



Rap Use In Illinois

January 10th 2007

North Central Asphalt User/Producer Group

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Thornton, Illinois



Agenda

- Background
- RAP Classification
- Processing
- Batch vs. Drum
- Where we use it
- Savings
- What lies ahead
- Questions?

Quiz Question..

Who said This???

“Our experience to date has shown that recycling of asphalt pavements offers a design alternative that provides the state a cost effective and energy efficient method of utilizing existing resources, while at the same time not sacrificing the quality of the resulting pavement system.”

Plant Locations

Gencor 600TPH



Thornton, Illinois



Plant Locations

Astec 375TPH



Joliet, Illinois

Plant Locations

Gencor 425TPH



Bourbonnais, Illinois



100,000 Tons In Thornton



50,000 Tons in Joliet



Illinois History 1980's

- 80's Started Milling Program
- Milling guidelines for plans
- RAP is property of contractors
- Policies allowed reuse of RAP back into binders lower lifts, surface and shoulders

Illinois History

1990's

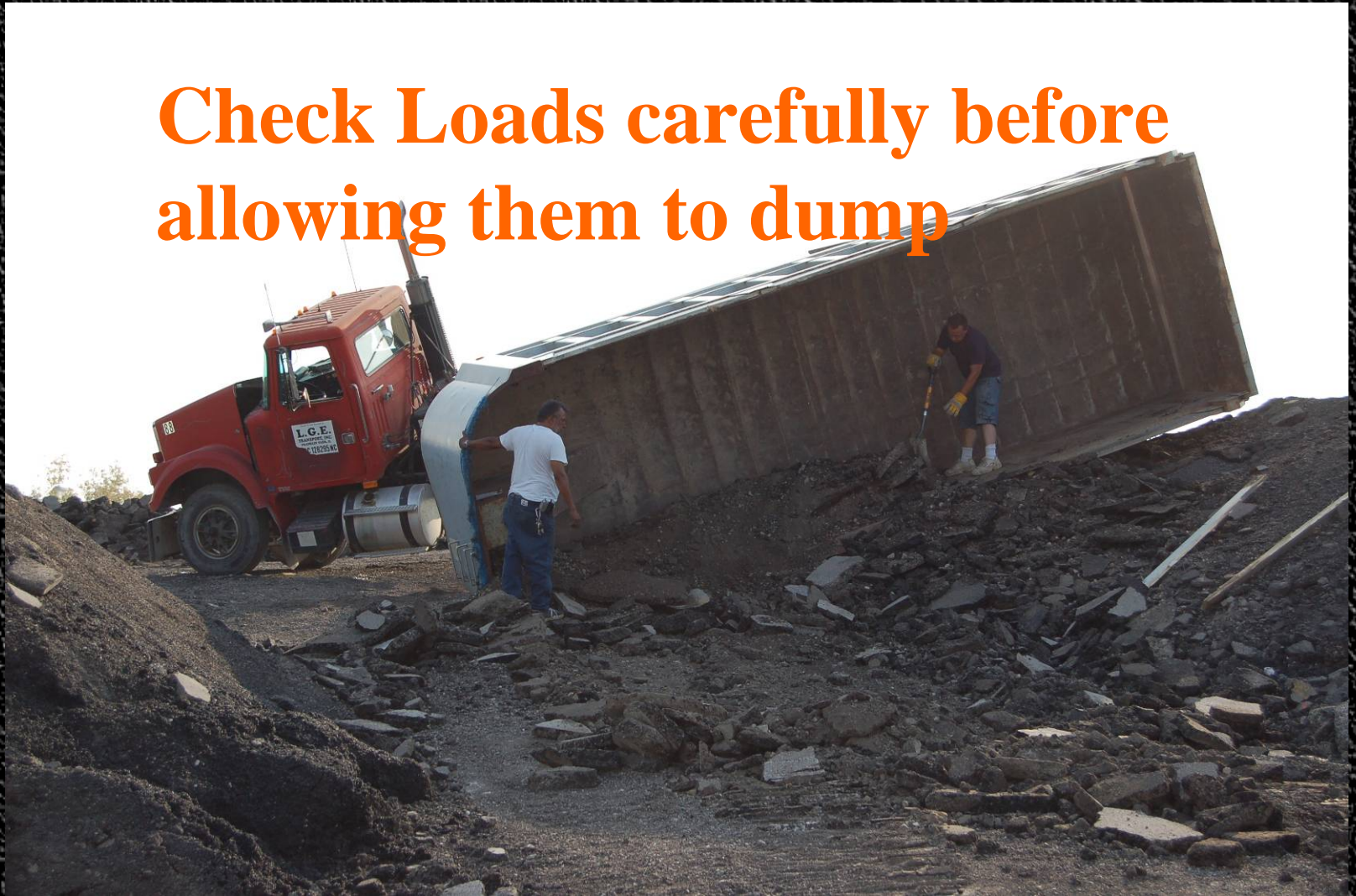
- SuperPave Mixes start without RAP
- As SuperPave became more common in use RAP stockpiles began to grow.
- Late 90's SuperPave Mixes allowed to use RAP

Illinois History New Millennium

- Developed RAP policy for SuperPave
- Review of piles found many contractors had poor RAP handling storage practices
- IDOT Added controls to allow more usage (stockpiling and crushing)

How do you handle incoming RAP?

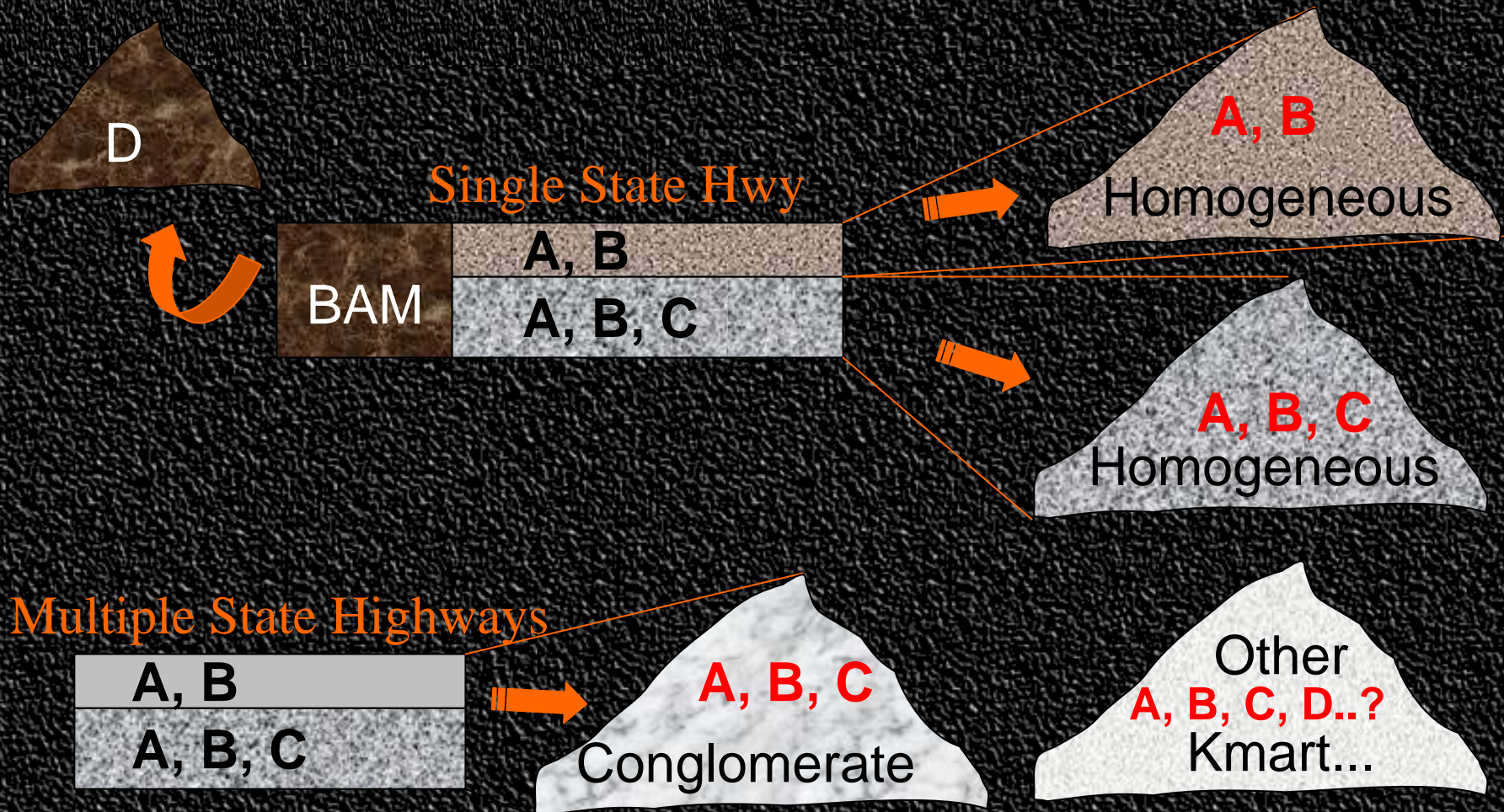
Check Loads carefully before allowing them to dump



