

## 6.4 MECHANICAL, ELECTRICAL, AND PLUMBING COMPONENTS

### 6.4.2 STORAGE TANKS AND WATER HEATERS

#### 6.4.2.4 WATER HEATERS

This category includes residential or small commercial water heaters. Most water heaters rest on the floor although smaller units may be wall- or shelf-mounted. Tankless water heaters are often wall-mounted.

#### TYPICAL CAUSES OF DAMAGE

- Unanchored or poorly anchored tanks may slide or overturn.
- Even if the restraint is strong enough to prevent complete overturning, if it is not rigid enough, the connections to gas and water lines may be damaged by tank movement and lead to fire or to water leakage

## Damage Examples



Figure 6.4.2.4-1 Unanchored water heaters overturned (Photo courtesy of Mason Industries).



Figure 6.4.2.4-2 Continuing water damage at the Talca Hospital in the 2010 magnitude-8.8 Chile Earthquake; water leaking from tank at right. This building was closed due to nonstructural damage, dominated by water damage (Photos courtesy of Bill Holmes, Rutherford & Chekene).

## SEISMIC MITIGATION CONSIDERATIONS

- Details shown are for tanks resting on the floor adjacent to a structural wall. Where the water heater is not located adjacent to a wall, it may be necessary to construct a frame around the tank or adjacent to the tank to provide anchorage.
- Flexible connections should be provided for the gas and water lines.

- Provide noncombustible spacers between the tank and wall for older units; newer units often have insulation inside the housing as part of the assembly and do not require the additional spacers.
- Larger tanks may be floor-mounted as shown for flat bottom tanks in Section 6.4.2.2 or as pictured in Figure 6.4.2.4-5
- See also *Guidelines for Earthquake Bracing of Residential Water Heaters* (California Department of General Services, 2005c) online at [www.documents.dgs.ca.gov/dsa/pubs/waterheaterbracing\\_11\\_30\\_05.pdf](http://www.documents.dgs.ca.gov/dsa/pubs/waterheaterbracing_11_30_05.pdf) for additional information.

### Mitigation Examples



Figure 6.4.2.4-3 Water heater corner installation using thin conduit (EMT) braces (Photo courtesy of California Department of General Services).



Figure 6.4.2.4-4 Corner installation using a commercially available strap; note flex copper tubing for water hook up (Photo courtesy of Cynthia Perry, BFP Engineers).



Figure 6.4.2.4-5 Base-mounted water heater located in a school; equipment supplied with metal base for mounting (Photo courtesy of EQE for the Salt Lake City School District).

