6.3 Architectural Components

6.3.2 Interior Partitions

6.3.2.3 Glazed Partitions

Glazed partitions are often used in office corridors or around conference rooms to provide enhanced interior lighting. Glazing may be found in light, heavy, or demountable partitions; glazed partitions may be either full height or partial height. Glazing assemblies may be vulnerable to earthquake damage; glazed partitions must have lateral support but should be isolated from the movement of the surrounding structure.

Provisions

BUILDING CODE PROVISIONS

Glazed partitions are subject to the provisions of Chapter 24 of the 2012 IBC, *International Building Code*, (ICC 2012), and are subject to the same requirements as exterior glazing. Seismic design is governed by ASCE/SEI 7-10, *Minimum Design Loads for Buildings and Other Structures (*ASCE, 2010). ASCE/SEI 7-10 focuses on providing a mechanism to accommodate building deformations, or sufficient ductility to accommodate drift without a failure of the glazed partition:

- The building code has specific requirements on the type of glazing that may be used in different areas. Tempered glass is required within 10' above a walking surface under some circumstances; check applicable code requirements. Wired glass with a grid of steel wire embedded in the pane is an option for some situations where fire and impact rating are not also required. ANSI A97.1 *Safety Glazing Materials Used in Buildings* (ANSI, 2004) is the standard that defines different kinds of safety glass.
- The design of glazing assemblies depends on the calculated inter-story drift for the building, and the type of glass. Like exterior glazing assemblies, they are sensitive to both accelerations and deformations and are subject to both in-plane and out-of-plane failures.

RETROFIT STANDARD PROVISIONS

ASCE/SEI 41-06, *Seismic Rehabilitation of Existing Buildings* (ASCE, 2007) classifies glazed partition systems as both acceleration and deformation sensitive.

- Glazed partition systems are subject to the requirements of ASCE/SEI 41-06 when

  - The performance level is Immediate Occupancy or Life Safety in high, moderate, and low seismicity areas, or
  - The performance level is Hazards Reduced in high, moderate, and low seismicity areas and the glazing is located over areas of public access or egress.
- ASCE/SEI 41-06 does not contain detailed acceptance criteria for glazed partitions. However, the behavior of these systems is very similar to glazed curtain wall systems. A drift analysis should be performed to determine if the glazing can accommodate the expected story drifts, and the anchorage of the glazed partition under seismic loading. The evaluation approach is similar to that used in ASCE/SEI 7-10.

Typical Causes of Damage

- Glazing assemblies may be damaged as a result of either in-plane or out-of-plane loading unless properly detailed. Failure of glazed partitions may create falling hazards, block corridors, and endanger occupants attempting to exit from damaged buildings. Glazing is particularly vulnerable in assemblies where there is insufficient clearance in the glazing pockets or insufficient isolation from the structure to accommodate inter-story drifts.
- Full height glazed partitions in flexible structures may fail unless they are isolated from the building deformations. In addition to broken glass, the mullions, gaskets, or setting block may be damaged. Damage may also include cracked or spalled finishes surrounding the glazing, deformed partition framing, and failed connections. Partial height glazed partitions may damage ceiling framing to which they are attached or can fall out-of-plane unless they are laterally braced to the structure above. Particularly hazardous is glazing used at the top portion of partial height partitions where it can fall from increased height; such glazing is often used to allow light transmission but reduce sound transmission.
- Glazed partitions may be damaged by impact from unanchored furniture or contents or suspended items without appropriate sway bracing.

DAMAGE EXAMPLES

Figure 6.3.2.3-1 Glass shards fallen from the top of partial height office partitions in the reception area during the magnitude-8.8 2010 Chile Earthquake (Photo courtesy of Rodrigo Retamales, Rubén Boroschek & Associates).

Figure 6.3.2.3-2 Damage to glazed doors at the Concepción airport in the 2010 Chile Earthquake. In the top photo the glazing in the sliding glass door shattered; in the lower photo the glass is intact but the door frames are misaligned (Photos courtesy of Rodrigo Retamales, Rubén Boroschek & Associates).