Coarse Aggregate Quality

Test	A	B	C	D
NaSO4 Soundness	15	15	20	25
LA Abrasion- Max loss	40	40	40	45
Max % Deleterious				
Shale	1.0	2.0	4.0	-
Clay Lumps	0.25	0.5	0.5	-
Coal & Lignite	0.25	-	-	-
Soft and Unsound	4.0	6.0	8.0	-
Other Deleterious	4.0	2.0	2.0	-
Total Deleterious	5.0	6.0	10.0	-

RAP Sources



Incoming RAP Handling Procedures [Best Practices]

1. Construction crew Foreman (Milling crew or demo crew) contacts Plant Foreman with RAP material information (location, type of pavement, thickness removed)
2. Accepting RAP with significant contamination (dirt, grass, concrete, clay, etc.) is prohibited by plant policy.
3. Plant Foreman determines the type of RAP (homogeneous/conglomerate/other) and where to stockpile.
4. Plant Foreman notifies Scale Clerk and Yard Loader Operator of incoming material type.

Incoming RAP Handling Procedures [Best Practices]

5. Scale Clerk instructs incoming RAP truck drivers where to dump material and tickets the incoming material loads to track RAP inventory by type.
6. Plant Loader Operator monitors quality of incoming material as trucks are dumping and he stockpiles the material. If any problems are observed the Loader Operator notifies the Plant Foreman for corrective action.

Incoming RAP Handling Procedures [Best Practices]

7. The Scale Clerk prints the daily plant report and highlights all incoming RAP with the proper classification (homogeneous/conglomerate/other). The reports are kept in a three ring binder in the Plant Ticketing Office to fulfill IDOT tracking requirements.
8. RAP is processed by type into separate processed stockpiles. The Plant Loader Operator is instructed by the HMA Plant Operator which material to feed the plant per the mix design requirement of the HMA.

RAP LOG - THORNTON YARD

DATE	TONS	NUMBER OF LOADS	LOCATION OF RAP	TYPE OF RAP
4/5/2006	1290	68	GE06801 KEDZIE AVE./OLYMPIAN WAY	CONG
4/7/2006	1631	78	GE06801 KEDZIE AVE./OLYMPIAN WAY	CONG
4/10/2006	1236	70	GE06801 KEDZIE AVE./OLYMPIAN WAY	CONG
4/17/2006	280	14	GE04107 DAN RYAN SKYWAY INTER.	CONG
4/17/2006	40	2	GE04108 IDOT DAN RYAN AT WELLS	CONG
4/17/2006	44	4	GE05241 SAUK VILLAGE MFT	CONG
4/18/2006	120	6	GE06901 63RD AND HALSTED	CONG
4/19/2006	40	2	GE05209 135TH ST., CICERO-KOSTNER	CONG
4/20/2006	1227	70	GE06801 KEDZIE AVE./OLYMPIAN WAY	CONG
4/24/2006	1059	57	GE06801 KEDZIE AVE./OLYMPIAN WAY	CONG
4/27/2006	124	8	GE06201 STEGER	HOMO
4/28/2006	200	10	GE05623 USAA 700K SPEC BLDG	OTHER
4/28/2006	18	1	GMRAP FROM OUTSIDE SOURCES 112TH & TORR	CONG
4/28/2006	104	7	GE06201 STEGER	CONG
5/2/2006	93	6	GE05216 SOUTH HOLLAND STREET RESURF	CONG

