

6.4 MECHANICAL, ELECTRICAL, AND PLUMBING COMPONENTS

6.4.1 MECHANICAL EQUIPMENT

6.4.1.5 HVAC EQUIPMENT SUSPENDED IN-LINE WITH DUCTWORK

This in-line HVAC equipment typically includes suspended items of sheet metal construction such as fans, coils, VAV boxes, and blowers. The connection details for suspended equipment may also include vibration isolators. Current codes require bracing for all items weighing over 20 pounds that are mounted more than 4 feet above the floor.

TYPICAL CAUSES OF DAMAGE

- Poorly supported items can fall.
- Items can swing and impact structural, architectural or other mechanical items. Internal components may be damaged by shaking or impact.
- Connections of fuel lines, water piping, electrical conduit or ductwork may be damaged. Equipment may cease to function due to misalignment or internal damage.

Damage Examples



Figure 6.4.1.5-1 Damage to suspended HVAC, signs, and louvers was caused when suspended fans in the mechanical penthouse swung and impacted the louver panels. Holy Cross Medical Center in Sylmar, as a result of the 1994 magnitude-6.7 Northridge Earthquake (Photo courtesy of Robert Reitherman).

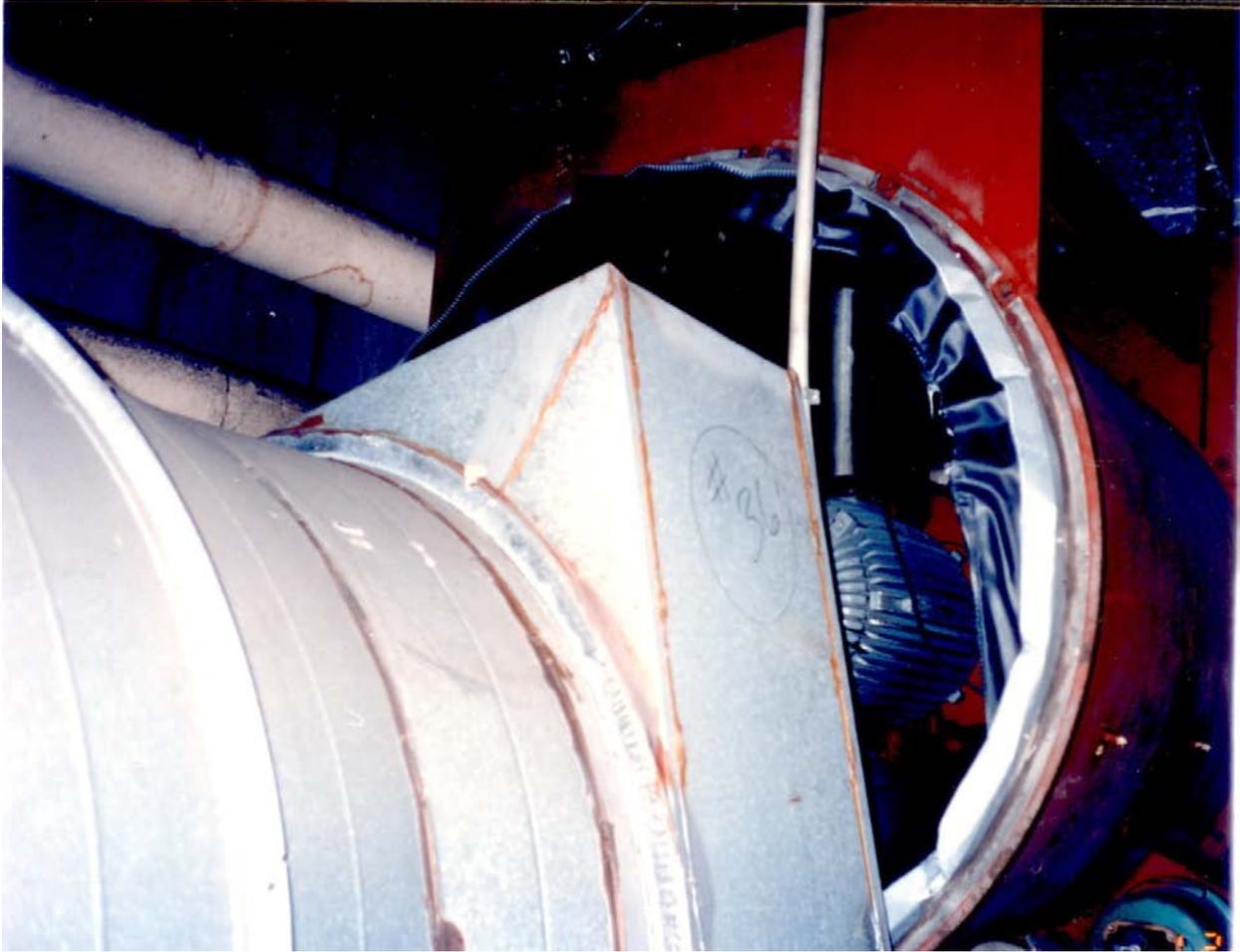


Figure 6.4.1.5-2 Sheet metal duct separated from suspended fan unit (Photo courtesy of Wiss, Jenney, Elstner Associates).



Figure 6.4.1.5-3 Suspended HVAC equipment came down at the Santiago airport terminal in the 2010 magnitude-8.8 Chile Earthquake (Photo courtesy of Gokhan Pekcan).

SEISMIC MITIGATION CONSIDERATIONS

- Items should be braced to structural elements with sufficient capacity to resist the imposed loads. Do not brace to other equipment, ducts, or piping. Flexible connections should be provided for fuel lines and piping. Equipment may be suspended either with or without vibration isolation.
- Refer to FEMA 412 *Installing Seismic Restraints for Mechanical Equipment* (2002) and FEMA 414 *Installing Seismic Restraints for Duct and Pipe* (2004) for additional information and details.
- Several engineered seismic bracing systems are available for suspended equipment and can be customized for most applications. Other options may be found on the internet.

