INTERIM
DESIGN GUIDELINES
FOR
SUBDIVISION STREET IMPROVEMENTS
IN
LONGVIEW, TEXAS
AND
EXTRA-TERRITORIAL JURISDICTION

October, 2018

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CHAPTER 1 GENERAL INFORMATION

I. PURPOSE

The purpose of these interim guidelines is to inform engineers, planners, and others concerned with subdivision design of the basic procedures and requirements for pavement design for subdivisions. These requirements are for use as guidelines and minimum standards only, and are not to be construed as a waiver by the City of Longview of the right to require a stringent design as conditions warrant.

II. DESIGN

All construction plans for subdivision improvements are to be prepared under the direction and supervision of a qualified professional engineer licensed in the state of Texas and such plans shall be dated and bear the seal and signature of that engineer.

A. APPROVALS

Approval of the construction plans by the City Engineer is a prerequisite for final plat approval.

III. INSPECTION

An inspector for the City of Longview will inspect all construction of the improvements described herein. No work of any nature shall begin without authorization of the City Engineer. The contractor shall cooperate with the inspector in coordinating construction and inspections, and shall notify the inspector so he may be present to inspect construction. Failure to notify the inspector properly may result in the City of Longview not accepting that work. The contractor would then be required to remove and reconstruct the improvements. The inspector shall not have the authority to approve defective work and his acceptance of improvements will not constitute any waiver of the contractor's responsibility in adhering to the construction plans and specifications, nor the design engineer's responsibility for the inspection of construction of his design.

CHAPTER 2 PAVING

I. GENERAL

The purpose of these guidelines is to guide the engineer in design and preparation of plans and specifications for the construction of public paving improvements. All paving improvements shall be designed and constructed in accordance with City of Longview requirements. Materials and construction methods for paving work (technical specifications) shall conform to the Texas Department of Transportation 2014 Standard Specifications for Construction of Highways, Streets, and Bridges, except where specifically noted otherwise in this publication. Where any questions arise as to the interpretation of the standards of design, the decision of the City Engineer will be final.

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II. ROADWAY DESIGN

A. ROADWAY PAVEMENT SECTION DESIGN:

The City of Longview does not have a typical or standard pavement section; therefore, this section presents the method for the thickness design of roadway pavements. It contains the design requirements for various street widths and traffic conditions, various subgrade support soils, and various types of pavement materials. Pavement design options are based on a combination of the above variables.

Step 1 - Determine the structural support of the roadway's existing subgrade. The subgrade strength is defined by having a California Bearing Ratio (CBR) test performed in accordance with ASTM Method D 1883-94 (Standard Test Method for Bearing Ratio of Laboratory - Compacted Soils) by a geotechnical and construction materials testing lab.

Soil borings are to be placed along the proposed roadway to provide a representative view of the existing subgrade. Laboratory tests are to be performed on these representative soil samples to determine natural moisture content, liquid

and plastic limits, and percent passing the No. 200 sieve. These tests are to be performed in accordance with ASTM Methods D 2216, D 4318, and D 422, respectively. Additional CBR tests are to be performed where above lab tests reveal variations in the subgrade according to the "Unified Soil Classification". Unified Soil Classifications are to be determined using procedures in accordance with ASTM Method D 2487. Additional CBR tests are to be performed on soil samples where roadway grades produce cuts into varying subgrade soils.

The existing subgrade shall be able to provide a stable working platform when compacted to a density of 95% standard proctor at optimum moisture content according to ASTM Method D 698. All organic and unstable materials are to be removed during construction and replaced with select fill. A geotextile material may be used at the discretion of the design engineer to enhance subgrade support.

Step 2 - Identify the street class. Street classifications are determined by the following attributes: Metropolitan Transportation Plan (MTP) designation, zoning, existing and future traffic volumes, and street width. (See Table II – A - 1). Choose the street type which matches the design roadway's attributes. If a design roadway's attributes fall between street classes, for example, a street that has both residential and commercial zoning, choose the street class which produces the most stringent pavement design.

