Understanding the rationale for exposure protection requirements in the NBCC

Cerelity Engineering Limited

https://doi.org/10.4224/40003940

CELERITY ENGINEERING LIMITED
100 – 535 West 10th Avenue
Vancouver BC V5Z 1K9
TEL: 604-375-0437
web: www.celerity.ca

Understanding the Rationale for Exposure Protection Requirements in the NBCC

For

Construction Research Centre (CRC)
National Research Council Canada (NRC)
Building M-59, Room 221
1200 Montreal Road
Ottawa, Ontario K1A 0R6

Prepared For

National Research Council of Canada
Contract No. 1020939

October 17, 2025

Celerity Project: 24218

Version	Date	Status	Prepared	Reviewed
A	January 10, 2025	DRAFT for NRC Technical Review	SG	-
B	March 20, 2025	DRAFT for NRC Internal Review	SG	BM
1	October 17, 2025	Issue to NRC	SG	-

Revision Log	Revision Notes
B	Revisions based on commentary from initial technical review
1	Removal of DRAFT watermark

CELERITY ENGINEERING LIMITED

Stefan Germann, M.Eng., P.Eng.
Senior Consultant

EXECUTIVE SUMMARY

This report has been commissioned as part of an internal National Research Council of Canada (NRC) research project that is part of the Construction Sector Digitalization and Productivity Challenge program.

This report reviewed and documented the historical changes within Division B, Part 3 and Part 9 in the 2020 National Building Code of Canada (NBCC). The area of focus within Division B was Articles 3.2.3.3 to 3.2.3.22 in Part 3, and Article 9.10.15.5 in Part 9, as these provisions are largely related to exposure protection from the horizontal spread of fire from one building to another.

To support this work, meeting minutes from the Standing Committee on Fire Protection meetings between 1985 and 2015 were reviewed.

Each provision was reviewed and the chronology of changes was documented. Where possible:

- code changes were substantiated based on various code committee meeting minutes,
- details were extracted to identify reasoning and rationale for a specific code change, and
- salient performance criteria were noted from test reports, and/or research papers to substantiate the level of performance of a given requirement.

Even though the requirements for exposure protection are provided with specific levels of performance that need to be met, such as a specific fire resistance rating or prescribed physical separation distance between a building and a property line. The historical review process found that overall performance criteria attributed to the provisions of Articles 3.2.3.3 to 3.2.3.22 in Parts 3 and provisions of Article 9.10.15.5 in Part 9 of Division B, were more often keyed to significant discussion as a committee, than specific scientific data. Thus,

As such, this report also aimed to identify gaps and/or areas of study. Each aforementioned code provision is provided with a specific section to highlight gaps and/or areas for further study. These areas of study and gaps are aimed at providing clarity and rationale for a specific set of prescribed requirements.

Thus, this report provides a detailed review of the current requirements for exposure protection in the NBCC and offers insights into areas where the defined level of performance can be substantiated.

LIST OF ACRONYMS

ASTM	American Society of Testing and Materials
CCR	Code Change Request
CRC	Construction Research Center
CSA	Canadian Standards Association
EBF	Effective Building Face
EIFS	Exterior Insulation and Finish System
FRR	Fire Resistance Rating
NBCC	National Building Code of Canada
NFPA	National Fire Protection Association
NRC	National Research Council of Canada
OSB	Oriented Strand Board

1 INTRODUCTION

The objective of this report is to review and document the historical changes that specifically relate to exposure protection from fire, and where possible identify the performance targets, calculation method(s) and assumptions that make up the exposure protection provisions in the 2020 National Building Code of Canada (NBCC), Parts 3 and 9 of Division B. Specifically, those noted in Division B.

1.1 Background

Currently, the NBCC acceptable solution requirements to limit fire spread from one building to an adjacent building are prescriptive, including the use of large tables. These tables for maximum permitted glazing and unprotected areas and limiting distance between buildings were developed based on a series of well-documented fire experiments conducted by the NRC in the late 1950's. However, the prescriptive requirements have been built upon since to include the impact of other design features and requirements, such as the type of material on the exposed building face, fire department response times, and combustible project projections, soffits for example. It is important to understand the calculation methods used to create these tables, the rationale for the exposure protection requirements, the changes made over the years.

This project will undertake an analysis of current provisions and review of historical changes and related documentation in an effort to clarify the current performance targets, calculations, and evaluation methods within the available literature related to the NBCC provisions on spatial separation and exposure protection, and specifically, that related to provisions of Articles 3.2.3.3 to 3.2.3.22, in Part 3 and provisions of Article 9.10.15.5 in Part 9 of Division B. Where possible, this report will describe calculation methods and assumptions used to develop Table 3.2.3.7.

The scope of work also includes reviewing and analyzing the experiments that were used to develop the current exposure protection provisions and identification of any gaps.

2 2020 PART 3 – EXPOSURE PROTECTION

The following sections summarize each of the acceptable solution code Articles as they changed through time and identify salient performance criteria. These sections are based on the Standing Committee on Fire Protection meeting minutes from 1985 to 2015, as well as independent research.

The chronology from inception of each Article and associated NBCC changes are summarized in Table 1. Additionally, for context, Appendix A includes direct excerpts from the 2020 NBCC for each code article assessed in this review.

Table 1 - Chronology of Code Changes Part 3

Code Article in 2020 Edition		1941	1953	1960	1965	1970	1975	1977	1980	1985	1990	1995	2005	2010	2015	2020
3.2.3.3	Wall Enclosing Attic or Roof Space	-	-	-	-	-	-	-	3.2.3.3	3.2.3.3.	3.2.3.3	3.2.3.3	3.2.3.3	3.2.3.3	3.2.3.3	3.2.3.3
3.2.3.4	Party Wall	-	3.4.6	3.2.2.1	3.2.4.5 3.2.4.6	3.2.3.4	3.2.3.4	3.2.3.4	3.2.3.4	3.2.3.4	3.2.3.4	3.2.3.4	3.2.3.4	R - 3.2.3.4	3.2.3.4	3.2.3.4
3.2.3.5	Wall with Limiting Distance Less Than 1.2 m	4.2.4.8	R- 3.4.5.2	R-3.2.2.1	3.2.4.5 3.2.4.6	R-3.2.3.4	3.2.3.4	3.2.3.4	3.2.3.4	3.2.3.4	R - 3.2.3.5	3.2.3.5	3.2.3.5	3.2.3.5	3.2.3.5	3.2.3.5
3.2.3.6	Combustible Projections	-	-	-	-	-	-	-	-	3.2.3.4	R - 3.2.3.6	3.2.3.6	3.2.3.6	R - 3.2.3.6	R - 3.2.3.6	R - 3.2.3.6
3.2.3.7	Construction of Exposing Building Face	4.2.4.1	3.4.5.2	3.2.2.1	3.2.4.5 3.2.4.6	3.2.3.5	3.2.3.5	3.2.3.5	3.2.3.5	3.2.2.5	R - 3.2.3.7	R - 3.2.3.7	R - 3.2.3.7	R - 3.2.3.7	R - 3.2.3.7	R - 3.2.3.7
3.2.3.8	Protection of Exterior Building Face	-	-	-	-	-	-	-	3.2.3.5	3.2.3.5	3.2.3.7	3.2.3.7	R - 3.2.3.8	R - 3.2.3.8	3.2.3.8	3.2.3.8
3.2.3.9	Protection of Structural Members	-	-	3.2.1.	3.2.4.5 3.2.4.6	3.2.3.5	3.2.3.5	3.2.3.5	R - 3.2.3.5	3.2.3.5	3.2.3.8	3.2.3.8	3.2.3.9	3.2.3.9	3.2.3.9	3.2.3.9
3.2.3.10	Unlimited Unprotected Openings	4.2.4.9	-	-	3.2.4.7	3.2.3.6	3.2.3.6	R - 3.2.3.6	R - 3.2.3.6	R - 3.2.3.6	R - 3.2.3.9	3.2.3.9	3.2.3.10	3.2.3.10	3.2.3.10	3.2.3.10
3.2.3.11	Low Fire Load, One Storey Building	-	-	-	-	3.2.3.7	3.2.3.7	3.2.3.7	3.2.3.7	3.2.3.7	3.2.3.10	3.2.3.10	3.2.3.11	3.2.3.11	3.2.3.11	3.2.3.11
3.2.3.12	Area Increase for Unprotected Openings	-	-	3.2.2.1	R - 3.2.4.8	3.2.3.8	3.2.3.8	3.2.3.8	R - 3.2.3.8	R - 3.2.3.8	R - 3.2.3.11	R - 3.2.3.11	R - 3.2.3.12	3.2.3.12	3.2.3.12	3.2.3.12
3.2.3.13	Protection of Exit Facilities	-	-	-	-	-	-	-	-	-	3.2.3.13	R - 3.2.3.12	3.2.3.13	3.2.3.13	3.2.3.13	3.2.3.13
3.2.3.14	Wall Exposed to Another Wall	-	-	3.2.2.6	-	3.2.3.10	3.2.3.10	R - 3.2.3.10	R - 3.2.3.10	R - 3.2.3.10	3.2.3.14	R - 3.2.3.13	3.2.3.14	3.2.3.14	3.2.3.14	3.2.3.14
3.2.3.15	Wall Exposed to Adjoining Roof	-	-	3.2.2.7	3.2.4.9	3.2.3.11	3.2.3.11	R -3.2.3.11	R - 3.2.3.11	3.2.3.11	3.2.3.15	3.2.3.14	3.2.3.15	3.2.3.15	3.2.3.15	3.2.3.15
3.2.3.16	Protection of Soffits	-	-	-	-	-	-	-	-	R - 3.2.3.11	R - 3.2.3.16	R - 3.2.3.15	3.2.3.16	R -3.2.3.16	3.2.3.16	3.2.3.16
3.2.3.17	Canopy Protection for Vertically Separated Openings	-	-	-	-	-	3.3.6.3 3.3.7.5	3.3.6.3 3.3.7.5	3.3.6.3 3.3.7.5	3.3.6.2 3.3.7.4	3.2.3.17	R - 3.2.3.16	3.2.3.17	3.2.3.17	3.2.3.17	3.2.3.17
3.2.3.18	Covered Vehicular Passageway	-	-	-	-	3.2.3.14	3.2.3.14	R - 3.2.3.14	3.2.3.14	3.2.3.13	3.2.3.19	R - 3.2.3.17	3.2.3.18	3.2.3.18	3.2.3.18	R - 3.2.3.18
3.2.3.19	Walkway Between Buildings	-	-	-	-	3.2.3.15	3.2.3.15	R - 3.2.3.15	R - 3.2.3.15	3.2.3.14	R - 3.2.3.20	R - 3.2.3.18	3.2.3.19	3.2.3.19	3.2.3.19	3.2.3.19
3.2.3.20	Underground Walkway	-	-	-	-	3.2.3.16	3.2.3.16	3.2.3.16	R - 3.2.3.16	3.2.3.15	3.2.3.21	R - 3.2.3.19	3.2.3.20	3.2.3.20	3.2.3.20	3.2.3.20
3.2.3.21	Storage and Process Equipment Located Outdoors	-	-	-	-	-	-	-	-	-	-	-	3.2.3.21	3.2.3.21	3.2.3.21	3.2.3.21
3.2.3.22	Installation of Service Lines Under buildings	-	-	-	-	-	-	-	-	-	-	-	-	R -3.2.3.22	3.2.3.22	3.2.3.22

