

6.3 ARCHITECTURAL COMPONENTS

6.3.1 EXTERIOR WALL COMPONENTS

6.3.1.2 ANCHORED VENEER

Anchored veneers are typically masonry, stone or stone slab units that are attached to the structure by mechanical means. These units and their connections must be designed to accommodate the anticipated seismic drift; otherwise they may pose a significant falling hazard.

TYPICAL CAUSES OF DAMAGE

- Anchored veneers and their connections may be damaged by inertial forces and by building distortion; units located at corners and around openings are particularly vulnerable.
- Rigid connections may distort or fracture if they do not have sufficient flexibility to accommodate the seismic drift; veneer units may crack, spall, or become completely dislodged and fall.
- Deterioration or corrosion of the mechanical connections is a significant concern; corroded connections may fail prematurely. Maintaining watertightness at joints is important for the longevity of the anchors.

Damage Examples

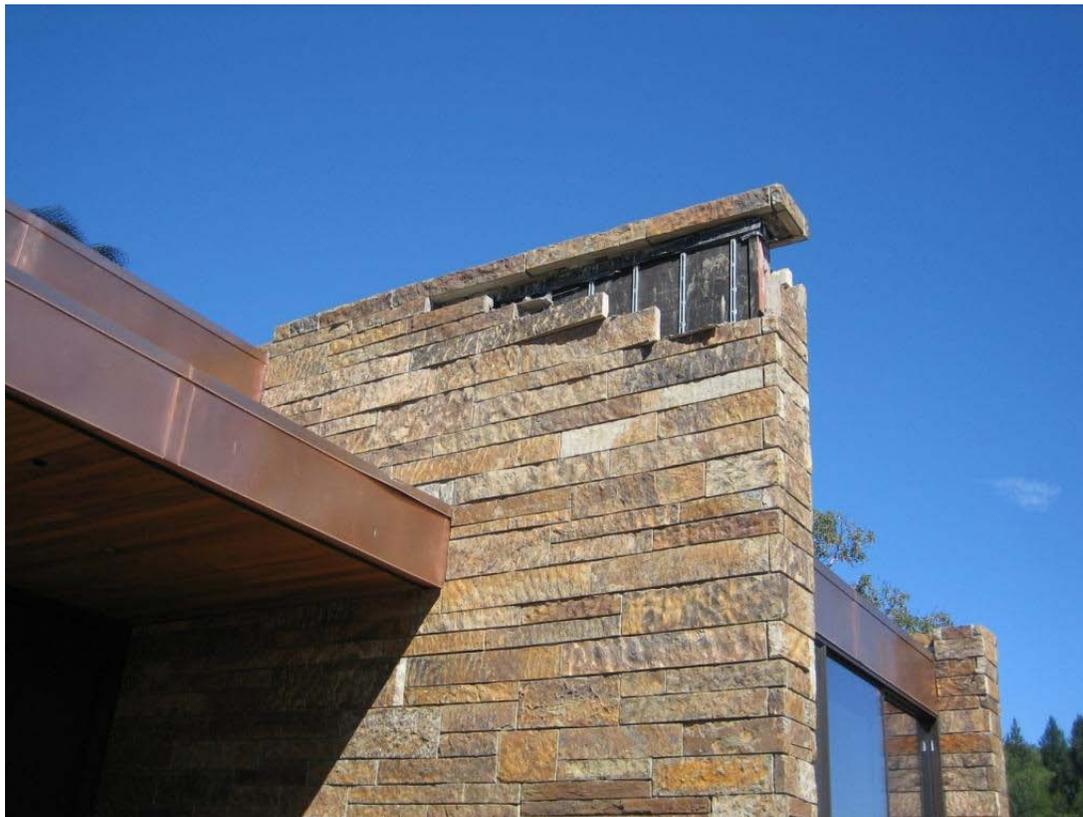


Figure 6.3.1.2-1 Fallen sandstone veneer as a result of a magnitude-4.4 earthquake in northern California. Post-earthquake investigation revealed missing dovetail anchors, missing pencil rods, and weak stone-to-mortar bond (Photo courtesy of Simpson Gumpertz and Heger).



Figure 6.3.1.2-2 Fallen sandstone veneer as a result of a magnitude-4.4 earthquake (Photo courtesy of Simpson Gumpertz and Heger).



Figure 6.3.1.2-3 Rubble from failed anchored veneer as a result of the 1994 Northridge Earthquake (Photo courtesy of Robert Reitherman).

