



Installation Considerations for Ceiling Radiation Dampers

Building codes include requirements for several types of dampers, including fire, smoke, combination fire-smoke and ceiling radiation dampers. Each type of damper is Listed by UL for use in particular code applications.



However, since ceiling radiation dampers serve a somewhat different purpose than the other damper types, there is often confusion about where a ceiling radiation damper should be used. To better understand ceiling radiation dampers; let's examine the protection provided by each type of damper:

- Fire dampers are intended to resist the passage of flames, but their ability to resist the passage of smoke or radiant heat has not been investigated.
- Smoke dampers are intended to resist the passage of smoke, but their ability to resist the passage of flame or radiant heat has not been investigated.
- Combination fire-smoke dampers are intended to resist the passage of flame and smoke, but their ability to resist the passage of radiant heat has not been investigated.
- Ceiling radiation dampers are intended to limit the

transfer of radiant heat into the concealed space when installed in the ceiling membrane of a fire-resistance rated floor-ceiling or roof-ceiling assembly.

Ceiling membrane considerations

To achieve the fire-resistance rating required by building codes, floor-ceiling or roof-ceiling assemblies generally are protected either through the use of a direct-applied protection material or through a ceiling membrane specifically designed to remain in place and resist passage of heat and flames into the concealed space above a ceiling.

To determine the hourly fire-resistance rating, the floor-ceiling or roof-ceiling assembly is placed on top of a test furnace and subjected to the UL 263 fire test exposure from underneath. The hourly fire-resistance rating is the time during which the assembly maintains its structural integrity, limits the



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temperature rise of any structural steel supports and limits the temperature rise on the unexposed (top) surface.

When a membrane ceiling is used to provide protection, the ceiling membrane needs to protect the components of the floor-ceiling or roof-ceiling assembly above the membrane from high temperatures, radiant energy and flames of the test furnace. Openings in the membrane, such as those provided for fluorescent lighting fixtures (luminaires), need to be protected with materials with suitable thermal insulation properties. Similarly, HVAC duct openings penetrating the ceiling membrane need to be provided with thermal protection against radiant heat during the fire exposure. Ceiling radiation dampers provide this protection.

Ceiling damper options

Floor-ceiling and roof-ceiling designs such as those included in the UL Online Certifications Directory include details on specific constructions that provide the desired hourly fire-resistance rating. For assemblies utilizing a ceiling membrane for protection, the design typically includes a description of the air ducts within the cavity of the assembly and the ceiling radiation dampers that protect the HVAC openings in the ceiling membrane. The ceiling radiation damper described in the design reflects the damper used during the UL 263 fire exposure test. For assemblies utilizing an acoustical ceiling, a hinged-door type damper typically protects HVAC openings.

The design may also call for the use of Duct Outlet Protection System A and/or B, which are described in the guide information for the assemblies. For assemblies using a gypsum board ceiling, the design will typically specify use of a UL Classified ceiling damper.

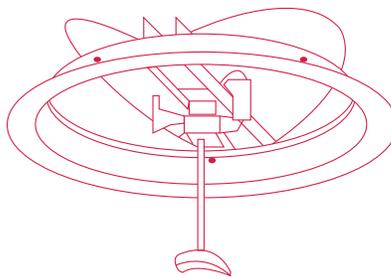
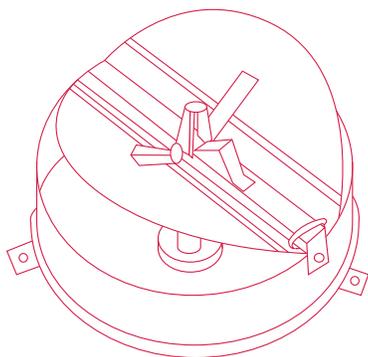
UL 555C investigations

Ceiling dampers are investigated either as part of the fire-resistance-rated floor-ceiling or roof-ceiling assembly or in accordance with requirements in UL 555C, the Standard for Safety for Ceiling Dampers. This standard includes requirements and methods of tests that apply to ceiling dampers intended for installation in fire-resistance rated floor-ceiling and roof-ceiling assemblies.