Note - The prefix “R” refers to a code revision.

2.1 Article 3.2.3.3 – Wall Enclosing Attic or Roof Spaces

2.1.1 2020 NBCC Provision

1. *An exterior wall enclosing an attic or roof space and located above an exposing building face, shall be constructed in conformance with the requirements for the exposing building face.*

2.1.2 Historical Review

This requirement was first introduced in the 1980 Edition of the NBCC to state that an "Exterior wall enclosing an attic or roof space and located above an exposing building face, shall be constructed in conformance with the requirements for the exposing building face." The contents of the Article have not changed since first introduction. The requirement to include attics and roof spaces was an attempt to regulate gable ended walls which were not required to meet exposing building face construction standards [1]. No other performance criteria were identified within the provided documentation.

The current intent of the Article as described is to "expand the application of Article 3.2.3.7., which would otherwise not apply to an exterior wall enclosing an attic or roof space located above an exposing building face." Supporting documentation [2] indicates that the portion of an exterior wall which encloses an unfinished attic or roof space and is located above an exposing building face, must be constructed to the same standards as the exposing building face.

2.1.3 Identified Performance Metrics

No quantitative performance metrics identified.

2.1.4 Gaps and/or Areas of Potential Further Study

None at this time.

2.2 Article 3.2.3.4 – Party Wall

2.2.1 2020 NBCC Provision

1. *A party wall shall be constructed as a firewall. (See Note A-3.2.3.4.(1).)*

This requirement was first introduced in the 1953 NBCC, Article 3.4.6, to state that "when two buildings are separated by a party or common wall, such wall shall conform to the requirements for firewalls." The contents of the Article have not fundamentally changed since first being introduced. No technical reason for the original requirement for party and common walls could be ascertained [1].

In May 2006, it was decided that additional review of party walls be conducted to address harmonization between Part 3 and Part 9 [3], and it was noted that reasons cited for the proposed change in the last cycle were that party walls are more a legal instrument rather than a construction needed for fire protection [4]. Rationale for the proposed change indicated that other existing requirements adequately address life safety. It does not discuss property protection.

In the 2010 Edition of the NBCC, the language of the requirement was changed to state that a "party wall shall be constructed as a firewall." Nevertheless, it is the general intent that the party wall is to be used to

limit the probability of fire spread from one building to an adjacent building during the time needed for emergency responders to carry out their duties, which could lead to damage to adjacent buildings.

2.2.2 Identified Performance Metrics

No quantitative performance metrics identified.

2.2.3 Gaps and/or Areas of Potential Further Study

None at this time.

2.3 Article 3.2.3.5 – Wall with Limiting Distance less than 1.2 m

2.3.1 2020 NBCC Provision

1. *Openings in a wall that has a limiting distance less than 1.2 m shall be protected by closures whose fire-protection rating is in conformance with the fire-resistance rating required for the wall.*
2. *Wired glass or glass block shall not be used for a closure referred to in Sentence (1).*

2.3.2 Historical Review

The 1941 edition called for a 6-ft separation for residential buildings, to be reduced by one-third (to 4 ft) if the building had only one storey and did not exceed a height of 35 ft. The minimum (lowest grade) spatial separation permitted by the 1953 edition was 7.5 ft; by 1960 it was 4 ft (1.2 m) for all occupancies, and it has remained generally constant since.

It is believed that the worst case for projection of flames from an opening, from the St. Lawerance burns tests, have been used to determine the distance at which any unprotected openings would be allowed. Maximum flame projection, from the tests, was 7 ft for a high hazard occupancy, and 7 divided by 2 (for the purpose of the Tables) is 4 ft when rounded upward for safety. There is little in the files to refute or substantiate this view [1] or draw it back to the original requirements of 4 ft (1.2m).

The wording of the Article was again slightly revised in 1980 and in 1995, however, the prohibition on glass block and wired glass for use as closures remained for openings having a limiting distance less than 1.2 m, and the general language was not fundamentally altered.

2.3.3 Identified Performance Metrics

Horizontal flame projection of 7 ft appears to be the limit used for code application.

2.3.4 Gaps and/or Areas of Potential Further Study

While the 7ft flame projection may appear to be reasonable, given the nature of the St. Lawerance Burns tests, i.e. outside with uncontrollable weather conditions, there would not be high degree of accurate reproducibility. Further study could be conducted to review flame extension from a window in a more controlled environment, for both sprinklered and non sprinklered applications.

2.4 Article 3.2.3.6 – Combustible Projections

2.4.1 2020 NBCC Provision

1. *Except for a building containing one or two dwelling units only, combustible projections on the exterior of a wall that could expose an adjacent building to fire spread and are more than 1 m above ground level, including balconies, platforms, canopies and stairs, shall not be permitted within*
    a. *1.2 m of a property line or the centre line of a public way, or*
    b. *2.4 m of a combustible projection on another building on the same property.*
2. *Except as provided in Sentence (4), where the exposing building face has a limiting distance of not more than 0.45 m, projecting roof soffits shall not be constructed above the exposing building face. (See Note A-3.2.3.6.(2).)*
3. *Except as provided in Sentence (4), where the exposing building face has a limiting distance of more than 0.45 m, the face of roof soffits shall not project to less than 0.45 m from the property line. (See Note A-3.2.3.6.(2).)*
4. *The face of a roof soffit is permitted to project to the property line, where it faces a public way. (See Note A-9.10.14.5.(11) and 9.10.15.5.(10).)*
5. *Where roof soffits project to less than 1.2 m from the centre line of a public way, or from an imaginary line between two buildings or fire compartments on the same property, they shall*
    a. *have no openings, and*
    b. *be protected by*
        i. *not less than 0.38 mm thick sheet steel,*
        ii. *unvented aluminum conforming to CAN/CGSB-93.2-M, "Prefinished Aluminum Siding, Soffits, and Fascia, for Residential Use,"*
        iii. *not less than 12.7 mm thick gypsum soffit board or gypsum ceiling board installed according to CSA A82.31-M, "Gypsum Board Application,"*
        iv. *not less than 11 mm thick plywood,*
        v. *not less than 12.5 mm thick OSB or waferboard, or*
        vi. *not less than 11 mm thick lumber.*
6. *For buildings of combustible construction, materials installed to provide the required protection of soffits may be covered with a combustible or noncombustible finish material.*

2.4.2 Historical Review

This requirement was first introduced in the 1985 Edition of the NBCC to state that except for "buildings containing 1 or 2 dwelling units only, combustible projections on the exterior of a wall that are more than 1 m above ground level, such as balconies, platforms, canopies, eave projections and stairs, and that could expose an adjacent building to fire spread, shall not be permitted within 1.2 m of a property line or an imaginary line between 2 buildings on the same property." This requirement is intended "to prevent the spread of fire from one building to another by way of combustible projections" [1]. The waiver for houses was included because of "substantial adverse public comment"; it was ''considered necessary" to permit current construction practices for houses.

Editorial changes were made in response to commentary made by the Manitoba Building Standards Board to include "the centre line of a public right of way" to permit greater flexibility in design [3].

Similarly, editorial changes were made in response to a letter from R.W. Rush, Vancouver, BC, [4] which identified an ambiguity in Sentence 3.2.3.4.(3), 1985 NBCC, related to the location of imaginary lines between buildings on the same property. The Committee noted that the intent of the Code is to ensure that there is not less than 2.4 m between combustible projections of one building and combustible projections on a neighbouring building on the same property [4]. It was the consensus of the Committee to amend Sentence 3.2.3.4.(3) so that the limitation on distance to a property line would remain at 1.2 m but that the value between two buildings on the same property should be not less than 2.4 m as in this way, there would be no need to attempt to locate an imaginary line with no fixed location.

The 2010 Edition of the NBCC included additional requirements for the projection of roof soffits. The rationale that supported the changes to NBCC 2010 appear to be noted in CCR 852 [5] and are supported by a study that resulted from a five storey apartment building fire in Fort MacMurray, Alberta [6], where various heat fluxes were analyzed.

Editorial changes were made to the 2015 [5] and 2020 [6] Edition of the NBCC to allow and provide context for projections facing a public way.

