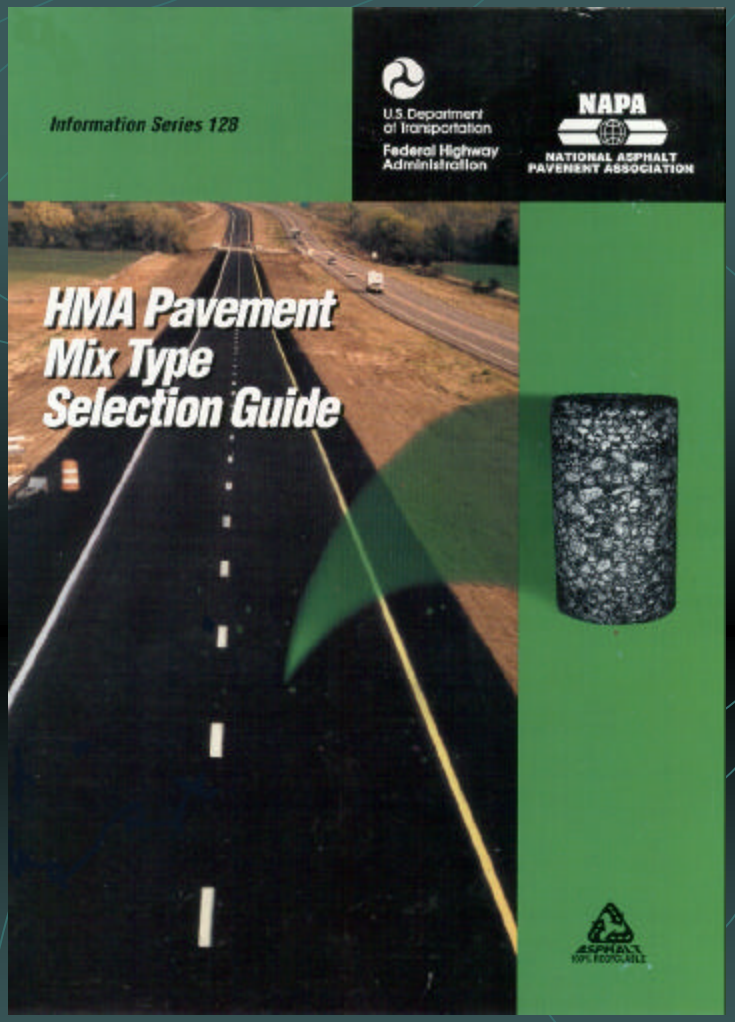
HMA Pavement Mix Type Selection Guide



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P.J. Keating Company

October 18th, 2001

HMA Pavement Mix Type Selection Guide

Manual Purpose

- Provide designers with a method for selecting appropriate mix types considering factors such as:
  - Existing pavement condition and necessary preparation
  - Subsurface Pavement structures
  - Environment
  - Traffic
  - Economy
- Manual developed by cooperative effort of the FHWA and NAPA
  - Brown, Epps, Garcia, Gulden, Hansen, Harrington, Michael, Page, Petros, Scofield, Sines, Weigel

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Intended Audience

- Consultant Engineers
- Architects
- New hires
  - State Agencies and Industry
- Provides a base line to begin from whether your in CT, ME, NH, NJ, NY, PA, or RI
- Information presented today will be familiar to many of us so please bear with me

HMA Pavement Mix Type Selection Guide

What's in the Selection Guide?

- Standard definitions
  - Pavement Layers and traffic
- General recommendations for surface preparation
- Discussion of mix types covered by the manual
  - Dense Graded, SMA, and OGFC
- Decision tree for mix type selection

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Dense Graded Mixes

- Considered the HMA workhorse since they may be used effectively in all pavement layers and for all traffic conditions
- Can be used for structural and functional overlays, for leveling and patching, and to provide pavement friction
- Defined by their Nominal Maximum Aggregate Size
- Defined by relative coarseness of the specific mix
  - Table 2 – Definition of Fine- and Coarse Dense Graded Mixtures

