North Central Region Mix and Aggregate Round Robin

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NCAUPG Conference

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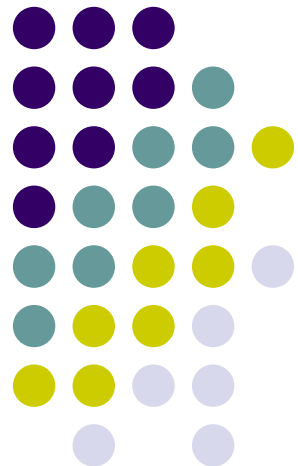
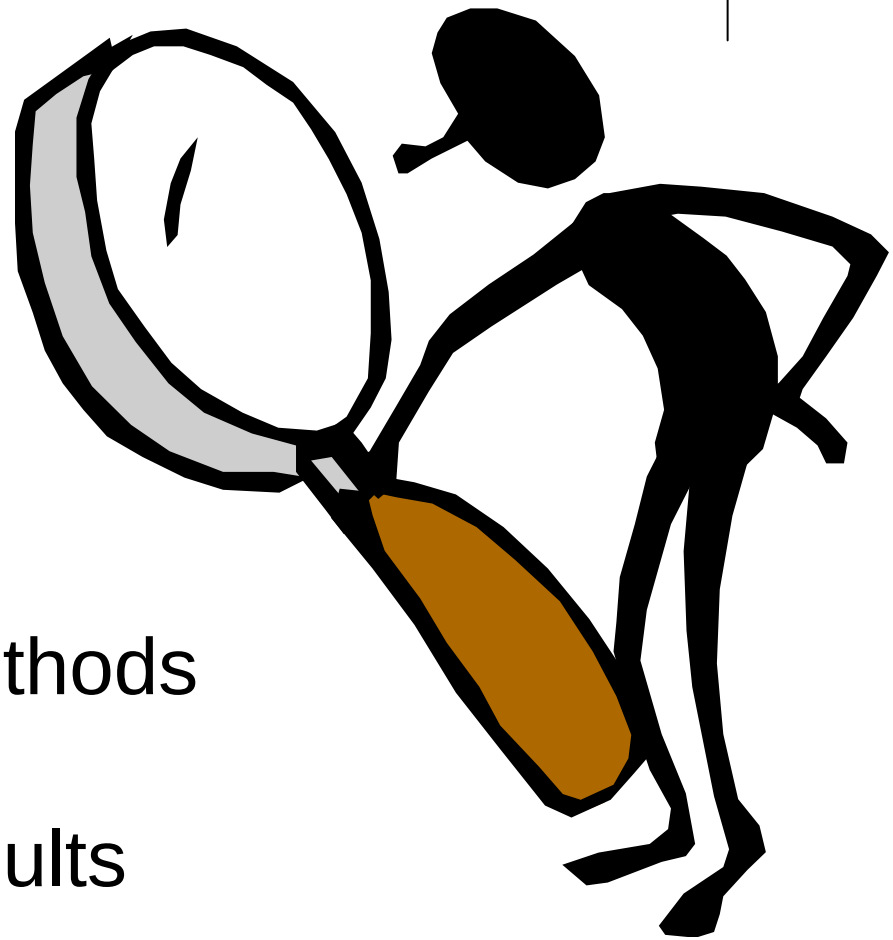


A Modest Proposal

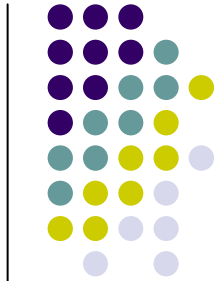
- Omaha, January 2004
- Erv Dukatz proposed a regional round robin
- Goals
  - Encourage more participation
  - Return to reason for the user/producer groups
  - Solve HMA problems common to all
  - Move talk about test standardization to action
  - ***Determine which test procedures cause significant HMA volumetric differences***.

Compare

- Test results
- NOT Specifications
- Which procedural differences in test methods cause significant differences in test results



What's the Point?



- If we know which procedural differences cause real differences in the results, we'll know:
  - Which tests would be easier to standardize regionally because they don't require changing our analyses or specifications
  - Which tests might warrant more study – are there better ways to test?

How to Do It

- Aggregates and binder from selected mixes sampled and sent to all other states along with
  - Gradations and blend percentages
  - Binder grade and design binder content
  - Number of gyrations (Nini, Ndes, Nmax)
- Each state conducts their procedures for mix design verification
- 4 quarts of binder and 10-25 kg of each agg!

