Thomas Peterson, P.E.
Executive Director

Thomas Clayton, SET
Director of Training & Member Services

Asphalt Pavement

Engineering & Maintenance

Colorado Asphalt Pavement Association

AUGUST 21, 2025

1

CAPA MISSION: TO ADVANCE THE USE AND QUALITY OF **ASPHALT PAVEMENTS** IN COLORADO.

Colorado Asphalt Pavement Association

2

3

All Types of Asphalt Pavements

Colorado Asphalt Pavement Association

Complete Service

- Best Practices
- Innovations
- New Technology
- Training & Education
- Marketing & Promotion
- Spec. Development
- Technical Assistance

Cradle to Grave

- Design
- Construction
- Maintenance
- *Asset Management*

4

Who is CAPA?

Colorado Asphalt Pavement Association
www.co-asphalt.com

Membership
24 Members
179 Assoc./Affiliates
81 Local Agencies

Industry Partners

5

52nd Annual Rocky Mountain Asphalt Conference & Equipment Show February 19-20

Rocky Mountain Asphalt Education Center

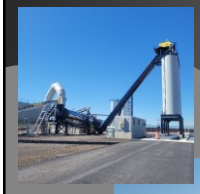
LabCAT Certified Technician

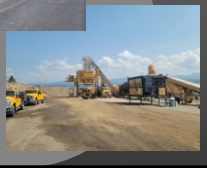
Rocky Mountain Asphalt Education Center

1996 - Present

6

THE COLORADO ASPHALT MARKET:
66 STATIONARY PRODUCTION FACILITIES
5 – 8 PORTABLE PRODUCTION FACILITIES
8 – 9 MILLION TONS






- A majority of producers operate sand, gravel, and quarry operations
- A majority of producers also are paving contractors
- *Some producers are privately held, locally owned and operated and some are large, vertically integrated, publicly traded, and nationally/internationally owned.*

7

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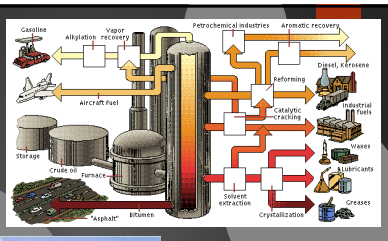
10

Crude Oil Refining Process



Crude oil is refined into products such as gasoline, asphalt, and waxes by a process.

11

12


The idea of phasing out or eliminating fossil fuels from a heavy civil construction standpoint is ……

13

14

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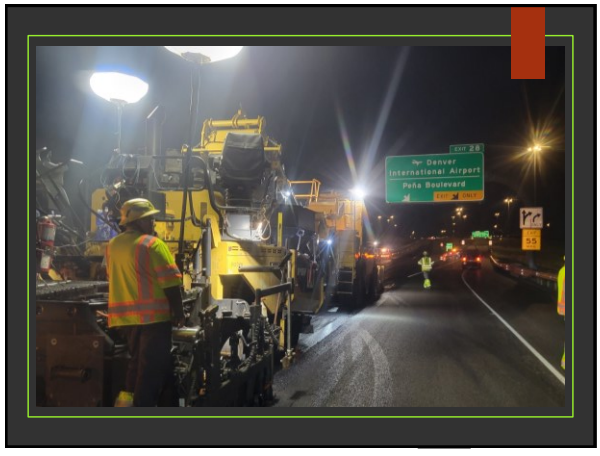

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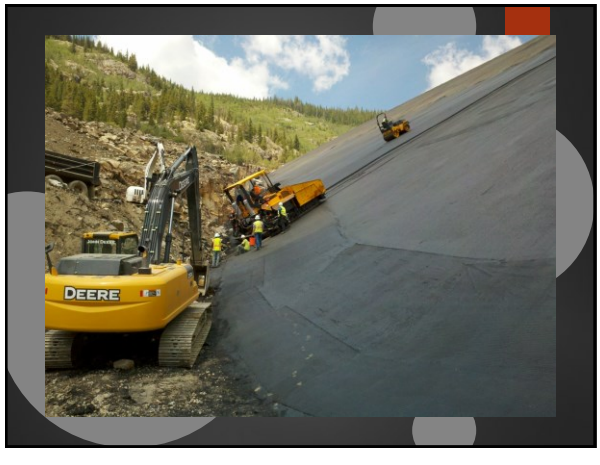

