

6.5 FURNITURE, FIXTURES, EQUIPMENT AND CONTENTS

6.5.3 COMPUTER AND COMMUNICATION EQUIPMENT

6.5.3.1 COMPUTER ACCESS FLOORS AND EQUIPMENT

Computer access floors are raised floor systems used in many facilities with heavy use of computer equipment; these provide space to run the equipment cables under the flooring.

TYPICAL CAUSES OF DAMAGE

- Access floors may collapse if not adequately braced and anchored.
- Equipment located on access floors that are not anchored or tethered may slide and hit a wall or other equipment and may suffer internal damage. Equipment castors can get lodged in floor openings.

Damage Examples



Figure 6.5.3.1-1 Temporary bracing for access floor collapsed in the 1994 magnitude-6.7 Northridge Earthquake (Photo courtesy of Wiss, Janney, Elstner Associates).



Figure 6.5.3.1-2 Damage to access floor with short anchored pedestals in the 2010 magnitude-6.7 Chile Earthquake; floor did not have lateral bracing. Note many tiles misaligned (Photos courtesy of Antonio Iruretagoyena, Rubén Boroschek & Associates).



Figure 6.5.3.1-3 Undamaged access floor with braced pedestals in the 2010 Chile Earthquake (Photo courtesy of Rodrigo Retamales, Rubén Boroschek & Associates).

SEISMIC MITIGATION CONSIDERATIONS

- ASCE 7–10, *Minimum Design Loads for Buildings and Other Structures* (ASCE, 2010), requires that access floors be designed as architectural components; Section 13.5.7.2 identifies the requirements for “special access floors.” For areas of high seismicity, the hazard to the flooring and associated equipment can be reduced by purchasing and installing systems meeting the requirements for special access floors.
- Access floor base pedestals should be anchored to the floor slab; taller pedestals may also need diagonal bracing. In zones of low or moderate seismicity, or where the floor height is less than 12 inches high, it may be feasible to adhere the pedestals to the floor slab rather than anchoring them. Check the internet for vendors who supply access floors with a seismic capacity rating.
- Equipment placed on access floors should be tethered; heavy equipment should be anchored to structural slab below. Anchorage may be accomplished through installation of an independent frame beneath the equipment. Alternatively, the equipment may be anchored to properly designed access floor framing, or supplemental bracing components.
- If unrestrained equipment on castors is present, cable openings through access floor should have lips to prevent the wheels from getting stuck.
- Proprietary base isolation systems are also available. The equipment is anchored to the isolation base and the isolation base is anchored to the structural slab.

Mitigation Examples



Figure 6.5.3.1-4 Raised floor braced with strut (Photo courtesy of Maryann Phipps, Estructure).



Figure 6.5.3.1-5 Data rack bolted through access floor to supplemental strut bracing below (Photo courtesy of Maryann Phipps, Estructure).