Among other tests, UL 555C includes a fire endurance test that utilizes the same time-temperature curve used in UL 263. The investigation of ceiling dampers for use in floor-ceiling or roof-ceiling assemblies previously rated with a hinged-door type damper involves a comparison of the fire resistance performance of the ceiling damper with that of a hinged-door type damper. This is done to confirm that the substitution of the ceiling damper does not reduce the hourly fire endurance rating of an assembly previously rated with the hinged-door type damper.

Classified ceiling dampers

Ceiling dampers that comply with UL 555C requirements are Classified under the Ceiling Dampers product category (CABS) found in the Online Certifications Directory at www.ul.com/database. The Classification covers ceiling damper models for use in lieu of hinged-blade type dampers in floor-ceiling or roof-ceiling designs that contain air ducts and specify the use of a hinged-blade type damper over each duct outlet; or in specific floor-ceiling and/or roof-ceiling designs. An air duct with a hinged-door type damper must be a specified component of the floor-ceiling and/or roof-ceiling design for a ceiling damper to be an acceptable option, unless the ceiling damper is Classified for use in the design.





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Ceiling dampers are to be installed in accordance with the manufacturer's installation instructions. These instructions will specify the location of a ceiling damper in a duct outlet relative to the ceiling level for ceiling dampers intended for installation in a duct outlet in lieu of hinged-door type dampers. This location must be followed during installation to achieve the hourly fire-resistance rating specified in the design.

The individual Classification information indicates whether each damper type can be used in all designs conforming to the specifications under the Classification or if each type can be used only in specific designs that show the Classified company name and damper type.

Installation considerations

Ceiling dampers, which are referred to as ceiling radiation dampers in the International Building Code, are required by Section 716.3.1 to bear the label of an approved testing agency and comply with the requirements of UL 555C or be tested as part of a fire-resistance-rated floor- or roof-ceiling assembly.

To determine if a ceiling damper is suitable for use in a floor-ceiling or roof-ceiling assembly, it will either be specified directly in the assembly design details or Classified for use with the specific design. The UL Classification Mark on a ceiling damper includes the UL symbol, the word CLASSIFIED and reference to the UL Fire Resistance Directory. The Classification Mark on a damper may also include direct reference to the specific designs for which it has been found suitable. Manufacturer's installation instructions are included with all ceiling dampers and include directions and information needed for proper installation.

Membrane Protection Using Air Terminal Units and Air Diffusers

Section 716.6.2 of the International Building Code (IBC) includes requirements for protecting duct and air transfer openings that penetrate the ceiling membrane of a fire-resistance rated floor-ceiling or roof-ceiling assembly. UL classifies units under three product categories that have been investigated for use in this application. As previously described, UL Classified ceiling dampers (CABS) are intended to protect air ducts that penetrate the membrane, and automatically shut in the event of a fire.

Air terminal units serve a similar function as ceiling dampers, but are:

- Designed to regulate the flow and distribute conditioned air within a building
- Ceiling mounted at the ends of ducted air systems
- Designed to be compatible with acoustical ceilings but are independently supported as shown in installation instructions supplied with each unit
- Investigated using the UL 263 time-temperature fire exposure

- Classified under the Air Terminal Unit product category (BZGU).

Ceiling air diffusers also serve a similar function as ceiling dampers, but are:

- Designed for dispersing the flow of air through suspended membrane ceilings
- Provided with factory-installed protection material that serves as a heat-transmission barrier
- Investigated using the UL 263 time-temperature fire exposure
- Classified under the Ceiling Air Diffusers product category (BZZU).

Ceiling air diffusers may be open on top when used with return air plenum (when permitted in the Classification information) or connected to air supply or air return ducts using Listed Class 0 or Class 1 air ducts and connectors. When flexible air ducts and/or connectors are used they should be supported by minimum 1 inch wide hangers or saddles at intervals, as necessary, to ensure that the duct and/or connector will not contact the back of the ceiling.