



Waller County

Road and Bridge Department- Engineering

Concrete Road/Street- New Construction, Repairs, Replacements

Waller County Acceptance Criteria for New Construction, Repair, and Replacement of Concrete Roadways:

Acceptance Guidance for Concrete Pavement

Criteria for all Concrete Placements

This document is prepared for use by the Waller County Engineering, Inspector and Contractors to provide an understanding and clarification, of Waller County's concrete pavement requirements; for acceptance within public roadways into the County Maintenance of Improvements within Subdivisions and Civil Site Developments. This document provides guidelines and requirements for local, residential and commercial concrete pavement applications, repairs and replacements.

Compliance with all specifications (*County, City, or project specific approved by Waller County Engineering*) is required. Designated Project Engineer shall notify Waller County Construction Inspectors of deficiencies that are not within the specification limits as soon as the deficiency becomes known, but in no case more than 24 hours after the construction activity. Examples include proof rolling, subgrade density, and concrete placement. These guidelines do not relieve the developer, engineer, or contractor from adhering to applicable specifications and standards.

These guidelines pertain to local residential, civil sites and commercial developments.

- Membrane curing compound shall be applied as soon as possible in compliance with the manufacturer's recommendations.
- Sawing shall take place when concrete strength is acceptable for sawing and in compliance with the specifications without creating excessive raveling along the sawcut.
- Where concrete pavement is to be removed and replaced, the material below the subgrade shall be deemed suitable by an approved lab.
 - Before replacing concrete, provide lab report for density, moisture, lime percentage, lime depth, and other related analysis of subgrade to Waller County. Lab report shall be sealed by a registered licensed Texas Engineer and include recommendations for over-excavation of subgrade material, subgrade treatment, or other mitigation needed to address concrete pavement cracking issues.

- When subgrade is removed, new subgrade shall be Cement Stabilized Sand (2 sack/cy, compacted) or as recommended by the lab report, whichever is more stringent. Epoxy dowels into holes drilled into the existing concrete pavement.
- Provide a maintenance bond for areas of concrete pavement repair or replacement for an additional two years from the Substantial Completion Date of Record.

Road Definitions (See Waller County Subdivision Development Regulations):

- Local Streets - principally provide direct access to lots within a subdivision.
- Collector Streets (Secondary Thoroughfares) –connect arterial streets with local streets.
- Arterial Streets (Primary Thoroughfares) –streets that are principally regional in nature and are used for through traffic and shall be divided into two classifications: 2.2.1 Streets which will serve vehicular traffic beyond the limits of the subdivision; and connect one collector or arterial with one or more collectors or arterials.

The following elements are covered in this document:

I. Concrete Pavement Deficiencies

- A. Concrete pavement Cracks
- B. Concrete Removal and Replacement
- C. Subgrade Treatment
- D. Sealant
- E. Half-Moon Cracking
- F. Corner Cracking
- G. Mapping Cracks
- H. Longitudinal Cracks
- I. Longitudinal Edge Cracks
- J. Transverse Cracks
- K. Diagonal Cracks/ Shattered Slab
- L. Shrinkage Cracks or Surface Cracks
- M. Bird Baths
- N. Curb Cracks
- O. Spalling
- P. Surface Delamination
- Q. Material Related Cracks
- R. Faulting

CONCRETE PAVEMENT

A. Concrete Pavement Cracks:

Normal or Accepted Cracking

- Visible cracks with no measurable width and no surface deflection are acceptable (e.g. shrinkage cracks) with repairs as directed in this guide or as directed by the County Engineer.
- Cracks less than or equal to 1/16" wide for less than 50% of the length of the crack shall be routed mechanically (1/4" wide and 1/4" deep groove) & sealed with a super low viscosity epoxy (gravity fed) sealant or approved alternative. Crack preparation and application of sealant will be in accordance with manufacturer's recommendations and be on the TxDOT Approved Sealant Sheet.