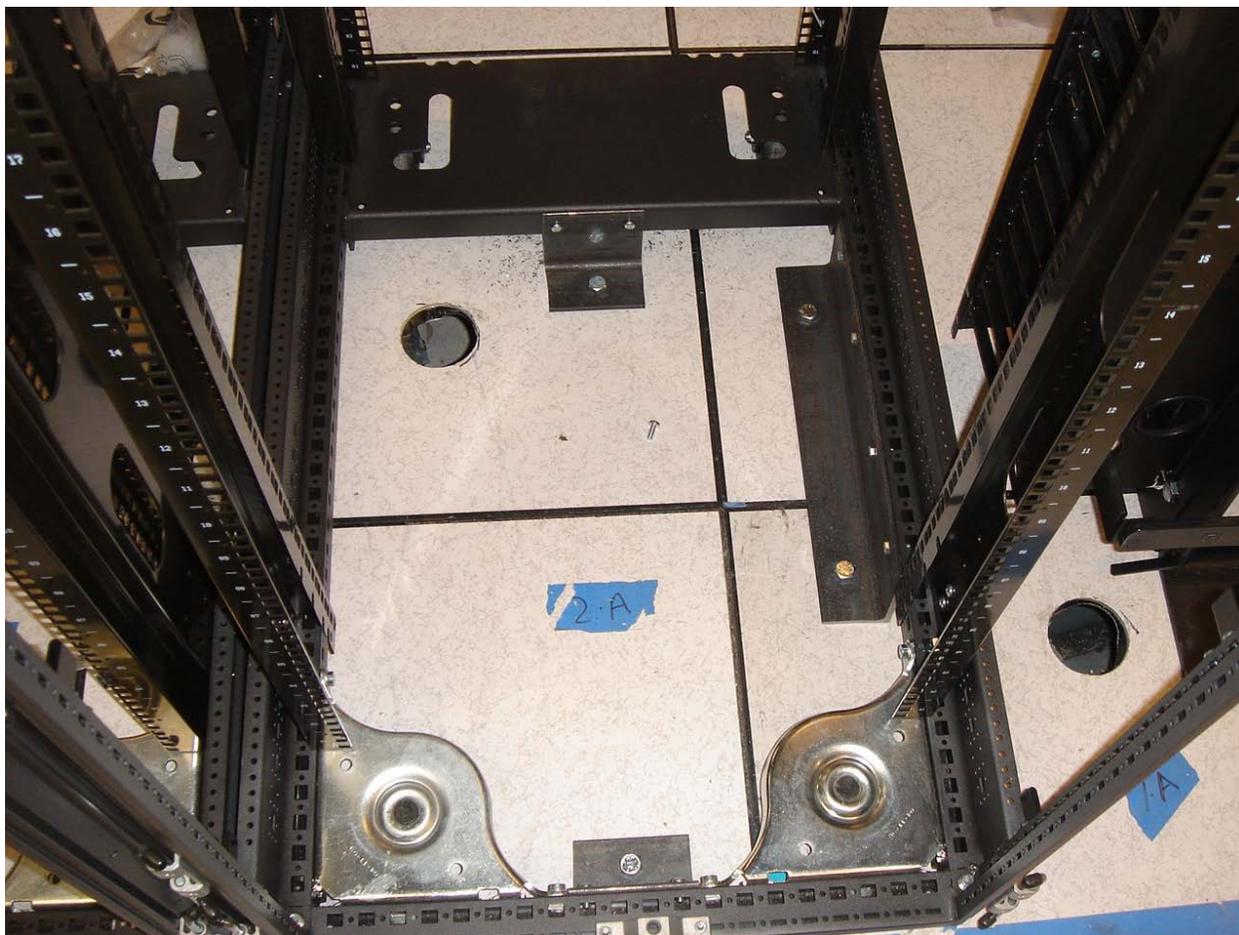


Figure 6.5.3.1-6 Base of data cabinet with supplemental angles bolted to strut bracing below floor (Photo courtesy of Maryann Phipps, Estructure).

