APPENDIX D PAVEMENT DESIGN CRITERIA AND REPORT

D.1 PURPOSE

This appendix provides the basic criteria, design procedures, and report guidelines for roadway pavements. Asphalt and Portland Cement Concrete (PCC) methodologies generally follow the CDOT methodology.

D.2 SUBGRADE INVESTIGATION

D.2.1 Field Investigation

The field investigation shall consist of borings or other suitable methods of sampling subgrade soils for visual classification to a depth of at least 5 feet below proposed subgrade elevation, at spacings of not more than 500 feet. A minimum of one boring shall be obtained for any roadway segment. Every fifth hole shall be 10 feet deep. The ECM Administrator may require more frequent testing or additional borings that extend deeper should bedrock or high groundwater be a design concern. All borings shall be field logged and visually classified. Samples shall be obtained from each soil type in the upper 24 inches of subgrade for testing and evaluation. Samples shall be taken after grading is completed and the subgrade is rough cut. Multiple samples shall be taken alternating among lanes and shall be evenly spaced.

D.2.2 Classification Testing

Each boring location shall be tested to determine Liquid Limit, Plastic Limit, Plasticity Index, and the percentage passing the U.S. Standard No. 200 sieve. Samples of sands and gravels will require gradation analysis for classification determination. These data shall be determined using the following methods:

- Liquid Limit - AASHTO T 89 (ASTM D 4318)
- Plastic Limit - AASHTO T 90 (ASTM D 4318)
- % Passing No. 200 - AASHTO T 11 (ASTM C 117)
- Gradation - AASHTO T 27 (ASTM D 422)

The results of these tests shall be used to calculate the AASHTO Classification and Group Index using AASHTO M 145.

Additional testing that shall be performed include:

- Moisture Content – AASHTO T 265
- Water Soluble Sulfates (for rigid pavements only) - AASHTO T 290

D.2.3 Soil Grouping

Soil samples collected in the field investigation can be combined to form soil groups. These groups determined by laboratory testing shall be based upon the AASHTO Classification, Group Index and location within the area investigated. Groupings shall not consist of samples with different AASHTO Classifications. Composite samples can be manufactured by combining small portions of each subgrade sample contained within the group and mixing to provide a uniform composite sample of the soil group. Composite samples shall be subjected to Classification Testing.

D.2.4 Subgrade Support Testing

Individual subgrade or composite samples shall be tested to determine the subgrade support value using either California Bearing Ratio (CBR) or Hveem Stabilometer (R-value) testing. In addition, a swell potential evaluation shall be performed when the plasticity index (PI) is greater than 10 or as deemed appropriate. These values shall be used in the design of pavement sections. Tests shall be conducted in accordance with the procedures listed below.

A. CBR Tests

California Bearing Ratio tests shall be conducted in accord with AASHTO T 193 with the following modifications:

- Note 4 of AASHTO T 193 shall not apply. A 3-point CBR evaluation is required.
- Surcharge shall be calculated using a unit weight of 140 pcf for Mix Asphalt and 135 pcf for untreated aggregate base course.
- The design CBR value shall be determined from the CBR - Dry Density Curve and shall be the CBR value at 95 percent compaction.
- In addition to the values requested in AASHTO T 193, Stress - Penetration curves for each sample, a CBR - Dry Density curve and Proctor Compaction test results shall be reported.

B. R-Value Tests

Hveem Stabilometer tests shall be conducted in accordance with AASHTO T 190. The design R-value shall be at 300 psi exudation pressure. The reported data shall consist of:

- Dry density and moisture content for each sample.
- Expansion pressure for each sample.
- Exudation Pressure - corrected R-value curve showing the 300-psi design R-value.

C. Swell Test

The results of a swell potential evaluation (ASTM D4546-96) shall be presented in the Pavement Design Reports where the PI of the existing material is greater than 10.

If the swell (at an overburden pressure of 100-150 psf, at specified compaction per CDOT and at optimum moisture content) is 2.0% or greater, the Pavement Design Report must provide mitigative measures to minimize the destructive swell potential. Since the pavement is not placed on the soils until after the soil has been scarified, moisture treated, and compacted to optimum, the "% swell" shall be measured from the point after the overburden pressure is applied, to the point after water is added.

D.3 PAVEMENT DESIGN CRITERIA

This section provides the input data used for the design of pavements for El Paso County roads.

D.3.1 ESAL

Equivalent Single Axle Loads (ESAL) are considered equivalent units based on 20-year design criteria and an 18-kip axle loading. All data and design nomographs use ESAL units for pavement loading repetitions. ESAL criteria shall conform to Table D-2.

D.3.2 Design Serviceability

Design values in Table D-1 shall be used for all County roadways.

