Saskatchewan
Municipal Affairs
and Housing

Building Officials Newsletter

Building Standards
January 2002

Exit Signs and Exit Direction Signs

The ability to evacuate a building in an emergency is the key element relating to life safety. The National Building Code of Canada (NBC) 1995 requires signs to indicate exits and, if necessary, signs to indicate the direction of exits to facilitate escape in the event of a fire.

Exit signs that are visible in the direction of exit travel are required over or adjacent to every exit door other than the main entrance in:

- buildings more than 2 storeys in building height,
- buildings having an occupant load of more than 150, and
- rooms or floor areas that have a fire escape as part of a means of egress.

Exits signs are required over or adjacent to every egress door other than the main entrance in:

- rooms with an occupant load more than 60 in Group A Division 1 occupancies, dance halls, licensed beverage establishments and other similar occupancies that, when occupied, have lighting levels below that which would provide easy identification of the egress doorway.

Exit directional signs are required in corridors and passageways:

- if needed to indicate the direction of exit travel,
- if an exit is not clearly visible, and
- in locations from which the principal exit signs cannot be seen.

Signs indicating that stairs and ramps do not lead to an exit are required in a building of more than 2 storeys in building height, if the stairs or ramps continue past an exterior exit door down to a basement.

Exit signs and exit direction signs can be internally or externally illuminated, the letters must meet required lettering size and stroke thickness, and the letters and background colours are specified depending upon whether the sign is internally or externally illuminated. The signs must be illuminated continuously while the building is occupied. In a building that is not occupied for part of the day, there is no need to maintain illumination of the exit signs during that period of time. If illumination of an exit sign (internal or external) is provided from an electrical circuit, that circuit must serve only emergency equipment and be connected to an emergency power supply.

All exits require lighting to enable a person to use that exit safely. This lighting can also be used for external illumination of an exit sign, but emergency lighting must also be directed at the sign. An externally illuminated sign can be painted or could be one of various types of electroluminescent or self-luminous

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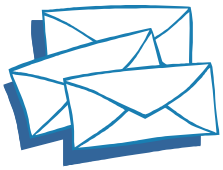
signs. Although the latter types of sign can be viewed under certain conditions without external illumination, the NBC 1995 does not accept them as complying with requirements for internally illuminated signs. They must be considered as externally illuminated signs, and provided with regular and emergency light sources accordingly. The level of intensity of internal illumination of exit signs should be sufficient that there is a clear contrast between the lettering and the background. If the sign could be exposed to high levels of external illumination, particularly sunlight, the internal illumination level required could be very high and an externally illuminated sign would be preferable.

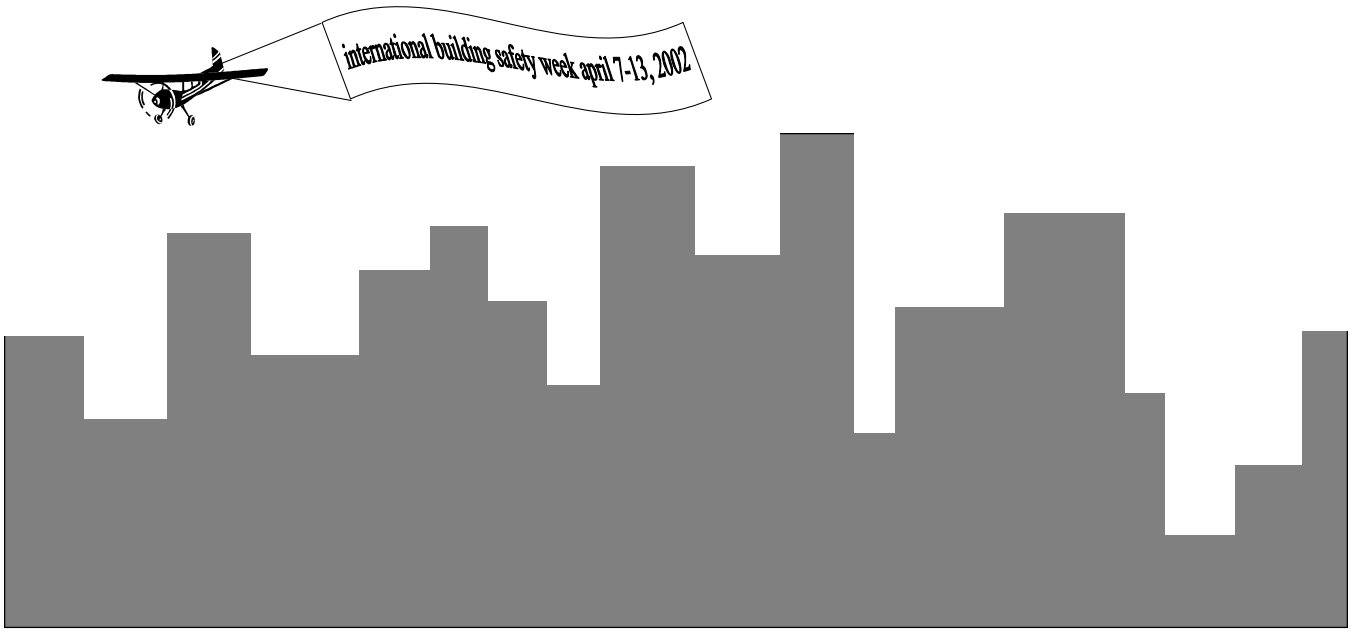
In addition to the signs that are required by the code, building owners may choose to install path markers or way-guidance systems to aid evacuation. The NBC 1995 does not address use of emergency way-guidance systems. Typically, these are self-luminous or photoluminescent signs, strips, tapes, paints, fabrics or plastics. They have been used in industrial applications and for information signage in elevators and lobbies. The Fall 1999 issue of "construction *innovation*" reported that National Research Council's Institute for Research in Construction Fire Risk Management Program conducted a study to assess the potential of photoluminescent material in assisting people to evacuate buildings safely. The material is relatively low cost, dependable, and offers good visibility in smoke. The study compared photoluminescent material to emergency lighting in the stairwells of a 13 storey office tower in Ottawa. The results of the study were promising, although some people who participated suggested using more way-guidance strips, and several said that the material should have been brighter. Future NRC research projects could focus on the effectiveness of the new photoluminescent materials now available – which glow longer and brighter – in guiding people from buildings or underground spaces. For more information on the study, please contact Dr. Guylène Proulx at (613) 993-9634.