Mitigation Examples

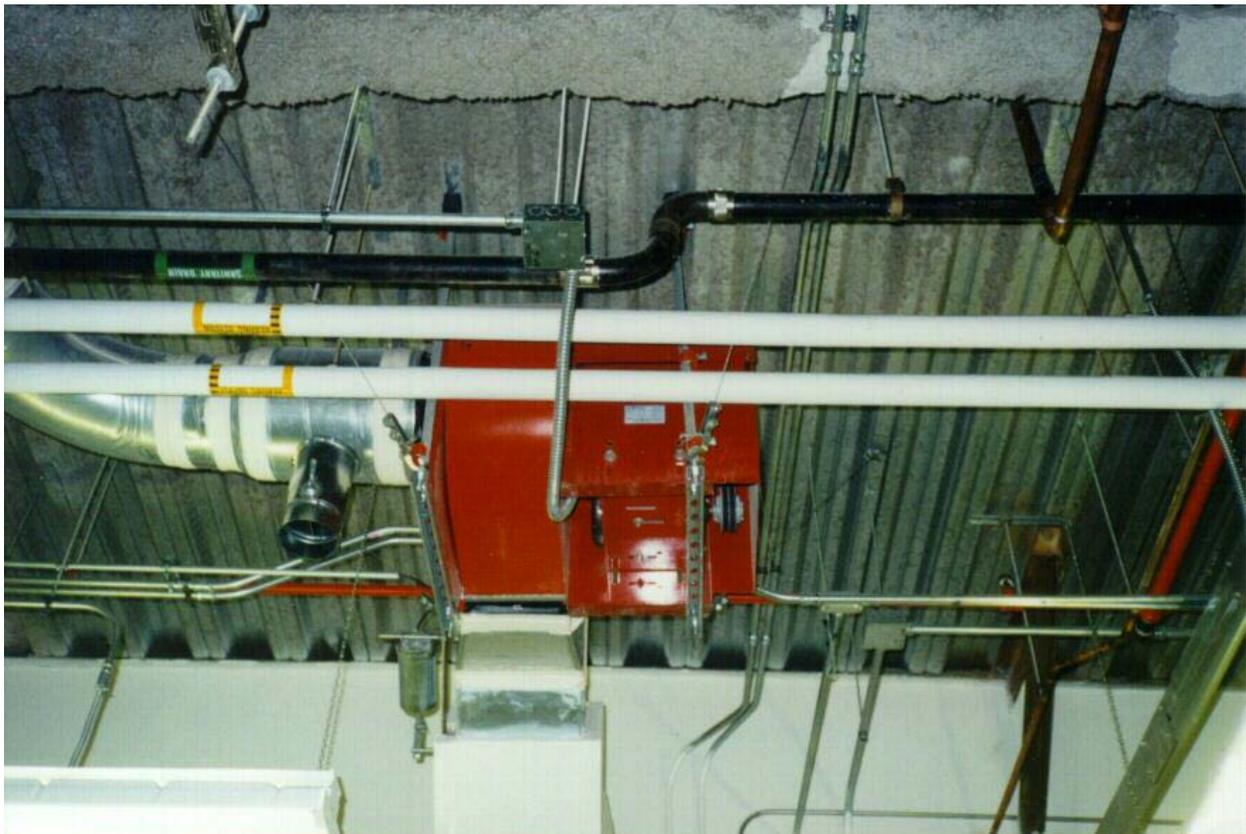


Figure 6.4.1.5-4 Suspended equipment with cable braces (Photo courtesy of Mason Industries).