Table D-1. Pavement Design Values

Roadway Functional Classification	Serviceability Index, SI	Lanes	Directional Distribution Factor, DD	Lane Distribution Factor, DL	Truck (%)
Rural					
Local	2.0	2.0	0.5	1.0	3.0
Minor Collector	2.5	2.0	0.5	1.0	4.0
Major Collector	2.5	2.0	0.5	1.0	5.0
Minor Arterial	2.5	4.0	0.5	0.9	7.0
Principal Arterial, 4-lane	2.5	4.0	0.5	0.9	8.0
Principal Arterial, 6-lane	2.5	6.0	0.5	0.7	9.0
Expressway, 4-lane	2.5	4.0	0.5	0.9	8.0
Expressway, 6-lane	2.5	6.0	0.5	0.7	10.0
Urban					
Local (low volume)	2.0	2.0	0.5	1.0	3.0
Local	2.0	2.0	0.5	1.0	4.0
Residential Collector	2.5	2.0	0.5	1.0	5.0
Nonresidential Collector	2.5	2.0	0.5	1.0	15.0
Minor Arterial	2.5	2.0	0.5	1.0	6.0
Principal Arterial, 4-lane	2.5	4.0	0.5	0.9	8.0
Principal Arterial, 6-lane	2.5	6.0	0.5	0.7	8.0
Expressway, 4-lane	2.5	4.0	0.5	0.9	8.0
Expressway, 6-lane	2.5	6.0	0.5	0.7	8.0

D.3.3 Minimum Pavement Section

Table D-2 provides the minimum acceptable pavement sections for County roadways. Final pavement designs must be based on actual subgrade support test results and the Transportation Impact Study (TIS).

Table D-2. Minimum Pavement Sections

Roadway Functional Classification	EDLA	ESAL	Composite Sections[1]		Full Depth Asphalt (in)	Portland Cement Concrete (in)
			Asphalt (in)	Base (in)		
Rural						
Local	5.0	32,850	3.0	4.0	4.0	5.0
Minor Collector	15.0	109,500	3.0	6.0	4.5	5.0
Major Collector	38.0	273,750	3.0	8.0	5.0	6.0
Minor Arterial	95.0	689,850	4.0	8.0	6.0	6.0
Principal Arterial, 4-lane	360.0	2,628,000	5.0	8.0	7.0	6.0
Principal Arterial, 6-lane	1,260.0	9,198,000	6.5	8.0	8.5	6.0
Expressway, 4-lane	540.0	3,942,000	6.5	10.0	7.5	6.0
Expressway, 6-lane	1,680.0	12,264,000	6.5	10.0	9.0	7.0
Urban						
Local (low volume)	5.0	32,850	3.0	4.0	4.0	5.0
Local (pavement only)[2]	15.0	109,500	3.0	6.0	4.5	5.0
Local	40.0	292,000	3.0	8.0	5.0	5.0
Residential Collector	113.0	821,000	4.0	8.0	6.0	6.0
Nonresidential Collector	113.0	821,000	4.0	8.0	6.0	6.0
Minor Arterial	270.0	1,971,000	5.0	8.0	7.0	6.0
Principal Arterial, 4-lane	720.0	5,256,000	5.0	8.0	8.0	6.0
Principal Arterial, 6-lane	1,120.0	8,176,000	6.5	8.0	8.5	6.0
Expressway, 4-lane	1,080.0	7,884,000	6.5	8.0	8.5	6.0
Expressway, 6-lane	1,344.0	9,811,000	6.5	10.0	9.0	7.0

[1] A composite section can only be used where the R-value of the subgrade soil is 30 or lower; or the CBR value is 5 or lower

[2] Section is for pavement design purposes only. All other design related requirements shall follow those designated under the Urban Local.

D.3.4 Flexible Pavement Strength Coefficients

The standard design coefficients for pavement materials are provided in Table D-1. Design values shall be verified by predesign mix test data and supported by daily construction tests.

D.3.5 Portland Cement Concrete Working Stress (f_t)

The working stress (f_t) shall be 75% of that provided by third-point beam loading which shall have minimum laboratory 28-day strength of 650 psi based on actual tests of materials to be used.

D.3.6 Gravel Roads

A minimum thickness of 6-inches shall be used on all newly constructed gravel roads meeting material specifications presented in Table D-7.

D.4 PAVEMENT DESIGN PROCEDURE

D.4.1 Flexible Pavements

The following procedure shall be used in determining the Structural Number (SN) and thickness of the pavement being designed.

A. Define ESAL

Determine ESAL from Table D-2. The ESAL calculated from the traffic volumes in the Traffic Impact Study shall be used whenever they exceed the minimum ESAL values given in Table D-2.

B. Define Serviceability Index (SI) and Nomograph Selection

Determine the SI of the roadway classification from Table D-1 to select the proper nomograph (Figure D-1 or Figure D-2) or use AASHTO pavement design software.

C. Resilient Modulus Usage (M_R) and CBR

Using the resilient modulus and ESAL, determine the SN from the appropriate design nomograph. A reliability of 80 percent and an overall deviation of 0.45 shall be used for flexible pavements. Resilient modulus shall be calculated using the following equations:

$$S_1 = [(R - 5) / 11.29] + 3$$

$$M_R = 10^{[(S_1 + 18.72) / 6.24]}$$

$$M_R = 1{,}500 * CBR$$

Where:

M_R = resilient modulus (psi)

S_1 = the soil support value

R = R-value obtained from the Hveem stabilometer

CBR = California Bearing Ratio

D. Pavement Design Thickness

The design thickness for the pavement structure can be determined by the general equation:

$$SN = a_1D_1 + a_2D_2 + a_3D_3 + ...$$

Where:

a_1 = Hot Mix Asphalt (HMA) strength coefficients

a_2, a_2, a_n. = strength coefficients of additional pavement components

D_1 = thickness of Hot Mix Asphalt (HMA) (inches)

D_2, D_3, D_n = thickness of additional pavement component sections

The strength coefficients for various components of the pavement structures are given in Table D-3. The component thickness selected must meet two conditions.

