Combustible Exterior Wall Construction

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Agenda

Combustible Exterior Wall Assembly in Buildings Required to be of Non-Combustible Construction

- Building Code Requirements
- Grenfell Tower Fire in Context
- Overview of CAN/ULC-S134-92 – Fire Test of Exterior Wall Assemblies (S134)
- Market Trends in Exterior Wall Design
- Drawing and Site Review under the CP program

Building Code Requirements

Exterior Wall Design - Relevant Sections of the Building Code:

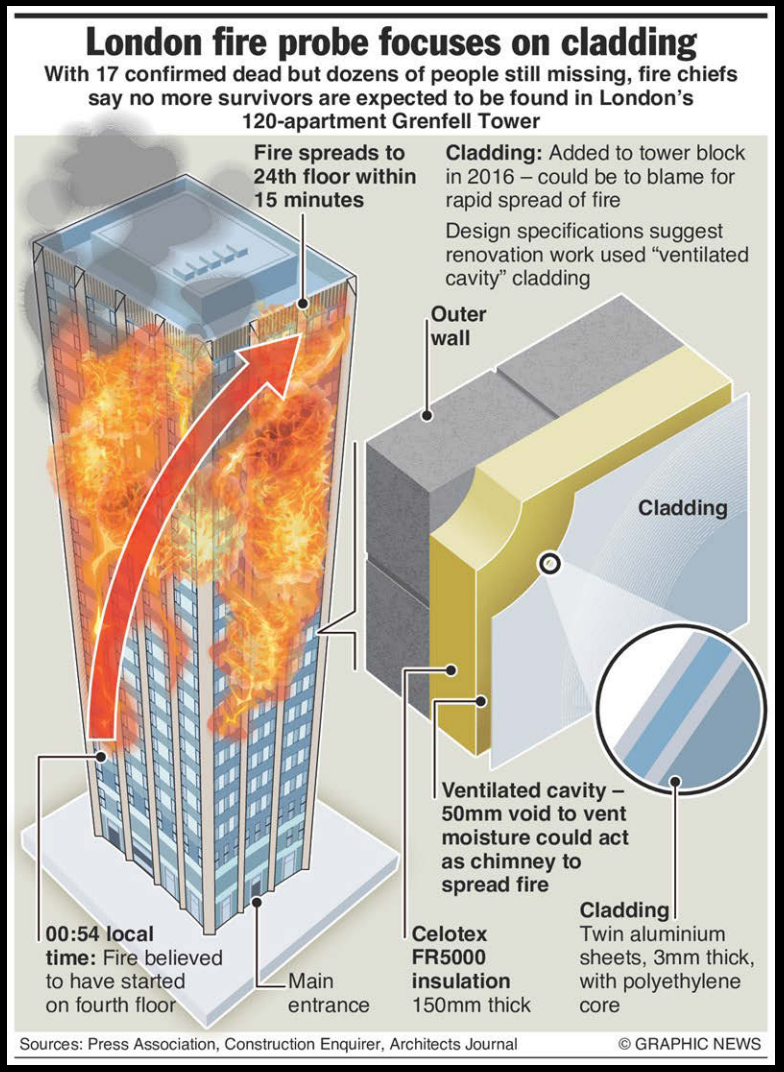
- Part 3 – Fire Protection, Occupant Safety and Accessibility
- Part 4 – Structural Design
- Part 5 – Environmental Separation
- Part 6 – Heating, Ventilation and Air-conditioning
- Part 10 – Energy and Water Efficiency

