Fire stops and fire blocks

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NRC·CNRC

Institute for Research in Construction

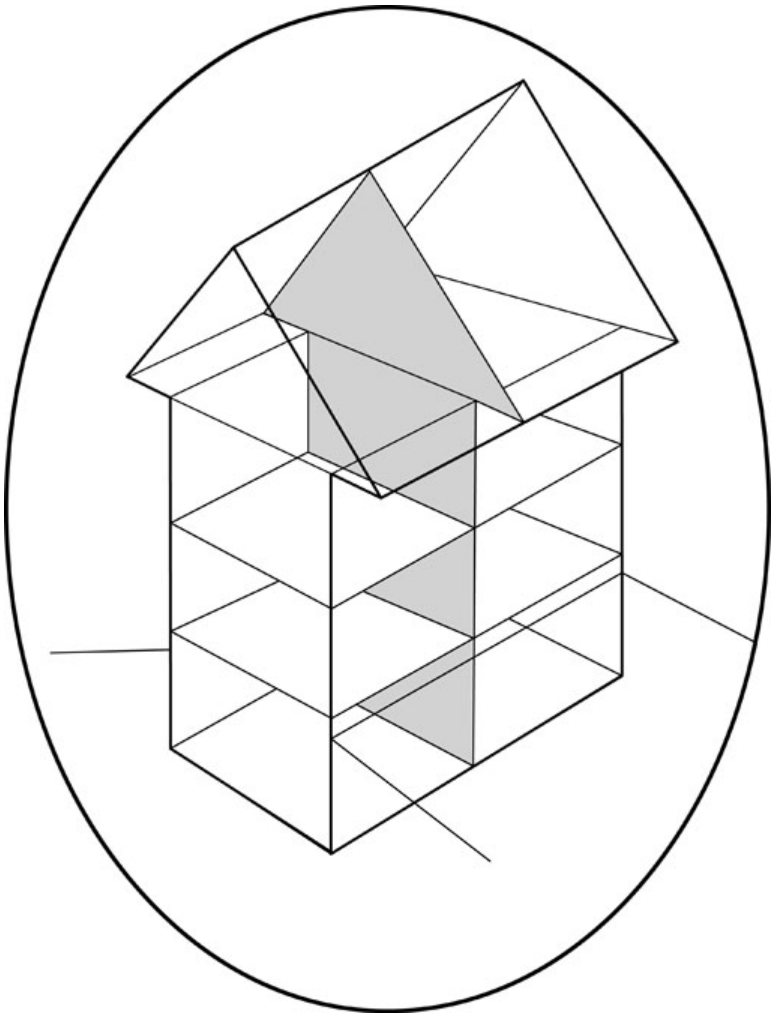
Fire Stops and Fire Blocks

David Quirt, Trevor Nightingale and Ken Richardson

National Research Council Canada
Conseil national de recherches Canada

Canada

Overview



- Why is this a concern?
- Developing the Best Practice Guide
- Contents of the Guide
- Future directions

Continuity of Fire Separations – Historic Context

- Major fires highlighted effect of weak points:
  - 1975: Brown's Ferry nuclear power plant fire
  - 1977: USA study on residential fire spread
  - 1981: MGM Grand Hotel fire
- Over several decades, major fires and research led to vastly improved fire stop technology
  …an industry was born!
- Related infrastructure of technical standards and regulations evolved in Canada and USA

Concealed Space Fire
Fort McMurray, April 2007

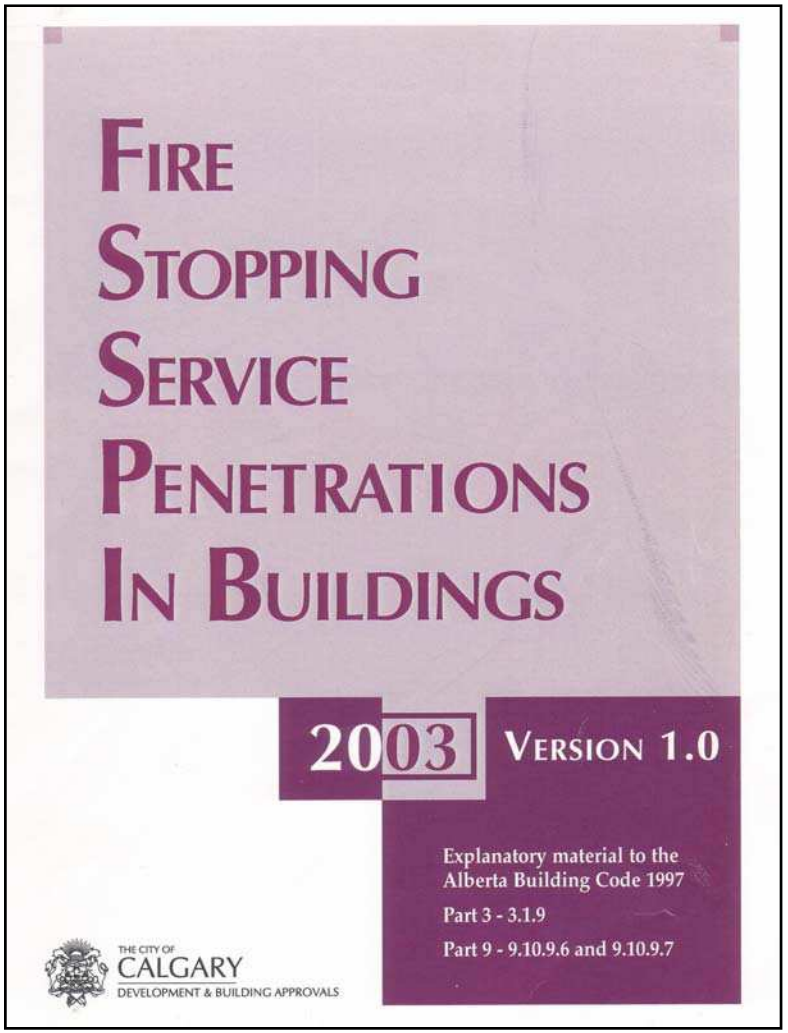
Photos: Fort McMurray FD

Concerns Remain

- Evolving products and test methods and lessons learned from major fires spur continuing refinement of regulations
- Many differences between Canada and USA (terminology, standards, regulations)
- Balancing between sound and fire control

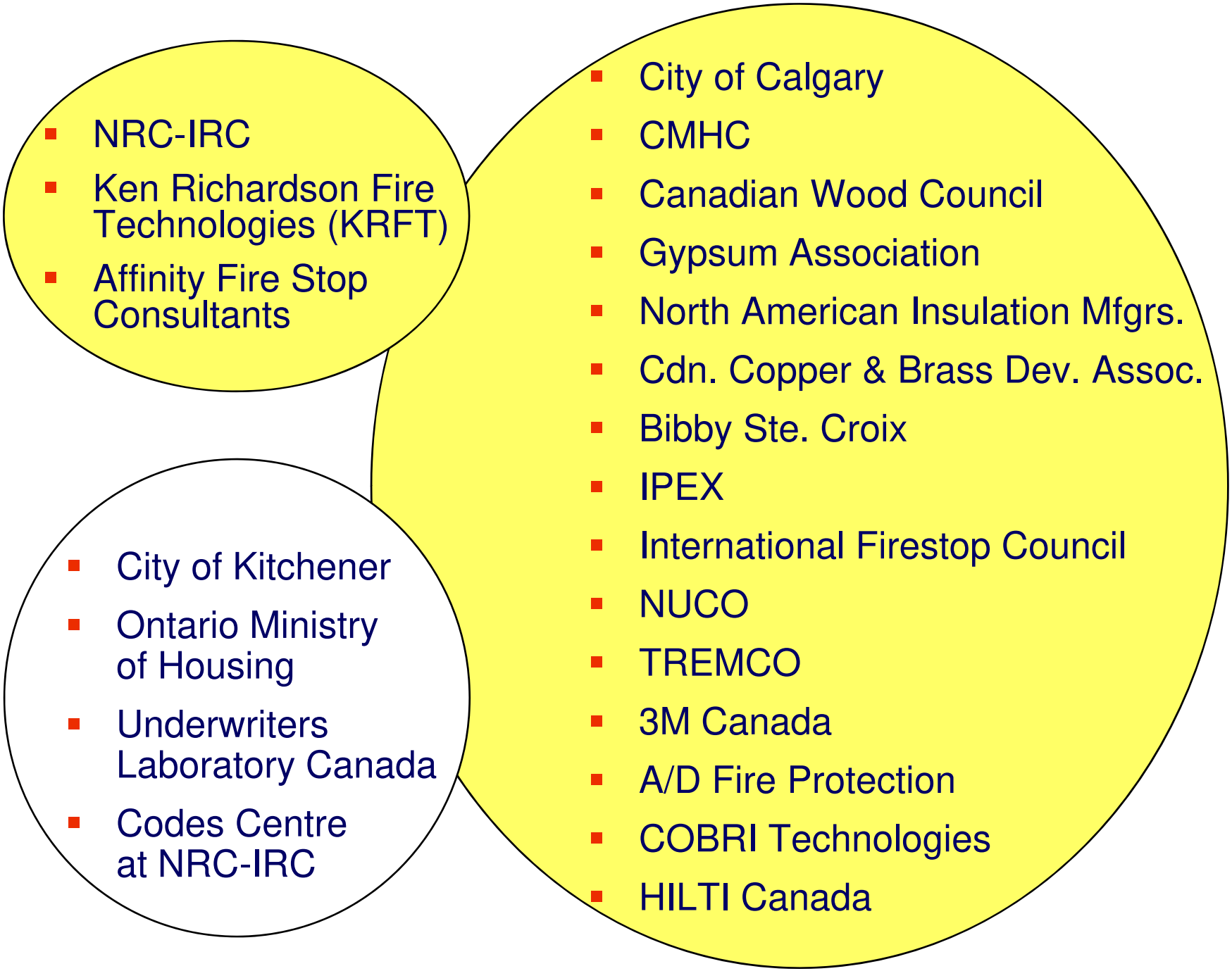
Starting Towards Consensus …

- Working with industry, the City of Calgary developed guidelines for through-penetration fire stops with the goal of improving fire stop practice in Calgary
- Calgary officials wanted a more comprehensive document



A Collaboration Is Born!

