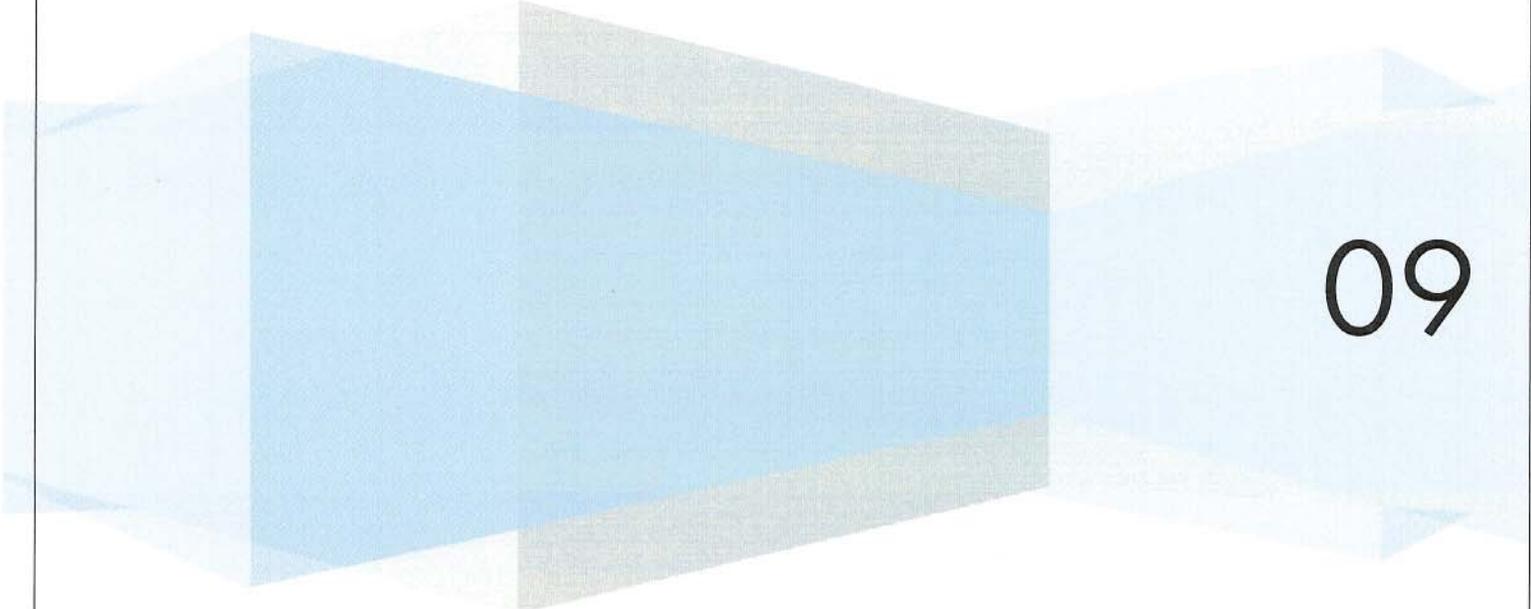


REPAIR OF WOOD FRAMED STRUCTURES WITH BRICK MASONRY VENEERS

Prepared for FEMA



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When the flooding of buildings consisting of wood frame construction and brick veneer occurs, complete demolition is not always required. The following method is suggested as an alternative to a complete demolition. In general, it involves removing the interior wall and ceiling finish materials, wall insulation, and exterior sheathing, and replacing these from inside the building to avoid removal and replacement of the exterior brick veneer. This method does not include any mechanical, electrical, and plumbing systems/components, replacements or repairs. It assumes that any of these systems damaged during, or as a result of the flooding, will have the requisite inspections and replacement work performed. This alternative method is not to be construed as a generic repair procedure applicable to every type of structure at every location within the United States. Local site conditions and requirements govern, and the appropriate experts should be consulted before any work is performed.

In the way of background, all engineering and construction work must conform to the latest addition of any local ordinances that may apply, any applicable national building codes and standards, and good engineering, architectural, and construction industry practices. These building codes include, but are not limited to: The International Code Council's (ICC) *International Building Code*, *The International Residential Code for One- and Two- Family Dwellings*," the American Wood Council's *National Design Specification for Wood Construction*," and the American Concrete Institute's (ACI) *Building Code Requirements and Specifications for Masonry Structures*. If a conflict should exist with any of the local ordinances, codes and standards, the most restrictive condition should be applied.

