Background for the Spatial Separation and Exposure Protection Requirements of the National Building Code of Canada 1985

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1.0 INTRODUCTION

This paper documents the findings of a search of National Building Code committee minutes and correspondence for material relevant to Subsection 3.2.3 of the 1985 Code, "Spatial Separation and Exposure Protection of Buildings".

Chapter 1 describes the purpose and scope of the study. Chapter 2 discusses the pertinent history, and delineates the topics which are addressed in detail in Chapter 3. The concluding chapter highlights the important findings of the study, and states what information could not be retrieved.

1.1 Objectives

Subsection 3.2.3 contains requirements designed to prevent fire spread between buildings or parts of buildings divided into fire compartments. It regulates building components such as exterior walls and roof coverings, and openings in these components. As the Code is constantly being updated and improved, it is useful for the concerned committees to know the background of the existing requirements.

Many of the original decisions were based on experimental data, while others had to be made arbitrarily. However, current committees cannot decide whether the research was adequate if it cannot be identified or if it is not accessible. Such is the case with much of the material in Subsection 3.2.3, and several questions have arisen which could not be answered without a thorough literature search. In particular, this study was considered an essential step of a current research project which deals with spatial separation requirements, the major subject of Subsection 3.2.3. Therefore the objective of this project was to

determine the background of each change which led to the present requirements.

1.2 Scope

This search was mainly limited to those documents which directly pertained to the preparation of Part 3 of the 1953 through 1975 editions of the Code, since most of the requirements in 3.2.3 were introduced in that period. These documents included minutes of all Use and Occupancy committees (Standing, Revision, etc.), the Panel on Fire, and various other subcommittees; all Part 3 correspondence 1952-1971; technical reports referred to in the above literature; and miscellaneous drafts and files related to the subject. The Revision Action Sheets for the 1975 through 1985 Codes were also consulted.

1.3 Abbreviations and References

Appendix A contains abbreviations for such items as technical phrases and committee titles which are used throughout this paper. The initials of some former committee members and Division of Building Research (DBR - now Institute for Research in Construction) staff are included for use in the References section and Appendix B.

A complete list of all files searched is included as Appendix B. Any item in the Reference section of this paper which has a "CF" number refers to a listing in this Appendix.

2.0 HISTORICAL PERSPECTIVE OF PART 3

The first edition of the National Building Code was published in 1941, a joint effort between the National Research Council (NRC) and the Department of Finance. Complete responsibility for the Code was given to the Associate Committee (ACNBC) in 1948, with DBR providing technical and secretarial support. Consequently all of the minutes and most of the correspondence on Part 3 after 1950 were channelled through DBR staff such as Stirling Ferguson, Jack Robertson, and John Shaver, to name a few.

2.1 Overview of Subsection 3.2.3

The 1941 edition contained a subsection entitled "Requirements Pertaining to the Exposure of Exterior Walls", which covered the construction of exterior walls, percentage of openings allowed, and limits on distances to the lot line, other walls, and adjacent roofs. In 1953, this was replaced by a subsection entitled "Separations, Grading and Requirements" which gave the designer a choice of construction or distance, or both, to provide the required separation between adjacent buildings, based on an estimated "fire load" (amount of combustibles per unit area) in the building providing the exposure.

A series of full-scale fire tests known as the St. Lawrence Burns was conducted in 1959, and extensively reported by the Fire Research Section. This led to a different approach to spatial separations in the 1960 code. Construction requirements for exterior walls depended on their proximity to the lot line, as well as the hazard they presented, which was determined by type of occupancy. Tables were introduced which specified the percentage of unprotected openings allowed in an exterior wall, depending on the above parameters, plus area and configuration of the wall. The format of the Tables has changed

somewhat in subsequent editions, but the concept has remained the same.

In 1970, several new items were added to Subsection 3.2.3, such as: requirements for protection of structural members from exterior fires; a special provision for one-storey buildings; the Equivalent Opening Factor; and requirements for fire-resistive construction of roof coverings, vehicular passageways, malls, and walkways.

2.2 Development of Topics

The current requirements have been loosely grouped into 16 categories for the purposes of this study. These are, in the order in which they appear in the 1985 Code:

a. Area of Unprotected Openings, Limiting Distance, and Closures
b. Definition: Area of Exposing Building Face
c. Construction of Party Walls
d. Limit of 1.2 m (4 ft) for Unprotected Openings
e. Combustible Projections
f. Construction of Exposing Building Face
g. Protection of Structural Members from Exterior Fires
h. Unlimited Unprotected Openings: Garages, Display Windows
i. Special Provision for One-Storey Buildings
j. Increased Openings Permitted: Sprinklers, Glass Block, Wired Glass
k. Equivalent Opening Factor
l. Walls Exposing Each Other
m. Walls Exposed to Roof
n. Protection of Soffits

o. Construction of Roof Coverings

p. Vehicular Passageways and Walkways

These topics (except for b.) have been charted to show their individual histories (see Figure 1). It is clearly seen that major changes occurred in 1953, 1960, and 1970, and these are the developments which this study set out to trace.

YEAR	1941	1953	1960	1965	1970	1975	1977	1980	1985
TOPIC									
Unprotected Openings, Limiting Distance, Closures		*	*	*	*	*	*	*	*
Party Walls: Construction			*	*	*	*	*	*	*
Limiting Distance less than 1.2 m	*		*	*	*	*	*	*	*
Combustible Projections									*
Construction of EBF	*	*	*	*	*	*	*	*	*
Protection from Exterior Fires					*			*	*
Unlimited Unprotected Openings Allowed	*		*	*	*	*	*	*	*
One-Storey Buildings	*				*	*	*	*	*
Increased Openings Permitted			*	*	*	*	*	*	*
Equivalent Opening Factor					*	*	*	*	*
Walls Exposing Each Other	*		*		*	*	*	*	*
Wall Exposed to Roof	*		*	*	*	*	*	*	*
Protection of Soffits									*
Roof Coverings					*	*	*	*	*
Vehicular Passageways and Walkways					*	*	*	*	*

* Asterisks denote editions in which requirements existed.

Figure 1 History of Topics

3.0 SUMMARY OF FINDINGS

In this chapter, the present code requirements, along with any relevant definitions, are outlined for each topic. The history of each subject is given starting with the year in which it was introduced. All of the references which shed light on the reasoning behind the requirements are then enumerated, and explained where necessary. Where there is overlap between topics, some references may be used twice, for clarity.

In many cases, the findings may not seem to have any direct bearing on the changes which occurred; they are simply presented for completeness. Also, where no reason is stated for a change, it may be assumed that no reason could be found in the literature.

