	STOCKPILE AT MIXING PLANT	50 LBS.
	AIR ENTRAINING ADMIXTURES	701.03	LAB		CERTIFICATION IDENTIFY AS APPROVED SOURCE. (CHECK FOR COMPLETIBILITY)		
	CHEMICAL ADMIXTURES	701.03	LAB		CERTIFICATION IDENTIFY AS APPROVED SOURCE. (CHECK FOR COMPLETIBILITY)		
	WATER	701.04	LAB		QUESTIONABLE SOURCE	SOURCE	1 QT.
	CONCRETE (FRESH MIX)	701.07	SLUMP	T-118	SAMPLE AND TEST 1ST DELIVERY UNIT AND EVERY 5TH UNIT THEREAFTER AND FOR EACH SET OF CYLINDERS OR BEAMS.	POINT OF DISCHARGE INTO FORMS	
			AIR CONTENT	T-152, T-155, T-159	SAME	SAME	
511	REINFORCING STEEL	723	LAB		ONE SET OF 3 CYLINDERS PER EACH DAY FOR LARGER THAN 20 CYLOS. FOR 28 DAY STRENGTH PLUS 1 ADDITIONAL SET FOR EACH ADDITIONAL 150 CYLOS. POURS SMALLER THAN 20 CYLOS. TO BE CAST AND TESTED AS REQUIRED TO INSURE QUALITY. ADDITIONAL BEAMS AND CYLINDERS ARE REQUIRED FOR PLACING STRUCTURE REINFORCEMENT FOR REMOVAL.		

SPEC. SECTION	ITEM	MAT'LS	TESTS	TEST METHOD	SAMPLING FREQUENCY	SAMPLING LOCATION	SIZE OF SAMPLE
SECTION 100 - INCIDENT AND CONSTRUCTION							
609	INTEGRATED CURB (COMBINED CURB AND GUTTER); BITUMINOUS CURBING AND HEADER CURBING.				SAME AS SECTION 508 & 411		
610	CONCRETE (OR BITUMINOUS); SIDEWALKS, DRIVEWAYS, AND DIVIDING STRIPS.				SAME AS SECTION 508 & 411		
611	MANHOLES FOR POT/STORM CURBS; INLET'S AND DRAINAGE BOXES.						
	# CONCRETE				AS SAME AS SECTION 508		
	STEEL CASTINGS	726.03	LAB		CERTIFICATION REQUIRED AND CHECK HEAT NUMBERS WITH REPORT NOTE		
	IRON CASTINGS	726.04	LAB		SAME		
	REINFORCING STEEL	726.05	LAB		SAME AS SECTION 511		
613	PIPE COGNOMITS.						
	CONCRETE PIPE	726.06	LAB		IDENTIFY AS PRETESTED AND MARKED NOTE		
	JOINT FIBER (MASTIC)	726.07			CERTIFICATION - SOURCE APPROVED BY LAB		
	JOINT FIBER (RUBBER GASKET)	726			MANUFACTURER'S CERTIFICATION INCLUDING TESTS AND IN SPEC.		
	JOINT FIBER (PLASTIC)	726.08			PRIOR APPROVAL BY LABORATORY		
	C.G.M. PIPE & PIPE ARCHES	726			CERTIFICATION - RECORD AND CHECK HEAT NUMBERS WITH REPORT NOTE		
	COVER MATERIALS FOR PIPE UNDER DRAIN	703.09	QUALITY		QUALITY SAMPLE EACH SIZE EACH SOURCE	JOB SITE	20-75 LBS.
	BEDDING MATERIAL CLASS A		SIEVE ANALYSIS	1-27	SEAL 12 SOUNDS EACH SIZE AGGREGATE	JOB SITE	15-30 LBS.
	CLASS B	701	VISUAL SIEVE ANALYSIS 200 SIEVE	1-27, 1-11	EACH 25 CU. YDS.	JOB SITE	3-6 PIECES EACH SIZE
	PLASTIC AND POLYETHYLENE PIPE & TUBING	726	LAB		IDENTIFY AS PRETESTED OR SAMPLE EACH SHIPMENT	JOB SITE	3 FT.
852	PREFABRICATED PAVEMENT EDGE DRAINS	LAB		CERTIFICATION	EACH LOT OR SHIPMENT		
SECTION 800 - TRAFFIC CONTROL DEVICES							
854	TRAFFIC STRIPE (PAINT)	711			IDENTIFY AS PRETESTED		
855	BEADS			SAME			
855	TRAFFIC STRIPE (PLASTIC)	711			IDENTIFY AS PRETESTED		
855	BEADS			SAME			
858	TRAFFIC STRIPE (CONSTRUCTION)	711			IDENTIFY AS PRETESTED		

INSURANCE AND BONDS: The Contractor (and any subcontractors) shall carry and keep in force during this Contract, policies of insurance in minimum amount as set forth below or as required by the laws of the State of Oklahoma. The Contractor shall also furnish an owner's Protective Policy in the same amounts with the City and Alexander Engineering Company, Inc. as the named assured, issued by the same insurance company as the Contractor's Liability Coverage. CONTRACTOR shall require its insurance carriers to waive all rights of subrogation against the OWNER, ENGINEERS, and their respective officers, directors, partners, employees, and agents.

Personal Injury, each person	\$ 100,000.00
Personal Injury, each accident	\$1,000,000.00
Property Damage, each occurrence	\$ 100,000.00
Property Damage, Aggregate	\$ 100,000.00

Employer's Liability and Workmen's Compensation in the amounts as required by law.

Automobile and Trucks Owned, Hired, and Non-Owned:

Personal Injury, each person	\$ 100,000.00
Personal Injury, each accident	\$1,000,000.00
Property Damage, each accident	\$ 100,000.00