- With the City of Calgary as a catalyst, Ken Richardson (KRFT) and NRC-IRC sought partners for the development of a “Best Practice Guide”
- Formed **S**pecial **I**nterest **G**roup on **S**uitable **A**coustic and **F**ire **T**echnologies
- Strong participation from most sectors of the fire protection community


NRC-IRC
Ken Richardson Fire Technologies (KRFT)
Affinity Fire Stop Consultants
City of Kitchener
Ontario Ministry of Housing
Underwriters Laboratory Canada
Codes Centre at NRC-IRC
City of Calgary
CMHC
Canadian Wood Council
Gypsum Association
North American Insulation Mfgrs.
Cdn. Copper & Brass Dev. Assoc.
Bibby Ste. Croix
IPEX
International Firestop Council
NUCO
TREMCO
3M Canada
A/D Fire Protection
COBRI Technologies
HILTI Canada

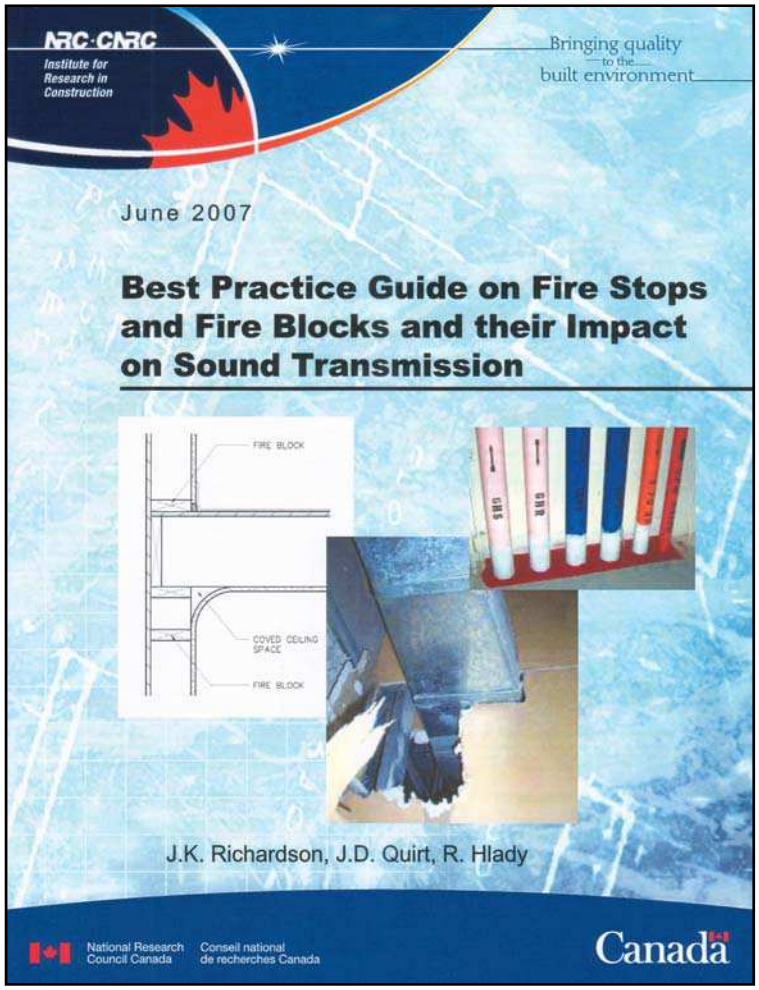
Development Process for Guide

- KRFT and NRC developed draft document
- Affinity Fire Stop Consultants prepared all illustrations (over 100)
- SIG-SAFT participants reviewed 3 drafts and provided comments
- Draft 3 was circulated to a wider audience of experts for further comment
- SIG-SAFT partners decided on final content

Contents of Guide

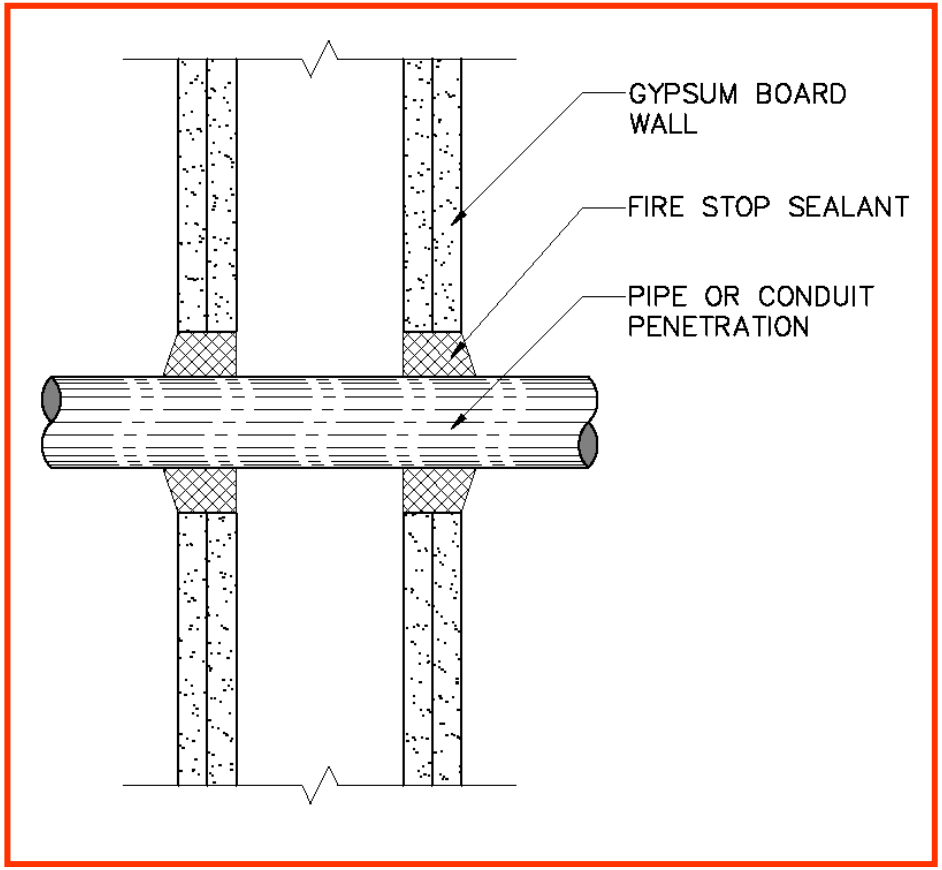
The basics:

- Fire compartmentation and noise control
- Types of fire stops and fire blocks
- Fire stop and fire block materials and systems
- Code requirements and technical standards
- Best practice issues
  - engineering judgements
  - inspection, etc.



New Terminology

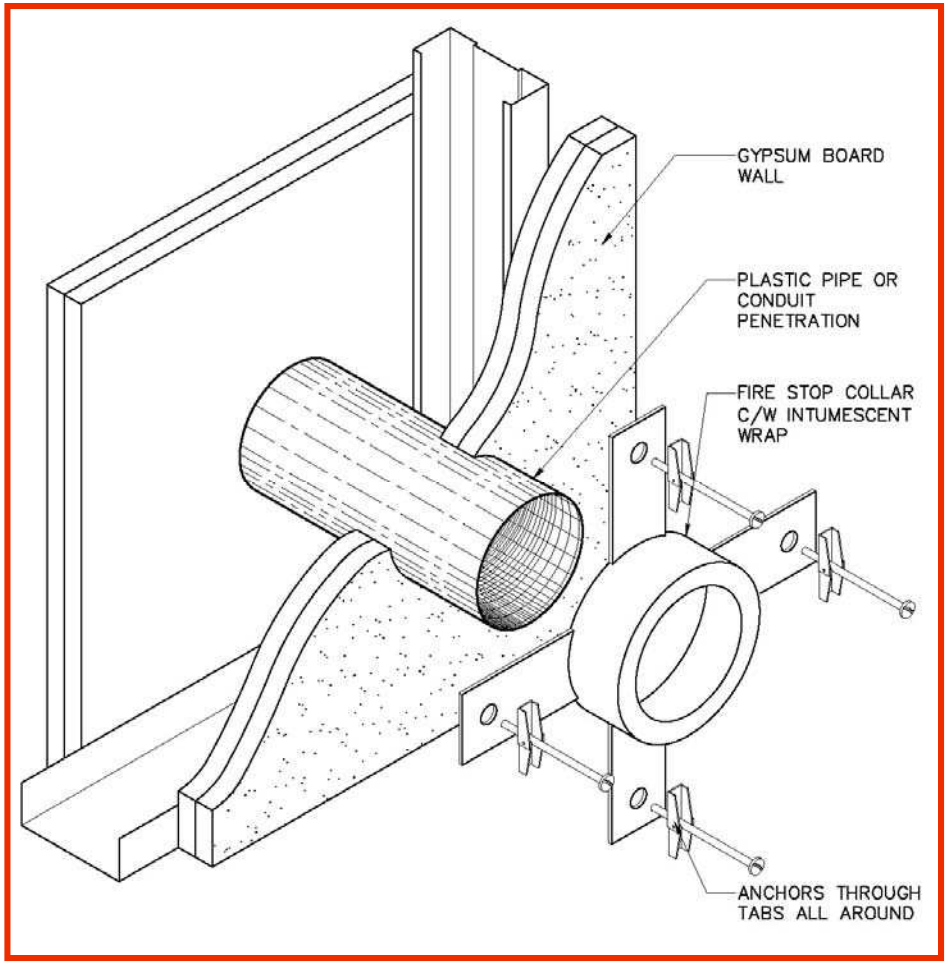
- **Fire Stop –**
  a material, component or system, and its means of support, used to fill gaps between fire separations, between fire separations and other construction assemblies, or around items which wholly or partially penetrate fire separations, to restrict the spread of fire and often smoke thus maintaining the integrity of a fire separation