3.1 Area of Unprotected Openings, Limiting Distance, and Closures

The 1985 Code defines an unprotected opening as

> "a doorway, window or opening other than one equipped with a closure having the required fire protection rating, or any part of a wall forming part of the exposing building face (EBF) that has a fire resistance rating (FRR) less than required for the EBF."

A closure is defined as

> "a device or assembly for closing an opening through a fire separation, such as a door, a shutter, wired glass or glass block..."

Limiting distance is defined as

> "the distance from an EBF to a property line, the centreline of a street, lane, or public thoroughfare, or to an imaginary line between 2 buildings or fire

compartments on the same property, measured at right angles to the EBF."

In 1941, openings were not permitted within certain distances from:

a) an adjacent lot line (the distance was measured at right angles to the vertical plane through the lot line)
b) a line located by the owner and separating two buildings on the same lot
or c) the centerline of a lane.

The area of openings was not considered; the only requirements were construction standards, which were different for each occupancy, and for varying distances from the applicable boundary.

In 1960, the term "limiting distance" meant the same as it does at present, except that on the same property, it was the distance to the midpoint (defined rather than variable) between two buildings or parts of the same building required to be separated. Tables 3.2.2.A and B used limiting distance and area of EBF to specify permissible area of unprotected openings in the EBF, varying from 0% at a limiting distance of less than 4 feet for all areas, to 100% at 100 ft for all areas (for normal hazard occupancies). These tables, and subsequent refinements, were based on data obtained from the St. Lawrence Burns. Originally the tables were drafted with limiting distance as the dependent variable[1], but the committee responsible for Part 3 decided that it would be more appropriate to invert them.[2]

A "Design Draft" considered by the Fire Panel in 1953[3] accepted wired glass, sprinklers, and shutters as protection for windows. The limiting distance for wired glass was set at 5 ft, although some members felt that 3 ft was adequate. It was also stated that windows should be evenly dispersed, and small.

At the first R/C meeting in 1959[4], unprotected openings were defined to be any

wall element not having the required FRR. Combustible cladding was also considered as an unprotected opening, regardless of the construction it covered. At the third meeting[5], it was suggested that a 10% unprotected opening category should be included in the inverted Table, and that the same values of limiting distance should be used for 100% unprotected openings as for 80%, since there was little difference in radiation at this point. A standard of 40% unprotected openings at a limiting distance of 10 ft was proposed, since this seemed to be a safe common practice in apartment buildings. The table which finally appeared in the Code had values somewhat more restrictive than this.

An appendix to these minutes[6] again shows the special status of wired glass and glass block: they could "be approved" for grade 1 closures, which meant that they were not always suitable as 3/4 hr closures. This was probably intended to restrict their use close to the lot line. Also, at an R/C meeting in 1964[7], a member pointed out "the inconsistency of wired glass being used as an unprotected opening as well as protection for an opening. The members agreed that wired glass should be regarded as protection only when installed in a particular way." Steel frames were chosen because "only they met temperature criteria". In interior separations, wired glass was permitted in stairwell openings until it was realized in 1967[8] that the temperature criteria for Class B doors was not met. Sentence 3.4.2.13.(2) was subsequently dropped.

Comments included as an appendix to R/C minutes in 1964[9] contain a remark from John McGuire, DBR staff, who indicated that the distance separations provided were too small for the unprotected openings allowed. Alternatives to the Tables were being sought, since many buildings do not have equally spaced windows or openings. The most popular of these was the "enclosing rectangle" approach, described by Langdon Thomas of the British Fire Research Section[10]. A draft prepared in the summer of 1969[11] incorporated this scheme into the format of the 1965 Code. Despite these efforts, the method was never

adopted, probably due to its complexity and to the fact that it was not really necessary, as demonstrated in a letter from Roger Hébert, City of Winnipeg, in 1964[12]. Hébert stated that "local concentrations of unprotected openings do not greatly affect limiting distance requirements except where local concentration % is large", and gave sample calculations based on the limiting distance tables in support of his theory. A "quick fix" which appeared in a draft in November 1968[13] gave the following provisions if the limiting distance were less than 15 ft: local concentrations of unprotected openings not to exceed 1.25 times the allowable area, and the centre to centre spacing not to exceed the horizontal dimensions of two unprotected openings. These requirements were also never adopted.

An objection[14] to the wording of the 1965 definition of limiting distance resulted in the phrase "two parts of a building required to be separated from each other" being dropped. The grounds were that it should state "fire separated", and should specify separate fire compartments. Evidently the committee thought that the definition was getting too clumsy for inclusion in Part 2, and made it as brief as possible.

Similarly a Draft for Public comment of the 1970 Code[15] elicited the idea that a requirement for "rapid response" of the Fire Department was "too nebulous" (3.2.3.1). This was updated to "properly equipped", then scrapped entirely by a Change Series which specified a response time of 10 minutes, and explained why: high radiation levels often occur within 10 to 30 minutes of "outbreak of flaming combustion".

As a revision to the 1985 Code, it was proposed to measure limiting distance to the nearest unprotected opening, as opposed to the exposing building face itself. This was rejected because it was considered that horizontal overhangs could force the flame front out from the opening to the plane of the EBF[16].

3.2 Definition: Area of Exposing Building Face

Part 2 of the 1985 Code defines exposing building face as

> "that part of the exterior wall of a building which faces one direction and is located between ground level and the ceiling of its top storey, or where a building is divided into fire compartments, the exterior wall of a fire compartment which faces one direction".

If fire separations have fire resistance equal to that required for the floor assembly (at least 3/4 hr) for normal hazard occupancies, or 2 hr fire resistance for high hazard, the area of EBF may be taken as the area of the faces described above. Exterior walls enclosing attic or roof space should be built in accordance with requirements for the EBF.

The 1960 definitions were similar, except that a 1 hr fire separation was required for normal hazard conditions. Since the area of the radiating surface was not a criterion for spatial separations prior to 1960, these definitions do not appear in the first two editions of the Code.

As mentioned in the previous section, unevenly spaced unprotected openings were a source of concern, and in one 1960 draft[17], EBF was proposed to be:

bounded by construction separation Grade 2 minimum
or "dimensions of the portion of the wall which contains a concentration of openings"
or height times length of wall.

There was also concern about A-frame type houses, which have steep roofs and little wall area, making the roof more of a hazard than the wall. A Committee Paper from the Advisory Fire Group[18] recommended: "Where roof pitch is 45° or greater, EBF shall

include the vertical area of the roof from the top of the exterior wall to the summit-line of the roof ... also where wall less than 8 ft high and roof slope between 4/12 and 12/12." Similarly, at an R/C meeting in 1964[19], Murdoch Galbreath (DBR staff) suggested that half the roof height should be used in the case of heavy timber construction without walls. The Secretary (Stirling Ferguson) clarified this as "half the projected area". The 1965 Code permitted the designer to consider "half the height only" (3.2.4.2(5)) of any part of the EBF sloped less than 45°. In 1970, this relaxation was replaced by a requirement (3.2.2.5) which stated that any roof pitched at 60° or more must be considered "as part of an external wall".

