Fire Protection of Membrane Penetrations in Residential Structures

This tip sheet provides guidance for the installation of horizontal venting, fire dampers, lights and similar penetrations in fire-resistance-rated floor/ceiling assemblies in residential structures, compliant with the 2021 International Residential Code (IRC) and International Building Code (IBC), with State of Washington amendments. These options are permissible in the following occupancies, when there is horizontal, fire-rated separation:

- IRC structures such as two-family dwellings or accessory dwelling units
- R-3 dwellings
- R-2 multi-family buildings
- Assisted Living Facilities licensed under Chapter 388-78A WAC, I-1 Condition 2
- Residential Treatment Facilities licensed under Chapter 246-377 WAC, I-1 Conditions 1 or 2

For use in other occupancies, please seek permission from your local jurisdiction. These options may be used in new or existing construction, and in buildings with or without fire sprinklers.

Ventilation Ducts

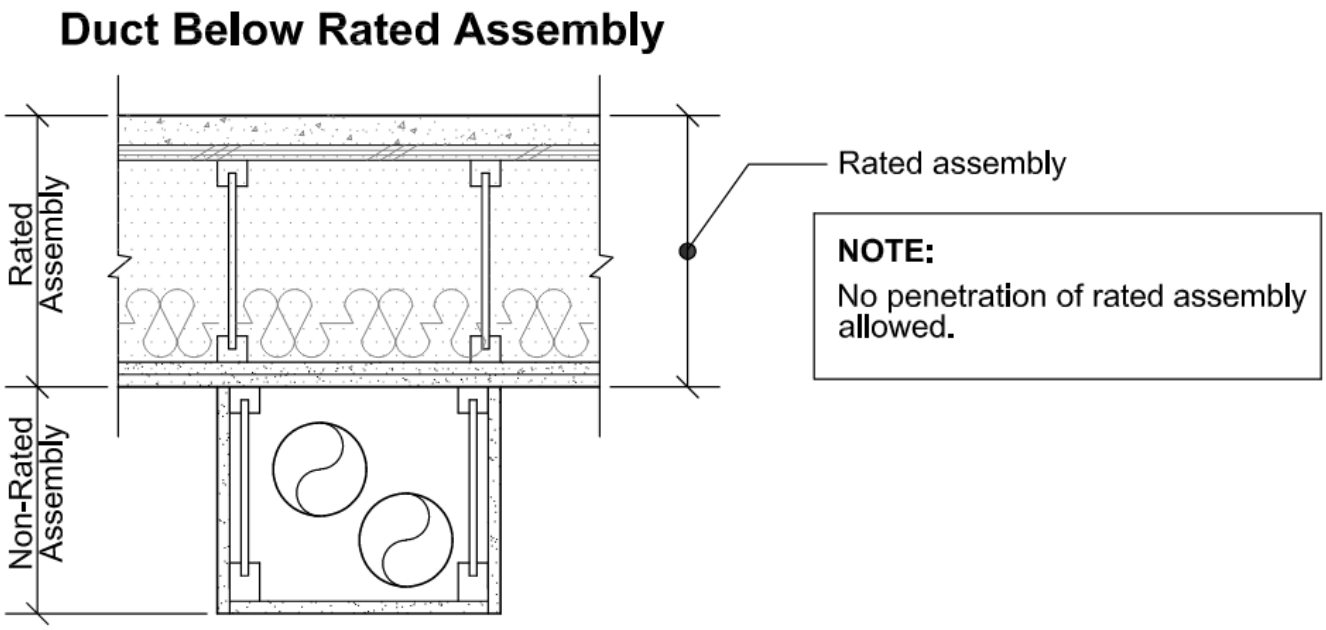

Figure 1

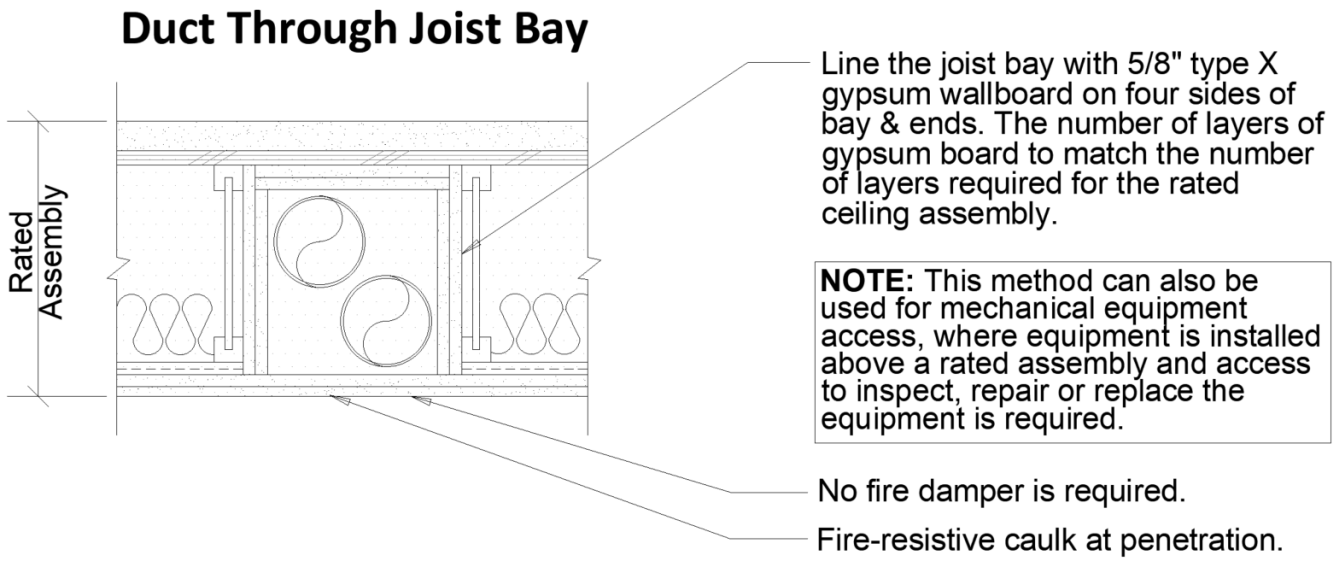

Figure 2

Ventilation Ducts Wrapped in a Listed Fire Wrap

1. Ventilation ducts are permitted to penetrate the rated floor/ceiling assembly when encased in a listed fire wrap. The fire wrap is required to meet the applicable standard and be installed per the listed assembly which includes the required duct support.
2. A listed firestop assembly meeting ASTM E814 or UL 1479 is required at all locations where a fire-wrapped duct penetrates a rated assembly.

