

Thoughts on Cracking



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MICHAEL F. PRAUL, PE
SENIOR CONCRETE ENGINEER
FHWA, OFFICE OF INFRASTRUCTURE



U.S. Department of Transportation
Federal Highway Administration
Office of Infrastructure

All images FHWA unless otherwise noted

Current Specifications



- **Slump**
 - No correlation with durability
 - Doesn't assess quality
- **Air Content**
 - Poor correlation with durability
 - Does not measure the air system
- **Strength**
 - No correlation with durability



Courtesy Dr. Peter Taylor



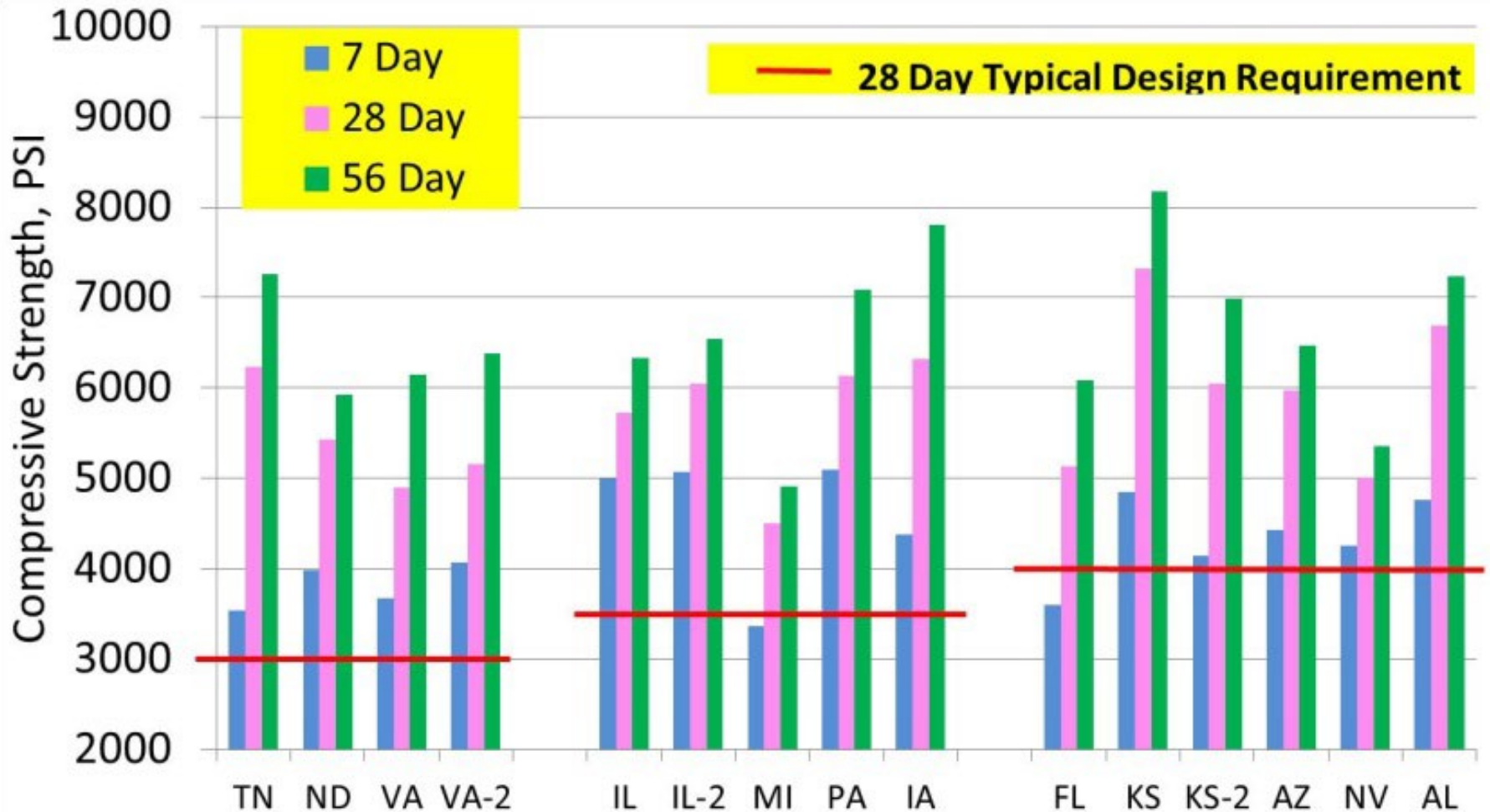
Concrete Acceptance



We are getting what we are willing to accept.