Setbacks, or discontinuous exterior walls, called for more exceptions to the rule. A letter from Roger Hébert in 1964[20] suggested that a setback of less than 5 ft should be considered as in the same plane; a setback of more than 5 ft, as a separate EBF. This appeared in modified form (no 5 ft restriction) in the 1965 edition only.

The article on exterior walls enclosing an attic or roof space was introduced in 1980 to regulate gable-ended walls which were not required to meet EBF construction standards.[21]

3.3 Construction of Party Walls

Sentence 3.2.3.4 (1) of the 1985 Code states, "Every wall that is a party wall shall be constructed as a firewall". A party wall is defined as

"a wall jointly owned and jointly used by 2 parties under easement agreement or by right in law, and erected at or upon a line separating 2 parcels of land each of which is, or is capable of being, a separate real-estate entity."

In 1941, a party wall was defined as

> "a wall used jointly by two parties under easement agreement and erected at or upon a line separating two parcels of land held under different ownership".

A common wall, on the other hand, was

> "owned by one party but jointly used by two parties one or both of whom is entitled to such use under the provisions of a lease."

Both were required to be 4-hr separations. The 1953 requirement was "when two adjoining buildings are separated by a party or common wall, such wall shall conform to the requirements for firewalls."

The "common wall" requirement was deleted in Change Series no. 2 to the 1970 Code. It was a subject of discussion at two S/C meetings in 1971[22] and 1972[23], because it was felt "the definition of Common Wall is confusing as applied to condominiums. A condominium wall may be shared by more than two owners; the wall may not go to the ground; when converting apartments to condominiums, must all 'common walls' have an FRR of 2 hours?" Since it was felt that the "restrictions of 3.2.2 would determine where a firewall is to be placed", it was decided to delete the phrase.

No technical reason was found for the original requirement for party and common walls.

3.4 Limit of 1.2 m (4 ft) for Unprotected Openings

Unprotected openings are not allowed within a limiting distance of 4 ft by the 1985

code. 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 for all occupancies, and it has remained constant since.

Because the limiting distance tables were drawn from data from the St. Lawrence Burns, it is believed that the worst case for projection of flames may have been used to determine the distance at which any unprotected openings would be allowed. Maximum flame projection was 7 ft for a high hazard occupancy[24], 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.

However, a 3-ft limiting distance is sometimes mentioned. Prior to the St. Lawrence Burns, the Fire Panel[25] chose a limiting distance of 5 ft for wired glass, noting that 3 ft was allowed in some municipalities. Another draft in that year[26] permitted 20% (or 30%) unprotected openings at a limiting distance of 3 ft. Much later, in preparation for the 1970 Code, an article entitled "Methods & Procedures of Design to Prevent Fire Spread by Radiation" gave a formula to calculate permissible unprotected openings as $(LD - 3)^2$, which indicates a cutoff of 3 ft for openings.

The Tables in the 1965 edition, however, had zeroes clearly spelled out in the first columns (from zero to 3 ft). According to a letter from Roger Hébert in 1963[27], this was to avoid unneccessary arguments between applicants and plan examiners.

3.5 Combustible Projections

A limiting distance of 1.2 m is imposed on combustible projections such as balconies, eaves and stairs on exterior walls, except for buildings containing only 1 or 2 dwelling units.

This requirement was introduced in 1985 "to prevent the spread of fire from one building to another by way of combustible projections".[28] The waiver for houses was included because of "substantial adverse public comment"; it was "considered necessary" to permit current construction practices for houses.

3.6 Construction of Exposing Building Faces

Construction requirements for exterior walls are presently spelled out in Part 3, and summarized in tabular form in the Commentary on Part 3. In 1970, only the table was used. The criterion for level of construction is the percentage of unprotected openings permitted; in 1960 and in 1941 it was the limiting distance of the face, which did not take into account the size of the building. These requirements were in transition in 1965, when they were given in terms of both limiting distance and unprotected openings permitted. In 1953, the fire load, and consequently the grade of separation required, were the factors dictating construction type. Cladding type was first specified in 1965. For clarity, a summary of these requirements is given in Figure 2.

1953

Fire Load (lb/ft^2)	Grade of Separation Required (add 1 for firewalls)	FRR if Construction Separation Only (hrs)	FRR of Closures (hrs)
10	1	1	3/4*
20	2	2	1
30	3	3	3
?	4	4	3

* 4" glass block or 1/4" wired glass may be used here for exterior walls.

1965*

1960** 1970-85

Occupancy	Limiting Distance (ft)	Unprotected Openings (%)	FRR (hrs)	Wall Construction	Cladding
	<4	0 - 10	1	N/C	N/C
Normal	4 - <10	>10 - 25	1	Combustible	N/C
Hazard	10 +	>25 - ≤100	3/4	Combustible	Combustible
		100	---	Combustible	Combustible
	<4	0 - 10	2	N/C	N/C
High	4 - <20	>10 - 25	2	Combustible	N/C
Hazard	20 +	>25 - ≤100	1	Combustible	Combustible
		100	---	Combustible	Combustible

* Both limiting distance and unprotected openings were criteria for construction requirements.

** Cladding was not regulated in the 1960 edition.

Figure 2 Construction Requirements for Exposing Building Faces, 1953 - 85

The philosophy behind these requirements is to provide a uniform degree of fire separation. Whether a firewall or a large spatial separation or a combination of these two approaches is used, the standard of fire protection should be the same. It is interesting to note, however, that while firewalls are required to be rated from both sides (3.1.5.2), exterior walls are only required to be rated from the interior (3.1.5.3). If two 1-hr exterior walls are placed only a few inches apart, the resulting fire separation is recognized by the Code as being equivalent to that provided by a 2-hr firewall, although the level of protection may be lower. In effect, only a 1-hr separation is guaranteed. It appears that rated exterior walls have traditionally been regarded as providing protection from the outside as well as the inside[29], although Article 3.2.1.4 in 1965 clearly stated that "the fire resistance requirements for any building are predicated on the possibility of a fire originating inside the building ... interior face only exposed to fire".

At that time, there was concern that "an entire wall could be made of glass brick or wired glass" instead of having a 1-hr FRR[32]. This was remedied in the 1960 code by a careful definition of fire separations, and requiring all exterior walls to be fire separations with an FRR of at least 3/4 hr.