2.4.3 Identified Performance Metrics

The details from the Fort MacMurray apartment fire study, as noted in CCR 852 [5], indicate that the expected heat flux at an exposed surface would be in the range of 84 to 158 kW/m^2 at a limiting distance of 5 m, and 15 kW/m^2 at a limiting distance of 30 m. This was based on an 18.9 m wide by 13 m high flame.

2.4.4 Gaps and/or Areas of Potential Further Study

The details provided in CCR 852 appear to indicate a large flame. Additional study could be undertaken to substantiate the assumption of an 18.9 m by 13 m high flame. Further, there is no additional discussion or consideration related to the inclusion of automatic fire sprinklers, which may limit the overall exposing and exposed surface heat fluxes.

2.5 Article 3.2.3.7 – Construction of Exposing Building Face

2.5.1 2020 NBCC Provision

1. *Except as provided in Sentences (3) and (4), and Articles 3.2.3.10. and 3.2.3.11., the fire-resistance rating, construction and cladding for exposing building faces of buildings or fire compartments of Group A, B, C, D or Group F, Division 3 occupancy classification shall comply with Table 3.2.3.7.*
2. *Except as provided in Sentences (3) and (4) and Article 3.2.3.10., the fire-resistance rating, construction and cladding for exposing building faces of buildings or fire compartments of Group E or Group F, Division 1 or 2 occupancy classification shall comply with Table 3.2.3.7.*

Table 3.2.3.7.
Minimum Construction Requirements for Exposing Building Faces
Forming Part of Sentences 3.1.6.9.(5) and 3.2.3.7.(1) to (4)

Occupancy Classification of *Building* or *Fire Compartment*	Maximum Area of *Unprotected Openings* Permitted, % of *Exposing Building Face* Area	Minimum Required *Fire-Resistance Rating*	Type of Construction Required	Type of Cladding Required
Group A, B, C, D, or Group F, Division 3	0 to 10	1 h	*Noncombustible*	*Noncombustible*
	> 10 to 25	1 h	*Combustible*, *Encapsulated mass timber*, or *Noncombustible*	*Noncombustible*
	> 25 to 50	45 min	*Combustible*, *Encapsulated mass timber*, or *Noncombustible*	*Noncombustible*
	> 50 to < 100	45 min	*Combustible*, *Encapsulated mass timber*, or *Noncombustible*	*Combustible* or *Noncombustible*(1)(2)
Group E, or Group F, Division 1 or 2	0 to 10	2 h	*Noncombustible*	*Noncombustible*
	> 10 to 25	2 h	*Combustible*, *Encapsulated mass timber*, or *Noncombustible*	*Noncombustible*
	> 25 to 50	1 h	*Combustible*, *Encapsulated mass timber*, or *Noncombustible*	*Noncombustible*
	> 50 to < 100	1 h	*Combustible*, *Encapsulated mass timber*, or *Noncombustible*	*Combustible* or *Noncombustible*

Notes to Table 3.2.3.7.:

(1) The cladding on Group C buildings conforming to Article 3.2.2.51. and on Group D buildings conforming to Article 3.2.2.60. shall be noncombustible or consist of a wall that satisfies the requirements of Article 3.1.4.8.

(2) The cladding on Group C buildings or parts thereof conforming to Article 3.2.2.48. and on Group D buildings or parts thereof conforming to Article 3.2.2.57. shall conform to Sentence 3.1.6.9.(2) or be noncombustible.

3. *Except as provided in Articles 3.1.4.8. and 3.1.6.9., the requirement in Table 3.2.3.7. for noncombustible cladding for buildings or fire compartments where the maximum permitted area of unprotected openings is more than 10% of the exposing building face is permitted to be waived for exterior wall assemblies that comply with Article 3.1.5.5. or 3.1.5.6.*

4. *Except as provided in Articles 3.1.4.8. and 3.1.6.9., the requirement in Table 3.2.3.7. for noncombustible cladding for buildings or fire compartments where the maximum permitted area of unprotected openings is more than 25% but not more than 50% of the exposing building face is permitted to be waived where*

    a. *the limiting distance is greater than 5 m,*
    b. *the building or fire compartment and all combustible attic and roof spaces are sprinklered throughout,*
    c. *the cladding*

        i. *conforms to Subsections 9.27.6., 9.27.7., 9.27.8., 9.27.9. or 9.27.10.,*
        ii. *is installed without furring members, or on furring not more than 25 mm thick, over gypsum sheathing at least 12.7 mm thick or over masonry, and*

iii. after conditioning in conformance with ASTM D2898, "Standard Practice for Accelerated Weathering of Fire-Retardant-Treated Wood for Fire Testing," has a flame-spread rating not greater than 25 on the exterior face when tested in accordance with Sentence 3.1.12.1.(1),

d. the cladding

i. conforms to Subsection 9.27.12.,
ii. is installed with or without furring members over gypsum sheathing at least 12.7 mm thick or over masonry,
iii. has a flame-spread rating not greater than 25 when tested in accordance with Sentence 3.1.12.1.(2), and
iv. does not exceed 2 mm in thickness, exclusive of fasteners, joints and local reinforcements (see Note A-3.2.3.7.(4)(d)(iv)), or

e. the exterior wall assembly complies with Article 3.1.5.5. or 3.1.5.6.

5. The construction requirements for the exposing building face stated in Sentences (1) and (2) shall be satisfied before increasing the unprotected opening area as permitted by Sentence 3.2.3.12.(1).

2.5.2 Historical Review

The requirements for the construction of exposing building faces were first introduced in the NBCC 1941 and only considered the limiting distance between buildings when establishing the construction requirements for exposing building faces. In 1953, changes to the requirements included the fire load and the grade of separation as factors dictating construction type. These earlier requirements only related to the construction of the exterior walls and did not include the cladding, and it was not until the release of the 1965 NBCC that cladding was considered. It was also in 1965 that the requirements transitioned to include variations in building sizes along with limiting distances.

In 1963 recommendations were made, and approved, for noncombustible construction for limiting distances of 4 to 10 ft, and in 1964 combustible construction with noncombustible cladding [1]. Further construction changes were brought about as a result of a fire in a warehouse in 1965 in Kitchener, Ont. The warehouse stocked plywood and was built 20 ft from the lot line with fire protection according to 3.2.1, but still considered as posing a serious hazard to adjacent buildings [1].

The current NBCC 2020 requirements for construction of the exposing building face are not fundamentally different than what was considered in 1941. Only the level of protection needed has changed. The philosophy behind these requirements is to ensure that an exposing building face will have a sufficient level of fire resistance to limit fire spread from one building to another before emergency responders can perform their duties.

2.5.3 Identified Performance Metrics

The criteria related to the required level of construction is the percentage of permitted unprotected openings, i.e. windows and doors, allowed in a specific building face, as determined by 2020 NBCC, Division B, Article 3.2.3.1 (the details of this specific Article are outside the scope of this report). However, there are

not any performance criteria attributed to the rationale for combustible/non-combustible cladding and construction or for the attributed fire resistance ratings.

2.5.4 Gaps and/or Areas of Potential Further Study

The degree of fire resistance is specifically based on the area of unprotected openings and overall limiting distance. While it is reasonable to consider the area of allowable unprotected openings to be directly proportional to the limiting distance, the increasing level of fire resistance could be reviewed. In many instances, the level of fire resistance needed for compliance with Article 3.2.3.7 may exceed the structural fire protection requirements in Subsection 3.2.2. In other words, the requirements in Article 3.2.3.7 may be overly conservative compared to other requirements in the 2020 NBCC. A more consistent approach to attributing fire resistance ratings could be evaluated against expected fuel loads for given major occupancies.

It is worth noting that McGuire [3] indicates that the risk associated with building face construction is the possibility that combustible materials on the exposed building face will be ignited by radiant heat. Study involving the spread of fire from within a building across combustible cladding systems poses a significant risk to the horizontal spread of fire within the time needed for fire department response. In other words, is the requirement for non-combustible cladding a necessary requirement for the exposing building of fire origin or is the requirement for the protection of an exposed building.

2.6 Article 3.2.3.8 – Protection of Exterior Building Face

2.6.1 2020 NBCC Provision

1. *Except as permitted by Sentence (3) and in addition to the requirements of Sentences 3.2.3.7.(1) and (2) and where the maximum permitted area of unprotected openings is greater than 10% of the exposing building face, foamed plastic insulation used in an exterior wall of a building more than 3 storeys in building height shall be protected on its exterior surface by*
    a. *concrete or masonry not less than 25 mm thick, or*
    b. *noncombustible material that complies with the criteria for testing and the conditions of acceptance stated in Sentence (2) when tested in conformance with CAN/ULC-S101, "Standard Method of Fire Endurance Tests of Building Construction and Materials."*
2. *The criteria for testing and the conditions of acceptance for a wall assembly to satisfy the requirements of Clause (1)(b) are that*
    a. *the fire exposed area of the wall assembly shall be not less than 9.3 m2 and have no dimension less than 2.75 m,*
    b. *the exposed surface shall include typical vertical and horizontal joints,*
    c. *the test shall be continued for not less than 15 min and the standard time/temperature curve of the referenced standard shall be followed,*
    d. *the noncombustible protective material must remain in place and no through openings should develop that are visible when viewed normal to the face of the material, and*

e. the noncombustible protective material should not disintegrate in a manner that would permit fire to propagate along the surface of the test assembly.

3. The requirements of Sentence (1) are waived for wall assemblies that comply with the requirements of Article 3.1.5.5. (See Note A-3.1.4.1.(1).)

2.6.2 Historical Review

"In preparation of the 1980 edition of the NBCC, a Task Group on Foamed Plastics was formed to recommend conditions under which foamed plastics could be used in concealed spaces in buildings of noncombustible construction" [4].

This requirement was first introduced in the 1980 NBCC and provides requirements for the protection of foamed plastic insulation used in an exterior wall. Based on discussion at the September 1985 meeting of the Standing Committee on Fire Protection, "it was noted that the general intent was to limit the propagation of flame up the exterior of a building and that the degree of concern depends on the specific requirement in question."