A lot of aspects to balance

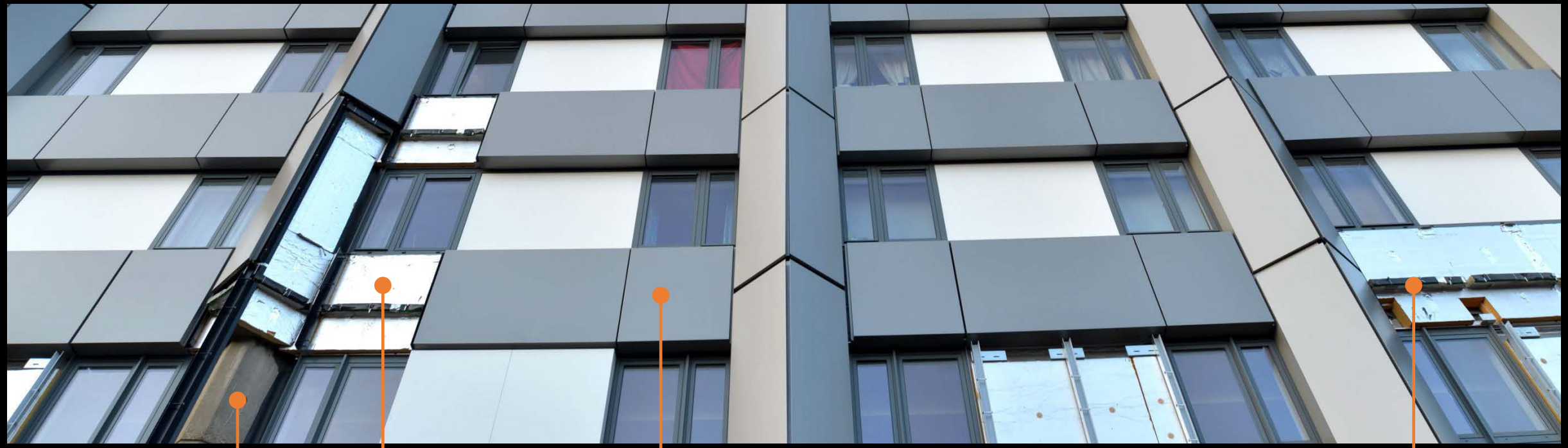
Also Influenced by:

- Municipal Planning and zoning requirements
- BC Hydro
- NFPA 96

Grenfell Tower Fire in Context



Grenfell Tower Fire in Context



Original building exterior (exposed concrete)

Polyisocyanurate (foamed plastic) insulation

Aluminum Composite Panels (ACM) with Polyethylene core (PE)

Fire blocking at slab edge (Polyisocyanurate insulation block)

Grenfell Tower Fire in Context

100% Curtainwall with no “cladding system”

Window wall with exposed concrete

Brick

Concrete wall

CAN/ULC-S134-92 – Fire Test of Exterior Wall Assemblies

(a) (b)

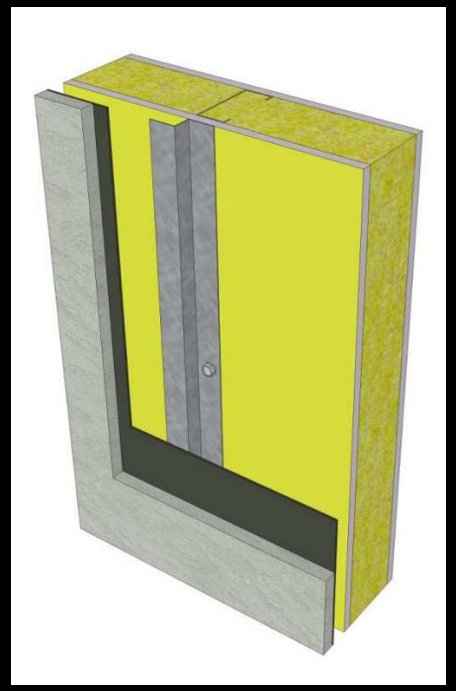
Figure 18: Photographs of the SWISSPEARL Exterior Wall Cladding CAN/ULC-S134 Test
(a) Pre-burn wall assembly, **(b)** post-burn wall assembly damage.

