SECTION DESIGN, MIXTURE DESIGNS AND QUALITY CONTROL

APWA

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STEVEN R. MARVIN

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Pavement Design Components

- Material Type
  - Asphalt Concrete
  - Aggregate Base
  - Cement Treated Base/Recycled CTS
- Traffic Use
- Subgrade Soil Support
  - R-value
  - CBR
  - Modulus
- Design period

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Terms

- Subgrade
- Aggregate Subbase (ASB)
- Aggregate Base (AB)
- Asphalt Concrete (AC)
- Full Depth Reclamation (FDR)
- Cement Treated Soil/Base (CTS/CTB)
- Lime Treated Soil (LTS)

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Full Depth Reclamation Mix Design

- Proportional Blend
- Variable Application Rates
- Measure design parameters including R-value, compressive strength, appearance, density

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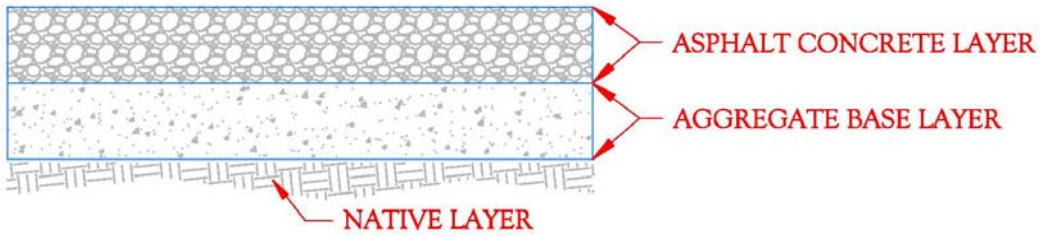
Proportion Blend

- Determine existing pavement section
  - Asphalt concrete thickness
  - Aggregate base thickness
  - Subgrade soil conditions
- Develop preliminary section requirements
  - Subgrade R-value



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Proportion Blend (cont'd)

- Determine site preparation method
  - Asphalt concrete removal/pulverization
  - Aggregate base thickness
- Determine site export requirements
  - Asphalt concrete thickness
  - Aggregate base thickness

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Proportion Blend (cont'd)

- Duplicate site blend
  - Mix with various Portland Cement application rates (probable 4% to 8%)
  - Observe mixing characteristics
  - Compact and determine treated maximum density
  - Determine 7 day compressive strengths

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TYPICAL ACCEPTANCE CRITERIA

- 7 Day Compressive Strength
  - 400 psi to 1100 psi
  - 750 psi typical

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Section Design - Conventional

- Total Section
  - T=0.0032(100-R)TI

    Where R = Subgrade R-Value and TI is Traffic Index

- Asphalt Concrete
  - (0.0032(100-22) + SF)/Gf

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Section Design – Stabilized Layer

- Total Section
  - R-Value + Traffic Index
- Asphalt Concrete
  - (40% Total Section + SF)/Gf

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Section Design Example

- Subgrade R-value 5
- Traffic Index 5.0 & 7.0
- Conventional Design
- Full Depth Reclamation

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Section Design Example

- Full Depth Reclamation
  - Conventional Design Procedures
  - Asphalt Concrete = 40% Total Section+ SF
  - Asphalt Concrete based on limiting FDR R-value

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Section Design Example- Conventional Section

T_{Total} = 0.0032(100-5)5.0

= 1.52’ (18.24”)

T_{AC} = 2.64” use 3”

T_{AB} = 9.76” use 10”

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Section Design Example- 40% Procedure

T_{Total} = 0.0032(100-5)5.0

= 1.52’ (18.24”)

T_{AC} = 3.87” use 4”

T_{FDR} = 6.87” use 8”

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Section Design Example- Conventional Section

Limit FDR R-value to 50 maximum

T_{Total} = 0.0032(100-5)5.0

= 1.52’ (18.24”)

T_{AC} = 4.80” use 5”

T_{AB} = 4.78” use 8”

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Section Design Summary – TI 5.0

• Asphalt Concrete	3”	4”	5”
• Aggregate Base	10”	-	-
• FDR	-	8”	8”
• Subgrade Compaction	90%	N/A	N/A

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Section Design Summary – TI 7.0

• Asphalt Concrete	4”	6”	4”	7 ½”
• Aggregate Base	15 ½”	-	7”	-
• FDR	-	11”	8”	8”
• Subgrade Compaction	90%	N/A	N/A	N/A

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Asphalt Concrete Material Selection

- Enhance Tensile Strength
- Enhance durability
- Recommend Use of
  - Type B AR8000
  - Type III B3 AR8000
  - Type A ¾” Maximum AR8000
  - Type B ¾” Maximum AR8000

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What is Quality Control?

- Any combination of documentation, inspection, observations or sampling that increases the understanding of the final product, individual components, and production variability

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Construction Controls

- Thickness control
  - Grade tolerances
    - Prior to treatment
    - After treatment

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Construction Controls

- Spread Rate
  - Pan weights
  - Truck yield
  - Daily yield
- Mixing Depth
  - Test holes
- Mixing Uniformity
  - Test holes/observations/pH indicator

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Construction Controls

- Mixture Characteristics
  - Maximum Density
  - Optimum Moisture
  - 7 Day Compressive Strengths

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Construction Controls

- Fine Grading
  - Timeliness
  - Compaction

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Construction Controls

- Curing
  - Moist Cure
  - Curing Seal
  - Traffic Limits

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Critical Elements

- Grade tolerances
  - Impacts thickness of completed layer
- Spread Rate/Mixing Depth
  - Impacts effective application rate
  - Impacts thickness of completed layer
- Mixture Uniformity
  - Impacts effective application rate
  - Impacts thickness of completed layer
  - Impacts short and long term performance

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Why Quality Control ?

- Increase probability of contract compliance
- Protect City, Contractor and Material Supplier
- Better understand performance issues over time
- Provide improved basis for future project design

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Proactive Production Control

- Construction Documentation
  - Material source confirmation
  - Material quantities
    - Mixture proportions
    - Spread rate
  - Material qualities
    - Mixture proportions
    - Spread rate
    - Layer strength

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Proactive Production Control

- Date and Location of work (street and limits)
- Construction equipment
  - Size
  - Number
  - Operating condition
- Weather conditions
- Existing surface conditions
- Set/cure time
- Rolling patterns (where applicable)

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Proactive Production Control

- Post construction inspection
  - Initial Performance review
  - Identify required corrective action
  - Comparison with quality control information
  - Long term performance review
  - Provide input relative to material or construction changes for future work

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ALTERNATIVE TO QC

- TRUST EVERYTHING WILL BE ALL RIGHT
- ACCEPT VARIABLE PERFORMANCE WITHOUT EXPLANATION
- ACCEPT VARIABLE PERFORMANCE WITHOUT POTENTIAL FOR IMPROVEMENT OF FUTURE PERFORMANCE

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