Proposals for changes to the NBC 1995 include use of photoluminescent exit signs without the need for external illumination. Meanwhile, care should be taken not to accept path markers and way-guidance systems in place of code conforming exit signs. §



Readers' Letters

If you wish to comment on anything you've read in the Building Officials Newsletter, please send your letter to us by fax, e-mail or post-mail at the addresses listed on the last page.



Special Changes to the National Model Codes

Special changes to the national model building, fire and plumbing codes were approved by the Canadian Commission on Building and Fire Codes (CCBFC) on October 29, 2001. Special changes may be issued without public review, when a situation exists that is potentially dangerous or that restricts the appropriate use of materials, systems, methods of design, etc. All special changes are included in the next regular public review. Once the following changes to the building code are issued as revisions by the CCBFC, they will come into force in Saskatchewan. In the meantime, building officials and other code users should prepare to implement these new provisions. (Please see the text of the letter that was sent to engineering associations regarding arch roof structures and the special change to Article 4.1.7.2. of the NBC 1995 and Commentary H of the *User's Guide — NBC 1995 Structural Commentaries*, on page 5 of this newsletter.)

Special Changes to the National Building Code of Canada 1995

add new Sentence 3.1.5.11.(7):

3.1.5.11. Combustible Insulation and its Protection

7) Foamed plastic insulation having a *flame-spread rating* of not more than 500 which forms part of a factory assembled non-*loadbearing* interior or exterior wall or ceiling panel that does not incorporate an air space is permitted to be used in a building required to be of *noncombustible construction* provided

a) the *building* is *sprinklered*,
b) the *building* is not more than 18 m high, measured between *grade* and the floor level of the uppermost *storey*,
c) the *building* does not contain a Group A, Group B, or Group C *major occupancy*,
d) the panel, when tested in conformance with ULC/ORD-C376-1995, "Fire Growth of Foamed Plastic Insulated Building Panels in a Full-Scale Room Configuration," meets the criteria defined in the document,
e) the *flame-spread rating* of a panel, determined by subjecting a sample, including an assembled joint, to the appropriate test described in Subsection 3.1.12., is not more than the *flame-spread rating* permitted for the room or space that it bounds.

(See Appendix A.)

add new Appendix note:

A-3.1.5.11.(7) Factory Assembled Wall Panels. It is intended that the panel samples submitted for testing will have typical joints that represent the field installation. The flame-spread testing will depend on the type of plastic that is used.

replace Sentence 3.1.5.19.(1) with:

3.1.5.19. Nonmetallic Raceways

1) Except for limits on size for penetrations of *fire separations* as required by Sentence 3.1.9.3.(2), within a *fire compartment* of a *building* required to be of *noncombustible construction*, totally enclosed nonmetallic raceways not more that 120 mm in diameter, or an equivalent rectangular area, are permitted to be used to enclose optical fibre cables and electrical wires and cables, provided the raceways exhibit a vertical char not more than 1.5 m when tested in conformance with the Vertical Flame Test (FT-4) – Conduit or Tubing on Cable Tray in Clause 6.16 of CSA C22.2 No. 211.0-M, "General Requirements and Methods of Testing for Nonmetallic Conduit."

