

SEISMIC INSTRUMENTATION OF BUILDINGS IN OREGON

EERI & DOGAMI
Post-Earthquake Reconnaissance Workshop
Integrating State Clearinghouse Efforts
April 9th 2018

Reid Zimmerman, P.E., S.E.
Chair, SEAO Seismic Committee



PENTAGON



HEXAGON



OREGON

CODE REQUIREMENTS

1613.7 Earthquake recording instrumentation. In Seismic Design Category D, every new building over six stories above grade in height with an aggregate floor area of 60,000 square feet (5574 m²) or more, and every new building over 10 stories in height regardless of the floor area, shall be provided with an approved system with not less than three approved recording accelerographs. The accelerographs shall be interconnected for common start and common timing.

Exception: In lieu of installing accelerographs, the applicant may deposit an amount equivalent to the cost of the accelerograph to the Earthquake Recording Instrument Fund in the Oregon Department of Geology and Mineral Industries (DOGAMI). Proof of the alternate payment shall be provided by the DOGAMI to the *building official* with the jurisdiction.

1613.7.1 Location. The instruments shall be located in the lowest floor level, midportion, and near the top of the building. (Upper-level instruments shall be positioned to record earthquake motions at mutually orthogonal directions; for example, N-S and E-W directions.) Each instrument shall be located so that access is maintained at all times and is unobstructed by room contents. A sign stating "MAINTAIN CLEAR ACCESS TO THIS INSTRUMENT" shall be posted in a conspicuous location. Agents of DOGAMI are considered deputies of the *building official* with jurisdiction and shall have access to accelerographs. If access to accelerographs is denied, DOGAMI shall have recourse to remedies provided by law.

1613.7.2 Maintenance. Maintenance and service of the instruments shall be provided by the owner of the building, subject to the approval of the *building official* and DOGAMI. Data produced by the instruments shall be made available to the *building official* on request.

1613.7.3 Records. Noninterpretive seismic data recorded by the accelerographs shall be filed with DOGAMI. Copies of individual records shall be made available by DOGAMI to the public on request and the payment of an appropriate fee.

Note: When strong motion accelerographs are required and installed in a building, the *building official* shall notify DOGAMI and indicate the address and location of the accelerographs within the building. DOGAMI can be reached at: 800 N.E. Oregon St., #28, Portland, OR 97232.

1613.7 Earthquake recording instrumentation. In Seismic Design Category D, every new building over six stories above grade in height with an aggregate floor area of 60,000 square feet (5574 m²) or more, and every new building over 10 stories in height regardless of the floor area, shall be provided with an approved system with not less than three approved recording accelerographs. The accelerographs shall be interconnected for common start and common timing.

Exception: In lieu of installing accelerographs, the applicant may deposit an amount equivalent to the cost of the accelerograph to the Earthquake Recording Instrument Fund in the Oregon Department of Geology and Mineral Industries (DOGAMI). Proof of the alternate payment shall be provided by the DOGAMI to the *building official* with the jurisdiction.

CODE REQUIREMENTS

1613.7 Earthquake recording instrumentation. In Seismic Design Category D, every new building over six stories above grade in height with an aggregate floor area of 60,000 square feet (5574 m²) or more, and every new building over 10 stories in height regardless of the floor area, shall be provided with an approved system with not less than three approved recording accelerographs. The accelerographs shall be interconnected for common start and common timing.

Exception: In lieu of installing accelerographs, the applicant may deposit an amount equivalent to the cost of the accelerograph to the Earthquake Recording Instrument Fund in the Oregon Department of Geology and Mineral Industries (DOGAMI). Proof of the alternate payment shall be provided by the DOGAMI to the *building official* with the jurisdiction.

1613.7.1 Location. The instruments shall be located in the lowest floor level, midportion, and near the top of the building. (Upper-level instruments shall be positioned to record earthquake motions at mutually orthogonal directions; for example, N-S and E-W directions.) Each instrument shall be located so that access is maintained at all times and is unobstructed by room contents. A sign stating "MAINTAIN CLEAR ACCESS TO THIS INSTRUMENT" shall be posted in a conspicuous location. Agents of DOGAMI are considered deputies of the *building official* with jurisdiction and shall have access to accelerographs. If access to accelerographs is denied, DOGAMI shall have recourse to remedies provided by law.

1613.7.2 Maintenance. Maintenance and service of the instruments shall be provided by the owner of the building, subject to the approval of the *building official* and DOGAMI. Data produced by the instruments shall be made available to the *building official* on request.

1613.7.3 Records. Noninterpretive seismic data recorded by the accelerographs shall be filed with DOGAMI. Copies of individual records shall be made available by DOGAMI to the public on request and the payment of an appropriate fee.

Note: When strong motion accelerographs are required and installed in a building, the *building official* shall notify DOGAMI and indicate the address and location of the accelerographs within the building. DOGAMI can be reached at: 800 N.E. Oregon St., #28, Portland, OR 97232.

