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by John Burrows

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A Review of Major Changes in the 2010 National Model Construction Codes

By John Burrows

Published in Construction Canada

This article reviews major changes to the 2010 National Construction Codes for an audience of architects, specification writers, engineers, and builders.

The 2010 editions of the National Model Construction Codes – the National Building Code of Canada, the National Fire Code of Canada and the National Plumbing Code of Canada – were released in November 2010. Published by the National Research Council Institute for Research in Construction (NRC-IRC), the new codes contain about 800 technical changes.

The 2010 revisions are the result of a five-year collaboration between the Canadian Commission on Building and Fire Codes, the provinces and territories, the construction industry and the public. This article focuses primarily on the most significant changes.

NBC Changes

Structural Safety

The 2010 NBC has changed requirements in Part 4 for live loads due to use and occupancy. A new load combination table has been added for crane loads to ensure design adequacy when crane loads act in concert with other loads. The minimum live loads for arenas, grandstands and stadiums having fixed seats with backs were reduced to reflect the fact that this seating arrangement discourages overcrowding and overloading that can result where there is moveable seating or bleachers. The same principle was extended to include churches, lecture halls and theatres that have fixed seats with backs. Guard loading has been revised for open viewing stands, where spectators are not restricted by fixed seating from crowding a guard. More weight-specific loads were introduced for live and concentrated loads for garages.

For wind design, Part 4 now requires that very tall buildings be designed using experimental methods (wind tunnel testing, etc.). Buildings 60 m or higher require dynamic analysis.

Safety issues for Part 9 buildings began to arise with the trend to open-concept construction, such as the practice of building on narrow lots and the use of big windows, particularly in areas where exposure to wind and earthquakes is high. This type of construction meant there could be inadequate strength to resist the lateral loads from high winds or earthquakes. To address this problem, new requirements for bracing and lateral load resistance were added to Part 9 based on three levels of risk: low to moderate, high, and extreme. Buildings in the *low to moderate* exposure category have resistance to wind and earthquake loads by virtue of traditional wood-frame construction composed of exterior sheathing, panel-type cladding, or gypsum board finish.

Buildings in the *high* exposure category require additional features to provide required resistance to lateral loads. Of all the locations identified in NBC Appendix C, six fall into this category for wind and 45 locations for earthquake exposure. For wind, locations in Newfoundland, Alberta, and the Northwest Territories are affected. Of the locations affected by seismic risk, most are located in the coastal region of British Columbia and three are located in the lower St. Lawrence region of Quebec.

For these areas, prescriptive requirements have been added to Part 9 so that builders can incorporate adequate lateral load resistance without the need for further structural engineering design. These include constructing walls using “braced wall panels” in “braced wall bands” that are continuous horizontally and vertically throughout the building. The panels and bands extend from the top of the supporting foundation, slab or sub-floor to the roof framing above. The requirements specify the number and type of walls needed and the spacing and materials that can be used. There is also the option of obtaining an engineered design based on Part 4.

Buildings in the *extreme* exposure category are required to be engineered according to Part 4. Of all the locations identified in NBC Appendix C, only one location falls into this category for wind, in Nunavut, and three locations for earthquake exposure, in the upper St. Lawrence region of Quebec.

Fire Safety

Parts 3 and 9 now require that exit signs in new buildings be in pictogram form, green on white. The requirement follows an ISO standard and unlike the old format, using red lettering on white (Exit/Sortie), the new signage is not dependent on literacy. This change reflects the international trend for exit signs and is more universally recognized.

Measures have been introduced in Parts 3 and 9 to improve fire safety in residential occupancies. In addition to the requirements for interconnected smoke alarms on each storey of a residential occupancy, interconnected smoke alarms must now be installed in each bedroom. These smoke alarms must be equipped with a battery back-up in addition to being hardwired.

The NBC has added definitions and clarifications to Parts 3 and 9 to improve the understanding of fire stops and fire blocks and the importance of sealing pipe and duct penetrations through fire separations. Cables placed within plenum spaces will require either an FT4 or FT6 rating depending on whether the building is of combustible or noncombustible construction respectively. New requirements have been introduced for the protection of conductors serving life safety systems, including fire alarms, emergency lighting, smoke control, elevators and fire pumps.

A number of fires that impacted multiple homes and buildings led to new requirements in Parts 3 and 9 to prevent the spread of fire from one building to another. These changes clarify fire department response time assumptions and under certain conditions limit the number and size of unprotected openings, the type of cladding that can be used and the degree to which soffits may overhang buildings.

Another safety issue is openable windows in high-rise residential buildings, which can pose a falling hazard, especially for children. This has led to new code requirements in Part 3 intended to limit the likelihood of falls. One safety option is a guard 1070 mm high, on the front of windows. The other is a limiter restricting the opening of a window to no more than 100 mm.

Air Quality

Ventilation

The 2010 NBC includes some changes to Part 6 that affect the design and operation of building ventilation systems. In previous editions of the NBC, it was not specifically indicated what constituted acceptable air for building ventilation purposes in terms of the concentration of particles and gases; it was assumed that the air being vented into the indoor building environment was acceptable. However, it was evident that, in some areas, outdoor air is not necessarily suitable for building ventilation.

