

# 2014 Q1 – PWD Proposed Rule Changes

PROPOSED VERSION for 1st Quarter 2014 Posting

## Transportation Criteria Manual – Section 3.1: Pavement Design Requirement

Earliest Possible Adoption: February 2014

### Transportation Criteria Manual –

#### Section 3.1: Pavement Design Requirements

##### 3.1.0 GENERAL

The City has observed premature distress on many of the heavily traveled streets and on streets built on subgrade soils with high plasticity indices (P.I. >20). *A map is provided in Appendix H to show the general soil type distribution within Austin, but this does not relieve the designer's responsibility to provide a geotechnical report and to design to the site specific soil condition. The minimum pavement standards included in this TCM does not relieve the design engineer from the responsibility of designing a cross section that is appropriate for the soil conditions to meet the required design life of 20 years.*

Pavement designs that are appropriate for soil conditions result in pavements that are maintainable over the entire useful life of the pavement structure. This is achieved with proper stabilization of subgrade soils that may necessitate using a combination of modification techniques for the subgrade soils: such as, but not limited to removal of objectionable soils, reinforcement strategies, and/or subgrade moisture control features described at the end of this subsection.

The program described herein was adopted from the Texas Department of Transportation (TxDOT) design system currently being utilized by the TxDOT and its local districts and is modified for municipal applications. The TxDOT design system was adapted from the American Association of State Highway and Transportation Officials (AASHTO), Interim Design Method, with modifications for local conditions and needs.

Modifications to the TxDOT highway programs were undertaken to make the highway programs for rural highway design more suitable for municipal conditions. These improvements included the addition of: 1) curb and gutter costs, 2) subgrade excavation costs, 3) additional costs associated with future overlays including thickened edge, edge milling and overlay tapering, 4) the effects of the distribution of heavy trucks on city streets of different classification and 5) revising the traffic modeling.

It is important to note that this program may not produce appropriate critical stresses in flexible pavements designed for relatively low Average Daily Traffic (ADT) values. *In order to insure adequate pavement designs for this situation, the pavement design procedure that is outlined in Appendix D and designated as the City Subdivision Information Memoranda (SIM) (see Appendix D); TxDOT Test Method Tex 117-E, "Triaxial Compression Tests for Disturbed Soils and Base Materials" should be used for comparison.*

*Since the SIM procedure directly uses the Texas Triaxial Subgrade Coefficient as the principal design parameter, and is based on a great deal of experience and background, the designer is encouraged to compare the results of his computerized pavement design against the SIM procedure. If the computerized pavement design produces a lesser pavement section, values of the input parameters being used in the computerized pavement design should be reexamined.*

*In addition, Appendix A of this manual provides miscellaneous pavement design forms.*

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### 3.1.1 DESIGN LIFE AND PERFORMANCE EXPECTATIONS

The City has established a goal of a 20-year life cycle for the design life of **the** City streets. Pavements must be designed to remain serviceable and below the defined roughness thresholds throughout the designated design life.

#### 1. Serviceability:

<u>Criteria</u>	<u>Period (Years)</u>		
	<u>0-2</u>	<u>2-10</u>	<u>10-20</u>
<u>Cracking</u>	<u>Nearly no cracking; less than 10 LF/LM</u>	<u>minimal cracking only; less than 50 LF/LM</u>	<u>minor cracking only; less than 200 LF/LM</u>
<u>Other Criteria</u>	<u>no noticeable roughness from new condition</u>	<u>minimal roughness and no surface patching required</u>	<u>no level ups required and no structural failures (block or alligator cracking)</u>

#### 2. Roughness:

<u>Class</u>	<u>ISI Initial Serviceability Index</u>	<u>TSI Terminal Serviceability Index</u>
<u>Arterial</u>	<u>4.20</u>	<u>2.50</u>
<u>Primary Collector</u>	<u>4.20</u>	<u>2.00</u>
<u>Collector</u>	<u>4.20</u>	<u>1.50</u>
<u>Residential</u>	<u>4.20</u>	<u>1.00</u>

While the Computerized Pavement Design procedure provides a more systematic treatment and manipulation of various design parameters, it does not appear to be sensitive enough to correctly design for the **effect of** shrink-swell potential of expansive subgrade soils. The following procedure is recommended as an approach to produce reliable life cycle pavement structural designs for City streets.

### 3.1.2 GENERAL PAVEMENT DESIGN REQUIREMENTS

1. Flexible pavements must be designed for crack resistance for both environmental (subgrade shrink/swell) and fatigue (surface thickness) modes. Although the fatigue requirement will most likely result in thicker surface layers, thinner allowable base layers will partially compensate for and offset some of the cost of the increased surface thickness. This concept has been referred to as a “balanced” design. Using MFPS alone does not ensure a “balanced” design.

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**2. Excessively thick base layers do not effectively compensate for subgrade soils with high swell potential. It is recommended that the designer consider one or more of the stabilization strategies listed in Section 3.1.3.**

**3. Rigid pavement designs must include proper jointing plans, joint types, and either non-erodible bases or a non-erodible prepared subgrades.**

### **3.1.3 DESIGN REQUIREMENTS FOR PAVEMENTS ON EXPANSIVE SOILS**

Whenever a soil investigation indicates that more than two feet of expansive subgrade soil with P.I. greater than 25 exists underneath the expected base layer, the design professional is advised to adopt **at least** one **and preferably a combination** of the following measures:

1. Replace 18 inches of subgrade by approved material with P.I. less than 15 and provide for appropriate edge drainage,
2. **Use Lime, cement, or lime/cement material to** stabilize eight to twenty-four inches of subgrade **as appropriate to minimize vertical shrink/swell potential and environmental cracking.**