Table D-3. Strength Coefficients

Pavement Structure Component	Strength Coefficients	Limiting Test Criteria
Conventional Materials		
Hot Mix Asphalt	0.40	See Section D.5.4
Existing Bituminous Pavement	0.20-0.40[1]	N/A
Aggregate Base Course	0.11	(CBR 80+ or R 78+)
Existing Aggregate Base Course	0.09	(CBR 50+ or R 69+)
Granular Subbase Course	0.07	(CBR 15 or R 50+)
Treated Materials		
Cement Treated Aggregate Base	0.23	(7 day, 640-1000 psi)
Fly Ash	0.10	(7 day, 150 psi @ 70°±)
Lime Treated Subgrade	0.14	(7 day, 160 psi, PI < 6)
Kiln Dust	0.10	(7 day, 150 psi, PI < 6)
[1] An average value of 0.30 can be used, unless analysis of existing pavement dictates a more representative coefficient.		

E. Total HMA Thickness

Total HMA thickness selected cannot be less than the minimum specified in Table D-2 for the roadway classification.

F. Base Course Thickness

The base course thickness selected cannot exceed 2.5 times the HMA thickness selected.

G. Swelling Soils

The design must reference any mitigation measures required when the subgrade contains swelling soils. Pavement Design Reports recommending permeable layers such as untreated aggregate base course in the pavement system, must present the measures to be used to ensure adequate drainage of such layers, and to maintain segregation of the layers from the swelling soils.

D.4.2 Rigid Pavement

The design of rigid pavements is a function of structural quality of the subgrade soil (R-value or CBR), traffic (ESAL), and the strength of the concrete (working stress). In comparison to the strength of the concrete slab, the structural contributions of underlying layers to the capacity of the pavement are relatively insignificant. Therefore, the use of thick bases or subbases under concrete pavement to achieve greater structural capacity is considered to be uneconomical and is not recommended. The following procedure should be used in determining the thickness of rigid pavement.

A. Define ESAL

Determine roadway classification and corresponding ESAL from Table D-2. The ESAL calculated from the traffic volumes in the traffic impact study shall be used whenever they exceed the minimum ESAL values given in Table D-2.

B. Define Serviceability Index (SI) and Other Variables

Determine design Serviceability Index (SI) of the roadway from Table D-1. For the purposes of design, the Concrete Elastic Modulus (E_c) shall be 3.4, the Mean Concrete Modulus of Rupture (S'_c) shall be 650 psi, the Load Transfer Coefficient (J) shall depend on the whether the shoulders are tied or non-tied and doweled or non-doweled (The J's shall be used. 2.8 for tied shoulders and doweled pavement, 4.2 for non-tied shoulders and non-doweled pavement. All other combinations shall be 3.6), and the Drainage Coefficient (C_d) shall be assumed to be 1.0 unless there is justification for a different number.

C. Effective Modulus of Subgrade Reaction (k) Determination

The Effective Modulus of Subgrade Reaction (k) shall be calculated using AASHTO. In most cases where there is no subbase, k can be calcualted using the following equations:

$$S_1 = [(R - 5) / 11.29] + 3$$

$$M_R = 10^{[(S_1 + 18.72) / 6.24]}$$

$$M_R = 1{,}500 * CBR$$

$$k = M_R / 19.4$$

Where:

M_R = resilient modulus (psi)

S_1 = the soil support value

R = R-value obtained from the Hveem stabilometer

CBR = California Bearing Ratio

D. Software or Nomograph Used

Determine the structural numbers using AASHTO pavement design software. Nomographs of the AASHTO parameters may be used instead (Figures D-3 and D-4). If the nomographs are used, copies of the nomograph determinations must be included with the design submittal. A reliability of 80 percent and an overall deviation of 0.35 shall be used for rigid pavements.

E. Slab Thickness

Use the slab thickness or the minimum thickness from Table D-2, whichever is greater.

F. Swelling Soils

The design must reference any mitigation measures required when the subgrade contains swelling soils. Pavement Design Reports recommending permeable layers such as untreated aggregate base course in the pavement system must present the measures to be used to ensure adequate drainage of such layers, and to maintain segregation of the layers from the swelling soils.