Major or Non-Accepted Cracking

- Cracks greater than 1/16" for more than 50% of the length of the crack, entire panel must be removed and replaced.
- Cracks within 12" of control or expansion joints must be removed and replaced.
- Cracks with a difference in elevation (e.g. surface deflection or joint fault) greater than 1/16" must be removed and replaced.
- Cracks extending across or for more than one panel must be removed and replaced.
- Spalled concrete pavement must be removed and replaced

Types of Cracks defined in this document:

- a) Half Moon Cracks
- b) Corner Cracks
- c) Multiple Cracks
- d) Longitudinal Cracks
- e) Transverse Cracks
- f) Shrinkage Cracks
- g) Bird Baths
- h) Curb Cracks
- i) Spalling
- j) Surface Delamination
- k) Material-Related
- l) Fault Panel
- m) Sealant

B. Concrete Removal and Replacement

- Local Roads - Minimum concrete pavement removal area will be minimum 6 linear feet and the full-lane Width.
- Arterial Roads - will require entire panel removal.
- More than one major crack will require entire panel removal.
- Minimum length of existing left concrete panel in place is 6 feet, i.e. No Concrete pavement section less than 6 feet in length.
- Minimum 3 linear feet distance from crack in both directions to saw cut.
- The minimum dimensions for full depth concrete pavement repair are one lane-width, and not less than 6 feet long. Repair areas smaller than the minimum will show excessive “rocking” against the adjoining concrete pavement sections. Likewise, the minimum remainder of the slab shall be at least 6 feet (to the end of slab or next repair area).

C. Subgrade Treatment

- Where concrete pavement is to be removed and replaced, the material below the subgrade shall be tested and deemed suitable by an approved lab.
- Before replacing concrete, provide lab report for density, moisture, lime percentage, lime depth, and other related analysis of subgrade to Waller County. Lab report shall be sealed by a Registered Texas Engineer and include recommendations for over-excavation of subgrade material, subgrade treatment, or other mitigation needed to address concrete pavement cracking issues.
- When subgrade is removed, new subgrade shall be 16” Cement Stabilized Sand (2 sack/cy, compacted) or as recommended by the lab report, whichever is more stringent. Epoxy 1” dowels into holes drilled into the existing concrete pavement.
- Concrete pavement depth shall be no less than 6” and/or equivalent to adjacent concrete pavement depth.
- Provide a maintenance bond for areas of concrete pavement repair or replacement for an additional two years from the Substantial Completion Date of Record.

D. Sealant:

Minor cracks may be sealed using an approved injection epoxy sealant at the beginning of the One-Year Maintenance Period. Panels and curbs will be re-evaluated at the end of the One-Year maintenance prior to determine the effectiveness of this treatment. If minor additional concrete pavement movement has reopened or the shrinkage cracks have lengthened resealing will be required.

If there is significant additional cracking or vertical movement is observed, concrete pavement replacement will be required. All sealants must be approved by Waller County in advance, and applied in Strict compliance with manufactures specifications.

- Epoxy injected sealant approved by the County Engineer.
- A mechanically constructed groove will be installed of approximately 1/4 “ width and 1/4 “depth extending past the end of the crack 6” either side. All sealants must be approved by Waller County in advance, and applied in Strict compliance with manufactures specifications.

Workmanship and Care

- Epoxy sealant will be placed in a workmanlike manner.
- Multiple application of sealant will not be accepted and result in replacement of concrete pavement panel.



Exhibit #D1

E. Half-Moon Cracking:

Half-moon cracking is caused by inadequate backfill compaction. May be seen around manholes or along curb lines.

- This type of crack will require the entire panel to be removed and replaced and Subgrade Treatment, Page 4-C.



Exhibit #E1

F. Corner Cracking:

Corner cracking (also known as a “corner break”) is a distinct full-depth fracture in a jointed concrete pavement. Corner cracks intersect adjacent transverse and longitudinal joints at an angle of approximately 45 degrees with the direction of traffic.

- This type of crack will require the entire panel to be removed and replaced and Subgrade Treatment, Page 4-C.



Exhibit #F2

G. Mapping Cracks:

- May be sealed using an approved injection epoxy sealant at the beginning of the One-Year Maintenance Period. Panels will be re-evaluated at the end of the One-Year Maintenance prior to determine the effectiveness of this treatment. If minor additional concrete pavement movement has reopened or the cracks have lengthened resealing will be required. If there is significant additional cracking or vertical movement is observed, concrete pavement replacement will be required. All sealants must be approved by Waller County in advance, and applied in Strict compliance with manufactures specifications.
Epoxy injected sealant approved by the County Engineer.
- A mechanically constructed groove will be installed of approximately 1/4 “width, and 1/4 “depth extending past the end of the crack 6” either side. All sealants must be approved by Waller County in advance, and applied in Strict compliance with manufactures specifications.

Workmanship and Care

- Epoxy sealant will be placed in a workmanlike manner.
- Multiple application of sealant will not be accepted and will result in replacement of concrete pavement panel.