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Dense Graded Mixes

Table 2: Definition of Fine- and Coarse Dense-graded Mixtures

Mixture NMAS	Coarse-Graded	Fine-Graded
37.5 mm (1 1/2”)	<35 % Passing 4.75 mm Sieve	>35 % Passing 4.75 mm Sieve
25.0 mm (1”)	<40 % Passing 4.75 mm Sieve	>40 % Passing 4.75 mm Sieve
19.0 mm (3/4”)	<35 % Passing 2.36 mm Sieve	>35 % Passing 2.36 mm Sieve
12.5 mm (1/2”)	<40 % Passing 2.36 mm Sieve	>40 % Passing 2.36 mm Sieve
9.5 mm (3/8”)	<45 % Passing 2.36 mm Sieve	>45 % Passing 2.36 mm Sieve

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Dense Graded Mixes – ETG Proposed Definitions

AASHTO MP2 Table 4 – Gradation Classification

Nominal Max Aggregate Size	37.5 mm	25.0 mm	19.0 mm	12.5 mm	9.5 mm
Primary Control Sieve	9.5 mm	4.75 mm	4.75 mm	2.36 mm	2.36 mm
PCS Control Point	47	40	47	39	47

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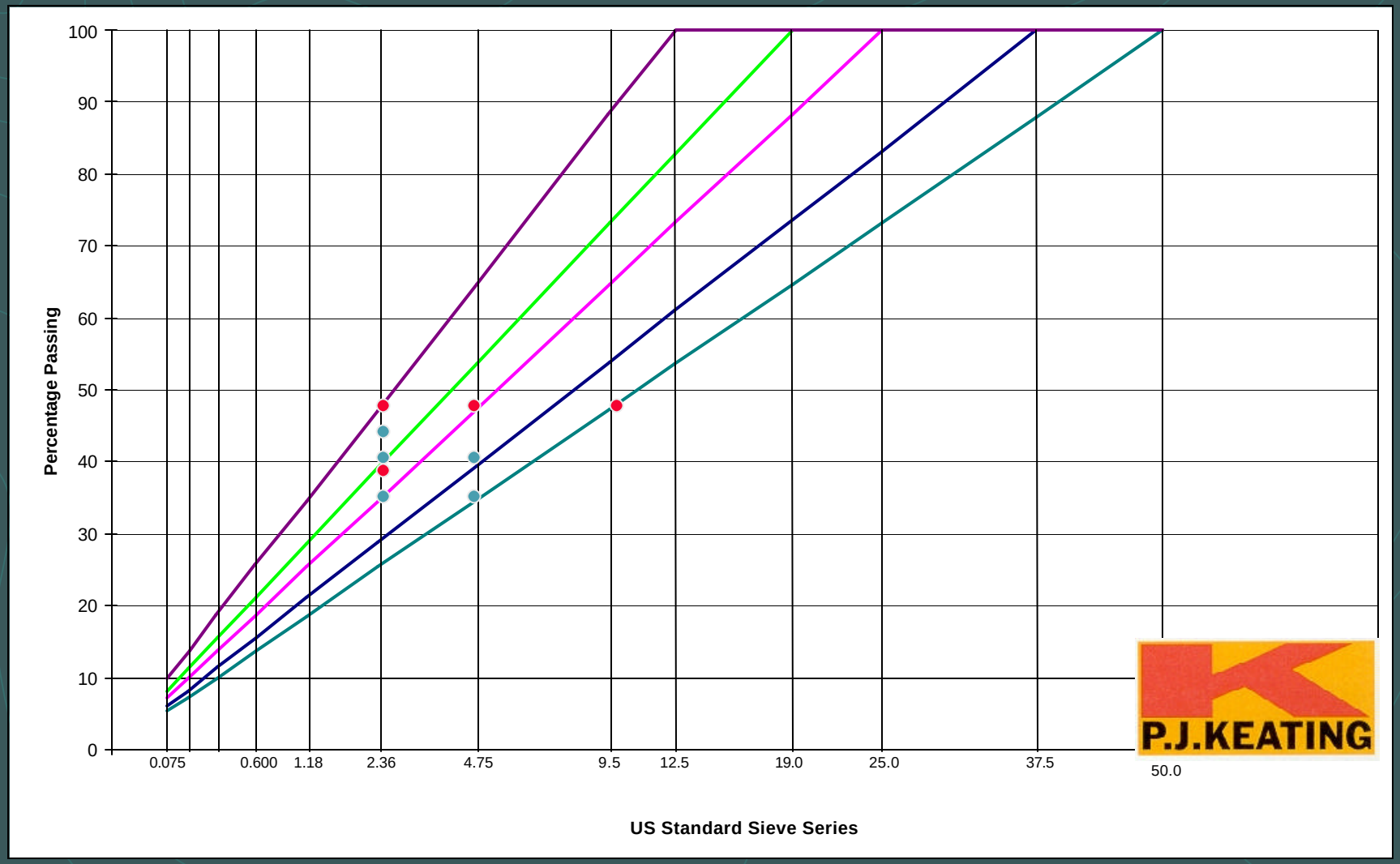
Dense Graded Mixes



