

Ceiling Dampers Explained

An AMCA International White Paper

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ABSTRACT

This white paper explains how to determine if a ceiling damper is approved for use in a specific fire-rated floor/ceiling or roof/ceiling assembly. It also explains the proprietary nature of designs in UL's Fire Resistance Directory with respect to ceiling dampers and discusses the relationship between the Fire Resistance Directory and the Gypsum Association's Fire Resistance Design Manual.

INTRODUCTION

UL's Fire Resistance Directory¹ contains design specifications for hundreds of building elements evaluated to meet the requirements of ANSI/UL 263, *Fire Resistance Ratings*.² Many of the floor/ceiling and roof/ceiling assemblies listed in the Fire Resistance Directory require the use of a "ceiling membrane"—most commonly, fire-rated acoustical ceiling tiles or gypsum board—to protect the structural members of the assembly during a fire (Figure 1). Because of the critical role the ceiling membrane plays in maintaining the integrity of an assembly during a fire, any penetration through a ceiling membrane must be evaluated during an ANSI/UL 263 fire test. In the case of HVAC penetrations, ceiling dampers are used to protect the openings.

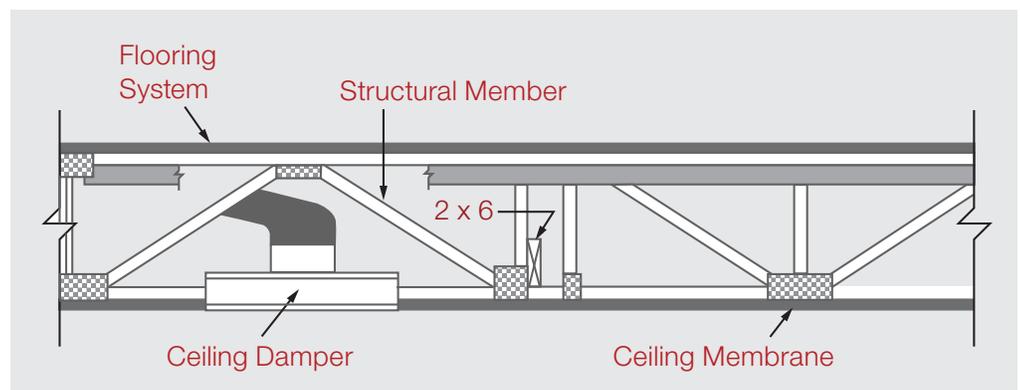


Figure 1. Example fire-rated floor/ceiling assembly.

This white paper explains how to determine if a ceiling damper is approved for use in a specific fire-rated floor/ceiling or roof/ceiling assembly. It also explains the proprietary nature of designs in the Fire Resistance Directory with respect to ceiling dampers and discusses the relationship between the Fire Resistance Directory and the Gypsum Association's Fire Resistance Design Manual.³

ANSI/UL 263 AND UL'S FIRE RESISTANCE DIRECTORY

Understanding the approvals that apply to ceiling dampers requires an understanding of the relationship between ceiling dampers and ANSI/UL 263. ANSI/UL 263 defines the test criteria used to evaluate entire building elements, such as rated floor/ceiling assemblies, for fire resistance. If a building element meets the test criteria, it earns a fire-resistance rating expressed in terms of hours. When utilized as the third-party listing agency by the sponsor of a fire test, UL issues a design number unique to a newly rated assembly and publishes a listing in the Fire Resistance Directory. The listing includes a drawing of the assembly and a detailed description of the required construction.

A key point is that fire-resistance ratings apply to entire tested assemblies, as opposed to assemblies' individual components and materials. As such, ceiling dampers themselves are not fire-rated; instead, the ratings ceiling dampers carry indicate the dampers' suitability for use in specific rated floor/ceiling and roof/ceiling assemblies.