Excavator with offset tooth ripper bucket



Closed circuit crusher/screen system

Inertia 5066 – 50” feed opening, 66” rotor diameter



Tyler/Tyroch 8'x20' two deck incline screen

Top Deck 1" screen

**Bottom Deck 1/2" Veno
Self Cleaning style**



**Normal Production approx. 160-220 tons per hour
(1/2" Minus)**

Rate varies depending on feed top size, moisture, condition of bars



Store RAP in a cool dry place



Rap Shelter



RAP Shelter



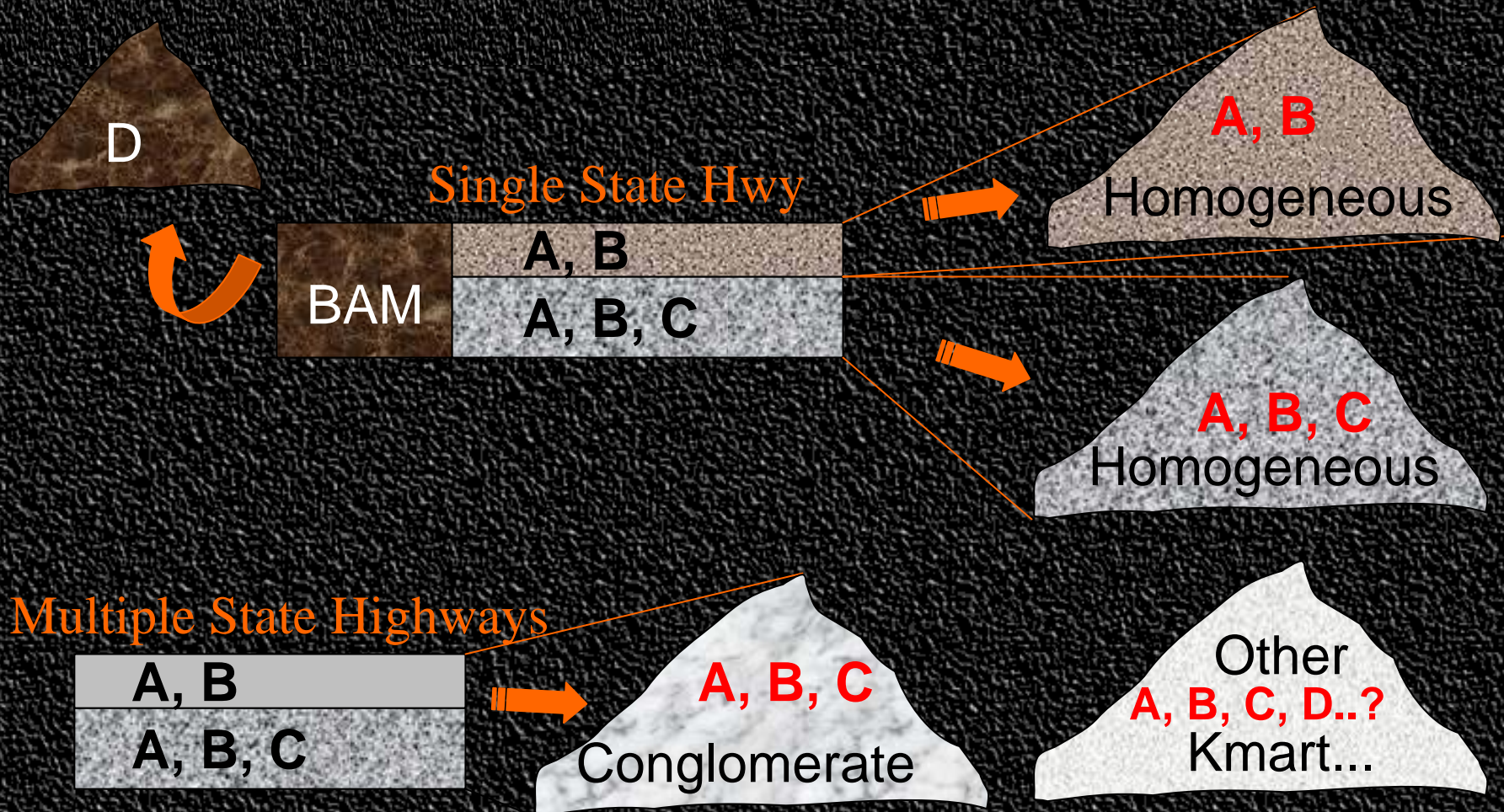
- Washed extraction tests every 500tons for the first 2000 tons and one per 2000 after.

- Test for Gradation and Asphalt content

Parameter	Homogeneous/ Conglomerate	Conglomerate "D" Quality
12.5mm (1/2 in.)	± 8%	± 15%
4.75mm (No. 4)	± 6%	± 13%
2.36mm (No. 8)	± 5%	
1.18mm (No. 16)		± 15%
600um (No. 30)	± 5%	
75um (No. 200)	± 2.0%	± 4.0%
AC	± 0.4%	± 0.5%