An Advisory Fire Group Committee paper in 1963[33] called for noncombustible construction for limiting distances of 4 to 10 feet. As shown in Figure 2, the Code now requires only the cladding to be noncombustible in this range. The following year[34], it was suggested that the R/C consider combustible construction with noncombustible cladding; the proposal was apparently approved.

In a letter to Stirling Ferguson[35], Roger Hébert suggested shading Table 3.2.2.A for pictorial representation of construction requirements. He also stated that the rationale for using 25% unprotected openings as a cutoff for higher construction requirements,

rather than a limiting distance of 10ft, was that the larger the EBF, the bigger the radiator, and the greater the danger from convection and flying brands. Other reasons mentioned at an R/C meeting[36] were that: 25% was the amount of window opening "in the traditional punch hole exterior wall treatment"; 25% corresponded with what might be expected on a house facade, and 3/4 hr fire resistance seemed reasonable for a house at the distances shown in the Table; the Table in the 1960 Code relaxed to 3/4 hr fire resistance at 10 ft limiting distance; the smallest building on the Table had window openings equal to 25% with a limiting distance of 10 ft (this was noted by Ferguson as being the most probable reason for choosing 25%). It was stated that Ferguson and Hébert "had been attempting to find a means by which a reduction to 3/4 hr fire resistance could be made at greater distances for larger buildings". A case which prompted the change in criteria for construction requirements in 1965 was that of a warehouse in Kitchener[37], stocked with plywood, built 20 ft from the lot line with fire protection according to 3.2.1, but posing a serious hazard to adjacent buildings.

3.7 Protection of Structural Members from Exterior Fires

This subject is unique in Subsection 3.2.3 in that it deals explicitly with self-protection from fire on another property. This would seem to be contrary to the philosophy of the Code, which generally imposes limits on the source of the hazard, not the threatened structure. However, looking at the context of the sentences in question (3.2.3.5.(4), (5), (6)), it is seen that they immediately follow requirements for EBF construction. In section 3.5 of this paper, it was noted that these requirements were actually intended to provide protection from exterior as well as interior fires, although this is not explicity stated. Therefore these Sentences would appear to be relaxations and further restrictions of the EBF requirements. The confusion that the entire Article has created is demonstrated first

by a draft letter from Stirling Ferguson[38] in which he wrote, "this is a new kind of requirement ... previously connected with insurance policies"; and second, by the editing of the letter by Jack Robertson, DBR staff, who apparently did not agree with this assessment.

The regulations, introduced in 1970, require an FRR at least equal to that required for protection from interior fires (1 hr minimum), for "structural members such as beams, columns, and arches placed wholly or partly outside an exterior face of a building and which are less than 3 m from the property line or centerline of a public thoroughfare". No protection is required for such members at 3 m or more; heavy timber members at this distance are not required to have noncombustible cladding. The dependence of the requirement on the distance to the property line clearly indicates that the expected fire hazard would be located on the adjacent property.

Subsection 3.2.1 of the 1960 code permitted "exterior" columns and arches to have the same FRR as the construction they supported (this minimum is still upheld in 3.2.2) if they were 10 ft (20 ft for high hazard occupancies) from the lot line. An explanation of "exterior" was given by Ferguson in 1966[39] which stated that the term referred to loadbearing masonry construction, not skeleton-frame type construction, meaning that these members were contained in the exterior walls. In 1965, unrated columns and arches of heavy timber construction could project out of exterior walls, with the same distance limits. At this time, interior and exterior loadbearing members were treated identically, following a committee decision.[40]

Another clause which has bearing on this subject is found in "exceptions to fire protection requirements", 3.1.5.5.(1)(g) in 1970, and moved to 3.2.2.1.(3) in 1980 "since it deals specifically with the requirements of Section 3.2"[41]. Originally this clause

exempted "loadbearing steel or concrete members, at least 3 m from a property line or centreline of a public thoroughfare and placed wholly or partly outside the exterior wall of a building exceeding 4 storeys in height", from fire protection if they were adequately protected from a fire occurring inside the building. A change was proposed in 1984[42] to delete the limiting distance requirement and add a reference to Sentence 3.2.3.5.(5) because it was judged that the former was redundant in light of 3.2.3.5.(4). It should be noted that the deleted relaxation was only for low buildings and only referred to construction requirements in Subsection 3.2.2, whereas its replacement only relaxes construction requirements in 3.2.3. In its original form, the Clause met with opposition from the Portland Cement Association, which wrote in 1969[43] to complain about: adequacy of supporting data: there were no fire tests available for such members; the problem of exposure on adjacent property where there might exist a non-conforming building with a large fire load; and the greater seriousness of the consequences of an exterior column collapsing, versus an interior column.

The reasoning for the 3.2.3.5 requirements was given in both the draft and final letters by Ferguson and Robertson[44], 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".

3.8 Unlimited Unprotected Openings

Completely open facades are currently permitted for 1st floor display windows in

mercantile occupancies where the limiting distance is at least 9 m, and in open air storage garages where the limiting distance is at least 3 m. Such display windows were first permitted in 1941, if they fronted on a street. This was subsequently dropped, then reintroduced in 1965. Unlimited unprotected openings in storage garages were introduced in 1975, and except for minor rewording, the requirements have remained the same.

An Advisory Fire Group Committee Paper in 1963[45] and a letter from Murdoch Galbreath in 1962[46] indicated that display windows facing a 60-ft street or highway were being considered, but no further discussion was found. A "Revision Action Sheet" in 1973[47] 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".

3.9 Special Provision for One-Storey Buildings

One-storey buildings with a low fire load (F3 occupancy) may have non-load-bearing EBF walls of noncombustible construction without an FRR if their limiting distance is at least 3 m. This relaxation was introduced in 1970. A different 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.

In the correspondence, however, the only possible mention of this subject is in a letter from Manufacturers Mutual in 1953[48] 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". The writer was referring to

the Minutes of the 3rd Meeting of the T/C on U & O, which were not found in this search, so it is not certain that the comment quoted above actually deals with this requirement.

3.10 Increased Openings Permitted: Sprinklers, Glass Block, Wired Glass

The present requirements read as follows: "the maximum area of unprotected openings in any EBF may be doubled where the building is sprinklered; the maximum area of unprotected openings in any EBF may be double where such openings are glazed with glass block or with wired glass ..." The fact that the first phrase of each requirement is repeated, rather than combined with "or" as was the case from 1965 to 1977, leads to the conclusion that the area may be quadrupled if both sprinklers and wired glass or glass block are present. In 1960, only wired glass was mentioned.

An Advisory Fire Group committee paper in 1963[49] specified that wired glass was to be used throughout if one was to take advantage of a double area. In 1962, a letter from the Plywood Manufacturers of B.C.[50] suggested, "since sprinklers reduce the hazard of a large fire with high radiation, it would appear logical to permit less severe fire separation requirements throughout this subsection where sprinklered buildings are concerned". The relaxation for sprinklered buildings appeared in the next edition.