Exhibit #G1

Longitudinal Cracks:

Minor Longitudinal Cracking:

Longitudinal cracking is nearly parallel to the concrete pavement centerline or lane-shoulder joint.

- **Normal or Accepted crack(s)** may be sealed using an approved injection and groove epoxy sealant at the beginning of the One-Year Maintenance Period. Panels will be re-evaluated at the end of the maintenance prior to determine the effectiveness of this treatment. If minor additional concrete pavement movement has reopened or the cracks have lengthened resealing will be required. If there is significant additional cracking or vertical movement is observed, concrete pavement replacement will be required. All sealants must be approved by Waller County in advance, and applied in Strict compliance with manufactures specifications.
- Cracks less than or equal to 1/16" wide for less than 50% of the length of the crack shall be routed mechanically (1/4" wide and 1/4" deep groove) & sealed with a super low viscosity epoxy (gravity fed) sealant or approved alternative. Crack preparation and application of sealant will be in accordance with manufacturer's recommendations and be on the TxDOT Approved Sealant Sheet.

Workmanship and Care:

- Epoxy sealant will be placed in a workmanlike manner.
- Multiple application of sealant will not be accepted and will result in replacement of concrete pavement panel.



Exhibit #H1

Major Longitudinal Cracks:

- Any crack separating more than 1/16" - Concrete pavement replacement is required. If there is significant additional cracking or vertical movement is observed, concrete pavement replacement will be required. If longitudinal cracks extending the entire length of the concrete road panel, this will require the entire panel or panels to be removed and replaced and subgrade treated as per Subgrade Treatment, Page 4-C.



Exhibit #H2

H. Longitudinal Edge Cracks:

- Any longitudinal crack extending more than 1 panel will require the entire panel or panels to be removed and replaced and subgrade treated as per C. Subgrade Treatment Note.
- Any longitudinal crack within 24" of the edge of road or edge of the panel regardless of size will require the entire panel or panels to be removed and replaced and Subgrade Treatment, Page 4-C.



Exhibit #I1

I. Transverse Cracks:

Transverse cracking, also called mid-panel or mid-slab cracking, is oriented laterally across the concrete pavement and perpendicular to the concrete pavement centerline. Diagonal cracking is oriented obliquely across a slab at roughly a 30- to 60-degree angle from the concrete pavement centerline. Slab cracking may also develop longitudinally, in which the crack is oriented parallel to the concrete pavement centerline.

Minor Transverse Crack:

- **Normal or Accepted cracks or Surface cracks** may be sealed using an approved injection epoxy sealant at the beginning of the One-Year Maintenance Period. Panels will be re-evaluated at the end of the maintenance prior to determine the effectiveness of this treatment. If minor additional concrete pavement movement has reopened or the shrinkage cracks have lengthened resealing will be required. If there is significant additional cracking or vertical movement is observed, concrete pavement replacement will be required. All sealants must be approved by Waller County in advance, and applied in Strict compliance with manufactures specifications.



Exhibit #J1

Major Transverse Crack:

- Any transverse crack separating more than 1/16" - Concrete pavement removal and replacement is required. If significant additional cracking or vertical movement is observed, concrete pavement replacement will be required.
- Transverse cracks across two adjacent lanes may indicate subsurface defects and both panels will be required to be removed and replaced and Subgrade Treated as per Subgrade Treatment, Page 4-C.



Exhibit #J2

J. Diagonal Cracking/Shattered Slab:

- If there is diagonal cracking or vertical movement is observed, concrete pavement replacement will be required. Replace Panel.
- This type of crack will require the entire panel to be removed and replaced and Subgrade Treatment, Page 4-C.
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Exhibit #K1

K. Shrinkage Cracks or Surface Cracks:

Minor Shrinkage Crack:

- **Normal or Accepted Shrinkage Crack** may be sealed using an approved injection epoxy sealant at the beginning of the One-Year Maintenance Period. Panels will be re-evaluated at the end of the maintenance prior to determine the effectiveness of this treatment. If minor additional concrete pavement movement has reopened or the shrinkage cracks have lengthened resealing will be required. If there is significant additional cracking or vertical movement is observed, concrete pavement replacement will be required. All sealants must be approved by Waller County in advance and be on the TxDOT Approved Sealant Sheet, and application of sealant will be in accordance with manufacturer's recommendations applied in strict compliance with manufactures specifications.