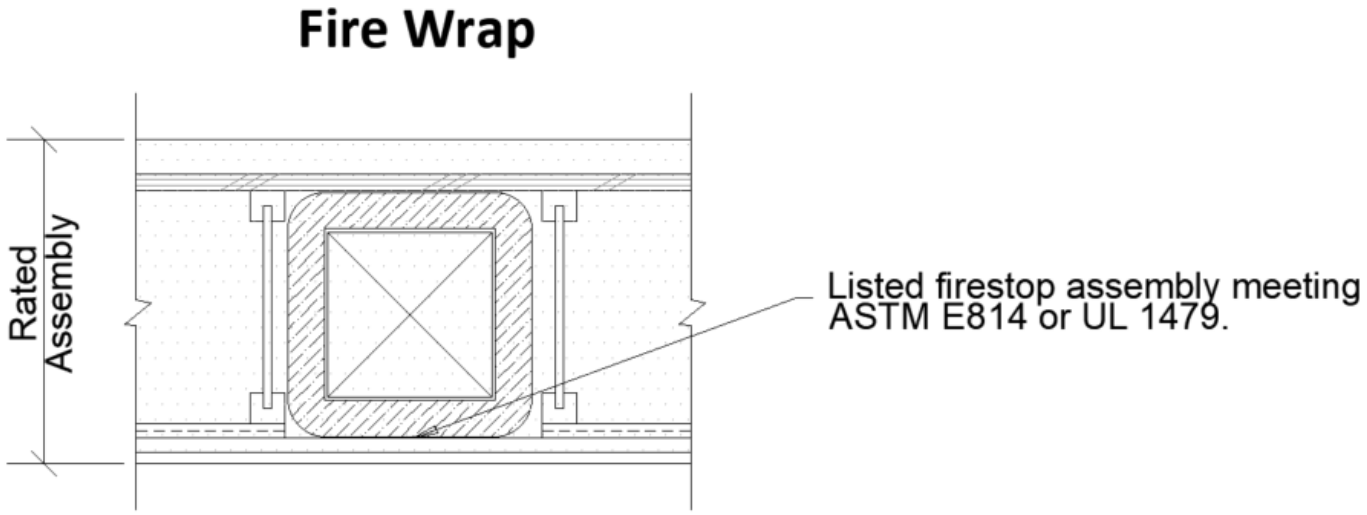

Figure 3

Dampers and Fan Boxes

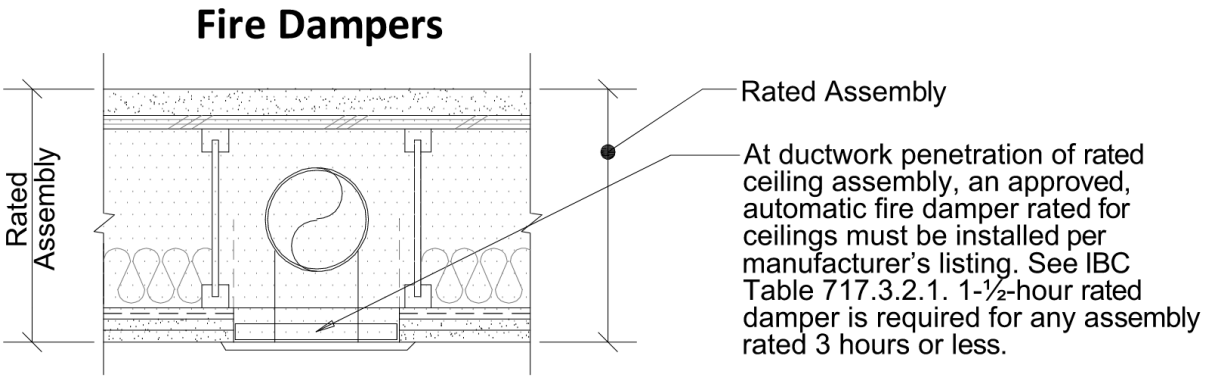

Figure 4

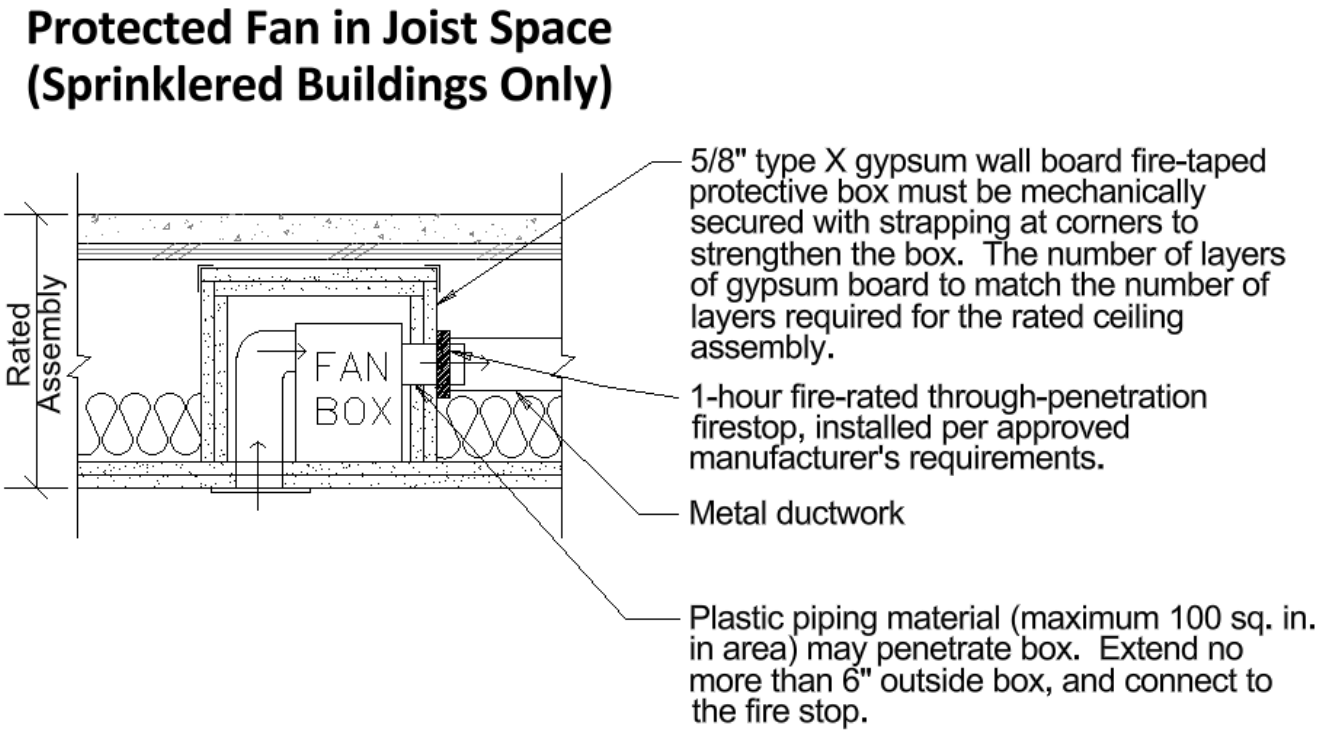

Figure 5

Toilet Exhaust Venting

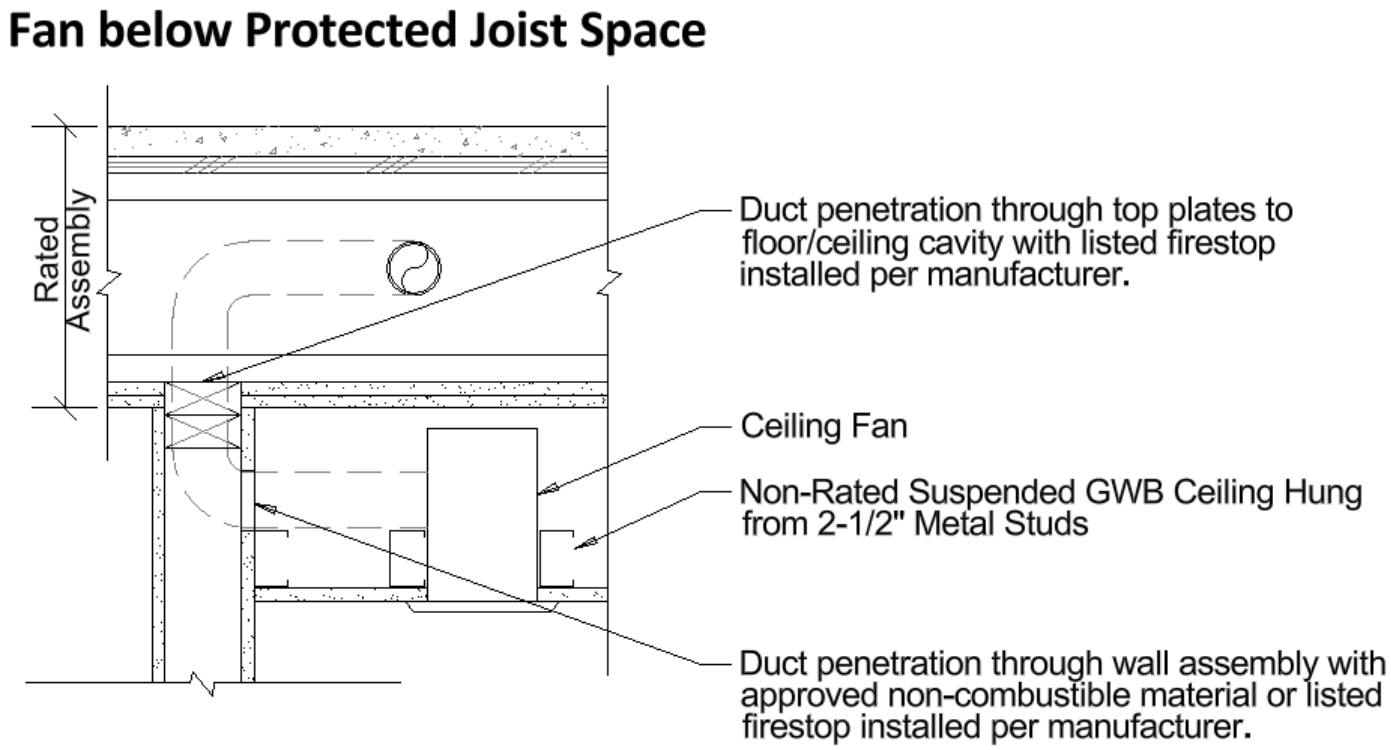

Figure 6

Toilet exhaust fans must be installed outside of the rated floor/ceiling assembly, and the exhaust must be protected going into the wall and from the wall into the floor/ceiling assembly but is not required to be fully “boxed out.” Fire and/or radiation dampers are not required.

The types of walls can be any of the following:

1. A non-fire-resistance-rated and non-bearing interior wall,
2. A 1-hour fire-resistance-rated, load-bearing interior wall constructed as a fire partition, or
3. A 1-hour fire-resistance-rated, non-bearing interior wall constructed as a fire partition.

Toilet exhaust venting can be installed in and above the bottom membrane of the 1-hour fire-resistance-rated floor/ceiling assembly. From this cavity, the venting will extend through the joist bay horizontally and terminate at the exterior wall. A ceiling radiation damper will be provided at the ceiling membrane opening. See Figure 7.