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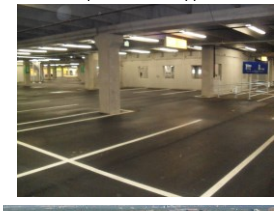
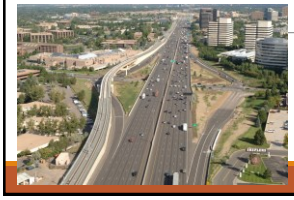
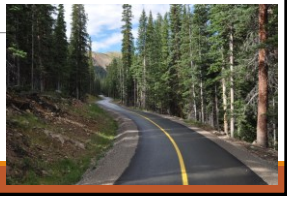
19

PAVEMENT DESIGN The design and the type of asphalt mixture used depends on the application – road, parking lot, city street ,



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Soil Basics 101

Sands (granular)
Silts
Clays (cohesive)

Performance

Atterberg Limits (PI, LL)
% passing -200 screen

21

Subgrade Strength (M_r)

Relative Quality	*R*-Value	California Bearing Ratio	Resilient Modulus (psi)
Good to Excellent	43	17	25,000
Medium	20	8	12,000
Poor	6	3	4,500

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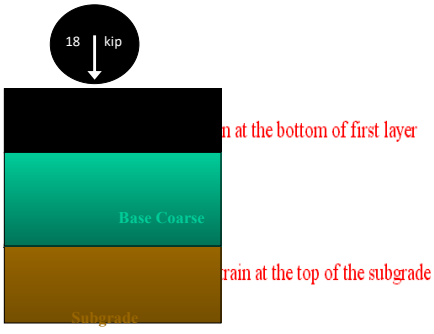
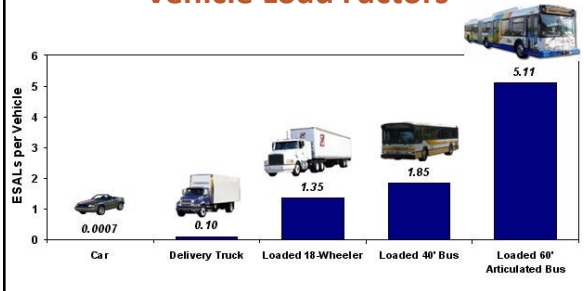
Structural Section Basics



23

Vehicle Load Factors

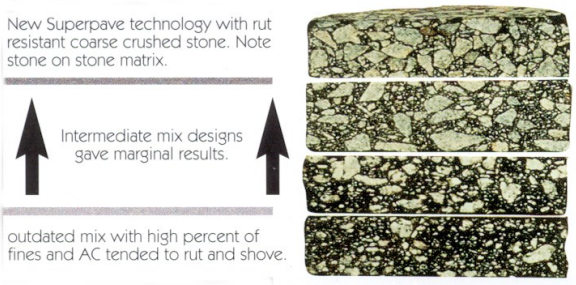


1 18,000 lb axle (truck) = **1929 cars**
1 bus = **2642 cars**

24

Improved material technology

- **Superpave has virtually eliminated rutting in Colorado**



25

Q: How long do asphalt pavements last?

A: Longer than most people think. Don't confuse the number of years to the next resurfacing (10, 12, or 15 years or more) with how long the pavement is in place. Most asphalt pavements have been in place since the original construction.

Pavement Core, I-25 N. of Pueblo, original construction - 1962

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Rehabilitation

Possible Distresses
- *Top-Down Fatigue*
- *Thermal Cracking*
- *Raveling*

Solutions
- *Mill & Fill*
- *Thin Overlay*

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PaveXpress
A Simplified Pavement Design Tool
WWW.PAVEXPRESSDESIGN.COM

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PaveXpress
Training - AC New Design
1 Project Information
2 Design Parameters
3 Traffic & Loading
4 Pavement Structure
5 Pavement Sub-Structure
Design Guidance
Design Inputs
PaveXpress
www.PaveXpressDesign.com
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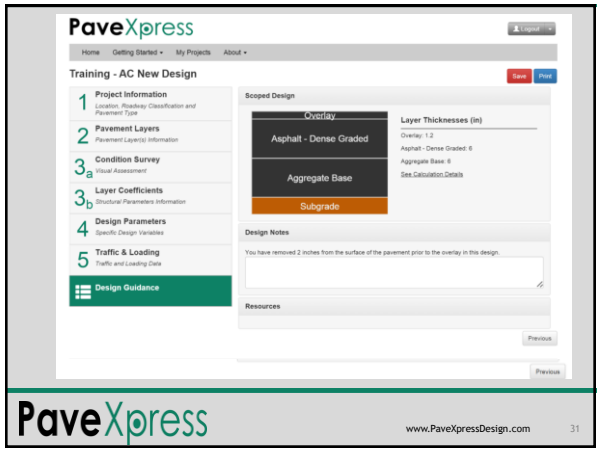
30


