

# Portland State University: Ondine Residential Hall Seismic Rehabilitation Project

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Ondine Residence Hall at Portland State University (PSU), Oregon, was seismically upgraded as a demonstration project to increase its earthquake safety and community awareness. Ondine Hall is a 1966 15-story concrete building that posed a serious life safety threat to hundreds of students due to serious structural deficiencies (Figure 1).

In April 2004, the Oregon Department of Geology and Mineral Industries was funded by the DHS- Federal Emergency Management Agency (FEMA) Predisaster Mitigation Program to conduct a partial seismic upgrade to the lower, most vulnerable floors. The mitigation design improved the inadequate shear wall thickness, inadequate bracing on the 1st and 2nd floors (i.e. soft stories), and the inadequate vertical rebar couplers.



Figure 1. Ondine residence hall: (A) view from southwest direction (B) view from northwest direction

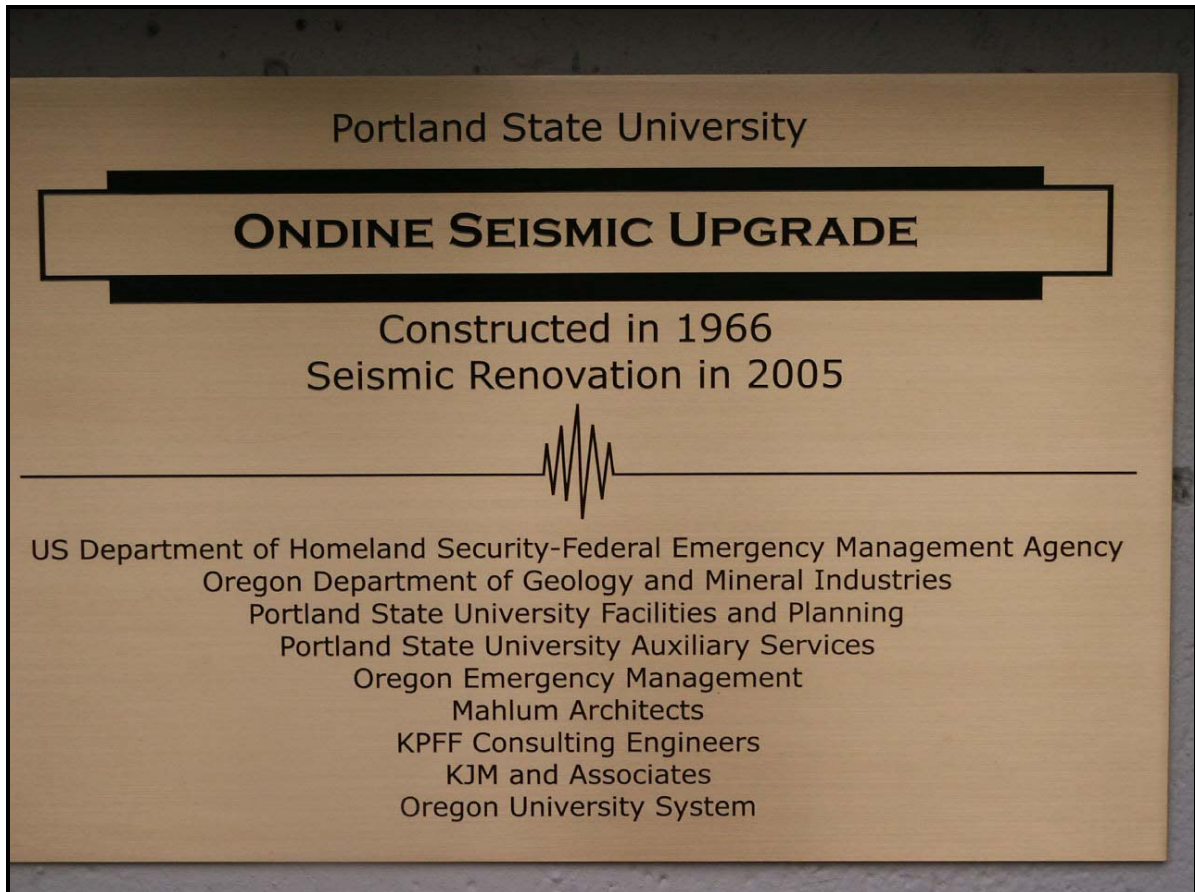
The seismic rehabilitation, which cost \$3 million, significantly reduces the potential for a catastrophic soft story collapse. The design included:

- Coupling the column reinforcement (rebar) (Figure 2a)
- Adding an exterior concrete shear wall along the south elevation (Figure 2b)
- Adding steel cross-bracing along the west elevation (Figure 2c)
- Adding 3/8" steel plates to the interior walls along the north and south elevations (Figure 2d)



Figure 2. Seismic rehabilitation solutions (A) identifying rebar coupler location in existing concrete columns (B) exterior shear wall addition (C) interior steel cross-bracing, and (4) interior steel plates.

As part of the demonstration project, a steel plate wall was permanently exposed in the cafeteria dining room, which was remodeled at the same time as the seismic rehabilitation construction. In addition, a commemorative plaque is mounted at the building's front entrance to remind the public of the pre-disaster mitigation measures taken and express gratitude to FEMA, Oregon Emergency Management, Oregon University System, and others involved in making this rehabilitation project a success. (Figure 3).



**Figure 3. Demonstration project plaque (schematic) that is mounted at the front entrance**