Figure 6.3.2.3-3 Failed wood framed glazing assembly in the 2010 Chile earthquake (Photo courtesy of Eduardo Fierro, BFP Engineers). The wood framing was held in place by metal or rebar brackets embedded in the masonry wall. The adobe wall on the left of the door collapsed and the brackets on the right side pulled out of the brick masonry wall (lower right). The glazing assembly at the rear entrance of the chapel was anchored overhead to the wood balcony framing and was undamaged.

Seismic Mitigation Considerations

- Architectural Design for Earthquake (Charleson, 2007) provides discussion and graphics pertaining to seismic detailing for glazing and glazed partitions. In addition, the American Architectural Manufacturer's Association (AAMA) has published guidelines for testing glazing assemblies and determining Δfallout. These guidelines may be obtained at www.aamanet.org.
- Glazing may be found in heavy, light, or demountable partitions; glazed partitions may be either full height or partial height. Anchorage details for heavy partitions are shown in Section 6.3.2.1, light partition details are shown in Section 6.3.2.2, and demountable partition details are shown in Section 6.5.5.2. The nonstructural surround must be self-supporting and not deliver loads to the glazing assembly from above or either side; thus, wall elements above the glazed portion may need to be suspended from above or

have an adequate lintel so the weight does not bear on the glazing or mullions. A deep leg slip track could be installed either at the top of the mullion or at the structure above, depending on the structural framing configuration. Note that because glazed partitions must meet the seismic drift limits for glass components, glazed partitions may require additional or different bracing than a similar partition without glazing. Also note that where the partition is properly detailed to be isolated from the seismic inter-story drift of the surrounding structure, the glass-to-frame clearance required around each pane of glazing is reduced. Special care should be given when detailing glass on intersecting planes such as corners and reentrant corners as these locations are particularly vulnerable to damage.