- We're getting strong concrete.
- We're not getting durable concrete.

Strength!



Suggested Ways to Optimize Cement Content



- Move to performance-type specification language; eliminate mandatory cement content requirements
- Optimize aggregate gradation
- Use supplementary cementitious materials
- Use maturity to determine opening times
- Promote quality control in the plant to provide more consistent production



Optimized Gradation Tool

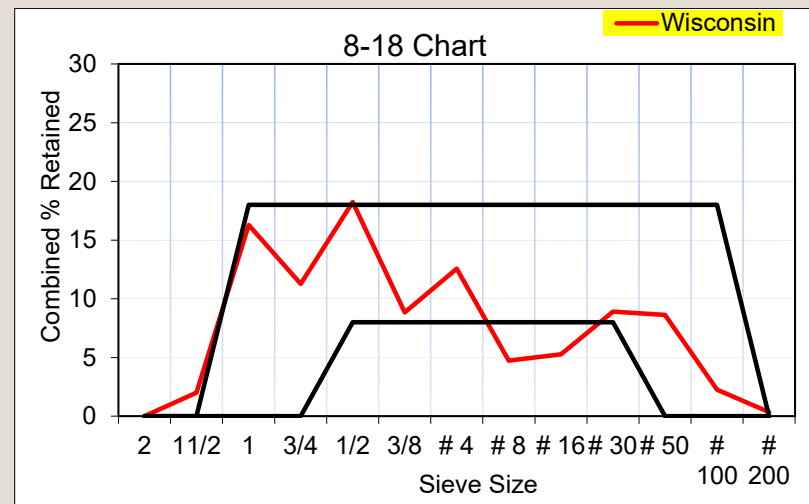
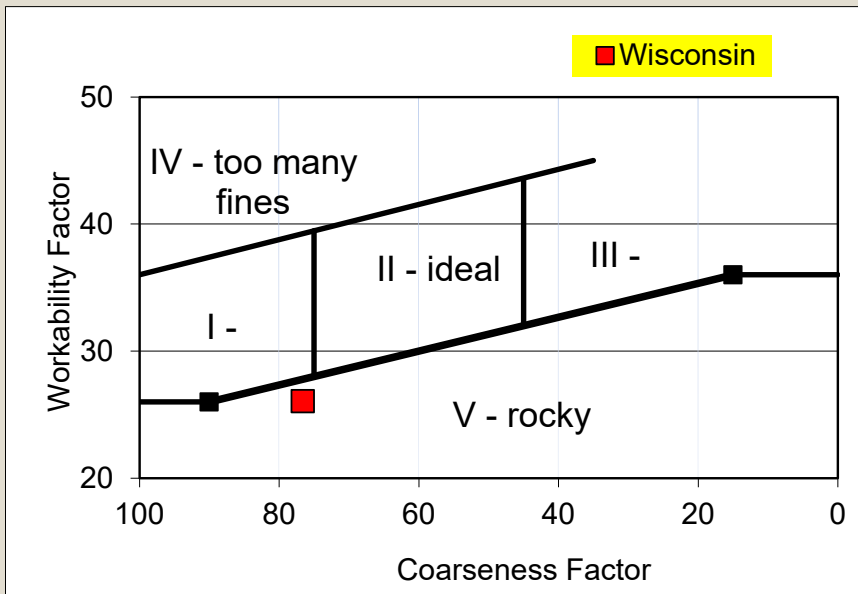
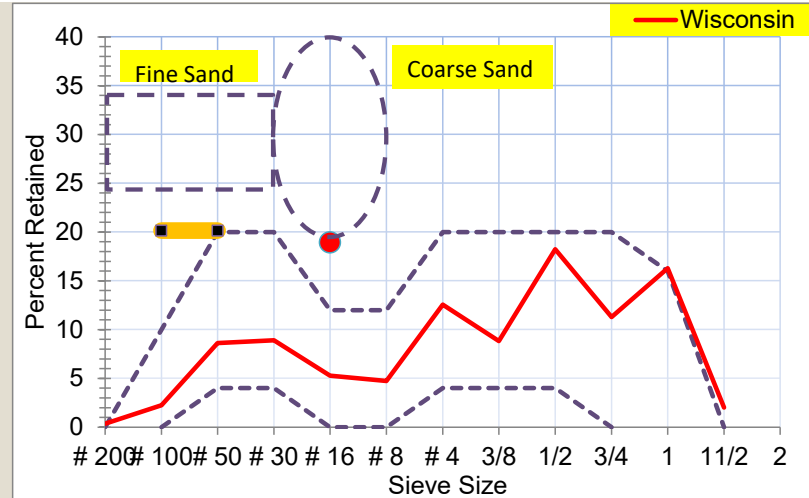
- Spreadsheets available for structural or paving applications.