Prior to the beginning of any repair work, the building must be thoroughly inspected by a licensed professional engineer, or a licensed architect, experienced in the type of construction present to determine the extent of the damage. Partial removal of floor, wall, and ceiling finish materials may be required to expose the underling structural components. Once this inspection is complete, that licensed professional shall have final authorization on the implementation of this procedure. It may not be appropriate for all buildings.

The licensed design professional shall prepare drawings, delineating the detailed extent of the repair work for submission to the local construction officials, so the appropriate permits can be acquired. Since this procedure includes the removal of the sheathing, the retained licensed professional shall pay particular attention to the overall lateral stability of the structure and of the brick veneer. Additional shoring and bracing drawings, along with a sequence of removal and replacement, may also be required to ensure that the integrity of the building, and the brick veneer, is not affected when exposed to any live, wind, or seismic loading conditions during construction.

The licensed design professional shall also inspect the work at each milestone hold-point, and provide a certification to the local construction official, that the work has been done in accordance with the design drawings. The contractor performing the work shall have direct

control and full responsibility for their own construction means, methods, techniques, sequences, procedures and compliance with the latest version of the “Occupational Safety and Health administration (OSHA), Department of Labor, Code of Federal Regulations, 29 CFR Chapter XVII, Part 1926 titled, “*Safety and Health Regulations for Construction.*”

The specific procedure includes the following.

1. Ensure that all electric, gas, and water utilities have been disconnected, de-energized, drained from their mains, and secured to prevent inadvertent re-energization.
2. Cut and remove any effected interior trim, drywall, plaster, and lath. Remove the wall insulation to expose the exterior sheathing.
3. Cut and remove any electrical, plumbing, and HVAC systems to facilitate the installation of the replacement sheathing.
4. Sheathing removal and replacement shall be as follows.

4.1. Small Areas where existing studs are not cut or damaged. [Reference sketch on page 6.]

- 4.1.1 Cut and remove the sheathing board to a location just above the damaged area and in between the studs. Cut all the straps or wall ties that secure the veneer to the exterior face of the sheathing. Also, disconnect any flashing from the face of the sheathing being removed. This existing flashing will be reused.

Additional sheathing may need to be cut and removed above the damaged area if the replacement sheathing is required to be staggered vertically by the Building Code or any local ordinances. ***[NOTE: Brick veneer is not meant to be a free standing element. Removing all of the damaged sheathing and subsequently all the anchors and wall ties securing that veneer to the building will likely result in damage of that same veneer that this procedure is attempting to save. Removing the sheathing forcibly may also cause damage to the veneer if any of the straps or wall ties remain connected to that sheathing. This work must be done carefully with the contractor’s best skill and attention. Additional bracing and shoring over and above that required for the stability of the building may be required specifically for the veneer.]***

- 4.1.2 Cut the nails securing the remaining strips of sheathing from the exterior face of the studs with a reciprocating saw and remove those strips.

- 4.1.3 Large protrusions of mortar must be carefully removed from the inside face of the brick veneer in areas where the new anchor bolts are to be installed so that the location of the brick face is not misjudged when holes are drilled for the new anchor bolts.

- 4.1.4 Completely clean and remove any debris from the space between the studs and from the space between the exterior face of the studs and the back of the brick masonry veneer.
- 4.1.5 To prevent mildew or mold growth that may be a contaminate from floodwater, apply water, bleach, mildewcide, and Portersept® (or similar product) to the brick veneer and any affected wood framing.
- 4.1.6 Secure a pair of two-inch by four-inch studs near the edges of the replacement sheathing board panel. These studs shall be installed along the interior face of the sheathing and 15 or 30 pound felt shall be installed along the exterior face. The weight of the felt paper shall be equivalent to the weight of the felt paper removed. Waterproof paint can be used as an alternative to the felt paper. If the airspace between the brick veneer was originally flashed, the replacement must be counterflashed to ensure that any moisture that passes through the masonry does not become entrapped. The flashing that remains and the new studs that are installed shall be trimmed as required to facilitate the installation of the new panel and flashing. A sketch of that counterflashing is included at the end of this procedure on page 8.