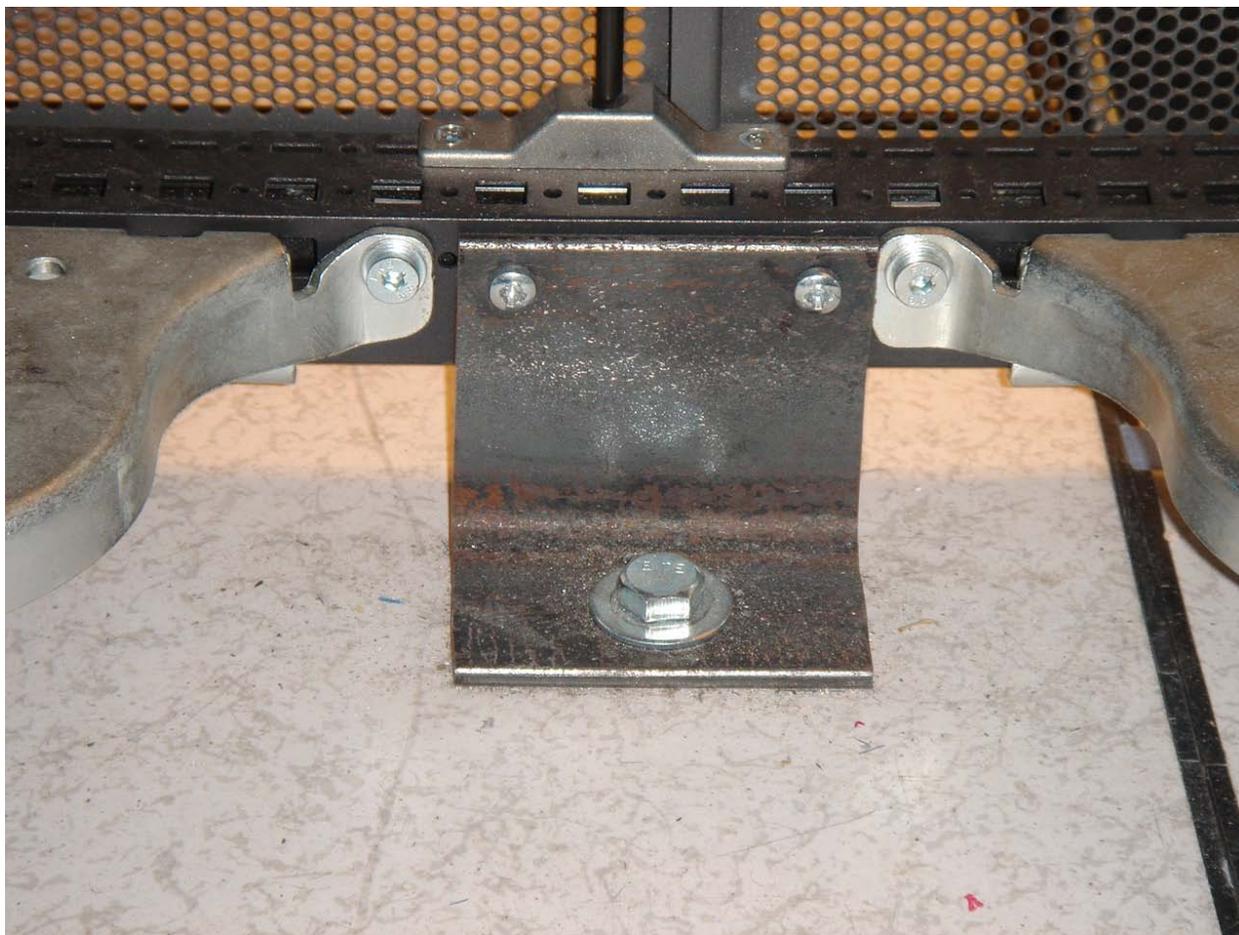
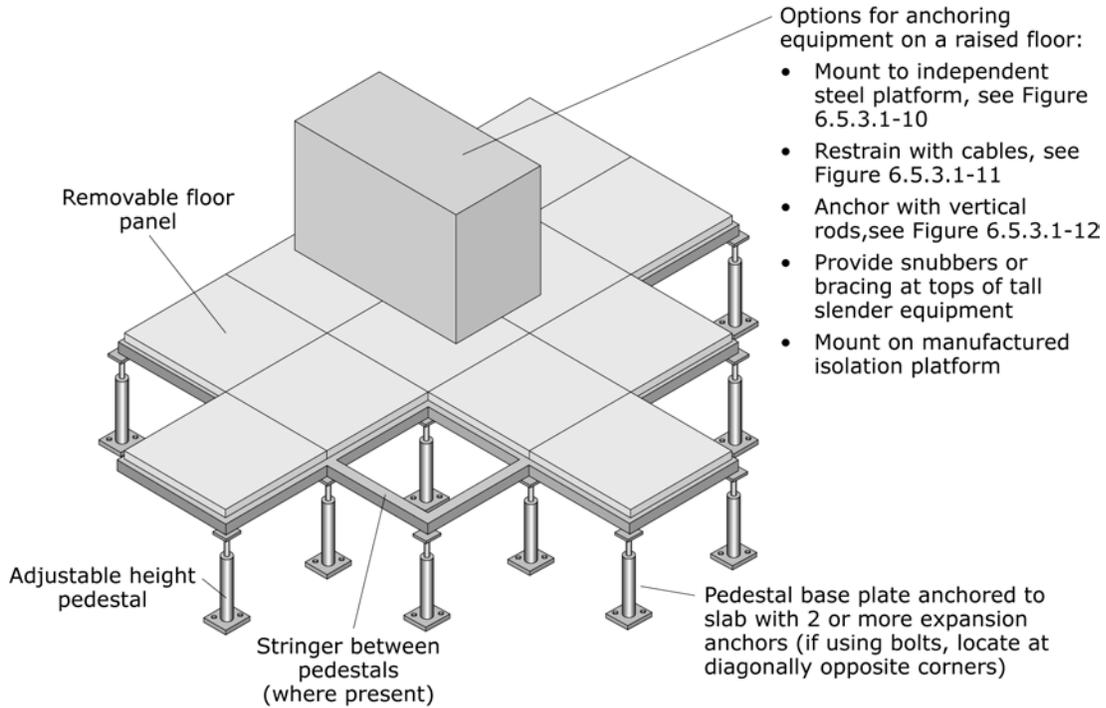


Figure 6.5.3.1-7 Close-up of supplemental angles connecting data cabinet to strut bracing below floor (Photo courtesy of Maryann Phipps, Estructure).