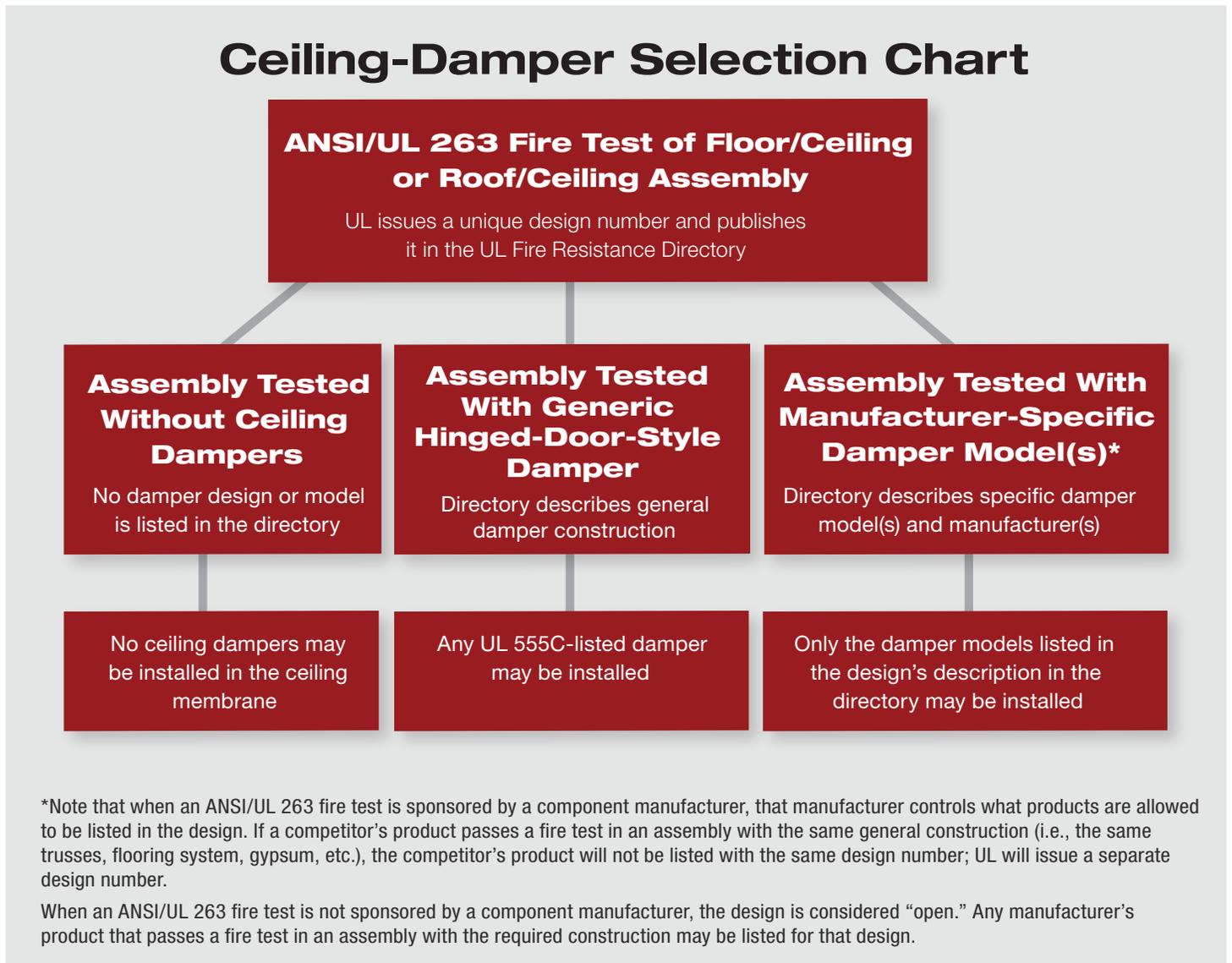


Figure 2. Ceiling-damper selection chart.

CEILING-DAMPER APPROVALS

Fire-rated floor/ceiling and roof/ceiling assemblies requiring membrane protection can be tested without ceiling dampers, with generic hinged-door-type dampers, or with manufacturer-specific damper models (Figure 2).

