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to **Innovation...**

2010 NATIONAL MODEL CONSTRUCTION CODES

Combustible Penetrations and Plenum Cables

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National Research
Council Canada

Conseil national
de recherches Canada

Canada

Introduction



- Presentation is part of a series on the 2010 National Model Construction Codes
- Model codes developed by Canadian Commission on Building and Fire Codes
- These codes must be adopted by provincial/territorial authorities to become law

2

This Presentation is part of a series of 13 on the 2010 National Model Construction Codes.

It is important to note that the model codes, which are developed by the Canadian Commission on Building and Fire Codes must be adopted by provincial/territorial authorities to become law.

This may mean that code requirements enacted by legislation within your province or territory might differ from what is presented here.

Please check with your local authority.

Topics



- Combustible penetrations
 - *Fire blocks*
 - *Fire stops*
- Plenum cables
 - FT-4
 - FT-6
- Protection of conductors
 - Serving life safety and fire protection systems

3

Today's presentation will deal with three issues:

First the discussion will focus on new changes related to the protection of penetrations through rated assemblies, which include the introduction of new definitions for fire stop and fire block along with requirements for their application.

The second part of the presentation will focus on new requirements for the use of FT-6 cabling when located in plenum spaces.

The third and final portion of the presentation will focus on the changes related to the protection (against fire) of electrical conductors serving life safety and fire protection systems.

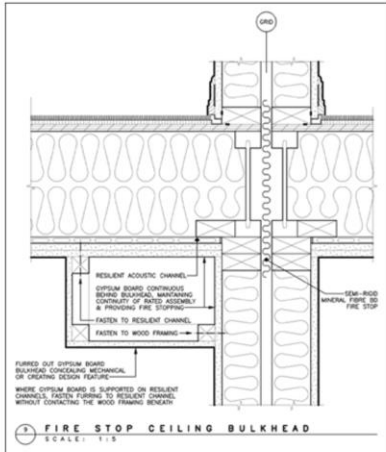
Combustible Penetrations



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Starting with the new requirements for combustible penetrations: fire blocks and fire stops.

New Definition – Fire Stop



Semi-rigid mineral
fibre fire stop

5

The following schematic and drawing illustrate what is being captured by the new definition of fire stop.

The schematic on the left shows a fire stop through a ceiling bulkhead. This example illustrates the use of mineral fibre in the gap at the penetration of the rated assemblies.

In the photo on the right, the arrow points to the gap where a duct penetrates a rated assembly. The fire stop would be applied in this gap to maintain the integrity of the rated assembly.

New Definition – Fire Stop



- *Fire stop:*
System consisting of a material, component and means of support used to fill gaps between fire separations or between fire separations and other assemblies, or used around items that wholly or partially penetrate a fire separation

6

A number of words and phrases are currently used to describe what is generically known as "fire stopping". In common usage, the terms "fire stop," "fire block," and "draft stop" are often used interchangeably; others attribute specific meanings to each term. In the 2005 edition of the National Building Code of Canada Parts 3 and 9, while there is no definition of the term "fire stop", the terms "fire stop" or "stop system" were used to encompass all such materials and systems, including those commonly called "fire blocks" or "draft stops" in other documents. There are, however, differences, often not subtle, that call for unique terminology for each different technology.

The new definition for fire stop and fire block parallels terminology that is used in the industry as well as other international codes and standards. It should also be noted that many of these changes stemmed from the work of a IRC-consortium project on fire stop and fire block systems.

The first definition is fire stop which has been defined as

A system consisting of a material, component and means of support used to fill gaps between fire separations or between fire separations and other assemblies, or used around items that wholly or partially penetrate a fire separation.

New Definition – Fire Block



Fire block at wall

This picture illustrates a fire block assembly along the back wall. In this case oriented strand board board has been utilized to maintain the separation between compartments.

New Definition – Fire Block



- *Fire block:*
Material, component or system that restricts the spread of fire within a concealed space or from a concealed space to an adjacent space

As I indicated earlier the NBC used the term “fire stop” to also describe a situation where a material or component was used to restrict the spread of flame from one compartment to the next.

The new definition of fire block now states:

a material, component or system that restricts the spread of fire within a concealed space or from a concealed space to an adjacent space.

Penetrations of Fire Separations



- All penetrations of a *fire separation* must be fire stopped per CAN/ULC-S115 standard with F rating and similar FRR for closures
- All penetrations of a *firewall* must be fire stopped per CAN/ULC-S115 standard with FT rating and similar FRR for the *fire separation*

9

Fire stopping requirements have been expanded to include all penetrations of rated assemblies, not just service penetrations. The new changes will now apply to assembly penetrations as well. This is considered to be more all inclusive.

The penetrations must be

- sealed by a fire stop system that, when subjected to the fire test method in CAN/ULC-S115, “Fire Tests of Firestop Systems,” has an F rating not less than the fire-protection rating required for closures in the fire separation, or
- cast in place.

Penetrations of a firewall or a horizontal fire separation that is required to have a fire-resistance rating shall be sealed at the penetration by a fire stop that, when subjected to the fire test method in CAN/ULC-S115 standard has an FT rating not less than the fire-resistance rating for the fire separation.