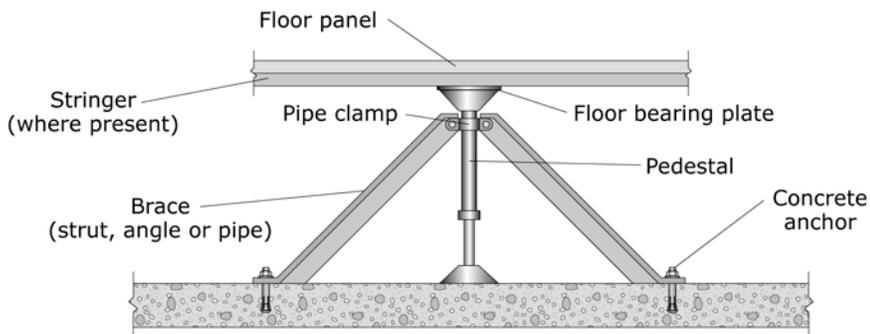


Figure 6.5.3.1-8 Strut framing added to brace data cabinet located on access floor. Bolts from angles above are connected to strut framing below (Photo courtesy of Maryann Phipps, Estructure).

Mitigation Details



Cantilevered Access Floor Pedestal

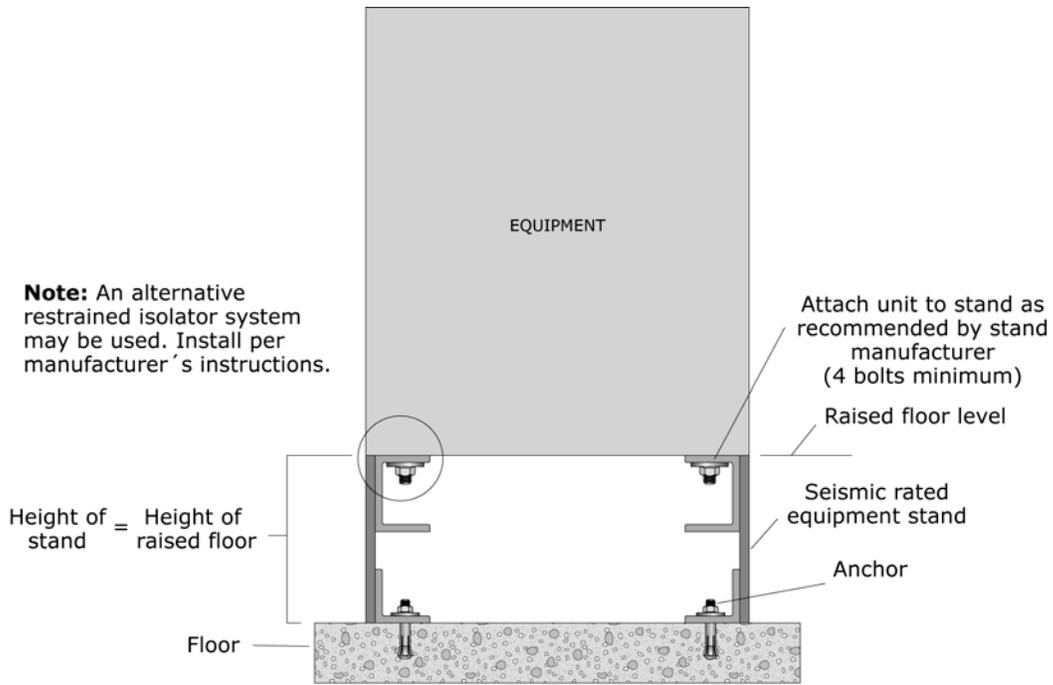


Braced Access Floor Pedestal

(use for tall floors or where pedestals are not strong enough to resist seismic forces)