TABLE II – A - 1
STREET CLASSIFICATIONS

Class	Zoning	Width (B-B)	Maximum Avg. Vehicle	Percent Trucks[1]	Avg. Gross Weight (Lbs)[2]	Single Axle Load Limit (Lbs)
Lane	Residential	29'	500	2	20,000	20,000
Sub-Collector	Residential	37'	4,800	5	25,000	20,000
Collector	Residential	37'	9,600	5	30,000	20,000
Collector	Commercial	53'	11,200	15	30,000	20,000
Collector	Industrial	53'	9,600	20	30,000	20,000
Arterial	All	66'	24,300	15	30,000	20,000

1. The Asphalt Institute, U.S. Federal Highway Administration
2. The Asphalt Institute, U.S. Federal Highway Administration.

Step 3 - Determine the total thickness of the pavement section for each type of pavement design. Four pavement design tables are provided (Tables II – A – 2, II – A – 3, II – A – 4, and II – A - 5), one for flexible base pavement, one for full-depth hot mix asphaltic concrete pavement, and one for concrete pavement. Each design table is divided into street classification columns and subgrade CBR % rows. Using the street class identified in Step 2, follow this column down until it intersects the subgrade CBR % row determined in Step 1. This number represents the total thickness of pavement section, in inches, to be used.

Step 4 - Determine the thickness of base. The minimum surface thickness is found at the bottom of each street class column. To obtain the thickness of base, subtract the surface thickness from the total thickness of the pavement section. The typical placement for the geogrid on geogrid-reinforced flexible base pavements is at the base/subgrade interface. On roadways that have an existing subgrade CBR % greater than 12, step four often provides the most economical

design and the design process could be stopped (see Example Problem II – A - 1), however, for roadways that have subgrade CBR% less than 12, the designing process should continue to provide an economical design.

Step 5 - Select a subbase material if the process is continued. The subbase can be the existing subgrade treated with lime or cement, or a select fill material, such as iron ore topsoil. The subbase material is sampled and the subbase strength is defined by having a CBR test performed.

Step 6 - Select the new thickness of base and surfacing. Taking into account the subbase CBR % value and using the pavement design table again, follow the same street class column down until it intersects the subbase CBR % determined in Step 5. This number represents the total thickness, in inches, of base and surfacing using the subbase in lieu of the existing subgrade. The base thickness is found by subtracting the surface thickness from the total thickness of base and surfacing.

Step 7 - Determine the thickness of the subbase material selected in Step 5. This is found by subtracting the total thickness of base and surfacing in Step 6 from the total thickness of the pavement section in Step 3. The minimum thickness of a subbase is six inches.

Step 8 - Determine the overall pavement section design. Add the surface thickness and base thickness found in Step 6 to the subbase thickness found in Step 7. (See Example Problem II – A - 2)

To determine the most economical and efficient roadway pavement design, the above process should be performed using each pavement design table, varying the subbase materials, and then applying current construction costs.

Step 9 - Design submittal. Submit the recommended roadway pavement section design on Form II – A - 9 to the City Engineer for approval. Also submit the

results of the CBR test(s) performed by a geotechnical and construction materials testing lab.