The sheathing on the new panel must overlap the exterior face of the existing studs when it is installed, so the location of the new studs on the new sheathing and the width of that new sheathing must be adjusted to account for the existing stud locations. For example, if the existing studs are spaced 16 inches on center, the replacement panel will be cut to a 16 inch width.

The sheathing along the edges of the individual panels may have to be chamfered based on the amount of space available between the studs and the brick veneer to facilitate installation.

Spray foam seal onto the edges of the existing sheathing and the sheathing of the new panels, in the event more than one panel is required, to act as a moisture barrier. The replacement panels will then be fitted into the space between the existing studs. If existing flashing is present, ensure that the new counterflashing overlaps it by a minimum of 2 inches. The new panel studs are then secured to the existing studs.

- 4.1.7 Install and secure two by four cross braces between the new panel studs at each location where the existing brick anchors/straps/ties were disconnected. Omit from the specific locations that were previously flashed. Drill holes through these cross braces and into the brick veneer. Install an anchor bolt (masonry toggle or epoxy bolt) through each and into the brick.

4.2. Large Areas where existing studs are cut or damaged. [Reference sketch on page 7.]

4.2.1 Provide a temporary load bearing wall no more than 3 feet inboard of the wall to be removed. If the wall to be removed is located along the second floor of a building, additional temporary walls must be built directly beneath it along the first floor and basement in order to ensure proper load transfer. This temporary wall is to carry all anticipated/required loadings from its highest point of support down through the structure to the ground floor or basement, whichever is lower. Wood dunnage may be required along any concrete slabs on grade to ensure that damage does not occur. These additional walls will not be required if their omission is certified by a licensed professional.

4.2.2 Cut the existing studs at or above the sheathing board to be replaced. Then cut and remove the sheathing board to a location just above the damaged area and in between the studs that will remain. Cut all the straps or wall ties that secure the veneer to the exterior face of the sheathing. Also, disconnect any flashing from the face of the sheathing being removed. This existing flashing will be reused.

Additional sheathing may need to be cut and removed above the damaged area if the replacement sheathing is required to be staggered vertically by the Building Code or any local ordinances. ***[NOTE: Brick veneer is not meant to be a free standing element. Removing all of the damaged sheathing and subsequently all the anchors and wall ties securing that veneer to the building will likely result in damage of that same veneer that this procedure is attempting to save. Removing the sheathing forcibly may also cause damage to the veneer if any of the straps or wall ties remain connected to that sheathing. This work must be done carefully with the contractor's best skill and attention. Additional bracing and shoring over and above that required for the stability of the building may be required specifically for the veneer.]***

4.2.3 Cut the nails securing the remaining strips of sheathing from the exterior face of the studs with a reciprocating saw and remove those strips.

4.2.4 Large protrusions of mortar must be carefully removed from the inside face of the brick veneer in areas where the new anchor bolts are to be installed so that the location of the brick face is not misjudged when holes are drilled for the new anchor bolts.

4.2.5 Completely clean and remove any debris from the space between the studs and from the space between the exterior face of the studs and the back of the brick masonry veneer.

4.2.6 To prevent mildew or mold growth that may be a contaminate from floodwater, apply water, bleach, mildewcide, and Portersept® (or similar product) to the brick veneer and any affected wood framing.

4.2.7 Replacement sheathing board is secured to new two-inch by four-inch studs (or two-inch by six-inch studs if two by sixes were removed) positioned so that they sister the previously cut studs. Secure a pair of two-inch by four-inch studs near the edges of the replacement sheathing board panel. These studs shall be installed along the interior face of the sheathing and 15 or 30 pound felt shall be installed along the exterior face. The weight of the felt paper shall be equivalent to the weight of the felt paper removed. Waterproof paint can be used as an alternative to the felt paper. If the airspace between the brick veneer was originally flashed, the replacement must be counterflashed to ensure that any moisture that passes through the masonry does not become entrapped. The flashing that remains and the new studs that are installed shall be trimmed as required to facilitate the installation of the new panel and flashing. A sketch of that counterflashing is included at the end of this procedure on page 8.