Mitigation Details

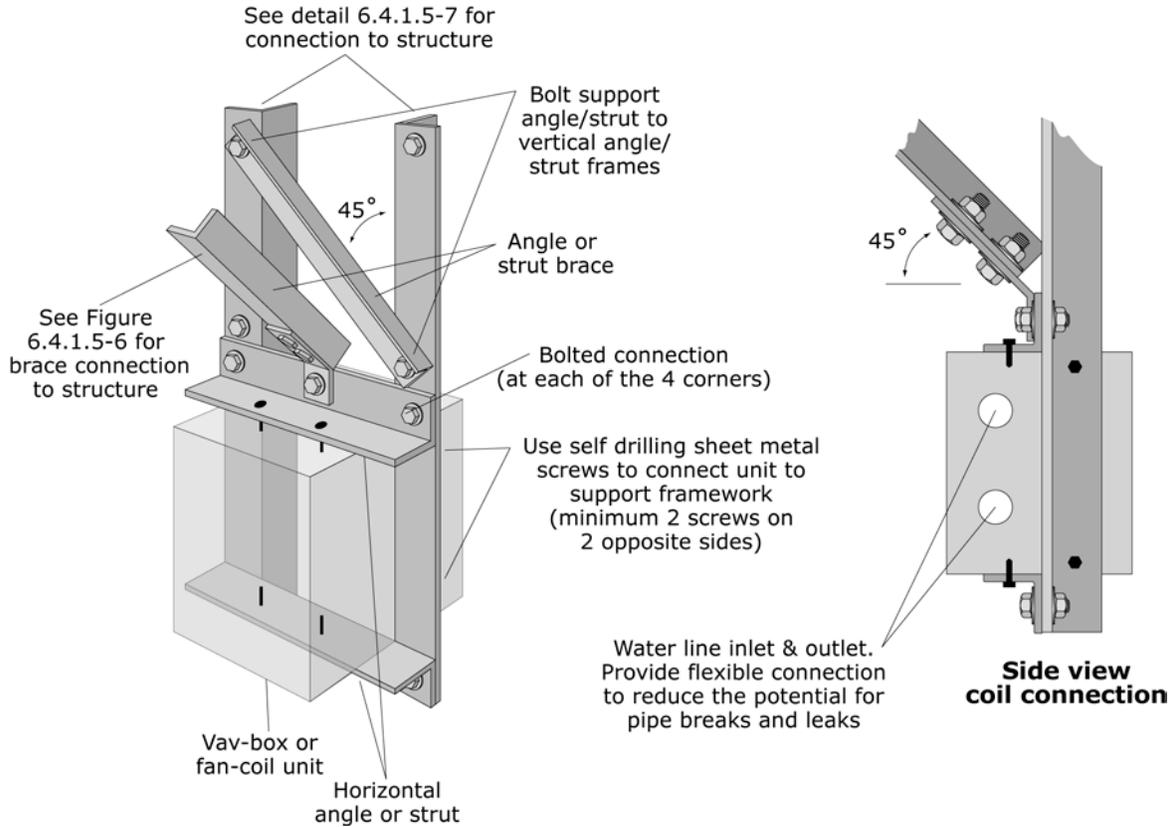


Figure 6.4.1.5-5 HVAC equipment suspended in-line with ductwork (ER).