Example of Through-Penetration Fire Stop

Fire Stop Materials and Systems

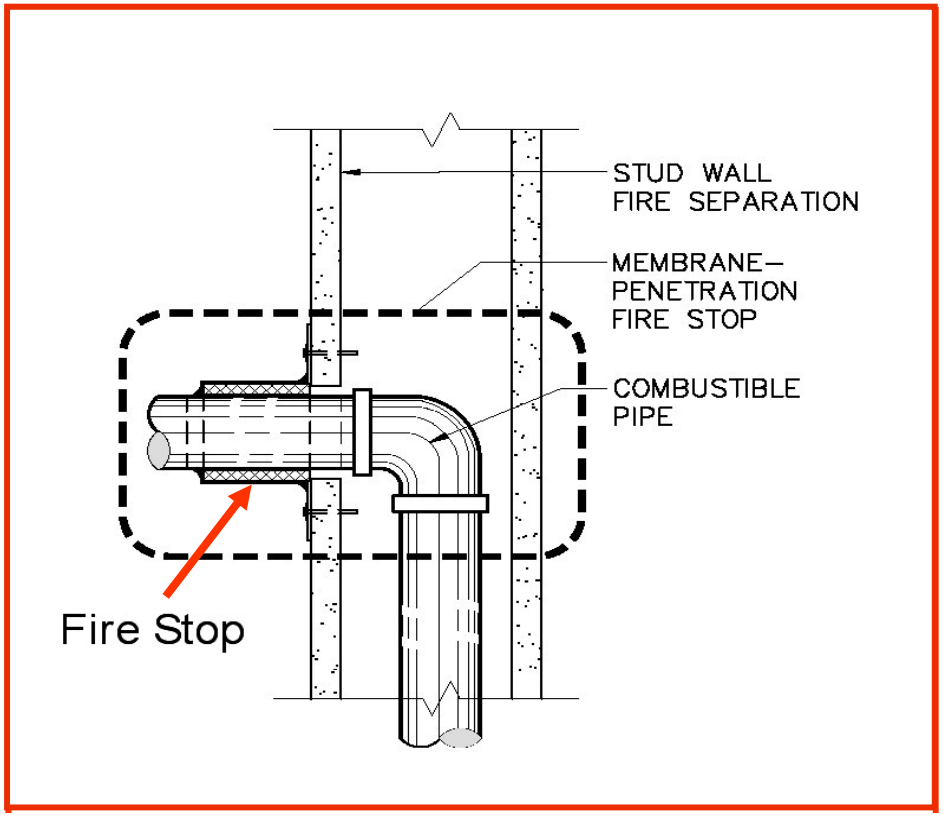
- Caulks/Sealants
- Putties
- Mortars/grouts
- Coatings/Sprays
- Foams
- Wraps
- Blocks/Pillows/Bags
- Composite Sheets/Boards
- Fire Stop Devices



Example of Fire Stop Device

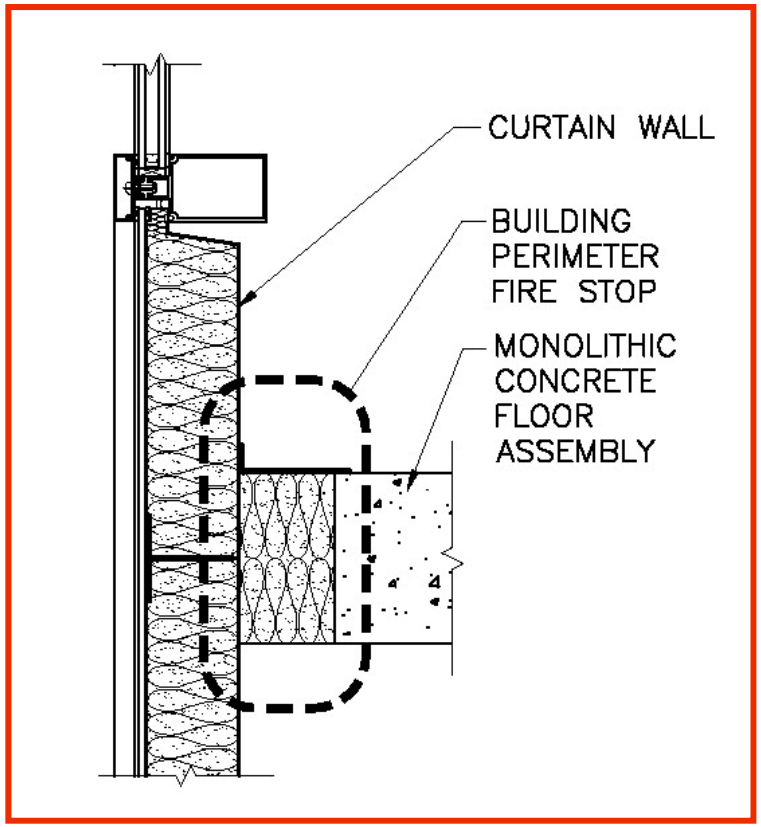
Fire Stops at Penetrations

- Through Penetration
- Membrane Penetration

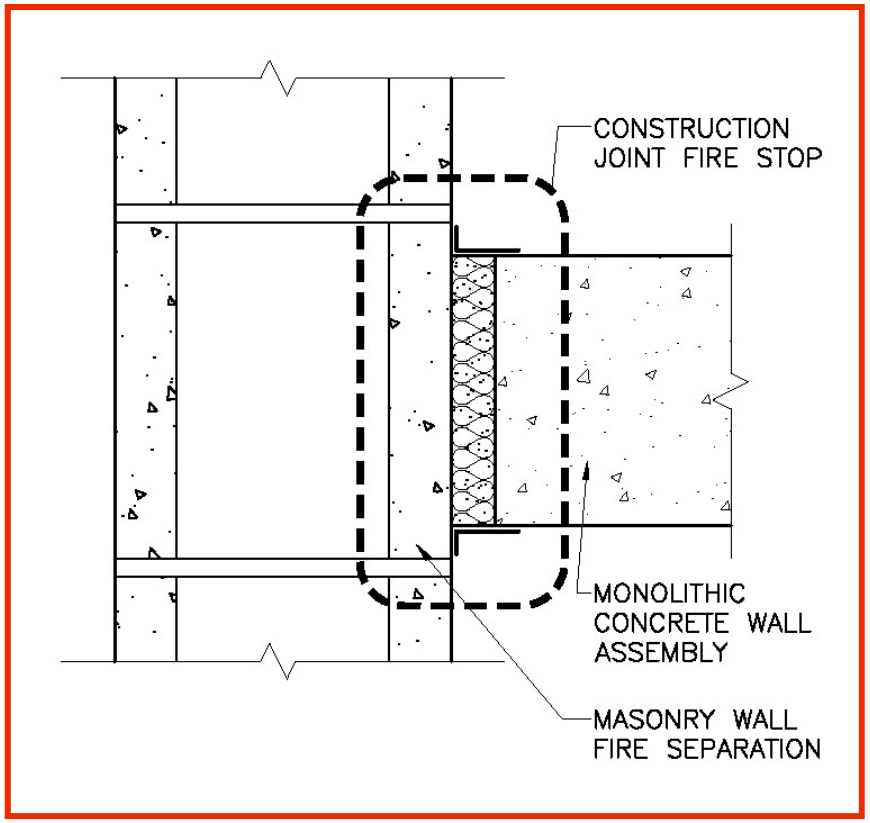


Example of a membrane penetration fire stop

Fire Stops at Construction Joints



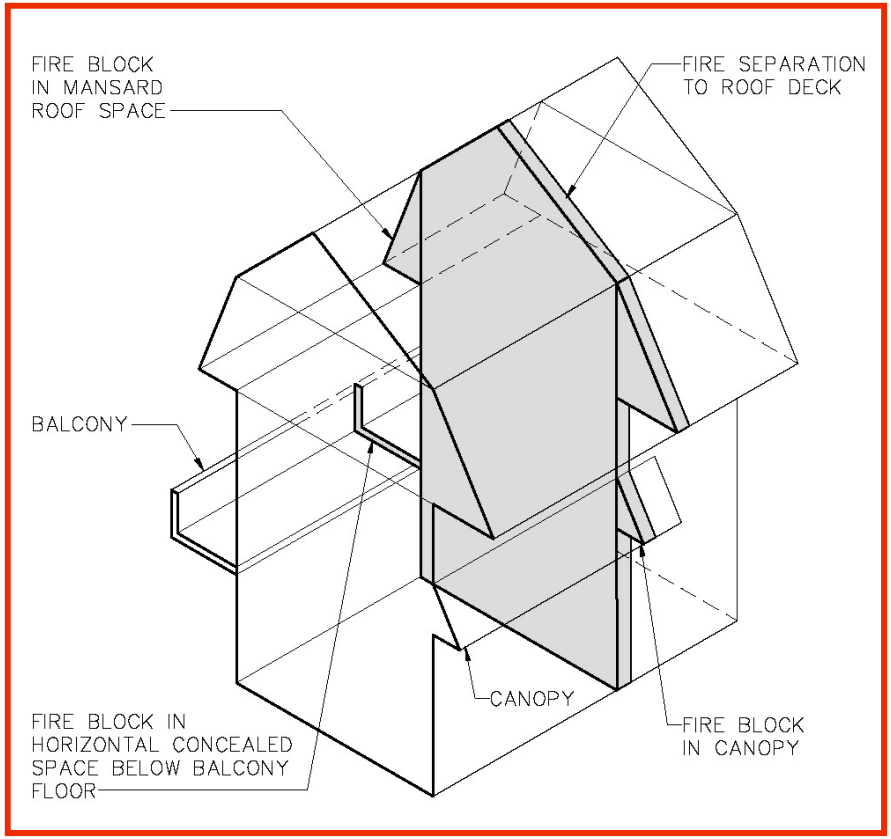
Example of a building perimeter fire stop