PaveXpress
Training - AC New Design
1 Project Information
2 Pavement Layers
3a Condition Survey
3b Layer Coefficients
4 Design Parameters
5 Traffic & Loading
Design Guidance
Scoped Design
Overlay
Asphalt - Dense Graded
Aggregate Base
Subgrade
Layer Thicknesses (in)
Design Notes
Resources
PaveXpress
www.PaveXpressDesign.com
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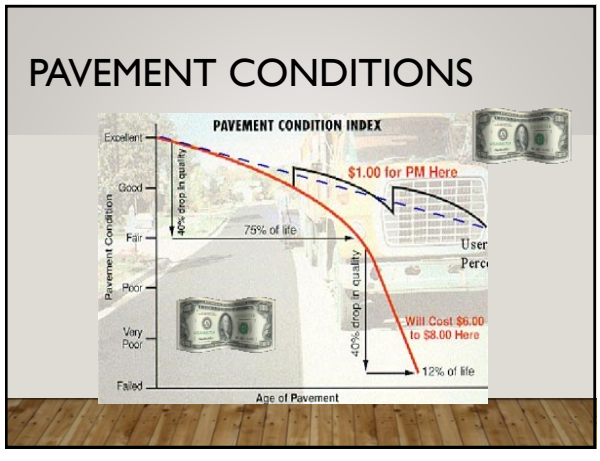
PAVEMENT CONDITIONS
PAVEMENT CONDITION INDEX
Excellent
Good
Fair
Poor
Very Poor
Failed
Pavement Condition
40% drop in quality
75% of life
$1.00 for PM Here
40% drop in quality
Will Cost $6.00 to $8.00 Here
12% of life
Age of Pavement

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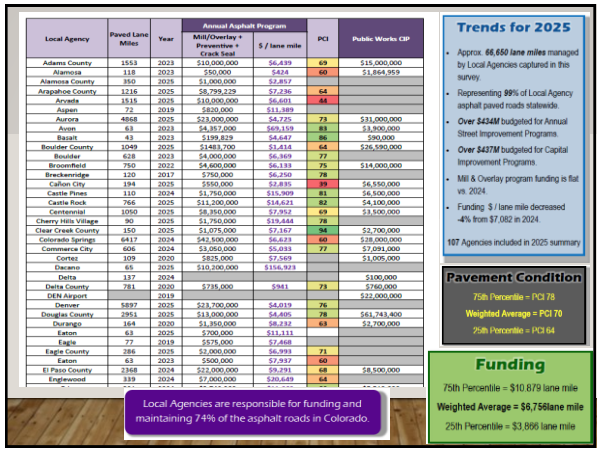
Local Agency
Paved Lane Miles
Year
Annual Asphalt Program
Mill/Overlay + Preventive + Crack Seal
$ / lane mile
PCI
Public Works CIP
Adams County 1553 2023 $10,000,000 $6,439 69 $15,000,000
Alamosa 118 2023 $50,000 $424 60 $1,864,959
Alamosa County 350 2025 $1,000,000 $2,857
Arapahoe County 1216 2025 $8,799,229 $7,236 64
Arvada 1515 2025 $10,000,000 $6,601 44
Aspen 72 2019 $820,000 $11,389
Aurora 4868 2025 $23,000,000 $4,725 73 $31,000,000
Avon 63 2023 $4,357,000 $69,159 83 $3,900,000
Basalt 43 2023 $199,829 $4,647 86 $90,000
Boulder County 1049 2025 $1483,700 $1,414 64 $26,590,000
Boulder 628 2023 $4,000,000 $6,369 77
Broomfield 750 2022 $4,600,000 $6,133 75 $14,000,000
Breckenridge 120 2017 $750,000 $6,250 78
Cañon City 194 2025 $550,000 $2,835 39 $6,550,000
Castle Pines 110 2024 $1,750,000 $15,909 81 $6,500,000
Castle Rock 766 2025 $11,200,000 $14,621 82 $4,100,000
Centennial 1050 2025 $8,350,000 $7,952 69 $3,500,000
Cherry Hills Village 90 2025 $1,750,000 $19,444 78
Clear Creek County 150 2025 $1,075,000 $7,167 94 $2,700,000
Colorado Springs 6417 2024 $42,500,000 $6,623 60 $28,000,000
Commerce City 606 2024 $3,050,000 $5,033 77 $7,091,000
Cortez 109 2020 $825,000 $7,569 $1,005,000
Dacono 65 2025 $10,200,000 $156,923
Delta 137 2024 $100,000
Delta County 781 2020 $735,000 $941 73 $760,000
DEN Airport 2019 $22,000,000
Denver 5897 2025 $23,700,000 $4,019 76
Douglas County 2951 2025 $13,000,000 $4,405 78 $61,743,400
Durango 164 2020 $1,350,000 $8,232 63 $3,700,000
Eaton 63 2025 $700,000 $11,111
Eagle 77 2019 $575,000 $7,468
Eagle County 286 2025 $2,000,000 $6,993 71
Eaton 63 2023 $500,000 $7,937 60
El Paso County 2368 2024 $22,000,000 $9,291 68 $8,500,000
Englewood 339 2024 $7,000,000 $20,649 64
Local Agencies are responsible for funding and maintaining 74% of the asphalt roads in Colorado.
Trends for 2025
Approx. 66,650 lane miles managed by Local Agencies captured in this survey.
Representing 99% of Local Agency asphalt paved roads statewide.
Over $434M budgeted for Annual Street Improvement Programs.
Over $437M budgeted for Capital Improvement Programs.
Mill & Overlay program funding is flat vs. 2024.
Funding $ / lane mile decreased -4% from $7,082 in 2024.
107 Agencies included in 2025 summary
Pavement Condition
75th Percentile = PCI 78
Weighted Average = PCI 70
25th Percentile = PCI 64
Funding
75th Percentile = $10,879 lane mile
Weighted Average = $6,756lane mile
25th Percentile = $3,866 lane mile