Berndt [4] noted that concerns were raised "over the possibility that fire issuing from a window could involve the plastic and result in fire propagating up the face of the building. It was considered that for noncombustible construction up to 3 storeys in building height, any permitted cladding would provide adequate protection. For higher buildings, the Task Group considered that additional protection was necessary to ensure that cladding would stay in place for a sufficient period to restrict the spread of fire from one storey to the next."

It was readily apparent to the September 1985 Committee [13] that the simple specification of a noncombustible material handles all relevant concerns. The final requirement for the Committee's consideration was Sentence 3.2.3.5.(3), which relates to the need to protect foamed plastics on the outside of buildings. The Committee noted that the word "noncombustible" was originally added to Clause 3.2.3.5.(3)(d) as an editorial change, presumably to clarify the relationship between protective material in Clause (d) and the requirement in Article 3.1.4.5. It was therefore agreed to add a new Clause 3.2.3.5.(3)(e) to allow the use of materials that cannot meet the acceptance criteria for noncombustibility but have exhibited acceptable performance characteristics since Clause (d), which was also editorially amended, currently restricts the choice of materials to noncombustible materials. Much of the discussion is a result of lobbying by those in support of exterior insulation and finish systems (EIFS).

The 1985 NBCC modified the original requirement and expanded on it, adding specific criteria for testing and conditions of acceptance to satisfy CAN/ULC-S101, "Fire Endurance Tests of Building Construction and Materials", which was omitted previously.

The 2010 NBCC was revised to include the provision that buildings with more than 10% unprotected openings be subject to the requirements of the Article. There does not appear to be any information in the records provided to quantify this change. It is noted that it may have been a result of code alignment with other requirements.

2.6.3 Identified Performance Metrics

No quantifiable performance metrics identified.

2.6.4 Gaps and/or Areas of Potential Further Study

None identified at this time

2.7 Article 3.2.3.9 – Protection of Structural Members

2.7.1 2020 NBCC Provision

1. *Structural members, including beams, columns and arches, that are placed wholly or partly outside the exterior face of a building and are less than 3 m from the property line or the centre line of a public thoroughfare shall be protected from exterior fire exposure by fire protection having a fire-resistance rating not less than that required for their protection from interior fire exposure, as stated in Articles 3.2.2.20. to 3.2.2.92., but not less than 1 h.*
2. *Structural members of heavy timber construction, including beams, columns and arches, that are placed wholly or partly outside the exterior face of a building and are 3 m or more from the property line or the centre line of a public thoroughfare need not be covered with noncombustible cladding.*

2.7.2 Historical Review

This requirement was introduced in the 1960 Edition of the NBCC and required exterior load bearing columns and arches to have a 1 hr fire resistance rating, except when located more than 10 ft from the lot line, and deals explicitly with self protection from fire on another property.

The 1965 Edition of the NBCC provided additional details for the protection of exterior structural members. Specifically, requiring the cladding of the structural member to be non-combustible. The NBCC 1980 clarified the original requirement by stating that the level of protection shall be in accordance with the structural fire protection requirements for a given occupancy as required in Subsection 3.2.2, but no less than 1 hour. The current requirement in the 2020 Edition has not changed from this.

2.7.3 Identified Performance Metrics

The reasoning for the requirements was given in both the draft and final letters by Ferguson and Robertson which stated, "the purpose of the Code requirement is to protect the owner ... from a fire originating on the adjacent property ... the technical reason for the protection is to protect the structural loadbearing members, to prevent the roof and upper floors of a building collapsing because of a fire in an adjoining building ... in previous editions exposure protection was not an issue because the Code assumed that all construction was at a distance at least equal to the limiting distance from the lot line".

2.7.4 Gaps and/or Areas of Potential Further Study

The provisions for structural fire protection in 2020 NBCC Subsection 3.2.2, i.e. applied fire resistance ratings, are generally based on an applied fuel load for a given occupancy and/or building size. If the structural members are exposed to fire from an adjacent building where the considered fuel load is greater than that for the structural members a lower level of performance is provided. Additional study is needed to evaluate the risk of exposed structural members to a more severe exposure condition than that they were designed to.

2.8 Article 3.2.3.10 – Unlimited Unprotected Openings

2.8.1 2020 NBCC Provision

1. *An exposing building face in a storage garage with all storeys constructed as open-air storeys is permitted to have unlimited unprotected openings provided it has a limiting distance not less than 3 m.*
2. *The exposing building face of a storey that faces a street and is at the same level as the street is permitted to have unlimited unprotected openings if the limiting distance is not less than 9 m.*

2.8.2 Historical Review

This requirement was first considered in the 1941 NBCC but was not included in the following two editions. In 1965 when the requirement was reintroduced it stated that an exposed building face which comprises the first storey of a building and which faces a 60 ft street may have 100% unprotected openings.

Editorial changes in the 1977 Edition of the NBCC modified the original language from 60 ft street to align with the concept of limiting distances. Later code changes modified the language to permit only open-air storage garages to have unlimited unprotected openings.

Except for minor rewording, the requirements have remained the same since.

2.8.3 Identified Performance Metrics

A "Revision Action Sheet" in 1973 [1] suggested the introduction of unlimited unprotected openings in storage garages with a limiting distance of at least 10 ft. The rationale was that "because of the low fire load in parking garages, present requirements limiting the percentage of openings are considered to be too restrictive", however, it appears that no specific fire load was presented to quantify the claim.

No further performance metrics were found.

2.8.4 Gaps and/or Areas of Potential Further Study

Study could be conducted to further identify a quantitative fuel load for storage garages and other occupancies for the purposes of quantifying the expected fuel load and heat flux from openings for storeys at grade and for storage garages.

2.9 Article 3.2.3.11 – Low Fire Load, One Storey Building

2.9.1 2020 NBCC Provision

1. *An exposing building face of a building of low-hazard industrial occupancy conforming to Article 3.2.2.91. is permitted to be of noncombustible construction without a fire-resistance rating provided*
    a. *it is not a loadbearing wall, and*
    b. *the limiting distance is not less than 3 m.*

2.9.2 Historical Review

The first mention relating to this provision is found in the 1941 edition, where the distance to the lot line within which fire resistive closures were required could be reduced by 1/3 for one-storey buildings [1]. Further reference to this was removed in later editions of the building code.

A relaxation was introduced in 1970, where one-storey buildings with a low fire load (F3 occupancy) may have non-loadbearing EBF walls of noncombustible construction without an FRR if their limiting distance is at least 3 m. However, the only mention of this subject is in a letter from Manufacturers Mutual in 1953 which states, "I don't know that I agree entirely with ... making a 1-storey building a special case. This is probably correct in actual practice but it seems to me that it is wrong in principle" [1].

The 1995 NBCC provided an editorial change to functionally align with the structural fire protection requirements in Subsection 3.2.2. However, the overall intent was not changed and remains the same in the current 2020 NBCC.

2.9.3 Identified Performance Metrics

No quantifiable performance metrics identified.

2.9.4 Gaps and/or Areas of Potential Further Study

None identified at this time.

2.10 Article 3.2.3.12 – Area Increase for Unprotected Openings

2.10.1 2020 NBCC Provision

1. *Except as required by Sentence 3.2.3.7.(5), the maximum area of unprotected openings in any exposing building face of a building that is not sprinklered is permitted to be doubled if the openings are glazed with*
    a. *glass block conforming to the requirements of Article 3.1.8.16., or*
    b. *wired glass assemblies conforming to Article D-2.3.15. of Appendix D.*

2.10.2 Historical Review

This requirement was first introduced in the 1960 Edition of the NBCC and allowed the area of unprotected openings to be doubled when wired glass was used. Glass block was introduced as allowable protection in this Clause in 1965 on the basis of test results which indicated that glass block provides at least the same resistance to flame penetration as wired glass [1].

The 1965 NBCC further allowed for the doubling of unprotected openings for sprinklered buildings, which was removed in the 1995 NBCC [1]. Based on the information provided, it could not be readily determined as to why there was a change in the 1995 code to delete the relaxation for sprinklered buildings. However, it likely had to do with the addition of Tables 3.2.3.1-C and D for sprinklered buildings, which were not included in previous code editions. It is noted that previous editions of the NBCC only included spatial separation tables for unsprinklered buildings, which generally outlined the permitted area of unprotected

openings within specific exposing building faces. With the introduction of the 1995 NBCC two new tables were added which included provisions for sprinklered buildings.

Later editions of the NBCC provided editorial details related to requirements for the wired glass and associated frames, and removed the allowance for sprinklered buildings, as this was captured elsewhere in the NBCC. However, the fundamental concept is unchanged in the current edition of the 2020 NBCC.

2.10.3 Identified Performance Metrics

No quantifiable performance metrics identified.

2.10.4 Gaps and/or Areas of Potential Further Study

Study could be conducted to further understand/quantify the overall reduction in heat flux from unprotected openings in sprinklered buildings, compared to what was identified in the St. Lawrence Burns. The current relaxation, i.e. doubling of allowed unprotected openings, appears to be anecdotal, without any real supporting evidence.