replace Sentence 4.1.7.2.(2) with:

4.1.7.2. Full and Partial Loading

2) In addition to the distribution in Sentence (1), flat roofs and shed roofs, gable roofs of 15° slope or less and arched or curved roofs shall be designed for the specified uniform snow load in Sentence 4.1.7.1.(1), computed using C_a = 1.0, distributed on any one portion of the loaded area, and half of this load on the remainder of the loaded area, in such a way as to produce the greatest effects on the member concerned. (See Appendix A.)

replace Paragraph H-31 in the User's Guide – NBC 1995 Structural Commentaries (Part 4) with:

31. Arch roofs (Figures H-2(a) and H-2(b)). Uniform and unbalanced load distributions are particularly important for the design of curved roofs.[19][22][23] In addition the requirements for "full and partial loading" apply. Case II loading may also be used for the design of domes (see Paragraph 24).

(Please note that Figures H-2(a) and H-2(b) are also replaced. For copies of these Figures contact Building Standards as shown on the back page of this newsletter, or call the Canadian Codes Centre at (613) 993-0069.)

replace Sentence 9.4.2.1.(1) with:

9.4.2.1. Application

1) This subsection applies to light frame constructions where wall, floor and roof planes are generally comprised of frames

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(continued from page 3 — Special Changes)

of small repetitive structural members, and where

a) roof and wall planes are clad, sheathed or braced on at least one side,
b) the small repetitive structural members are spaced not more than 600 mm o.c.,
c) the span of any structural member does not exceed 12.20 m,
d) the maximum deflection of the structural roof members does not exceed the limits specified in Sentence 9.23.13.11.(1) based on the loads specified in that Sentence,
e) the maximum total roof area, not withstanding any separation of adjoining *buildings* by *firewalls*, is 4550 m^2, and
f) for flat roofs, there are no significant obstructions on the roof, such as parapet walls, spaced closer than the distance calculated by:

$$D_o = 10 (H_o - 0.8 S_s)$$

where

D_o = minimum distance between obstructions,
H_o = the height of the obstruction above the roof, and
S_s = ground snow load.

(See Appendix A.)

add new Appendix note:

A-9.4.2.1.(1) Application of Simplified Part 9 Snow Loads. The simplified specified snow loads described in Article 9.4.2.2. may be used where the structure is of the configuration that is typical of traditional wood-frame residential construction and its performance. This places limits on the spacing of joists, rafters and trusses, the spans of these members and supporting members, deflection under load, overall dimensions of the roof and the configuration of the roof. It assumes considerable redundancy in the structure.

Because very large buildings may be constructed under Part 9 by constructing firewalls to break up the building area, it is possible to have Part 9 buildings with very large roofs. The simplified specified snow loads may not be used when the total roof area of the overall structure exceeds 4550 m^2. Thus, the simplified specified snow load calculation may be used for typical town-house construction but would not be appropriate for, for example, much larger commercial or industrial buildings.

The simplified specified snow loads are also not designed to take into account roof configurations that seriously exacerbate snow accumulation. This does not pertain typical projections above a sloped roof such as dormers, nor does it pertain to buildings with higher and lower roofs. Although two-level roofs generally lead to drift loading, smaller light-frame buildings constructed according to Part 9 have not failed under these loads. Consequently, the simplified calculation may be used in these cases. Rather, this limitation on application of the simplified calculation pertains to roofs with high parapets or significant other projections above the roof, such as elevator penthouses, mechanical rooms or larger equipment that would effectively collect snow and preclude its blowing off the roof.

The reference to Sentence 9.23.13.11.(1) invokes, for roof assemblies other than common lumber trusses, the same performance criteria.

replace Sentence 9.7.2.1.(1) with:

9.7.2.1. Window Standard

1) Except as provided in Sentence (2), windows shall conform to CAN/CSA-A440-M, "Windows," but need not meet airtightness, watertightness and wind load resistance requirements more stringent than those for classifications A1, B1 and C1 in CAN/CSA-A440-M, "Windows." (See Appendix A and Article 9.7.6.1.)

2) Windows need not comply with Clause 10.15 of CAN/CSA-A440-M, "Windows," Energy Rating for Heating Conditions of Residential Windows.

replace Sentence 9.25.2.4.(2) with:

9.25.2.4. Installation of Loose-Fill Insulation

2) Where loose-fill insulation is installed in an unconfined sloped space such as an attic space over a sloped ceiling, the supporting slope shall not be more than

a) 4.5 in 12 for mineral fibre or cellulose fibre insulation, and
b) 2.5 in 12 for other types of insulation.

