

FLEXIBLE PAVEMENT ANALYSIS

The AASHTO Chart 400-2 (7) following the example in this appendix is for a Flexible Pavement, Terminal Serviceability Index (Pt) of 2.5. (A Pt of 2.0 is used for the analysis of pavement overlay only.) A Pt of 2.0 may also be used when designing temporary or interim pavements. It should be noted that the AASHTO Chart 400-2 may not be used when designing for Pt = 2.0. See Materials & Research for more information when using Pt of 2.0.

The variables needed to use the Chart 400-2 are Regional Factor, Soil Support Value (S), and Average Daily Load (ADL).

In New Hampshire the following factors are used:

Regional Factor (takes into account climate differences)

Coastal Region	2.0
South and Central Region	2.5
North Region	3.0

Soil Support Value (for the top of each course)

	Range	Use
Crushed stone (very coarse, coarse, fine)	8.5 - 9.0	8.5 *
Reclaimed Stabilized Base (with or without extra stone)		
Average crushed gravel base course	7.0 - 8.0	7.5
Bank run, sandy gravel base course	6.2 - 7.0	6.5
Sand sub-base	5.5 - 6.3	5.5
Original ground	4.0 - 5.0	4.5

* The Bureau of Materials and Research prefers to use 8.5.

Average Daily Load (In the mean year of the twenty-year design period, this factor expresses the weight and number of axle-load applications forecast, in terms of equivalent 18 kip single-axle loads per day.)

The ADL forecast is obtained by request to the Traffic Research Section of the Bureau of Traffic.

The Chart 400-2 provides the nomograph solution for the weighted Structural Number (SN) for the material under the layer being examined. In lieu of the nomograph solution, an Excel worksheet has been developed that can be used to determine the required Structural Number. A copy of the Excel worksheet may be obtained from the Bureau of Materials and Research.

The value obtained from Chart 400-2 is compared to the computed value (accumulated) for the layer being examined using the following pavement layer coefficients. In order for the design to be valid, the cumulative SN must exceed the required SN for each layer.

Pavement Layer Coefficient used to calculate the SN (per inch of thickness):

Type of Material	SN/inch
Bituminous Concrete Pavement (wearing course, binder course, high strength)	0.38
Bituminous Concrete Base	0.34
Road Mix Pavement (C-2, PMST, etc.)	0.20
Asphalt Treated Gravel Base	0.24
Crushed Stone Base (fine gradation)	0.14
Crushed Stone Base (coarse gradation)	0.14
Crushed Stone Base (very coarse gradation)	0.14
Crushed Ledge Rock	0.10
Crushed Gravel Base	0.10
Bank Run Gravel Base	0.07
Sand Sub-Base	0.05
Reclaimed Stabilized Base	0.14*

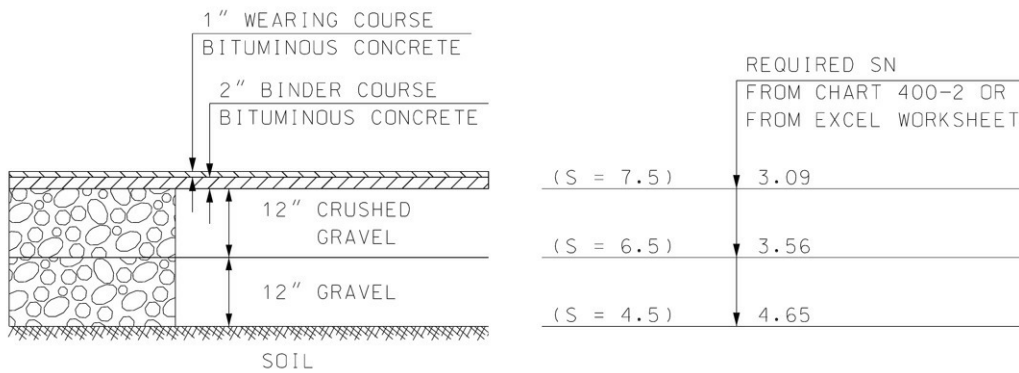
* Recommended by USACE Cold Regions Research and Engineering Laboratory (CRREL), *Special Report 94-30: Layer Coefficients for NHDOT Pavement Materials (11)*.

After computing the pavement structure of the typical section, the computed estimated amounts needed for the project should be sent to the Bureau of Materials and Research Pavement Management Section together with the proposed pavement design for approval. The following items should be included with the Pavement Design request:

- Locus Map/Aerial Photograph
- ADL
- Preliminary Engineering Report
- General Plans (if available)
- Proposed Profile (if available)
- Record Construction Plans and Typical Sections (if available)
- Proposed pavement design/treatment being considered
- Project schedule and target advertising date with a requested turnaround time

The Bureau of Materials and Research's Geotechnical Section provides recommendations for areas of extra sand for frost protection and locations of underdrain. This is specified in a separate request to the Geotechnical Section, see Chapter 2.

EXAMPLE:



Proposed pavement and base, given:

ADL = 575

Pt= 2.5

R.F. = 2.5

Structural Section	SN/inch	Cum. SN	Required SN
1" wearing course bituminous concrete	1" x 0.38 = 0.38	0.38	
2" binder course bituminous concrete	2" x 0.38 = 0.76	1.14	3.09
12" crushed gravel	12" x 0.10 = 1.20	2.34	3.56
12" gravel	12" x 0.07 = 0.84	3.18	4.65

APPENDIX 7-1

The difference in surface courses SN (cumulative), 1.14 to the required SN of 3.09 indicates a need for 1.95 (increased pavement thickness) or a need for 5¼ inches of additional pavement thickness ($1.95 \div 0.38 = 5.13$). Therefore the pavement thickness should be increased to 3" + 5.5" or a total of 8.5 inches, roundup to the nearest ½ inch; see the attached Sample Analysis Trial #1.

When 8.5 inches of pavement (1" wearing, 2½" binder and 5" base course) is proposed, the tabulation looks like this and is satisfactory whereby the cumulative SN exceeds the required SN for each layer. If the Cumulative SN is not larger than the Required SN for every layer, the design is not considered to be valid; see the attached Sample Analysis Trial #2.

Structural Section	SN/inch	Cum. SN	Required SN
1.0" wearing courses	1" x 0.38 = 0.38	0.38	
2.5" binder course	2.5" x 0.38 = 0.95	1.33	
5" base course	5" x 0.34 = 1.70	3.03	3.09
12" crushed gravel	12" x 0.10 = 1.20	4.23	3.56
12" gravel	12" x 0.07 = 0.84	5.07	4.65