2.11 Article 3.2.3.13 – Protection of Exit Facilities

2.11.1 2020 NBCC Provision

1. *Except as required by Sentence (3) and as permitted by Sentence 3.4.4.3.(1), if the plane of an exterior wall of an exit enclosure forms an angle less than 135° with the plane of an exterior wall of the building it serves, and an opening in the exterior wall of the exit enclosure could be exposed to fire from an opening in the exterior wall of the building, the opening in either the exterior wall of the exit or the exterior wall of the building shall be protected in conformance with the requirements of Sentence (4) where the opening in the exterior wall of the building is within 3 m horizontally and*
    a. *less than 10 m below an opening in the exterior wall of the exit, or*
    b. *less than 2 m above an opening in the exterior wall of the exit.*

    (See Note A-3.2.3.14.(1).)
2. *If an unenclosed exterior exit stair or ramp could be exposed to fire from an opening in the exterior wall of the building it serves, the opening in the exterior wall of the building shall be protected in conformance with the requirements of Sentence (4) where the opening in the exterior wall of the building is within 3 m horizontally and*
    a. *less than 10 m below the exit stair or ramp, or*
    b. *less than 5 m above the exit stair or ramp.*
3. *Except as permitted by Sentence 3.4.4.3.(1), if an exterior exit door in one fire compartment is within 3 m horizontally of an opening in another fire compartment and the exterior walls of these fire compartments intersect at an exterior angle of less than 135°, the opening shall be protected in conformance with the requirements of Sentence (4).*
4. *The opening protection referred to in Sentences (1) to (3) shall consist of*

a. glass block conforming to the requirements of Article 3.1.8.16.,

b. a wired glass assembly conforming to Article D-2.3.15. of Appendix D, or

c. a closure conforming to the requirements of Subsection 3.1.8. and Articles 3.2.3.1. and 3.2.3.14.

2.11.2 Historical Review

This requirement was first introduced in the 1970 NBCC as Article 3.4.5.1. However, the language was limited to an exposed exit opening from an exposing opening located within specific vertical and horizontal distances from the exit opening. Based on the information provided there was no specific rationale available to identify any performance reasoning for the initial inclusion of the requirements, between 1970 to 1990.

At the February 1991 meeting of the Standing Committee on Fire Protection, it was determined that editorial revisions were to be made for consistency between Articles 3.2.3.13, 3.2.3.14 and 3.1.10.6. In the 1995 Edition of the NBCC the noted changes were made: "Sentences (1) and (2) are being revised by adding the words "and the exterior walls of these fire compartments intersect at an exterior angle of less than 135°" to harmonize the requirements of these two sentences with that of Sentence (3). This change is based on the acceptance of the 135° angle as a limit of concern for adjacent fire compartments in buildings.

Sentence (3) has been revised to consider the concern of radiation from sources that are horizontally separated and those that are either up or down from the door opening, similar to the requirements of Sentences (1) and (2)."

At the March and April meetings of the Standing Committee on Fire Protection in 1993 it was acknowledged that the use of 135° "was somewhat arbitrary, but is used elsewhere in the NBCC for similar situations."

2.11.3 Identified Performance Metrics

No quantifiable performance metrics identified.

2.11.4 Gaps and/or Areas of Potential Further Study

Study could be conducted to further understand the overall reduction in heat flux from unprotected openings in sprinklered buildings. The current provisions do not appear to take into account sprinklered building conditions.

Further, consideration should be given to the heat flux received by an exit from an opening within the building it serves, and whether or not the heat flux received is sufficient to either cause harm to egressing occupants or result in fire spread. A review of the noted distance limitations (3m, 5m, etc) could be undertaken to determine if the requirements are overly conservative for the expected heat fluxes from the openings, especially considering sprinklered buildings.

2.12 Article 3.2.3.14 – Wall Exposed to Another Wall

2.12.1 2020 NBCC Provision

1. Except as required by Sentences (3) and 3.2.3.13.(1) or as permitted by Sentence 3.2.3.19.(5), if an unprotected opening in an exterior wall of a fire compartment is exposed to an unprotected opening in the exterior wall of another fire compartment, and the planes of the 2 walls are parallel or at an

angle less than 135°, measured from the exterior of the building, the unprotected openings in the 2 fire compartments shall be separated by a distance not less than D_o where

$$D_O = 2D\left(\frac{\theta}{90} \times D\right)$$

but in no case less than 1 m, and

D = the greater required limiting distance for the exposing building faces of the 2 fire compartments, and

ϑ = the angle made by the intersecting planes of the exposing building faces of the 2 fire compartments (in the case where the exterior walls are parallel and face each other, ϑ = 0°).

(See Note A-3.2.3.14.(1).)

2. *The exterior wall of each fire compartment referred to in Sentence (1) within the distance, Do, shall have a fire-resistance rating not less than that required for the interior vertical fire separation between the fire compartment and the remainder of the building.*
3. *Sentence (1) does not apply to unprotected openings of fire compartments within a building that is sprinklered throughout, but shall apply to*
    a. *unprotected openings of fire compartments on opposite sides of a firewall, and*
    b. *exposure from unprotected openings of a fire compartment that is not protected by an automatic sprinkler system.*

2.12.2 Historical Review

This provision was originally added to the 1960 NBCC, and made allowances for walls to meet at an angle of less than $90°$, with a limiting distance between openings equal to the separation distance if the openings were parallel [1]. The 1965 edition did not mention this subject. In 1970 and 1975, the restriction was imposed on walls meeting at a firewall at an angle of 135° or less, but there was still no requirement for wall construction.

The requirement was fundamentally revised in the 1977 NBCC to state that "where 2 exterior walls meet at a firewall at an external angle of 135° or less, one or both of the intersecting exterior walls shall be constructed as a firewall without openings and conforming to Subsection 3.1.8. so that

$$L_0 = 2L - \left(\frac{\theta}{90} \times D\right)$$, but in no case less than 3ft.

where

L_O = the horizontal distance measured from the point of intersection of the exterior walls along either wall or measured diagonally from any point on one exposing building face to any point on the other exposing building face,

L = the greater required limiting distance of the exposing building faces, and

θ = the external angle between the two exterior walls.

If walls in separate fire compartments face each other at an angle of 135° or less, they must not have openings within a distance L_o of each other, which may be as much as twice the limiting distance if they face each other directly. Within this distance, the walls must have at least the FRR required for the fire separation. The 1960 Code made provisions for walls meeting at an angle of less than 90°, with limiting distance the distance between openings.

Editorial rearrangements occurred in 1977 and 1980 that placed restrictions on wall construction "to ensure sufficient separation between openings in adjacent fire compartments to prevent the spread of fire from one compartment to another at exterior openings" in order to limit fire jumping around the end of a wall and exposing the adjacent property [1].

Subsequent editorial changes provided further context to the requirement, by changing the requirement from firewall to fire separation, and ultimately to fire compartment.

Additionally in the 1990 and 1995 Editions the following additional details were provided respectively:

- The exterior wall of each fire compartment in Sentence (1) within the distance, D_0, shall have a fire-resistance rating not less than that required for the interior vertical fire separation between the compartment and the remainder of the building, and
- Sentence (1) does not apply to unprotected openings of fire compartments within a building that is sprinklered throughout, but shall apply to
    - unprotected openings of fire compartments on opposite sides of a firewall, and
    - exposure from unprotected openings of a fire compartment that is not protected by an automatic sprinkler system.

The current 2020 Edition of the NBCC contains this final language and no further reasoning could be attributed to the changes.

2.12.3 Identified Performance Metrics

No quantifiable performance metrics identified.

2.12.4 Gaps and/or Areas of Potential Further Study

There is potential for inconsistent application when measuring openings distances, as it is unspecified whether measurement should be from the closest window edges or the centre of the window, where the highest overall heat flux could be expected.

Consideration and/or study could be given to the potential heat flux emitted from a specific fire compartment to an opening in another compartment, and if this exceeds a specific hazard threshold.

Study and consideration should be given to the benefits of sprinklers within the building.

2.13 Article 3.2.3.15 – Wall Exposed to Adjoining Roof

2.13.1 2020 NBCC Provision

1. *Except as permitted by Sentence 3.2.3.19.(5), if a wall in a building is exposed to a fire hazard from an adjoining roof of a separate fire compartment that is not sprinklered in the same building, and*

the exposed wall contains windows within 3 storeys vertically and 5 m horizontally of the roof, the roof shall contain no skylights within 5 m of the exposed wall.

2.13.2 Historical Review

The original requirement, which was implemented in the 1960 NBCC, only regulated windows in walls within 3 storeys directly above the roof.

Changes were made to the requirements and it was agreed that window protection for windows adjacent to roofs be in accordance with the NFPA handbook. Further, a 15 ft (5 m) horizontal restriction was added in 1965, to address commentary that windows on each side of the roof for some distance might also be involved and should be protected. This was based on the addition of a noncombustible multistorey building to a combustible 1-storey building [1].

The 1980 Edition of the NBCC permitted a relaxation for sprinklers but otherwise left the requirement unchanged. The current 2020 Edition of the NBCC has not changed since the last edits in 1980.

2.13.3 Identified Performance Metrics

No quantifiable performance metrics identified.

2.13.4 Gaps and/or Areas of Potential Further Study

Study could be conducted to evaluate the potential hazard associated with skylights within 5 m of an exposed wall. It is possible the that the overall fire severity below the roof would have an impact on the location and size of skylights.

2.14 Article 3.2.3.16 – Protection of Soffits

2.14.1 2020 NBCC Provision

1. *Except as permitted by Sentences (3) and (4), where there is a common attic or roof space above more than 2 suites of residential occupancy or above more than 2 patients' sleeping rooms, and the common attic or roof space projects beyond the exterior wall of the building, the soffit, and any opening in the soffit or other surface of the projection located within 2 500 mm of a window or door opening, shall be protected by*
    a. *noncombustible material*
        i. *not less than 0.38 mm thick, and*
        ii. *having a melting point not below 650°C,*
    b. *plywood not less than 11 mm thick,*
    c. *strandboard or waferboard not less than 12.5 mm thick, or*
    d. *lumber not less than 11 mm thick.*
2. *The soffit protection required by Sentence (1) shall extend the full width of the opening and to not less than 1 200 mm on either side of it, and shall apply to all openings through the soffit within this limit.*

3. *If an eave overhang is completely separated from the remainder of the attic or roof space by the use of fire blocks, the requirements of Sentence (1) do not apply.*
4. *The protection required by Sentence (1) for projections is permitted to be omitted if*
    a. *the fire compartments behind the window and door openings are sprinklered in accordance with Article 3.2.5.12., and*
    b. *all rooms, including closets and bathrooms, having openings in the wall beneath the soffit are sprinklered, notwithstanding exceptions permitted in the standards referenced in Article 3.2.5.12. for the installation of automatic sprinkler systems.*

2.14.2 Historical Review

This requirement was first introduced in the 1985 Edition of the NBCC. Experience had shown that fire penetrates roof soffits easily, exposing adjoining suites, and making the fire separation between them useless [1]. However, within the information provided there was no supporting evidence of this.