Special Change to the National Plumbing Code of Canada 1995

replace Sentences 6.1.7.(2) and (3) with:

6.1.7. Relief Valves

2) Every hot water tank of a *storage-type service water heater* shall be equipped with a temperature relief valve with a temperature sensing element

a) located within the top 150 mm of the tank and
b) designed to open and discharge sufficient water from the tank to keep the temperature of the water in the tank from exceeding 99° C under all operating conditions.

(continued on Page 5)

(continued from page 4 — Special Changes)

A letter was sent by the Secretary of the Canadian Commission on Building and Fire Codes to the professional engineering associations across Canada, regarding the special change to Article 4.1.7.2. and Commentary H of the *User's Guide — NBC 1995 Structural Commentaries*. The text of the letter is reproduced below.

Special Change to the National Fire Code of Canada 1995

replace Sentence 6.4.1.1.(1) with:

6.4.1.1. Inspection, Testing and Maintenance

1) The inspection, testing and maintenance of standpipe and hose systems shall conform to NFPA 25, "Standards for Inspection, Testing and Maintenance of Water Based Fire Protection Systems." §

Dear Sirs:

Re: Special Change to the Structural Design Requirements for Arched Roofs.

This letter is to advise you of a potentially significant design shortcoming in the snow load provisions of the National Building Code (NBC) and request that you inform your members of the issue so that they may take appropriate action as soon as possible. A Special Change to the NBC addressing this shortcoming has been approved by the Canadian Commission on Buildings and Fire Codes.

The design shortcoming was brought to the attention of the Standing Committee on Structural Design at its 36th meeting held in October 1999. It received a report indicating that the current 1995 NBCC snow load requirements can produce an unsafe condition in arch roof structures with a rise to span ratio greater than 1 in 10. The current code requirements for snow load state that only those arch roofs with a rise to span ratio equal to or less than 1 in 10 must be designed for both the specified uniform snow load on the entire roof surface and the partial snow loading stipulated in Sentence 4.1.7.2.(2) of the NBCC 1995. The report indicated that the partial snow load should also be applicable to roofs whose rise to span ratio is greater than 1 in 10.

To respond to the concern raised by this report, the Canadian Codes Centre engaged the services of a noted snow and wind load specialist to model the arch roofs and provide recommendations to the Standing Committee on Structural Design. That specialist proposed the following changes to the NBCC Part 4 and to the Structural Commentaries:

- *the limits for the rise to span ratio for arched or curved roofs be removed from the unbalanced load condition in Sentence 4.1.7.2.(2) of the NBCC 1995*
- *in Figures H-2(a) and H-2(b) of the Structural Commentaries, the limit on Case II of 2Ss be replaced by a limit of 3 kPa*
- *a transition formula be introduced in Figures H-2(a) and H-2(b) to account for the rise to span ratio of the roof.*

A Special Change to the NBC incorporating these changes has been approved by the Canadian Commission on Buildings and Fire Codes and will be published shortly. The Special Change is now being examined by the provinces and territories. Although adoption may take some time, there is nothing in the current wording of the NBC to preclude designers from using these procedures immediately.

In addition, it is advisable that existing arched or curved roof structures with a rise to span ratio greater than 1/10 be analyzed for the unbalanced snow load criteria of Sentence 4.1.7.2.(2) of the NBC 1995 as modified by this Special Change.

Detailed information regarding the revised snow load design criteria can be obtained by contacting the Canadian Codes Centre at (613) 993-0069.

Yours truly,

John W. Archer, Secretary, Canadian Commission on Building and Fire Codes

SPAG News

by Tim Macaulay,
Saskatchewan Health

NOTE: There is no current news to report from the Saskatchewan Plumbing Advisory Group (SPAG). Those who have questions regarding SPAG should contact Tim Macaulay, Saskatchewan Health at (306) 787–7128, fax (306) 787–3237, or e-mail tmacaula@health.gov.sk.ca.

