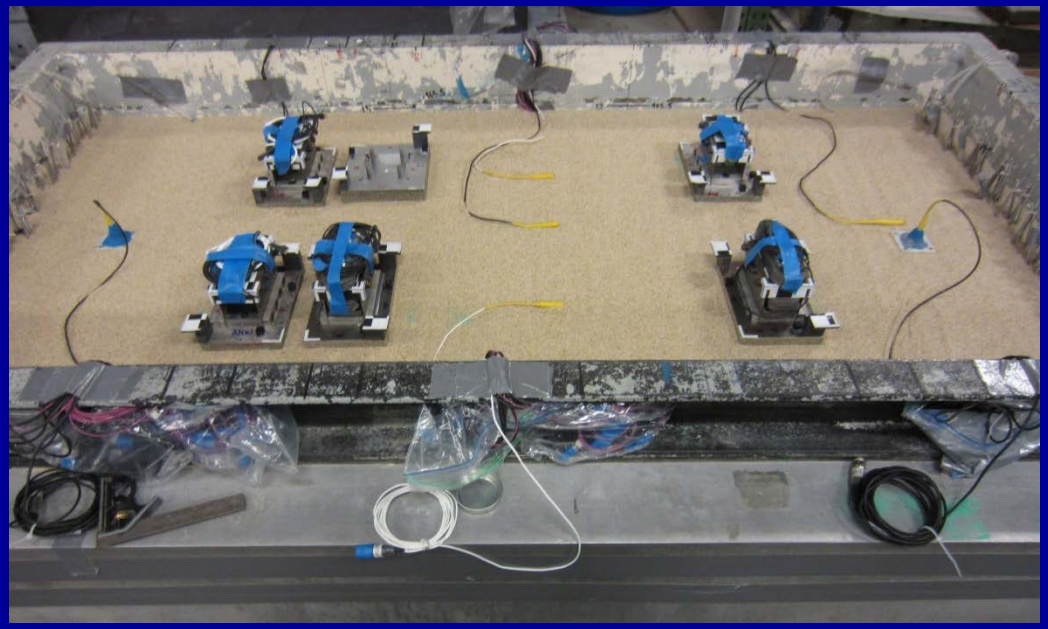
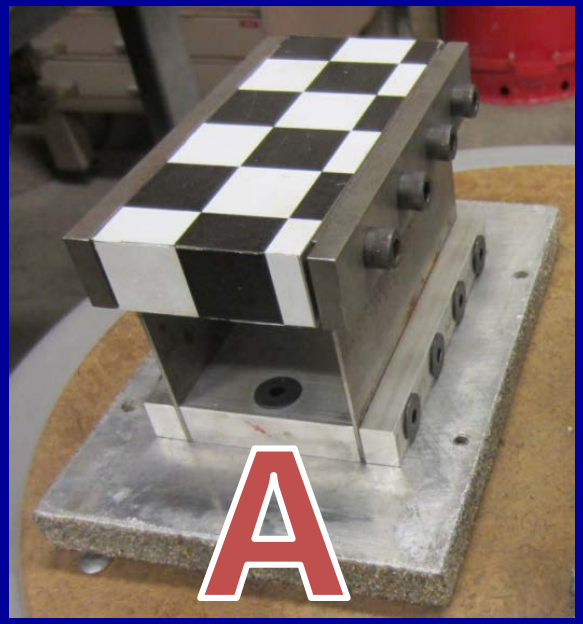
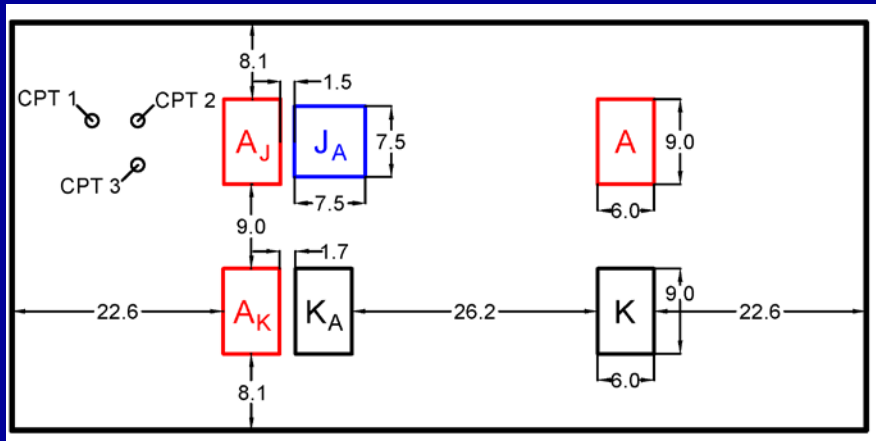
CENTRIFUGE TEST OF ADJACENT MAT-SUPPORTED BUILDINGS AFFECTED BY LIQUEFACTION

