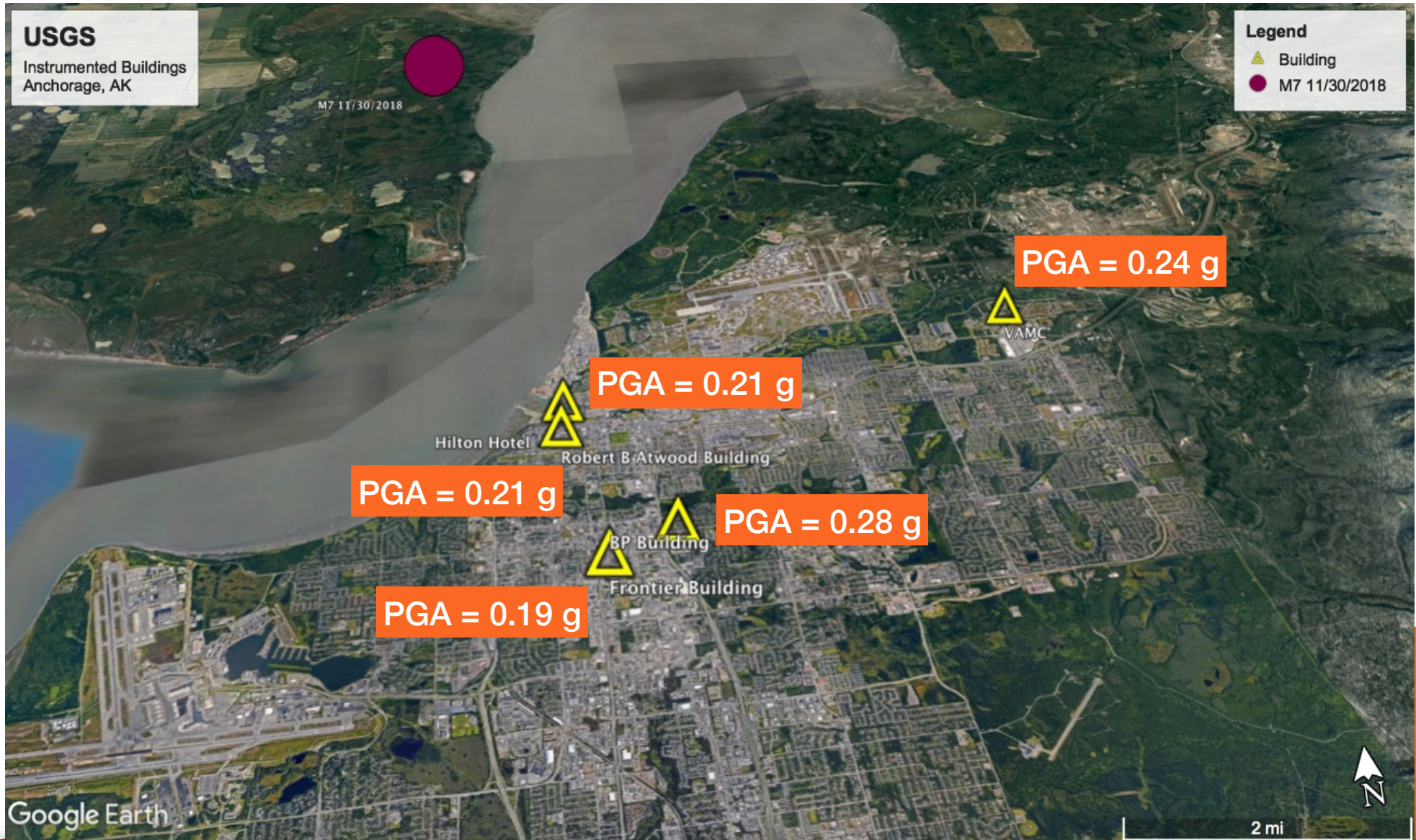


USGS INSTRUMENTED BUILDINGS ANCHORAGE, ALASKA

Erol Kalkan, Jamie Steidl, Jim Smith, and