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Advantages of Fine- and Coarse Dense Graded Mixes

- Fine-Graded Mixes
  - Lower permeability
  - Improved workability (< 25 mm (1”) NMAS)
  - Thinner lifts
  - Greater durability for low volume roads
  - Smooth texture
- Coarse-Graded
  - Allows thicker lifts to be placed
  - Increased macro texture
  - Economy

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Stone Matrix Asphalt Mixes

- Gap-graded HMA which maximizes rutting resistance and durability
- Stable stone on stone skeleton held together by a rich mixture of PGB, filler, and stabilizing agent
- Used almost exclusively for surface courses on high volume interstate and US highways
- Can be considered as an intermediate layer in cases where heavy slow moving vehicles use the pavement

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Open Graded Friction Course Mixes

- Designed to be permeable to water to reduce the potential for hydroplaning, and splash and spray
- Use of modified asphalts and/or fibers is highly recommended to increase the amount of binder in the mix improving their durability and performance
- Should only be used on medium to high volume roadways with high posted speeds
- Asphalt treated permeable base is used below dense graded or SMA mixes as a drainage layer

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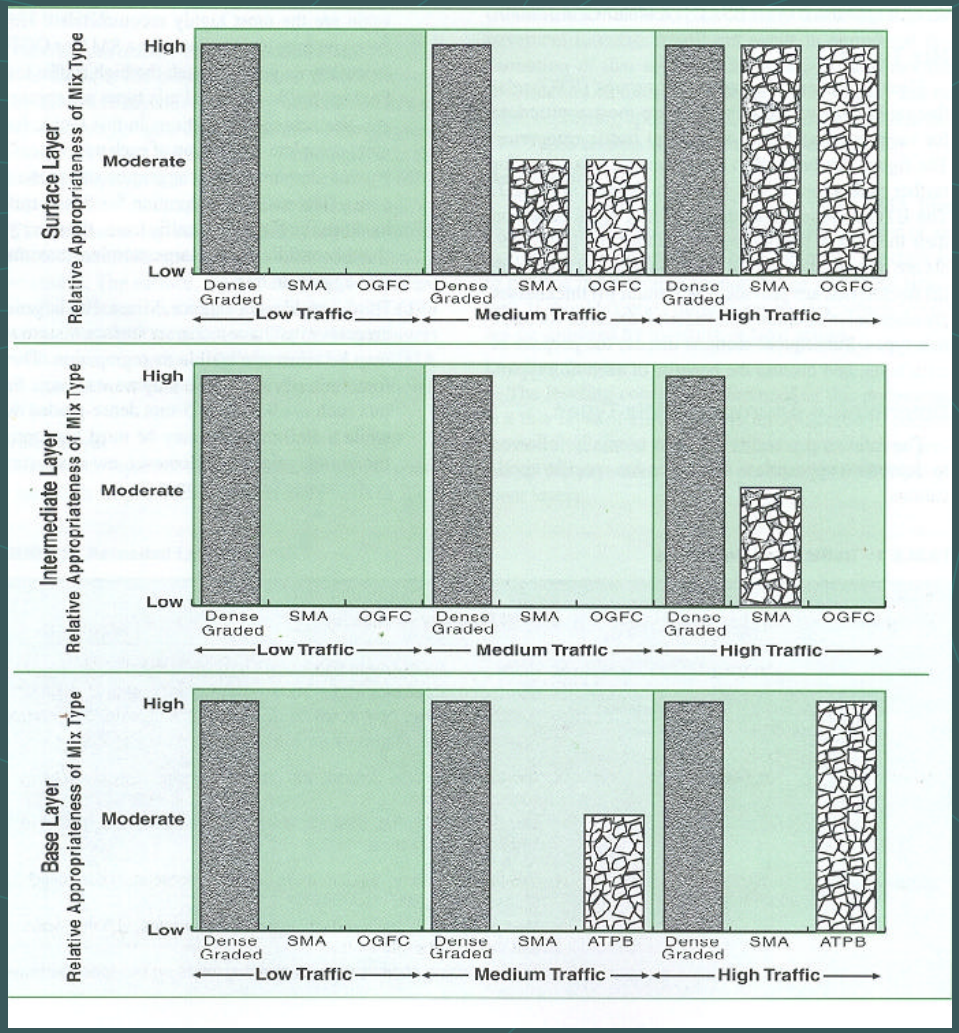
Recommended General Mix Types for Surface, Intermediate, and Base Courses – Figure 2



