

PCC Aggregates in Louisiana

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Concrete Aggregates

- 60 - 75% of concrete volume
- Affect plastic concrete properties
 - Water demand
 - Workability
- Affect hardened concrete properties
 - Thermal properties
 - Durability

Concrete Aggregates

- Most common aggregates
 - Sand
 - Gravel
 - Crushed Stone
- Produce normal weight concrete
 - 140 to 150 lbs/ft³

Concrete Aggregates

- Must conform to standards
 - AASHTO
 - ASTM
 - DOTD

Aggregate Characteristics

Characteristic	Test
Abrasion Resistance	ASTM C 131 (AASHTO T 96), ASTM C 535, ASTM C 779
Freeze-Thaw Resistance	ASTM C 666 (AASHTO T 161), ASTM C 682, AASHTO T 103
Sulfate Resistance	ASTM C 88 (AASHTO T 104)
Particle Shape and Surface Texture	ASTM C 295, ASTM D 3398
Fine Agg. Degradation	ASTM C 1137
Void Content	ASTM C 1252 (AASHTO T 304)
Bulk Density	ASTM C 29 (AASHTO T 19)
Grading	ASTM C 117 (AASHTO T 11), ASTM C 136 (AASHTO T 27)

Aggregate Characteristics

Characteristic	Test
Relative Density	ASTM C 127 (AASHTO T 85)—fine aggregate ASTM C 128 (AASHTO T 84)—coarse aggregate
Absorption and Surface Moisture	ASTM C 70, ASTM C 127 (AASHTO T 85), ASTM C 128 (AASHTO T 84), ASTM C 566 (AASHTO T 255)
Strength	ASTM C 39 (AASHTO T 22), ASTM C 78 (AASHTO T 97)
Def. of Constituents	ASTM C 125, ASTM C 294
Aggregate Constituents	ASTM C 40 (AASHTO T 21), ASTM C 87 (AASHTO T 71), ASTM C 117 (AASHTO T 11), ASTM C 123 (AASHTO T 113), ASTM C 142 (AASHTO T 112), ASTM C 295
Alkali Resistance	ASTM C 227, ASTM C 289, ASTM C 295, ASTM C 342, ASTM C 586, ASTM C 1260 (AASHTO T 303), ASTM C 1293

