Air Diffusion Tests under Downward Hydraulic Gradient

NSF Project: Liquefaction Mitigation Using Entrapped Air
(Award #:CMS-0509894)
Test Setup

- Drainage Beaker
- Reinforced Concrete Column
- Partially Saturated Ottawa Sand
- Plexiglass Tube
- Inflow Water
- Excess Water Out
- Constant Heads
- Water
- 2" NPT
- 7.62 cm (3") Plexiglass Tube
- Outflow Water
- 120 cm
- Constant Heads
- Water
Typical Test Results

Variation of Degree of Saturation for Air Entrapped Ottawa Sand Specimen under Vertical Downward Hydraulic Gradient

\[ \text{Gradient, } i \]

Degree of Saturation, S (%)

\[ \epsilon_{\text{initial}} = 0.71 \]
\[ \epsilon_{\text{final}} = 0.71 \]
\[ S_{\text{initial}} = 84.8\% \]
\[ S_{\text{final}} = 84.8\% \]
Typical Test Results

Flow Rates under $i=0.2$ for Air Entrapped and Fully Saturated Specimens

- **Fully Saturated Sand**
  Specimen $S=100\%$, $e=0.72$

- **Partially Saturated Sand**
  Specimen, $S=84.8\%$, $e=0.71$
Typical Test Results

Coefficient of Permeability for Air Entrapped and Fully Saturated Specimens

- Fully Saturated Sand Specimen (S=100%, e=0.72)
  \[ k = 0.09 \text{ cm/sec} \]

- Partially Saturated Sand Specimen (S=84.8%, e=0.71)
  \[ k = 0.05 \text{ cm/sec} \]

- Q/A = 0.0933*i
- Q/A = 0.0518*i