Sprinkler Penetrations



- Fire stopping not required around sprinkler head penetrating a *fire separation*



10

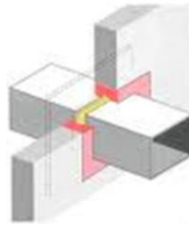
The new provision permits sprinklers that penetrate a fire separation or a membrane forming part of an assembly required to have a fire-resistance rating to exclude the fire stop requirements, provided the annular space created by the penetration of a sprinkler head is covered by a metal escutcheon plate in accordance with NFPA 13, "Installation of Sprinkler Systems."

This was permitted on the basis that some sprinkler installations are void if product is applied around the sprinkler head as the fire stop material could interfere with the proper operation of the sprinkler.

Fire Damper Penetrations



- Fire stopping not required around *fire dampers* penetrating a *fire separation* where installation listing specifies a clearance for operational reasons



The NBC 2005 required fire stops where a duct containing a fire damper penetrates a fire separation. However, fire damper manufacturers contend that fire stops at this location could impede the operation of the damper and thus void the damper listing.

Permission has been provided to exclude fire stopping in this application, provided the fire damper is installed in conformance with NFPA 80, "Fire Doors and Other Opening Protectives."

Combustible Piping Penetrations



- Any size *combustible* pipe permitted to penetrate a *fire separation*



12

This change will now allow any size combustible pipe to penetrate a fire separation.

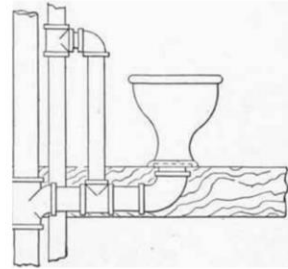
There was no justification for the 30 mm diameter size limit for combustible water distribution piping penetrating a vertical fire separation. It was noted that the 30 mm limit was probably introduced into the Code some time ago and may have been adequate at that time. However, today listed fire stop systems do exist for larger openings.

The limitation to only vertical fire separations was not justified and this penetration is now permitted for both vertical and horizontal assemblies.

Combustible Drain Piping



- Elimination of restriction on drain piping penetrating a horizontal fire separation
- ~~Combustible~~ drain piping permitted to penetrate a horizontal fire separation provided it leads directly from a noncombustible water closet through a concrete floor slab



The current limitations that only permitted combustible drain piping to penetrate a horizontal fire separation provided it led directly from a noncombustible water closet through a concrete floor slab have been removed.

This provision could not be justified since fire stop systems do exist for combustible piping in both horizontal and vertical penetrations.

Fire Stop – Polypropylene Pipes



- Must now meet ULC-S115, “Fire Tests of Fire Stop Systems” standard with a pressure differential of 50 Pa between the exposed and unexposed sides, with the higher pressure on the exposed side



14

Polypropylene pipes and fittings are permitted to be used for drain, waste and vent piping for the conveyance of highly corrosive materials and for piping used to distribute distilled or dialyzed water in laboratory and hospital facilities in a building required to be of noncombustible construction, provided... amongst other requirements

the piping that penetrates a fire separation is sealed at the penetration by a fire stop that has an FT rating not less than the fire-resistance rating of the fire separation when subjected to the fire test method in CAN/ULC-S115, “Fire Tests of Firestop Systems,” with a pressure differential of 50 Pa between the exposed and unexposed sides, with the higher pressure on the exposed side.

A question was raised to determine why there were three different ratings for plastic piping. Comments indicated that FT rating applies to specific pipe that behave like copper pipe when submitted to an internal pressure of 50 Pa (i.e. polypropylene). It was noted that there is a lack of statistics showing that FT rating is required on all pipes and polypropylene pipe will burn under heat. Therefore, the FT component should be retained, unlike other plastics (i.e. PVC) that will soften to allow fire stop to seal the opening.

The Standing Committee on Fire Protection agreed that the 50 Pa pressure differential must be included for polypropylene pipe due to the characteristics of the pipe under fire conditions.

Penetrations



- Single conductors of cables > 25 mm in overall diameter
 - Not grouped
 - Spaced a minimum of 300 mm apart



15

The NBC 2005 permitted single conductors or cables with combustible jacketting to penetrate a fire separation required to have a fire-resistance rating without being incorporated in the assembly at the time of testing, provided the cables were not grouped.

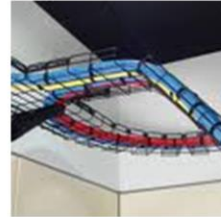
This new change clarifies what is intended by “grouped”:
by including dimensions of a spacing (i.e. at least a minimum of 300 mm apart).

The 300 mm spacing coincides with the ULC testing protocol.

Plenum Cables



- Combustible penetrations
 - *Fire blocks*
 - *Fire stops*
- Plenum cables
 - FT-4
 - FT-6
- Protection of conductors
 - Serving life safety and fire protection systems



Let's move into plenum cables.