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SUSTAINABILITY

MATERIALS

- Recycled Asphalt Pavement (RAP)
- Warm Mix Asphalt
- Liquid Alternatives to Hydrated Lime

DESIGN

- Perpetual Pavements

CONSTRUCTION

- Efficiency in Project Delivery

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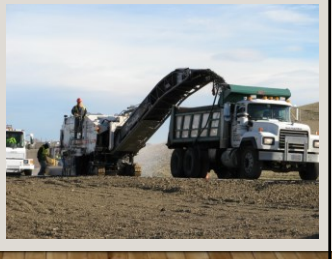
MATERIAL CONSERVATION – UTILIZE MORE RECYCLED ASPHALT PAVEMENT

Asphalt pavements are 100% recyclable and are the #1 product recycled in the U.S. each year.



Specify for innovation ....

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MOR BARK
Recycled Asphalt Shingles - Issues
- availability
- cost
- performance
- gradation
- percent maximum
- amount of deleterious material

37


Asphalt pavements are designed and engineered for quality and performance. Material components need to be evaluated with respect to the cost/benefit. We cannot consider our pavements as linear landfills.

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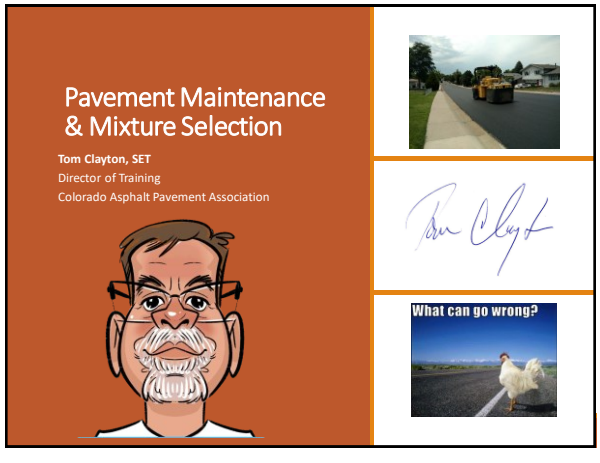
Pavement Maintenance & Mixture Selection
Tom Clayton, SET
Director of Training
Colorado Asphalt Pavement Association
What can go wrong?

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CRACKS LEFT ALONE FORM POTHOLES!

40

THE PURPOSE OF CRACKSEALING FLEXIBLE PAVEMENTS

- Protects the base and/or sub-base from water erosion.
- Preserves the adjacent pavement around the cracks from the freeze-thaw cycles.
- Eliminates the damaging effects sand and stone.
- Extends pavement life.
- Is cost effective.