Floor Numbering

The NBC 1995 requires that Arabic numerals indicating the assigned floor number be mounted permanently on the stair side of the wall at the latch side of doors to exit stair shafts in all buildings [Articles 3.4.6.18. and 9.9.10.9.]. Each floor is to be numbered so that it can be identified by occupants, including those with a visual impairment, who are using the exit stair. The number must be at least 60 mm in height and raised above the wall surface approximately 0.7 mm. The number must be placed not more than 1 500 mm above the finished floor and not more than 300 mm from the door (see Figure 1). The number must be contrasting in colour with the wall surface. To be effective, it should provide maximum colour contrast. §

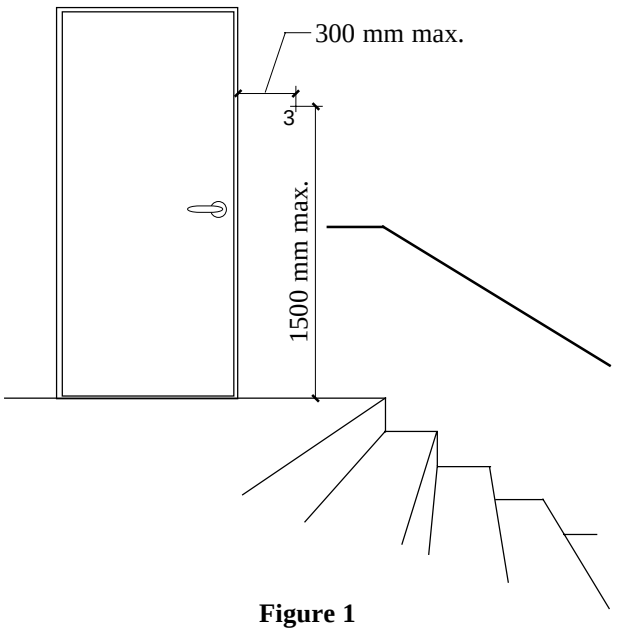

Figure 1
Floor Numbering

Determining Limiting Distances

Development of the built environment is a process that has evolved over many years, and that continues to evolve as this article is being typed. Development is generated by many different factors, including economic influences, social pressures, and demographics. As communities expand, the utilization, cost and impact of land usage affects the built environment that helps to make up an integral part of the fabric of our society that we all live in.

To positively control development, basic regulations have been devised and developed to protect the interests of the community at large. Zoning is one tool that helps to maintain order, efficiency, and harmony in the use of land, including separating potentially conflicting land uses, promoting land uses and development in certain areas, and prohibiting undesirable development.

The National Building Code of Canada (NBC) also provides the authority having jurisdiction with a means to regulate development. Similar to zoning, implementation of the NBC provides us with a secure, safe, and healthy environment in our houses, workplaces, leisure and education facilities, shopping malls, and other buildings in our communities.

One of the main influences on any proposed new building is the specific lot being considered for development. Constraints such as lot area, topography, location, zoning, infrastructure, and the presence of existing buildings contribute to the size, positioning, and function of the proposed building.

An important NBC principle is that one person's property should not be allowed to damage another's. Therefore, buildings are set back from property lines or existing buildings on the same lot, to reduce the risk of fire spread, particularly if they have windows or door openings that can expose adjacent buildings.

The NBC uses the concept of spatial separation to achieve the required setbacks. Spatial separation is essentially the space between buildings that ensures that they are spaced far enough apart that fire is unlikely to spread by radiation from one building to another.

The amount of heat radiation that is produced by a building face during a fire depends on the size of the exposing building face and the area of openings. Fire

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(continued from page 6 — Determining Limiting Distances)

load also plays an important role. Buildings with higher fire loads (i.e., Group E or Group F, Division 2 occupancies) are expected to radiate more heat. For example, a clothing retailer (Group E, mercantile occupancy) would be stocked with large quantities of combustible material that would create a larger fire load than would be expected in a medical office (Group D, business and personal services occupancy).

In addition to accounting for the fire load characteristics of building occupancy, the spatial separation requirements in the NBC are based on the theory that the construction of the facing walls, the amount of unprotected openings, and the distance between two buildings should provide at least 20 minutes before fire in one building starts to ignite the adjacent one. This allows time for fire fighters to arrive and control the spread of fire.

Since building owners cannot control what is built on adjacent properties, the spatial separation calculations are done independently for each building. When a building faces a property line, the distance from the property line to the "exposing building face" is the "limiting distance," and the type and rating of the wall construction and the allowable amount of unprotected openings are determined from the NBC. (See Flow Chart 1.)

If the owner wants to use a less fire-resistant type and rating for the wall construction or more unprotected openings, then the wall must be moved a further distance from the property line—a larger "limiting distance" is required. Conversely, a more fire-resistant type and rating or fewer unprotected openings will require a smaller "limiting distance."

