

NBC 2015

Fire Separations, Fire Rated
Separations, Assemblies with a
Fire Resistance Rating, and
Firewalls

What's the Difference?

Definitions

■ Fire Separation

- Construction assembly that acts as a barrier against the spread of fire.
- May or may not have a fire resistance rating.
- Intended to provide a barrier to the spread of smoke and fire until a response is initiated. If the building is sprinklered a non-rated fire separation is required to remain in place long enough to allow for sprinkler system activation.

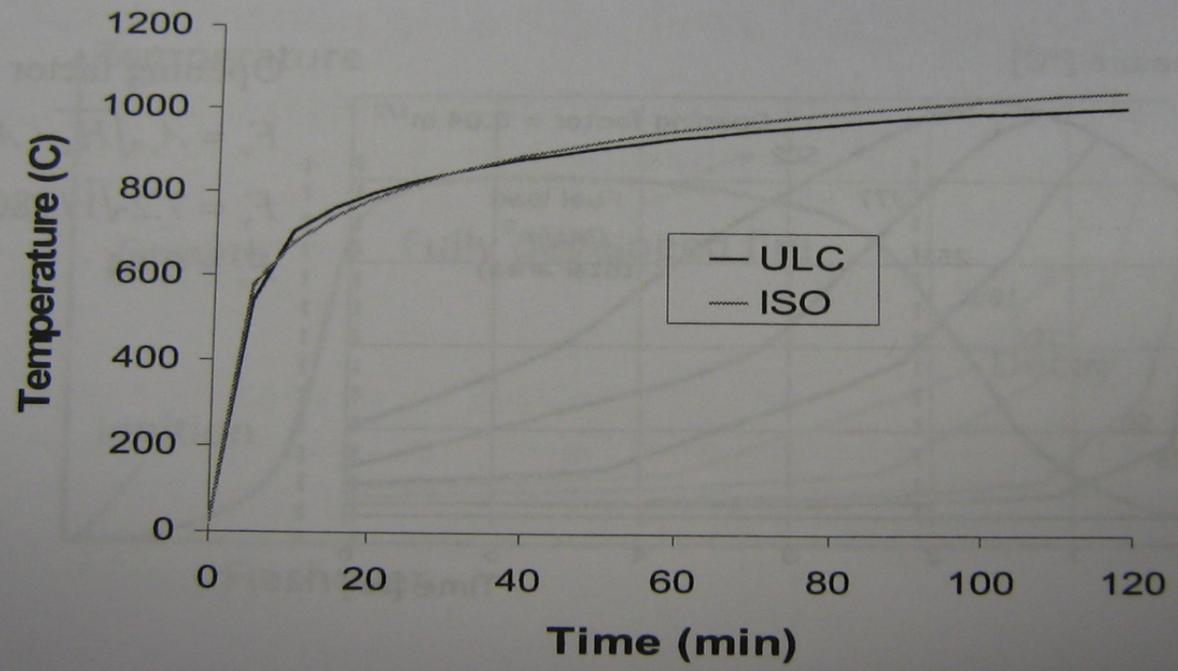
Definitions

■ **Rated Fire Separation**

- Construction assembly which is designed to act as a fire separation with a given fire resistance rating (typically $\frac{3}{4}$, 1, 1 $\frac{1}{2}$, 2 and 3 hours)
- Fire resistance is based on CAN/ULC-S101 which is a test protocol using a standard time/temperature curve. Similar to ASTM E119.
- Construction assemblies are either tested by an accredited testing lab to CAN/ULC-S101 or they are constructed based on generic methods outlined in NBC 2015, Division B, Appendix D.

CAN/ULC-S101 FIRE

Standard Time-temperature Curves



Definitions

- **Rated Fire Separation** Continued
 - CAN/ULC S101 tests for an average maximum temperature rise (140⁰ Celsius) and a maximum single point temperature rise (180⁰ Celsius) on the unexposed side of the assembly. There is no requirement for a limitation on the passage of smoke. The test is limited to the passage of flame and the transmission of heat through the assembly.
 - This means that a 1 hour rated fire separation will not necessarily be smoke tight for the 1 hour period.

Definitions

- **Assembly with a Fire Resistance Rating**
 - The structure of a given assembly can withstand the CAN/ULC S101 fire test for the specified length of time.
 - An assembly with a fire resistance rating is not the same as a fire rated separation. The assembly with a fire resistance rating is not required to be a barrier against the passage of smoke and flame.