Plenum Cables



- Combustible construction
 - FT-4 rating
- Noncombustible construction
 - FT-6 rating, or
 - FT-4 rating when enclosed in noncombustible raceways



17

There is evidence that there is an accumulation of cables in plenums, both because of proliferation of data cables in modern office buildings and because new generations of cables are being installed without removing the old ones.

The change from FT-1 to FT-4 rating for cables in plenums of building of combustible construction is seen as an enhancement of fire protection features within this space.

The change from FT-4 to FT-6 for buildings required to be of non-combustible construction is seen as an enhancement of fire protection features within this space.

FT-6 rated cables are now required, based primarily on the fact that greater smoke development occurs in FT-4 rated cables as compared to FT-6, and there is no limitation on the quantity of smoke developed in the FT-4 cable test while the FT-6 test includes limitations on average and peak smoke production.

Plenum Cables



- Exceptions for cables and wires used for
 - Signals for fire alarm
 - Security
 - Radio
 - Television

18

Cables or wires within plenum spaces that are used for the transmission of signals in fire alarm, security, radio, and television broadcasting, closed circuit television or community television systems need not comply with the requirements for the FT-6 or FT-4.

Raceways in Plenums



- Raceways within plenum space shall
 - FT-6 rating in *buildings* required to be of *noncombustible construction*
 - FT-4 rating in *buildings* permitted to be of *combustible construction*



Raceways within a plenum space must be

totally enclosed nonmetallic raceways which have an FT-6 rating in buildings required to be of noncombustible construction, or

totally enclosed nonmetallic raceways which have an FT-4 rating in buildings permitted to be of combustible construction.

Exceptions to FT-6



- Drop-down cables from plenum permitted to be FT-4 rated when length is not greater than 9 m



20

This new change allows an exception to the FT-6 requirements for exposed wiring components where the wiring extends from the plenum not more than 9 m in length including drop down to the floor level. In this case FT-4 rating is permitted.

Without this exception, the new requirements could force the use of FT-6 rated cables in metallic raceways, which could not be justified from a fire protection basis.

Protection of Conductors



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 - FT-6
- **Protection of conductors**
 - Serving life safety and fire protection systems

Let's move on to protection of conductors.

2005 NBC Conductor Requirements



- Protection of electrical conductors
 - Installed in service spaces containing other *combustible* material and used in connection with fire alarm systems and emergency equipment (high buildings)
 - a) Separated from remainder of service space by fire separation having fire-resistance rating not less than 1 hour, or
 - b) Protected against fire exposure from power supply source to branch circuits serving equipment to ensure continued operation for not less than 1 hour

22

2005 NBC requires all conductors installed in service spaces containing other combustible materials and used in connection with fire alarm systems and emergency equipment in high buildings to be

- Separated 1 hour FRR, OR
- Protected against fire from source of power branch circuits

Protection of Conductors



2010 NBC

- Conductors from emergency power serving
 - Fire alarms (high buildings)
 - Emergency lighting (high buildings)
 - Fire pumps (all buildings)
 - Mechanical systems (areas of refuge and contained use)
 - Elevators (high buildings)



23

This new change introduces new requirements for protection of electrical conductors serving life safety and fire protection systems.

Within buildings considered high-rise:

Conductors serving fire alarms

Emergency lighting

Elevators, smoke control, central control centres

In all buildings:

Areas of refuge and contained use areas

Fire pumps

Let's look a little closer to see what degree of protection is required.

Methods of Protection



- Conformance to ULC-S139 standard, OR
- Located in *service space* with *fire-resistance* rating of 1 to 2 hours



24

The protection of the conductors can be provided in one of two ways:

Either the cabling itself needs to be listed to ULC-S139, “Fire Test for Evaluation of Integrity of Electrical Cables,” or

The cables need to be located in a service space that is separated from the remainder of the building by a fire separation that has a fire-resistance rating of at least 1 to 2 hours depending on the application.

Service Space



- Room must be dedicated solely for housing of electrical equipment and conductors



Where protection against fire is provided by means of a rated service space, no other combustible materials are permitted in that area.

Fire Alarm Conductor



- Protection from emergency power supply to distribution equipment
- Protection between transponders or annunciators in different *fire compartments*
- No protection between branch circuit and individual devices on same *storey*

26

The conductors between the emergency power supply and the distribution equipment are required to be protected. If the distribution equipment and the equipment it serves are located within the same room, only the conductors leading up to the distribution panel need be protected.

Within a storey no protection of the electrical conductors is required between the transponders or fault isolation device and the input-output devices (i.e. detectors, pull stations, signaling device).

Emergency Lighting



- Protection from emergency power supply to distribution equipment
- No protection between distribution panel and lighting units on same *storey*



Similar to the fire alarm conductor protection requirements, protection is required from the emergency power source to the distribution panel.

Where the distribution panel serves multiple units on the same storey, protection between the panel and the individuals units is not required.

Summary



- Introduced new definitions for fire stop and fire block
- Introduced relaxations for penetrations of fire separations
- Qualified penetration protection requirements
- Requirements for FT-6 rated cables in plenum spaces
- Protection of conductors serving life safety and fire protection systems

Read from slide



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Questions?

Send them to us at codes@nrc-cnrc.gc.ca

Thank you!