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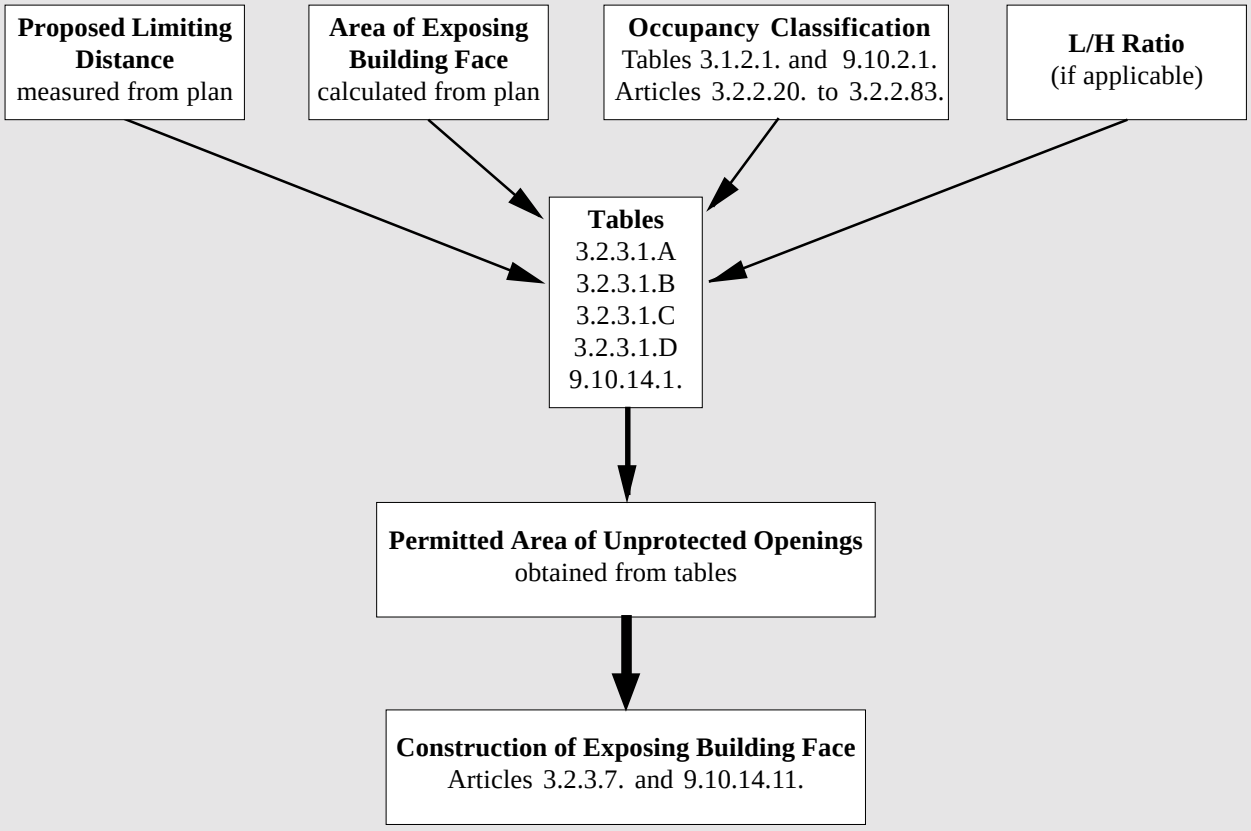
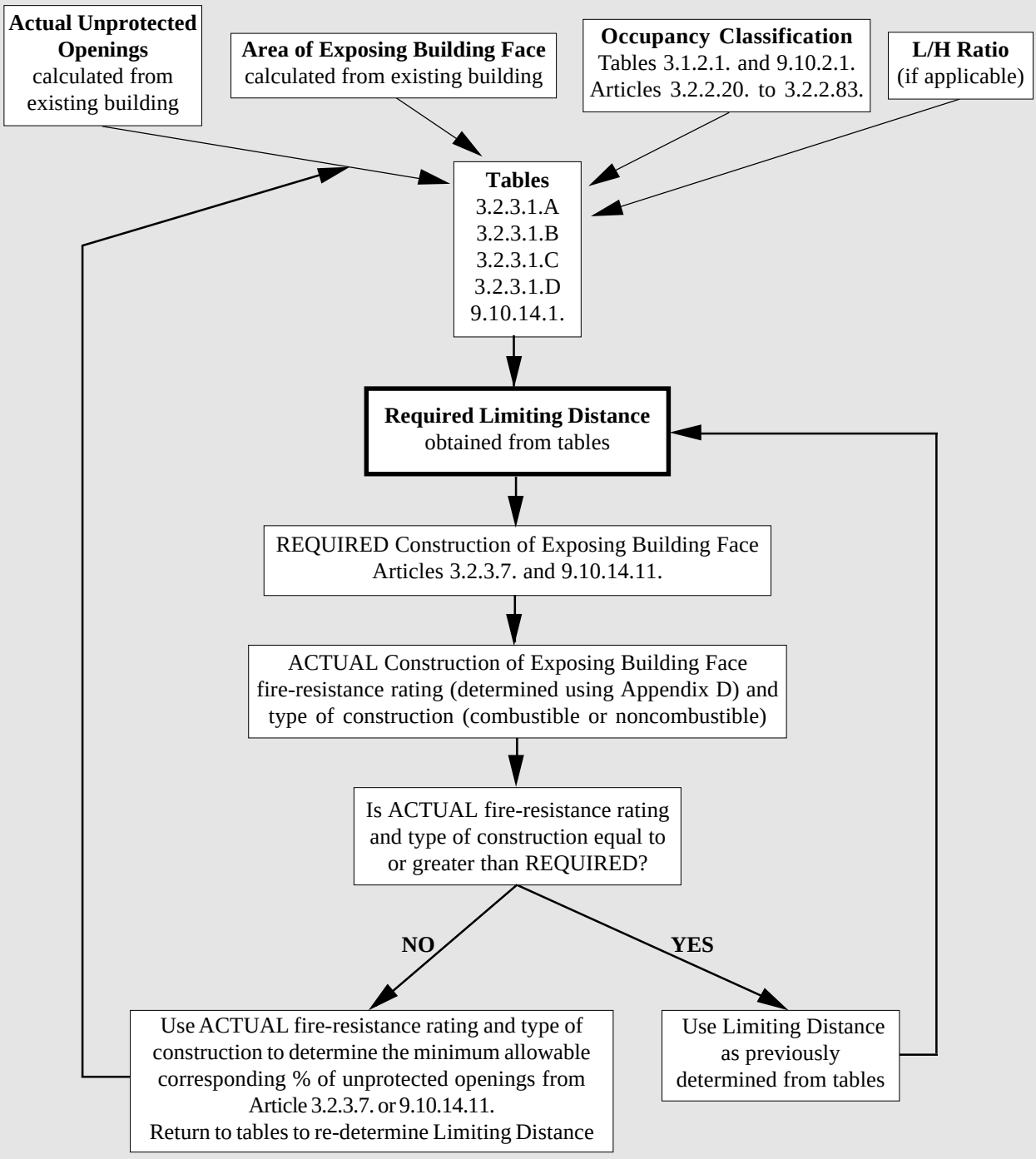
Flow Chart 1: New Building and Limiting Distance to Property Line