In a memo in 1967[51], John Shaver suggested, "to be consistent, shouldn't the area of openings permitted be greater than above (twice) when the building is sprinklered and also provided with wire glass and frames?" This has since been spelled out clearly in the Commentary on Part 3.

Glass block was introduced as allowable protection in this Clause in 1965 on the

basis of test results[52] which indicated that glass block provides at least the same resistance to flame penetration as wired glass.

3.11 Equivalent Opening Factor

Introduced in 1970, this factor permits acceptance of a wall assembly which fails to provide the required FRR due to heat transmission, by equating excess heat loss to equivalent window area. If the new total area of unprotected openings is less than that allowed by the Tables, the wall assembly may be used.

A working paper for the S/C on U & O in March 1967[53] suggested that "consideration should be given to waiving the temperature criteria on the outside wall surface, provided it remained in place for the period specified, and the safe distance based upon likely radiation hazard had been determined". The Fire Section was to investigate this possibility; no further mention was found of how the formula was derived.

3.12 Walls Exposed to Each Other

If walls in separate fire compartments face each other at an angle of 135° or less, they must not have openings within a distance D_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. 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. In 1977, the walls also had to be firewalls.

A handwritten addition to a 1959 draft[54] reads "Where the exterior wall of a building is at right angles to the exterior wall of an adjacent building, the direct distance between any windows ... shall equal the distance separation which would be required if the walls were parallel". This is the 1960 requirement applied to different buildings. Another comment from an R/C meeting in 1964[55] suggests "should this limiting distance not be half the distance between openings?", indicating concern that the values in the Tables were only half the actual distance needed between openings.

A letter from Hébert in 1969[56] called for a spatial separation of 2 times the limiting distance where unprotected openings of two fire compartments exposed each other at less than 180°. A draft several months earlier[57] had called for only the limiting distance at 90° or less.

Editorial rearrangements which occurred in 1977[58] ensured that "requirements for wall construction apply regardless of the presence of openings". This was "to prevent fire on one side of a firewall from jumping around the end and exposing the adjacent building". Similarly in 1980[59], changes which applied to all fire compartments, including those formed by firewalls, ensured "sufficient separation between openings in adjacent fire compartments to prevent the spread of fire from one compartment to another at exterior openings".

3.13 Walls Exposed to Roof

The present restriction, in the case of an adjoining wall and roof in the same

building, is imposed on the roof: no skylights may be placed within 5 m of the wall if any windows are within 5 m horizontally and 3 storeys vertically of the roof. Prior to this, walls within these distances were required to be protected with wired glass in metal frames, except in 1960, where only windows directly above the roof, and not to the sides, were regulated.

At a meeting of the R/C on U & O in 1964[60], "the problem of windows in walls above adjoining roofs was considered and it was agreed that window protection according to the NFPA handbook should be required". A memo from Walter Ball in 1963[61] stated, "I would think that windows on each side of the roof for some distance might also be involved and should be protected". He cited the case of the addition of a noncombustible multistorey building to a combustible 1-storey building. Murdoch Galbreath's response was that Table 3.2.2.A should be used for the closest window to the roof, and the distance doubled. The 15-foot horizontal restriction was added in 1965.

This requirement only applies to two parts of the same building. In a letter in 1965[62], Bob Montador, City of Vancouver, cited the common case of an open-air parking garage separated by a firewall from an adjacent high-rise hotel. No protection was required for the openings in the hotel exposed to the roof of the garage, because they were two distinct buildings, but a hazard existed, and he concluded, "we need a regulation to take care of this".

One alternate method of calculating the distance within which openings should be protected was contained in a draft attached to a letter from Roger Hébert in 1969[63]. The distance, given by an empirical formula, depended on the square root of the width of a roof having an FRR of less than 1 hour. Another method was proposed in a 1968 draft[64] and regulated the situation where a new building was built adjacent to a shorter building whose

roof had an FRR of less than 1 hour. The height to be protected was given as: 50 ft minus the distance between the buildings.

It is worthwhile noting that the last three cases dealt with separate buildings. The Code generally does not impose restrictions based on hazards on adjacent properties over which the owner has no control.

3.14 Protection of Soffits

Certain noncombustible materials are required to protect soffits which are adjacent to an attic or roof space common to two or more suites, unless the overhang is completely separated from the roof space by firestopping.

Introduced in 1985, this requirement was "intended to provide additional fire protection for the soffit and make it more difficult for fire to enter the roof space".[65] Experience had shown that fire penetrates roof soffits easily, exposing adjoining suites, and making the fire separation between them useless.

3.15 Construction of Roof Coverings

Roof covering requirements were transferred to Subsection 3.2.3 in 1970. Generally, a Class A, B, or C covering is required. In 1941, they depended on fire zones: fire retardant in zone 1, fire retardant if within 3 ft of the lot line in zone 2, and wood shingles were allowed beyond this[66] In the next three editions, coverings were mentioned in Part 4 and in the "Materials" sections. 1953 and 1960 saw wood shingles and other

coverings, conforming to tests which were then included in Part 5 (Materials), used without regard to fire zones. Exceptions to the present requirements have included: in 1970, Group A-2 buildings of less than 2 storeys and 10 000 ft^2, provided the covering was underlain with a noncombustible material; in 1980, buildings of less than 1 000 m^2; in 1985, tents and air-supported structures.

An Advisory Fire Group Committee Paper in 1963[67] stated, "except for Group C-2 (low-density housing), roofs of all buildings shall be covered with approved noncombustible materials". Another paper, "Roofing Materials" in 1967[68], required Class A or B coverings for noncombustible construction, Class C for combustible, and permitted wood shingles or shakes on small buildings. An explanation of this proposal was given in a letter from Ross Thomson in 1968[69]. He stated that the Code was "performance oriented", and that this relaxation would permit asbestos underlay for wood shingles, a common practice in Toronto at the time. Further, a note on a draft of 3.2.3 in 1969[70] establishes committee policy on the subject: "The intent of the Code is to be silent regarding small buildings ... The ACNBC recognizes that some control ... is necessary ... also that this is ... already controlled through local practice ... many factors vary, such as climate ... special procedures by which fire departments accomodate local conditions ... not practical nor beneficial to establish a uniform standard across the country at the present time".

Another 1968 draft[71] had more variations on these requirements: roof coverings not meeting Class C specifications were to be allowed on 2-storey buildings of 6 000 ft^2, and on buildings of 9 000 ft^2 if a noncombustible underlay was provided and a burning brand time of 20 minutes achieved. The latter allowance was intended to provide "for an intermediate stage between non-conforming and Class C by permitting an improved non-conforming roof covering". Twenty-minute burn-through time was to provide for fire

department response, since this was the time factor assumed in calculating the spatial separation tables.

