

SECTION IV

PAVING DESIGN REQUIREMENTS

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## General:

Both concrete pavement, flexible base pavement and the subgrade for both shall be designed and constructed in accordance with applicable "TxDOT Standard Specifications for the Construction of Roads and Bridges" (1993). Where conflicts occur, the requirements set forth in these guidelines shall supersede. Flex base shall be TxDOT Item 247 TyA, Gr1.

Treatment of the subgrade shall be determined by a certified geotechnical engineer, accredited by the American Association for Laboratory Accreditation (A2LA). Recommendations(s) of the certified geotechnical engineer shall be adhered to unless the specified treatment is not consistent with conditions found during construction, at which time the geotechnical engineer will be required to make adjustments, as needed.

The following design requirements are applicable to all pavement under Galveston County's jurisdiction that is to be constructed by the development community.

## A. Typical Sections

1. Roadway cross sections, curb and gutter streets, shall conform to "Geometric Design Guidelines for Subdivision Streets, Harris County and City of Houston" and any subsequent revisions thereto. MINIMUM R.O.W. IS 60'.
2. Roadway cross sections for streets with ditches:
  - 2.1 Major thoroughfares shall be two (2) divided traffic lanes of twenty-four (24') edge to edge for each lane with minimum six foot (6') shoulder on each side.
  - 2.2 Minimum width of the paving section for low density single family developments shall be twenty two feet (22') with a six foot (6') shoulder on each side. Thickness, cement content and reinforcement requirements, see IV.B-1 (below). All other roadways shall be designed in such a manner that the combined width of the paving and the shoulders is equal to or greater than the width requirements for a curb and gutter street with identical land use being planned for adjacent property. Thickness and reinforcement for such streets shall be seven inches (7") thick and

reinforced with #4 (1/2") bars 18" on center each way. In no case shall minimum width of roadway be less than 28 feet (28') edge to edge of paving in any development with the exception of Low Density Single Family Residential Subdivisions. The County shall determine which subdivisions are low density single family type.

B. Minimum Thickness and Reinforcement Requirements for Concrete Pavement

1. For pavement less than thirty feet (30') F/F of curb, the concrete pavement is to be a minimum of six inch (6") uniform thickness, 5.0 sacks of Portland Cement per cubic yard, reinforced with #4 (1/2") deformed steel reinforcing bars spaced a maximum of 18" center to center each way.
2. Pavement thickness and reinforcement for major thoroughfare streets shall be designed in accordance with item 5, below, and shall have minimum width of twenty-four feet (24') F/F of curb for each one-half of the roadway section. The concrete pavement shall be a minimum of 8" uniform thickness, 5.0 sacks of Portland Cement, reinforced with #4 (1/2") deformed steel reinforcing bars spaced a maximum of 18" center to center each way.
3. For all other curb and gutter streets, the concrete pavement shall be a minimum of 7" uniform thickness, 5.0 sacks of Portland Cement, reinforced with #4 (1/2") deformed steel reinforcing bars spaced 18" center to center each way.
4. All reinforcing steel shall conform to TxDOT Specifications Item 440, Reinforcing Steel.
5. In the event special circumstances and engineering analysis indicate the need of a stronger pavement than those listed above, pavement thickness and reinforcement shall be supported by design analysis. Design method and loading requirements shall conform to current TxDOT or AASHTO Methods.

C. Flexible Base Pavement with Ditches

1. Minimum thicknesses are as follows:
  - 1.1 6" subgrade as specified in the applicable TxDOT Item 260 or Item 275.
  - 1.2 8" of compacted base; crushed limestone, or approved equal(s). TxDOT Item 247, TyA, Gr1.

- 1.3 1-1/2" of Hot Mix Hot Laid Asphaltic Concrete Pavement. TxDOT Item 340, TyD.
2. Flexible Base Pavement for all developments other than Low Density Single Family residential shall be supported by design analysis conducted by a certified geotechnical engineer. Recommendation of the geotechnical engineer shall be strictly followed. Design method and loading requirements shall conform to current TxDOT or AASHTO Methods.
3. Pavement Width:
  - 3.1 Minimum shall be twenty two feet (22') edge to edge of paving with a six foot (6') shoulder on each side. (Low Density Single Family Residential).
  - 3.2 Roadway widths shall be designed in accordance with criteria set forth in "Roadway Cross Sections for Streets with Ditches". See Section IV-A.
  - 3.3 Ditch sections will follow requirements given under drainage.