Example of a construction joint fire stop between a floor slab and a masonry wall

New Terminology

- **Fire block** – a material, component or system installed in a concealed space in a building to restrict the spread of fire and often smoke in that concealed space and from that concealed space to another

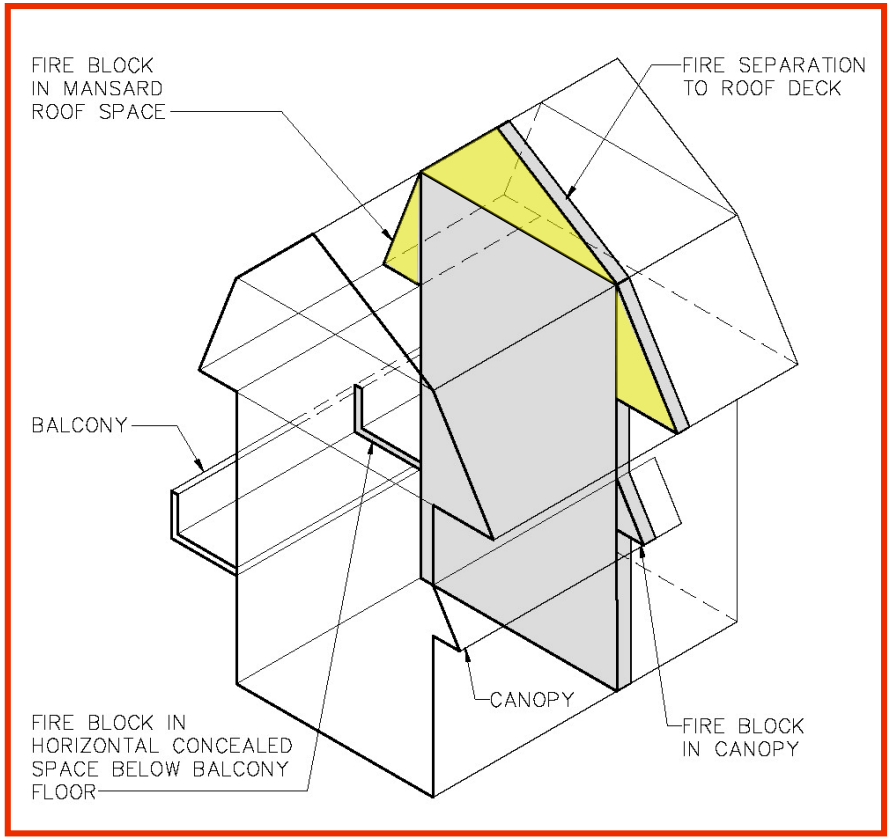


Example of Fire Blocks in a concealed space

Types of Fire Blocks

Two types:

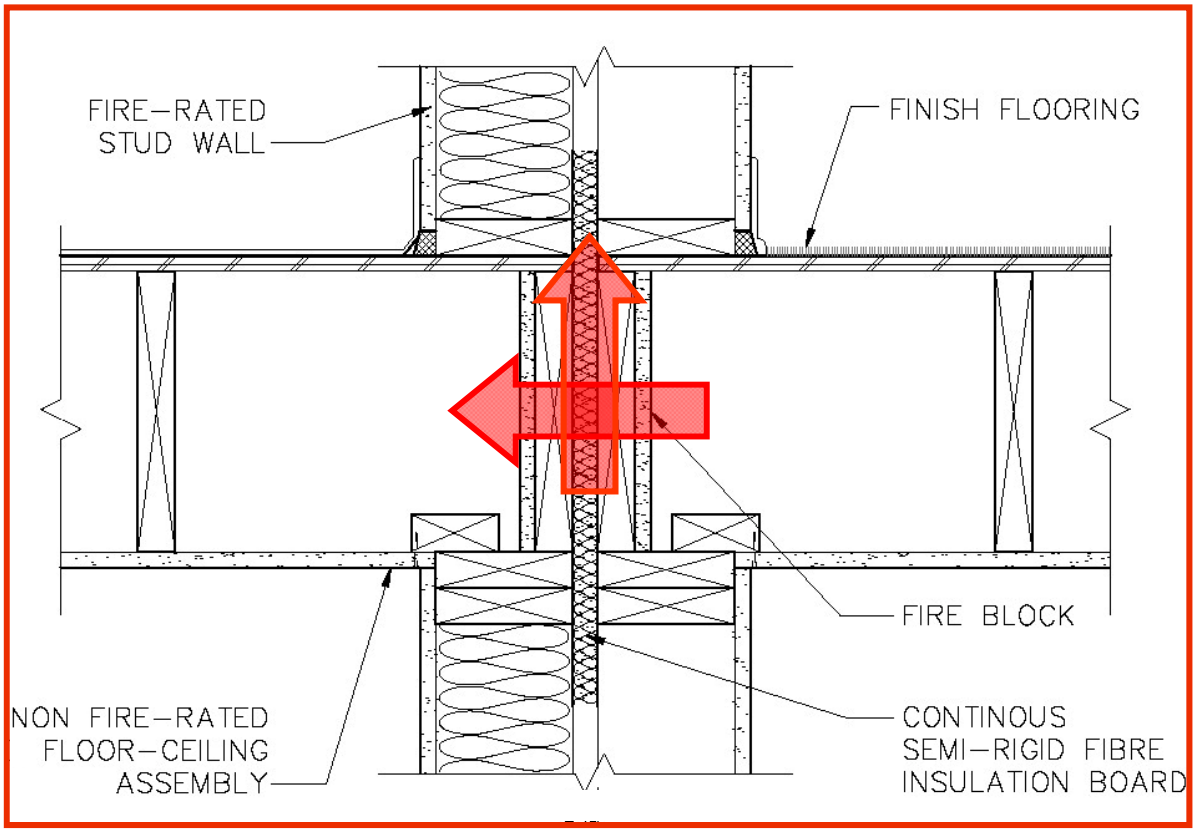
- Concealed Space Division
- Inter-Concealed Space Blocks



Concealed space fire blocks

Fire Block Materials and Systems

- Gypsum Board
- Sheet Steel
- Solid Lumber
- Plywood/OSB
- Semi-Rigid Fibre Insulation Board
- Listed Fire Stops

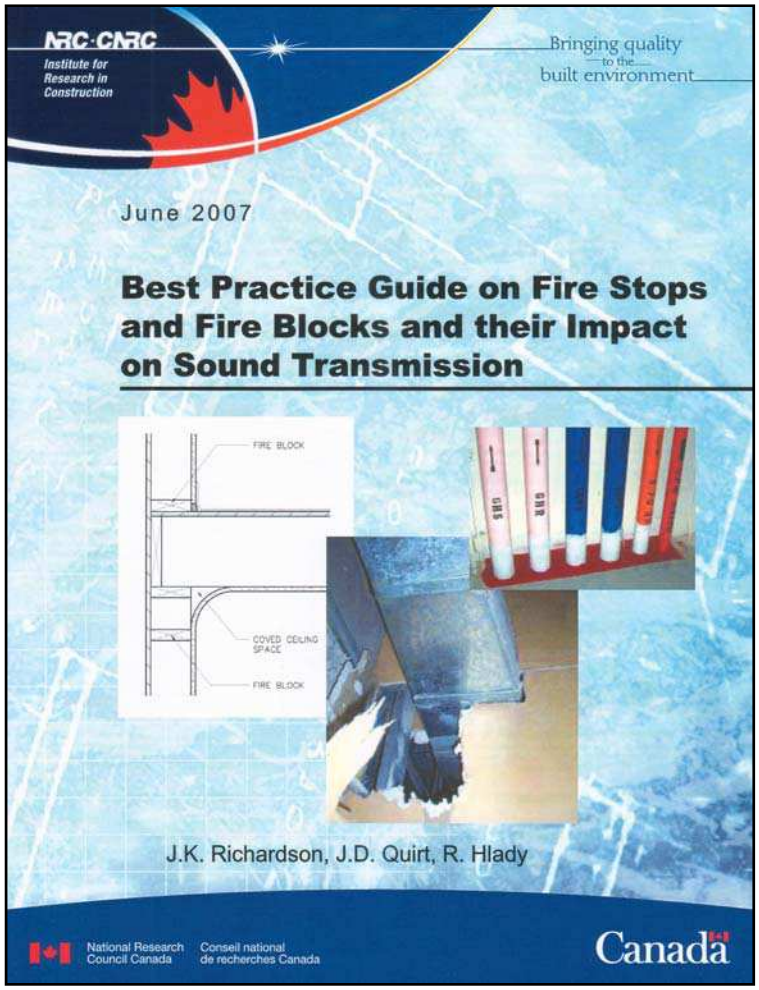


Example of a fire block in a concealed space between 2 walls

Content of Guide

Best practice for:

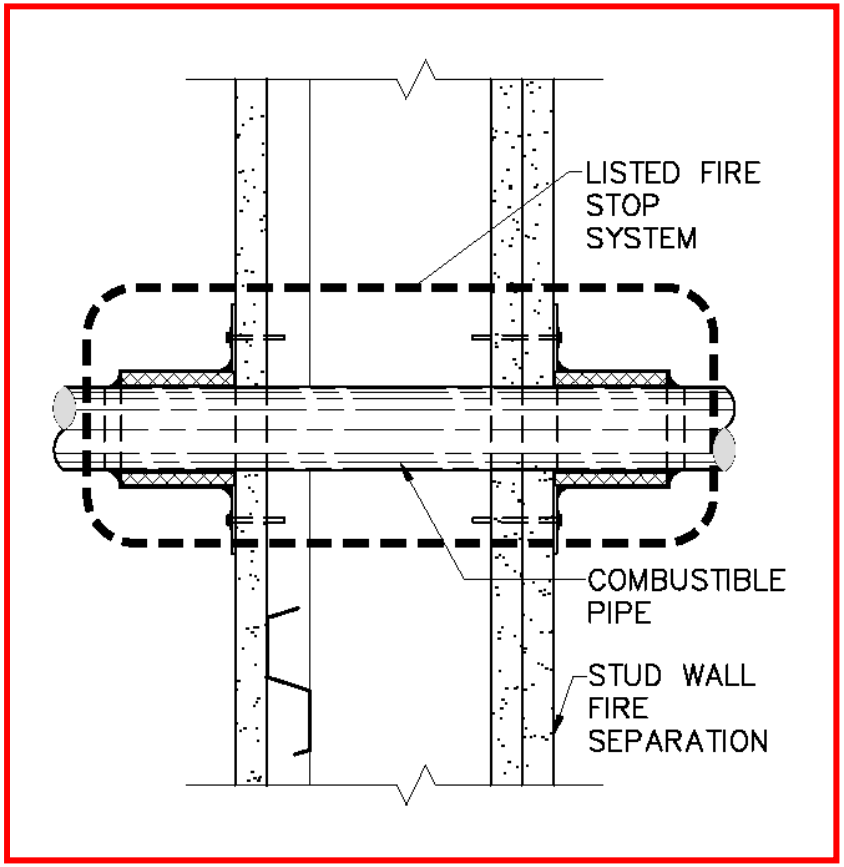
- Pipe penetrations
- Electrical penetrations
- Mechanical penetrations
- Construction joints
- Building perimeter joints
- Fire blocks



Best Practice for Piping Penetrations

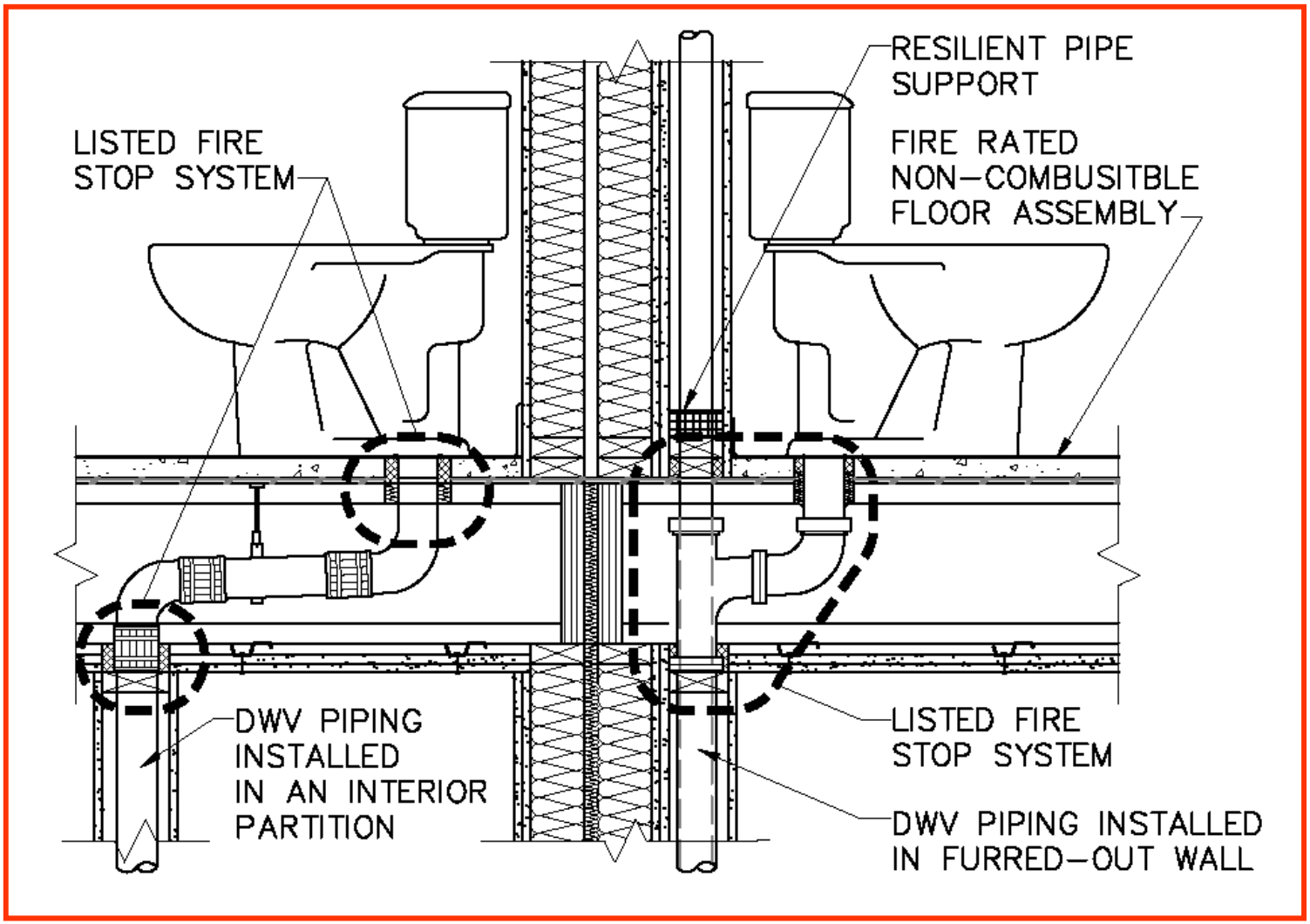
Penetrations through:

- concrete floor slabs
- joisted floors
- concrete/masonry walls
- stud walls
- roof spaces



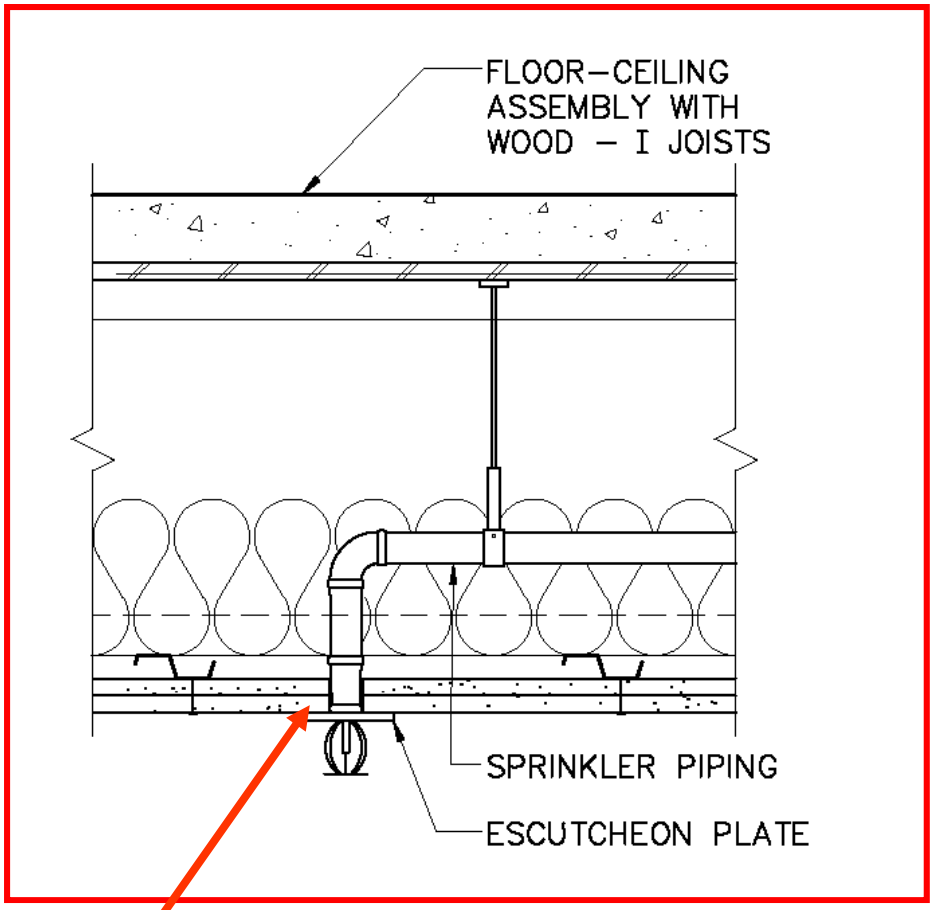
Example of a stud wall penetration with combustible pipe

Fire and Sound Together



Technology Conflict Identified

- Is a fire stop needed at the point where sprinkler piping penetrates the ceiling membrane?