CAN/ULC-S134-92 – Fire Test of Exterior Wall Assemblies

Exterior Wall Assembly Tested	Height of flame on wall above opening (max. 5m)	Heat flux at 3.5m above opening (max. 35 kW/m$^{2)}$	R-value of tested assembly	Outboard insulation included in assembly
Trespa Meteon Kraft FR	2.5m	21.2 kW/m^2	R-9.0	Yes – 75mm NComb
ABET MEG Exterior Grade Phenolic Panels Class A or F1	2.75m	14.5 kW/m^2	R-7.9	No
Alucobond Plus (3A Composites USA Inc.)	3.0m	27.0 kW/m^2	R-7.9	No
Swiss Pearl “Carat”	2.0m	6.9 kW/m^2	R-0	No (60mm air cavity)

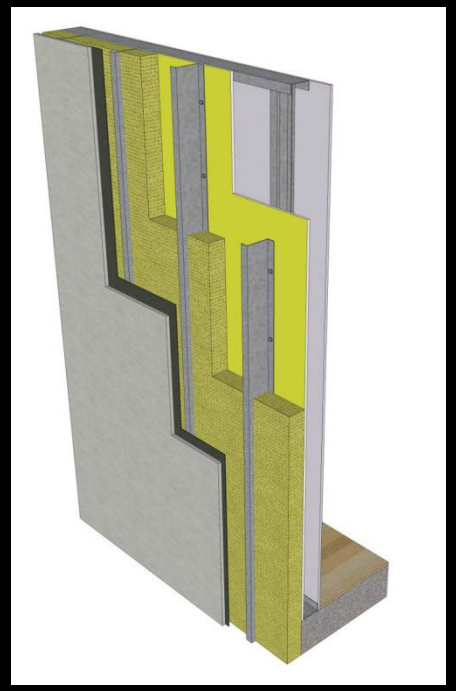
Market Trends in Exterior Wall Construction

Typical Assembly
Tested to S134



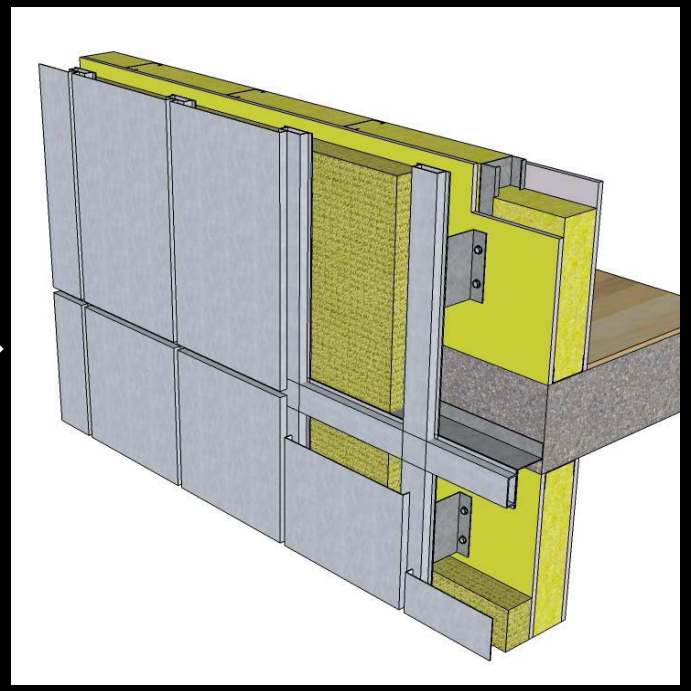
R-7.9
Cavity insulation between framing at 16” OC

ASHRAE 90.1 - 1997



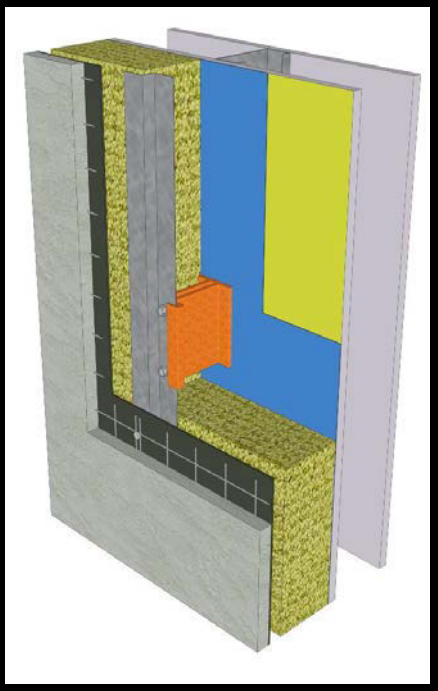
R-9.0
3” Outboard insulation with continuous z-girts at 16” OC