Definitions

■ Firewalls

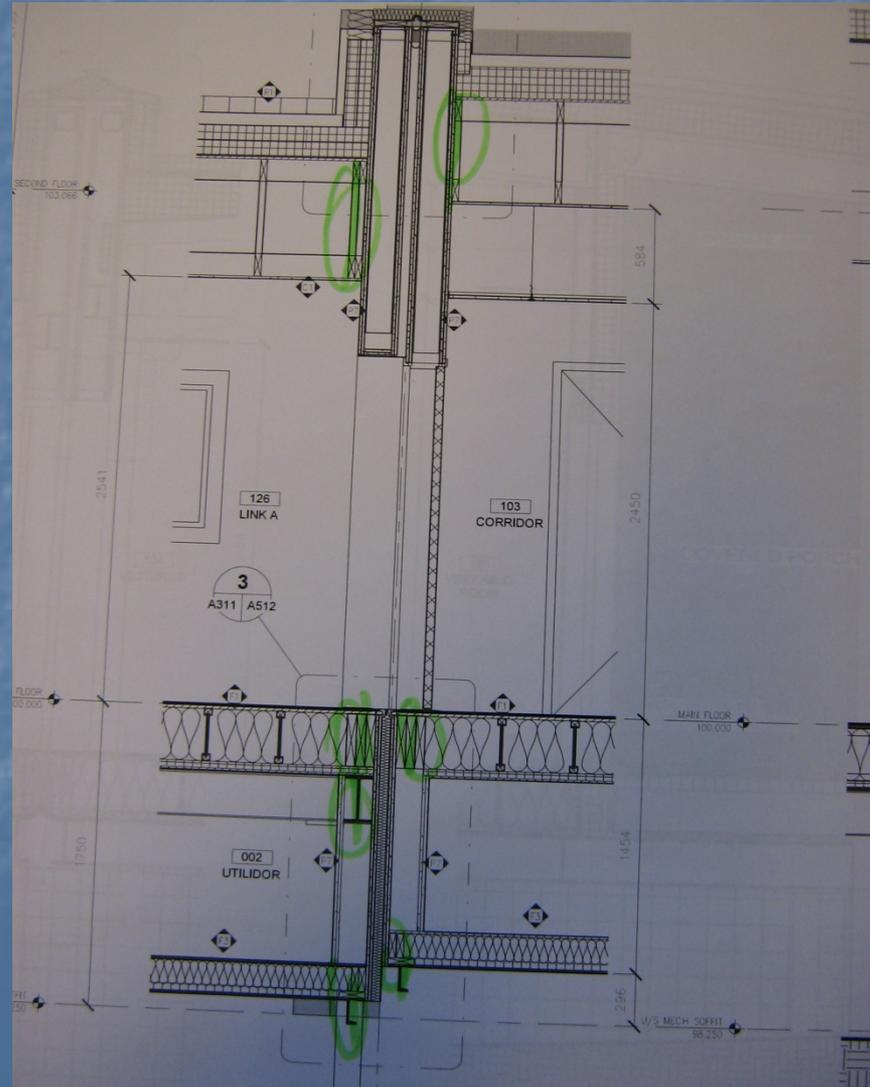
- A type of **fire separation** of **non-combustible** construction that subdivides a building or separates adjoining buildings to resist the spread of fire and that has a **fire resistance rating** as prescribed in the Code and **has structural stability to remain intact under fire conditions for the required fire rated time.**

Definitions

■ Firewalls

- A firewall must be structurally independent from adjacent framing, or, structural framing connected to the firewall shall either have a fire resistance rating equal to or greater than that of the firewall or their collapse due to fire will not affect the integrity of the firewall.
- A firewall must be able to withstand a fire and prevent fire spread by containing a fire to one side of the wall until the fire burns itself out or is extinguished.

Structurally Independent Firewall



Where are they used?

- **Non-Rated Fire Separations**
 - Floor and Wall Assemblies
 - Public Corridors in Sprinklered Buildings
 - Corridors Used by the Public in Sprinklered Assembly occupancies
 - Janitor Rooms in Sprinklered Buildings
 - Corridors Serving Patient Sleeping Rooms

Where are they used?

- **Rated Fire Separations**
 - Floor and Wall assemblies
 - Exits and Exit Corridors
 - Exit Vestibules
 - Public Corridors
 - Suites
 - Janitor Rooms in non sprinklered buildings

Where are they used?