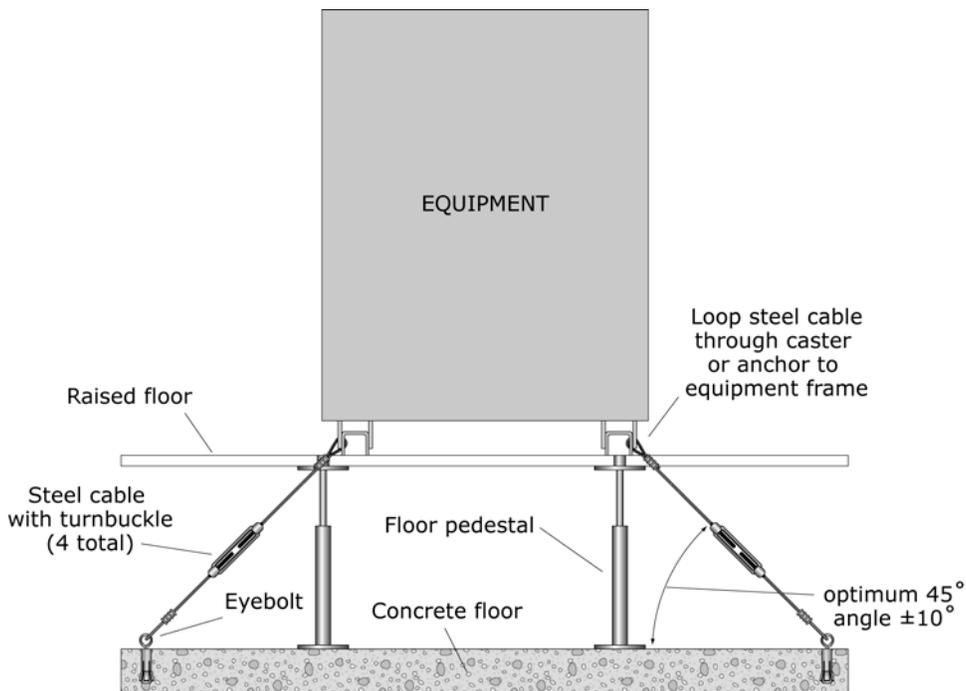
Note: For new floors in areas of high seismicity, purchase and install systems that meet the applicable code provisions for "special access floors."

Figure 6.5.3.1-9 Equipment mounted on access floor (ER).



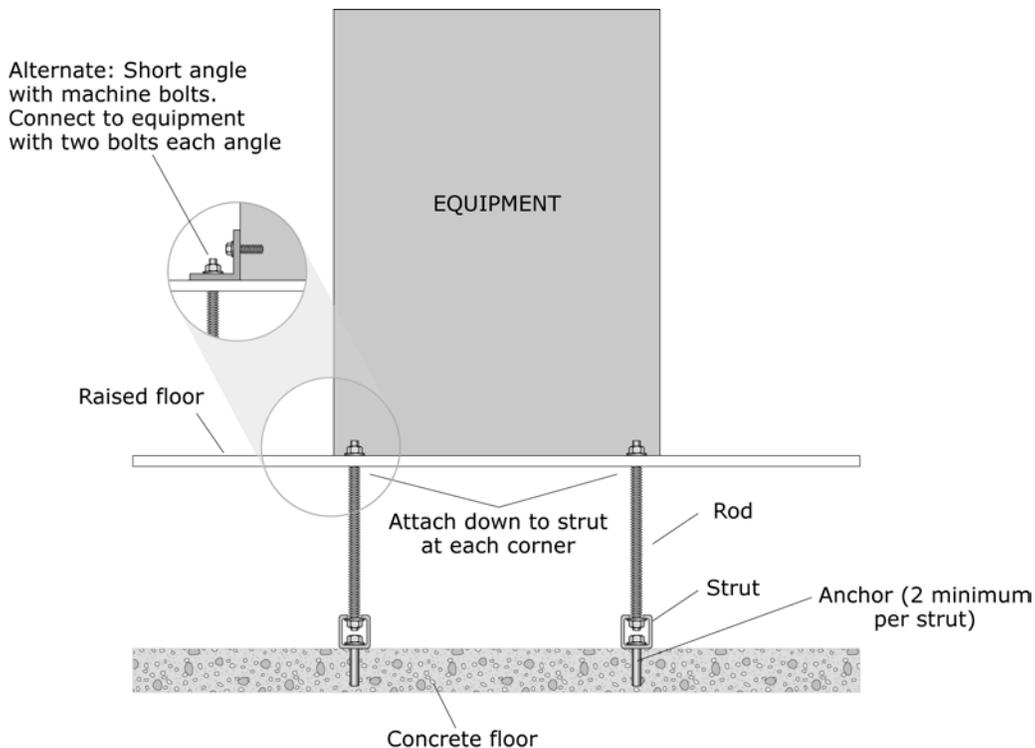
Equipment installed on an independent steel platform within a raised floor

Figure 6.5.3.1-10 Equipment mounted on access floor - independent base (ER).



Equipment restrained with cables beneath a raised floor

Figure 6.5.3.1-11 Equipment mounted on access floor – cable braced (ER).



Equipment anchored with vertical rods beneath a raised floor

Figure 6.5.3.1-12 Equipment mounted on access floor – tiedown rods (ER).