D. Grade Design Requirements

1. Curb and Gutter Sections:
  - 1.1 Minimum gradient on gutter shall be 0.25 percent.
  - 1.2 Maximum drop of grade tangents from opposite directions to a common inlet shall be 1.5 feet.
  - 1.3 The maximum allowable curb run to an inlet shall be seven hundred feet (700') one way for residential streets and three hundred feet (300') one way for major thoroughfares or streets within commercial developments.
  - 1.4 Maximum cut from finished grade at property line to top of curb shall be 1.75 feet.
  - 1.5 Minimum one percent (1%) fall around intersection turnout for a minimum radius of twenty-five feet (25'). Grade for larger radius shall be determined on an individual basis.
  - 1.6 Vertical curves shall be installed when algebraic difference in grades exceeds one percent (1%). Elevations shall be shown at ten-foot (10') intervals through vertical curves.

- 1.7 Radius of cul-de-sac pavement:
- 7.1 Residential shall be a minimum of forty-two feet (42') to face of curb.
  - 7.2 Commercial shall be a minimum of fifty feet (50') to face of curb.
- 1.8 When a curb and gutter intersects a drainage ditch, the grade of gutter shall be above the designed water surface of the ditch in accordance with requirements of Galveston County and the applicable Galveston County Drainage District.
- 1.9 Minimum grade for cul-de-sac shall be 0.60 percent along gutter.
- 1.10 Major thoroughfares shall be superelevated in accordance with sound engineering practice whenever the center line radius of lanes or rights-of-way are less than 2,000 feet.
- 1.11 For boulevard sections, the amount of cross slope over the pavement section should be shown on the drawings. The usual cross slope is one-fourth inch (1/4") per foot from curb line to curb line, and one-eighth-inch (1/8") per foot for left turn lanes and esplanade crossovers. For streets with single paving sections, the amount of cross slope over the pavement section shall be 1/4" per foot from center to edge of pavement.
- 1.12 A minimum gradient of 0.40 percent around the longest radius is required on an L-type street intersection.
- 1.13 When meeting an existing curbed street, top-of-curb grades should be laid to meet an elevation six inches (6") above the existing gutter, except at inlets.
- 1.14 Grades should be laid to match the top of the curb of an existing inlet.
- 1.15 Vertical curves should be labeled every ten feet (10'). Maintain minimum of 0.03 feet on ten-foot (10') intervals by altering the calculated elevations.
- 1.16 When the curb grades are not laid below the natural ground, fill lines shall be shown on the drawings and shall be of a sufficient height to insure a minimum of three-eighths-inch (3/8") per

foot transverse slope toward the curb from the property line between a point two feet (2') outside right-of-way and top of the curb. If this type fill is required and the pavement is adjacent to a non-participating property owner, fill easements from this property owner shall be obtained, filed, and a copy of the easements shall accompany the final drawings.

- 1.17 Grades should be labeled for all top of curbs except at railroad crossings. Center line grades are acceptable for approved streets with ditch sections only.
- 1.18 Gutter elevations are required for vertical curves where a railroad track is being crossed.
- 1.19 The gradient for tangents to vertical curves at railroad crossings shall be a maximum of 3.5 percent and 4.0 percent at bridges, box culverts and pedestrian tunnels.
- 1.20 Where railroad crossings are not at right angles to the pavement slab, vertical curves should be calculated for each curb line and should be posted at ten-foot (10') intervals in the profile.
- 1.21 Valley Gutters are not permitted.

2. Roadway Sections with Ditches:

- 2.1. Minimum grade on ditches - 0.10 percent
- 2.2 Ditch design to handle runoff as determined in Section III.C-10, "Drainage Design Requirements".
- 2.3 Side slopes of ditch not steeper than 3:1 for unimproved ditches. Steeper slopes may be allowed when existing right-of-way is limited or other construction features dictate the design.
- 2.4 Culverts shall be designed to carry ditch discharge, but not less than eighteen-inch (18") pipe and all driveways shall have culverts or bridges; no paved dips for driveways.

E. Inlets:

1. Type "BB" inlets or equal shall be used on all curb and gutter sections unless certain conditions exist which warrant the use of other standard inlets. See Section III.

2. Inlets at all low points on gutter gradient.
3. Inlets should be placed away from the major thoroughfare and on the side streets at street intersections.
4. Attempt to keep the proposed inlets away from the esplanade openings and out of major thoroughfare intersections. Also attempt to keep inlets out of future driveways.
5. Inlets shall be placed at the end of pavement in order to eliminate drainage from the pavement gutter into a ditch when the drainage is toward the end of the pavement or from the ditch to the pavement gutter.
6. When meeting a ditch, storm water must be received by use of an approved structure. See Section III.C-9.13.

