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Legget, R. F.

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THE NATIONAL BUILDING CODE OF CANADA: A GENERAL REVIEW

by

Robert F. Legget

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The National Building Code of Canada: A General Review

Robert F. Legget
Chairman,
Associate Committee of the National Building Code

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The National Building Code of Canada is an advisory document published by the National Research Council for use throughout Canada. It is basically a set of minimum regulations respecting the safety of buildings with reference to public health, fire protection, and structural sufficiency. The Code relates to buildings and simple structures but is not intended for use with specialized civil engineering structures. Its essential purpose is the promotion of public safety through the use of desirable building standards throughout Canada. As an advisory document only, it has no legal standing until and unless it is adopted for specific use by a provincial government or municipal administration.

It may seem strange, at first sight, to find an agency of the Federal Government issuing a document which is essentially a local municipal ordinance. The fact that the National Building Code is actually printed in the form of a by-law is evidence of its unusual character. Under the terms of the British North America Act regulation of such local matters as building operations was made the responsibility of the provincial governments. They have, in turn, delegated this responsibility for urban areas to local municipal governments, through their Municipal Acts. Building regulations throughout Canada are therefore local municipal ordinances, commonly called "building by-laws". Some allied aspects of public safety of a general or specially technical character—such as the use of pressure vessels, the installation and operation of elevators, and above all the installation in buildings of electrical distribution systems—are reserved by the provinces for their own direct control and supervision, generally through their Departs of Labor.

Municipal building regulations are, however, directly responsible for the control of the design and erection of all buildings in their respective municipal areas. Because this control is exercised over at least two-thirds of all current building in Canada, local building by-laws are municipal ordinances of great importance. Many of these by-laws have been developed locally through the years and follow no general pattern. Starting usually from simple by-laws in connection with the prevention of fires, they have been steadily enlarged as new developments in building were introduced, and as new needs for control were recognized. The result has been a collection of local ordinances which vary greatly throughout the land, not only in arrangement but also in technical content. For this reason local building by-laws have long been the object of criticism as being probably "the greatest obstacle to progress in building throughout Canada."

Such criticisms are usually made without regard to the fact that building by-laws are necessary regulations for the protection of the public with reference to fire, structural safety, and public health. Critics also overlook the impossibility of maintaining up-to-date building by-laws at the local level while advances in building practice are developing at an unprecedented rate. As the volume of construction throughout the country has steadily increased, municipal governments have found themselves more and more concerned with the actual administration of their building by-laws. Correspondingly, the technical requirements of building regulations have increased in their complexity, leaving all but the largest municipalities in such a position that they have had neither the technical staff nor the necessary funds for keeping their building ordinances in step with modern building practice.

The type of technical problem which has had to be considered in building regulations requires expert technical advice far beyond the reach of most municipalities in this country. Some of the more important aspects of these problems are:

1. Consideration of requirements for fire protection, in keeping with the use of the new building materials and the increase in fire hazards in ordinary homes;
2. Careful assessment of special features of new structural systems before their widespread use; and
3. Increasing attention to such public health requirements as ventilation, minimum room sizes, and essential sanitary facilities such as septic tanks for individual sewage disposal.

History of the National Building Code

The seriousness of these problems, and their full complexity, appears first to have been recognized in the mid-thirties. The introduction of the first Dominion Housing Act led the Administrator of the Act, F. W. Nicholls, to consult with municipalities as to the local regulations then available for the control of house building under the terms of this Act. The difficulties of the municipalities in this connection became generally evident. Building had been steadily becoming more complicated, following the technical impetus given by the war of 1914-1918 and yet with the coming of the thirties no municipality had the necessary financial resources for work on the revision of its building by-law, or for the preparation of a building by-law where none existed.

It was clear that no solution could be expected at the municipal level, but it was conceivable that this was a field in which federal agencies might be able to assist, if the problem of building regulations could be looked at from the national point of view. When appeal was made to the then President of the National Research Council, General A. G. L. McNaughton, it was found that the idea of a national building code had already been discussed at meetings convened by the Council. Jointly with the Department of Finance (then administering the National Housing Act), the National Research Council thereupon appointed a representative committee to investigate the problem; a secretariat was formed; building codes of other countries were examined; and it was finally decided to prepare a National Building Code for Canada.

The 1941 Edition

This was envisaged as an advisory document which would be prepared by representative national committees, drawing upon the best of technical and professional skills, and which could then be made available to any municipality merely for the cost of printing. If and when this document was legally adopted by any municipality for this purpose it could be used as its own building regulation. Work began in 1937 and good progress was made even though the task involved starting the development of a technical manual covering all major aspects of building. The outbreak of war failed to stop the work. In 1941 the first National Building Code of Canada—a volume of over 400 pages—was pub-

lished by the National Research Council and sold for one dollar a copy to all who wished to have it.