1613.7.1 Location. The instruments shall be located in the lowest floor level, midportion, and near the top of the building. (Upper-level instruments shall be positioned to record earthquake motions at mutually orthogonal directions; for example, N-S and E-W directions.) Each instrument shall be located so that access is maintained at all times and is unobstructed by room contents. A sign stating "MAINTAIN CLEAR ACCESS TO THIS INSTRUMENT" shall be posted in a conspicuous location. Agents of DOGAMI are considered deputies of the *building official* with jurisdiction and shall have access to accelerographs. If access to accelerographs is denied, DOGAMI shall have recourse to remedies provided by law.

CODE REQUIREMENTS

1613.7 Earthquake recording instrumentation. In Seismic Design Category D, every new building over six stories above grade in height with an aggregate floor area of 60,000 square feet (5574 m²) or more, and every new building over 10 stories in height regardless of the floor area, shall be provided with an approved system with not less than three approved recording accelerographs. The accelerographs shall be interconnected for common start and common timing.

Exception: In lieu of installing accelerographs, the applicant may deposit an amount equivalent to the cost of the accelerograph to the Earthquake Recording Instrument Fund in the Oregon Department of Geology and Mineral Industries (DOGAMI). Proof of the alternate payment shall be provided by the DOGAMI to the *building official* with the jurisdiction.

1613.7.1 Location. The instruments shall be located in the lowest floor level, midportion, and near the top of the building. (Upper-level instruments shall be positioned to record earthquake motions at mutually orthogonal directions; for example, N-S and E-W directions.) Each instrument shall be located so that access is maintained at all times and is unobstructed by room contents. A sign stating "MAINTAIN CLEAR ACCESS TO THIS INSTRUMENT" shall be posted in a conspicuous location. Agents of DOGAMI are considered deputies of the *building official* with jurisdiction and shall have access to accelerographs. If access to accelerographs is denied, DOGAMI shall have recourse to remedies provided by law.

1613.7.2 Maintenance. Maintenance and service of the instruments shall be provided by the owner of the building, subject to the approval of the *building official* and DOGAMI. Data produced by the instruments shall be made available to the *building official* on request.

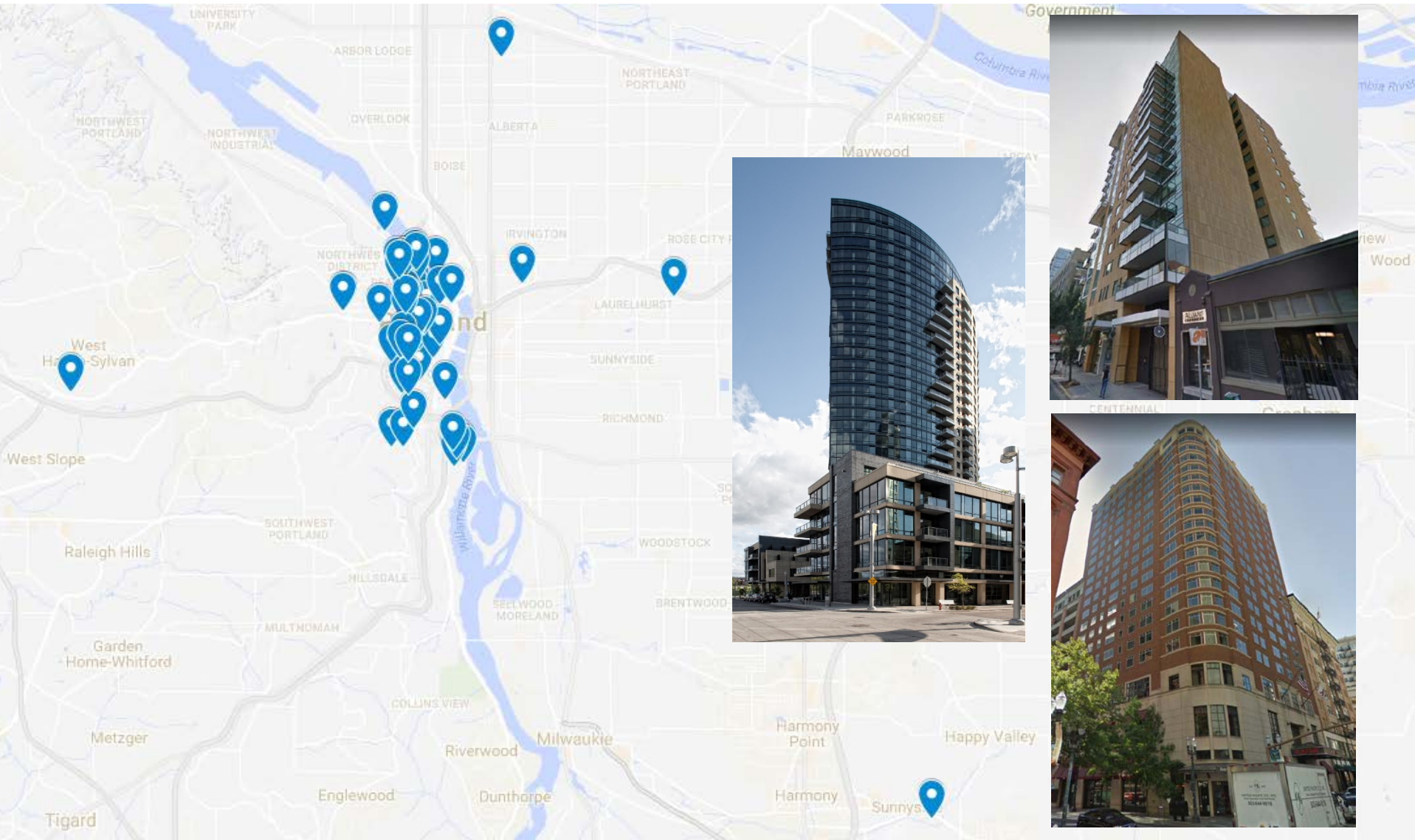
1613.7.3 Records. Noninterpretive seismic data recorded by the accelerographs shall be filed with DOGAMI. Copies of individual records shall be made available by DOGAMI to the public on request and the payment of an appropriate fee.