F. Curbs, Sidewalks and Driveways

1. Curbs:
  - 1.1 Standard curb height is six inches (6"), constructed in accordance with Galveston County Subdivision Standards.
  - 1.2 Curbs are to be decreased from six inches (6") to zero inches (0") in ten feet (10') when approaching railroad tracks or existing roadway without curbs.
2. Sidewalks and Driveways
  - 2.1 All sidewalks and driveways shall conform to handicap requirements of the state and with the ADA.
  - 2.2 Sidewalk Construction in Esplanade: When concrete sidewalks are constructed in esplanades, they shall be six inches (6") thick.

G. Requirements for Intersections, Turnouts, Transitions and Thoroughfares

1. At a "T" intersection with a street that has not been improved to its ultimate width, concrete pavement should be stopped either at the right-of-way line or the end of the curb return, whichever would require less concrete removal at a future date.

2. When roadway turnouts are placed where an existing cross street intersects, the turnout should be sized to fit the ultimate pavement width and then transitioned to the existing roadway utilizing same materials as exist on the existing road/street. Length of transition shall conform to "Geometric Guidelines for Subdivision Streets, Harris County and City of Houston", and any subsequent revisions thereto.
3. When paving only one (1) roadway of a proposed two (2) roadway thoroughfare, all left turn lanes and esplanade crossovers in the one half (1/2) of the right-of-way where the roadway is being paved shall be paved to center line of the street right-of-way.
4. When meeting an existing concrete street at right angles, the existing street shall be saw cut in a V-shape extending from the curb returns to a point where the centerline of the proposed pavement intersects the quarter point of the existing street in order to create a crowned intersection. In the event that this construction causes excessively rough riding condition making adequate control of the vehicle difficult, a special design will be considered to eliminate this condition.
5. All traffic signs, striping, channelization devices, etc. must comply with the Manual on Uniform Traffic Control Devices.

#### H. Miscellaneous Paving Requirements

1. If driveways are to be constructed with the paving project, show locations on the drawings and post a center line for the driveway at the property line with elevation for each drive.
2. Private streets should be treated as if they were driveways, and the sidewalk area should be honored with no curb extending through this area.
3. Standard paving headers shall be placed at the end of all concrete slabs.
4. All concrete to be removed shall be removed either to an existing joint or a sawed joint.
5. A thirty (30) mph minimum sight distance shall be used on all crest vertical curves. Forty (40) mph minimum for major thoroughfares.



6. Standard City of Houston Type III barricades shall be placed at the end of all dead-end streets not terminating in a cul-de-sac and other locations where applicable.
7. Traffic Signs and Street Name Signs: Prior to final acceptance of the improvements, the owner of the development must furnish and install the traffic signs and street name signs for all intersections. The street name signs shall be standard City of Houston type. The traffic signs shall be the standard TxDOT type for small roadway signs.
8. Approval of all affected agencies must be obtained prior to approval of County Engineer.
9. A letter of agreement approving the construction plan crossing is required when paving is placed over a transmission pipeline.
10. Horizontal dowels are required when meeting concrete pavement that has no exposed steel.
  - 10.1 Dowels should be #6 bars, twenty four (24") long, twenty-four inches (18") center to center, embedded twelve inches (12") and epoxied.
  - 10.2 As an alternate to 10.1 above, saw cut and remove existing concrete to expose a minimum of twelve inches (12") of steel (longitudinal to the new construction) with an equivalent cross section area of steel equal to the proposed pavement steel.
11. Dead-end streets designed to be extended in the future shall have fifteen inches (15") of reinforcing steel exposed beyond the pavement, coated with asphalt and wrapped with burlap for future pavement tie. Maximum cul-de-sac length is 1000' for single family, 800' for all others.
12. Guidelines set forth in the Manual on Uniform Traffic Control Devices shall be strictly followed.
13. "Cold" joints are not allowed.
14. When any of the roads or streets of a subdivision or re-subdivision are constructed over, across or along any existing oil, gas, sulphur, chemical or other pipeline running through the subdivision or re-subdivision, such pipeline shall be lowered and cased in such a manner as to meet the minimum requirements of the pipeline company and Galveston County.

15. Road rights-of-way shall be staked with three fourths inch ( $3/4$ " ) iron rods at all P.C.'s, P.T.'s, block corners and dead end streets prior to acceptance of the improvements. Lot corners may be staked with minimum five eighths inch ( $5/8$ " ) iron rods (or other suitable metal pipes).
  
16. The following City of Houston, Department of Public Works and Engineering Standard Construction Details for Street Paving, dated September 1996 are adopted as part of these subdivision regulations: 02632-11, 02754-01, 02754-02, 02763-01, 02763-02, 02775-01, 02775-02, 02902-01.