

6.5 Furniture, Fixtures, Equipment and Contents

6.5.5 *Miscellaneous Furniture, Fixtures and Equipment*

6.5.5.3 Miscellaneous Furniture and Fixtures

Furniture and fixtures come in all shapes and sizes. Items on castors will roll; squat items are likely to slide; medium height items may slide, rock back and forth, or overturn; tall narrow furniture is likely to overturn. This category provides general recommendations for a wide range of items such as shop and kitchen equipment, vending machines, large office copiers, pianos, china hutches, and entertainment centers.

Typical Causes of Damage

- Unrestrained items may slide, impact other items, tip, and/or overturn. Failure of one item may damage others or cause the collapse of other items.
- Contents supported on furniture or fixtures may fall, break, or spill.

DAMAGE EXAMPLES



Figure 6.5.5.3-1 Residential damage in the 1994 magnitude-6.7 Northridge Earthquake (Photo courtesy of Wiss, Janney, Elstner Associates).



Figure 6.5.5.3-2 Existing condition: Unrestrained kitchen equipment (Photo courtesy of EQE for the Salt Lake City School District).



Figure 6.5.5.3-3 Equipment on wheels did well during the 2010 magnitude-8.8 Chile Earthquake; there were no reported injuries or examples of overturning related to equipment mounted on wheels. Centrifuges on wheels shown in photo (Photo and information courtesy of Bill Holmes, Rutherford & Chekene).

Seismic Mitigation Considerations

- Many proprietary items are available to restrain a wide variety of furniture and fixtures. Check the internet for seismic safety fasteners and security restraints.
- Provide floor or wall anchorage for vulnerable items, especially items near doors, exits, beds or other locations where people spend many hours. Anchor freestanding items together and to the floor. Provide tethers for items like kitchen equipment, vending machines, or grand pianos. Provide edge restraints and drawer and cabinet latches.
- Canvas or metal straps can be used to attach some items where it is not acceptable to penetrate the furniture or housing. Multiple tethers may be needed for strength and stability; for instance a tether to only one leg of a grand piano may pull the leg off.
- Where several items need to be tethered and the edges do not line up with studs in the adjacent wall, a continuous steel angle or wood 2x4 may be attached to the wall and

then the tether restraints in turn attached to the steel angle wood stud. Where items are attached to partitions, verify that the partition and attachment or bracing to the structure above are adequate for the imposed loading.

MITIGATION EXAMPLES



Figure 6.5.5.3-4 Anchored wood key cabinets in industrial plant control room; note top and bottom units anchored together and both anchored to wall (Photo courtesy of Eduardo Fierro, BFP Engineers).



Figure 6.5.5.3-5 Typical tethering details for kitchen equipment and vending machines. Tether provided on both sides of equipment and does not penetrate the equipment housing (Photos courtesy of Maryann Phipps, Estructure).