Jason De Cristofaro

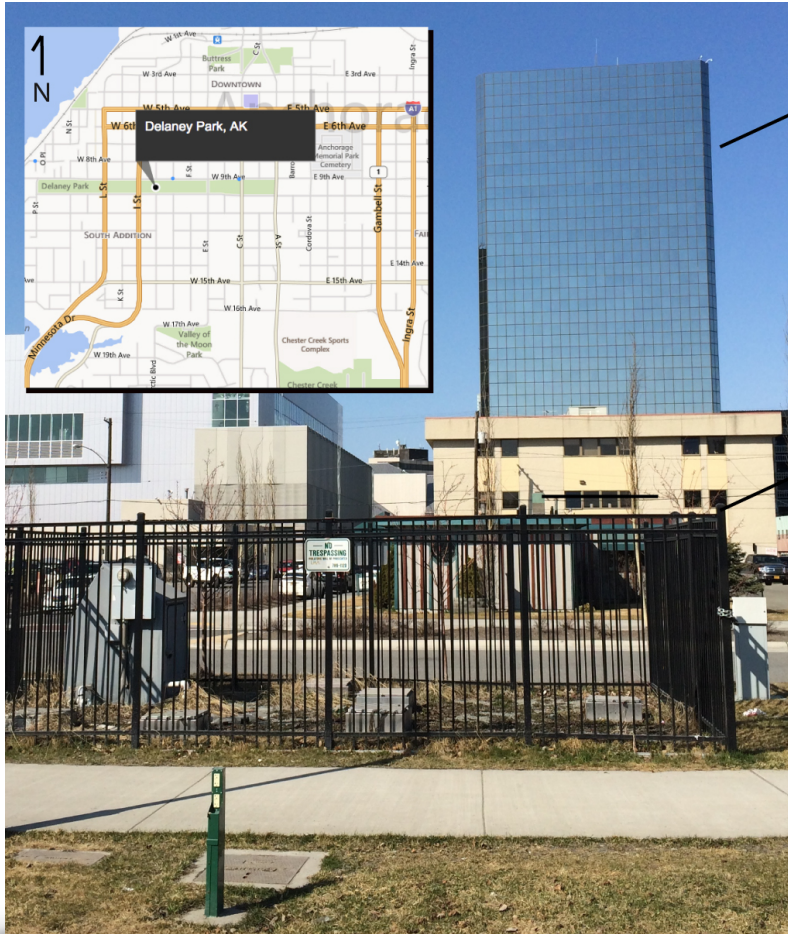
Earthquake Science Center
United States Geological Survey