Figure D-1. Flexible Pavement Nomograph with SI=2.0

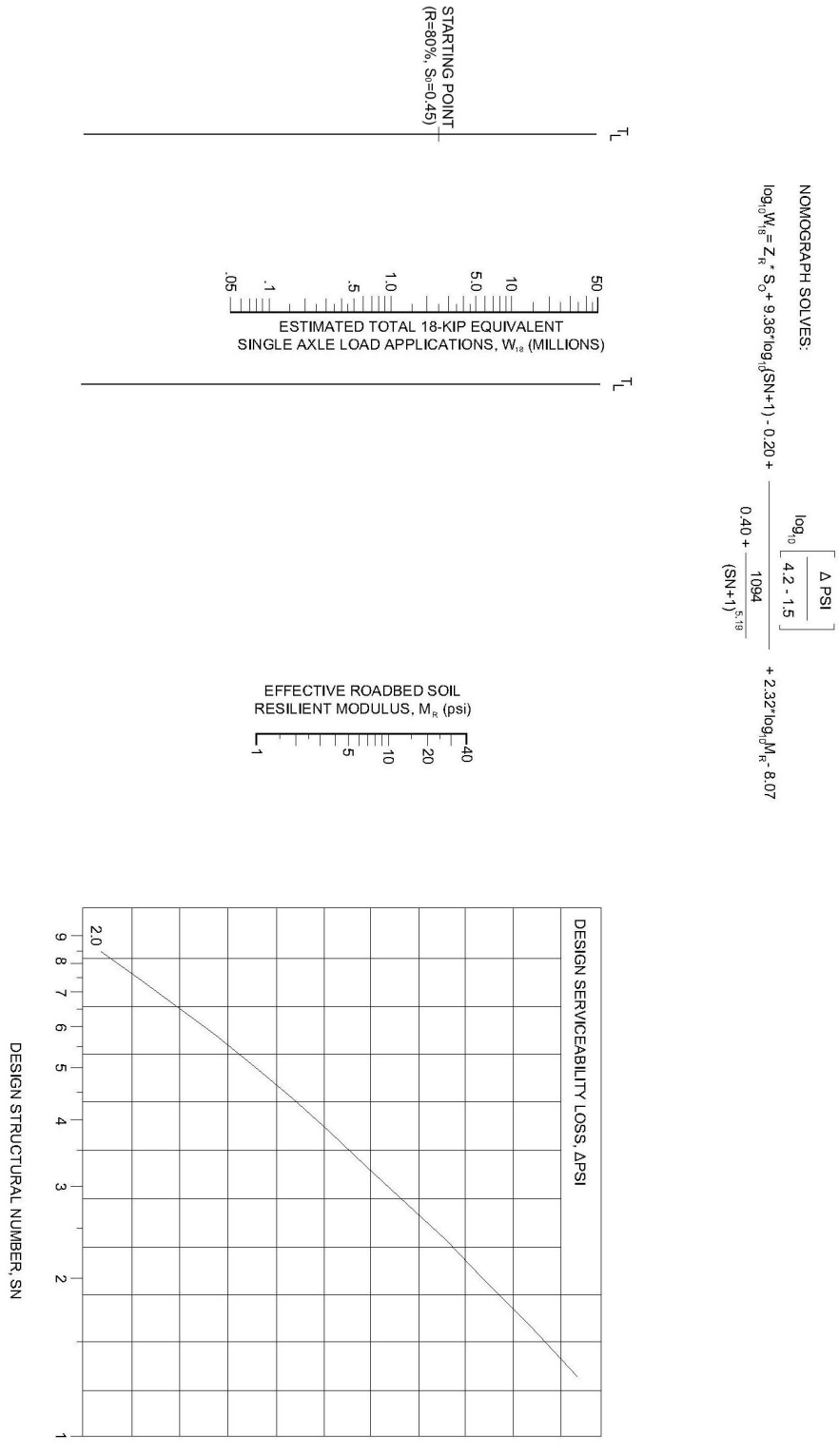


Figure D-2. Flexible Pavement Nomograph with SI=2.5

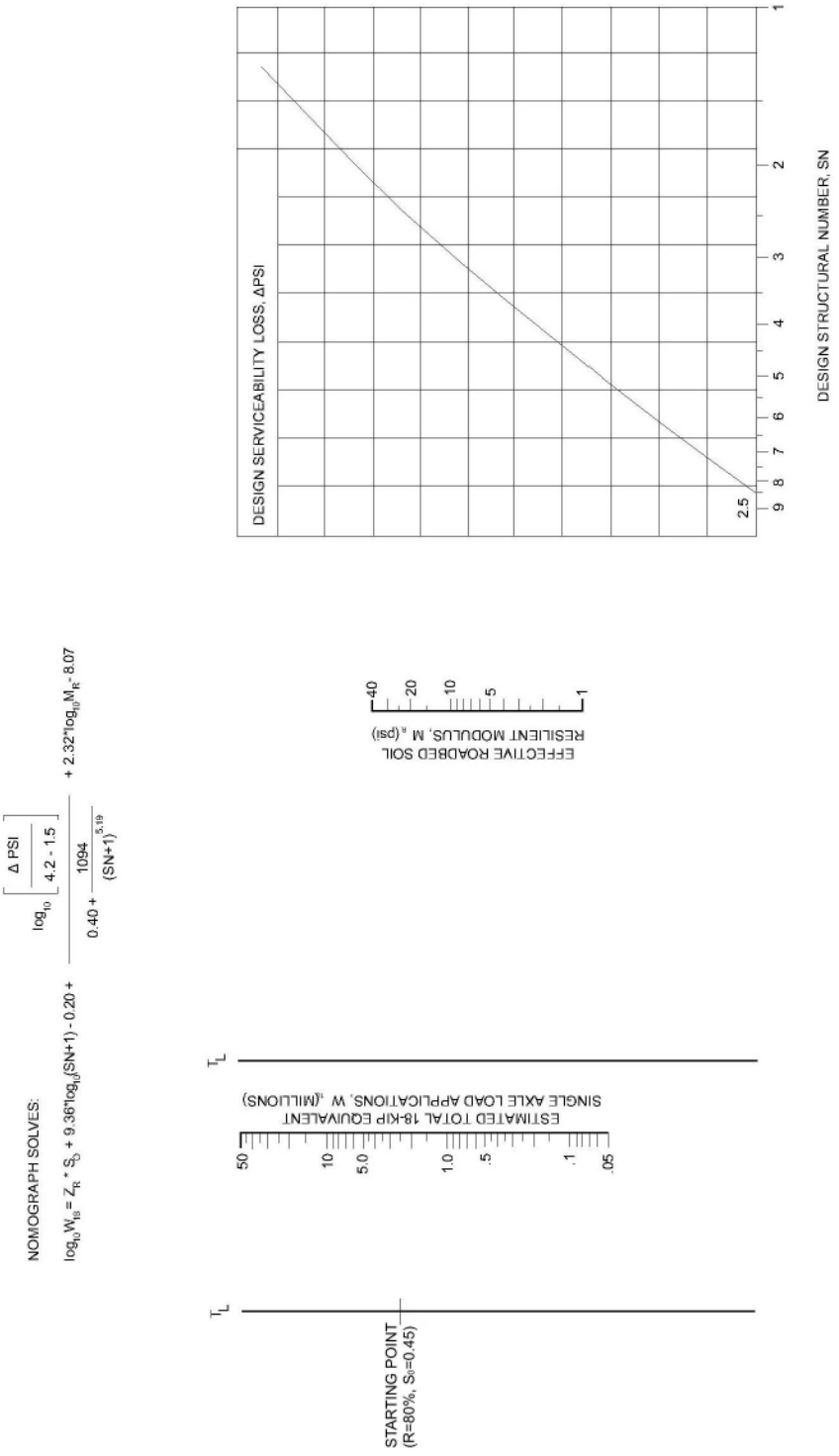


Figure D-3. Rigid Pavement Nomograph

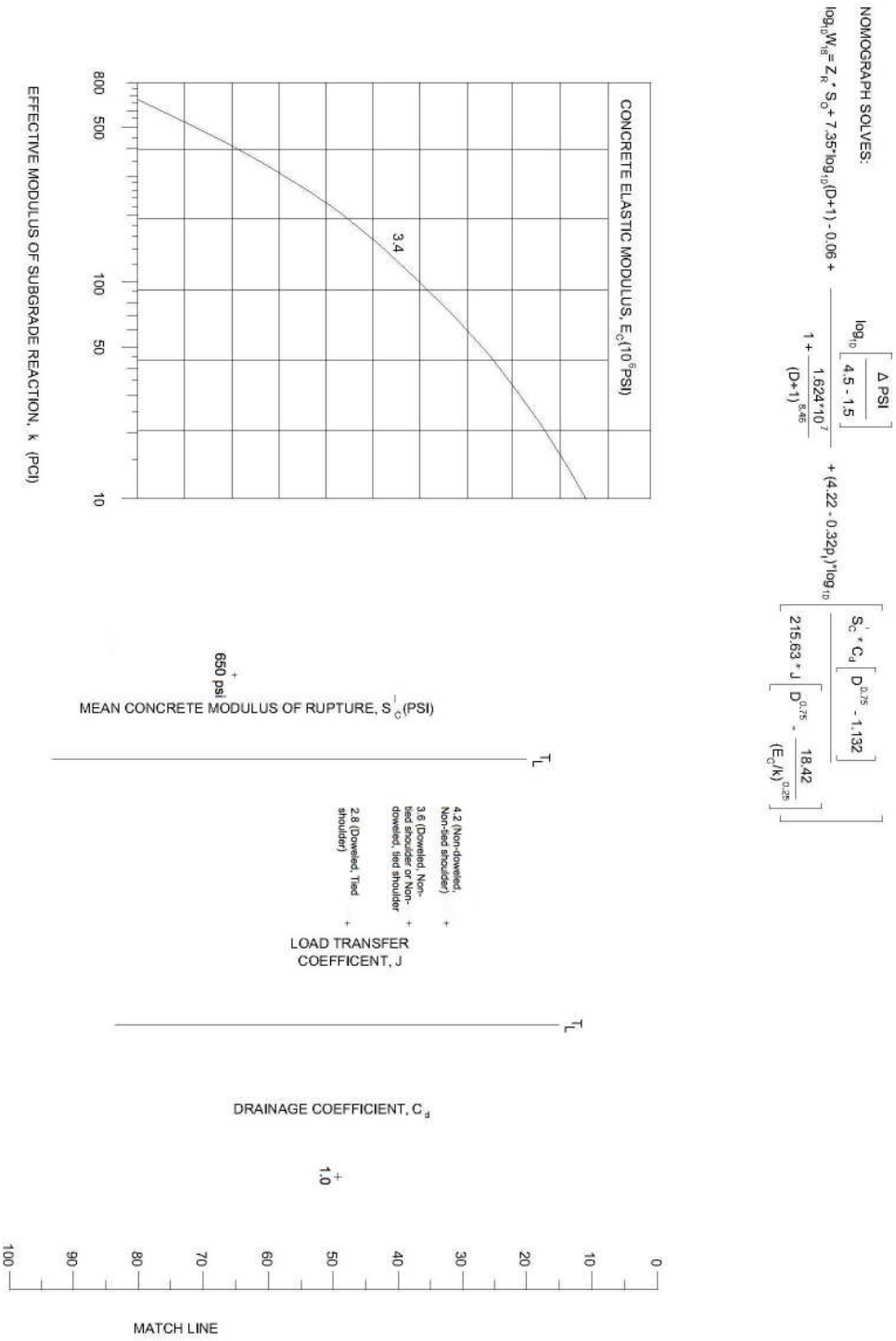
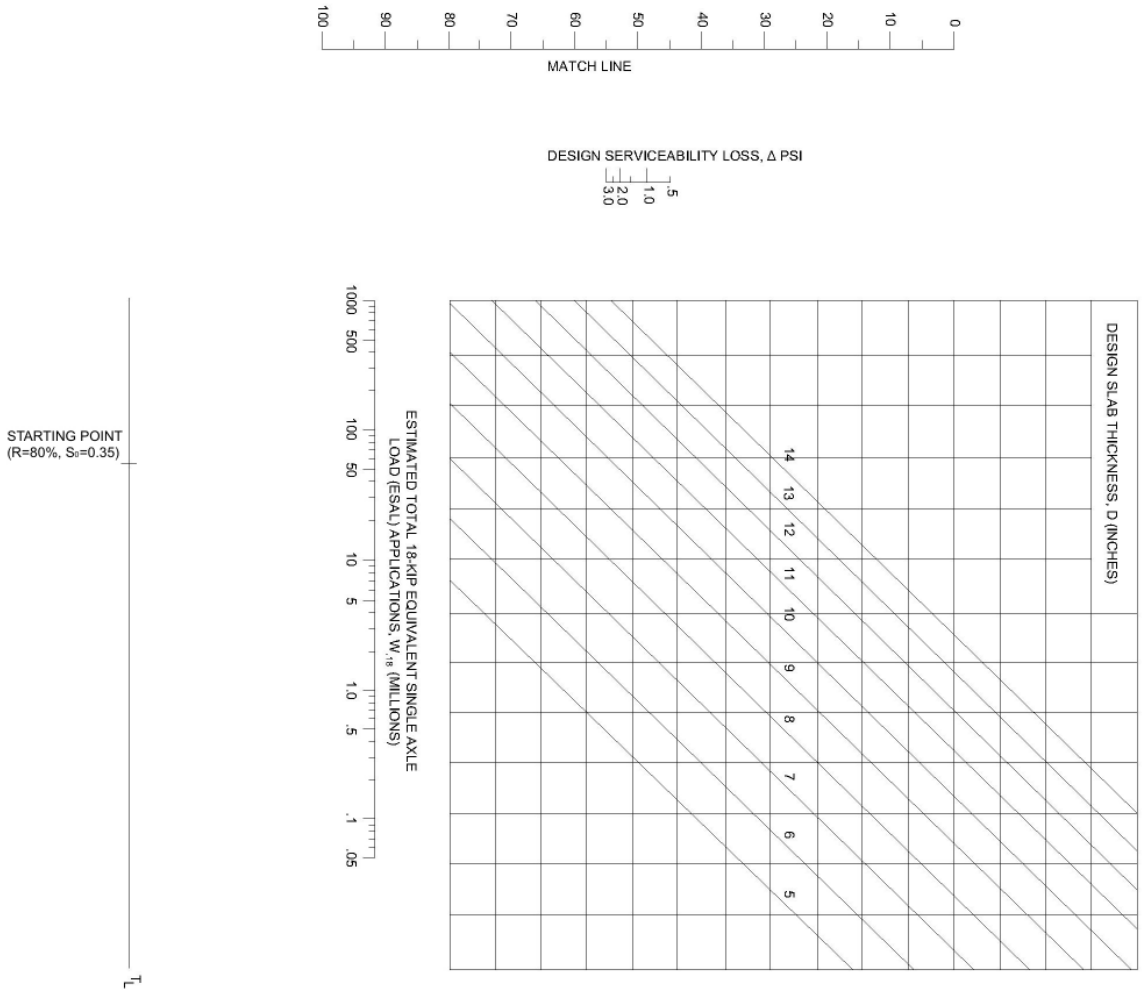


Figure D-4. Rigid Pavement Nomograph Cont.



D.5 MATERIAL SPECIFICATIONS

D.5.1 General

The material specifications presented are performance oriented. All sources of mined or manufactured materials used in public improvement construction must be annually approved by the ECM Administrator as having met the appropriate materials performance specifications.

D.5.2 Procedure for Material Source Approval

On or before April 1st of each year, or a minimum of 14 calendar days before construction, a material supplier for any public improvements may supply written documentation and material test results from a competent materials testing laboratory that describes:

- Material(s) being tested to meet the ECM Administrator specifications.
- The test procedures employed.
- The supplier's manufacturing, mining or treating process by which the tested materials were created.
- The material test results.