Wisconsin					
Sieve Size, in	Fine 1 Agg	Fine 2 Agg	Inter Agg	Coarse Agg	Combined % Passing
2"	100		100	100	100
1.5"	100		100	93	99
1"	100		100	39	91
3/4"	100		98	5	85
1/2"	100		55	1	67
3/8"	100		33	1	58
No. 4	98		3	0	45
No.8	85		1	0	39
No.16	68		1	0	31
No.30	38		1	0	18
No.50	9		1	0	5
No.100	2		1	0	1
No.200	1		1	0	1
Weights					
%'s	45%		40%	15%	100%

Too Coarse

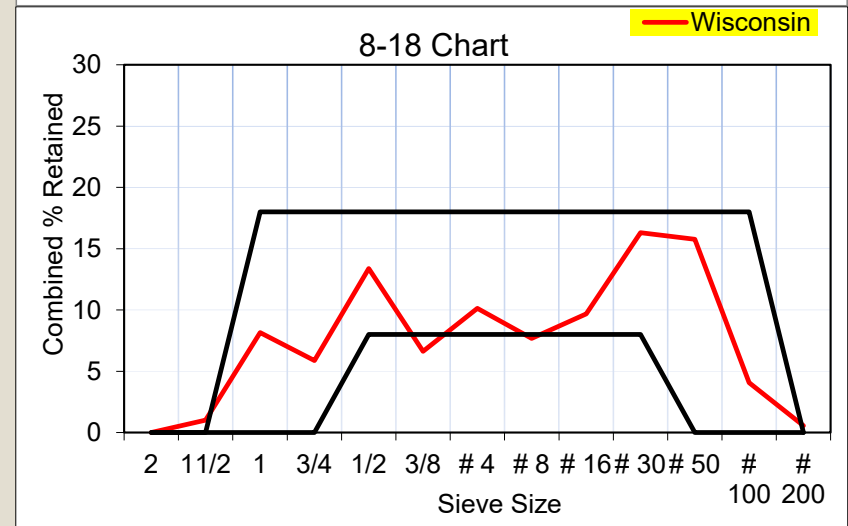
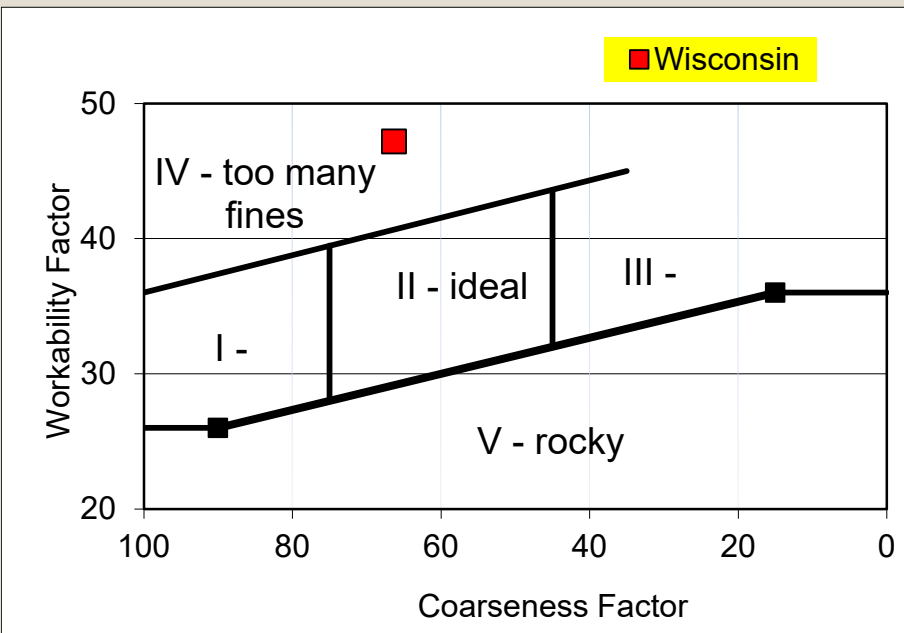
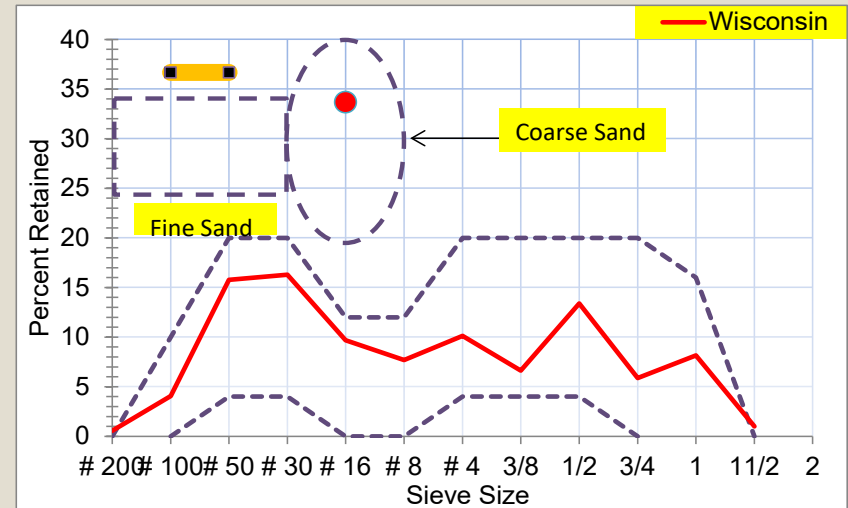
Wisconsin				
Sieve Size, in	Fine 1 Agg	Fine 2 Agg	Inter Agg	Coarse Agg
%'s	30%		40%	30%



