County of Atascosa
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FLEXIBLE PAVEMENT DESIGN CRITERIA
FEBRUARY 13, 2023

SUBSURFACE EXPLORATION

A soil investigation must be performed for the design of pavement structures. The number of borings and locations shall be sufficient to accurately determine the stratum along the proposed street(s) and roadway(s) infrastructure. The geotechnical engineering firm providing the service must present a copy of the current, official accreditation by the American Association for Laboratory Accreditation (A2LA) or the American Association of State Highway and Transportation Officials (AASHTO – through the AASHTO Materials Reference Laboratory (AMRL)).

Borings

Prior to performing geotechnical field investigations, the geotechnical engineer or representative should identify the soil series in the NRCS Soil Survey that may be encountered in the field investigation and coordinate with the design engineer to identify areas of cuts and fills. Additionally, field reconnaissance to determine site access should be performed along with identifying existing pavement conditions and traffic conditions where applicable prior to conducting the field sampling.

- At least one bore shall be made within each soil series identified in the NRCS Soil Survey. Additional bores shall be located in areas where proposed roads are crossing or in close proximity to drainage pathways, creek beds, stock ponds, or natural lows. Bore spacing will be determined by the project geotechnical engineer, but in no cases will the spacing exceed 1,000 linear feet.
- Depth of Sampling:
  Record the coordinates of the location and the surface elevation where the soil boring is being taken. Identify soils at 2.5 foot intervals or at every change in the physical characteristics of the soil to a depth of at least 10 feet. Where cuts are required that exceed the minimum bore depth, bores will be continued to a depth of 5 feet below proposed roadway subgrade.
- Backfilling of Test Borings
  Bore holes must be filled or plugged to prevent injury to livestock or people in the area and to minimize the entry of surface water into the bore hole. If surface contamination of lower aquifers or cross contamination is a concern, the backfill material will be bentonite pellets or grout. Where borings penetrate asphalt and/or concrete, the borings must be patched with similar materials.

Fill

In areas where fill is required to establish the street/roadway subgrade, specifications and testing information must be developed to address the existing soil interface between the fill materials that is brought in or the existing soils on the site. Additional testing must be performed on fill material to confirm the assumed Soil Modulus value and plasticity index.

DESIGN PARAMETERS

The design of pavement structures shall be in accordance with the American Association of State Highway and Transportation officials (AASHTO) Guide for Design of Pavement Structures, 1993 or latest approved edition. The pavement design report must be signed by a professional engineer registered in the State of Texas. However, the report may be prepared under the supervision of a professional engineer registered in the State of Texas. The following design

requirements shall be used for flexible pavement design:

- Equivalent Single Axle Loading (ESAL) - (See Tables 1 & 2 for road classification)
  - Local A – A minimum of 100,000 ESALs shall be used in the design.
  - Local B and Collector – A minimum of 2,000,000 ESALs shall be used in the design. If the street will have more than 152 daily truck trips, an ESAL calculation for the expected truck traffic must be submitted.
  - Arterial – A minimum of 3,000,000 ESALs shall be used in the design. If the street will have more than 228 daily truck trips, an ESAL calculation for the expected truck traffic must be submitted.
  - For further information and reference, see Table 1 – Atascosa County Curb & Gutter Road Standards, and Table 2 – Atascosa County Rural (Shoulder-Section) Road Standards.

- Service Life – Twenty (20) years

- Standard Deviation (S_o) – 0.45

- Serviceability
  - Initial Serviceability (p_o) – 4.2 (flexible pavements); 4.5 (Rigid Pavements)
  - Terminal Serviceability (p_t) – 2.0 (Local A & Local B Streets)
    – 2.5 (Collector and Arterial Streets)
- Reliability Level
  - 70 (Local A Streets)
  - 90 (Local B and Collector Streets)
  - 95 (Arterial Streets)

Minimum Section – Street structural sections shall be designed to carry the calculated ESAL loading relative to the soil modulus of subgrade reaction of the roadbed soil (subgrade). The soil modulus of subgrade reaction shall be determined by Resilient Modulus (M_R) testing or multiplying the CBR of the roadbed soil by 1,500. The structural section shall be determined by the design engineer and/or the geotechnical engineer. At no time shall the street structural layers be less than the following:

Minimum HMAC Thickness (S_c= 0.44)	Local A: 2” Local B/Collector: 3” Arterial: 4”
Two Course Surface Treatment (S_c=0.00)	Expected traffic volume <500 vehicles per day for the street and County Road Section (without standard or header curb) is used
Aggregate Base Course (S_c= 0.14)	8” Layer (6” if existing subgrade is limestone, CBR >= 7.9)
Asphalt Treated Base Course (S_c= 0.38)	6” Layer
Cement Stabilized Base Course (S_c= 0.23)	6” Layer
Mechanically Stabilized Layer (S_c see below)	8” Layer
Subbase Course (S_c varies by material)	6” Layer
Subgrade Treatment/Stabilization (S_c see below)	6” Depth

Mechanically Stabilized Layers

Mechanically stabilized layers may be used. No structural credit will be given to bi-axial geogrid material. Uni-axial geogrid is not allowed. A structural credit may be given to the aggregate base course that is mechanically stabilized with tri-axial geogrid material. The structural credit will only be given to the aggregate material layer above the geogrid material at a value determined using AASHTO’s mechanistic-empirical modeling methods.

Lime Stabilization

To include a lime stabilized layer as part of the structural pavement system, the application rate of lime shall be determined based on laboratory testing and shall be the lowest percentage of lime that provides:

- a pH of 12.4 or the highest pH achieved in accordance with ASTM D6276 *Standard Test Method for Using pH to Estimate the Soil-Lime Proportion Requirement for Soil Stabilization*,
- a PI of less than 20 in accordance with ASTM D4318 *Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils*,
- an unconfined compressive strength (UCS) at 7-days of at least 160 psi in accordance with ASTM D5102 *Standard Test Methods for Unconfined Compressive Strength of Compacted Soil-Lime Mixtures (Procedure B) (*In addition,

curing should occur for 7 days at 40°C and specimens should be subjected to 24-hr capillary soak prior to testing*)*, and
- [*Optional Criteria for Expansive Soils*] a three dimensional expansion of less than 1% (or maybe 2%).

For construction verification the following shall be conducted in the field:

- After initial mixing the soil-lime mixture shall mellow for a period of two to three (2 – 3) days. Maintain moisture during mellowing;
- After mellowing and final mixing, the pulverization shall be checked using the following criteria (remove non-slaking aggregates retained on the ¾ inch sieve from the sample):
    - Minimum passing 1 ¾" sieve 100
    - Minimum passing ¾" sieve 85
    - Minimum passing No. 4 sieve 60
- Sample soil-lime mixture for determination of Maximum Dry Density (MDD). In the laboratory, mold specimens to 95% of MDD at optimum moisture content and verify UCS to be at least 160 psi in accordance with procedure outlined above for mixture design.
- Compact and check field density (minimum of 95% of MDD required);
- Cure for an additional 2 to 5 days (total mellowing and curing time should total at least 5 days).
- Verify depth of lime stabilized layer to depth as noted on plan to within +/- 1.0 inch.

Cement Stabilization

To include a cement stabilized layer as part of the structural pavement system, the application rate of cement shall be determined based on laboratory testing and shall be the lowest percentage of cement that provides:

- a PI of less than 25 in accordance with ASTM D4318 *Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils*,
- an unconfined compressive strength (UCS) at 7-days of at least 250 psi in accordance with ASTM D1633 *Compressive Strength of Molded Soil-Cement Cylinders. (C*uring should occur for 7 days in a damp room and without capillary soaking*)*, and
- [*Optional Criteria for Expansive Soils*] a three dimensional expansion of less than 1% (or maybe 2%).

For construction verification the following shall be conducted in the field:

- After mixing, the pulverization should be checked using the following criteria:
    - Minimum passing 1 ¾" sieve 100
    - Minimum passing ¾" sieve 85
    - Minimum passing No. 4 sieve 60
- Sample soil-cement mixture for determination of MDD. In the laboratory, mold specimens to 95% of MDD at optimum moisture content and verify UCS to be at least 250 psi in accordance with procedure outlined above for mixture design.
- After mixing, compact the soil-cement mixture and cure for a period of three (3) days. Maintain moisture during curing;
- Compact and check field density (minimum of 95% of MDD required);
- Run three (3) passes of a 12 ton roller after the three (3) day curing time to create micro cracks, if UCS at 7-days exceeds 500 psi.
- Verify depth of cement stabilized layer to depth as noted on plan to within +/- 1/8 inches using TxDOT Test Method TEX-140-E *Measuring Thickness of Pavement Layer*.