- Moistures of all aggregates and RAP daily

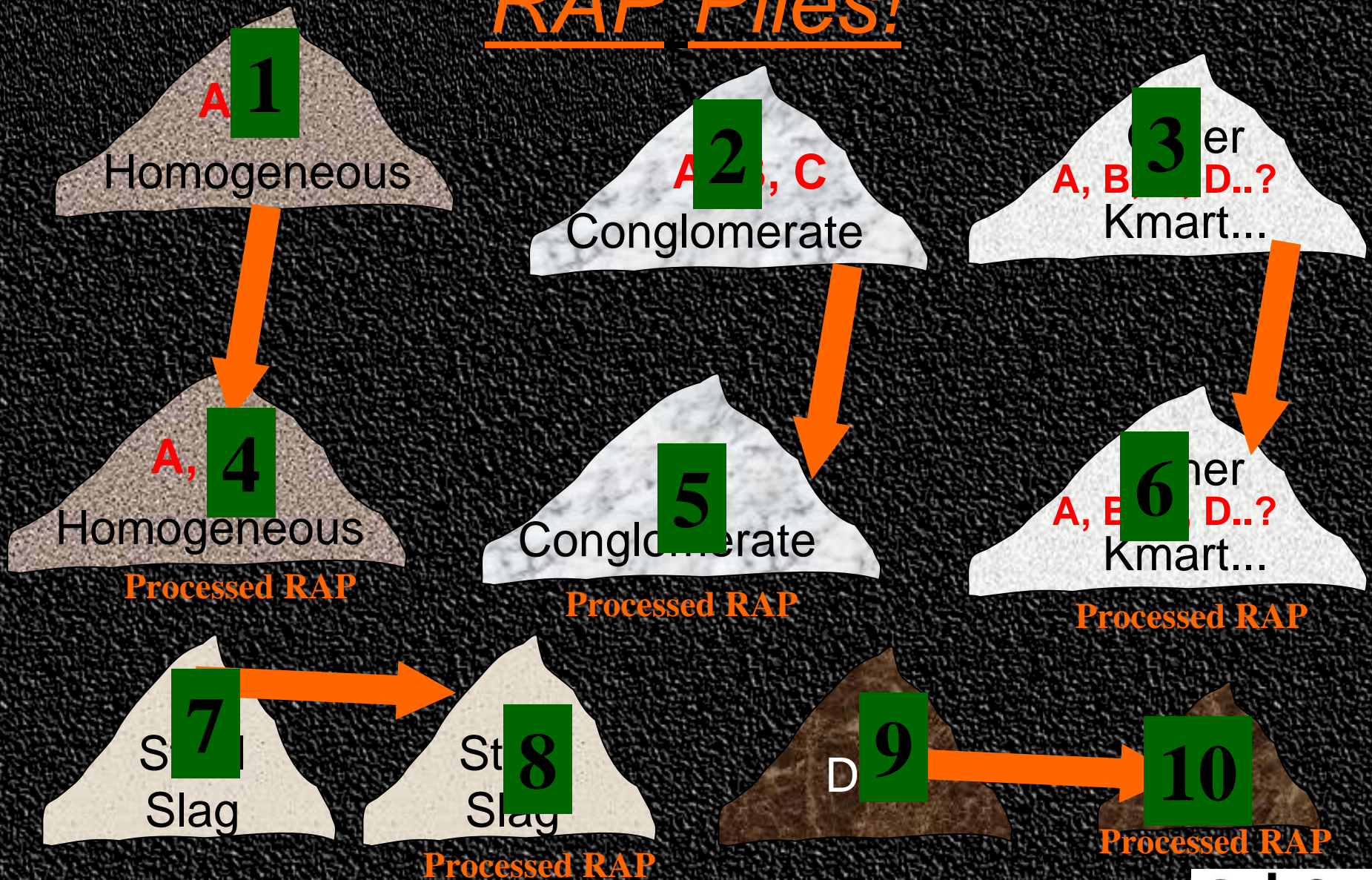
RAP Sources



In Illinois we Classify RAP



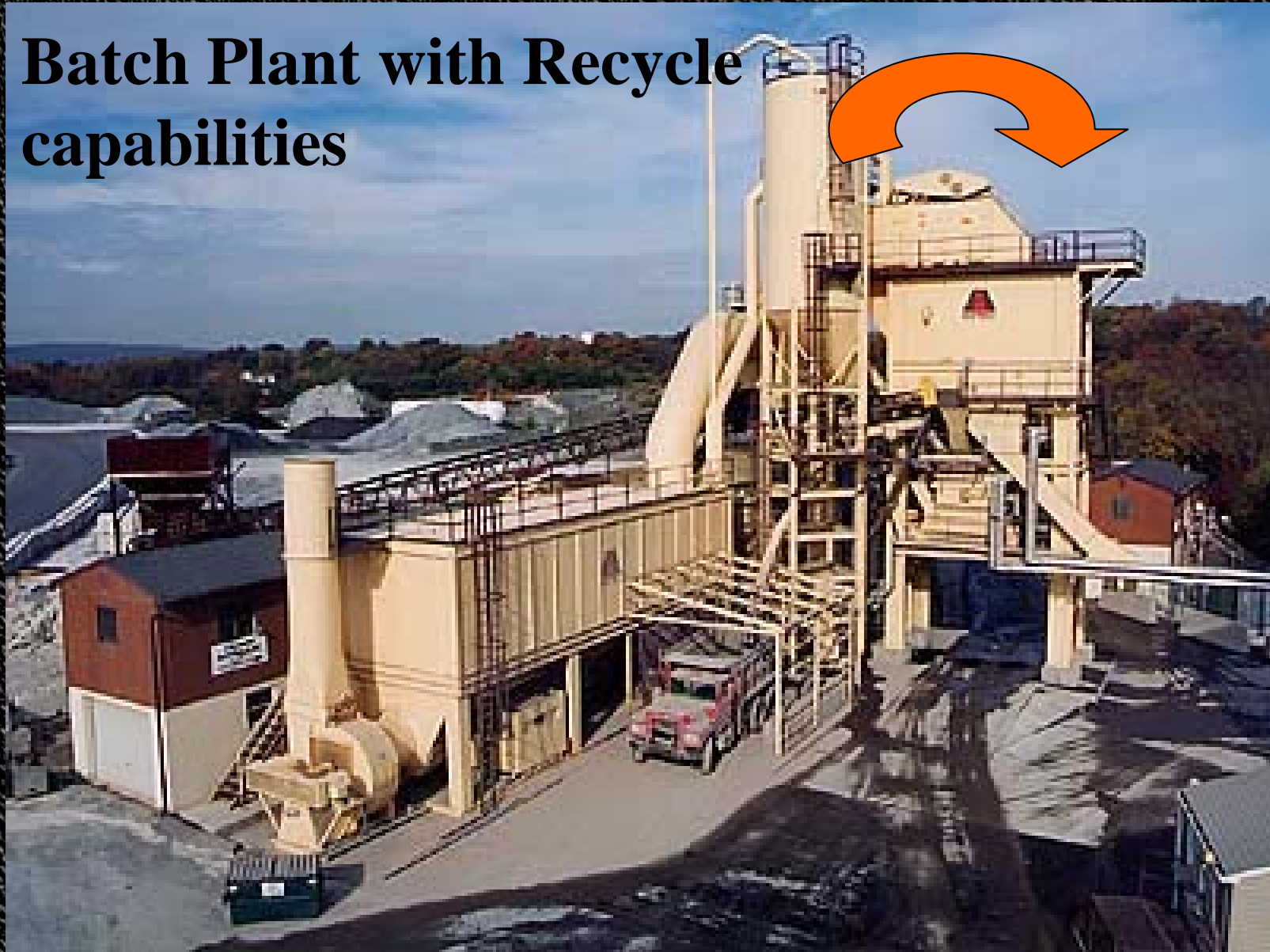
RAP Piles!