Assemblies tested without ceiling dampers.

Installation of ceiling dampers in assemblies tested without HVAC penetrations through their ceiling membranes is prohibited (Figure 3). If the use of ceiling dampers is not called out in the construction details of an assembly in the Fire Resistance Directory, it is critical the design not be specified for or used in applications requiring HVAC penetrations through ceiling membranes.

Assemblies tested with generic hinged-door-type dampers.

A hinged-door-type damper is a generic ceiling-damper design not specific to a given manufacturer. During ANSI/UL 263 fire tests of floor/ceiling and roof/ceiling assemblies, hinged-door-type dampers often are used so as not to restrict the type of damper that can be used as part of an assembly during a building's construction. In actual building construction, however, hinged-door-type dampers rarely are used. UL 555C, *Standard for Ceiling Dampers*,⁴ is used to compare the performance of a damper manufacturer's design with that of a hinged-door-type damper. Thus, when a hinged-door-type damper is used during a fire test, any manufacturer's UL 555C-classified damper (Figure 4) is approved for use in the construction of that rated assembly.

In the Fire Resistance Directory, construction requirements for generic hinged-door-type dampers are given; specific damper models and manufacturers are not called out. Figure 5 is an example diagram and damper description for an assembly tested with a generic hinged-door-type damper.

Assemblies tested with manufacturer-specific damper models.

When a floor/ceiling or roof/ceiling assembly is fire-tested with a manufacturer-specific damper, that damper model will be specified in the Fire Resistance Directory, and only that damper can be installed (Figure 6). When manufacturer-specific damper models are called out in the Fire Resistance Directory,

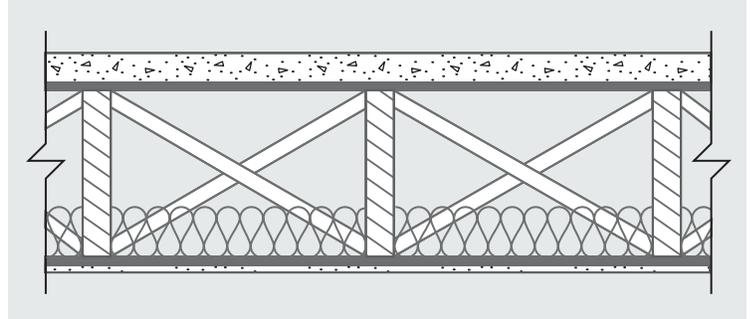


Figure 3. Example floor/ceiling assembly in which installation of ceiling dampers is prohibited.

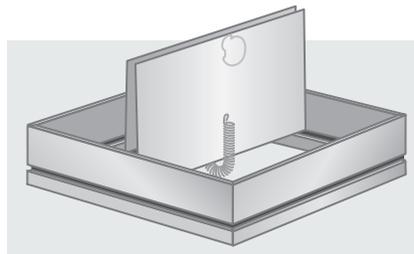
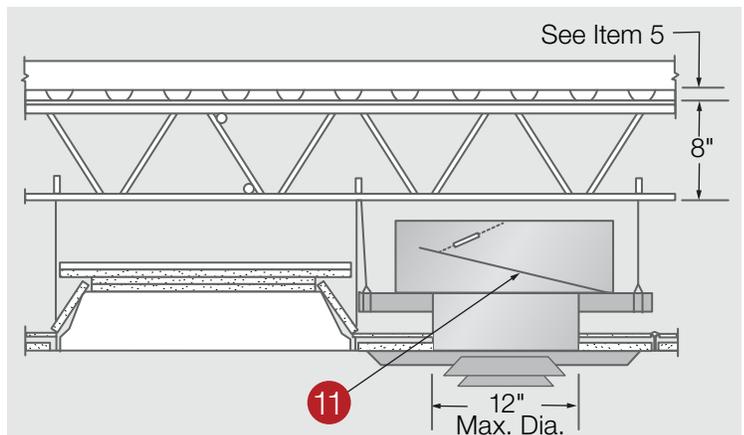
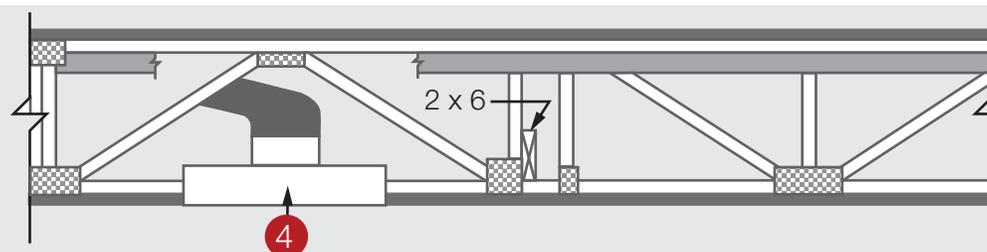