A signed statement shall be provided by the material supplier certifying the materials tested are representative of the materials to be provided for public improvements during the coming 365-day period.

D.5.3 Violations of Approval Conditions

Any and all material used to construct public improvements that is not from a certified source, or that is from a certified source and fails random material tests ordered by the ECM Administrator, may be subject to complete removal as a condition of the ECM Administrator acceptance of that public improvement. Additional tests will be required to confirm the existence and extent of the sub-standard material prior to the initiation of remedial action. The extent of the material to be removed will be at the discretion of the ECM Administrator.

D.5.4 Hot Mix Asphalt (HMA)

Hot mix asphalt (HMA) materials shall meet the requirements of and be placed according to the latest edition of the Pikes Peak Region Asphalt Specification. The Pikes Peak Region Asphalt Specification can be obtained online at: http://adm.elpasoco.com/NR/rdonlyres/A8D006F3-BB2B-4FC1-AD65-32180CF4F2E6/0/PikesPeakRegionAsphaltPavingSpecs1106.pdf.

D.5.5 Portland Cement Concrete Pavement

This material shall consist of a mixture of coarse and fine aggregates, Portland Cement, water and other materials or admixtures as required. Colorado Department of Transportation Class "P" mix may be used. The only alternatives to "P" shall be according to Section 412.03 of CDOT Standard Specifications. Other high-early strength

concretes may be used where special conditions warrant, subject to written approval by the ECM Administrator.

A. Cement Requirements

Portland cement shall comply with the CDOT requirements and the type of cement shall be Type II, unless sulfate conditions dictate otherwise. Table 2.2.3 in Chapter 2.2 of ACI 201, indicates recommendations for sulfate resistance.

B. Fine Aggregates

Fine aggregates shall meet CDOT Section 703.01 requirements and gradation as shown in Table D-4.

Table D-4. Fine Aggregates for Portland Cement Concrete

Sieve Size Or Test Procedure	Percent Passing By Weight Or Test Requirement
3/8"	100
#4	95 – 100
#16	45 – 80
#50	10 – 30
#100	2 – 10
#200	3, Maximum
Friable Particles, %	1.0, Maximum
Coal & Lignite, %	1.0, Maximum
Deleterious Material (AASHTO T-11), %	3.0, Maximum
Sand Equivalent (AASHTO T-176), %	80.0, Minimum
Fineness Modulus	2.50 – 3.50
Sodium Sulfate Soundness, %	20.0, Maximum

C. Coarse Aggregate

Coarse aggregates shall meet CDOT Section 703.02 requirements and gradation as shown in Table D-5.

Table D-5. Coarse Aggregates for Portland Cement Concrete

Sieve Size Or Test Procedure	Percent Passing By Weight Or Test Requirement
2"	100
1- ½”	95 – 100
¾”	35 – 70
3/8”	10 – 30
#4	0 – 5
#200	1, Maximum (1.5% if crushed fines)
% Wear	45.0, Maximum
Clay Lumps & Friable Particles, %	2.0, Maximum
Coal & Lignite, %	0.5, Maximum
Sodium Sulfate Soundness, %	12.0, Maximum

D. Fly Ash

Fly Ash shall comply with CDOT Section 701.02.

E. Water

Water shall meet the requirements of CDOT Section 712.01.

F. Air Entraining and Chemical Admixtures

Air entraining and chemical admixtures shall meet the requirements of CDOT Sections 711.02 and 711.03. No additive manufactured with the purposeful addition of chloride shall be permitted. Water-reducing admixtures are used when concrete temperatures are as follows: Type A is used with ambient temperature range of 50 to 90 degrees inclusive; Type D is used when ambient temperature is over 90 degrees.

G. Reinforcement

Reinforcing steel shall meet the requirements of CDOT Section 709.01, grade 40 minimum.

H. Laboratory Design Strength

Minimum compressive laboratory design strength shall be 3,750 psi; minimum modulus of rupture or flexural strength shall be 650 psi.

I. Aggregate Base Course Material

This material shall consist of hard, durable particles or fragments of stone or gravel, crushed to required sizes, containing an appropriate quantity of sand or other finely-divided mineral matter which conform to the requirements of AASHTO M 147, and CDOT Section 703.03. In addition, the material must have an R-value of 72 or greater, or a CBR of 80+, and must be moisture stable.

The materials to be used in construction shall be tested and a mix design submitted to The ECM Administrator for approval. Only aggregate from approved sources shall be used. As a minimum, the mix design report shall contain documented gradation, Atterberg limits, and CBR/R-value testing.

Two types of crushed aggregate base course are acceptable. The gradation specifications for these two types of base course are listed in Table D-6.

D.5.6 Gravel for Gravel Roads

Gravel described in this section shall be used for gravel shoulders, repairing gravel surfaces, or in cases where gravel roads are allowed. The gradation specification for this material is listed in Table D-7.