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THE ASPHALT INSTITUTE SAYS…
"CRACK SEALING IS THE MOST IMPORTANT MAINTENANCE WORK YOU CAN HAVE DONE TO EXTEND THE LIFE OF YOUR PAVEMENT."

42

"EACH $1.00 SPENT ON PREVENTIVE MAINTENANCE SAVES $4.00 TO $10.00 LATER."

CDOT BIG MAC (MATERIALS ADVISORY COMMITTEE)

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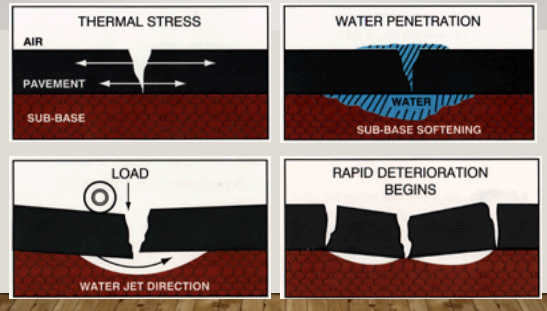
CRACKS LEAD TO BIGGER PROBLEMS IF NOT SEALED IN TIME.



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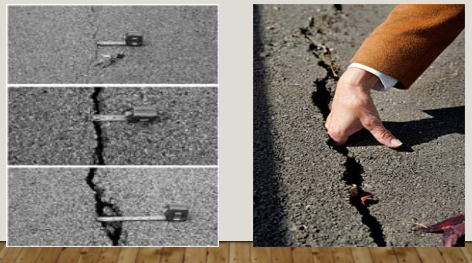
ANY QUESTIONS

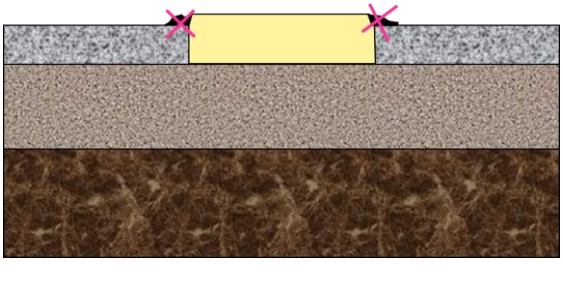
on why to crackseal?



45


Overlay Program
Patch or Mill First?

46



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No treatment Applied
Paved in 2017
Preventative Treatment applied
Town of Castle Rock, Black Feather Trail 2023

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Asphalt Mixture Selection

Specifying the right asphalt mixture for the right application is a very important consideration as it relates to long term pavement performance.

Designing a mixture to be durable and able to withstand surface oxidation and weathering needs to be balanced with having stability to withstand rutting (ie. permanent deformation).

The question is, what is the correct mix for a particular roadway?

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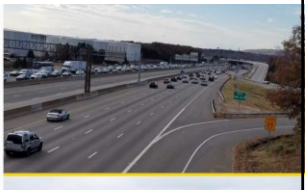
HIGH-VOLUME INTERSTATES

- Stone Matrix Asphalt Surface and Binder Layers
- Polymer Modified Binders



50

Low-Volume Local Roads and Streets

Scenic By-Ways and Parkways

51

Asphalt Mixes for Parking Lots

52

Asphalt Mixture Selection

The predominate distresses on lower volume roads are durability related and include surface raveling, oxidation, and low temperature thermal cracking.

53

What is appropriate for the Design and Maintenance of Local Agency Roads?

The questions arise;

- How many local roads does CDOT build or maintain?
- How many highways do Local Agencies Build and Maintain?

Are all roads the same?

Is there a design that is “one size fits all”?

What grading (mixture) should be placed in a parking lot versus a Collector?

What is the appropriate Binder to use?

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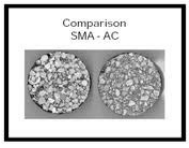
Asphalt Mixture Selection

A common specialty mix that is used routinely by CDOT for high traffic urban interstate rehabilitation and by some local agencies for high traffic urban arterial roadways is stone matrix asphalt (SMA).



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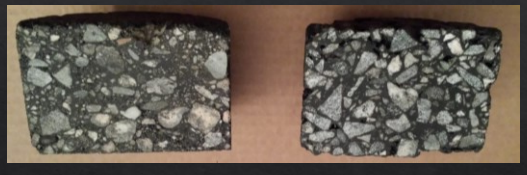

½" Mix (SX) ½" SMA

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Asphalt Mixture Selection

- The most common mix in a number of locations in Colorado is:

PG 64-22, SX, 75 gyration mix with 20% RAP

- In the high country it is more common to use a PG 58-28 asphalt binder
  - PG 58-28 is a softer asphalt binder and is used in colder climates, in high RAP mixes, and/or where low temperature thermal cracking is a concern.

