Evaluation of RapidAir457 Air Void Analyzer

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Implementation of RapidAir 457
Problem Statement

- Poor air void system has been noted on several pavements exhibiting early deterioration.
- Providing a well entrained air void system is essential to producing concrete with freeze thaw durability.
- ASTM C 457 method of linear traverse is time consuming and susceptible to human error.
- The RapidAir457 air void analyzer would provide quicker results of hardened concrete air void systems.
Laboratory specimens were cast with concrete proportioned with 4, 6, 8, and 10 percent air content.

Results were compared to an image technique performed at Iowa State University.

Also, investigated repeatability between samples and operators.
Research Results

- Good correlation between methods with R square greater than 0.90 for air content and spacing factors
- Repeatability of multiple runs on same specimen.
  - Air content std. dev. = 0.03
  - Spacing factor std. dev. = 0.001
- Variability between operators
  - Air content Std. dev. = 0.18–0.40
  - Spacing factor std. dev. = 0.003–0.013
Research Recommendations

- RapidAir 457 air void analyzer is an excellent tool used to obtain hardened air void parameters in concrete.
- Results are accurate, repeatable, and far less time consuming than linear traverse and the image analysis techniques.
- From sawing to air void enhancement, the total time for sample preparation was approximately 45 minutes with actual test time of less than 15 minutes.
- The system is user friendly and was able to be used by qualified laboratory technicians with minimal training.
Implementation

- Annual review of hardened air void analysis of project cores to benchmark in place air content trends
- Verification of air content from field project cores when improper testing was performed
- Validation of aggregate correction factor from field cylinders using plastic air content results
- Determine areas of non-complying air content from project cores
- Other concrete research and forensic investigations.
Value of Implementation

- Linear traverse at private lab ~$700 per sample
- Image analysis at local university ~$300 per sample
- RapidAir 457 cost per sample at Iowa DOT lab ~$100 per sample
- Samples can be tested within a day at Iowa DOT lab. Samples sent to other labs can take a week to a month to get results.