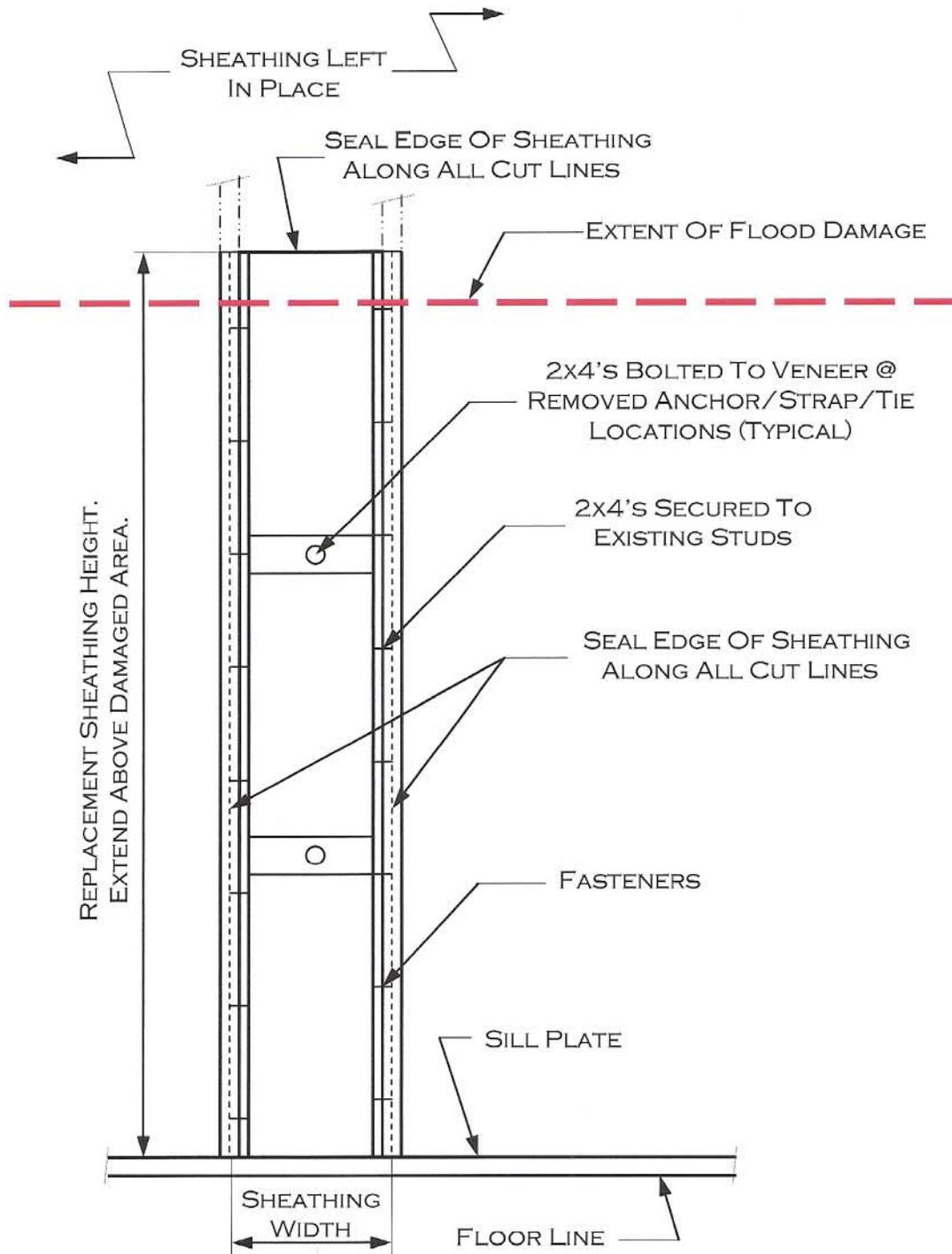
The sheathing on the new panel must overlap the exterior face of the existing studs when it is installed, so the location of the new studs on the new sheathing and the width of that new sheathing must be adjusted to account for the existing stud locations.

The sheathing along the edges of the individual panels may have to be chamfered based on the amount of space available between the studs and the brick veneer to facilitate installation.

Spray foam seal onto the edges of the existing sheathing and the sheathing of the new panels, in the event more than one panel is required, to act as a moisture barrier. The replacement panels will then be fitted into the space between the existing end studs. If existing flashing is present, ensure that the new counterflashing overlaps it. The new panel studs are then secured to the existing studs. The cut portions of the original studs are then reinstalled and the new panel studs are then secured to all existing and previously cut studs. The end result of this process is that the new studs “sister” the original cut studs.