The requirements permitted the use of specific combustible and non-combustible materials that would effectively block the passage of flames from windows or door openings into the soffit. The provisions were provided to limit the effects of fire from a “window or door opening within 2.5 m of the overhang” from entering the unprotected soffit (see 1984 Changes for 1985 NBCC, 3.2.3.11.(2) to (4)), thus protection along the “full width of the opening and to at least 1.2 m on either side of it, with no unprotected opening into the soffit within this limit” was then required. These requirements were "intended to provide additional fire protection for the soffit and make it more difficult for fire to enter the roof space. However, no specific performance criteria were found within the information provided.

The 1990 Edition of the NBCC provided clarification to the initial requirement, but did not fundamentally change the purpose or intent. Additional changes were made to the requirement in subsequent additions. However, the changes generally aimed to provide clarification to the original requirement, thus the requirement in the current edition of the NBCC is not fundamentally changed.

2.14.3 Identified Performance Metrics

No quantifiable performance metrics identified.

2.14.4 Gaps and/or Areas of Potential Further Study

None identified at this time.

2.15 Article 3.2.3.17 – Canopy Protection for Vertically Separated Openings

2.15.1 2020 NBCC Provision

1. *Except as permitted by Sentences (2) and (3), if a storey classified as a Group E or Group F, Division 1 or 2 major occupancy is required to be separated from the storey above by a fire separation,*
    a. *every opening in the exterior wall of the lower storey that is located vertically below an opening in the storey above shall be separated from the storey above by a canopy projecting not less than 1 m from the face of the building at the intervening floor level, and*

b. the canopy required by Clause (a) shall have a fire-resistance rating not less than that required for the floor assembly but need not be more than 1 h, except as required elsewhere in this Subsection.

2. *Except as permitted by Sentence (3), the canopy required by Sentence (1) is permitted to be omitted if the exterior wall of the upper storey is recessed not less than 1 m behind the exterior wall containing the opening in the lower storey.*

3. *The requirements of Sentences (1) and (2) are permitted to be waived if the building is sprinklered throughout.*

2.15.2 Historical Review

This requirement was first introduced in the 1975 NBCC. Editorial changes in the 1995 Edition of the NBCC provided clarification to the original requirement and allowed for a relaxation for sprinklered buildings. However, the fundamental approach has not changed in the current 2020 Edition of the NBCC.

2.15.3 Identified Performance Metrics

No quantifiable performance metrics identified.

2.15.4 Gaps and/or Areas of Potential Further Study

Study concerning vertical fire spread could be conducted to determine if there is a critical height difference between openings in the lower storey and upper storey that does not require a horizontal projection or recess. This requirement only applies to openings and does not considered fire spread over cladding. Is there significant benefit to protecting windows if the cladding is not protected?

Current editions of the NBCC do not provide fuel load requirements for various major occupancies, other than Group F, Division 2 and 3. Though it is generally assumed that Group E uses have a higher fuel load, some may not be any different than other uses, thus overly restricting building construction.

2.16 Article 3.2.3.18 – Covered Vehicular Passageway

2.16.1 2020 NBCC Provisions

1. *A covered vehicular passageway designed as a receiving or shipping area shall be separated from every building or part of a building adjoining it by a fire separation having a fire-resistance rating not less than 1.5 h.*

2. *A covered vehicular passageway constructed below grade shall be of noncombustible construction.*

2.16.2 Historical Review

This requirement was first introduced in the 1970 Edition of the NBCC and required buildings connected by a covered vehicular passageway to be considered as a single building unless specific considerations are made to limit the spread of fire. Generally covered vehicular passageways required a 1 hr fire separation, noncombustible construction below grade and a flame spread of 25 or less for interior surface finishes.

The 1977 Edition of the NBCC simplified the language and limited the fire ratings associated with covered passageways to loading bays only and removed the requirement for surface flame spread ratings.

The requirements for covered vehicular passageways were considerably reworded in 1977 (see Changes for NBCC 1977, 3.2.3.14) with the intent of regulating passageways in all buildings, instead of assuming that the requirements applied only when the vehicular passageway divided a building into smaller buildings. No specific performance criteria were found within the information provided.

A small change to the requirements for underground walkways in 1980 (Changes for NBCC 1980. 3.2.3.1) indicated that "sprinklers are required only to protect hazards created by an occupancy in an underground walkway"

The current 2020 Edition of the NBCC fundamentally reflects these changes but only requires a specific fire resistance rating for covered passageways that are designed as shipping and receiving areas.

2.16.3 Identified Performance Metrics

None identified.

2.16.4 Gaps and/or Areas of Potential Further Study

The passageway is considered to be equivalent to a storage garage based on the applied fire resistance rating (1.5 hours). However, a covered vehicular passageway may not be loaded with combustible fuel to the same degree as a storage garage.

2.17 Article 3.2.3.19 – Walkway between Buildings

2.17.1 2020 NBCC Provision

1. *Except as required by Sentence 3.2.3.20.(2), if buildings are connected by a walkway, each building shall be separated from the walkway by a fire separation with a fire-resistance rating not less than 45 min.*
2. *Except as permitted by Sentence (4), a walkway connected to a building required to be of noncombustible construction shall also be of noncombustible construction.*
3. *Except as provided in Sentence (4), a walkway connected to a building or part of a building permitted to be of encapsulated mass timber construction shall be of noncombustible construction or encapsulated mass timber construction.*
4. *A walkway connected to a building required to be of noncombustible construction or to a building or part of a building permitted to be of encapsulated mass timber construction is permitted to be of heavy timber construction, provided*
    a. *not less than 50% of the area of any enclosing perimeter walls is open to the outdoors, and*
    b. *the walkway is at ground level.*
5. *A walkway of noncombustible construction used only as a pedestrian thoroughfare need not conform to the requirements of Articles 3.2.3.14. and 3.2.3.15.*

2.17.2 Historical Review

These requirements were first introduced in the 1970 Edition of the NBCC and are intended to limit the spread of fire from one building to a separate building via a connecting at, or above, grade walkway. In

general, the original provisions required walkways between buildings to be of non-combustible construction, separated from the buildings by a fire separation with a 45 min fire resistance rating and openings in the exterior wall of the building needed to be protected in accordance with the requirements for walls exposed to an adjoining roof.

Covered malls were removed from the NBCC in 1985, with the intent to regulate them in the same manner as public corridors. Testing had shown that providing a cover between parts of a building increased the danger of fire spread [1].

Subsequent editions of the NBCC allowed for relaxations to the primary requirements only and placed a limitation on the overall width of a walkway. The current 2020 Edition of the NBCC fundamentally follows the original intent.

2.17.3 Identified Performance Metrics

No quantifiable performance metrics identified.

2.17.4 Gaps and/or Areas of Potential Further Study

None at this time.

2.18 Article 3.2.3.20 – Underground Walkway

2.18.1 2020 NBCC Provision

1. *An underground walkway shall not be designed or used for any purpose other than pedestrian travel unless*
    a. *the purpose is acceptable to the authority having jurisdiction, and*
    b. *sprinklers are installed in any space in the walkway containing an occupancy.*
2. *Buildings connected by an underground walkway shall be separated from the walkway by a fire separation with a fire-resistance rating not less than 1 h.*
3. *An underground walkway shall be of noncombustible construction suitable for an underground location.*
4. *In an underground walkway*
    a. *smoke barrier doors shall be installed at intervals of not more than 100 m, or*
    b. *the travel distance from the door of an adjacent room or space to the nearest exit shall be not more than one and a half times the least allowable travel distance to an exit for any of the adjacent occupancies as permitted by Sentence 3.4.2.5.(1).*
5. *An underground walkway between buildings shall be not more than 9 m wide.*

2.18.2 Historical Review

This requirement was first introduced in the 1970 Edition of the NBCC to limit fire spread between buildings via underground walkways. The requirement placed limitations on the uses of the walkway, generally required the walkway to be fire separated from the buildings by fire separations with a 1 hour fire resistance rating and limited surface flame spread ratings to 25.

The 1995 Edition of the NBCC placed further restrictions on underground walkways by limiting the widths to not more than 9 m. The current 2020 Edition of the NBCC still aligns with these requirements.

2.18.3 Identified Performance Metrics

No quantifiable performance metrics identified.

2.18.4 Gaps and/or Areas of Potential Further Study

Sentence 3.2.3.4.(4) notes that smoke barrier doors are to be installed. However, the language is ambiguous when placed in the context of Sentence 3.1.8.4.(4) and 3.1.8.5.(6).

2.19 Article 3.2.3.21 – Storage and Process Equipment Located Outdoors

2.19.1 2020 NBCC Provisions

1. *Location of outdoor storage and outdoor process equipment in relation to buildings shall conform to Parts 3 and 4 of Division B of the NFC.*

2.19.2 Historical Review

This requirement was first introduced in the 2005 Edition of the NBCC and states that "Location of outdoor storage and outdoor process equipment in relation to buildings shall conform to Parts 3 and 4 of Division B of the National Fire Code of Canada, and has not changed since.

2.19.3 Identified Performance Metrics

No quantifiable performance metrics identified.

2.19.4 Gaps and/or Areas of Potential Further Study

Exterior open air fire dynamics are different than compartment fires. Study around commodity storage and the horizontal spread of fire to an exposed building could be looked at, in order to determine appropriate protection requirements for exterior walls exposed to an exterior fire.