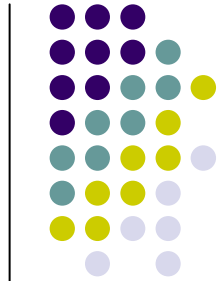
Aggregate Test Results

- Individual Gsb's, if available
- Combined Gsb (measured or calculated)
- Fine Aggregate Angularity, FAA
- Coarse Aggregate Angularity or Percent Crushed
- Gradation of the design blend

HMA Test Results

- Gse
- Gmb at N_{design} (measured or backcalculated)
- Gmm
- Va
- VMA
- VFA
- Density at N_{design}
- Compacted sample height and weight

Other Information



- Brand and model of gyratory
- Method of angle calibration
- Compaction procedure used
- Short term aging procedure
- Mixing and compaction temperatures
- Test methods or equations used
- Gradations washed or not

Obviously

- ***This is a lot of work!***
- Participating Labs
  - Indiana
  - Iowa
  - Kansas
  - Nebraska
  - Wisconsin
  - NCSC Lab

Mixtures Tested

- Nine mixes from five states
- Three 9.5mm, three 12.5mm, three 19mm
- Binder grades: PG58-28 (2), 64-22 (2), 64-28, 70-28 (2), 76-22, 76-28
- Ndesign: 50, 75, 96, 100, 109, 125
- For traffic levels from under 300,000 to 40 million ESAL’s

Timeline

- Proposal reviewed, finalized and distributed at end of June 2004.
- Mixes distributed in about September-October
- Results received from December 14, 2004, to January 11, 2005

Very Preliminary Findings

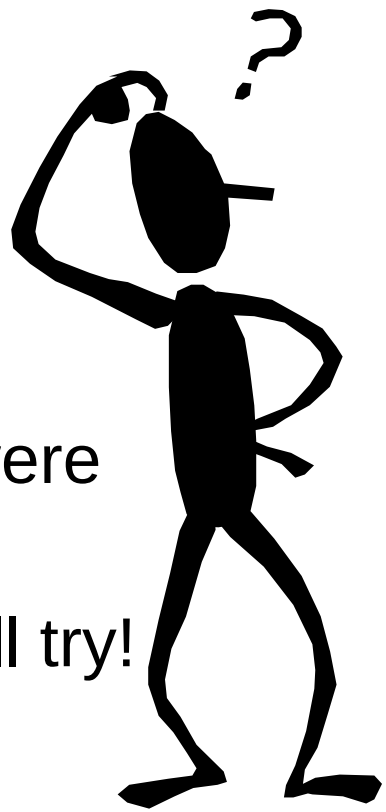
- Mix is a significant variable in every case
- The labs found significantly different mixture bulk specific gravities for the same mixes
- Air voids varied significantly between labs (follows from Gmb)
- VMA and VFA will also vary (not tested yet)
- Implies something was different in the compaction process or how bulks were determined

Very Preliminary Findings

- Maximum specific gravity does not vary significantly between labs
- Fine aggregate angularity does not vary significantly between labs
- Aggregate bulk specific gravity does not vary significantly between labs
- These might be areas where we can adopt one simple test procedure for the parameter

What's Next?

- Continue data analysis and statistics
- Dig into why compaction apparently differed
  - Differences in gyratories?
  - Differences in internal angles?
  - Different compaction temperatures?
  - Different short term aging?
  - Or is it a difference in how the bulks were measured?
  - May not be able to determine, but we'll try!

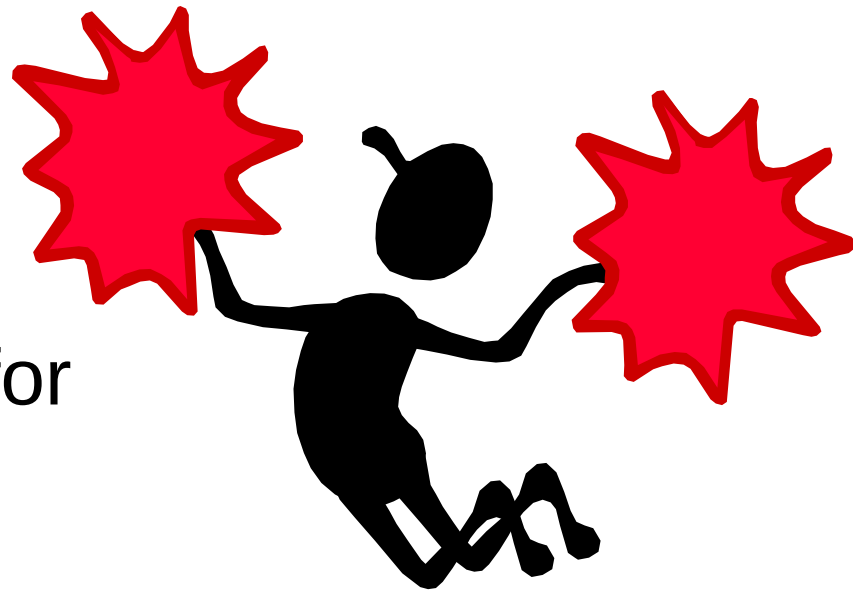


What's Next?

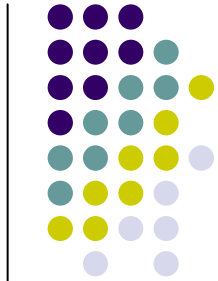
- Prepare report summarizing all results
- Distribute to participants for review
- After review/revision, provide to NCAUPG Management Committee and NCSC Steering Committee for further action
  - Pursue standardization as appropriate
  - Research differences in test results
  - Do more extensive round robins on individual tests

Thanks!

- Many, many thanks to the participating labs and technicians for all their hard work
- Thanks to Erv Dukatz for issuing the challenge
- Thanks to the NCAUPG for supporting the idea



Training in 2005



- Binder course, March 2-3
- Mix Design for Experienced Designers, March 30-31
- Nebraska Binder and Mix Design Training, February 22-25
- Customized courses available on request