SEISMIC MITIGATION CONSIDERATIONS

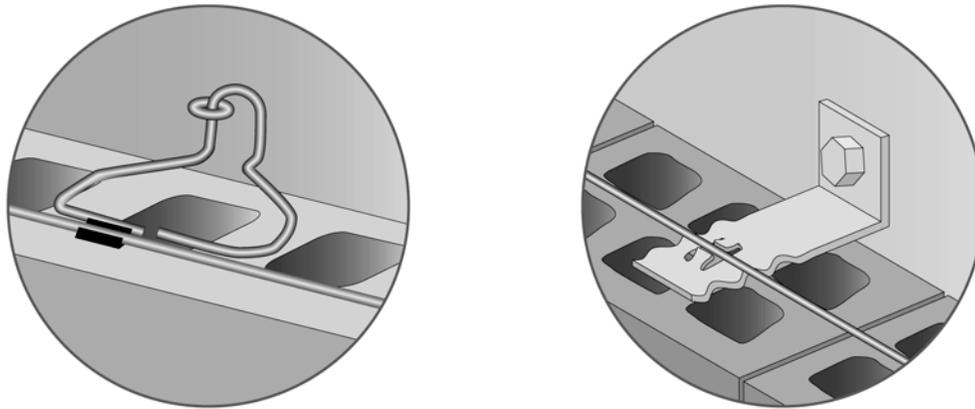
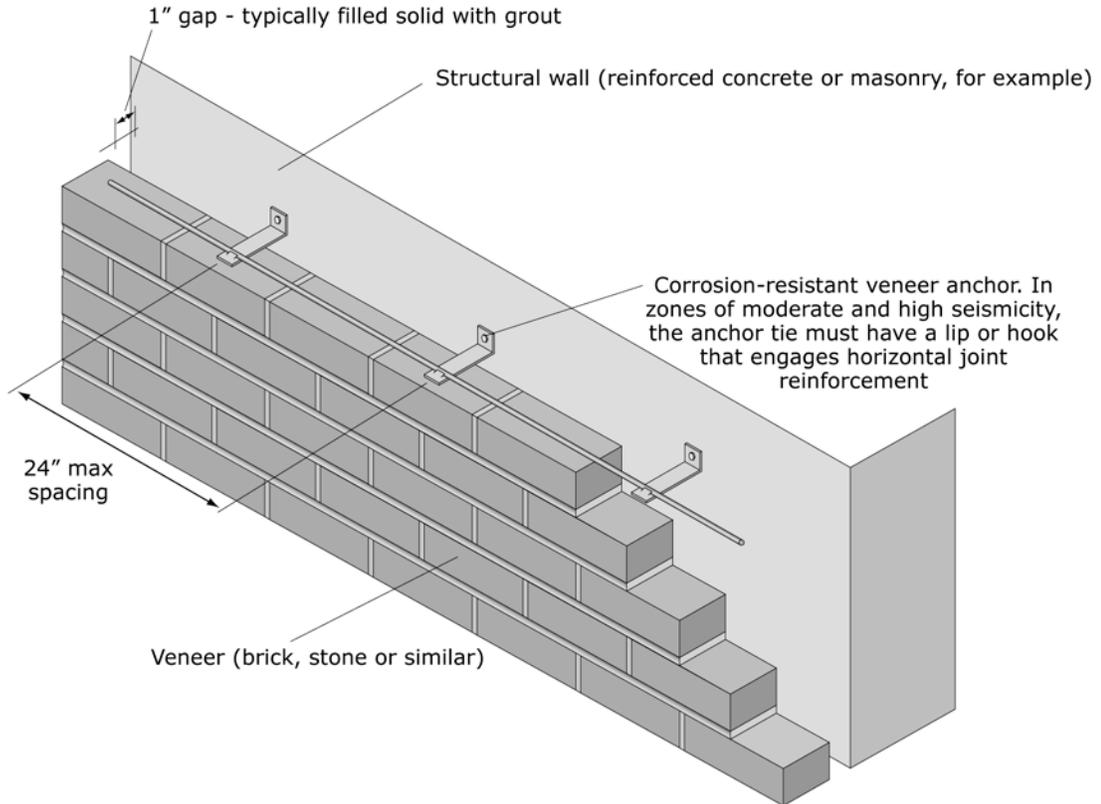
- ASCE/SEI 7-10, *Minimum Design Loads for Buildings and Other Structures* (ASCE, 2010), contains a number of prescriptive requirements and limitations on the use of anchored veneer. These include height limits, drift limits, deflection limits, limits on the use of combustible structural supports such as wood, limits on basic wind speed, cavity size limits, mortar bed minimum thickness limits, and minimum tie spacing limits. Check the applicable code requirements when considering seismic mitigation options.
- Existing veneer anchors should be checked periodically and corroded anchors should be replaced. Tie spacing should be compared with current code requirements to evaluate whether the anchorage is sufficient. Additional anchors may reduce the falling hazards.
- There are many vendors who supply veneer anchors; these are typically metal wires or clips with a positive attachment to the structural backing that are embedded in the veneer mortar bed. The seismic version of these anchors requires an additional horizontal wire placed in the mortar bed and attached to the anchor. Some examples of these seismic veneer anchors are shown, others can be found online.

Mitigation Examples



Figure 6.3.1.2-4 Installation of stone veneer showing anchorage to steel dovetail clips which are fastened to steel studs bolted to the grouted reinforced masonry wall behind (Photo courtesy of Simpson Gumpertz and Heger).

MITIGATION DETAILS



Examples of veneer anchors. There are many proprietary types available

Figure 6.3.1.2-5 Anchored veneer (ER).