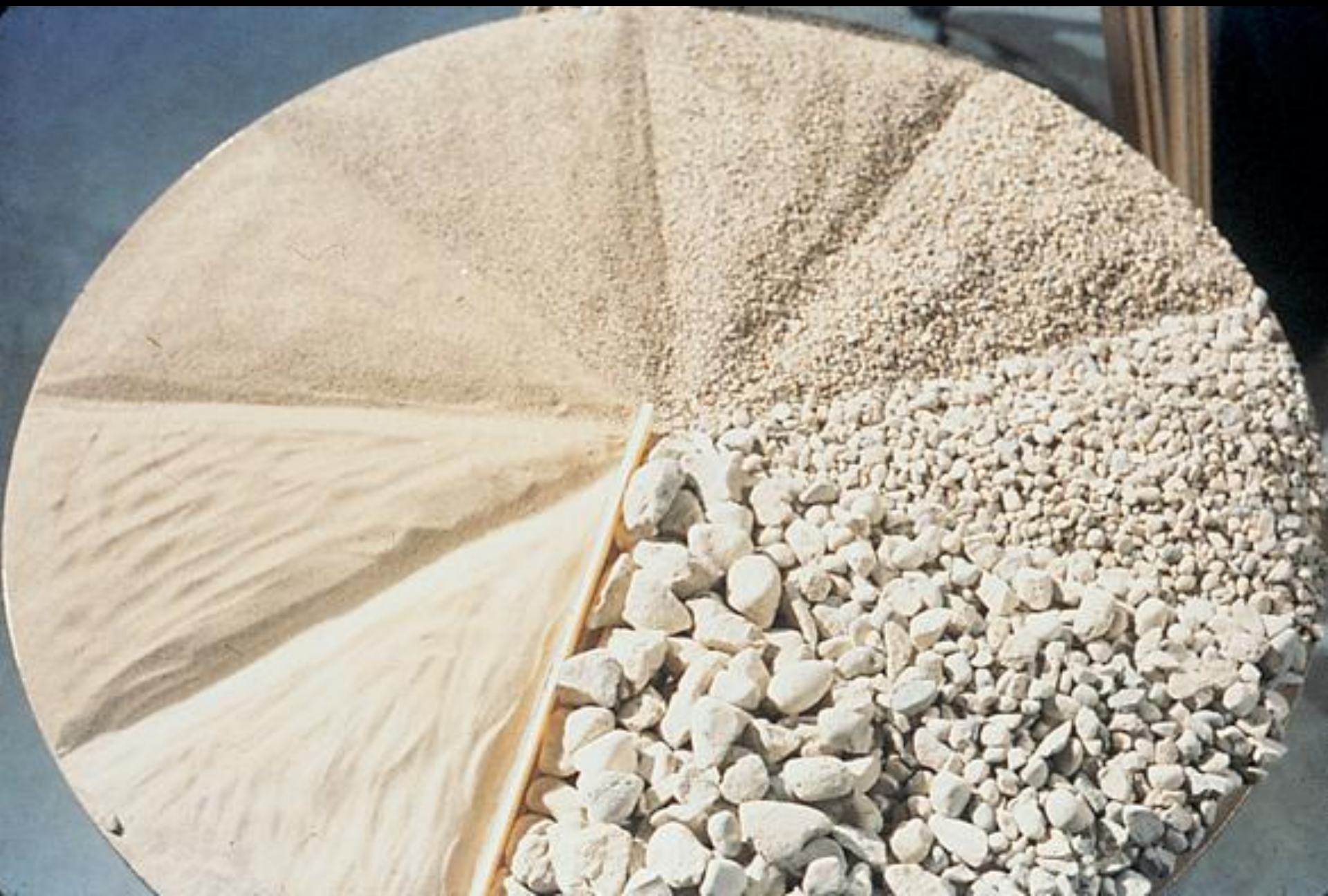
Aggregate Characteristics

2006 Standard Specifications Section 1003.01

Property	Test Method
Deleterious Materials	DOTD TR 119
Unit Weight	AASHTO T 19
Specific Gravity & Absorption of FA	AASHTO T 84
Specific Gravity & Absorption of CA	AASHTO T 85
Polish Value	AASHTO T 278 and T 279
Amount of Material Finer than No. 200 Sieve	DOTD TR 112
Sieve Analysis	DOTD TR 113
Liquid Limit and Plasticity Index	DOTD TR 428

Aggregate Gradation

- Particle size distribution
- Determined by sieve analysis
 - ASTM C117 / C136
 - AASHTO T11/T27
 - DOTD TR 113
- Requirements for PCC aggregates
 - 2006 Standard Specs Section 1003.02



Past Experiences

- Plastic concrete issues
 - Excess “fatty” mortar
 - Segregation
- Durability problems
 - Weak surface
 - Pavement surface wearing out too quick
 - Failing joint edges

