ASHRAE 90.1 – 2010
(R-15 +)



R-16.3
4” Cavity and 4” outboard insulation with steel clips at 24”x24” OC

New CofV RZ Target
< Passive House (R-30+)



R-31.1
4” Cavity
8” Outboard insulation with thermal clips at 24”x24”

* Illustrations on this slide were prepared by RDH Building Science Inc.

Market Trends in Exterior Wall Construction

You are reviewing a set of drawings for a non-combustible highrise project and notice the typical wall assembly is comprised of:

- ½" interior GWB
- 3 5/8" steel studs
- 5/8" Exterior GWB
- 2" XPS insulation
- Thermal clips at 24" x 24" O.C.
- Swiss Pearl "Carat" cladding and associated support (per S134 test on previous slide)

1. The Certified Professional should:
   a) Reject the design and require compliance with the S134 tested assembly
   b) Reject the design and require masonry cladding in compliance with 3.2.3.8.(1).(a)
   c) Recommend use of non-combustible metal cladding which would permit the use of combustible insulation on elevations with 100% UPO permitted
   d) The addition of combustible insulation and thermal clips to a listed assembly is not a significant deviation and the S134 tested assembly should be accepted
   e) None of the above

Market Trends in Exterior Wall Construction

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e) None of the above

No S134 assemblies meets Part 3 and 10. Interpretation is required between the tested assembly and the proposed assembly. Reasonable modifications include:

- Addition of Non-combustible insulation (mineral wool)
- Addition of Non-combustible thermal clips
- Compliance with compartmentalization of cavity (at every floor and horizontally). Note that mineral wool insulation is a fire blocking material so flashing does not need to penetrate insulation

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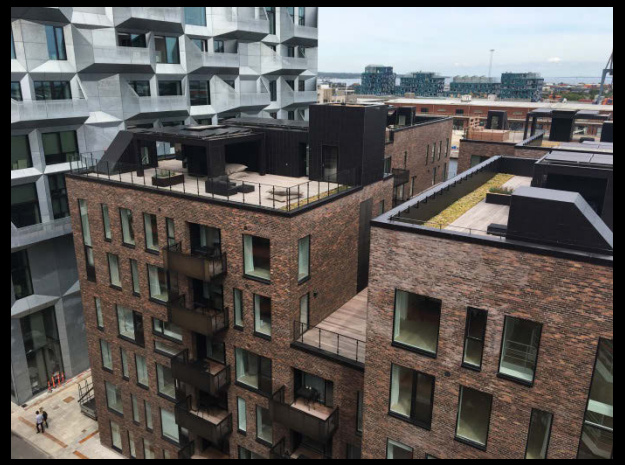
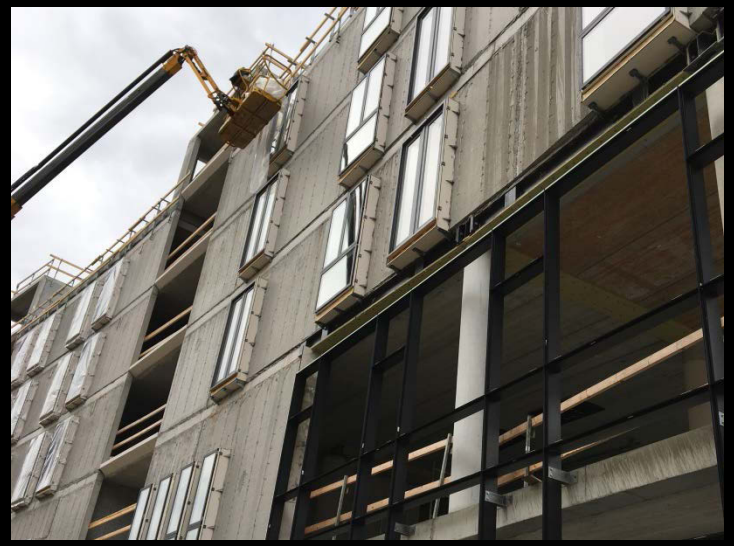
Market Trends in Exterior Wall Construction