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HMA Grading Size and Location

CDOT HMA Grade	Nominal Maximum Aggregate Size (NMAS)	Application
SF	No. 4 sieve	Leveling Course, Rut Filling, Scratch Course, etc.
ST	3/8 inch	Thin Lifts and Patching
SX	½ inch	Top Layer (Preferred)
S	¾ inch	Top Layer, Layers Below the Surface Patching
SG	1 inch	Layers Below the Surface, Deep Patching

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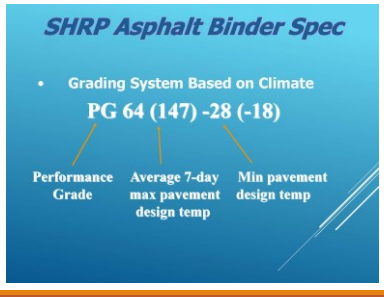
PG Binders, Do you understand what the numbers mean?



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Asphalt Mixture Selection Guideline

PG ASPHALT BINDER	SUGGESTED USE
PG 58-34*	Modified asphalt, very low temp. climates, low volume roadways
PG 58-28	Unmodified, low volume roadways
PG 64-22	Unmodified, most commonly used PG grade, for low, moderate and high volume roadways
PG 64-28*	Modified asphalt, Moderate to high volume roadways, colder climates
PG 70-28*, PG 76-28*	Modified asphalts, very high volume roadway

*** - denotes modified asphalt binder, generally restricted to top mat paving**

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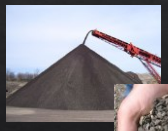
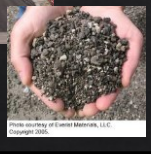
Asphalt Mixture Selection

- Some agencies are allowing more than 25% recycled asphalt pavement (RAP) and CDOT allows 23% Binder replacement from RAP in lower lift, it is more common for agencies to use a standard 25% RAP on all mixes on all lifts.

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Local Agency Trends

ASPHALT MIX DESIGN

Design / Traffic	☐ N_{design} = 50 gyrations ☐ N_{design} = 75 gyrations	<100,000 ESALs ≥100,000 to <3 million ESALs	
Binder	☐ PG 58-28	☐ PG 64-22	☐ PG 76-28 (Top lift only)
Grading		Minimum Lift (3x)	Maximum Lift (5x)
	☐ ST (⅜")	1 ½"	2 ¼"
	☐ SX (½")	1 ½"	2 ½"
	☐ S (¾")	2"	4 ¼"
	☐ SG (1")	3"	5 "
	☐ SMA (½")	1 ½"	2 ½"
	☐ SMA (¾")	3"	4 ¼"
Anti – Strip	☐ Liquid	☐ Lime	

BEST PRACTICES to include in Mix Design		
RAP	☐ 25%	☐ 35% (Grading SG only)
WMA	☐ Additive	☐ Foaming

AGENCY EXCEPTIONS

- ☐ No RAP in wearing course
- ☐ No RAP allowed in mixture
- ☐ No WMA allowed in mix

Air Voids

4.0%

3.5%

ASPHALT
THE SMOOTH | QUIET RIDE

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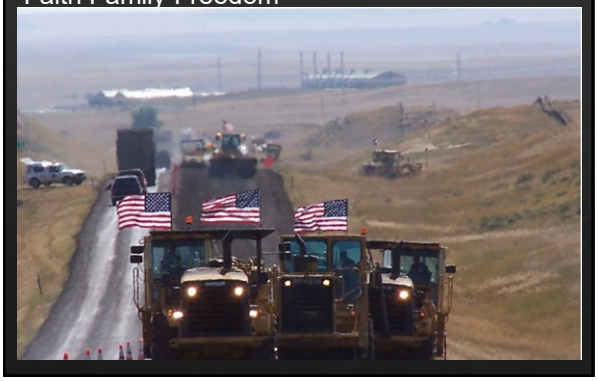
The Construction Industry of Colorado - Faith Family Freedom



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Calibre

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Colorado Asphalt Pavement Association

We're a Resource for YOU,
A Phone Call or E-Mail Away!

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