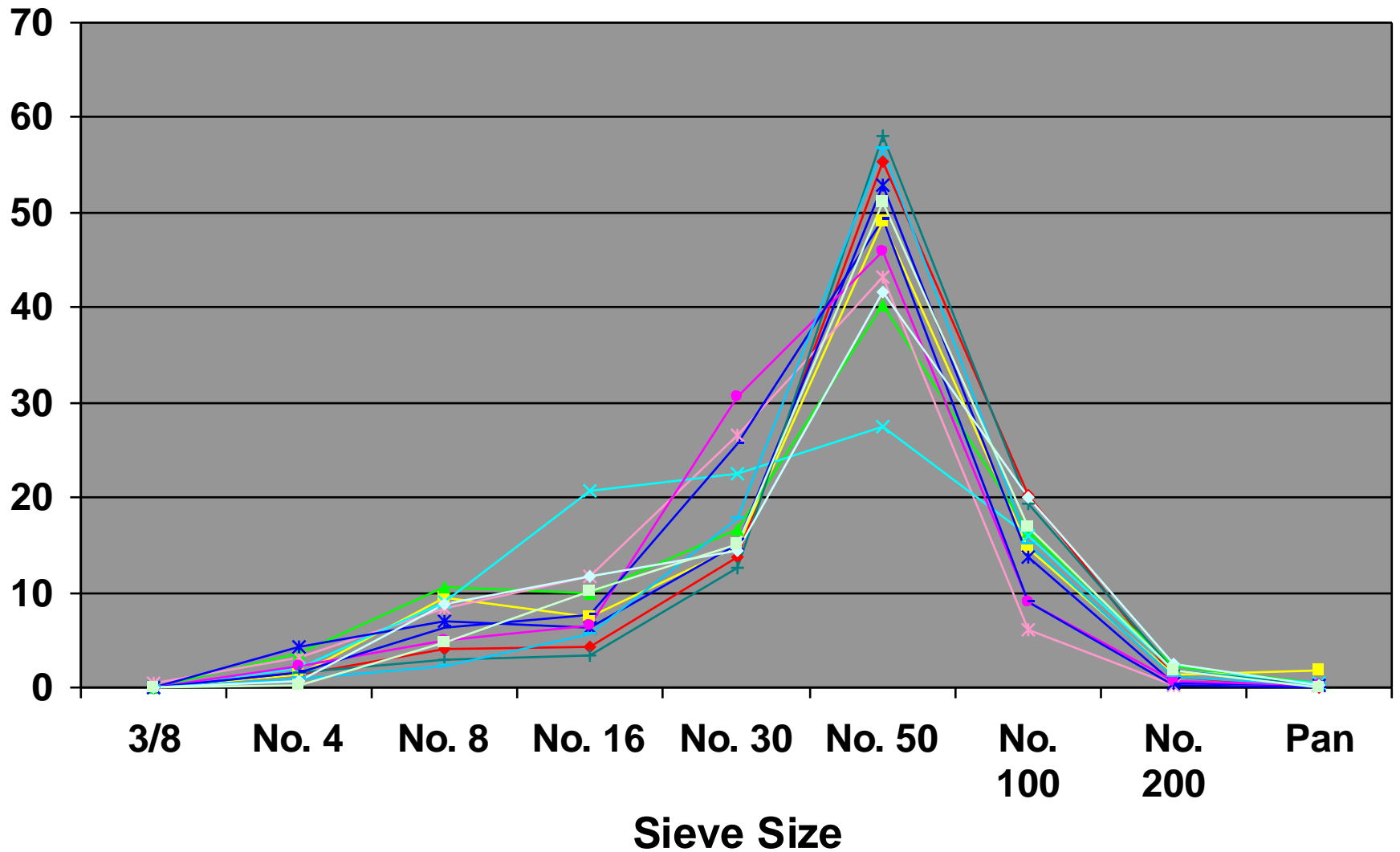




Cause of Problem

- Gap graded mixtures
 - No intermediate size aggregates
- Natural sands
 - Excessive No. 50 material
 - No intermediate sizes