2.20 Article 3.2.3.22 – Installation of Service Lines under Buildings

2.20.1 2020 NBCC Provisions

1. *When a building is erected over existing buried flammable gas mains, such service lines shall be encased in gas-tight conduits in conformance with CAN/CSA-Z662, "Oil and gas pipeline systems."*

2.20.2 Historical Review

This requirement was first introduced in the 2010 Edition of the NBCC states that "when a building is erected over existing buried flammable gas mains, such service lines shall be encased in gas-tight conduits in conformance with CAN/CSA-Z662, "Oil and gas pipeline systems." The requirement has not changed since its inception.

2.20.3 Identified Performance Metrics

No quantifiable performance metrics identified.

2.20.4 Gaps and/or Areas of Potential Further Study

None at this time.

3 2020 PART 9 – EXPOSURE PROTECTION

It is noted that unlike the exposure protection requirements in Part 3, which are generally attributed to a specific Article, the Part 9 requirements are all contained within a single Article, with specific requirements attributed to a specific sentence. The following summarizes the Acceptable Solutions for code Article 9.10.15.5 and is based on the Standing Committee on Fire Protection meeting minutes from 1985 to 2015.

In the 1960 Edition of the NBCC, the requirements for exposure protection of buildings within the scope of Part 9 were generally scant and relied upon good practice in accordance with the Canadian Housing Standard as published by the NRC. It was in the 1970 Edition of the NBCC that the requirements substantially changed. These changes generally reflected those in Part 3.

Table 2 - Chronology of Code Changes Part 9

Code Article in 2020 Edition		1970	1975	1977	1980	1985	1990	1995	2005	2010	2015	2020
PART 9												
9.10.15.5.(1)	Wall Enclosing Attic or Roof Space	-	-	-	9.10.15.7	9.10.14.7	9.10.14.11	9.10.14.11.(1)	9.10.15.5.(1)	9.10.15.5.(1)	9.10.15.5.(1)	9.10.15.5.(1)
9.10.15.5.(2) 9.10.15.5.(3)	Construction of Exposing Building Face of Houses	9.10.15.7	9.10.15.8	9.10.15.8	9.10.15.8	9.10.14.8	9.10.14.12	R - 9.10.14.12	9.10.15.5.(2) 9.10.15.5.(3)	9.10.15.5.(2) 9.10.15.5.(3)	9.10.15.5.(2) 9.10.15.5.(3)	9.10.15.5.(2) 9.10.15.5.(3)
9.10.15.5.(4)	Construction of Exposing Building Face between Houses and Garages	9.10.15.8	9.10.15.9	9.10.15.9	9.10.15.9	9.10.14.10	9.10.14.14	9.10.14.14	9.10.15.5.(4)	R - 9.10.15.5.(4)	9.10.15.5.(4)	9.10.15.5.(4)
9.10.15.5.(5) 9.10.15.5.(6) 9.10.15.5.(7)	Combustible Projections	-	-	-	-	9.10.14.9	R - 9.10.14.13	9.10.14.13	9.10.15.5.(5)	R - 9.10.15.5.(5) R - 9.10.15.5.(6) R - 9.10.15.5.(7)	9.10.15.5.(5) 9.10.15.5.(6) 9.10.15.5.(7)	9.10.15.5.(5) 9.10.15.5.(6) 9.10.15.5.(7)
9.10.15.5.(8) 9.10.15.5.(9) 9.10.15.5.(10) 9.10.15.5.(11) 9.10.15.5.(12)	Protection of Soffits	-	-	-	-	9.10.12.6	9.10.12.5	9.10.12.5	9.10.12.4	9.10.15.5.(8) 9.10.15.5.(9) 9.10.15.5.10) 9.10.15.5.(11)	9.10.15.5.(8) 9.10.15.5.(9) R - 9.10.15.5.(10) 9.10.15.5.(11) 9.10.15.5.(12)	9.10.15.5.(8) 9.10.15.5.(9) 9.10.15.5.(10) 9.10.15.5.(11) 9.10.15.5.(12)
9.10.15.5.(13)	Protection of Structural Members	-	-	-	9.10.15.10	9.10.14.11	9.10.14.15	9.10.14.15	9.10.15.5.(6)	9.10.15.5.(12)	9.10.15.5.(13)	9.10.15.5.(13)

Note - The prefix “R” refers to a code revision.

3.1 Sentence 9.10.15.5.(1) – Wall Enclosing Attic or Roof Spaces

3.1.1 2020 NBCC Provisions

1. *Except as provided in Sentences (4) and (13), each exposing building face and any exterior wall located above an exposing building face that encloses an attic or roof space shall be constructed in conformance with Sentences (2) and (3)*

    a. *for the exposing building face as a whole, or*

    b. *for any number of separate portions of the exposing building face (see Subclause 9.10.15.2.(1)(b)(iii), Sentence 9.10.15.4.(2), and Note A-9.10.15.4.(2)).*

    (See also Subsection 9.10.8.).

3.1.2 Historical Review

This requirement was introduced in the 1980 Edition of the NBCC and harmonized with the Part 3 requirement, which was introduced at the same time. Prior editions of the NBCC did not specifically include attics and roof spaces as part of the exposing building face.

Editorial changes were included in the 2005 Edition of the NBCC to allow for flexibility when assessing separate portions of a building. This allowance differs from that required by Part 3. However, no specific details could be found within the information provided related to this change.

Sentence 9.10.15.5.(1) directly aligns with Article 3.2.3.3. and it would be expected that any performance criteria associated with Article 3.2.3.3. would directly apply to Part 9 and vice versa.

3.1.3 Identified Performance Metrics

No quantifiable performance metrics identified.

3.1.4 Gaps and/or Areas of Potential Further Study

Same as for Part 3.

3.2 Sentence 9.10.15.5.(2) and 9.10.15.5.(3) – Construction of Exposing Building Faces of Houses

3.2.1 2020 NBCC Provision

2. *Except as provided in Sentences (4) and (5), where the limiting distance is less than 0.6 m, the exposing building face and exterior walls located above the exposing building face that enclose an attic or roof space shall have a fire-resistance rating of not less than 45min, and*

    a. *the cladding shall be metal or noncombustible cladding installed in accordance with Section 9.20., 9.27. or 9.28. (see Note A-9.10.14.5.(1)),*

    b. *the cladding shall*

        i. *i) conform to Subsection 9.27.12.,*

        ii. *ii) be installed without furring members over gypsum sheathingatleast12.7mmthickorovermasonry,*

iii. *iii) have a flame-spread rating not greater than 25 when tested in accordance with Sentence 3.1.12.1.(2), and*

iv. *not exceed 2 mm in thickness exclusive of fasteners, joints and local reinforcements, or*

c. *the wall assembly shall comply with Clause 3.1.5.5.(1)(b) when tested in conformance with CAN/ULC-S134, "Standard Method of Fire Test of Exterior Wall Assemblies."*

3. *Except as provided in Sentence (4), where the limiting distance is equal to or greater than 0.6 m and less than 1.2 m, the exposing building face and any exterior wall located above the exposing building face that encloses an attic or roof space shall have a fire-resistance rating of not less than 45min, and*

a. *the cladding shall be metal or noncombustible cladding installed in accordance with Section 9.20., Subsection 9.27.11. or Section 9.28. (see Note A-9.10.14.5.(1)),*

b. *the cladding shall*

i. *conform to Subsection 9.27.6., 9.27.7., 9.27.8., 9.27.9., or 9.27.10.,*

ii. *be installed without furring members, or on furring not more than 25mm thick, over gypsum sheathing at least 12.7 mm thick or over masonry, and*

iii. *after conditioning in conformance with ASTM D2898, "Standard Practice for Accelerated Weathering of Fire-Retardant-Treated Wood for Fire Testing," have a flame-spread rating not greater than 25 when tested in accordance with Sentence 3.1.12.1.(2),*

c. *the cladding shall*

i. *conform to Subsection 9.27.12.,*

ii. *be installed with or without furring members over gypsum sheathing at least 12.7 mm thick or over masonry,*

iii. *have a flame-spread rating not greater than 25 when tested in accordance with Sentence 3.1.12.1.(2), and*

iv. *not exceed 2 mm in thickness exclusive of fasteners, joints and local reinforcements, or*

d. *the wall assembly shall comply with Clause 3.1.5.5.(1)(b) when tested in conformance with CAN/ULC-S134, "Standard Method of Fire Test of Exterior Wall Assemblies."*

3.2.2 Historical Review

When first introduced in 1970, the construction requirements for exterior walls generally aligned with those in Part 3. However, relaxations were permitted for buildings containing only dwelling units in which no dwelling unit was located above another dwelling unit. In this case, the exposing building face was permitted to be of combustible construction regardless of limiting distance. Further, combustible cladding was also permitted when the limiting distance exceeded 2 ft.

The 1975 Edition included new language prohibiting unprotected openings in exposing building faces where the limiting distance was less than 2 ft.

A February 1986 letter submitted to the Associate Committee for the National Building Code of Canada from the Vinyl Council of Canada provided test data for the use of vinyl cladding in lieu of non-combustible cladding. The test data generally argues and indicates that vinyl and aluminium siding have a low flame spread rating, i.e. <25. The 1995 Edition included language specifically related to cladding for houses, which relaxed the requirements for non-combustible cladding and allowed vinyl siding at limiting distances less than 0.6 m. Additional reasoning for this change is provided in the minutes of the Standing Committee on Fire Protection meeting held in October 1991.

Editorial changes were noted in Standing Committee on Fire Protection meeting minutes from October 2007, to harmonize with Part 3 and allow other types of cladding materials.

3.2.3 Identified Performance Metrics

No quantifiable performance metrics identified.

3.2.4 Gaps and/or Areas of Potential Further Study

Same as for Part 3 above.