Figure 4. Example UL 555C-classified ceiling damper.



11. Damper — No. 13 MSG galv steel, 14 by 14 in. Protected on both surfaces with 1/16 in. ceramic fiber paper and held open with a Fusible Link. (Bearing the UL Listing Mark). Damper to overlap duct outlet 1 in. min.

Figure 5. Example diagram and damper description for an assembly permitting the use of UL 555C-approved dampers.



4. Damper (Optional, To be used with Air Duct Item 3) — For use with min 18 in. deep trusses. Max nom 21 in. long by 18 in. wide, fabricated from galvanized steel. Plenum box max size nom 21 in. long by 18 in. wide by 14 in. high (inner dimension) fabricated from either galvanized steel or min 1 in. thick Listed Duct Board bearing the UL Listing Marking having a min R-Value of 4.3. Installed in accordance with the instructions provided by the manufacturer. Max damper openings not to exceed 180 sq in. per 100 sq ft of ceiling area.

Damper Brand XXX – Model CRD-YYY

Figure 6. Diagram and damper description for floor/ceiling and roof/ceiling assemblies requiring manufacturer-specific damper model.

dampers “only” tested to the requirements of UL 555C are not approved for use.

COMBUSTIBLE FLOOR/CEILING AND ROOF/CEILING ASSEMBLIES

Combustible floor/ceiling and roof/ceiling assemblies have structural members—most commonly, trusses and joists—made of wood (Figure 7). Rated assemblies without wooden structural members are referred to as “non-combustible.”

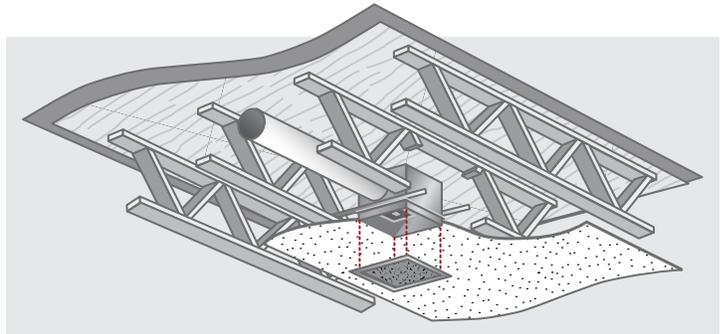


Figure 7. Example combustible floor/ceiling assembly.

Testing shows hinged-door-type dampers do not provide enough thermal protection for a combustible assembly to pass an ANSI/UL 263 fire test. Only manufacturer-specific damper models tested as part of an assembly may be used. Dampers “only” carrying a UL 555C classification are not approved for use in combustible assemblies.