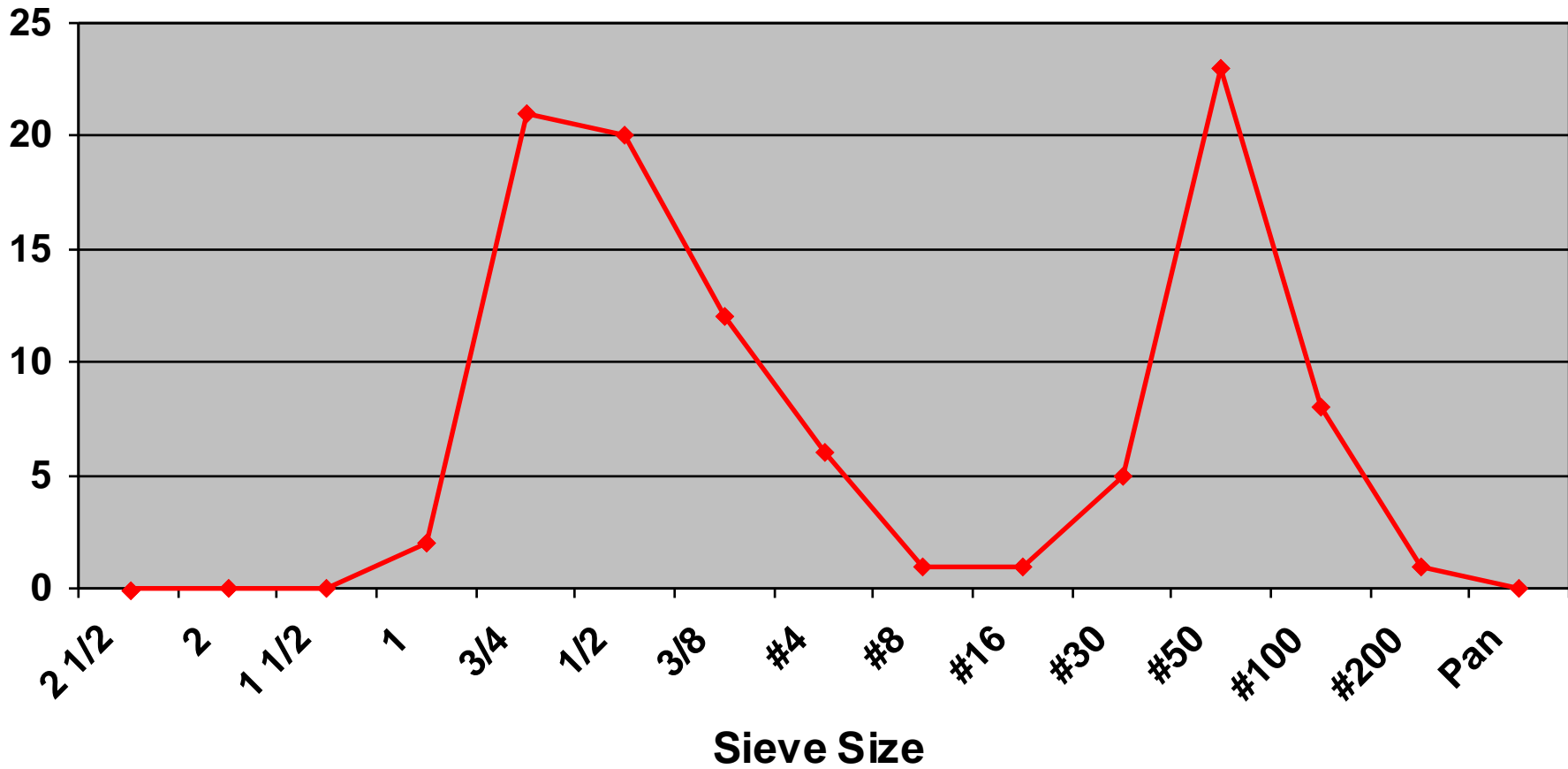
LA Sands



Typical PCCP Mix

60% #57 Limestone

40% Natural Sand



Solution

- More uniform pavement mixtures

Optimized PCCP Mix

45% #57 Limestone

15% Natural Sand

40% Int. Aggregate

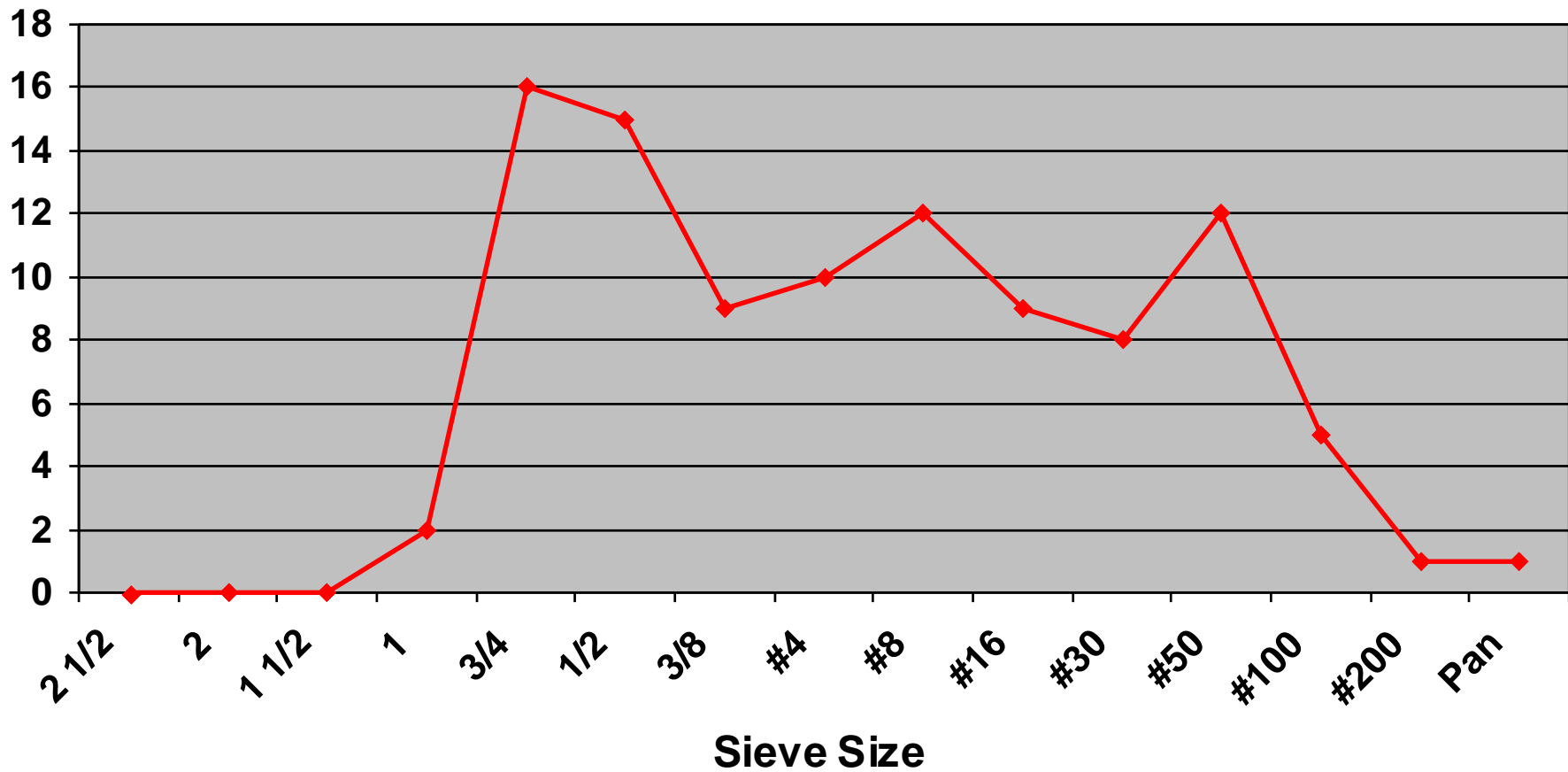