Exhibit #L1

Major Shrinkage Cracking:

- **Vertical or Horizontal Movement** - Any crack separating more than 1/16".
- This type of crack will require the entire panel to be removed and replaced and Subgrade Treated as per C. Subgrade Treatment Page 4-C.
-



Exhibit #L2

L. Bird Baths:

Normal or Accepted Bird Baths – (Less than 1/4” in depth and less than 2 feet in length within 15 feet of an expansion joint)

- Minor grinding within 6 inches of curb, no more than 1/4” in depth and within 15” of an expansion joint.
- Grinding in the center of the panel or the entire panel is NOT ACCEPTABLE, grind must be “Feathered” so as not to create an edge.



Exhibit #M1

Major Bird Baths

- More than 1/4" in depth and more than 2 feet in length, within the driving lane or extending more than 24" from the curb or extending in front of a driveway - concrete pavement replacement is required.
- This type of crack will require the entire panel to be removed and replaced and Subgrade Treated as per Treatment, Page 4-C.



Exhibit #M2

M. Curb Cracks & Damage:

Hairline curb cracks are acceptable and do not require action. Curbs will be re-evaluated at the end of the maintenance prior to determine the effectiveness of this treatment. If minor additional curb cracking has reopened or the cracks have lengthened resealing will be required. If after one year there is significant or additional cracking or vertical movement is observed, curb replacement will be required. Major cracking of curb requires replacement. All sealants must be approved by Waller County in advance and be on the TxDOT Approved Sealant Sheet, and application of sealant will be in accordance with manufacturer's recommendations applied in strict compliance with manufacturer's specifications.

Normal or Accepted Curb Cracks:

- Curb cracks that have any measurable separation but do not meet the threshold of replacement can be sealed using an approved injection epoxy sealant, at the beginning of the One-Year Maintenance Period.



Exhibit #N1

Major Curb Crack or Breaks:

- Replacement is required. The major cracks or broken curbs are to be replaced in sections no less than 4 ft.



Exhibit #N2



Exhibit #N3

N. Spalling:

Minor Spalling:

Damage is superficial and affects the surface only.

- Minor concrete spalling can be repaired using neat Type VII epoxy (no sand) to help protect against deterioration caused by exposure to water, chlorides, and other contaminants as per TXDOT “Concrete Repair Manual” dated March 2021.



Exhibit #01



Exhibit #O2



Exhibit #O3

Major Spalling:

- Damage is more than ¼' below surface.
- This type of surface defect will require the entire panel be removed and replaced and Subgrade Treated as per Treatment, Page 4-C.

Surface Delamination:

Surface delamination in concrete pavements is closely related in appearance to scaling and spalling. However, the mechanism of failure is different. Delamination may be viewed as the development of a horizontal crack within the slab that results in separation of the surface layer to a depth of 1/2 to 2 inches from the remaining concrete. Delamination may be limited to an extent, or it may be widespread depending on the basic cause of the separation. Although delamination is normally seen adjacent to concrete pavement joints and may extend 3 feet or more into the slab, it can also occur anywhere in the slab.

Minor Spalling:

Damage is superficial and affects the surface only.

- Minor concrete spalling can be repaired using neat Type VII epoxy (no sand) to help protect against deterioration caused by exposure to water, chlorides, and other contaminants as per TXDOT "Concrete Repair Manual" dated March 2021.





Exhibit #P2

O. Material-Related Cracks:

A material-related distress (MRD) is any failure that occurs in concrete pavements as the result of the properties of the materials in the concrete pavement and their interaction with the environment. MRDs in concrete pavements are commonly typified by a network of multiple, closely spaced cracks, often accentuated with staining or deposits. However, visual inspection alone cannot confirm the presence or absence of material related issues. Laboratory testing of concrete pavement core samples is required to definitively confirm the mechanisms that may be contributing to the distress. Material-related distresses include the following:

- This type of crack will require the entire panel to be removed and replaced and Subgrade per Treatment, Page 4-C.



Exhibit #Q1

R. -Faulting:

Faulting is the difference in elevation across a joint or crack in a concrete pavement due to loss of load transfer. It is a symptom of loss of uniform subgrade support. The loss of uniform support is due to pumping, which is the expulsion of soil and water due to traffic through a concrete pavement joint, crack, or concrete pavement/shoulder edge.

- This type of crack will require the entire panel to be removed and replaced and Subgrade Treated as per Treatment, Page 4-C.



Exhibit #R1