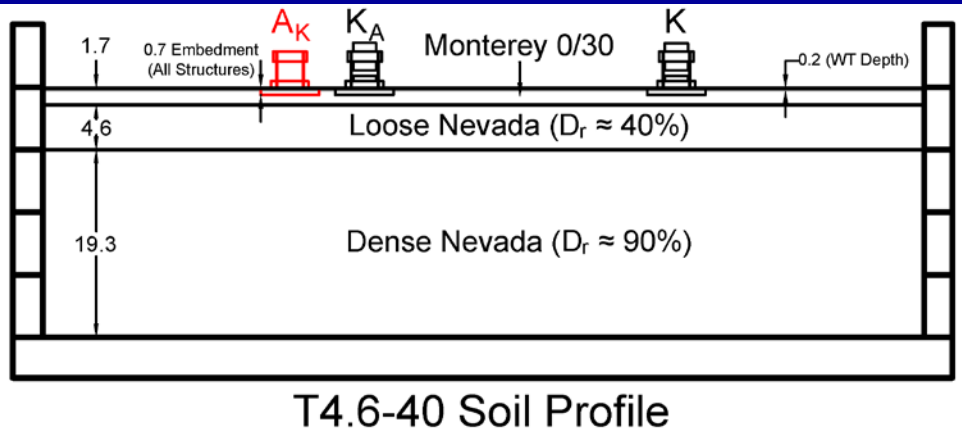
Connor Hayden, Jacquelyn Allmond, Isabelle Rawlings, Bruce Kutter, Jonathan Bray, Tara Hutchinson, Gregg Fiegel, Joshua Zupan, Andrew Whittaker