TABLE II – A - 2

FLEXIBLE BASE PAVEMENT DESIGN

DESIGN PERIOD = 20 YEARS

TOTAL PAVEMENT SECTION					
SUBGRADE OR SUBBASE CBR %	LOCAL 29' B – B RESIDENTIAL	SUB-COLLECTOR AND COLLECTOR 37' B - B RESIDENTIAL	COLLECTOR 53' B – B COMMERCIAL	COLLECTOR 53' B - B INDUSTRIAL	ARTERIAL 66' B - B
	Inches	Inches	Inches	Inches	Inches
2	32	35	36.5	38	39
3	24	27.5	29	30	31
4	21	23	24	24.5	25
5	18	19.5	20.5	21	21.5
6	16	17.5	18	18.5	19
7	14	16	16.5	17	17.5
8	13	14.5	15	15.5	16
9	12	13.5	14	14.5	15
10	11	12.5	13	13	13.5
12	9.5	10.5	11	11.5	12
15	8	9	9.5	10	10
20	7.5	8	9	9.5	10
25	7.5	8	9	9.5	10
MINIMUM SURFACE & BASE SECTION					
HMAC	2	2	2	2.5	3
BASE	5.5	6	7	7	7
MINIMUM STABILIZED SUBBASE SECTION					
	6	6	6	6	6
FLEXIBLE BASE SPECIFICATIONS					
Texas Department of Transportation "2014 Standard Specifications For Construction of Highways, Streets, And Bridges" Item 247 shall govern except California Bearing Ratio Tests will replace Triaxial Classes and the maximum PI = 9. The base shall be compacted to a density of 98% modified proctor at optimum moisture content according to ASTM Method D 1557.					
Grade	1, 2, 3	1, 2, 3	1, 2	1, 2	1, 2
Minimum CBR% of Base	40	60	70	70	80

TABLE II – A – 3

FULL DEPTH HMAC PAVEMENT DESIGN

DESIGN PERIOD = 20 YEARS

TOTAL PAVEMENT SECTION					
SUBGRADE OR SUBBASE CBR %	LOCAL 29' B – B RESIDENTIAL	SUB-COLLECTOR AND COLLECTOR 37' B - B RESIDENTIAL	COLLECTOR 53' B – B COMMERCIAL	COLLECTOR 53' B - B INDUSTRIAL	ARTERIAL 66' B - B
	Inches	Inches	Inches	Inches	Inches
2	12.5	14	15.5	16	16.5
3	10.5	12	13.5	13.5	14
4	9.5	10.5	12	12	12.5
5	8.5	9.5	11	11	11.5
6	8	9	10	10	10.5
7	7.5	8.5	9.5	9.5	10
8	7.5	8	9	9	9.5
9	7	7.5	8.5	8.5	9
10	6.5	7.5	8	8.5	9
12	6	7	7.5	8	8
15	5.5	6.5	7	7.5	7.5
20	5.5	6	7	7	7
25	5.5	6	6.5	7	7
MINIMUM HMAC SURFACE & BASE SECTION					
TYPE “D” TYPE “B”	1.5 4	2 4	2 4.5	2.5 4.5	3 4
MINIMUM STABILIZED SUBBASE SECTION					
	6	6	6	6	6
HOT MIX ASPHALTIC CONCRETE SPECIFICATIONS					
Texas Department of Transportation "2014 Standard Specifications For Construction of Highways, Streets, And Bridges" Item 341 with coarse aggregate being crushed so that a minimum of 50% of particles retained on # 4 sieve shall have more than one crushed face when tested in accordance with Test Method Tex-413 A (Particle Count).					

TABLE 4.4

CONCRETE PAVEMENT DESIGN

DESIGN PERIOD = 35 YEARS

TOTAL PAVEMENT SECTION						
SUBGRADE OR SUBBASE CBR %	Local 29' B-B		COLLECTOR 39' B-B Local	COLLECTOR 59' B-B Commercial	COLLECTOR 64' B-B Industrial	ARTERIAL 66' B-B
	Cul-De-Sac	Local				
2	7	8	9	10	11	11
3	6	7	8	9	10	10
4	6	7	8	9	10	10
5	6	6	7	8	9	9
6	6	6	7	8	9	9
7	6	6	7	8	9	9
8	6	6	7	8	9	9
9	6	6	7	8	9	9
10	5	6	7	8	8	8
12	5	6	6	7	8	8
15	5	6	6	7	7	7
20	5	5	6	7	7	7
25	5	5	6	6	7	7
MINIMUM STABILIZED SUBBASE SECTION						
	6	6	6	6	6	6
CONCRETE SPECIFICATIONS						
Texas Department of Transportation "2014 Standard Specifications For Construction of Highways, Streets And Bridges", Item 360 with a minimum compression strength of 3000 PSI at 28 days (5 sacks of cement per cubic yard). Pavement design shall be Concrete Pavement Contraction Design (CPCD) as shown in the City of Longview Standard Details						

EXAMPLE PROBLEM 4.1

Required: Determine a pavement section for a collector street in a commercial area.