Batch Plant with Recycle capabilities



Batch Plant with Recycle capabilities

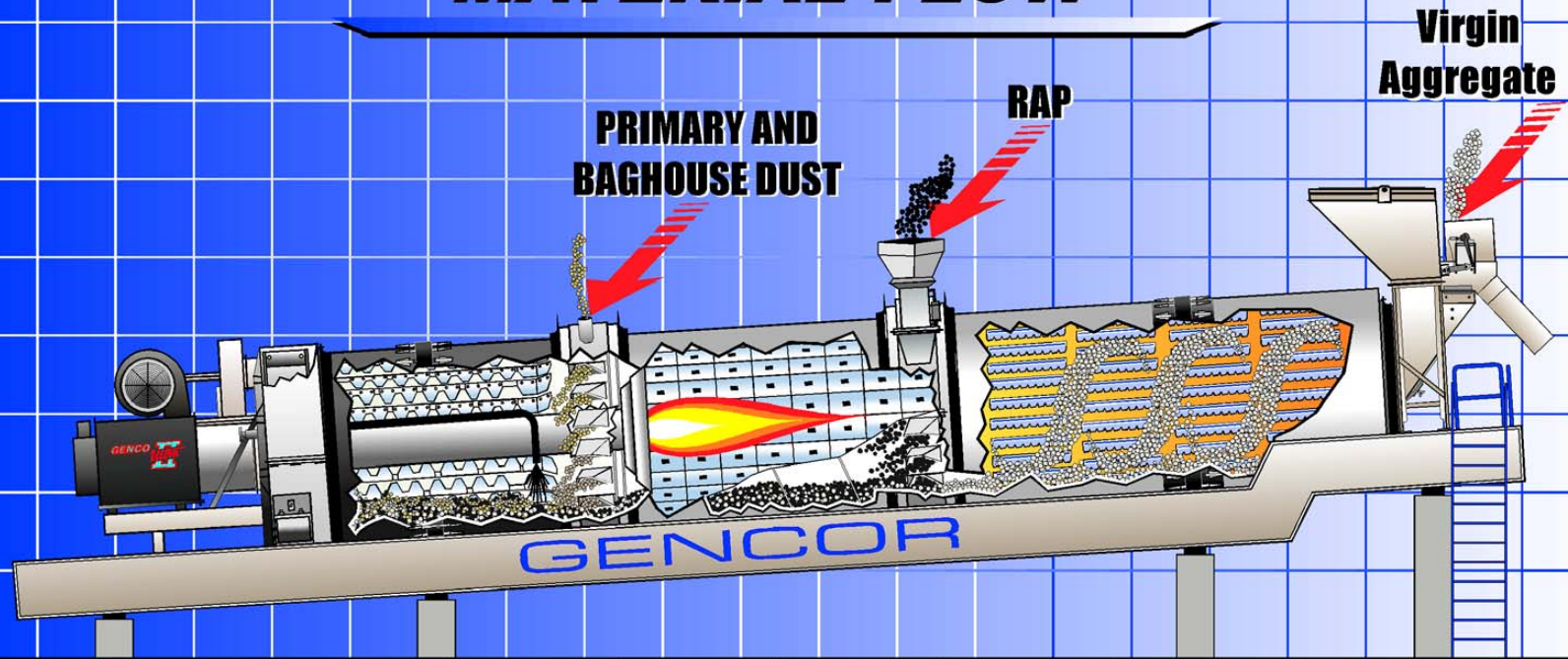


Batch Plant with Recycle capabilities

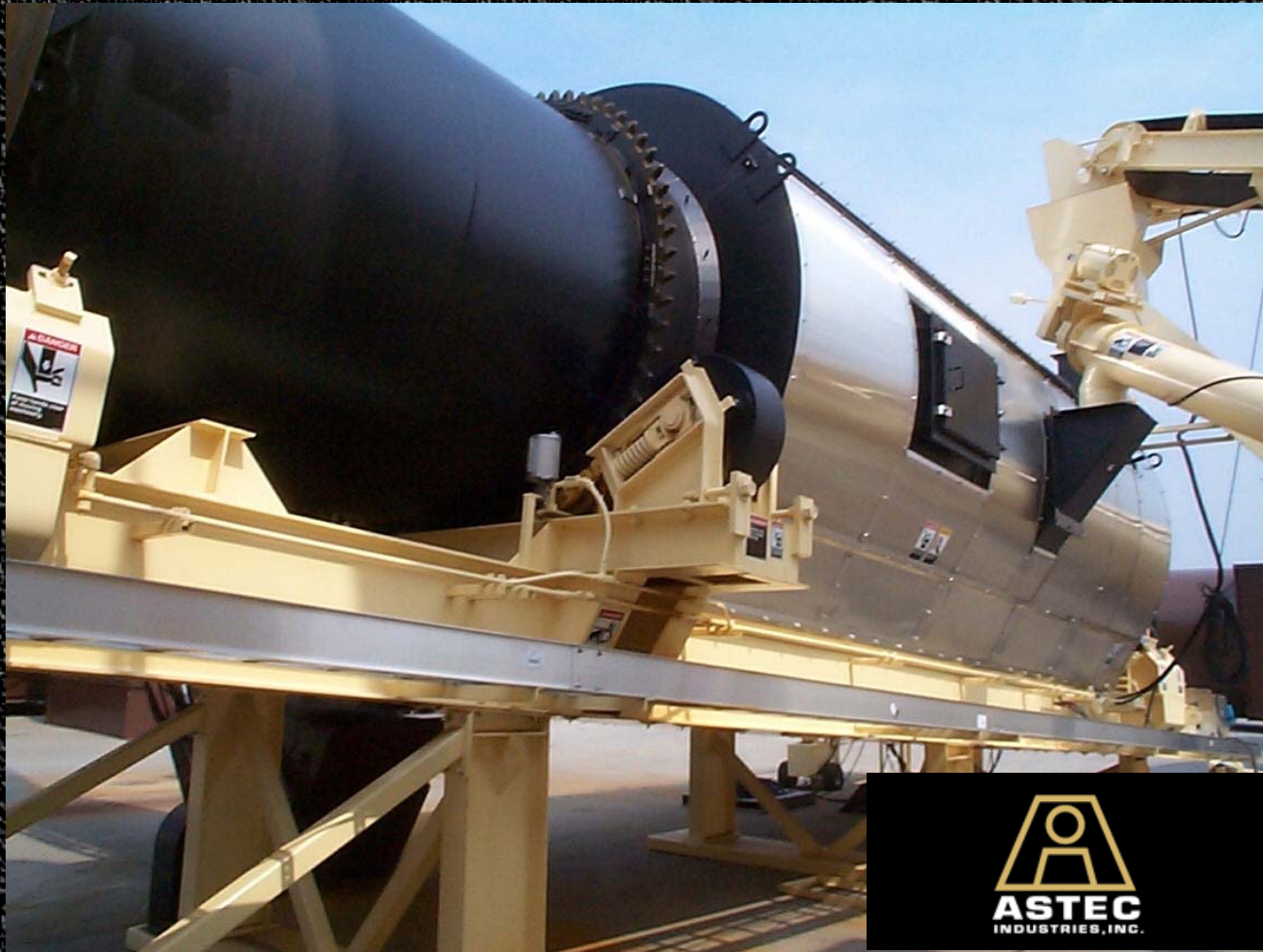
Cold Sand bin adds sand to weigh hopper



ADVANCED RAP ENTRY MATERIAL FLOW



Astec Double Barrel



Max RAP %

TABLE 1. Maximum RAP Percentages for Various Mixes

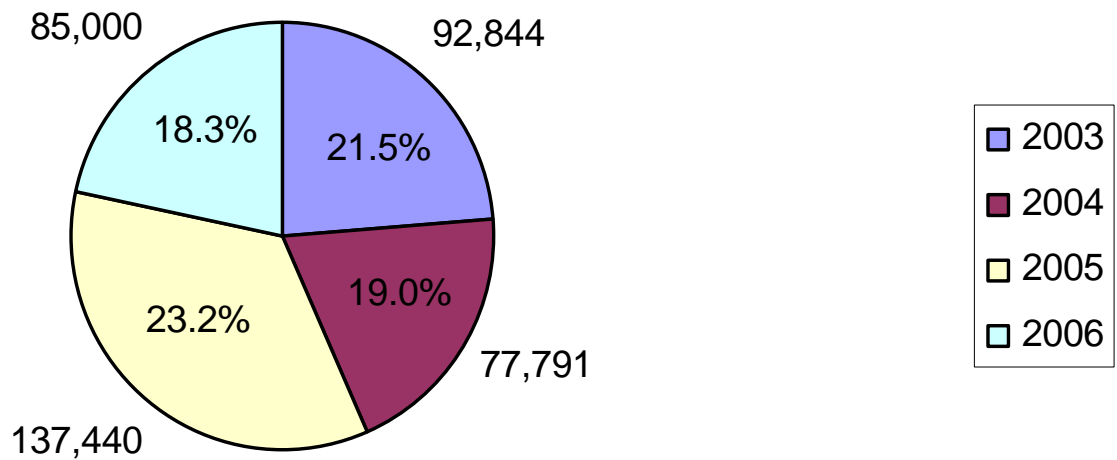
N-Design	Binder/Level Binder	Surface
30	30	30
50	25	15
70	15	10
90	10	10
105	0	0

No RAP in Polymer Mixes/ Shoulders up to 50%

Thornton

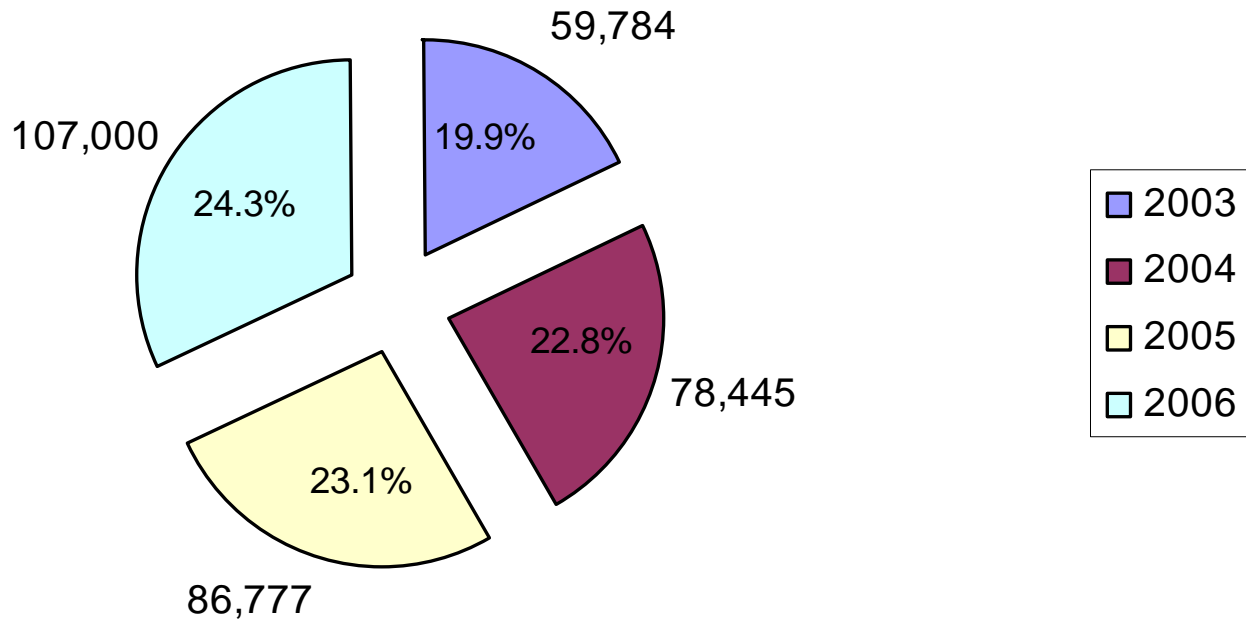
	RAP Processed	HMA Produced	Average % recy.
2003	92,844	431,782	21.5%
2004	77,791	408,786	19.0%
2005	137,440	591,817	23.2%
2006	85,000	463,244	18.3%