## Mitigation Details

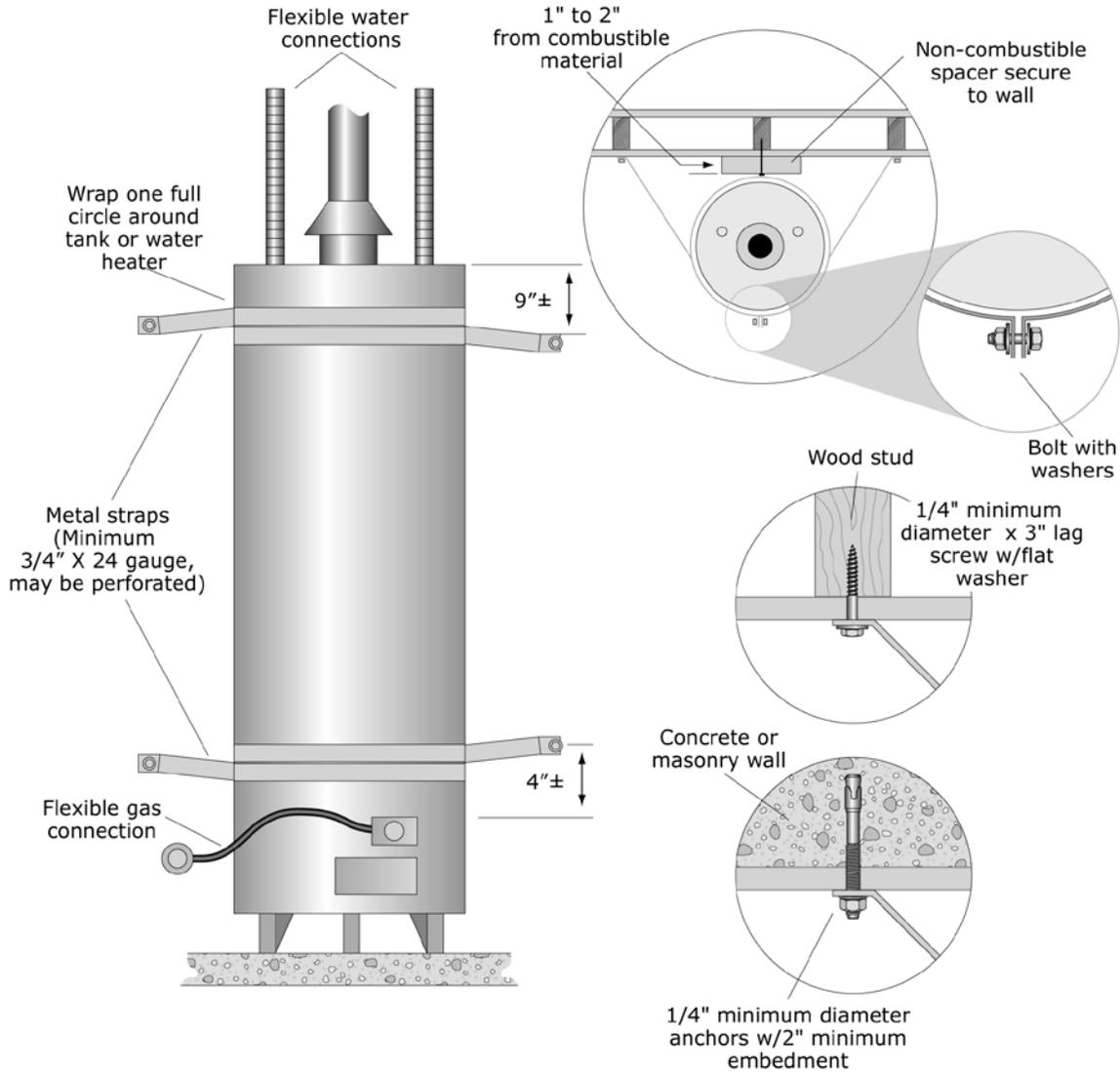


Figure 6.4.2.4-6 Water heater (PR).

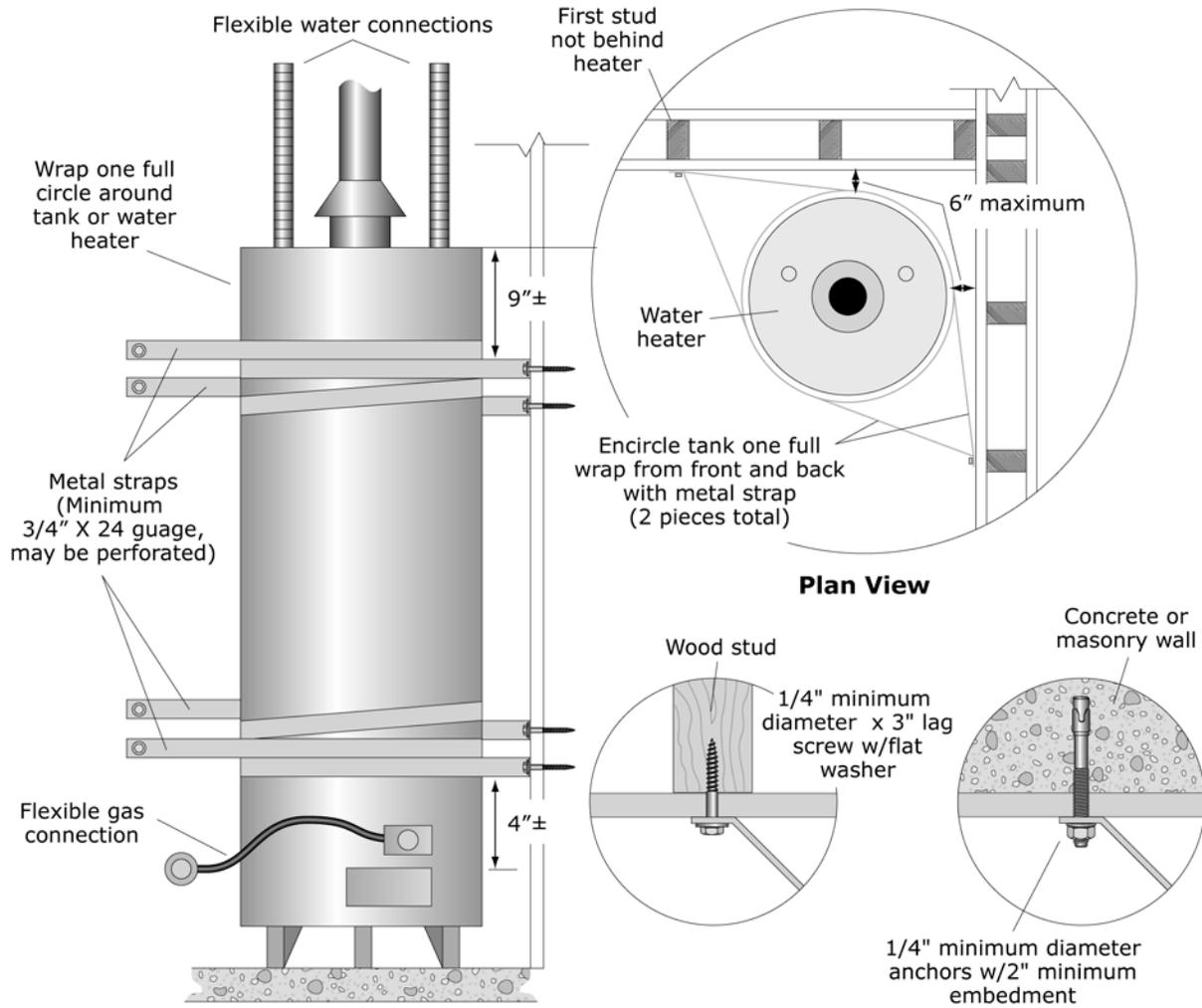


Figure 6.4.2.4-7 Water heater - corner installation (PR).