Solution A: FLEXIBLE BASE PAVEMENT SECTION

Step 1 - From testing the roadway's existing subgrade, a CBR of 12% was obtained.

Step 2 - From Table 4.1, the street classification was determined to be a 59' B-B commercial street.

Step 3 - From Table 4.2, "Flexible Base Pavement Design", the total thickness of the pavement section was determined to be 11".

Step 4 - The thickness of base without a subbase is found by subtracting the minimum surface from the total thickness; 11" - 2" = 9". The design process could stop here with an overall pavement section design of 2" HMAC Surface on 9" Flexible Base. However, a treated subgrade may produce a more economical design.

Step 5 - The existing subgrade is treated with lime, (say 6%) and testing shows the new subbase material has a CBR of 20%.

Step 6 - From Table 4.2, the new total thickness of base and surfacing is 9". The new thickness of base with a subbase is found by subtracting the minimum surface from the new total thickness of base and surface; 9" - 2" = 7".

Step 7 - The subbase thickness is found by subtracting Step 6 from Step 3; 11" - 9" = 2". However, minimum subbase thickness is 6".

Step 8 - The overall pavement section design is found by adding Step 6 to Step 7; 2" HMAC Surface on 7" Flexible Base on 6" Lime Treated Subbase.

Solution B: FULL DEPTH HMAC PAVEMENT SECTION

Step 1 - From testing the roadway's existing subgrade, a CBR of 12% was obtained.

Step 2 - From Table 4.1, the street classification was determined to be a 59' B-B commercial street.

Step 3 - From Table 4.3, "Full Depth HMAC Pavement Design", the total thickness of the pavement section was determined to be 7.5".

Step 4 - The thickness of base without a subbase is found by subtracting the minimum surface from the total thickness; 7.5" - 2" = 5.5". The design process could stop here with an overall pavement section design of 2" HMAC Surface on 5.5" HMAC Base.

Solution C: CONCRETE PAVEMENT SECTION

Step 1 - From testing the roadway's existing subgrade, a CBR of 12% was obtained.

Step 2 - From Table 4.1, the street classification was determined to be a 59' B-B commercial street.

Step 3 - From Table 4.4, "Concrete Pavement Design", the total thickness of the pavement section was determined to be 7". The design process could stop here with an overall pavement section design of 7" Concrete Pavement on untreated subgrade.

EXAMPLE PROBLEM 4.2

Required: Determine a pavement section for a local street in a residential subdivision.

Solution A: FLEXIBLE BASE PAVEMENT SECTION

Step 1 - From testing the roadway's existing subgrade, a CBR of 3% was obtained.

Step 2 - From Table 4.1, the street classification was determined to be a 29' B-B residential street.

Step 3 - From Table 4.2, "Flexible Base Pavement Design", the total thickness of the pavement section was determined to be 24".

Step 4 - The thickness of base without a subbase is found by subtracting the minimum surface from the total thickness; 24" - 2" = 22". A base thickness of 22" is excessive, and the design process should continue to find a more economical design.

Step 5 - The existing subgrade is treated with lime, (say 6%) and testing shows the new subbase material has a CBR of 9%.

Step 6 - From Table 4.2, the new total thickness of base and surface is 12". The new thickness of base with a subbase is found by subtracting the minimum surface from the new total thickness of base and surface; 12" - 2" = 10".

Step 7 - The subbase thickness is found by subtracting Step 6 from Step 3; 24" - 12" = 12".

Step 8 - The overall pavement section design is found by adding Step 6 to Step 7; 2" HMAC Surface on 10" Flexible Base on 12" Lime Treated Subbase.

Solution B: FULL DEPTH HMAC PAVEMENT SECTION:

Step 1 - From testing the roadway's existing subgrade, a CBR of 3% was obtained.