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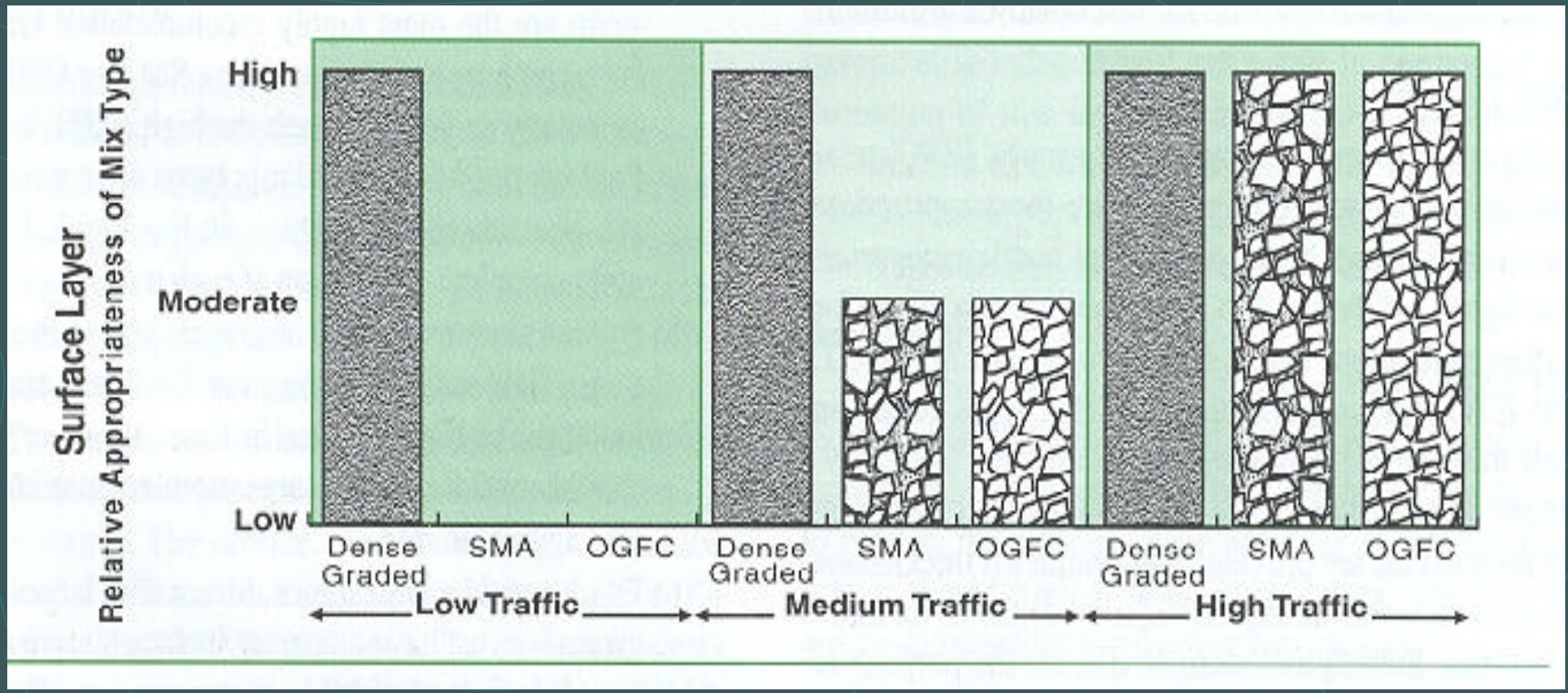
Recommended General Mix Types for Surface, Intermediate, and Base Courses – Figure 2



