How does it work?

- Measures time rate of air loss from a mortar sample mixed into a liquid
- Uses Stoke's Law to calculate rate of bubble rise through the liquid

What it reports

- **Entrained air content** by volume of concrete and by void size.
- **Spacing factor** - average maximum distance in the cement paste from the periphery of a void.
- **Specific surface** - ratio of the surface area of a void to its volume. Specific surface is an indirect measure of the size of the air voids. Smaller voids have higher specific surface.

The AVA Advantage

- Immediate results for immediate Improvements
- Evaluate effects of concrete materials and placement procedures
- More control of air-void characteristics in fresh concrete
- Testing almost anywhere – AVA is completely contained in a carrying case
- Rapid QC/QA testing, useful for concrete placed in extreme climates
- Control of mix design for durability and prequalification

A Kansas Case History

Kansas pavements less than 10 years old were cracked and deteriorating at joints, even though the aggregate was sound and the total air contents (5.5 % on average) met the specifications. Examination of core samples showed poor spacing factors in paste. Spacing factor assurance on projects under construction was the distress prevention strategy of choice, but petrographic analyses were not fast enough. In 2001 and 2002, an Air Void Analyzer (AVA) was used for monitoring concrete paving projects. When contractors were given immediate results, they were able to make immediate improvements in the concrete air systems of on-going projects. In order to estimate future cost savings, the improvement in durability was estimated from the improved spacing factors. Future cost savings, estimated from the reduced repair costs of the more durable pavements, were $1,136,000 for 2001-2002 projects.

Distressed concrete on I-70 in Kansas City, Kansas

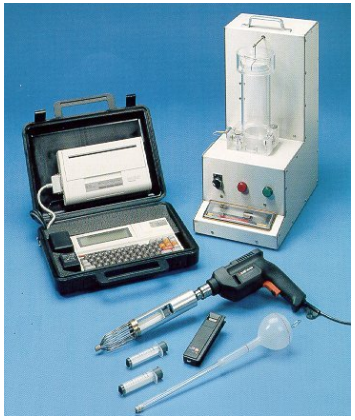
INTRODUCING THE AIR VOID ANALYZER (AVA)

A FOCUS TECHNOLOGY of the AASHTO Technology Implementation Group

Lead States and Lead Companies
CA, IA, KS, MO, NC, NY, VA, WI
Master Builders, WR Grace,
Germann Instruments
Construction Technology Laboratories, Inc
FHWA Mobile Concrete Trailer

What is the Air Void Analyzer?

It's an apparatus for rapid measurement of the air-void characteristics of fresh concrete. It is useful for verifying and controlling the air-void system before and during production.



Why is this important?

The size and distribution of the air voids, NOT the total air content, determine the durability of the concrete. Concrete with an adequate air-void system has better freeze-thaw durability, sulfate resistance and scaling resistance.

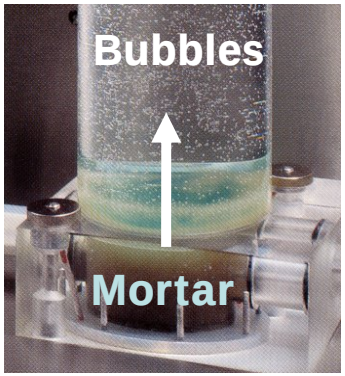
What do those other tests do?

The existing tests used on fresh concrete (roll-o-meter, pressure meter) measure total air content, not the size of the voids and their distribution. Before the development of the Air Void Analyzer this information could only be determined from samples of hardened concrete in the lab.

Using the AVA

AVA specimens are collected by vibrating a wire cage into fresh concrete using a percussion drill. The mortar fills the cage and a syringe captures a mortar sample.

The mortar sample is placed in the viscous liquid at the bottom of the riser cylinder. The sample is stirred and the air bubbles contained in the mortar are released.



Air bubbles rise through a water column, larger bubbles rising faster than smaller ones, and collect under a dish. The buoyancy of the dish changes and is recorded as a weight change. A computer algorithm uses the weight change with time to calculate the air-void characteristics.

From the States

"The ability to obtain timely answers to questions regarding adequate in-place air, which would then allow immediate mix or production changes, provides an ideal opportunity for Missouri to place a more appropriate focus on quality instead of quantity of air during construction."

Patty Lemongelli, Missouri DOT

"NCDOT purchased the Air Void Analyzer for two reasons: concise data, and innovative technology. The field of concrete technology and design continues to change daily. NCDOT is seizing the opportunity to improve efficiency and reliability by adopting its newest product: the AVA."

Sam Frederick, North Carolina DOT

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