- **Rated Fire Separations** Continued
 - Multi suite Storage Rooms in Residential occupancies
 - Corridors used by the public in Assembly occupancies
 - Service Rooms
 - Service Spaces and Service Shafts
 - Elevator Machine Rooms
 - Elevator Shafts
 - Electrical Vaults

Where are they used?

- **Assemblies with a Fire Resistance Rating**
 - Mezzanines
 - Load bearing Walls, Beams, Arches, Columns and Structure supporting fire rated separations and assemblies.
 - Exterior walls which are exposed building faces.

Where are they used?

■ Firewalls

- To separate adjoining buildings. This could be two buildings touching each other at a property line.
- To subdivide a building into a number of smaller buildings. This is often done in order to reduce the construction requirements of the building or avoid sprinklering the building.

Construction

■ Fire Separations

- Can be constructed of most materials permitted within the construction classification (combustible or non-combustible) provided the assembly is smoke tight and resists the passage of fire.
- Typical assemblies use non-rated drywall membranes.
- In a sprinklered building it is assumed that a fire separation will remain in place for a period of 10 to 15 minutes to allow for sprinkler activation.

Construction

■ Rated Fire Separations

- Most commonly constructed using fire rated drywall on wood or steel studs for walls and wood or steel framing for floors depending on building construction classification.
- Drywall used in rated fire separations is required to be fire rated type "X". Note that NBC 2015 Appendix D-2.3.4 (walls) and D-2.3.12 (ceilings) no longer list times for non-rated drywall.
- Walls or floor assemblies using multiple layers of drywall shall have overlapping joints.
- Can also be constructed using concrete block, cast in place concrete and pre-stressed concrete. In the case of reinforced and pre-stressed concrete, the concrete cover over the reinforcing steel becomes an important factor in determining fire resistance rating along with the type of concrete.

Construction

- **Assemblies with a Fire Resistance Rating**
 - The objective here is to provide the structure with a fire resistance rating. This can be done in the following ways;
 - Wrap wood or steel members with fire rated drywall.
 - Use heavy timber construction which has an inherent fire resistance rating.
 - Protect steel members with an intumescent coating.
 - Protect steel members with a concrete coating

Construction

■ Firewalls

- Are required to be non-combustible construction.
- Typically constructed of masonry or concrete.
- Masonry walls typically have filled cells with reinforcing steel for structural stability.
- Can also be constructed using steel studs and drywall provided it meets the requirements of NBC 2015 Sentence 3.1.10.2.(4).
- Note that firewalls are to be designed for lateral loading conditions as per NBC 2015 Article 4.1.5.17.