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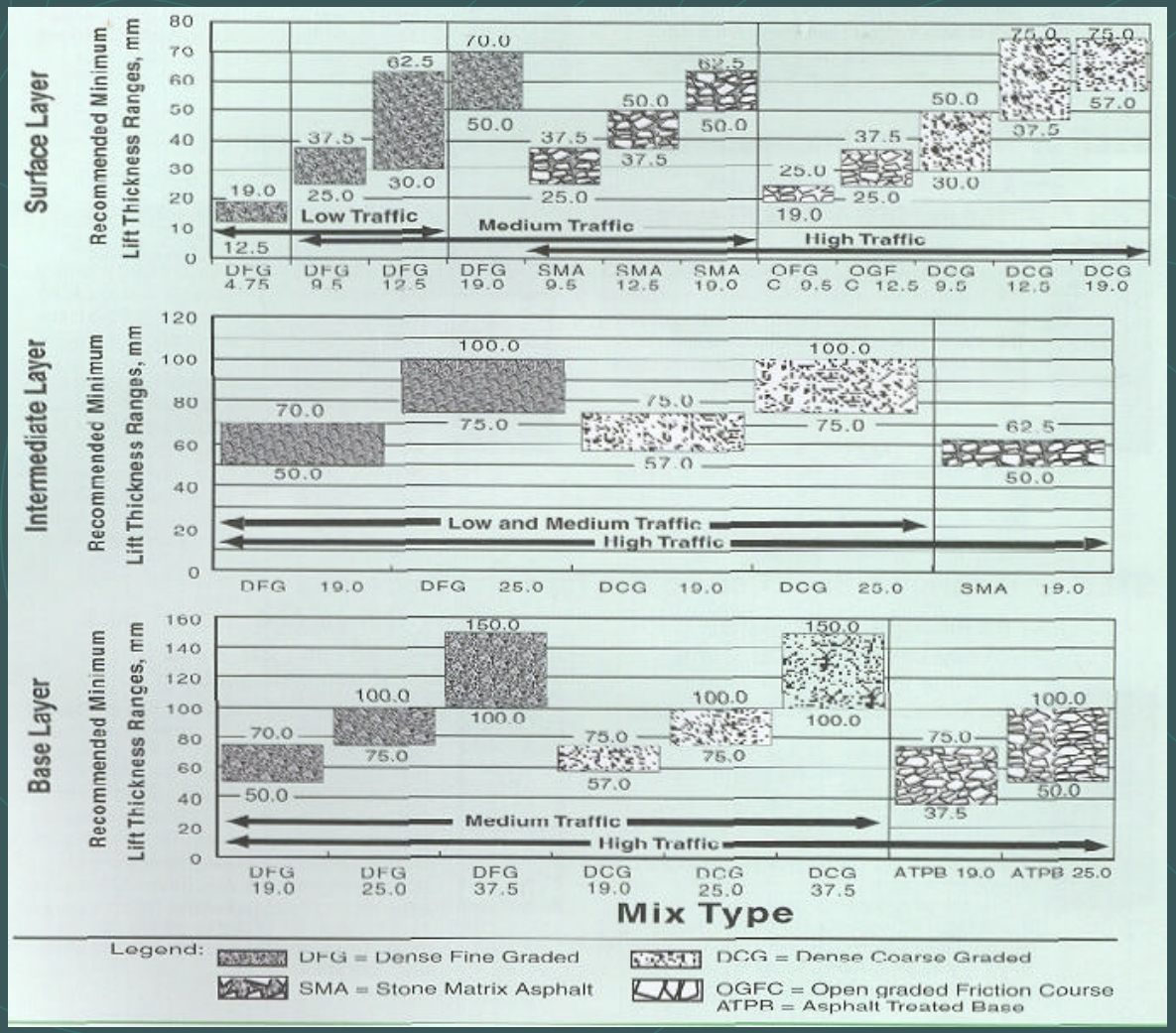
Recommended Mix Types for Surface, Intermediate, and Base Courses – Figure 3