This shows a typical method for determining construction type and rating of the wall and the allowable amount of unprotected openings for the exposing building face of a new building when the limiting distance is measured to the adjacent property line.



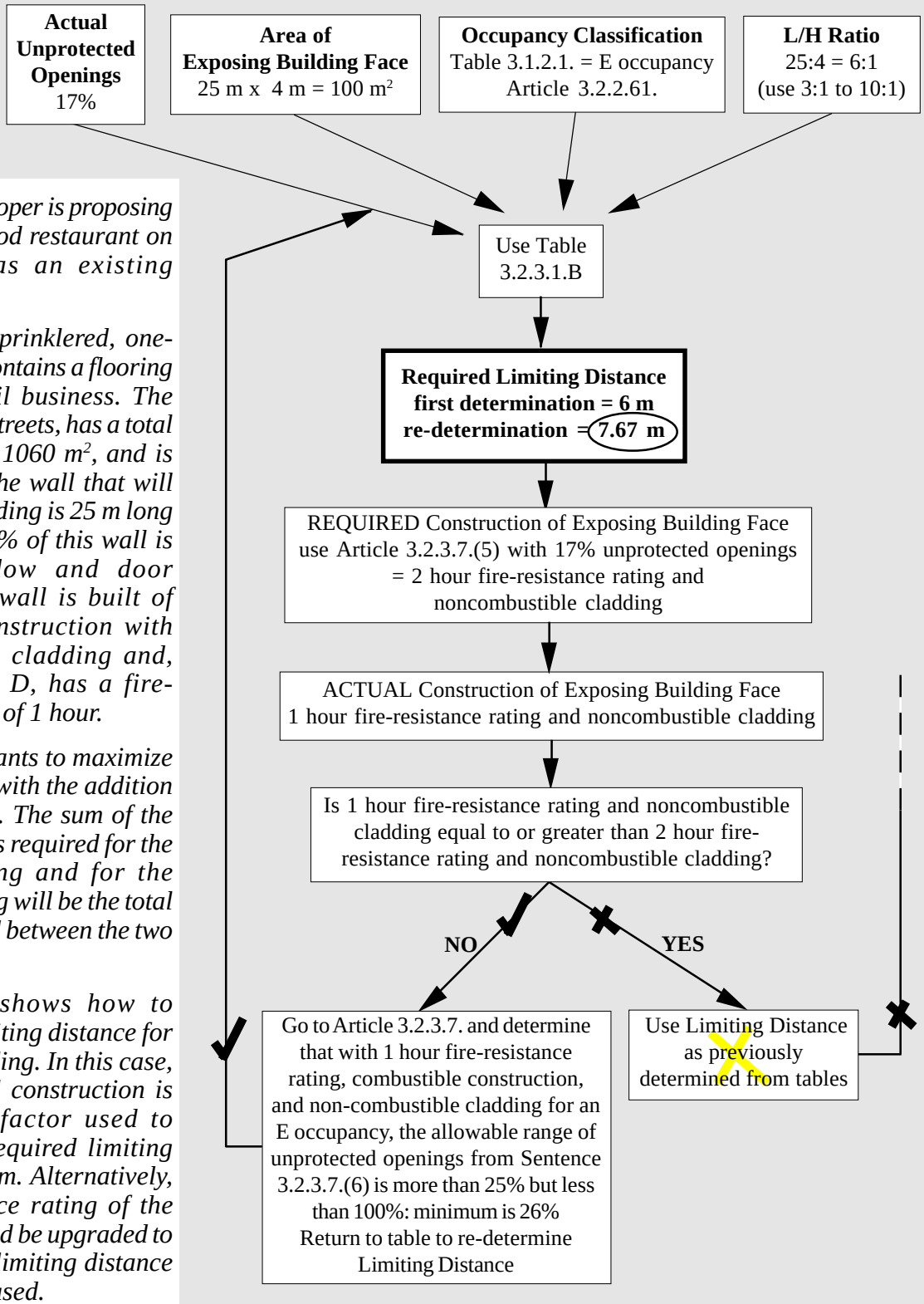
Flow Chart 2: Existing Building and Limiting Distance to an Imaginary Line