Lets go to Scandinavia where they have been building highly insulated buildings for decades…

Market Trends in Exterior Wall Construction



Market Trends in Exterior Wall Construction



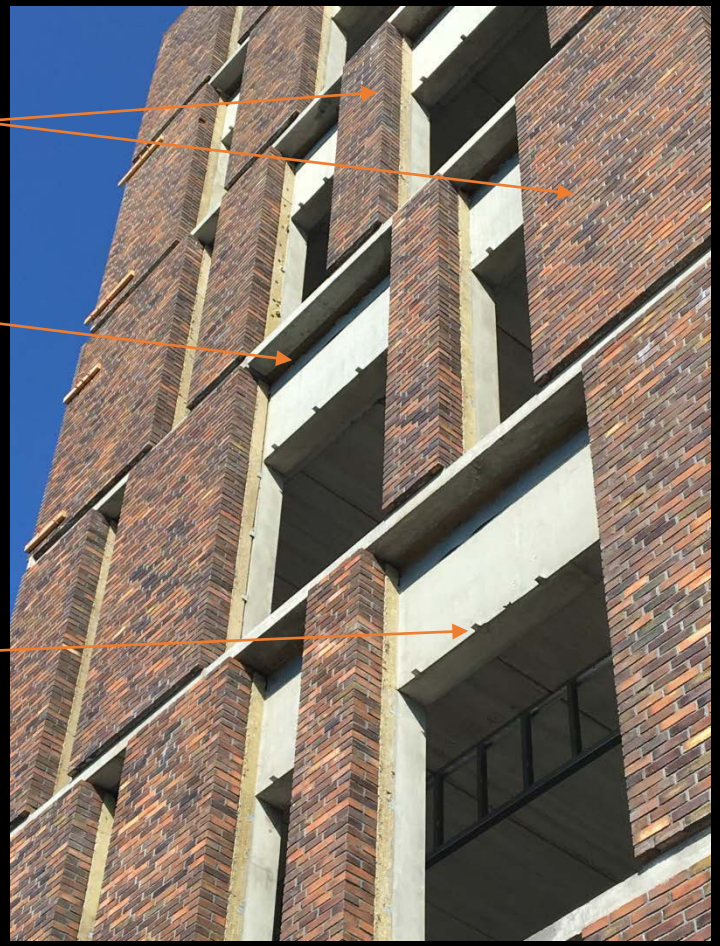
Projected window openings to allow for thick insulation

12” mineral wool insulation (+/- R-40)