RAP Processed

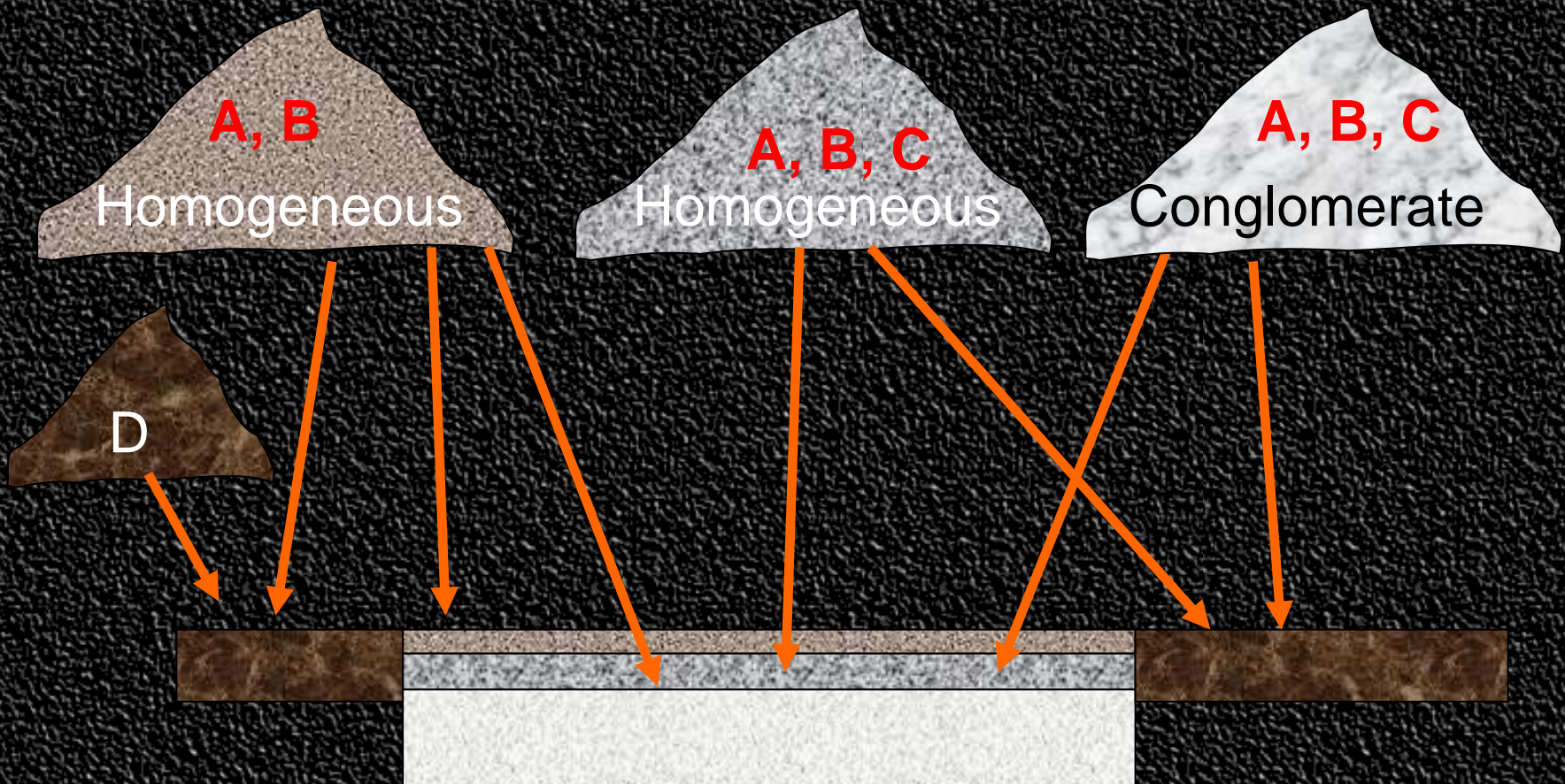


Year	Joliet		
	RAP Processed	HMA Produced	Average % recy.
2003	59,784	300,561	19.9%
2004	78,445	344,184	22.8%
2005	86,777	375,755	23.1%
2006	107,000	440,248	24.3%