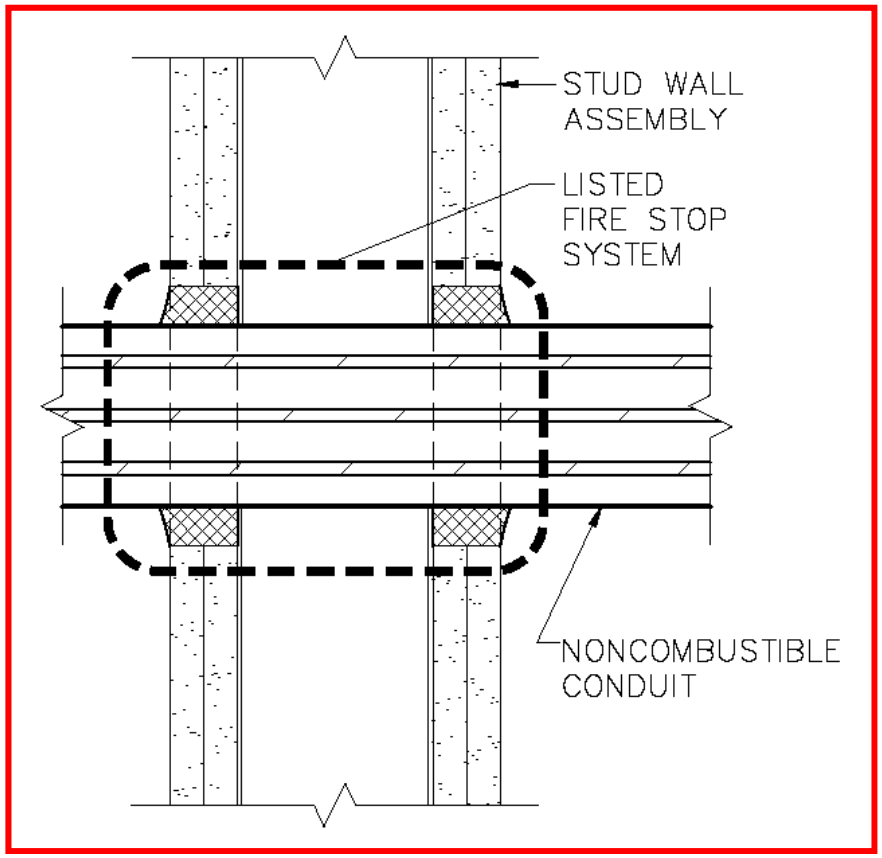


Is a fire stop needed here or not?

Best Practice for Electrical Penetrations

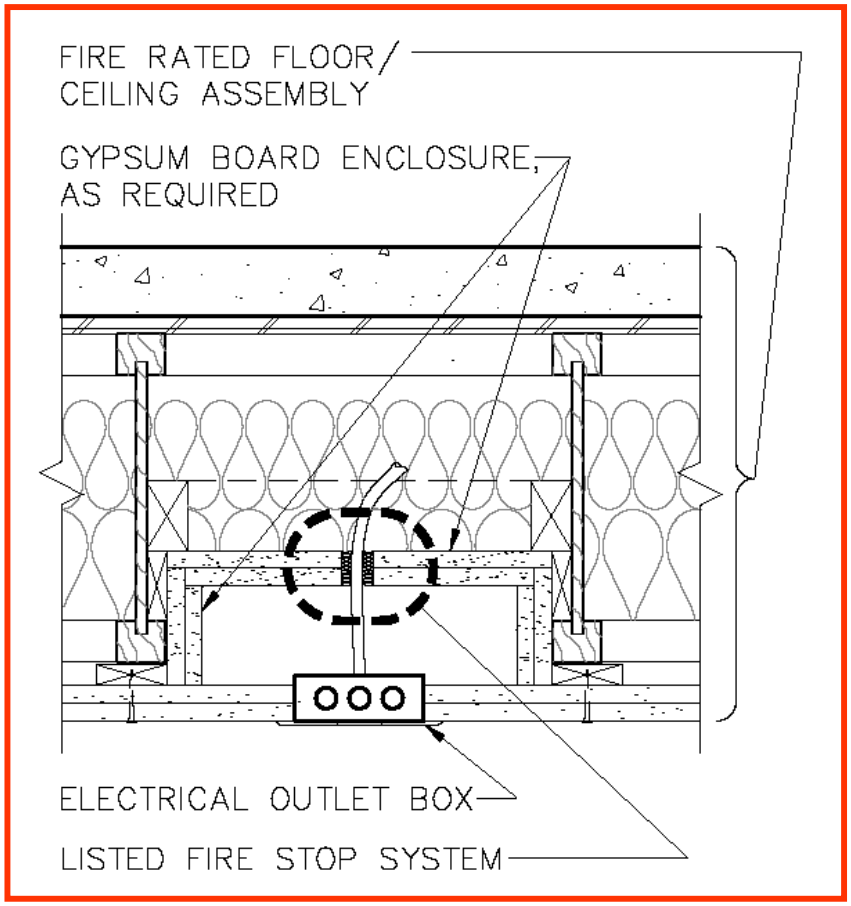
Penetrations through:

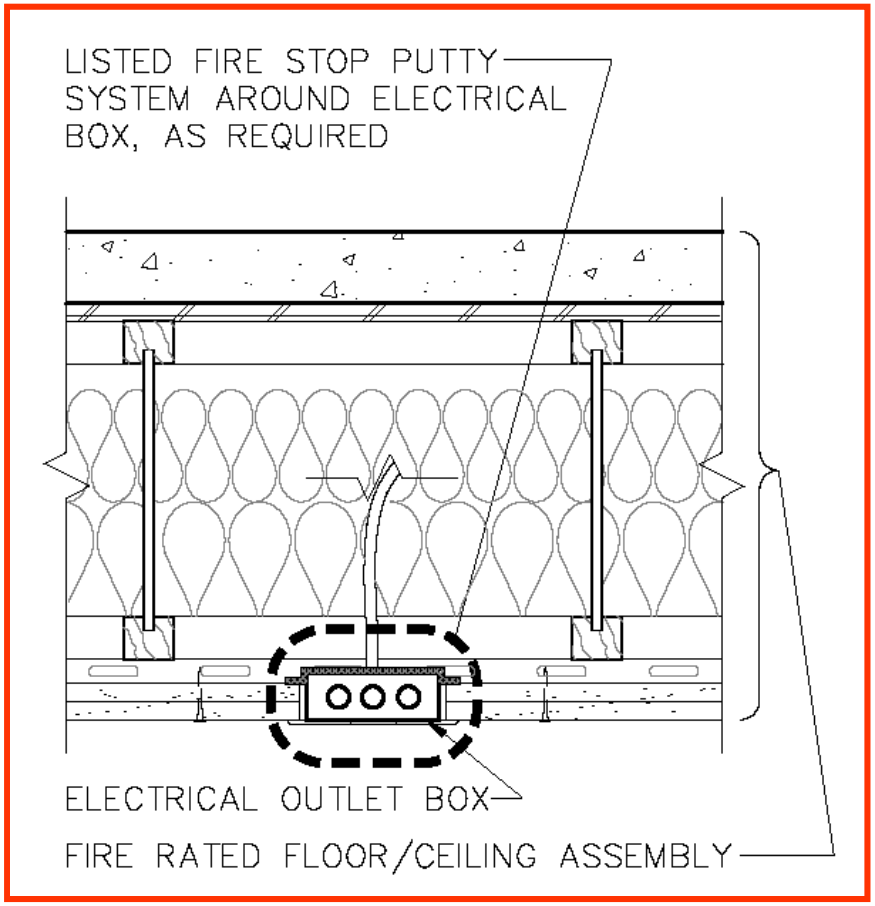
- concrete slab floors
- joisted floors
- concrete/masonry walls
- stud walls
- cable trays