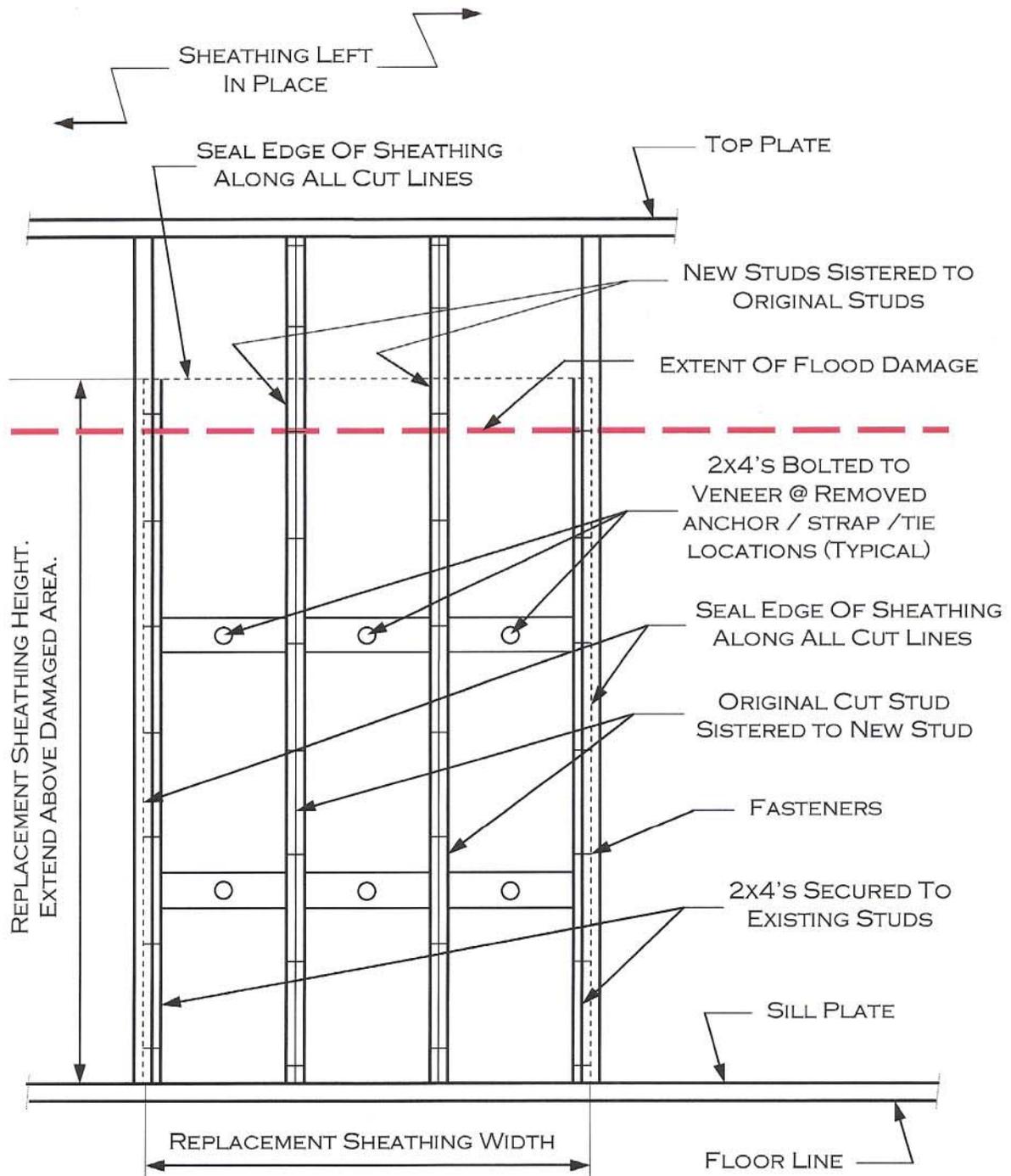
4.2.8 The temporary wall can then be removed and any ceiling damage repaired.

4.2.9 Install and secure two by four cross braces between the new panel studs at each location where the existing brick anchors/straps/ties were disconnected. Omit from the specific locations that were previously flashed. Drill holes through these cross braces and into the brick veneer. Install an anchor bolt (masonry toggle or epoxy bolt) through each and into the brick.