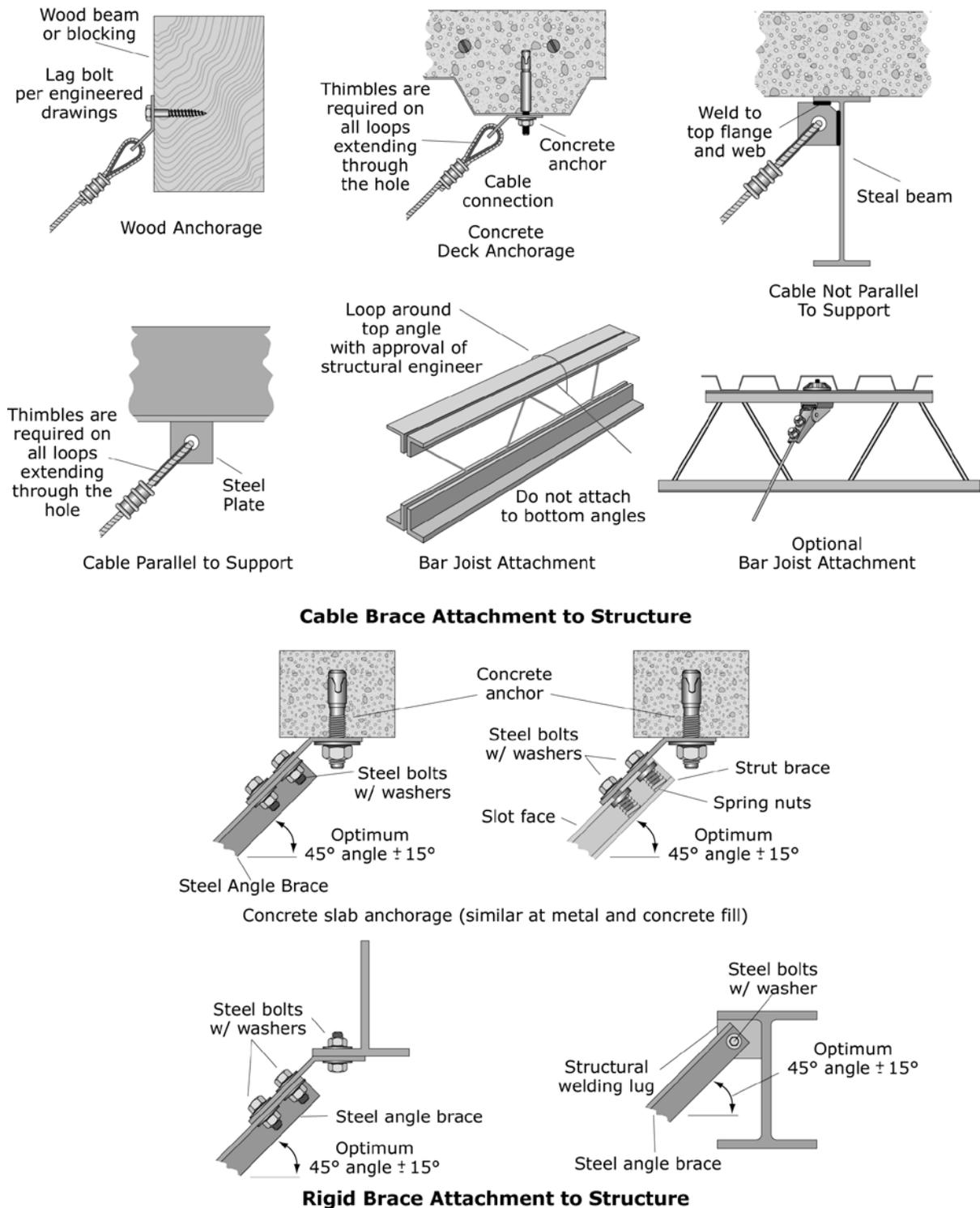


Figure 6.4.1.5-6 Cable and rigid brace attachments to structure (ER).