Example of a cable/conduit penetration through a stud wall

Best Practice for Electrical Penetrations

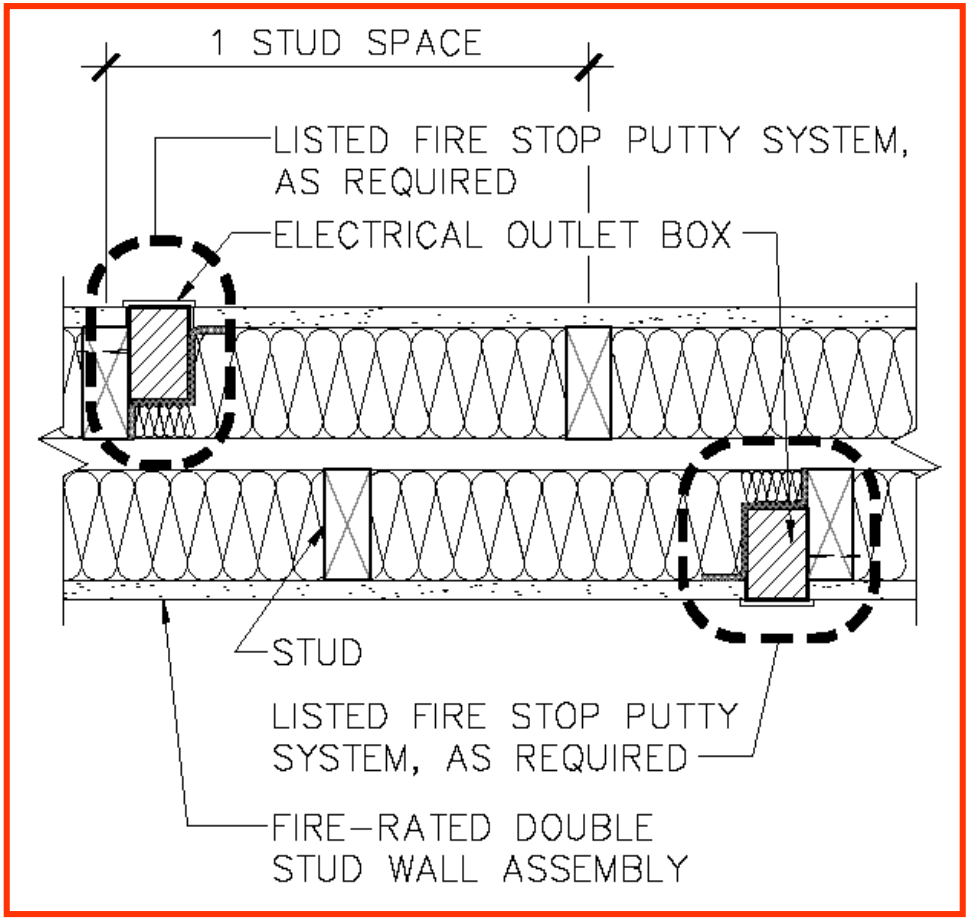




Examples of electrical box on ceiling

Best Practice for Electrical Penetrations

- In some cases, the treatments to control fire also control noise

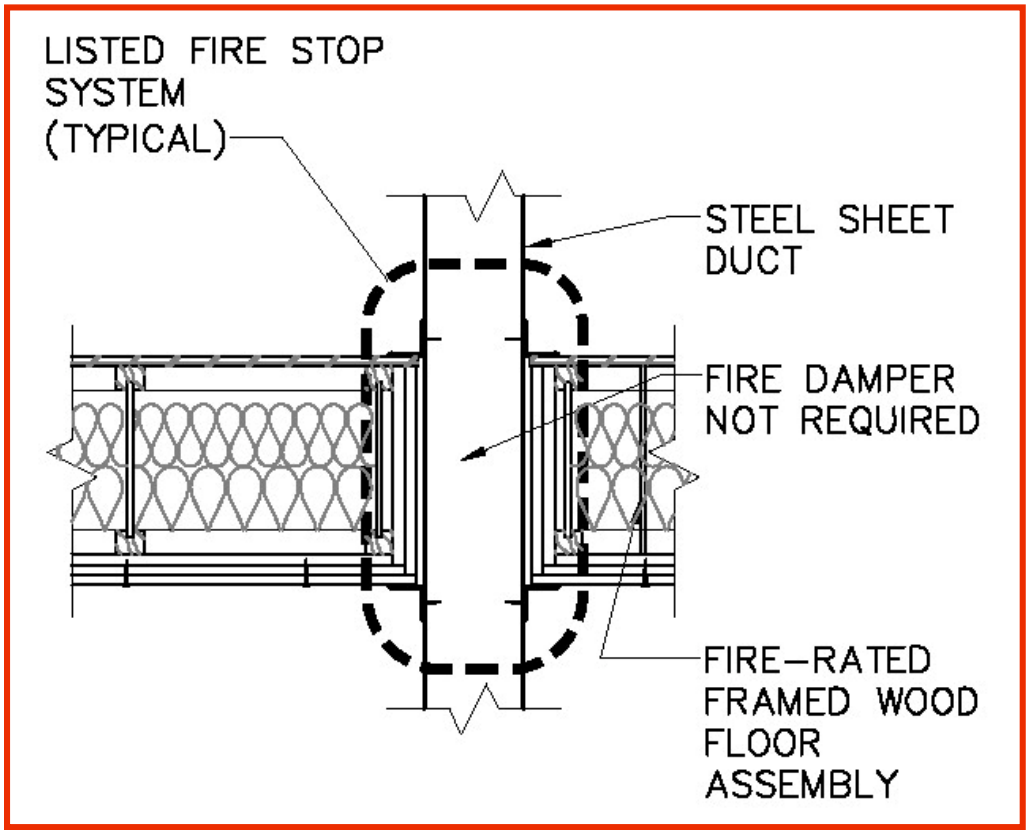


Example of electrical boxes on both sides of stud wall (more than 1 stud space apart)

Best Practice for Mechanical Penetrations

Penetrations through:

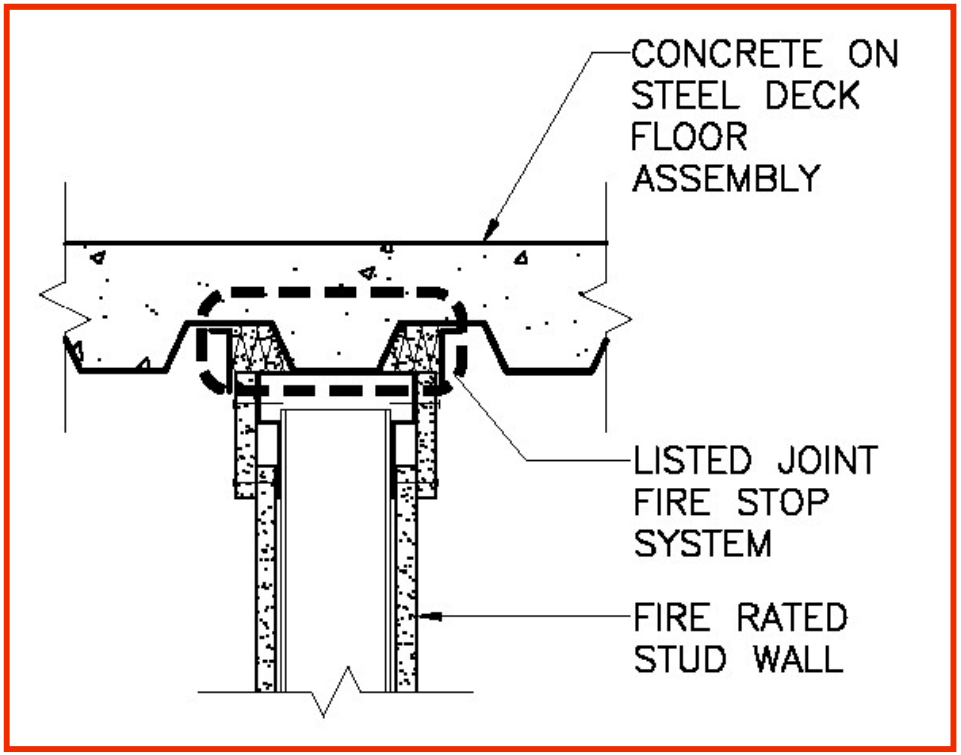
- concrete slab floors
- joisted floors
- concrete/masonry walls
- stud walls
- vertical shafts



Example of a duct penetration of joisted floor where a fire damper is not required

Best Practice for Construction Joints

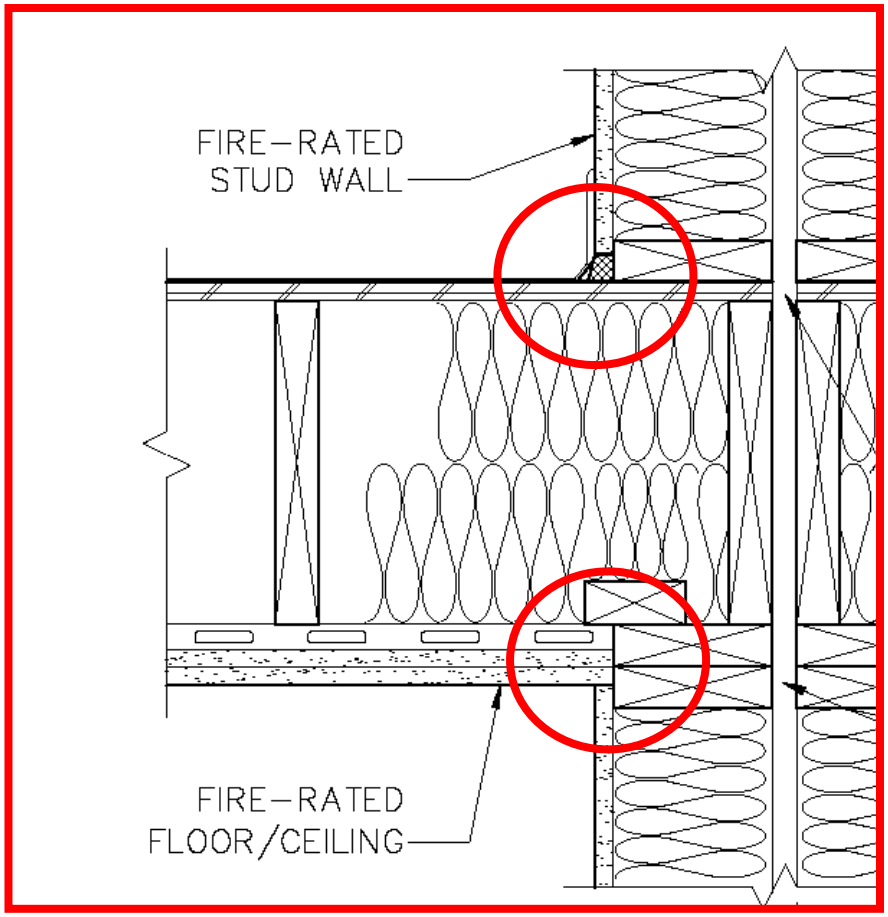
- Tops of walls
- Bottom of walls
- Between adjacent floors
- Between adjacent walls