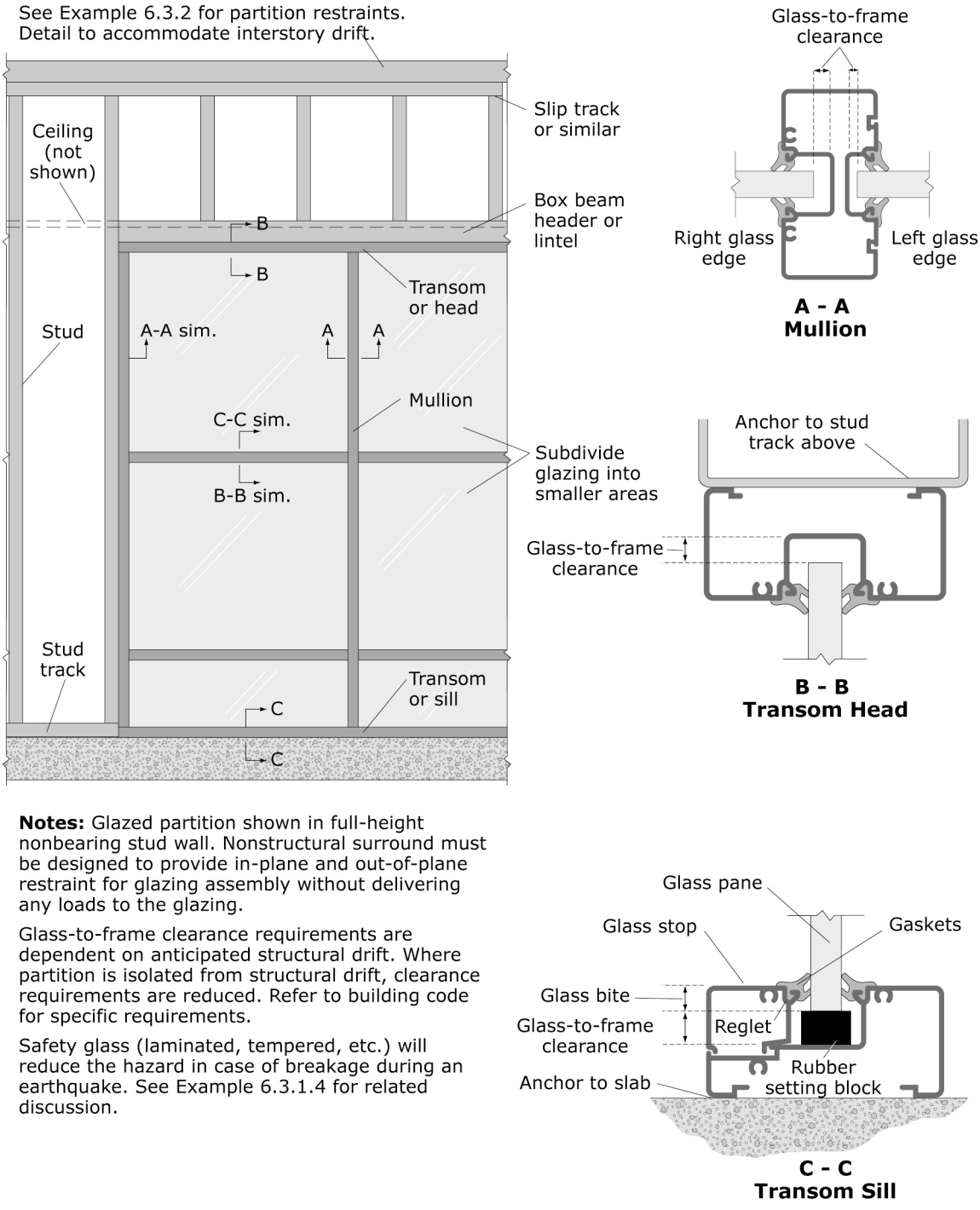
- Safety glazing, such as laminated or tempered glass, may be required in areas adjacent to stairways or subject to human impact; check the applicable code for specific requirements. Use of safety glass will reduce the hazard in the event that some of the glazing breaks in an earthquake.
- All glass assemblies have become common for enclosing lobby areas or atria in large commercial buildings. These typically are suspended from specially designed steel framing and may include details such as glass fins and steel connecting hardware. These assemblies are typically left free to slip at the bottom and must be specially detailed at edges and corners to avoid impact with adjacent panes.
- Glazed partitions should not be used to provide lateral support to other nonstructural components such as book shelves, electrical panels, file cabinets, unless adequate lateral resistance can be shown. In addition, such items should not be located where they can tip, fall, or swing and break the partition glazing.
- The use of glazed partitions should be avoided in emergency exit corridors or stairways; limiting the height and area of partition glazing or using multiple smaller panes of glass may be less hazardous than larger and taller panes.

MITIGATION EXAMPLES

Figure 6.3.2.3-4 Glazed partition supported at base with slip track at top; partition above glazing suspended and braced from above. Glazing subdivided into relatively small panels with ample clearance at mullions (Photo courtesy of Cynthia Perry, BFP Engineers).

Figure 6.3.2.3-5 Specialized glazing details for glass dome using specialty hardware, such as large sealant joints required to accommodate thermal movement and seismic deformations at the California Academy of Sciences, San Francisco, California (Photos courtesy of Cynthia Perry, BFP Engineers).

MITIGATION DETAILS



Notes: Glazed partition shown in full-height nonbearing stud wall. Nonstructural surround must be designed to provide in-plane and out-of-plane restraint for glazing assembly without delivering any loads to the glazing.

Glass-to-frame clearance requirements are dependent on anticipated structural drift. Where partition is isolated from structural drift, clearance requirements are reduced. Refer to building code for specific requirements.

Safety glass (laminated, tempered, etc.) will reduce the hazard in case of breakage during an earthquake. See Example 6.3.1.4 for related discussion.

Figure 6.3.2.3-6 Details for full-height glazed partition (ER).