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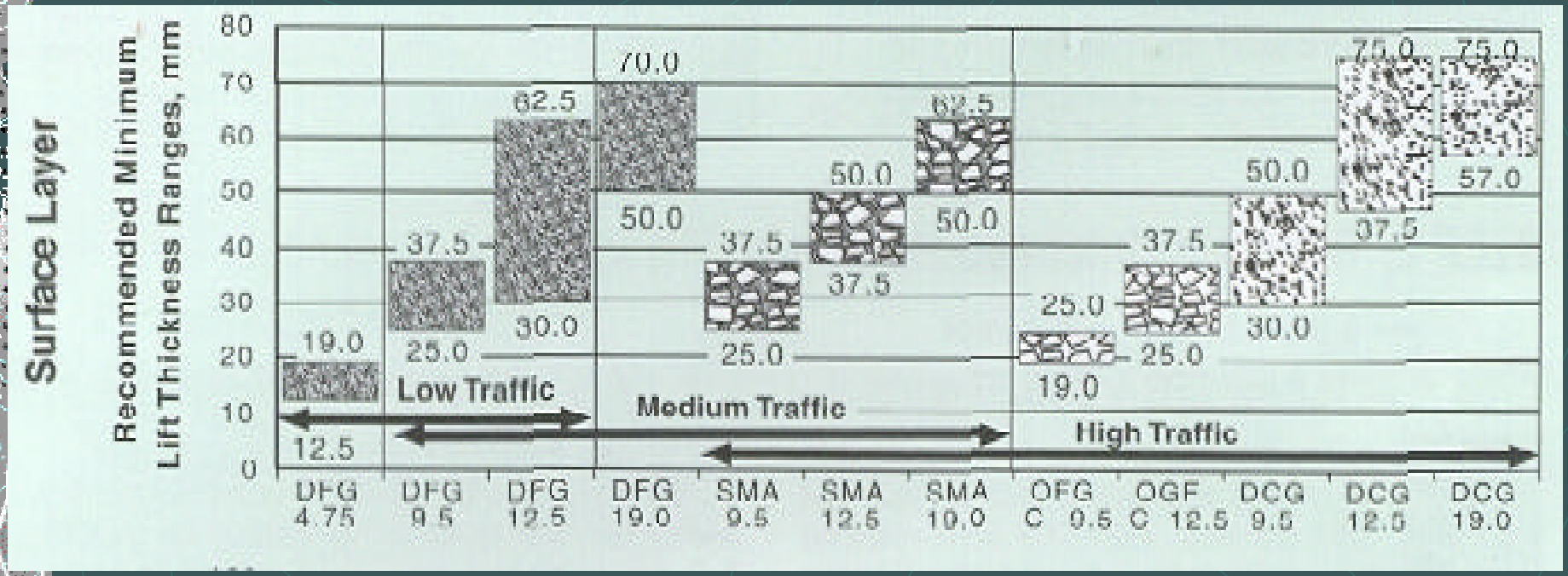
Recommended Mix Types for Surface, Intermediate, and Base Courses – Figure 3



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Determining Appropriate Mix Type Decision Tree

- Determine the total thickness of HMA required
  - New construction – structural design
  - Rehabilitation – pavement and structural design evaluation
- Determine the type of mixture appropriate for the surface coarse based on traffic and cost
  - Determine the proper aggregate size to use for the mix
    - Pavement loading the main concern

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Determining Appropriate Mix Type Decision Tree

- Continued ..
  - Consider appearance
    - Larger NMAS mixes will have coarse texture and may not be appropriate for all applications
  - Consider traffic flow through the work zone
    - When lane drop-offs are allowed smaller NMAS mixes may be preferred for safety
  - Consider construction phasing
    - Will an underlying layer be exposed to traffic for extended time or over the winter? If yes, a smaller NMAS mix may be preferred

Never compromise on performance when selecting a mix type.

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Determining Appropriate Mix Type Decision Tree

- Subtract the thickness of the surface course from the total thickness
- Repeat steps 2 and 3 for the remaining lifts
- Example Problem

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Decision Tree Example Problem

- Given: A structural evaluation for a 20 km new pavement on a high volume, urban highway with heavy truck traffic requires a total thickness of 300 mm (12”) of HMA, sections of pavement will be open to traffic following completion of intermediate course
- Solution:
  - Step 1 Determine total thickness
    - Provided as a given
  - Step 2 Determine type of mix for surface course
    - Proper aggregate size considering loading
    - Consider appearance
    - Consider traffic flow
    - Consider construction phasing

