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PROPOSED VERSION for Internal Review

Transportation Criteria Manual – Section 3: Pavement Design Requirements
Previous Revision: 8/1/2002
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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). In response to this problem the City upgraded its construction specifications and construction-testing program and refined the pavement design procedure. ***However, the modest interim criteria suggested by the 1992 amendment to this section for minimum pavement section enhancements have often proven inadequate. Therefore, be advised that the minimum pavement standards included in this TCM do not relieve the design engineer from the responsibility of designing a cross section that is appropriate for the soil conditions and meets the required design life.***

Designs that are appropriate for soil conditions are defined as properly stabilized subgrade soils resulting in pavements that are maintainable over the entire useful life of the pavement structure. Stabilization techniques may include a combination of modification of the subgrade soils, removal of objectionable soils, reinforcement strategies, and/or subgrade moisture control features 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 Highways 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.**~~ The minimum pavement thickness requirements presented in Table 3-11; however, eliminate the need to crosscheck with the City Subdivision Information Memoranda (SIM) design procedure.

~~**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.**~~

Therefore, The SIM procedure ~~**is**~~ outlined in Appendix D ***is hereby deprecated.***

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

3.1.1 DESIGN LIFE AND PERFORMANCE EXPECTATIONS

It should be emphasized that, like the rest of the Country, the City has established a goal of a 20-year life cycle for the design of the City streets. ***Pavements must be designed to remain serviceable and below the defined roughness thresholds throughout the designated design life.*** Based on an evaluation of the performance of street pavements and an assessment of the streets' conditions, the long-standing SIM design procedure fell short of that goal. The reasons for that are:

1. The rapid increase in traffic volume and truck loading is much greater than anticipated, and
2. Design procedure did not adequately take into account the effect of shrink-swell potential of expansive soil on pavement distresses.

The Public Works Department is in the process of re-evaluating the City Computerized Pavement Design based on the performance of various classifications of streets within the City. ***This effort is being studied by a consultant under the purview of the Capital Area Pavement Engineers Council (CAPEC) lead by the City of Austin, Travis County, and Williamson County. However, the CAPEC project will take another full year in addition to the posting cycle time to adopt at a minimum.*** 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 the effect of shrink-swell potential of expansive subgrade soils. In the meantime 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 which using MFPS alone does not assure.***

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2. ***Excessively thick base layers are no longer considered an effective means of addressing subgrade soils with high swell potential. Thus, the 50% more base option has been eliminated. Instead, it is recommended that the designer consider one or more of the stabilization strategies listed below.***

3. ***Rigid pavement designs must include proper jointing plans, joint types, and either non-erodible bases or assure the existence of 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 more than four and provide for appropriate edge drainage,

2. Lime***, cement, or lime/cement*** 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. Although 4 foot barriers may be adequate, barriers of 6 to 10 feet are often required to be effective. Contiguous sidewalks and driveways placed at the time of roadway construction are highly desirable and will be considered a horizontal barrier. An acceptable design with moisture barriers must be used in combination with at least one other strategy listed herein,***

4. ***Reinforcement of the pavement section with a documented GeoGrid design acceptable to the Director of the Public Works Department or designated representative. An acceptable GeoGrid design must be used in combination with at least one other strategy listed herein,***

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