Table D-6. Aggregate Base Course Materials

Sieve Designation	Percent Passing By Weight	
	Class 5	Class 6
1-1/2”	100	
1”	95 – 100	
¾”		100
#4	30 – 70	30 – 65
#8		25 – 55
#200	3 - 15[1]	3 – 12
Liquid Limit (LL)	30, Maximum	30, Maximum
[1] ASTM C-117		

Table D-7. Gravel for Gravel Roads

Sieve Designation	Percent Passing by Weight
¾”	100
#4	50 – 78
#8	37 – 67
#40	13 – 35
#200	4 – 15
Plastic Index (PI)	4 – 12

D.5.7 Cement Treated Aggregate Base Course

This material shall consist of a mixture of aggregate materials, Portland cement and water as outlined in CDOT Section 308. Acceptable aggregates include CDOT Classes 4, 5, and 6.

The materials to be used in construction shall be tested and a mix design submitted to the ECM Administrator for approval. As a minimum, the mix design report shall contain a description of material sources, gradations, and Atterberg limits of aggregates, cement type, Proctor compaction curves and unconfined compressive strength results for each mix, strength versus cement content curves, a design mix, and special construction procedures recommended. Testing shall be in accordance with appropriate AASHTO specifications.

The mix shall have a 7-day compressive strength of at least 650 psi, and no more than 1000 psi. The minimum acceptable cement content shall be 5 percent by weight. Only approved mix designs shall be used. Approvals are required on a project basis or an annual basis for suppliers. Mixes shall be approved, prior to issuance of a Construction Permit.

D.5.8 Class C Fly Ash Treated Subgrade

This material consists of a mixture of native or imported soils, Class C fly ash, and water, as outlined by ASTM C 618 or AASHTO M-295. Minimum in-place thickness for this material shall be eight (8) inches.

The materials to be used in construction shall be tested and a mix design submitted to the ECM Administrator for approval. As a minimum, the mix design report shall contain a description of material sources, gradations, and Atterberg limits of the native soils, fly ash type, Proctor compaction curves and unconfined compressive strength results for each mix, strength versus fly ash content curves, a design mix, and special construction procedures recommended. Testing shall be in accordance with appropriate AASHTO specifications.

To be approved, the mix shall have a minimum 7-day compressive strength of 150 psi.

Only approved mix designs shall be used. Approvals are required on a project basis prior to issuance of a Construction Permit.

D.5.9 Lime Treated Subgrade

This material consists of a mixture of native or imported soils, hydrated or quick lime and water, as outlined by ASTM Specification C 977 or AASHTO M216. Minimum in-place thickness for this material shall be eight (8) inches.

The materials to be used in construction shall be tested and a mix design submitted to the ECM Administrator for approval. As a minimum, the mix design report shall contain a description of material sources, gradation and Atterberg limits of native soils, Atterberg limits and 7-day unconfined compressive test results for each mix, strength versus lime content curves, a design mix and special construction procedures recommended. Testing shall be in accordance with appropriate AASHTO methods.

The mix shall have a minimum 7-day compressive strength of 160 psi. In addition, the Plasticity Index of the treated soil shall not exceed 6. The minimum acceptable hydrated lime content shall be 4 percent by weight.

Only approved mix designs shall be used. Approvals are required on a project basis prior to issuance of a Construction Permit.

D.5.10 Kiln Dust Treated Subgrade

This material consists of a mixture of native or imported soils, kiln dust and water, as outlined by ASTM and AASHTO Specifications. Minimum in-place thickness for this material shall be eight (8) inches.

The materials to be used in construction shall be tested and a mix design submitted to the ECM Administrator for approval. As a minimum, the mix design report shall contain a description of material sources, gradation and Atterberg limits of native soils, Atterberg limits and 7-day unconfined compressive test results for each mix, strength versus kiln dust content curves, a design mix and special construction procedures recommended. Testing shall be in accordance with appropriate AASHTO methods.

The mix shall have a minimum 7-day compressive strength of 150 psi. In addition, the Plasticity Index of the treated soil shall not exceed 6.

Only approved mix designs shall be used. Approvals are required on a project basis prior to issuance of a Construction Permit.

D.6 PAVEMENT DESIGN REPORT

The Pavement Design Report shall be prepared by or under the supervision of and signed and seal by a professional engineer registered or authorized to practice in the State of Colorado. The Pavement Design Report shall include the following information:

- Vicinity map to locate the investigated area.
- Scaled drawings showing the location of borings.
- Scaled drawings showing the estimated extent of subgrade soil types and ESAL for each roadway.
- Pavement design alternatives for each roadway on a scaled drawing.
- Tabular listing of sample designation, sample depth, Group Number, Liquid Limit, Plasticity Index, percent passing the No. 200 sieve, AASHTO Classification, Group Index, soil description, and moisture content. Percent soluble sulfate will also be necessary for rigid pavements.
- Identification of any samples that were consolidated to create composite samples for testing purposes.
- CBR or R-value test results of each soil type used in the design.
- Pavement design nomographs properly drawn to show Soil Support - ESAL – SN and/or output from an approved AASHTO pavement design program.
- Design calculations including all design assumptions.
- A discussion regarding potential subgrade soil problems including, but not limited to: soils with swelling potential, frost susceptible soils, ground water, drainage considerations (surface and subsurface), cold weather construction (if appropriate), soluble sulfates in the subgrade, and other factors or properties that could affect the design or performance of the pavement system.
- Recommendations to alleviate or mitigate the impact of problems discussed in Item I.
- Pavement Mix Types to be used for the project.