The reason given by the S/C on U & O in 1971[72] for exempting Group A-2 buildings from fire-retardant roof requirements was that it would permit wooden roofs, particularly on churches.

3.16 Vehicular Passageways and Walkways

Requirements for vehicular passageways and walkways were introduced in 1970, along with specifications for covered malls which were subsequently dropped from Subsection 3.2.3. Generally, covered vehicular passageways require 1 hr fire separations, noncombustible construction below grade, and a flame spread rating of 25 or less for interior finish. A fire separation with an FRR of 3/4 hrs (1 hr if underground) is required for walkways, along with noncombustible construction unless the walkway is more than 50% open and at grade. Pedestrian travel only is allowed in underground walkways unless otherwise approved, and the walkway sprinklered. The flame spread requirement was dropped in 1985 for editorial reasons[73].

A paper entitled "Covered Malls and Walkways" written in 1968[74] gave definitions of covered malls, covered walkways, and enclosed walkways. It called for firesafety measures such as water curtains, sprinklers, standpipe and hose, and access openings every 100 ft.

It was decided to delete the requirements for covered malls in 1985 with the intent to regulate them on the same basis as public corridors[75]. One reason for this change was that covered malls could be used as substitutes for an open street or a firewall, but heat

buildup in such an enclosed space is quite different from that in an unenclosed space. Testing had shown that providing a cover between parts of a building increased the danger of fire spread from one part to another, rather than decreasing it. Another reason was that existing requirements were based on the assumption that the mall would not contain an occupancy, but there was evidence that such mall spaces were eventually used for activities other than simple pedestrian-oriented uses.

The requirements for covered vehicular passageways were considerably reworded in 1977[76] with the intent of regulating passageways in all buildings, instead of assuming that the requirements applied only where the vehicular passageway divided a building into smaller buildings.

A small change to the requirements for underground walkways in 1980[77] indicated that "sprinklers are required only to protect hazards created by an occupancy in an underground walkway".

4.0 CONCLUSIONS

Although the record of minutes and correspondence seems extensive, there were very few cases where the evidence was sufficient to draw firm conclusions about the origins of the topics in Subsection 3.2.3. In some instances, there were whole documents missing; in others, the recording procedures were too brief, and only the final actions taken were noted.

4.1 Missing Documents

A scan of Appendix B will quickly identify at least one large gap in the record: no correspondence was found for the period mid-1954 to 1960. This is particularly unfortunate, as presumably there would be considerable mention of the St. Lawrence Burns in these papers. Correspondence for 1960 to 1963 is limited to one binder; probably there is material missing for these years as well. Also missing, as noted earlier, are minutes of the T/C on U & O around 1953.

It was expected that many internal memorandae would be found, which would have communicated experimental findings of the Fire Section to the code writers. However, very few such memos were found; perhaps communication was verbal, or reports were made at meetings.

4.2 Insufficient Recording

The most valuable documents uncovered in this search were the Revision Action

Sheets which were first used for the 1975 edition. These sheets give the technical reason for each change to the Code, summarizing discussion from the Code committee meetings. The minutes in this period were also very well kept, and included any papers or technical information discussed. Prior to 1970, however, the minutes were very brief, often summarizing two days of discussion in five double-spaced pages. No formal record was kept of the reasons for changes; often the best information was obtained from handwritten notes in the margins of drafts, or from clues in the correspondence.

4.3 Highlights

This project was prompted by recurring questions about several subjects, especially the reason for the restriction on unprotected openings with limiting distances less than 4 ft. Other topics included limiting distance and area of EBF for stepped faces; the reason for placing the exterior-fire requirement in 3.2.3, where it did not seem to belong; and whether area of unprotected openings were originally intended to be quadrupled where both sprinklers and wired glass were used.

The most probable reason for the 4-foot requirement is precedent, coupled with a factor of safety applied to the results from the St. Lawrence Burns. The minimum distance beyond which wired glass may be used as protection is also debatable, as no technical reason was put forward for the 5-foot restriction before 1960, and no wired glass testing was performed during the Burns.

The Commentary on Part 3 allows designers to consider irregular building faces as being composed of several EBF's in different planes, with limiting distance measured from each separately. Although the Code has never spelled this out very clearly, this has

certainly been the intent, at least since 1965.

Protection from exterior fires was seen to have been implied in the requirements for EBF construction. Clauses in other sections were dropped when it was seen that these further relaxations and restrictions made them redundant.

It was also seen that in 1967, the suggestion was made to permit more than doubled openings when both wired glass and sprinklers were used. Reorganization of the pertinent clauses appears to support an intention to allow this, and the Commentary now spells this out clearly.

4.4 Afterword

In 1960, Stirling Ferguson viewed the evolution of building codes in this way:

> "Building regulations always arise as the result of a calamity caused by a hazard which had not been previously foreseen. From this direct experience, regulations are written closely associated with the occupancy and other conditions surrounding the circumstances of the calamity.
>
> "As the number of such regulations accumulate, they become unwieldly, they conflict with one another, and it becomes clear that certain common denominators of generalization can be made."[78]

It is hoped that this report will shed some light on the questions which have arisen concerning Subsection 3.2.3, and that it will help future codewriters to untangle apparent conflicts, clarify the original intent, and so produce a quality document that will be useful to designers and builders in Canada.

REFERENCES

No.	CF	
1	2	1st Meeting R/C on U & O, December 1959, Appendix C.
2	-	Conversation with JHM, May 1987.
3	55	"Design Draft", 6th Meeting Fire Panel 1953.
4	2	1st Meeting R/C on U & O, December 1959, Appendix C.
5	2	3rd Meeting R/C on U & O, April 1960.
6	2	3rd Meeting R/C on U & O, April 1960, Appendix A.
7	36	7th Meeting R/C on U & O, October 1964.
8	36	7th Meeting R/C on U & O, October 1964, Appendix B, "Comments".
9	-	Williams-Leir, George, "Approximations for Spatial Separation", Fire Technology, May 1966.
10	28	Draft of 3.2.3, July 1969.
11	20	Letter from RLM to JJS, November 14, 1967.
12	15	Letter from RVH to RSF, January 9, 1964.
13	24	Draft of 3.2.3, November 1968.
14	18	Letter from Canadian Sheet Steel Building Institute to RSF, April 20, 1967.
15	27	Draft for Public Comment, Part 3, 1970.
16	60	1984 Changes to 1985 NBC, 3.2.3.1.(3).
17	13	Draft, "Exterior Fires".
18	35	Committee Paper #5, 7th Meeting AFG, 1963.
19	36	4th Meeting R/C on U & O, April 1964.
20	15	Letter from RVH to RSF, January 9, 1964.
21	56	Changes for NBCC 1980, 3.2.3.3.
22	49	10th Meeting S/C on U & O, October 1971, Appendix D, p. 4.
23	50	11th Meeting S/C on U & O, April 1972.