This shows a typical method for determining the required limiting distance for an existing exposing building face. The analysis begins the same as for a new building, except that the actual area of unprotected openings is substituted for the proposed limiting distance. If the existing construction type and rating of the exposing building face are insufficient, the analysis continues with substitution of a suitable area of unprotected openings and re-determination of the required limiting distance.



Flow Chart 3: Example of Existing Building and Limiting Distance to Imaginary Line

This shows the process for determining required limiting distances for the exposing building face of an existing building, with the appropriate numbers and calculations inserted into Flow Chart 2.



Example: A developer is proposing to build a fast food restaurant on the same lot as an existing building.

The existing unsprinklered, one-storey building contains a flooring and carpet retail business. The building faces 2 streets, has a total building area of 1060 m², and is unsprinklered. The wall that will face the new building is 25 m long by 4 m high. 17 % of this wall is used for window and door openings. This wall is built of combustible construction with noncombustible cladding and, using Appendix D, has a fire-resistance rating of 1 hour.

The developer wants to maximize the lot coverage with the addition of the restaurant. The sum of the limiting distances required for the existing building and for the proposed building will be the total distance required between the two buildings.

This example shows how to calculate the limiting distance for the existing building. In this case, the existing wall construction is the governing factor used to determing the required limiting distance of 7.67 m. Alternatively, the fire-resistance rating of the existing wall could be upgraded to 2 hours and the limiting distance of 6 m could be used.

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When a building is built on the adjacent property, the spatial separation calculations must be done for the second building relative to the property line as well. The required spatial separation for the two adjacent buildings is the sum of the limiting distances that are required for each exposing building face.

If two buildings are located on one lot, there is no property line between them. In this case the limiting distance is measured to an imaginary line between the two buildings. When one building already exists, the required limiting distance must be determined based on the same factors as for a new building. (See Flow Chart 2.) In some cases, the type and rating of the construction of the exposing building face in the existing building face will be the determining factors in selecting the correct limiting distance. (See Flow Chart 3.)

When building officials review plans for spatial separations, the following factors are considered: occupancy classification, total area of exposing building face, ratio of length to height, area of unprotected openings, and construction of the exposing building face. Accurate combination of these factors permits measurement of limiting distances to a property line or an imaginary line for each building. This information is then used to crosscheck submitted plans for code compliance. §

Saskatchewan Building Officials Association
SBOA Spring Conference
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For more information visit www.sboa.sk.ca.

Building Standards
Saskatchewan Municipal Affairs and Housing
310 – 1855 Victoria Avenue
Regina SK S4P 3V7
General Inquiries (306) 787–4113
Fax (306) 787–9273
www.municipal.gov.sk.ca/safety/buildstandards.shtml

Margaret Kuzyk, P.Eng., Chief Building Official
(306) 787–4517 mkuzyk@mah.gov.sk.ca

James Weldon, B.Sc., Assistant Chief Building Official
(306) 787-4519 jweldon@mah.gov.sk.ca

Shelly Toniello, Administrative Coordinator
(306) 787–3642 stoniello@mah.gov.sk.ca

HAVE THINGS CHANGED? Please send us your corrections.
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