Smith Memorial Student Union
Portland State University
Seismic Upgrade
2002-2004

Smith Memorial Student Union (SMSU)
SMSU is located at the center of the PSU campus and houses most of the student organizations and other non-academic facilities and functions. These include a ballroom, lounges, a food court and associated dining areas, meeting & conference rooms, and offices.

SMSU covers an entire 200’ x 200’ city block. It has four stories above ground, a full basement level, and a partial sub-basement housing mechanical equipment and storage. There are penthouse areas housing additional mechanical equipment.

Construction History
Phase 1 (1956) is located at the northwest portion of the site. It is two stories above ground, a basement, and a sub-basement. It is a steel frame structure with lightweight concrete on a steel deck.

Phase 2 (1958) is located at the northeast portion of the site. It is four stories above grade with a basement level. It was the original PSU library. It is a combined steel frame and reinforced concrete structure.

Phase 3 (1960) is located at the southwest portion of the site and extends over the original Phase 1 structure. It is a four-story structure above grade with a basement at its southwest portion and adds a two-story structure housing a ballroom over the original Phase 1 structure. It is a steel frame structure with lightweight concrete on a steel deck.

Phase 4 (1963) is located at the southeast portion of the site and completes the building as it currently sits. It is a four-story structure with a basement. It is a steel frame structure with lightweight concrete on a steel deck.

Seismic Upgrade
In 1998 a masterplan for the redevelopment of SMSU was undertaken. One of the development options considered was the addition of a 5th floor to house the student health services and counseling programs (Health CAPS). This option triggered a discussion for the need to seismically upgrade the building if a 5th floor was to be added. It was determined that it was economically infeasible at the time of the study to add the 5th floor. However, it was decided that a seismic upgrade of the building would be a good use of funds for the sole reason to provide additional safety for the building users in the event of an earthquake. It was also decided to design the seismic upgrades to accommodate the addition of a partial 5th floor in the future should funds become available. KPFF Consulting Engineers were retained by Robertson Merryman Barnes, the architects, to evaluate various methods of seismically upgrading SMSU.

One design option considered was the installation of additional shear walls. This option was determined to be too intrusive to construct primarily because the building was to
remain occupied during the retrofit and there was little flexibility as to the locations for the shear walls.

It was decided to install a system of steel braces with seismic dampers or "shock absorbers". This system has several advantages over the shear wall system such as allowing a greater degree a flexibility as to location, not having to extend the system to the basement and sub-basement and allowing for installation of the frames at a slower pace thus providing time for temporary relocation of the building users.

Originally, it was intended to install the damper system over a one-year period, demolishing only the immediate area of work, installing the damper system, and repairing the area of work. Because SMSU was due for major renovation work, it was decided to combine the seismic upgrades with the renovation work. A schedule was developed to complete much of the renovation work and all of the seismic work over a two-year period. Work commenced in June 2002 and is scheduled for completion in September of 2004.

Several factors must be considered when determining the actual costs associated with seismically upgrading an occupied building:
- Costs associated with the structural and architectural design and permitting
- Actual cost to install the seismic components
- Costs associated with hazardous material abatement – asbestos and lead paint in SMSU
- Costs associated with the temporary relocation of the building users during construction

Because other renovation work has been combined with the seismic work on SMSU, distilling the costs associated with the only the seismic portion of the work is problematic. Fortunately, we received an estimate for only the seismic work from the contractor on this project prior to the decision to combine the additional renovation work.

**SMSU Area Summary**

<table>
<thead>
<tr>
<th>Floor</th>
<th>Area (s.f.)</th>
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</thead>
<tbody>
<tr>
<td>4th Floor</td>
<td>24,130</td>
</tr>
<tr>
<td>3rd Floor</td>
<td>37,250</td>
</tr>
<tr>
<td>Mezzanine</td>
<td>10,940</td>
</tr>
<tr>
<td>2nd Floor</td>
<td>39,110</td>
</tr>
<tr>
<td>1st Floor</td>
<td>39,440</td>
</tr>
<tr>
<td>Basement</td>
<td>39,810</td>
</tr>
<tr>
<td>Sub-basement</td>
<td>19,870</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>210,550</strong></td>
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</tbody>
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(Excludes 6250 s.f. of open area above 3rd floor Ballroom)
(Excludes west exterior balcony)

**Seismic Upgrade Costs**

<table>
<thead>
<tr>
<th>Item</th>
<th>Cost (s.f.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Architectural design Fees</td>
<td>$ 72,840</td>
</tr>
<tr>
<td>Structural Design Fees</td>
<td>186,395</td>
</tr>
<tr>
<td>Permit Fees*</td>
<td>20,000</td>
</tr>
<tr>
<td>Relocation costs**</td>
<td>40,000</td>
</tr>
</tbody>
</table>
Special inspections**          40,000
Construction Costs          2,552,000
Hazardous materials Abatement***  364,000
Total Seismic Upgrade Costs  $3,275,235

Seismic Upgrade Costs per square foot ($3,275,235 / 210,550 s.f.) $15.56 per s.f.

Summary
Seismically upgrading a building such as SMSU can be costly. In addition to the direct construction costs outlined above, other factors contribute to the high cost of upgrading a structure like SMSU. These additional factors are mostly related to working in an occupied building. Consider the following:
- Noise: Major structural modifications are noisy necessitating performing some work during off-hours such as evenings and weekends. Overtime costs can be substantial.
- Dust and odor: Building users are more aware of the health risks associated with exposure to dust and fumes that accompany construction work of this nature. Additional time and funds will be expended to isolate the work areas from occupied spaces. Temporary partitions and barriers can add considerable costs. In addition, air monitoring may be an added expense.
- Exiting: Construction work can infringe on exiting routes. Added time and funds may be required to reconfigure exit paths
- Utilities: Disruptions in utilities and accidental fire alarms may be expected.
- Occupant relocation: As spaces are impacted, the occupants will need to be relocated to temporary quarters. Costs will be incurred for moving furniture, lost productivity, and reconfiguring phone and data service.
- Construction staging: A tight urban site will require tightly controlled material and work staging areas. The closure of public walks and streets can be costly.
- Other upgrades: Some jurisdictions required Fire and Life safety and ADA upgrades when doing major construction work. This work can add significantly to the cost of the project.

The above factors and others must be considered when considering the timing, funding, and other impacts of a seismic upgrade.

*Extrapolated based on permit fees on permitted work up to the date of this memo
**Estimated
***Extrapolated based on abatement required on work performed up to the date of this memo and excluding estimated abatement associated with remodeling work not immediately associated with the installation of the seismic dampers ($6500 Per damper frame x 56 frames = $364,000)