Note: When strong motion accelerographs are required and installed in a building, the *building official* shall notify DOGAMI and indicate the address and location of the accelerographs within the building. DOGAMI can be reached at: 800 N.E. Oregon St., #28, Portland, OR 97232.

1613.7.2 Maintenance. Maintenance and service of the instruments shall be provided by the owner of the building, subject to the approval of the *building official* and DOGAMI. Data produced by the instruments shall be made available to the *building official* on request.

1613.7.3 Records. Noninterpretive seismic data recorded by the accelerographs shall be filed with DOGAMI. Copies of individual records shall be made available by DOGAMI to the public on request and the payment of an appropriate fee.

CURRENT IMPLEMENTATION OF CODE REQUIREMENTS



CURRENT IMPLEMENTATION OF CODE REQUIREMENTS

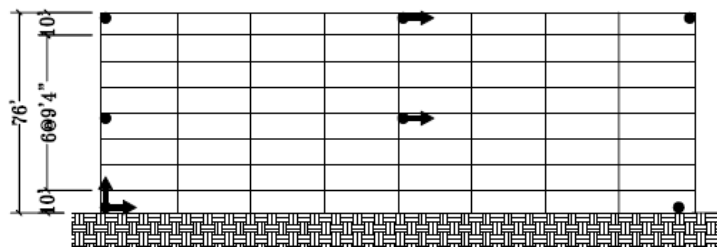


PATH TO IMPROVING BUILDING INSTRUMENTATION IN OREGON

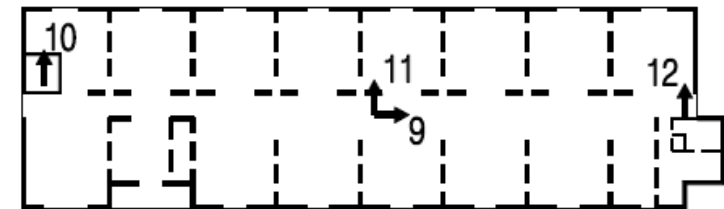
- Education of jurisdictions to increase enforcement
- Proposed amendment to the 2019 Oregon Structural Specialty Code

Exception: In lieu of installing accelerographs, the applicant may deposit an amount equivalent to the cost of **equipment, materials, installation and maintenance for 10 years of** the accelerographs **and all associated hardware and wiring** to the Earthquake Recording Instrument Fund in the Oregon Department of Geology and Mineral Industries (DOGAMI). Proof of the alternate payment shall be provided by DOGAMI to the *building official* with the jurisdiction.

- Encourage owners to voluntarily instrument or, when required, instrument to greater density over building height
- Establish building database (past and future)
- Standardized form for documenting accelerometer locations as a supplement to DOGAMI's *Earthquake Recording Instrumentation Fact Sheet*



Roof
8th Floor
5th Floor
1st Floor



- Funding to administer Earthquake Recording Instrument Fund

DISCUSSION TOPICS

- Should money paid into the Earthquake Recording Instrument Fund be restricted to funding building-related instrumentation? Or is it better spent on free-field instrumentation?
- Does a developer (i.e., short term building owner) have any incentive to instrument versus contribute to the Earthquake Recording Instrument Fund? If so, what are those incentives?
- Are there opportunities to collaborate with other organizations to ensure data is actually collected after an earthquake?
- Where do we want seismic instrumentation of buildings in Oregon to be in 20 years? How do we get there?

THANK YOU

Reid Zimmerman, P.E., S.E.
(503) 227-3251
reid.zimmerman@kpff.com