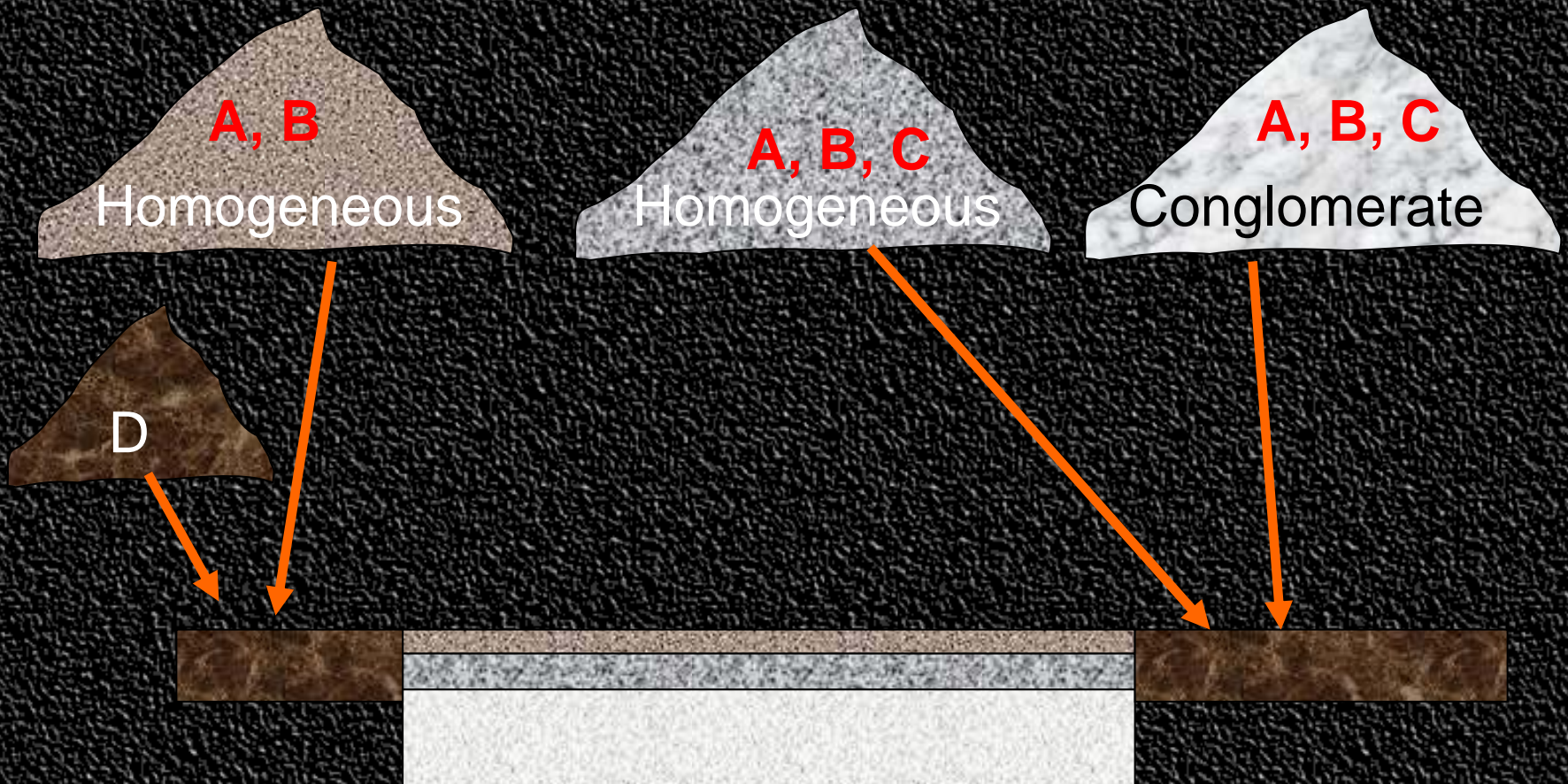
RAP Processed



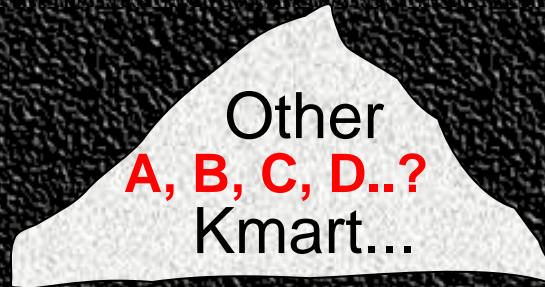
Non-Polymer Overlays



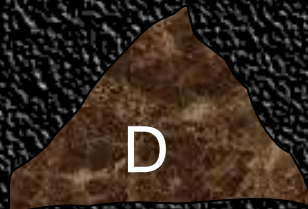
Polymer Overlays



RAP Usage



Private Use or Waste



BAM Mixes

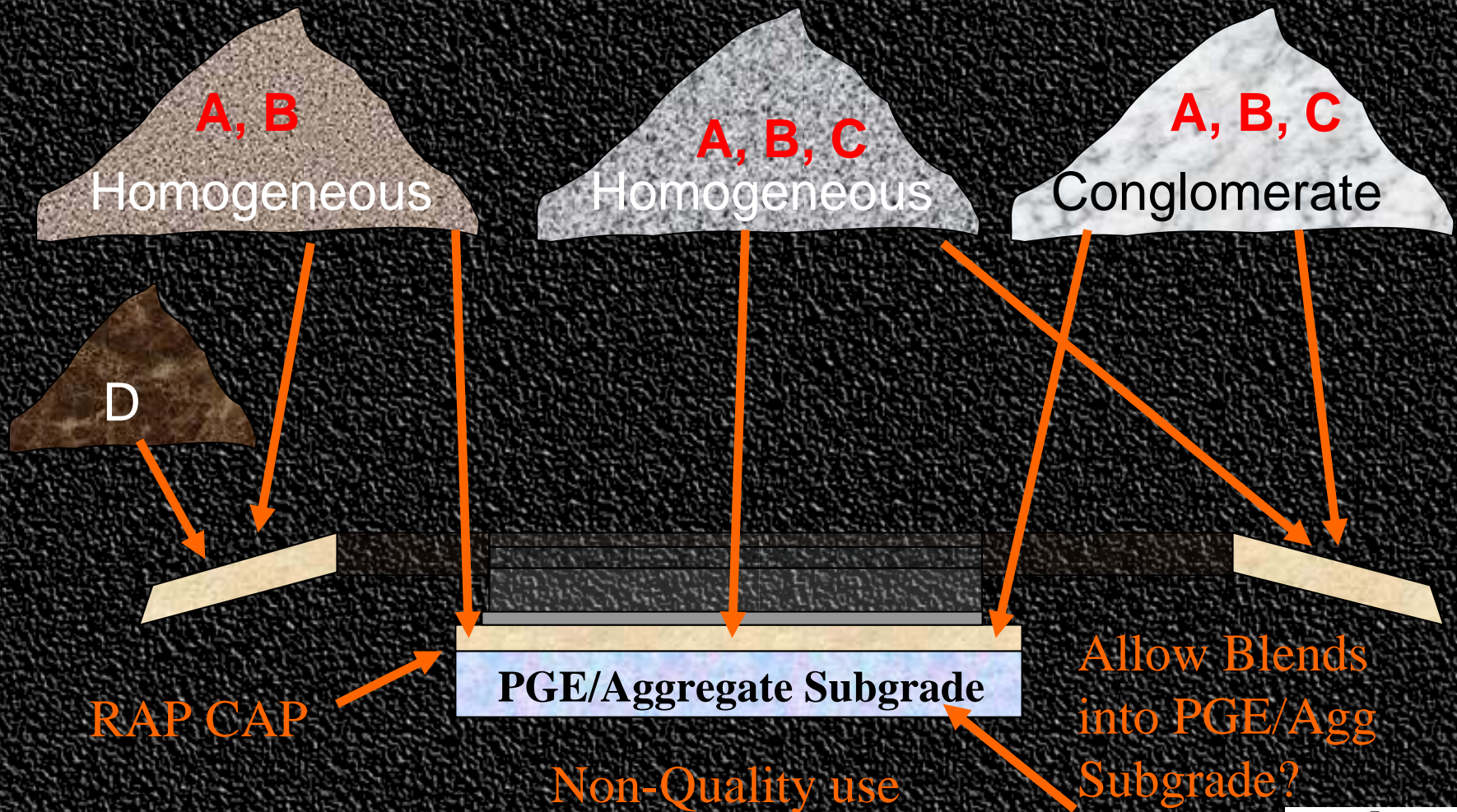
Shoulders/Agg Cap

Private use or waste

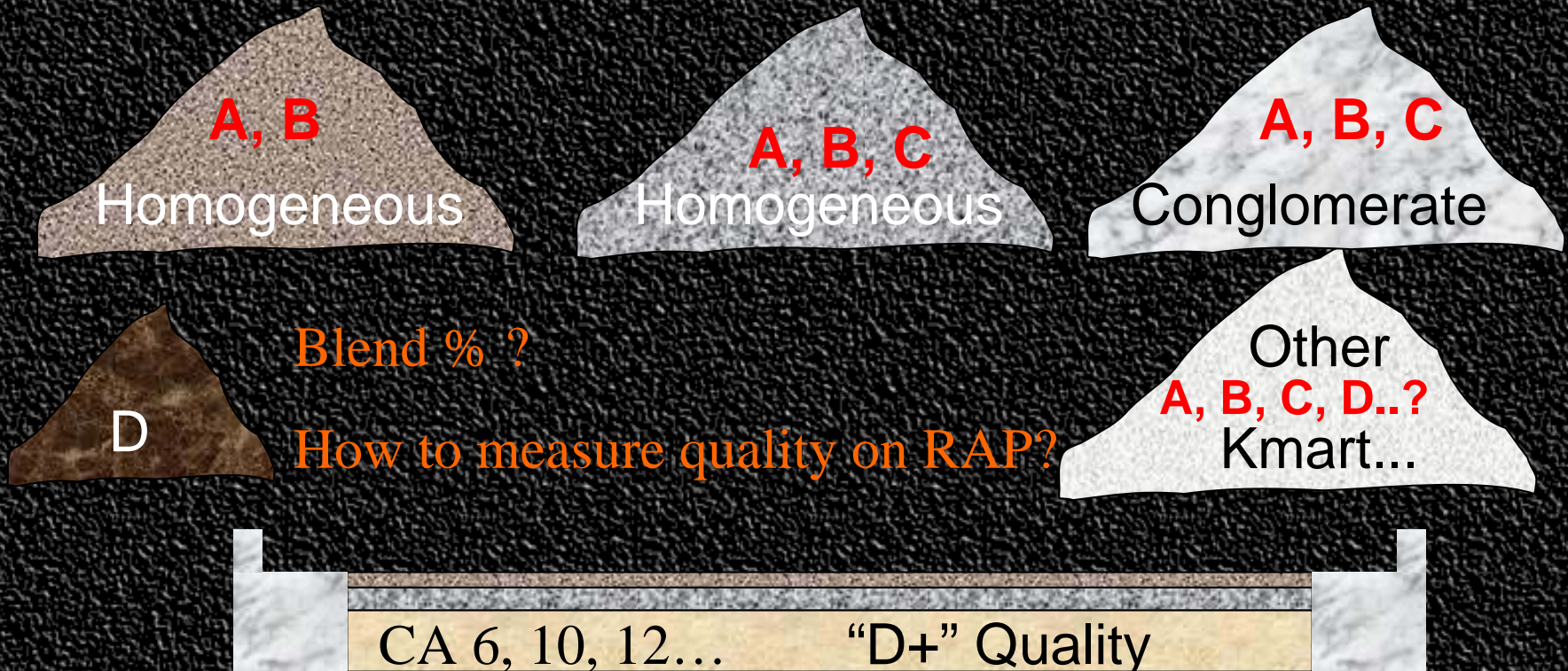


Surface Only or waste

Shoulders/Subgrade/PGE



Aggregate Bases



Overlay PG Grades

N-Design	ESAL -M	Standard	Slow	Standing
30	<0.3	PG 58-22	PG64-22	PG64-22
50	0.3 to < 3	PG64-22	PG70-22 SBR or SBS PG70-22	SBS-PG76-22
70	3 to < 10	PG64-22	PG70-22 SBR or SBS PG70-22	SBS-PG76-22
90	10 to < 30	PG64-22	PG70-22 SBR or SBS PG70-22	SBS-PG76-22
105	> Or = 30	PG70-22 SBR or SBS PG70-22	PG70-22 SBR or SBS PG70-22	SBS-PG76-22

Polymer mixes can not be recycled

Illinois Groups Charge 2005-2006

- Retain quality & performance
- Strive for highest value use
- Create policies that have economic sustainability
- Protect the environment
- Training for local agencies on RAP specification

Progress has been made in Illinois!

Max RAP %

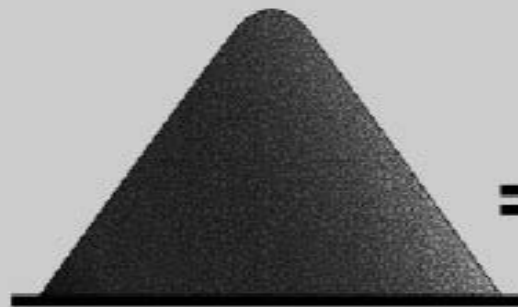
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90	10 10%	10 10%
105	0 10%	0 10%

RAP in Polymer Mixes/ Shoulders up to 50%

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Polymer mixes can not be recycled

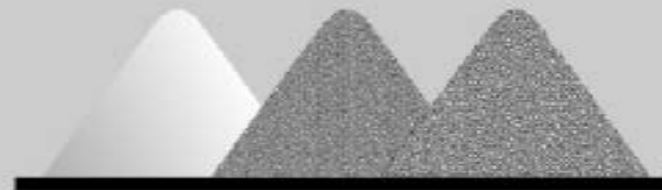


30,000 Tons of RAP

=



70 - 6,000 Gallon Transport Trailers
and 28,200 Tons of Clean Aggregate



RAP is Worth the Virgin Material It Replaces

Asphalt Costs

PG Grade	Cost	Increase from PG64-22	Mix Increase*
64-22	\$400	\$0	\$0.00
58-22	\$425	\$25	\$1.5
70-22	\$500	\$100	\$6.00
76-22	\$525	\$125	\$7.50
76-28	\$570	\$170	\$10.20

***Does not include plant considerations**

Asphalt Costs

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64-22	\$400	\$0	\$0.00 (\$5.00)
58-22	\$425	\$25	\$1.5 (\$5.31)
70-22	\$500	\$100	\$6.00 (\$6.25)
76-22	\$525	\$125	\$7.50 (\$6.56)
76-28	\$570	\$170	\$10.20 (\$7.13)