Instrumented Buildings



- Five buildings in 18 km radius of the 2018 M7 earthquake's epicenter

Atwood Building



Atwood Building

Free-field surface station and
downhole array with six boreholes

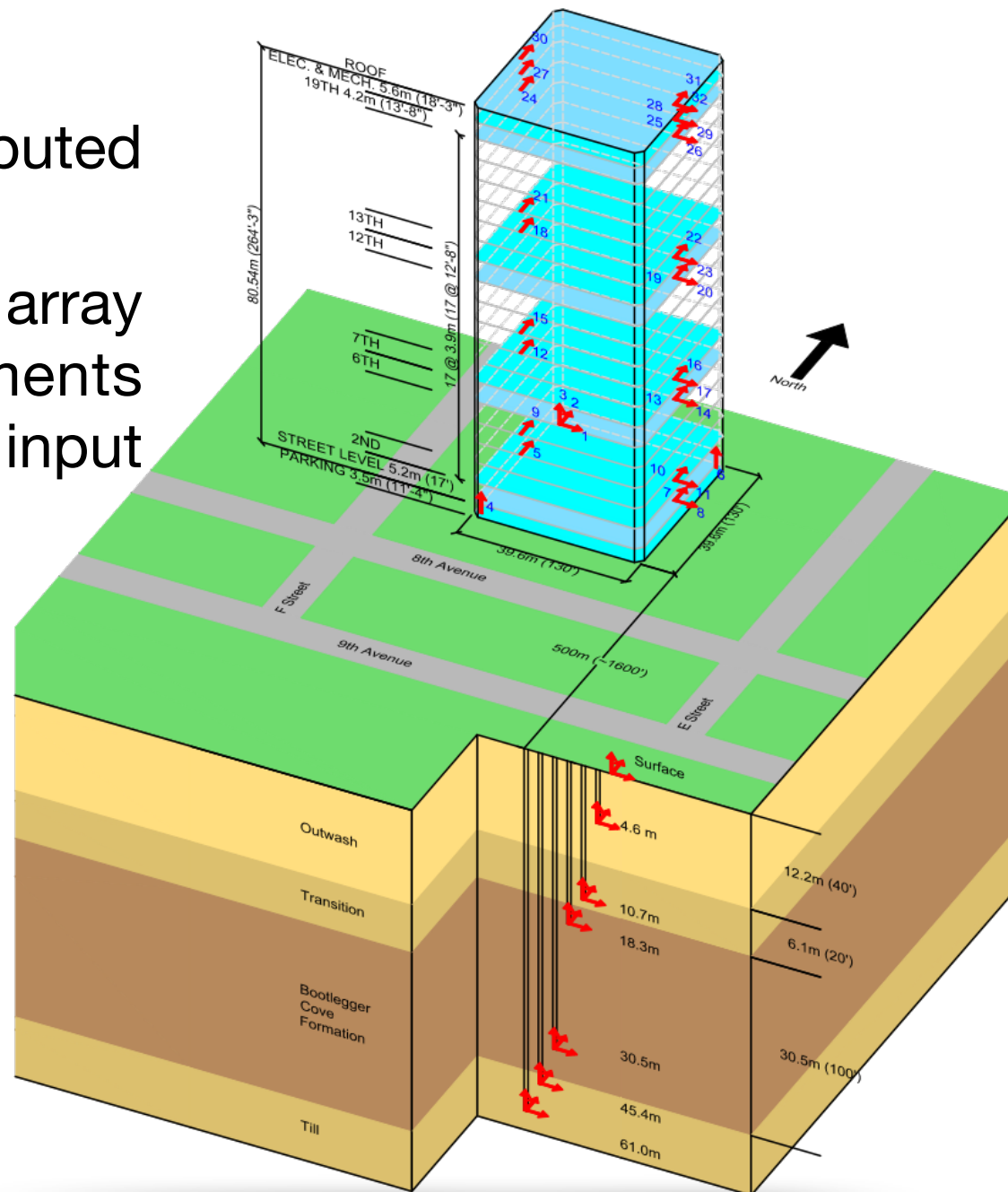


- 20-story steel-moment frame building with basement used as a parking garage,
- Constructed in 1980 according to 1979 UBC.

Instrumentation & Observations

- Instrumented in 2003,
- 32 accelerometers distributed on 10 levels,
- Free-field and downhole array to measure soft sediments response and provide input wavefield data.

- Non-structural ceiling & sheetrock damage
-
- PGA = 20.8% g
 - Peak Str. Acc. = 44.4% g



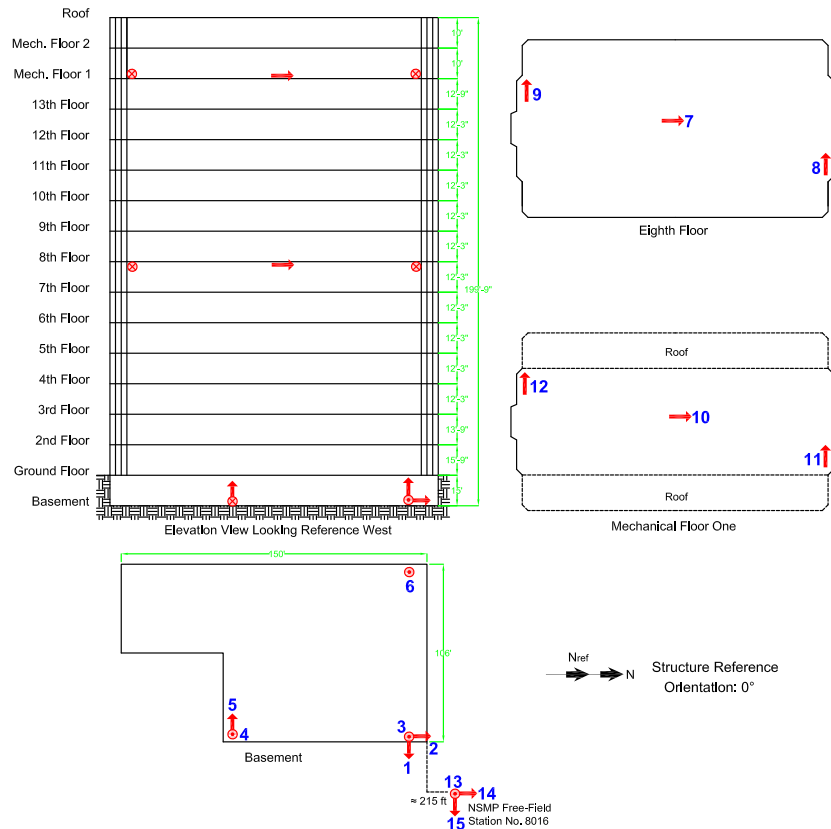
BP Building



- 13-story steel-moment frame building,
- Constructed in 1985.

Instrumentation

AK: Anchorage, BP Building - 15 Story Office Building
NSMP Station No: 8016



Structural and architectural drawings, and soil report may be available upon request. (E-mail: nsmp@usgs.gov)

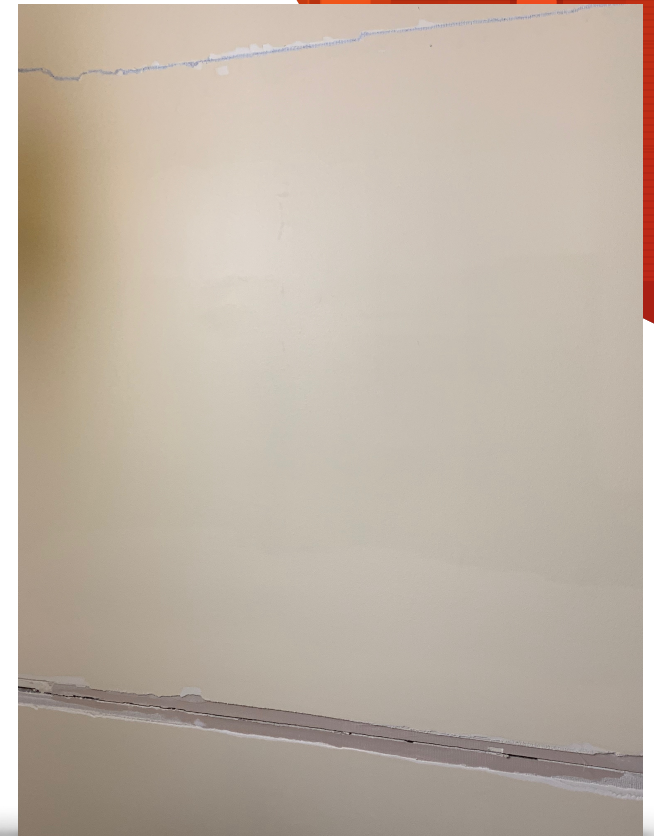
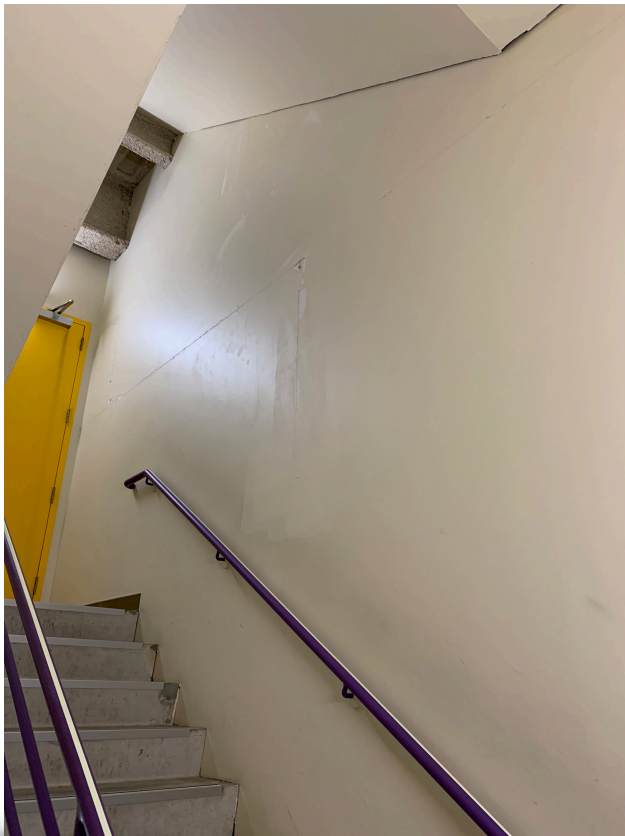
Diagram: 9/4/2013
Revision: 5



- Instrumented in 1987-88, updated instrumentation in 2015,
- 12 accelerometers at three levels (basement, 8th, mech. floor).

Observations

- Non-structural ceiling & sheetrock damage
- PGA = 28.3% g
- Peak Str. Acc. = 33.6% g



Frontier Building



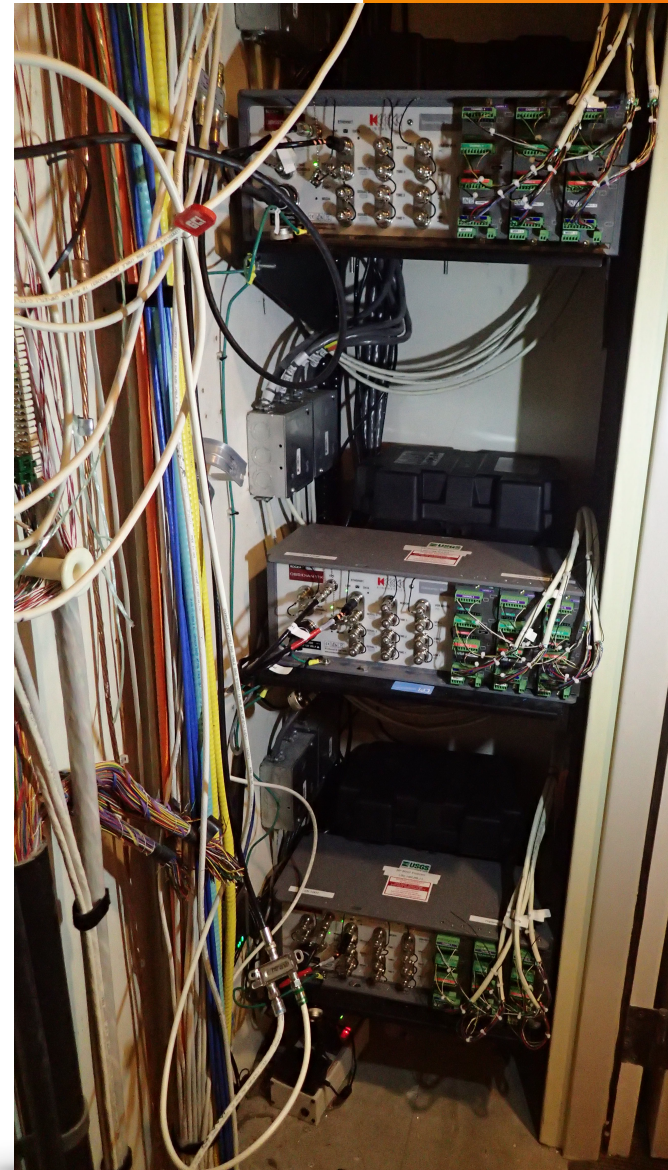
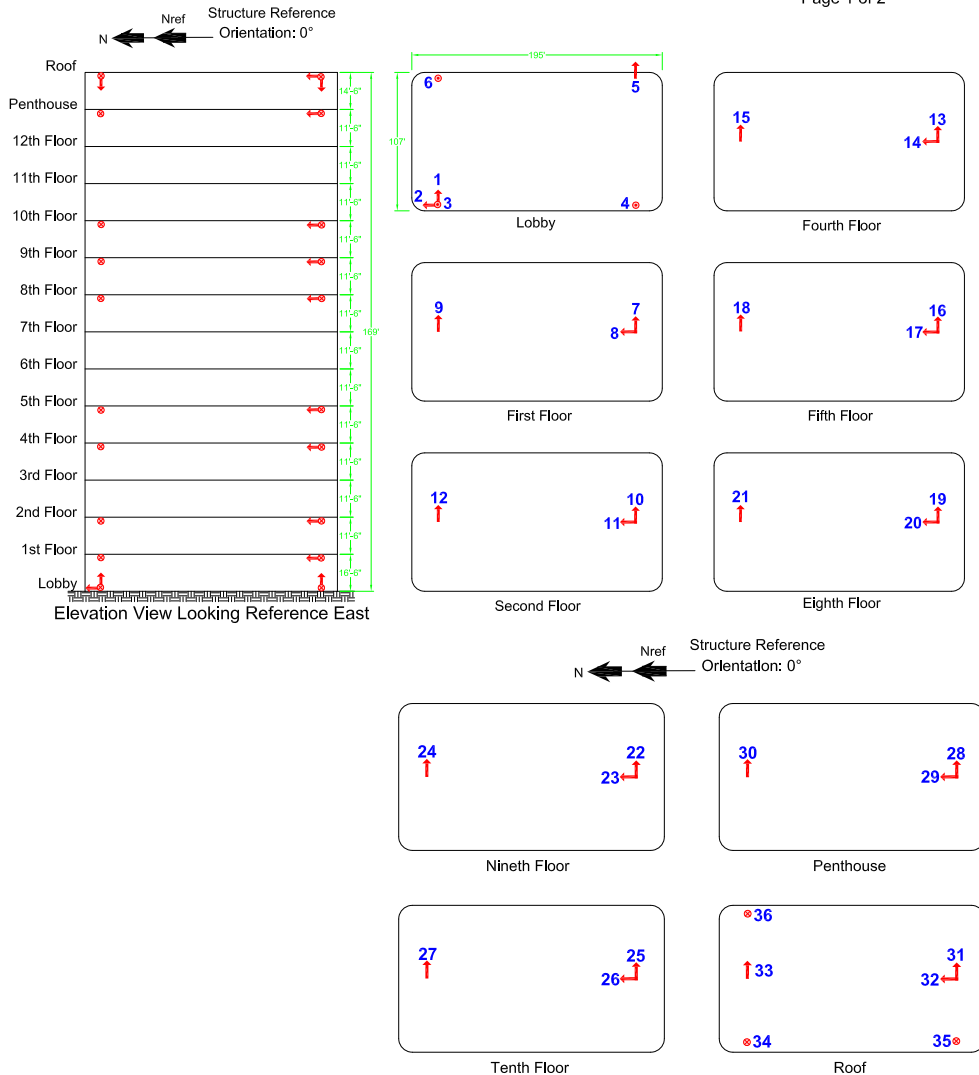
- 14-story cast-in-place moment resistant RC frame structure with rigid diaphragms supported by circular columns,
- Constructed in 1981 per 1979 UBC,
- Building has no basement and no shear walls.

Instrumentation

AK: Anchorage, Frontier Building - 14 Story Office Building
NSMP Station No: 8042



Page 1 of 2



- Instrumented in 2007 with 36 accelerometers on ten levels.

Observations

- Non-structural ceiling & sheetrock damage
- PGA = 19.3% g
- Peak Str. Acc. = 22.3% g

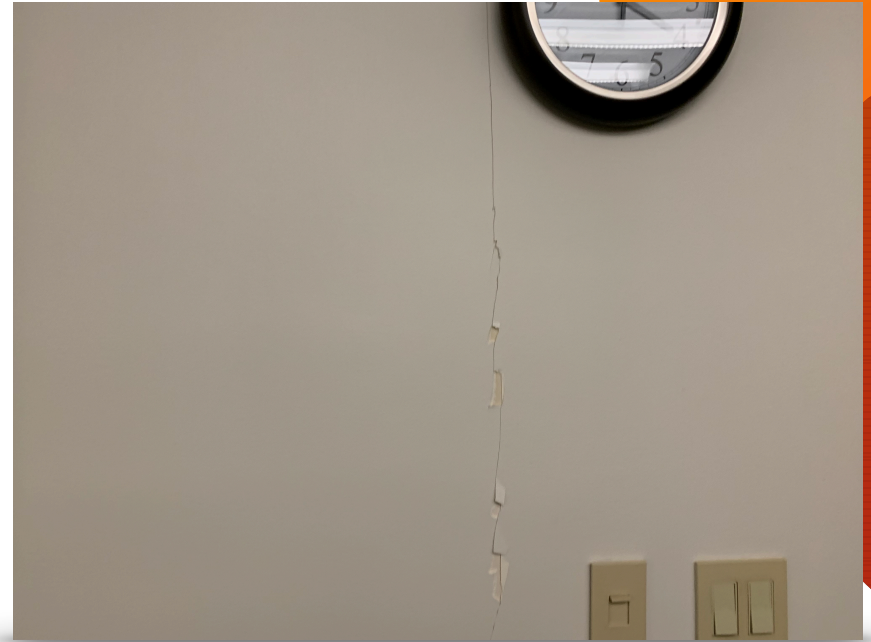


Photo credit: Dr. Wael Hassan

Hilton Building

- 21-story building constructed in 1971,
- Updated instrumentation in 2015,
- 12 accelerometers at five levels, (basement, 6th, 14th, 22th floor, roof).



- Non-structural ceiling & sheetrock damage
- PGA = 21.4% g
- Peak Str. Acc. = 65.1% g