Step 2 - From Table 4.1, the street classification was determined to be a

29' B-B residential street.

Step 3 - From Table 4.3, "Full Depth HMAC Pavement Design:, the total thickness of the pavement section was determined to be 10.5".

Step 4 - The thickness of base without a subbase is found by subtracting the minimum surface from the total thickness; 10.5" - 2" = 8.5".

Step 5 - The existing subgrade is treated with lime, (say 6%) and testing shows the new subbase material has a CBR of 9%.

Step 6 - From Table 4.2, the new total thickness of base and surface is 7". The new thickness of base with a subbase is found by subtracting the minimum surface from the new total thickness of base and surface; 7" - 2" = 5".

Step 7 - The subbase thickness is found by subtracting Step 6 from Step 3; 10.5"' - 7" = 3.5", however, minimum subbase thickness is 6".

Step 8 - The overall pavement section design is found by adding Step 6 to Step 7; 2" HMAC Surface on 5" Flexible Base on 6" Lime Treated Subbase.

Solution C: CONCRETE PAVEMENT DESIGN:

Step 1 - From testing the roadway's existing subgrade, a CBR of 3% was obtained.

Step 2 - From Table 4.1, the street classification was determined to be a 29' B-B residential street.

Step 3 - From Table 4.4, "Concrete Pavement Design", the total thickness of the pavement section was determined to be 7".

Step 4 - The design process could stop here with an overall pavement section design of 7" Concrete Pavement on untreated subgrade. However, a treated

subgrade may produce a more economical design.

Step 5 - The existing subgrade is treated with lime, (say 6%) and testing shows the new subbase material has a CBR of 9%.

Step 6 - From Table 4.4, the new total thickness of pavement is 6".

Step 7 - The subbase thickness is found by subtracting Step 6 from Step 3; 7" - 6" = 1", however, minimum subbase thickness is 6".

Step 8 - The overall pavement section design is found by adding Step 6 to Step 7; 6" concrete Pavement on 6" lime treated subbase.

FORM 4.1

CITY OF LONGVIEW
ROADWAY PAVEMENT SECTION DESIGN

SUBDIVISION/PROJECT NAME:
STREET NAME:

Step 1 California Bearing Ratio Test (CBR) of Existing Subgrade

Boring #	Station #	Offset Distance	Depth of Material Tested	CBR %

Step 2 Street Classification:
Step 3 Total Thickness of Pavement Section.

Flexible Base (Table 4.2)	Full Depth HMAC (Table 4.3)	Concrete (Table 4.4)	Geogrid Reinforced (Table 4.5)

Step 4 Thickness of Base.

	Flexible Base	Full Depth HMAC	Geogrid Reinforced
Total Thickness of Pavement Section (Step 3)			
Surface Thickness	(-) _____	(-) _____	(-)
Base Thickness			

Step 5 Subbase Material. (If used)

	Flexible Base	Full Depth HMAC	Concrete	Geogrid Reinforced
Type of Subbase				

Step 6 Thickness of Base & Surfacing. (If A Subbase Is Used)

	Flexible Base	Full Depth HMAC	Concrete	Geogrid Reinforced
Total Thickness of Base & Surfacing				
Surface Thickness	(-)	(-)	(-)	(-)
Base Thickness				

Step 7 Subbase Material Thickness. (If A Subbase Is Used)

	Flexible Base	Full Depth HMAC	Concrete	Geogrid Reinforced
Total Pavement Section Thickness (Step # 3)				
Total Thickness of Base and Surfacing (Step # 6)	(-)	(-)	(-)	(-)
Subbase Thickness (Minimum 6")				

Step 8 Overall Pavement Section Design

	Flexible Base	Full Depth HMAC	Concrete	Geogrid Reinforced
Surface Thickness				
Base Thickness				
Subbase Thickness				

RECOMMENDATION:	THICKNESS	MATERIAL
SURFACE	_____	
BASE	_____	
SUBBASE	_____	

SIGNATURE:

TITLE:

DATE: