Embankment Load Tests on a Coal Ash Basin

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Outline

- Site/Facility Overview
- Project Background
- Field Test Introduction
- Instrumentation Program
  - Inclinometers
  - Observation System
  - Surveying
  - Settlement Arrays
  - Piezometers
- Findings
E.W. Brown Generating Station
Ash Treatment Basin

- Basin created
- Basin raised
- Basin raised
- Basin full

- 1960
- 1970
- 1980
- 1990
- 2000
2005 Field Test

- Characterize ash as foundation material
- Unscheduled interruption of operations
- Dewatered ash basin
- 1 month to prepare, 1 month to conduct test
- Aggressive plan to obtain maximum data
- Instruments abandoned in place
- Cold, wind, dust
In-situ Testing

- Vane shear
- Cone penetrometer
- T-bar penetrometer
- Downhole seismic
- Nuclear density probe
- Neutron probe
Instrumentation Program

West Fill
20 ft

East Fill
23 ft

Inclinometer

Piezometers

Vibrocompacted

Bottom of Ash Deposits

Settlement Points
Installed Instruments
Inclinometers

Lateral Displacement (ft)

Elevation (ft)

West Fill

East Fill

-0.1 0.0 0.1 0.2 0.3

840

850

860

870

880

890
Observation System

- **Purpose**
  - Record of construction progress
  - Capture events engineers miss

- **Construction**
  - Color security camera
  - Time-Lapse VCR

- **Lessons Learned**
  - Automatic digital stills better
  - Vantage point difficult
  - No scale reference
Surveying

- Differential GPS
- Uses
  - Construction Layout
  - Locating Instruments
  - Monitoring Fill Height

Surface Profile - West Test Fill

Surface Profile - East Test Fill

- Slope = 1.4:1
- φ_{repose} = 35.8°
Settlement Arrays

- Installation: Magnetic Extensometers
- Challenges
  - Keep Strings Untangled, Organized
  - String Strength
  - Backfill Bridging
Vibrating Wire Piezometers

- **Purpose:** pore pressure

- **Installation**
  - Direct Burial
  - Unvented Transducers

- **Lessons Learned**
  - Measure Elevation
  - Backfill, Joint Seals
  - Influence of Weather
Findings

- Vibrocompaction reduced settlements ~50%
- Excess pore pressures dissipate within a few days
- Settlements take place over same time
- Staged construction rates
- Vibrocompaction not needed
- Construction Cost Savings
  - Less conservative
  - Better construction bids
  - ~ 50 times field test cost