Model Structures and Layout





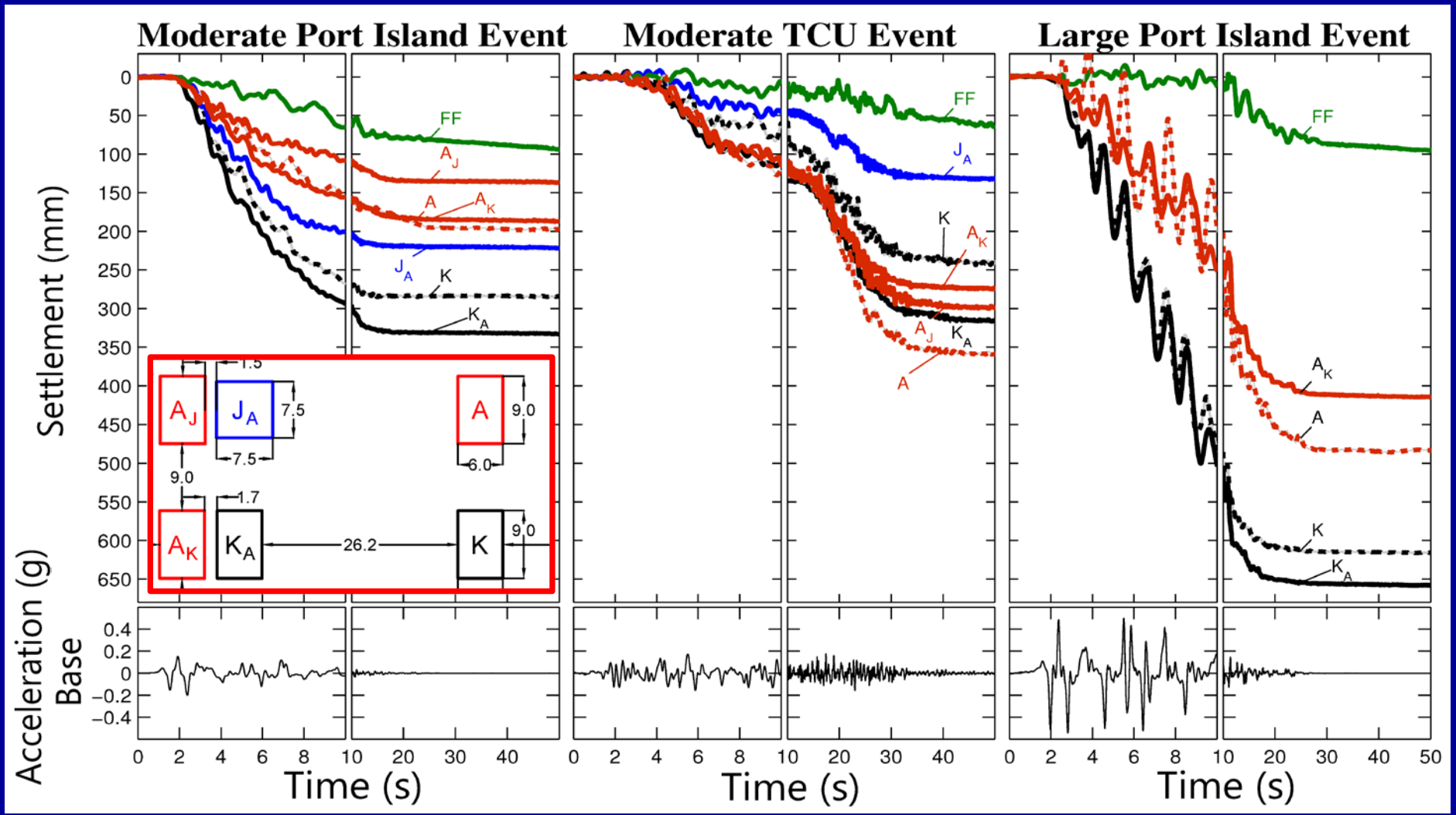


T4.6-40 Soil Profile

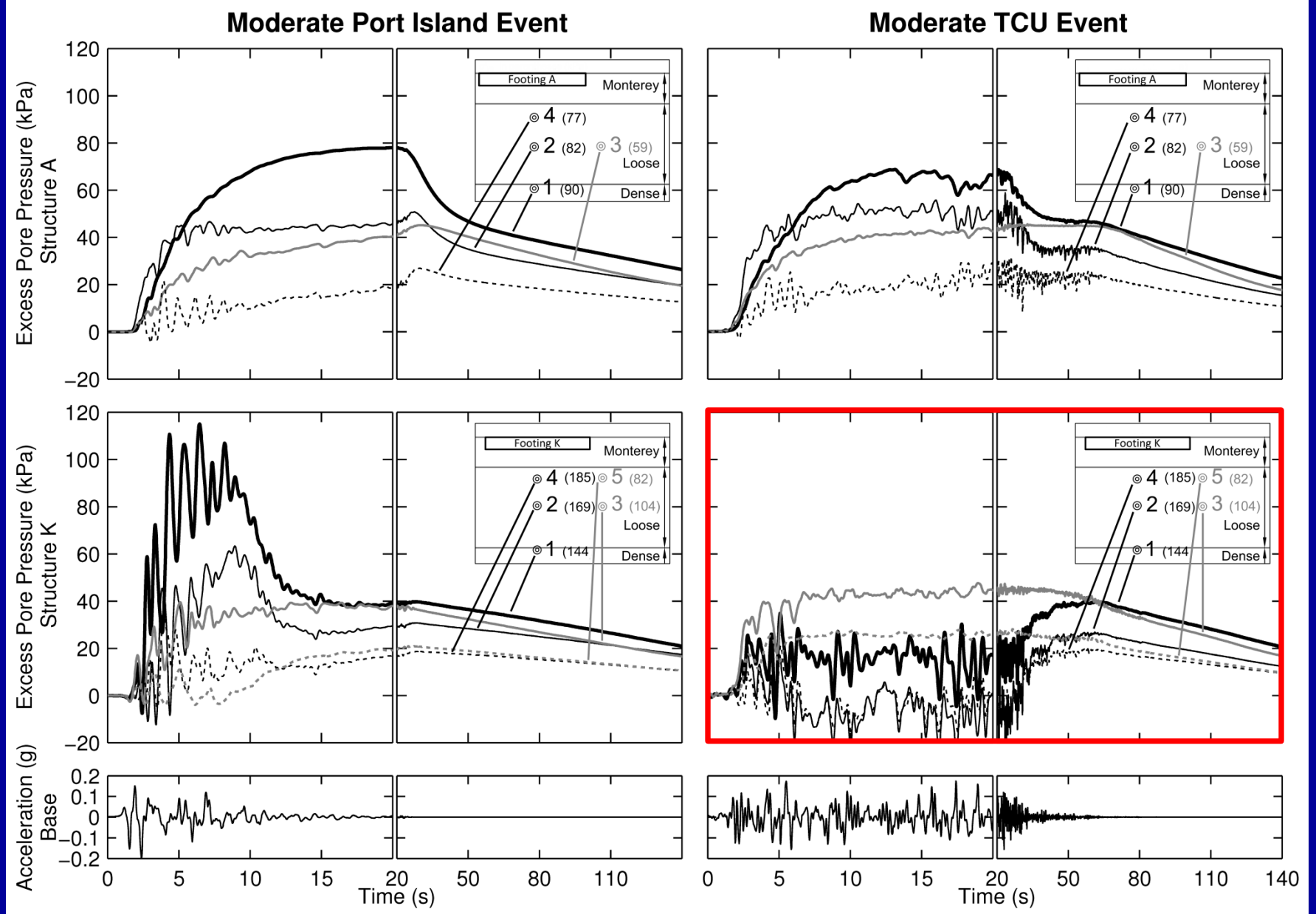
Three Primary Shaking Events:

Moderate Port Island (PRI), TCU, and Large PRI

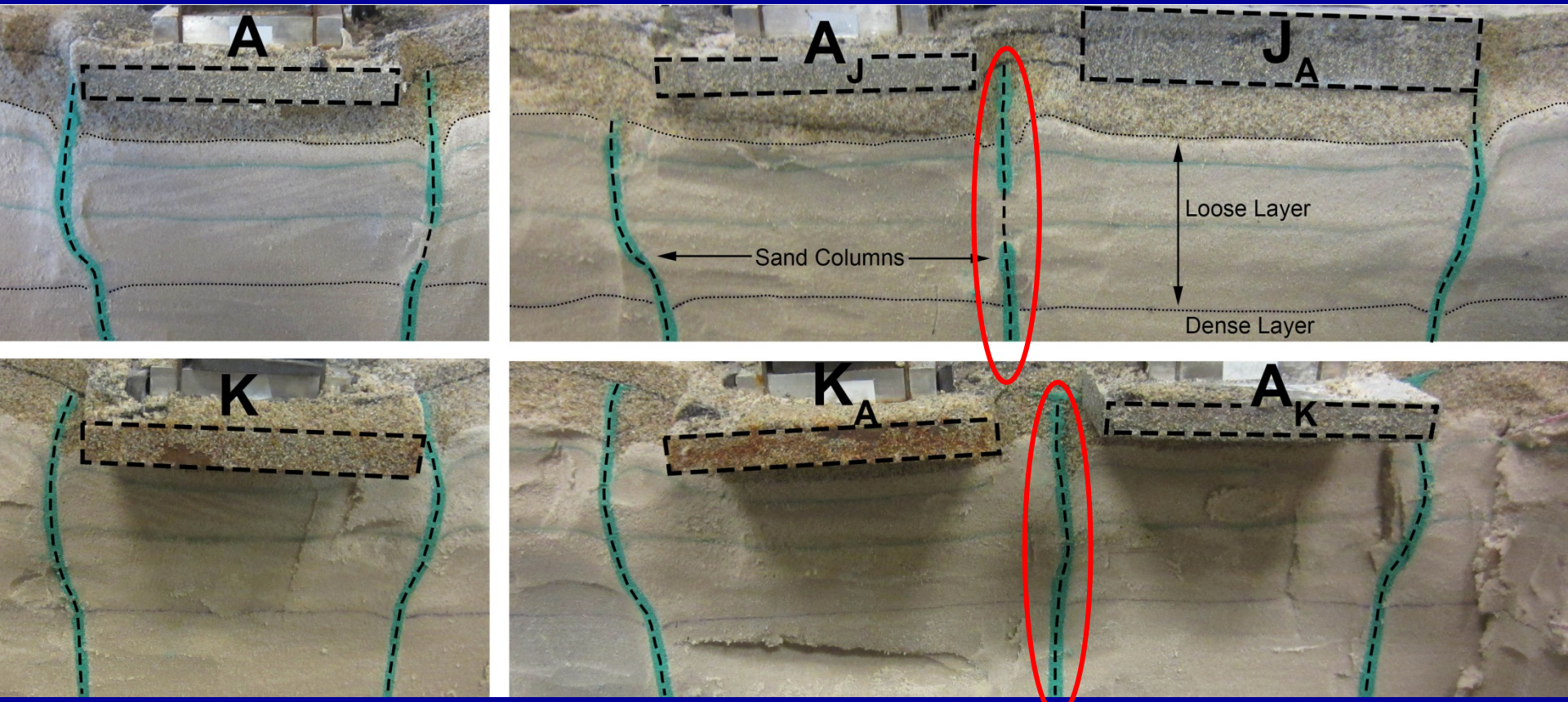
Settlement


Moderate Port Island Event
Moderate TCU Event
Large Port Island Event
Settlement (mm)
Acceleration (g)
Base
Time (s)
FF
A_J
A
A_K
J_A
K
K_A
1.5
7.5
9.0
6.0
1.7
26.2