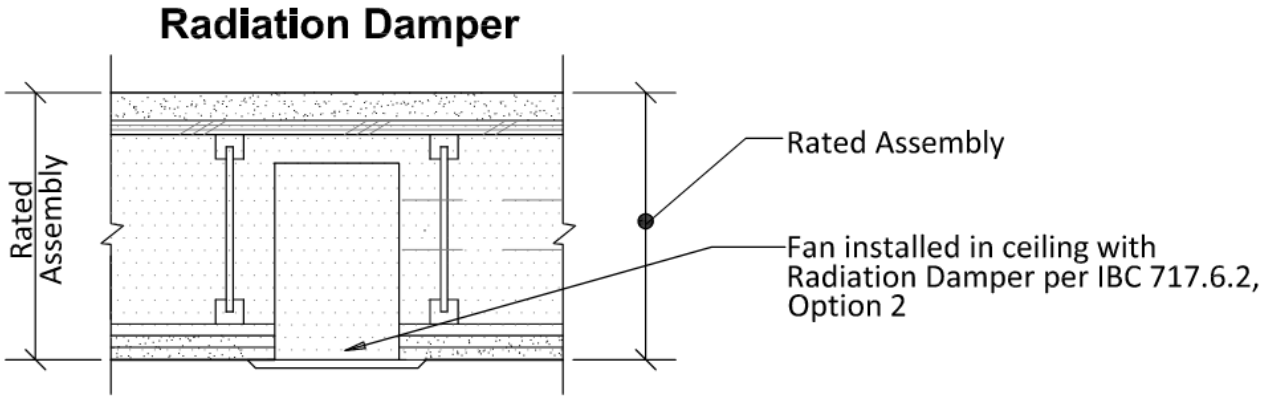

Figure 7

Domestic Kitchen Exhaust Venting

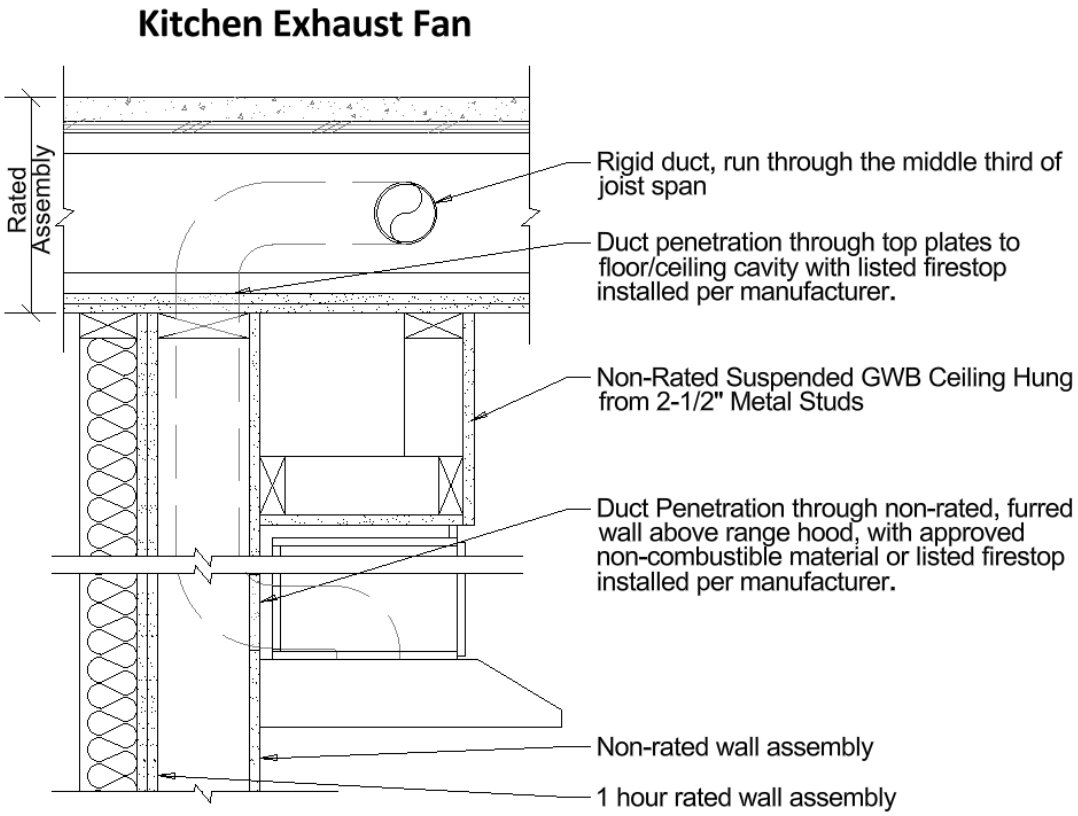

Figure 8

For domestic kitchen exhaust, the duct cannot penetrate fire-resistance-rated walls and instead must be installed within a furred-out wall or chase. The venting may penetrate through the top plates and into the rated floor/ceiling assembly, then must terminate at an exterior wall. Fire and/or radiation dampers are not required.