Openings

■ Fire Separations

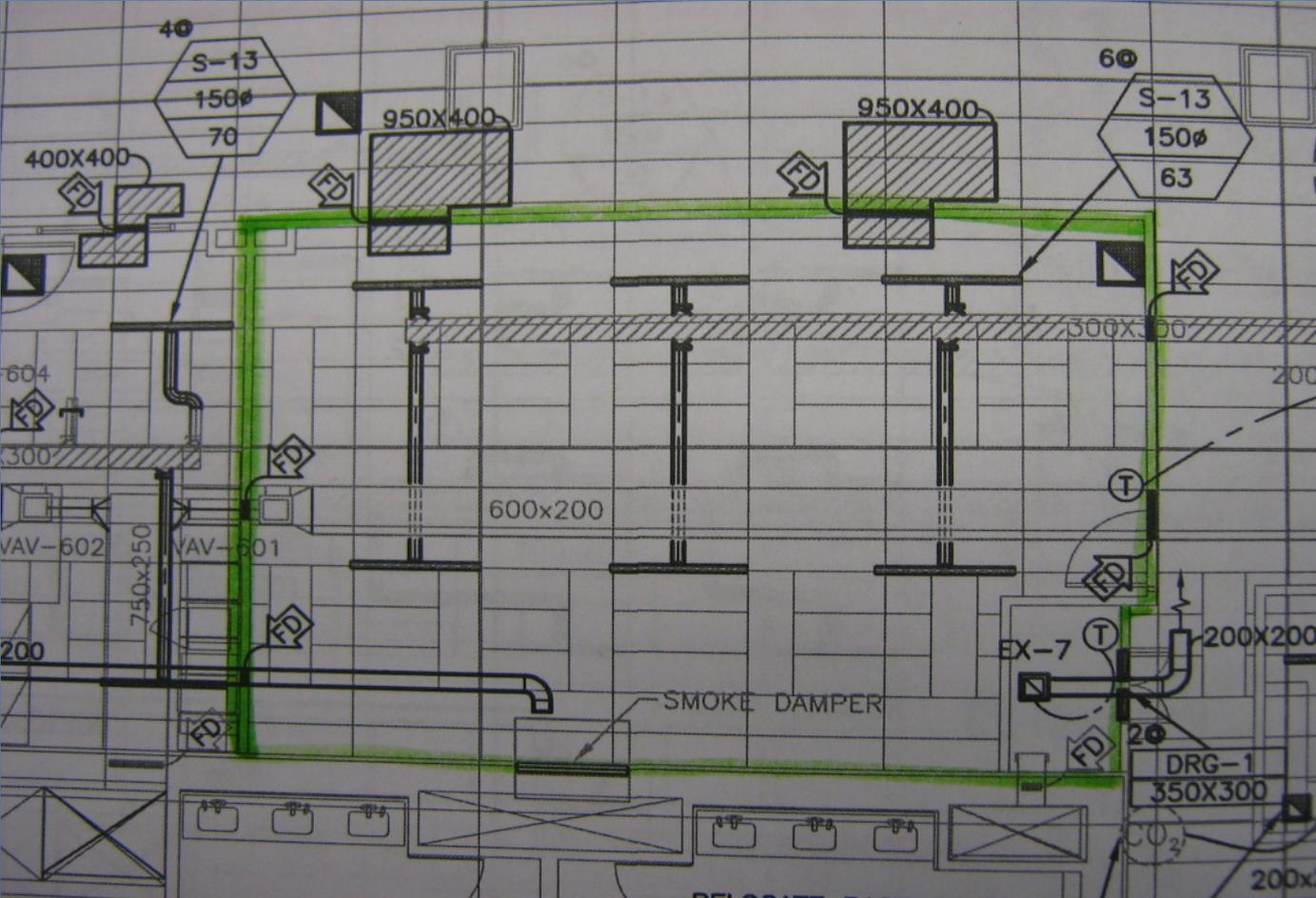
- Cannot have openings which would allow for the passage of fire or smoke.
- Openable windows or partitions are not permitted.
- Maximum size of openings protected by closures is limited to those found in NBC 2015 Article 3.1.8.6. Sizes depend on whether or not the adjacent fire compartments are sprinklered.
- Doors require closers as per NBC 2015 Article 3.1.8.13. Exceptions for; classrooms, "D" occupancies less than 3 stories, patients sleeping rooms.
- Doors require latching hardware as per NBC 2015 Article 3.1.8.15.

Openings

■ Fire Separations Continued

- Ducts must be cast in place or sealed to the fire separation with fire stop material. The duct itself acts as the fire separation and does not require a fire damper if the fire separation is not rated.
- Air transfer openings require a smoke damper activated by local smoke detectors and fire alarm. A fire damper is not adequate as it does not retard the passage of fire and smoke until the fusible link is activated. Refer to NBC 2015 Sentence 3.1.8.7(2).
- Firestopping of service penetrations is required. NBC 2015 Article 3.1.9.1

Air Transfer Ducts



Openings

■ Fire Rated Separations

- Similar limitations on openings as fire separations including maximum area and dimension of openings but with additional requirements for fire rating assemblies and closures
- Windows and glass block permitted in openings of walls with a 1 hour fire rating or less as per NBC 2015 Article 3.1.8.16.
- Ducts penetrating rated fire separations require fire dampers as per NBC 2015 Article 3.1.8.7. Exceptions found in NBC 2015 Article 3.1.8.8.

Openings

- **Fire Rated Separations** Continued
 - Service penetrations require sealing with fire stop materials which have an FT Rating equivalent to the rating of the fire separation.
 - Doors to have a fire rating as per NBC 2015 Articles 3.1.8.4 and 3.1.8.12 (20 minute closures).
 - Doors in exit stairs of buildings over 3 stories require a temperature rise limitation in addition to the fire rating. NBC 2015 Article 3.1.8.17.

Temperature Rise Limit

- What's the difference between a **regular fire rated door** and a **fire rated door with a temperature rise limit**?
- A **regular fire rated door** is tested to CAN/ULC-S104 using the CAN/ULC-S101 fire test but the only requirement is remain intact without developing significant openings even after the hose stream test. There is no requirement for an average or maximum temperature rise as in wall assemblies. The door can get red hot during the fire test as long as it remains sealed and does not develop cracks.