Excess Pore Pressure



Excavation Photos



Nearly vertical columns indicate limited lateral soil movement

- Adjacent structure limits lateral movement

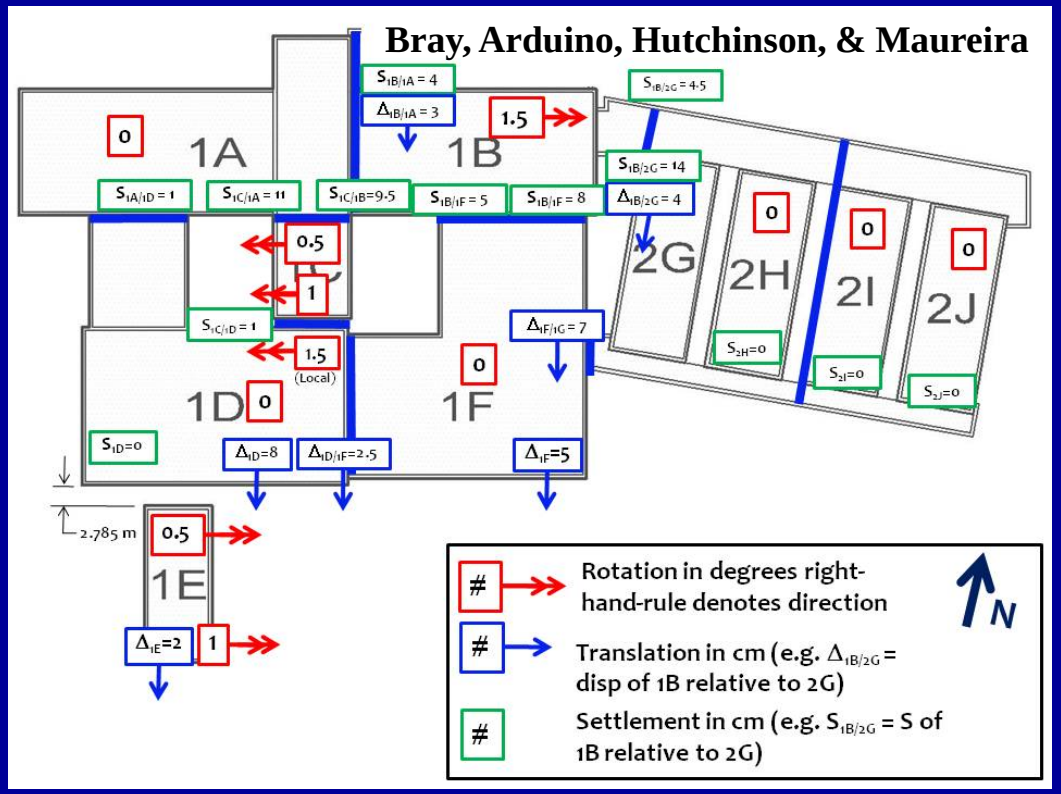
LIQUEFACTION-INDUCED SSI DAMAGE DUE TO THE 2010 CHILE EARTHQUAKE

Connor Hayden, Nicholas Trombetta, Carla Serrano
Jonathan Bray, Tara Hutchinson, and Christian Ledezma

Hospital Provincial, Curanilahue

- 10 isolated wings: 1 – 6 stories
- Varying liquefaction damage

LL=42, PL=29,Fines=48%



Numerical Modeling

At Fugro, have performed numerical analyses for several major projects:

Liquefaction: New Bridge for the St. Lawrence, Montreal

3-D Site Response: Diablo Canyon Nuclear Plant, California

Seismic Response of MSE Walls: NFL Stadium, Los Angeles

SSSI Numerical Modeling

- Calibrate numerical models against centrifuge test
- Starting study comparing FLAC with OpenSEES
  - Compare against well documented (>140 sensors) centrifuge test
- Future
  - Ensure that numerical models are capturing SSSI
  - Sensitivity analyses on key parameters
  - Develop simple relationships that can be used easily in practice
- Interested in other aspects of liquefaction as well
- Intend to incorporate probabilistic risk assessments in future research