VA Medical Center

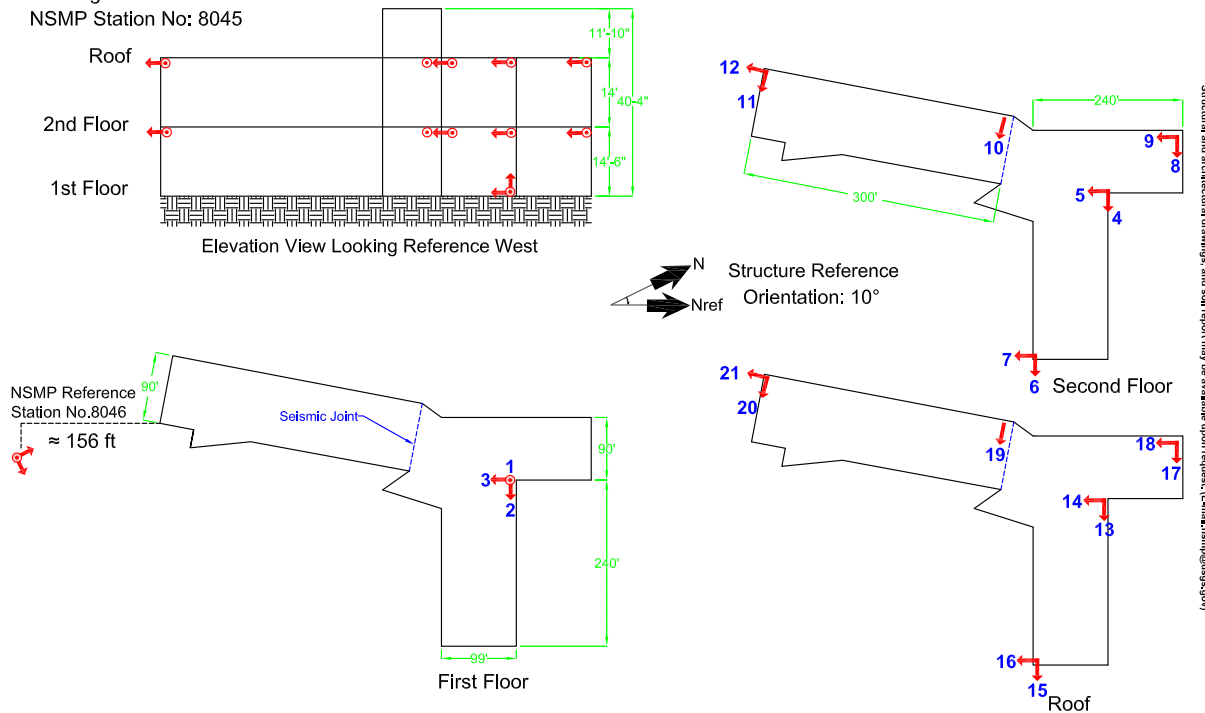


- Two-story steel building, designed in 2007 per IBC 2003 and completed in 2010,
- Main building is special concentric braced frame,
- Link building is ordinary steel moment frame,
- Building has no basement.

Instrumentation

U.S. Department of Veterans Affairs
Anchorage, AK - Steel Moment Frame, Two-Story Hospital Building
Building No: B100
NSMP Station No: 8045

Revision Number: 11
Revised on 2/25/2013



SENSOR LOCATIONS

- Instrumented in 2010 with 21 accelerometers,
- Equipped with free-field to measure site response.

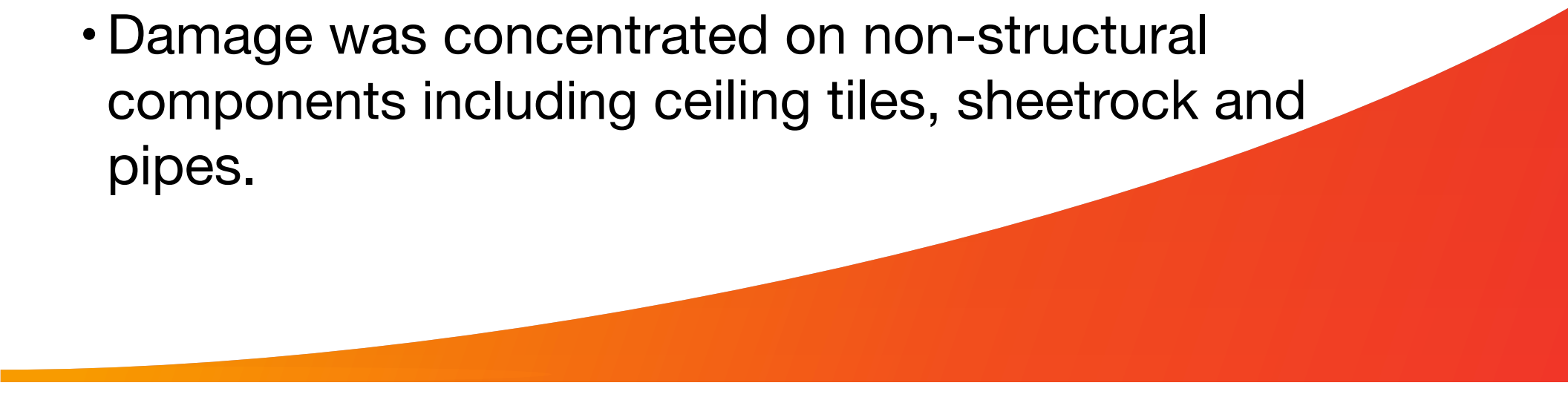
Observations



- Non-structural ceiling damage at second floor
- PGA = 24% g
- Peak Str. Acc. = 111% g
(recordings are under review)



Concluding Remarks

- USGS maintains instrumentation of five buildings in Anchorage,
 - Two of them have a dedicated free-field station, one building (Atwood) has also a dedicated downhole array,
 - Largest peak ground acceleration was observed at BP building (0.28 g) and largest peak structural acceleration was observed at VAMC (1.11 g),
 - Damage was concentrated on non-structural components including ceiling tiles, sheetrock and pipes.
- 



Thanks ...