~~3. Increase the thickness of the designed flexible base by 50%, and~~

**3. Horizontal or vertical moisture barriers of sufficient width or depth to minimize moisture migration into and out of the subgrade soils.**

**a. Although 4 foot barriers may be adequate, barriers of 6 to 10 feet are often required to be effective.**

**b. Contiguous sidewalks and driveways placed at the time of roadway construction are highly desirable and will be considered a horizontal barrier.**

**c. An acceptable design with moisture barriers must be used in combination with at least one other strategy listed here.**

**4. Reinforcement of the pavement section with GeoGrid.**

**a. a documented GeoGrid design must be approved by the Director of the Public Works Department or designated representative.**

**b. An acceptable GeoGrid design must be used in combination with at least one other strategy listed here.**

5. Other **measures** as may be approved by the Director of the Public Works Department or designated representative.

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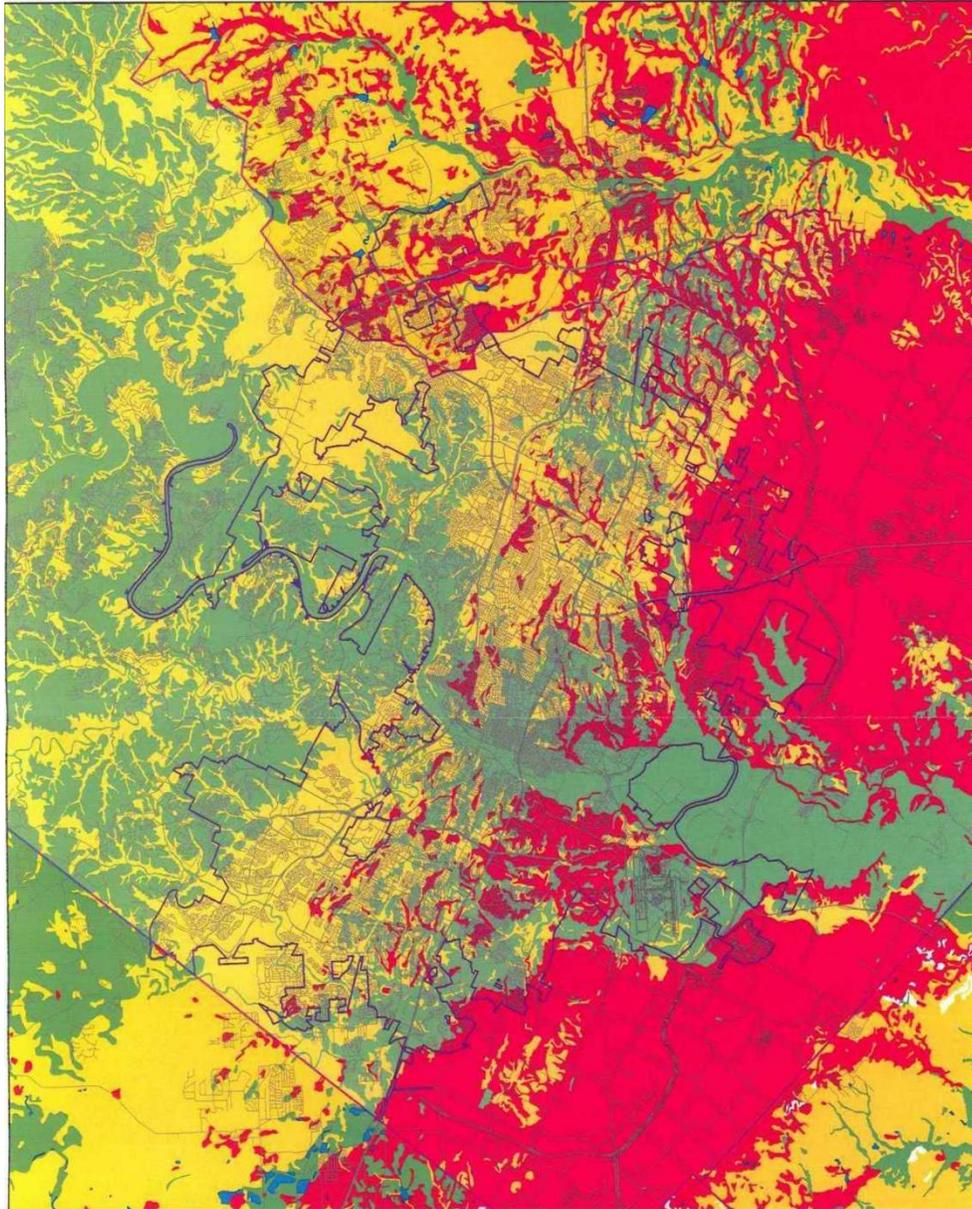
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### APPENDIX H: Soils Map

Map of the Austin Area Soils Based On Plasticity Index (PI)



**Austin Area Soils Map**

- County Boundaries
- Full Purpose Austin
- Street Centerlines

**Plasticity Index (PI)**

- Low (0 - 30)
- Moderate (31 - 40)
- High (41 - 58)

Street & Bridge  
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October 17, 2012

Pavement designs on high plasticity soils such as the fat clay soils found in the Austin and Central Texas area must be carefully designed to withstand very large swell potentials. Areas shown on the map in red are representative of the boundaries of soil formations that are most likely to have these characteristics.

This map has been provided for general guidance only. Site specific geotechnical information is required for pavement designs and always controls in the determination of any soil parameters.

This product is for informational purposes and may not have been prepared for or be suitable for legal, engineering, or surveying purposes. It does not represent an on-the-ground survey and represents only the approximate relative location of property boundaries.

This product has been produced by the Public Works Department for the sole purpose of geographic reference. No warranty is made by the City of Austin regarding specific accuracy or completeness.