

### Project Description:

The project consisted of a new 8-story mixed use structure located downtown Boise, Ada County, Idaho. As a cost savings measure Aggregate Piers were proposed in conjunction with the project Geotechnical Engineer as a value engineer alternate to deep foundations or over-ex of the full site that were proposed to reach the bearing layer indicated on the soil profile. Not only did the piers save on project cost but also on overall schedule.

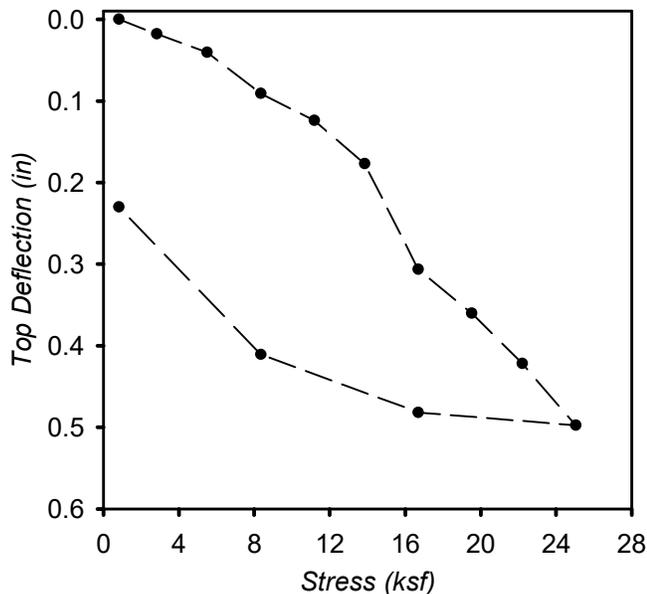
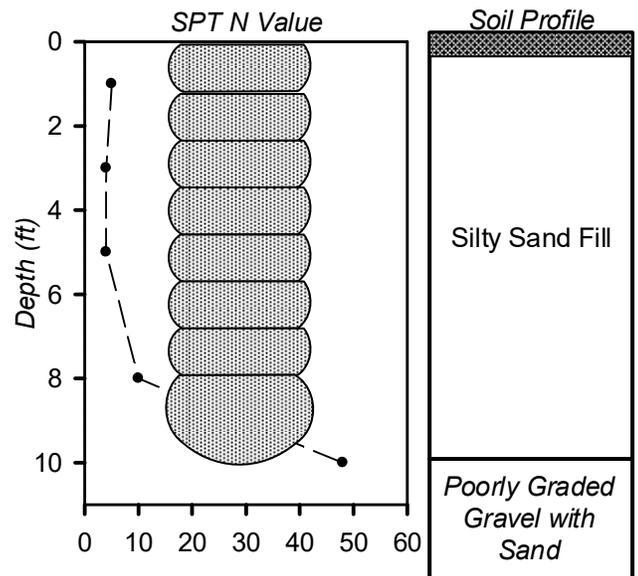
### Project Details:

- 196 Aggregate Piers installed.
- The Aggregate Piers were designed to mitigate compressibility of a silty sand fill overlying poorly graded gravel with sand and to increase the bearing capacity to 6000 psf.



### Team Details:

- General Contractor – McAlvain Companies, Inc.
- Architect – Holst Architecture, Inc.
- Structural – Froelich Engineers, Inc.
- Geotechnical – Materials Testing & Inspection



One modulus load test was performed with the following results:

- Design load per pier = 83 kips
- Total settlement at 150% of the design load = 0.5”

### Vibration Analysis:

There were some concerns about vibration during the construction process of the aggregate piers located next to an existing old brick building and the damage it could cause on it.

Based on the USBM RI8507 Safe Blasting Criteria, lower frequency vibrations of 10 Hz or less can cause damage to masonry structures while higher frequencies of 10 Hz or more do not.

The USBM ‘safe level blasting’ chart below, shows the relationship between vibration frequency and predictable damage. At low frequencies (about 3 Hz to 10 Hz) a safe level ground motion of 0.5 in/s to avoid damaging sensitive materials is recommended. For higher frequency vibrations, the vibration velocities allowed increases. At about 30 Hz and greater, vibration velocities of up to 2.0 in/s are considered safe for building materials.



According to the measured values, the maximum ground vibrations for the three Aggregate Piers closest to the building was 0.193 in/s, 0.195 in/s, and 0.160 in/s. These vibrations occurred at a frequency of roughly 64 Hz.

Modeling data of Aggregate Pier construction show that ground vibrations are likely to reach roughly 1.075 in/s. These vibrations are in the range of 30 to 64 Hz. Based on the USBM RI-8507 Safe Blasting Criteria, these vibrations will remain less than the safe level.