COMPANY-SPONSORED DESIGNS

When a company or an organization contracts UL to conduct an ANSI/UL 263 fire test of a building element, that company or organization becomes the “sponsor” of the test. Often, to improve the flexibility of their designs for contractors, sponsors ask UL to evaluate alternate construction materials. Although a manufacturer can request its product to be evaluated for use in a design, all changes must be authorized by the sponsor. Typically, damper-manufacturer sponsors allow only their damper models or damper models they produce and license for other manufacturers to be listed in their designs. The result is that many damper manufacturers have their own floor/ceiling and roof/ceiling design numbers. This is true despite, in many cases, the original construction of the test assemblies on which designs are based, with the exception of the dampers, being identical.

Consider an example in which Manufacturer A successfully tests its damper design in a rated assembly with a specific flooring system, specific structural members, and a specific type of gypsum board as the ceiling membrane and UL issues a design number such as LXXA. If Manufacturer B were to test its damper in an assembly identical to LXXA and the assembly were to pass, Manufacturer B would not be permitted to list its damper as being approved for use in LXXA. Instead, UL would issue a new design number, such as LXXB, to Manufacturer B. Though the same construction may have been utilized for the original test assemblies, the designs could diverge over time if one of the sponsors were to run additional tests or ask UL to conduct engineering evaluations to allow alternate construction materials.

In a case in which the sponsor is not a component manufacturer, any product that can pass the required testing can be listed as approved for use. Such a design is referred to as “open.”

GYPNUM ASSOCIATION’S FIRE RESISTANCE DESIGN MANUAL

UL’s Fire Resistance Directory is not the only publication used in the specification of construction requirements for rated floor/ceiling and roof/ceiling assemblies. Design numbers from the Gypsum Association’s Fire Resistance Design Manual also commonly are called out in specifications.

The Gypsum Association is not a testing agency; its listings are based on test data from various accredited third-party laboratories, all of which conduct fire tests of floor/ceiling and roof/ceiling assemblies per ANSI/UL 263. Although some Gypsum Association design numbers are proprietary to the manufacturer of the gypsum board used as the ceiling membrane, Gypsum Association designs are not proprietary with respect to damper design. In our example case of two damper manufacturers passing UL/ANSI 263 fire tests using identical test assemblies, the separate UL design numbers they were issued could be referenced with a single Gypsum Association design number. The ceiling-damper models approved for use in a specific Gypsum Association design can be determined by consulting the test reports and/or design numbers of the testing agency.

SUMMARY

Ceiling dampers are crucial components of many fire-rated floor/ceiling and roof/ceiling assemblies. Though the specification and selection of ceiling dampers can be confusing, pitfalls can be avoided if the following points are kept in mind:

1. Fire-rated floor/ceiling and roof/ceiling assemblies requiring ceiling-membrane protection fall into one of three categories:
 - a. Assemblies tested without ceiling dampers, in which installation of ceiling dampers is prohibited.
 - b. Assemblies tested with generic hinged-door-type dampers, in which any UL 555C approved damper may be installed.
 - c. Assemblies tested with manufacturer-specific damper models, in which only the damper models specifically called out in UL's Fire Resistance Directory may be installed. All combustible floor/ceiling and roof/ceiling designs permitting ceiling dampers require the use of manufacturer-specific damper models; dampers carrying "only" UL 555C approval may not be used in combustible assemblies.
2. The company or organization that contracts UL to conduct an ANSI/UL 263 fire test is the sponsor of the test and, as such, must authorize any design changes or additions. In cases in which the sponsor is a manufacturer, competitors' products cannot be evaluated as alternatives without authorization from the sponsor. Thus, if an architect's intent is for only a certain damper model or manufacturer to be used on a project, he or she should specify a design number that lists only the model or manufacturer of interest. If the architect's intent is to specify an assembly meeting a code-mandated fire-resistance rating and certain general construction requirements and allow any component manufacturer who meets those requirements to be used on the project, he or she should specify multiple design numbers or specify designs that are "open."

By understanding the test standards associated with and the approvals and proprietary nature of UL's Fire Resistance Directory, you can ensure the ceiling dampers selected and installed on your project have been tested and approved for the application.

REFERENCES

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