Table 1003-1A Percent Retained of Total Combined Aggregates

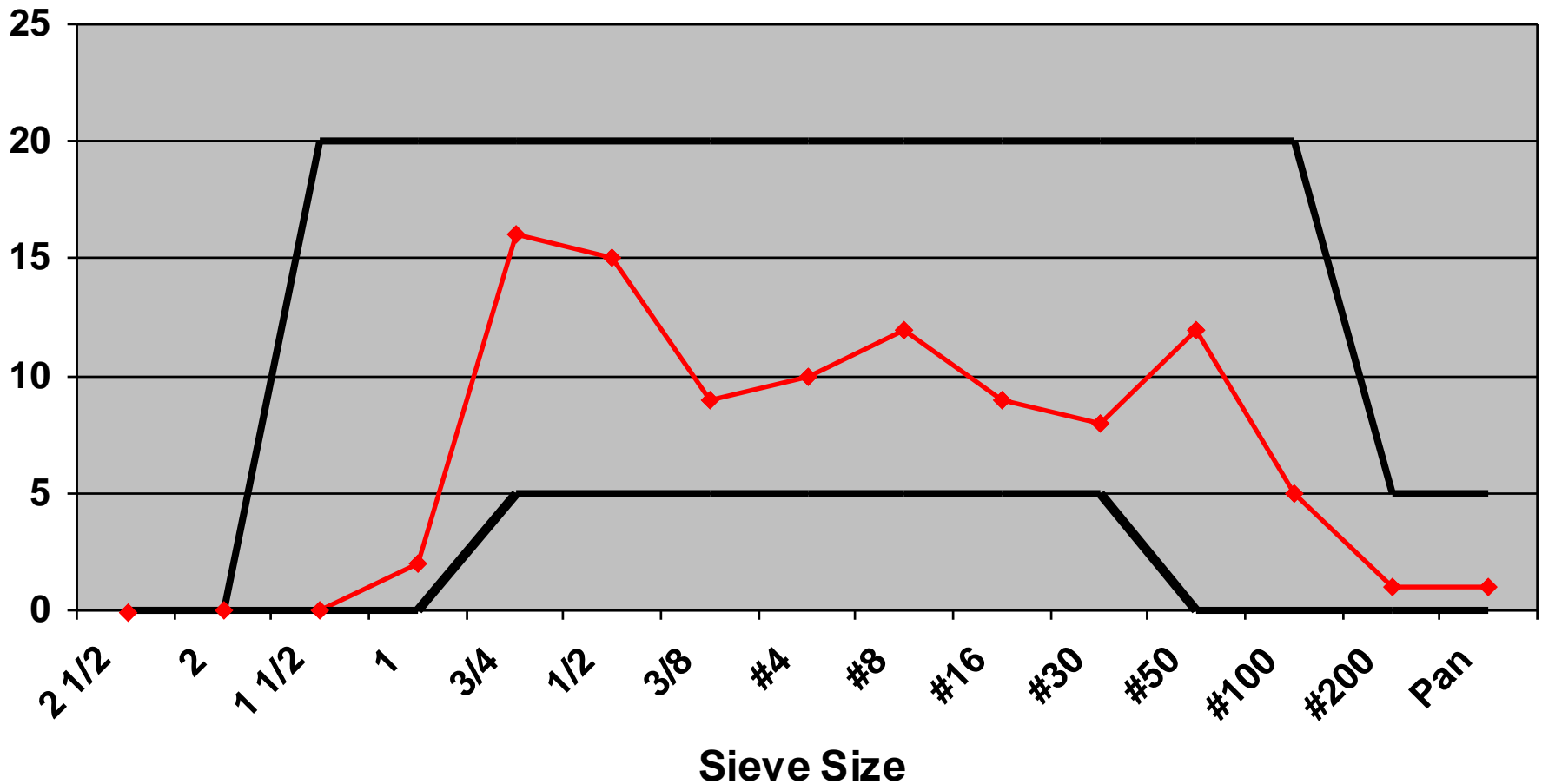
Sieve Size	Pavement Type	
	Type B	Type D
2 1/2 in.	0	0
2 in.	0	0 – 20
1 1/2 in.	0 – 20	0 – 20
1 in.	0 – 20	5 – 20
3/4 in.	5 – 20	5 – 20
1/2 in.	5 – 20	5 – 20
3/8 in.	5 – 20	5 – 20
No. 4	5 – 20	5 – 20
No. 8	5 – 20	5 – 20
No. 16	5 – 20	5 – 20
No. 30	5 – 20	5 – 20
No. 50	0 – 20	0 – 20
No. 100	0 – 20	0 – 20
No. 200	0 – 5	0 – 5

Type B PCCP Mix

45% #57 Limestone

15% Natural Sand

40% Int. Aggregate



Benefits

- Improved workability
- Improved durability
- Improved warping and curling resistance

Tools

Thank you