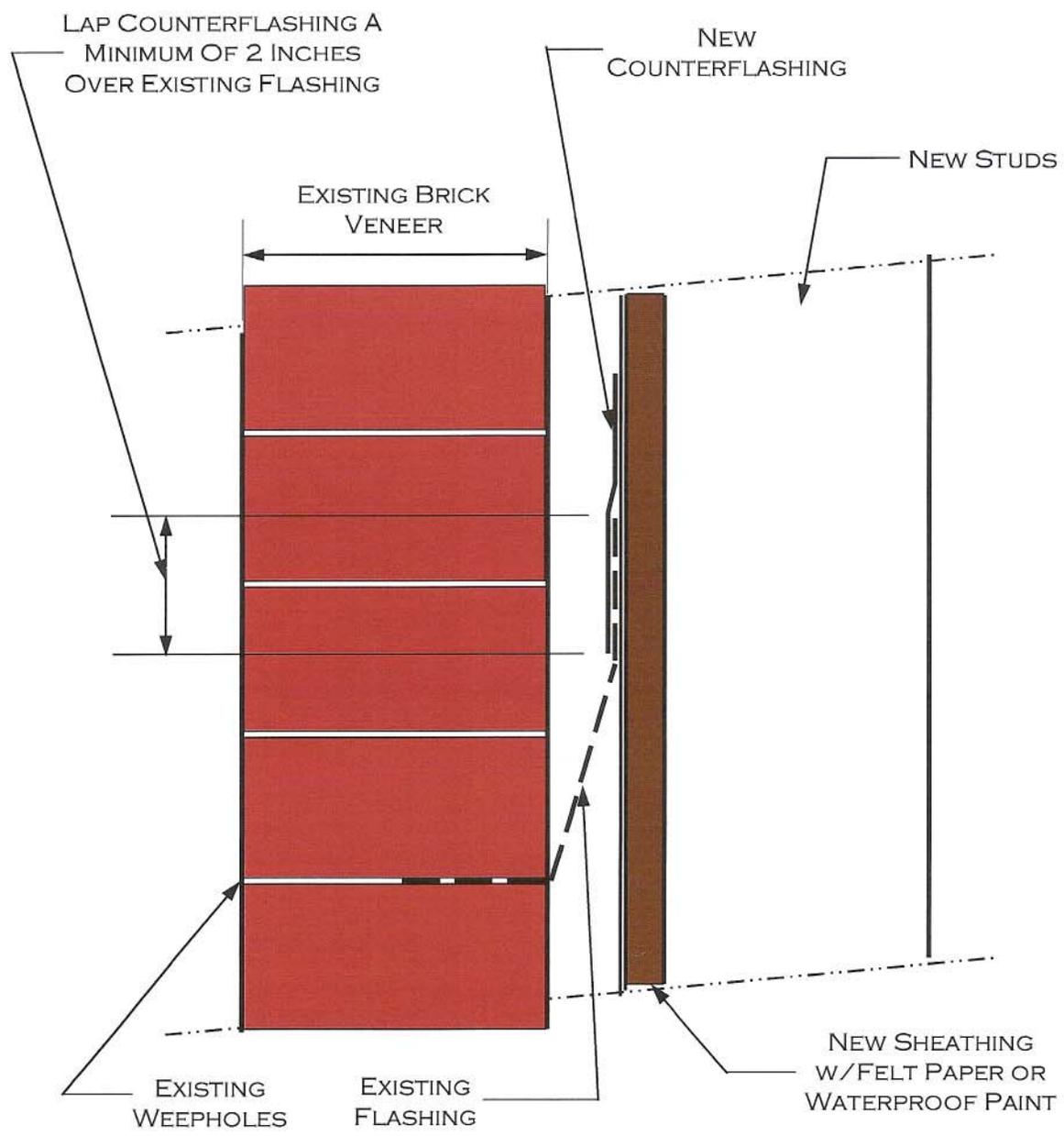
SMALL AREAS WHERE EXISTING STUDS ARE NOT CUT OR DAMAGED.

(Viewed from the interior of the building)



LARGE AREAS WHERE EXISTING STUDS ARE CUT OR DAMAGED.

(Viewed from the interior of the building)



**FLASHING – COUNTERFLASHING
DETAIL**
(If flashing is present)