24	-	McGuire, J.H., "Fire and the Spatial Separation of Buildings", Fire Technology, November 1965.
25	55	"Design Draft", 6th Meeting Fire Panel, 1953.
26	8	"Draft Circulated for Comment", July 1953.
27	14	Letter from RVH to RSF, December 16, 1963.
28	60	1984 Changes for 1985 NBC, 3.2.3.4.(3)
29	-	Conversation with ATH, July 1987.
30	2	1st Meeting R/C on U & O, December 1959, Appendix C.
31	13	Draft "Exterior Fires".
32	2	1st Meeting R/C on U & O, December 1959, Appendix F.
33	35	Committee Paper #5, 7th Meeting AFG, 1963.
34	36	4th Meeting R/C on U & O, April 1964.
35	14	Letter from RVH to RSF, December 16, 1963.
36	36	2nd Meeting R/C on U & O, December 1963.
37	14	Memo from RSF to Regional Stations, March 26, 1963.
38	33	Memo from RSF to JMR, December 12, 1970.
39	17	Letter from Midland Industrial Services, June 16, 1966; Interpretation of "Exterior" by RSF.
40	36	7th Meeting R/C on U & O, October 1964, p. 17.
41	56	Changes for 1980 NBC, 3.2.2.1.(3).
42	60	1984 Changes for 1985 NBC, 3.2.2.1.(3)(g).
43	26	Letter from Portland Cement Association, March 14, 1969.
44	33	Memo from RSF to JMR, December 12, 1970. Letter from JMR to Mulder Canada, December 22, 1970.
45	35	Committee Paper #5, 7th Meeting AFG, 1963.
46	14	Letter from MG to Lunenberg, N.S., July 30, 1962.
47	52	"Revision Action Sheet", 13th Meeting S/C on U & O, November 1973, Appendix C, p. 21.
48	5	Letter from Manufacturers Mutual to RSF, February 27, 1953.

49	35	Committee Paper #5, 7th Meeting AFG, 1963.
52	14	Letter from Plywood Manufacturers B.C. to JMR, November 20, 1962.
51	59	1983 Changes for 1985 NBC, 3.2.3.8.(2).
52	19	Memo from JJS to Sb/C on Structural Fire Protection, August 2, 1964.
53	39	"Consideration of Additional Methods for Calculating Spatial Separation", Working Paper for S/C on U & O, 3rd Meeting, May 1967, Appendix D.
54	13	"Exterior Fires" - part of draft.
55	36	Comments, 7th Meeting R/C on U & O, October 1964, Appendix B.
56	25	Letter from RVH to JJS, February 19, 1969; comments on attached draft.
57	57	Changes for NBCC 1977, 3.2.3.10.
58	56	Changes for NBCC 1980, 3.2.3.10.
59	24	Draft of 3.2.3, November 15, 1968.
60	2	3rd Meeting R/C on U & O, April 1960.
61	14	Memo from Walter Ball to JMR, January 7, 1963.
62	15	Letter from RLM to RSF, February 10, 1965.
63	25	Letter from RVH to JJS, February 19, 1969, including Draft and Comments.
64	24	Draft of 3.2.3, November 15, 1968.
65	60	1984 Changes for 1985 NBC, 3.2.3.11.(2) to (4)
66	-	NBC 1941: 4.4.3.4, 4.4.4.3, 4.4.5.
67	35	Committee Paper #5, 7th Meeting AFG, 1963.
68	19	"Roofing Materials - Proposed Revision to Part 3", July 28, 1967.
69	21	Letter from CRT to JJS, January 4, 1968.
70	28	Draft of 3.2.3, July 1969.
71	24	Draft of 3.2.3, November 1968.
72	49	10th Meeting S/C on U & O, October 1971, Appendix D.
73	60	1984 Changes for 1985 NBC, 3.2.3.14.
74	21	"Covered Malls and Walkways", March 1968.

75	59	1983 Changes for 1985 NBC, 3.2.3.13.
76	57	Changes for NBCC 1977, 3.2.3.14.
77	56	Changes for NBCC 1980, 3.2.3.16.
78	-	Manuscript of Memoirs, Stirling Ferguson.

APPENDIX A

Abbreviations

1. Technical Terms

EBF	Exposing Building Face
FRR	Fire Resistance Rating
N/C	Noncombustible

2. Committee Terms

DBR	Division of Building Research
IRC	Institute for Research in Construction
NRC	National Research Council
NBC	National Building Code
ACNBC	Associate Committee on the National Building Code
AFG	Advisory Fire Group
U & O	Use & Occupancy
C/C	Coordinating Committee
R/C	Revision Committee
Sb/C	Subcommittee
S/C	Standing Committee
T/C	Technical Committee

Meeting 3-B denotes 3rd Meeting, Appendix B.
C-file denotes a Correspondence File

3. Major Contributors

RSF	Stirling Ferguson	RLM	Bob Montador
MG	Murdoch Galbreath	JMR	Jack Robertson
ATH	Oz Hansen	JJS	John Shaver
RVH	Roger Hébert	GWS	Gordon Shorter
KI	Joe Izumi	CRT	Ross Thomson
JHM	John McGuire	GWL	George Williams-Leir

APPENDIX B

Searched Files

Following is a complete list of the files which were consulted during this project. For reference purposes, binding is indicated as follows:

B1	Hardbound volume
B2	Softbound black cover
B3	Accordion-type file folder
B4	Stapled minutes

Locations as of July 1987 are as follows:

L1	M24 Service Tunnel Entrance
L2	M24 Basement - Plant Area
L3	M24 Basement - "Cage" Area
L4	M24 Codes Section Conference Room

Files		Binding/ Location
CF1	"Minutes of Advisory Fire Group and Panels 1955-59". 5 AFG meetings: exits, fire escapes, heights & areas, fire zones. - Meeting 5-F: Report to AFG from Panel on Heights & Areas	B1 L1
CF2	"Minutes of Revision Committees NBC 60 Vol. 1". Meetings 1-6 R/C on U & O 1959-61 - Report from Panel on Exits - Heights & Areas; The Boxes - Meeting 3-A: ACNBC Construction Standards for Fire Protection - Comments on 1960 Draft	B1 L1
CF3	C-file M4-B6-T5 Vol. 1 June/51 - July/54 "Panel on Fire - T/C on Use"	B3 L3
CF4	C-file with incorrect title: "Minutes of AFG & Panels 1952-62". Contains correspondence for that period: RSF - architectural questions; MG - technical inquiries	B1 L1
CF5	C-file M4-B6-T5-P3 Vol. 1. Jan/52 - May/54. "Panel on Fire - T/C on Use"	B3 L3