Asphalt binder savings based on an average AC content of 5% liquid in RAP and blending 25% Rap in mix.

*Does not include plant considerations

Mix cost savings

\$6.06/ton Savings

	Virgin Surface		
<u>Material</u>	<u>\$/ton</u>	<u>%</u>	<u>Mix cost</u>
Aggregate cost	\$ 10.00	94.0%	\$ 9.40
Asphalt cost	\$ 410.00	6.0%	\$ 24.60
	Total mix cost		\$ 34.00
	Recycle Surface		
<u>Material</u>	<u>\$/ton</u>	<u>%</u>	<u>Mix cost</u>
Aggregate cost	\$ 10.00	70.25%	\$ 7.03
Asphalt cost	\$ 410.00	4.75%	\$ 19.48
RAP*	\$ 5.75	25%	\$ 1.44
	Total mix cost		\$ 27.94
*Assume 5% liquid in the RAP			

Who Saves the \$6.07/ton?

- The Contractor?
- The DOT/Customer?
- Some split between the two..

I think it depends on your market....

What has RAP saved the tax payers of Illinois 2003-2006

- Thornton – 393,075 tons of RAP
- Joliet – 332,006 tons of RAP
- Total – 725,081 tons of RAP in 4 years

This will produce 2,900,324 tons of HMA
at 25% RAP

What has RAP saved the tax payers of Illinois 2003-2006



At \$6.00/ ton savings = \$17,401,944

NAPA Recycling Task Force

- Communicate the Economic\$ of Recycling.
- Develop Guidelines on higher RAP content mixes.
- Conduct a technology transfer program.
 - Equipment
 - Mix Design
 - Research



The Real Goal

End the misperceptions that RAP mixtures are inferior to Virgin!

- **Good Control of incoming material**
- **Strong processing controls on RAP**
- **Sound Mix Designs using RAP**
- **Quality Control in production and laydown**
- **Continue to do more research and share experiences**

Illinois Future with Shingles?

Private



State



Did you Know?



“Our experience to date has shown that recycling of asphalt pavements offers a design alternative that provides the state a cost effective and energy efficient method of utilizing existing resources, while at the same time not sacrificing the quality of the resulting pavement system.”

Charles F. Potts, P.E.
State Materials and Research Engineer
Florida Department of Transportation

Thank you to David Lippert for
inviting me to speak in Minnesota
in January!

Any questions?