For this reason, the NBC has set maximum levels in air used for building ventilation purposes for particulate matter, ground-level ozone and carbon monoxide. These are based on the National Ambient Air Quality Objective (NAAQO) benchmark levels published under Section 8, Part 1, of the Canadian Environmental Protection Act (CEPA). The goal of the limits is to reduce the probability that, as a result of the operation of a ventilation system, a person in a building will be exposed to an unacceptable risk of illness due to poor indoor air quality.

In locales where there are provincial or territorial requirements for air quality, the design of ventilation systems should be based on them. In the absence of such requirements, the limits prescribed by the National Building Code will apply. The change to Part 6 requires that, in areas where the outdoor air quality does not meet the acceptable NAAQO levels, building ventilation systems be provided with devices to clean the outdoor air to meet them, prior to its distribution to indoor occupied spaces.

Soil Gas

Protection from soil gas ingress is now required in all buildings. This protection is achieved by requiring a continuous air/soil gas barrier at soil/foundation interfaces. The new Health Canada guideline of 200 Bq/m³ for maximum allowable radon concentration led to these changes. Under Parts 5 and 6, engineers must now consider radon protection in their designs.

Air barrier requirements have been consolidated and prescriptive measures have been added to Part 9, including measures for providing a rough-in for an active radon removal system, so that in the event radon does become a problem, an economic way of removing it will be available. The responsibility of testing for radon is left to the building owner. The Health Canada guideline recommends that if test results indicate an annual average concentration exceeding 200 Bq/m³, the completion of the subfloor depressurization system may be necessary to reduce the radon concentration. This would involve uncapping the rough-in pipe and connecting it to a ventilation system exhausting to the outside.

Standards

The National Model Construction Codes reference many Canadian or North American standards. One important change to the 2010 NBC is reference in Parts 5 and 9 to a new harmonized North American standard (along with a Canadian Supplement) for windows, doors and skylights. There is now a new procedure for specifying windows, doors and skylights, as the previous rating system has been replaced with actual design load and pressure ratings. Performance grades for windows, doors, and skylights will now need to be selected according to the Canadian Supplement to ensure that products suit the conditions and geographic location for which they are intended.

A new ASTM standard for sealants used in building envelope construction has been referenced in Parts 5 and 9. It reflects changes in technology, materials and design and replaces a standard that was considerably out of date.

Climatic and Seismic Data

Climatic data for wind, rain, degree days and temperature were updated using recent data from Environment Canada. Snow load data will be updated in the 2015 code. A better way of calculating seismic data has been used to update seismic data. For short period structures, the seismic design loads have generally been decreased. For long-period structures, the loads have generally increased.

Secondary Suites

Requirements for secondary suites located in houses have been introduced into Part 9. In this context houses include freehold row houses and semi-detached (two dwelling units side-by-side), but excludes secondary suites in condominiums, duplexes (two dwelling units on top of each other) and other multi-family buildings. Prior to 2010, secondary suites were addressed using the same provisions as for duplexes or multi-unit residential buildings. These provisions often imposed additional requirements in terms of fire and sound protection, egress and exiting when compared to requirements for single-family dwellings. The new requirements are intended to accommodate the construction of secondary suites at a reasonable cost without compromising the health and safety of the occupants.

NFC and NPC Changes

The National Fire Code (NFC) now requires that buildings or facilities be protected from fires originating from demolition or construction sites. Protective measures might be active such as sprinklers, water curtains or fire watch, or passive such as keeping the storage of combustible materials away from buildings. Requirements for fire safety plans and fire department access to sites have been improved. Requirements for the commissioning and decommissioning of standpipe systems, as well as restrictions on placement of bitumen kettles on rooftops, have been added. Roofing operations that include hot works (activities such as open flames or any work producing heat or sparks) must meet new requirements.

Other key changes in the NFC deal with leak detection, monitoring and handling of certain dangerous goods, and the protection of storage tanks, sumps, and piping systems containing flammable and combustible liquids. Limits to quantities of flammable and combustible liquids stored within buildings have been updated.

To draw a clear line between the roles of the NFC and the NBC, building design requirements in the NFC were moved to the NBC (except for spill control measures). Appropriate cross-referencing between the two codes was added.

The National Plumbing Code (NPC) has updated pipe sizing requirements to accommodate the current standard practice of using water-conserving appliances and fixtures in buildings and facilities. Appendix material has been added to clarify hydraulic loading and the effect of water quality on plumbing design. Non-potable water systems are gaining popularity due to water-conserving practices and guidance has been introduced to indicate how these need to be designed and identified.

Detailed information about these code changes and many more not mentioned in this article can be found in presentations available at

http://www.nationalcodes.ca/eng/presentations/2010_codes_presentations.shtml

Purchasing the New Codes

Printed versions of all three codes are available in both binder and soft-cover formats. Electronic versions are available as downloadable PDF documents, replacing the CD-ROM versions. On-line subscriptions are also offered.

The new codes can be purchased from NRC-IRC by telephone, regular mail or the virtual store:
www.nrc.gc.ca/virtualstore

Emergency changes were published for the *NBC* in June 2011. NRC also published a new edition of the *National Energy Code of Canada for Buildings 2011*. For more information, visit www.nationalcodes.ca.

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