Temperature Rise Limit

- What's the difference between a **regular fire rated door** and a **fire rated door with a temperature rise limit**?
- A **fire rated door with a temperature rise limit** has to meet the same requirements and testing as a regular fire rated door but has the additional requirement of limiting temperature rise. These doors are typically insulated and have a different construction than regular fire rated doors. Temperature rise limitations are listed on NBC 2015 Table 3.1.8.17. Temperature rise limits are either 250⁰ Celsius after 30 minutes or 250⁰ Celsius after 1 hour depending on the use and fire rating of the door. These limits are based on exposure to the CAN/ULC-S101 fire test.

Temperature Rise Limit



Openings

- **Assemblies with a Fire Resistance Rating**
 - Openings do not require fire rated closures. The fire rating is limited to structure only.
 - For example; A fire rated bearing wall, supporting a fire rated separation on the main floor, with wood stud framing, in a basement would only require fire rated drywall protection over the studs and plates on both sides. Fire rated windows, doors, fire dampers and firestopping is not required. It may however be necessary to wrap the drywall around the stud framing at openings for windows and doors.

Openings

- **Assemblies with a Fire Resistance Rating**
 - Exterior walls as part of an exposed building face would normally only have the structure of the wall with a fire resistance rating. If however the openings in the wall exceed those allowed then it may be necessary to have fire rated closures such as doors and windows as well.

Openings

■ Firewalls

- Aggregate width of openings shall be less than 25% of the width of the wall. Maximum size of openings is 22 m² (sprinklered) and 11 m² (non-sprinklered). Maximum dimension of 6 m (sprinklered) and 3.7 m (non sprinklered) as per NBC 2015 Article 3.1.10.5.
- Windows are not permitted in a firewall as the minimum fire rating of a firewall is 2 hours which is above the maximum 1 hour rating for walls with windows.
- Service penetrations are acceptable provided they are fire stop sealed with an FT rating equal or greater than the rating of the firewall. Services penetrating firewalls have to be designed such that their collapse on either side of the firewall will not cause damage to the firewall as per NBC 2015 Sentence 3.1.10.1.(4).

Openings

■ Firewalls Continued

- Doors in 2 hour rated firewalls require a 1 ½ hour fire rating and a temperature rise limitation of 250⁰ Celsius after 30 minutes. Those in 4 hour rated firewalls require a 3 hour fire rating and a temperature rise limitation of 250⁰ Celsius after 60 minutes.
- The NBC does not prohibit duct penetrations of a firewall. Fire dampers however are not insulated and are not tested for a temperature rise limitation. They can heat up and ignite combustible materials on the other side of the firewall. As such duct penetrations of a firewall would not be recommended unless a fire damper design could be done which would be equivalent to the temperature rise limitations of doors.

Fire Blocks

- Definition;
 - Barrier which restricts the spread of fire in a concealed space or between a concealed space and an adjacent space. NBC 2015 Div A, Article 1.4.1.2
 - Intended to retard the passage of flames for 15 minutes when subjected to CAN/ULC-S101 Fire Test. NBC 2015 Sentence 3.1.11.7.(1).

Fire Blocks

- Where are they used ?;
 - Unsprinklered crawl spaces more than 600 m² or dimension greater than 30 m.
 - Unsprinklered attic spaces of combustible construction with maximum areas and dimensions dependant on flame spread rating of materials.
 - Unsprinklered concealed spaces of combustible construction in; floors, balconies, canopies, cornices etc.

Fire Blocks

- Construction (NBC 2015 Article 3.1.11.7);
 - Gypsum board (regular or type X) 12.7 mm or more with supported joints.
 - Solid Lumber 38 mm or more
 - Plywood, Waferboard and Strandboard, 12.5 mm or more with supported joints.

Fire Blocks

- Openings;
 - Openings to be protected to maintain the integrity of the construction. NBC 2015 Sentence 3.1.11.7.(5).
 - Doors should either be fire rated with a 20 minute fire resistance rating or constructed of similar material to the fire block. Regardless which approach is chosen they need be equipped with a door closer and latching hardware.
 - Service penetrations, construction elements and ducts to be fire stop sealed where they penetrate the Fire Block. NBC 2015 Sentence 3.1.11.7.(6).
 - Air transfer openings should be avoided, but if they occur, they shall be protected with a fire damper or fire stop flap to maintain the integrity of the construction.

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