Too Fine



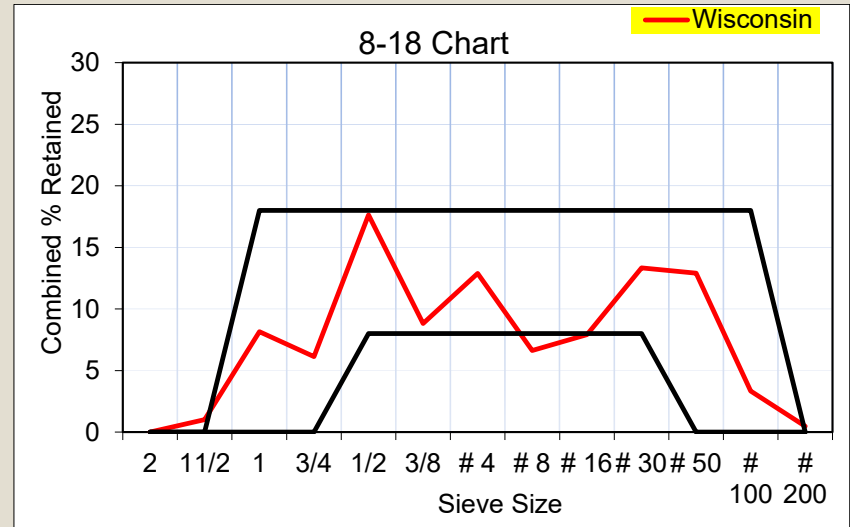
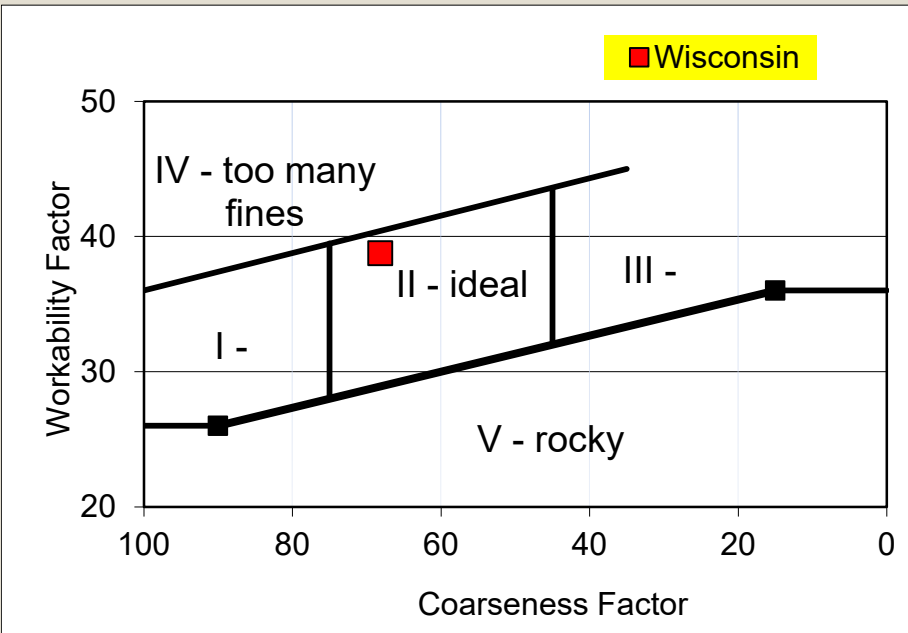
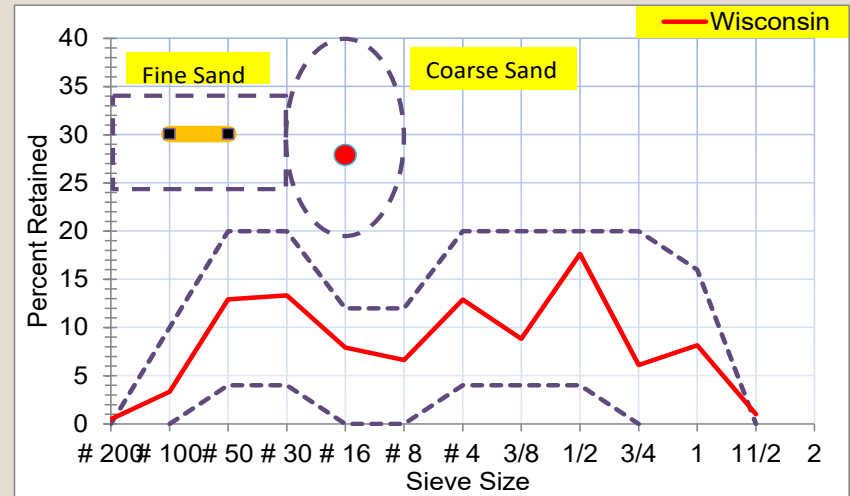
Wisconsin				
Sieve Size, in	Fine 1 Agg	Fine 2 Agg	Inter Agg	Coarse Agg
%'s	55%		30%	15%



Optimized?



Wisconsin				
Sieve Size, in %'s	Fine 1 Agg	Fine 2 Agg	Inter Agg	Coarse Agg
	45%		40%	15%



Are We Prioritizing Crack Reduction?



➤ Design

- Bridge deck rebar mat

➤ Materials

- Slump but not shrinkage testing/paste content
- 28-day strength testing

➤ Construction

- 28-day testing
- Curing placement and maintenance

Food For Thought



Image: Pixabay

Questions?



Image Pixabay

Contact info:

Michael.Praul@dot.gov

207-512-4917