Example of fire stop at a top of wall joint above a steel stud wall

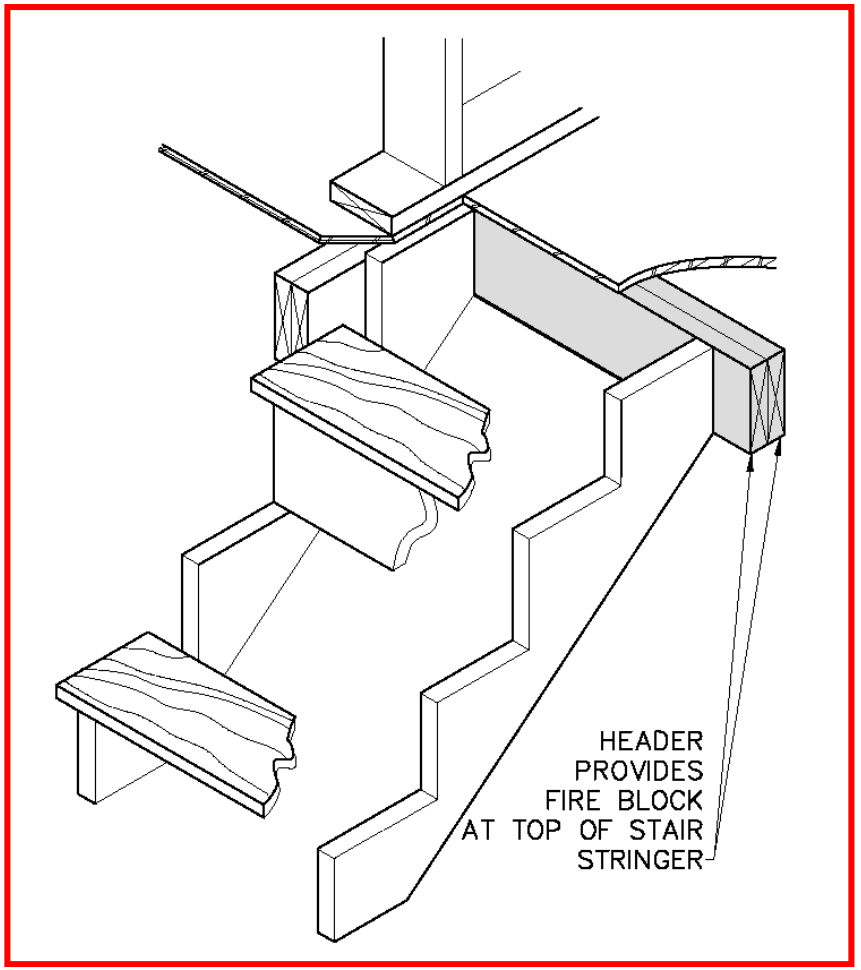
Another Technology Fine Point!

- Are fire stops needed at joints where stud walls meet ceilings, floors or other walls?



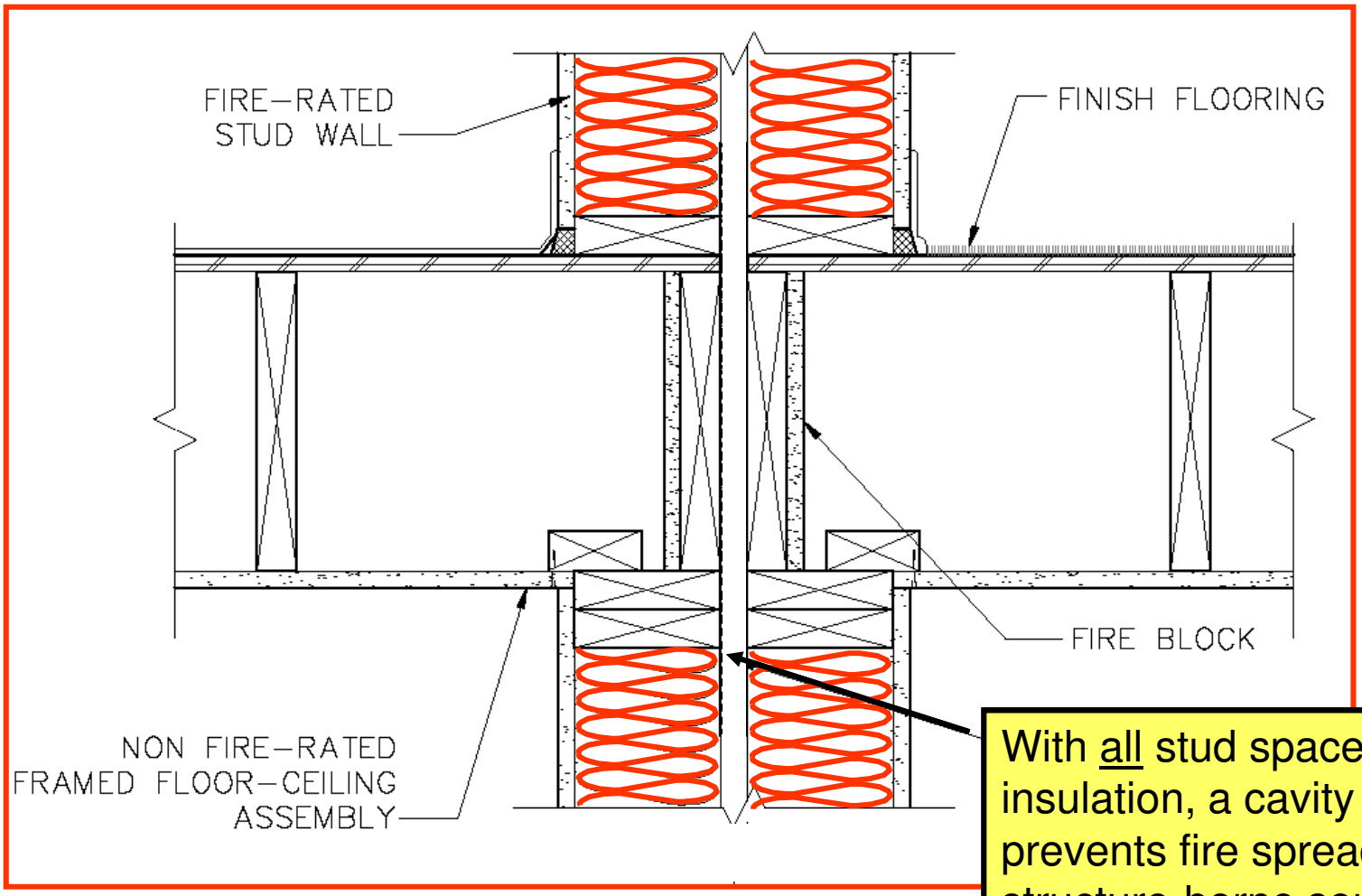
Best Practice for Fire Blocks

- Inside wall assemblies
- Inside horizontal concealed spaces
- Between horizontal and vertical concealed spaces
- Between nailing elements



Example of fire block at head of stairs

Best Practice for Fire Blocks



With all stud spaces full of insulation, a cavity <25mm prevents fire spread, without structure-borne sound

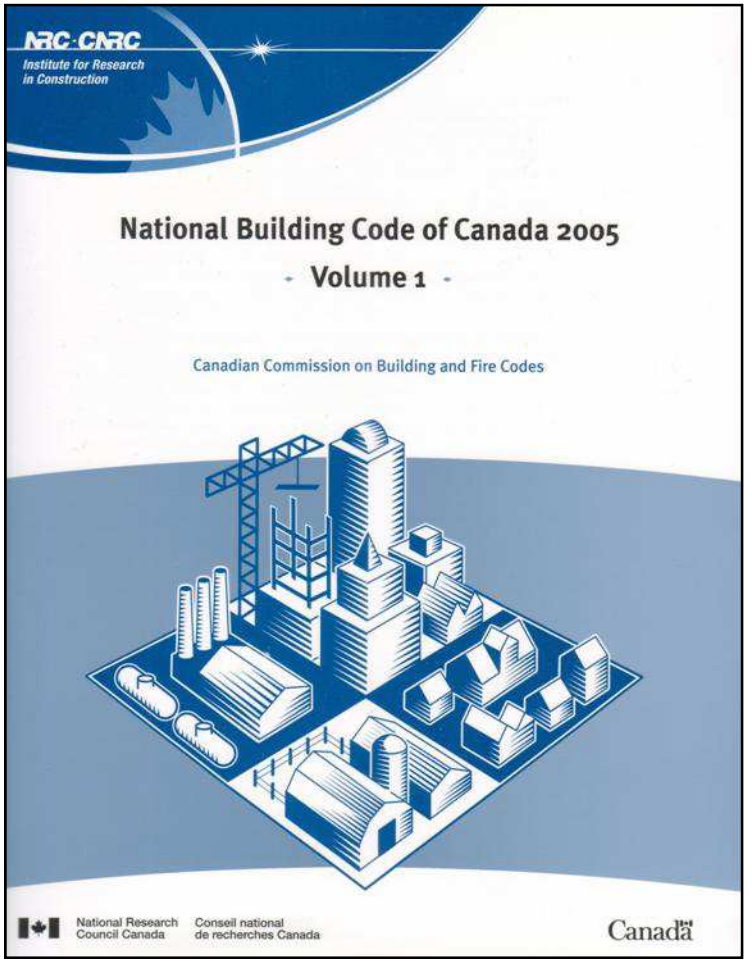
Example of fire block in wall/floor cavity

Future Directions

- Guide was developed to improve the design, installation and inspection of fire stops and fire blocks. It ***should*** become outdated!
- Guide contains text and illustrations to demonstrate best practice as it is currently known. That will change!
- Guide has already served as a catalyst for many proposed changes for NBCC in 2010

Some Current Code Issues

- Perimeter fire stops
- Performance criteria for fire blocks
- Should fire stops resist smoke spread?
- Fire stops for structural assembly penetration of walls and floors



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