CF6	C-file M4-B6-T5-P3 Jan/52 - May/54. "Panel on Fire - T/C on Use" Similar to CF5; contains Reference Sheets.	B2 L3
CF7	M4-B6-T5-P3 "Use - Fire - Supplementary". NFPA and other reports: - Hotel fires - DBR Report S24: Ottawa Ordnance Depot Fire 1951 - DBR Technical Paper #50: Fire Separations in 1953 NBC	B3 L3
CF8	"First Draft Part 3 - Circulated for Comment", July/53	B2 L3
CF9	"Fire Working Papers" - RSF. - Lecture on NBC - Fire Safety for Schools in Ontario - Fire Safety in Hospitals - Fire (focus on architecture)	B2 L3
CF10	M4-B6-T5 "Use & Occupancy Drafts - Tech Papers 1953, Vol. 2".	B2 L3
CF11	"Use & Occupancy Draft for Comment, Printed Late 1952".	B2 L3
CF12	"Comments on Part 3", Fall 1964. Contains 3 letters.	B3 L3
CF13	Miscellaneous drafts and correspondence 1959-64.	B3 L3
CF14	C-file S3 1961-3, including Minutes of R/C on U & O.	B2 L2
CF15	C-file S3 1964-65.	B2 L2
CF16	C-file S3 Vol. 3, 1965.	B2 L2
CF17	C-file S3 1966. - 1st Meeting Life Safety Sb/C - "Psychosocial Phenomena and Building Design"	B2 L2
CF18	C-file S3 Spring 1967.	B2 L2
CF19	C-file S3 July-Sept/67.	B2 L2
CF20	C-file S3 Oct-Dec/67.	B2 L2
CF21	C-file S3 Jan-April/68.	B2 L2
CF22	C-file S3 May-June/68.	B2 L2
CF23	C-file S3 July-Oct/68.	B2 L2
CF24	C-file S3 Nov-Dec/68. - "Psychosocial Considerations of Environmental Design" - KI	B2 L2
CF25	C-file S3 Jan-Feb/69. - "Fire Safety in High Rise Buildings as related to Elevators"	B2 L2

CF26	C-file S3 March/69.	B2 L2
CF27	C-file S3 April-May/69. - Data, European Fire Tests on Steel Columns - "Provision for Fire Safety in High-Rise Office Buildings"	B2 L2
CF28	C-file S3 June-July/69. - French Draft of Part 3	B2 L2
CF29	C-file S3 Aug-Sept/69.	B2 L2
CF30	C-file S3 Oct/69-Feb/70. - "Fire Hazard of Plastic Diffusers in Dual-Purpose Fixtures"	B2 L2
CF31	C-file S3 March-June/70. - UL Report "Sliding Doors for use as Exit Doors"	B2 L2
CF32	C-file S3 July-Sept/70. - "Smoke Travel in Shopping Malls"	B2 L2
CF33	C-file S3 Oct-Dec/70.	B2 L2
CF34	C-file S3 Jan-May/71. - 2 papers by KI: "A Message to the Architects" "The (In)Human(e) Environment"	B2 L2
CF35	Minutes Advisory Fire Group 1962-63 Meetings 6 & 7. Meeting 6: - Paper for AFG on changes in Part 3 1953-60 Meeting 7: - #1 "Treatment of Flame Spread and Combustibility in NBC" Committee - #2 "Use of Fire-Retardant Wood in NBC" Papers - #4 House-garage separation - #5 Fire spread between buildings	B1 L1
CF36	Minutes R/C on U & O, 1963-64. 7 Meetings. Major topic: Heights & Areas. - Draft of Part 3 for comment, 1964.	B1 L1
CF37	Minutes, Fire Test Board 1962-64. Meetings 1-11.	B1 L1
CF38	Minutes, Fire Test Board 1965-67. Meetings 12-13.	B1 L1
CF39	Minutes, S/C on U & O 1966-68. 4 Meetings. Minutes, Life & Safety Sb/C. 2 Meetings. - Meeting 1-C: "FRR of Doors & Closures" - MG - Meeting 1-D: "Fire & SS of Buildings" - JHM - Meeting 2: "Digest of 214 Comments" - Meeting 4-E: Heights & Areas	B1 L1
CF40	Letter Ballots S3 Vol. 1, 1971-73.	B2 L2
CF41	Draft & Comments 1975 NBC S3. - Canadian Carpet Institute: Comments - 1975 Part 3 Draft, published July 1964	B2 L2

CF42	Minutes 1st Meeting R/C on Part 3, Oct/72.	B4 L1
CF43	Minutes 2nd Meeting C/C of S/C on U & O, 13 Feb/73	B4 L1
CF44	Minutes 3rd Meeting C/C of S/C on U & O, 26 Feb/73.	B4 L1
CF45	Minutes 4th Meeting C/C of S/C on U & O, 12 March/73.	B4 L1
CF46	Minutes 5th Meeting C/C of S/C on U & O, 22 May/73. - Appendix C: "Fire Protection Requirements for High-Rise Buildings"	B4 L1
CF47	Minutes 6th Meeting C/C of S/C on U & O, 12 June/73. - Appendix AA: Fires in Hospitals	B4 L1
CF48	Minutes 9th Meeting S/C on U & O, 15 April/71. - Appendix F: "Part 3: Statements of Intent" - RSF	B4 L1
CF49	Minutes 10th Meeting S/C on U & O, 13 Oct/71.	B4 L1
CF50	Minutes 11th Meeting S/C on U & O, 17 April/72.	B4 L1
CF51	Minutes 12th Meeting S/C on U & O, 27 March/73. - "Measures for Fire Safety in Tall Buildings"	B4 L1
CF52	Minutes 13th Meeting S/C on U & O, 14 Nov/73.	B4 L1
CF53	Minutes 14th Meeting S/C on U & O, 30 May/74.	B4 L1
CF54	Minutes 15th Meeting S/C on U & O, 13 Jan/75.	B4 L1
CF55	Minutes Fire Panel 1952-54 (9 meetings). 1st Joint Meeting: T/C on Use & Design & Fire Panel.	B2 L3
CF56	Changes for NBCC 1980, Parts 1 to 3, Vol. 1.	B1 L4
CF57	Changes for NBCC 1977, Parts 1 to 3, Vol. 1.	B1 L4
CF58	1974 Changes for 1975 NBC, Vol. 1.	B1 L4
CF59	1983 Changes for 1985 NBC, Vol. 1.	B1 L4
CF60	1984 Changes for 1985 NBC, Vol. 1.	B1 L4