3.3 Sentence 9.10.15.5.(4) - Construction of Exposing Building Face between Houses and Garages

3.3.1 2020 NBCC Provision

4. *The requirements regarding fire-resistance rating and type of cladding-sheathing assembly shall not apply to the exposing building face or projections from an exposing building face of a dwelling unit facing a detached garage or accessory building, or a garage or accessory building facing a dwelling unit, where*
    a. *The detached garage or accessory building serves only one dwelling unit,*
    b. *The detached garage or accessory building is located on the same property as that dwelling unit, and*
    c. *the dwelling unit served by the detached garage or accessory building is the only major occupancy on the property.*

3.3.2 Historical Review

The 1970 Edition of the NBCC added requirements for the fire resistance of the exposing building face of a storage garage, which were dropped in the 2005 NBCC. Prior to the 1970 NBCC, code editions were silent on the spread of fire between garages and single-family buildings. The 1977 NBCC provided clarification that exterior cladding on storage garages serving a single dwelling unit did not need to be of noncombustible construction. The 2010 NBCC provided further relaxation to include projections not requiring the application of wall construction. The current requirements have not changed since 2010.

3.3.3 Identified Performance Metrics

No reasoning in terms of performance could be found for these relaxations, or for the level of performance for the initial requirements or subsequent changes.

3.3.4 Gaps and/or Areas of Potential Further Study

It is noted that this this is a fundamental shift from the general approach taken by the building code to limit fire spread between buildings on the same property. In the interest of promoting efficiency in the construction sector, study could be undertaken to assess the risks associated with fire spread between buildings on the same property regardless of use.

3.4 Sentences 9.10.15.5.(5) to 9.10.15.5.(7) – Combustible Projections

3.4.1 2020 NBCC Provisions

5. *Except as provided in Sentence (6), combustible projections on the exterior of a wall that are more than 1 m above ground level and that could expose an adjacent building to fire spread shall not be permitted within*

    a) 1.2 m of a property line or the centreline of a public way, or

    b) 2.4 m of a combustible projection on another building on the same property.

6. *Except as provided in Sentences (8) to (11), Sentence (5) shall not apply to*

    c) buildings containing one or two dwelling units only, and

    d) detached garages or accessory buildings, where

        i. the detached garage or accessory building serves only one dwelling unit,

        ii. the detached garage or accessory building is located on the same property as that dwelling unit, and

        iii. the dwelling unit served by the detached garage or accessory building is the only major occupancy on the property.

    (See Note A-9.10.14.5.(7).)

7. *Where combustible projections on an exposing building face are permitted by Sentence (6), are totally enclosed and constructed with solid faces, such as for fireplaces and chimneys, and extend within 1.2 m of a property line,*

    e) the construction of the face and sides of the projections shall comply with the corresponding requirements for exposing building faces for limiting distances less than 1.2 m as stated in Sentence (2) or (3), and

    f) where the underside of the projection is more than 0.6 m above finished ground level, it shall be protected by

        i. not less than 0.38 mm thick noncombustible material,

        ii. unvented aluminum conforming to CAN/CGSB-93.2-M, "Prefinished Aluminum Siding, Soffits, and Fascia, for Residential Use,"

        iii. not less than 12.7 mm thick gypsum soffit board or gypsum ceiling board installed according to CSA A82.31-M, "Gypsum Board Application,"

iv. not less than 11 mm thick plywood,

v. notlessthan12.5 mm thick OSB or waferboard, or

vi. not less than 11 mm thick lumber.

(See Note A-9.10.14.5.(8).)

3.4.2 Historical Review

Introduced in the 1985 Edition of the NBCC, the general rationale is assumed to fall in line with the discussions associated with Part 3, as the language in both Part 3 and Part 9 aligned up to 2010.

The 2010 Edition of the NBCC added significant measures to the requirements for combustible projections, while at the same time deleting language related to specific projection types. No reasoning specifically related to Part 9 was found within the information provided for these measures. However, it is noted that Sentences 9.10.15.5.(5) and 9.10.15.5.70 are equivalent to Sentences 3.2.3.6.(1) and 3.2.3.6.(4), respectively. Thus, the rationale used for Part 3 is likely harmonized with Part 9.

Part 9 deviates significantly from Part 3, where requirements for combustible projections are completely relaxed between a storage garage or accessory building when serving a single dwelling unit. No supporting rationale was found to support this relaxation.

3.4.3 Identified Performance Metrics

No quantifiable performance metrics identified.

3.4.4 Gaps and/or Areas of Potential Further Study

Same as for Part 3.

3.5 Sentence 9.10.15.5.(8) to 9.10.15.5.(12) – Soffit Protection

3.5.1 2020 NBCC Provision

8. Except as provided in Sentence (10), where the exposing building face has a limiting distance of not more than 0.45 m, projecting roof soffits shall not be constructed above the exposing building face. (See Note A-3.2.3.6.(2).)

9. Except as provided in Sentence (10), where the exposing building face has a limiting distance of more than 0.45 m, the face of roof soffits shall not project to less than 0.45m from the property line. (See Note A-3.2.3.6.(2).)

10. The face of a roof soffit is permitted to project to the property line, where it faces a public way. (See Note A-9.10.14.5.(11) and 9.10.15.5.(10).)

11. Where roof soffits project to less than 1.2 m from the property line, the centre line o fa public way, or an imaginary line between two buildings or fire compartments on the same property, they shall

a. have no openings, and

b. be protected by

i. *notlessthan0.38mmthicksheetsteel,*

ii. *unvented aluminum conforming to CAN/CGSB-93.2-M, "Prefinished Aluminum Siding, Soffits, and Fascia, for Residential Use,"*

iii. *not less than 12.7 mm thick gypsum soffit board or gypsum ceiling board installed according to CSA A82.31-M, "Gypsum Board Application,"*

iv. *not less than 11mmthick plywood,*

v. *not less than 12.5 mm thick OSB or waferboard, or*

vi. *not less than 11 mm thick lumber.*

(See Note A-3.2.3.6.(2).)

12. *For buildings of combustible construction, materials installed to provide the required protection for soffits may be covered with a combustible or noncombustible finish material.*

3.5.2 Historical Review

This requirement was first introduced in the 1985 Edition of the NBCC at the same time as the requirements in Part 3. The general language is also harmonized with that in Part 3.

The requirements for soffit protection in Part 9 are generally harmonized with the requirements in Part 3. It is noted that there are additional provisions in Part 9 that are specific to small buildings and residential dwelling units. However, these are general relaxations to the primary code requirement.

Based on the information provided, quantitative rationale for the relaxations could not be determined. It is noted that for the current requirements:

- Sentence 9.10.15.5.(8) is equivalent to 3.2.3.6.(2),
- Sentence 9.10.15.5.(9) is equivalent to 3.2.3.6.(3),
- Sentence 9.10.15.5.(10) is equivalent to 3.2.3.6.(4), and
- Sentence 9.10.15.5.(11) is equivalent to 3.2.3.6.(5).

3.5.3 Identified Performance Metrics

No quantifiable performance metrics identified.

3.5.4 Gaps and/or Areas of Potential Further Study

Same as for Part 3.

3.6 Sentence 9.10.15.5.(13) – Protection of Structural Members

3.6.1 2020 NBCC Provision

13. *Heavy timber and steel columns need not conform to the requirements of Sentence (1), provided the limiting distance is not less than 3 m.*

3.6.2 Historical Review

The requirements in Part 9 for the protection of structural members is functionally equivalent to those in Part 3.

3.6.3 Identified Performance Metrics

Same as for companion Article 3.2.3.9.

3.6.4 Gaps and/or Areas of Potential Further Study

Same as for Part 3.

SUMMARY AND CONCLUSION

This report reviewed the current exposure protection requirements in the NBCC. Specifically, Division B, Part 3, Articles 3.2.3.3 through to 3.2.3.22, and Division B, Part 9, Article 9.10.15.5. Each of these provisions outline and detail various prescribed acceptable solutions for limiting the probability of fire spread from one building to another.

Based on a review of each requirement, it was largely found that the historical basis that forms a specific requirement is largely attributed to discussion as at a committee level, and not on specific testing or research. While the code identifies various levels of performance that need to be met within the prescribed acceptable solutions, such as a defined level of fire resistance or physical separation distance between a building and the property line, there are typically no quantitative performance metrics that can be used to substantiate the requirements. As a result, the provisions are largely qualitative in their determination.

As a result, a number of areas of study and/or gaps in application have been identified. The specific details of these can be found within the body of this report, and are largely related to quantifying a specific performance target set by a particular acceptable solution.

REFERENCES

[1] J. L. Woollerton and G. C. Gosselin, Background for the Spatial Separation and Exposure Protection Requirements of the National Building Code of Canada 1985, Ottawa: NRCC, 1988.

[2] CCBFC, User's Guide: NBC 1995: Fire Protection, Occupant Safety and Accessibility (Part 3), NRCC, 1996.

[3] SCFP, "Minutes of the Fifth Meeting of the Standing Committee on Fire Protection," NRCC, 1986.

[4] SCFP, "Minutes of the Tenth Meeting of the Standing Committee on FIre Protection," NRCC, 1988.

[5] "Summary for Standing Committee on Fire Protection - CCR 852," NRCC, 2013.

[6] D. Yung, "Radiant Heat Flux from an Exterior Fire Involving a Four Storey Apartment Building that occured on April 17, 2007, in Fort MacMurray, Alberta".

[7] CCBFC, "Proposed Change 856 - NBC10 Div. B 3.2.3.6," NRCC, 2010.

[8] SCFP, "Minutes of teh 2015-03 Meeting of the Standing Committee on Fire Protection," NRC, 2015.

[9] J. H. McGuire, "Fire and the Spatial Separation of Buildings," NFPA, Boston, 1965.

[10] J. F. Berndt, "Committee Paper on Noncombustible Cladding," Associate Committee on the National Building Code, 1985.