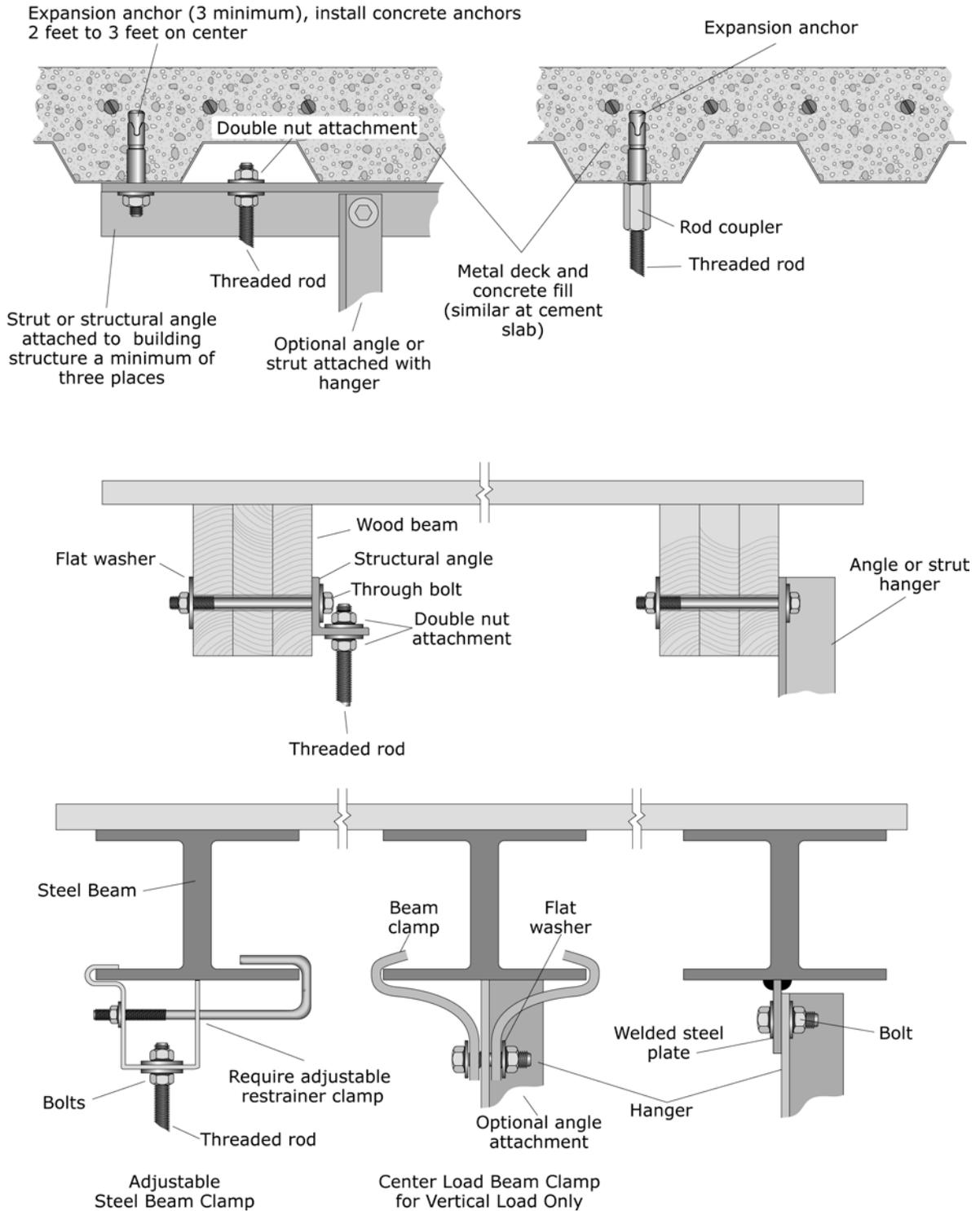


Figure 6.4.1.5-7 Hanger attachment details (ER).