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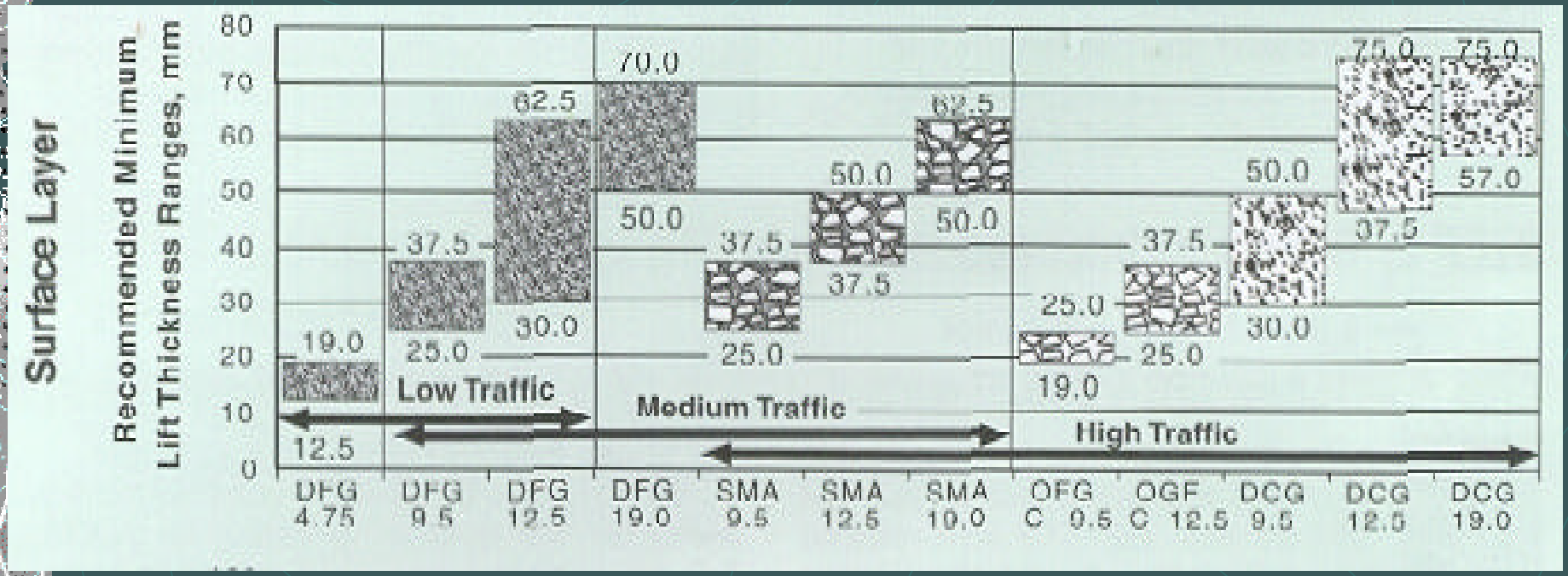
Recommended Mix Types for Surface, Intermediate, and Base Courses – Figure 3



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Decision Tree Example Problem - Continued

- Based on Figure 3 either SMA, OGFC, or Dense Coarse Graded Mix would be appropriate
  - Select 12.5 mm DCG mix for surface at 50 mm

- Step 3 Subtract surface lift from total section required
  - Total remaining HMA for intermediate and base course 250 mm
- Step 4 Repeat steps 2 and 3 until complete
  - Proper aggregate size considering loading
  - Consider appearance
  - Consider traffic flow
  - Consider construction phasing

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Decision Tree Example Problem - Continued

- Based on Figure 3 either Dense Fine Graded, SMA, or Dense Coarse Graded Mix would be appropriate
  - Select 2 lifts of 19 mm DCG mix for intermediate course at 75 mm
- Subtract intermediate lifts from remain HMA required
  - Total remaining HMA for base course is 100 mm
- Step 4 Repeat steps 2 and 3 until complete
  - Proper aggregate size considering loading
  - Consider appearance
  - Consider traffic flow
  - Consider construction phasing

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Decision Tree Example Problem - Continued

- Based on Figure 3 either Dense Fine Graded or Dense Coarse Graded Mix would be appropriate
  - Select 1 lift of 37.5 mm DCG mix for the base course at 100 mm

- This represents only one possible solution to the problem given
- Remember
  - Not all mixes may be available in your location
  - When using OGCF it does not count as part of the structural layer

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Summary

- Guide is intended to provide a rationale method for mix selection and to specify lift thickness
- Guide provides a good basic foundation of information for those not familiar with HMA terminology to work from
- Guide provides strategy for maximizing the effectiveness of Dense Graded, SMA, and OGFC mixes

Guide is not intended to address every situation

HMA Pavement Mix Type Selection Guide

Where to Obtain Your Copy

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