Precast concrete exterior wall assembly

Thermal break at eyebrow

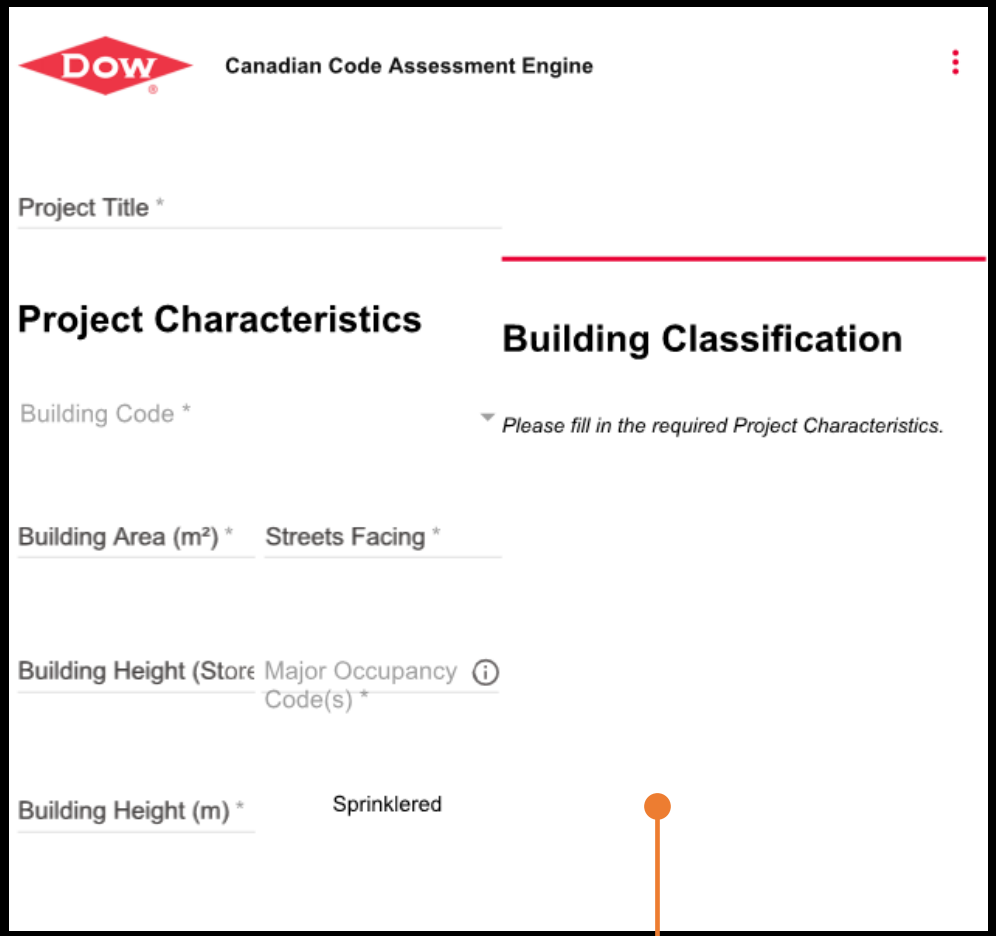
Curtainwall support projects glazing in plane with insulation



Drawing and Site Review under the CP Program

Design Phase

- Additional focus will be required for exterior wall assemblies with respect to Fire and Life Safety requirements of the Building Code.
- Review exterior wall assembly schedule in detail for compliance with Part 3. All S134 assemblies should be clearly identified. Acceptable deviations noted.
- Where combustible materials are proposed within wall assembly confirm details for compartmentalization and protection.
- S134 test is a vertical test, not necessarily applicable for horizontal exterior soffit assembly.
- Liaise with the AHJ early in design phase if deviations from the requirements of the building code are proposed.

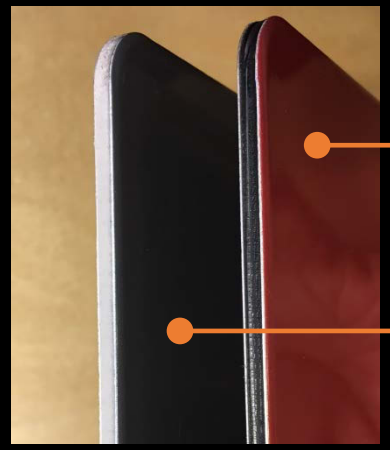


On-line tool:
https://canadabuildingcode.dow.com/

Drawing and Site Review under the CP Program

Construction Phase

- Communicate with the contractor that there will be additional focus on exterior wall assemblies with respect to Fire and Life Safety requirements of the Building Code.
- Review shop drawings for exterior wall cladding. Acceptable deviations noted.
- Review shop drawings where combustible materials are proposed within exterior wall assembly and confirm details for compartmentalization and protection.
- S134 test is a vertical test, not necessarily applicable for horizontal exterior soffit assembly.
- Check materials shipped to site are consistent with approved shop drawings.
- For projects with ACM panels confirm FR core (white) colour for buildings if non-combustible cladding (S134) is required.



Black core = Polyethylene (PE) = Combustible

White core = Fire Resistant (FR) = S134 compatible

Questions?

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