The years of war naturally interfered greatly with its use and general recognition. It was not until 1943, for example, that the Canadian Code was described in an official report of the British Ministry of Works as "quite the best building code extant" of all codes then available for study in all languages. Its intended use by municipalities was similarly impeded by the imperatives of war but, after a slow start, its circulation developed steadily so that eventually 10,000 copies were distributed, almost all in Canada. It came into use, either directly as the local building regulation, or indirectly as a reference document for use in association with the local by-law, in over two hundred municipalities. Its wide use proved that the concept of such a nationally advisory document was sound. Its acceptance by provincial and municipal authorities throughout Canada showed that such a national service was locally acceptable.

Advances in building practice were again accelerated by the technological developments of war. Soon after 1945, therefore, it became obvious to Council authorities that the National Building Code should be reviewed if it was to fulfil its intended national purpose. At about the same time, Central Mortgage and Housing Corporation was established by the Federal Government, being charged with the administration of the revised National Housing Act. Officers of the Corporation early recognized the need for an up-to-date general building code in Canada. The original intention to associate work on the code with research in the building field was revived. For this and other associated reasons, the Council established in 1947 its Division of Building Research.

Start of the Associate Committee

A first task of those responsible for developing this new Division was discussion with officers of the Corporation about the future of the National Building Code of Canada. With the change in the administration of the Housing Act, it was clear that new direction for work on the Code was necessary. By agreement, therefore, the Council undertook this responsibility, setting up an Associate Committee on the National Building Code. As with other N.R.C. associate committees, this body was appointed by the Council as a group of about two dozen interested and expert Canadian citizens, appointed as individuals and not representatives, with specific terms of reference. To ensure full liaison with building research, the Director of the Division of Building Research of the Council was appointed Chairman of the Associate Committee. All other members, however, had no connection with the Council, being nationally selected both geographically and professionally. From the outset, a trade union member has given invaluable aid to the Committee. The terms of reference of the Associate Committee were (and still are) to promote uniformity of building regulations throughout Canada and to maintain the National Building Code of Canada as an up-to-date and progressive document.

After full deliberation, the Committee decided to achieve its first objective by concentrating on the second. If the National Code could be made, and maintained, as so desirable a building regulation that municipalities would want to adopt it in place of their own regulations, uniformity would be achieved much more speedily than by any attempt to deal with local regulations piecemeal. Accordingly, the use of the 1941 document was carefully reviewed. It was found that, apart from some obvious omissions, the chief complaint against the pioneer code was always with regard to its arrangement. The arrangement of building regulations was therefore made the subject of a research study. A year's work resulted in a completely new scheme of arrangement which appeared to meet all objections. It was adopted; it has proved completely successful in use.

The 1953 Edition

Under the guidance of the Associate Committee, the 1941 Code was then completely revised in accordance with the new arrangement. This involved voluntary contributions of time and thought from about two hundred Canadians, working through the medium of twenty-nine technical committees. Architects, engineers, contractors, members of trade unions, representatives of manufacturers, house builders and many others, worked steadily over a four-year period, drawing upon world-wide sources of information, issuing drafts of all their documents for public criticism and comment throughout Canada, basing all their work on the earlier code but bringing into the new document reference to all major modern advances in building. The great task was completed early in 1954 when the National Building Code (1953) was finally published.

The Code was published in the form of a by-law, ready for adoption by any municipality merely by the insertion of the appropriate name, providing the contents were found to be locally acceptable. Its unique feature, derived from the new arrangement, was that the entire document was arranged in a number of completely independent parts. So clear-cut were the divisions that it was possible to issue the Code in bound form for official use and in loose-leaf form, indicative of the ease with which any one part may be revised when necessary without interference with the rest of the Code. Consistent with this arrangement was the assembly of all administrative provisions in the first part. This would facilitate the adoption of the Code anywhere in Canada, since the technical provisions are independent of purely local requirements. Local climate was covered in a special Climate Part of the Code; arrangements were made so that local climatic features could be obtained for any municipality for appropriate use with the Design Parts of the Code.

Third and Fourth Editions

The revision of the 1953 Code for reissue in 1960 was carried out by a number of small revision committees. Each part and section of the Code was reviewed and revised as necessary to bring the whole up-to-date. Although some major changes were made, the arrangement whereby each part was complete within itself was retained in order that future revisions and amendments could be made to any one part without affecting any other part. The size of the Code was reduced to 6 by 9 inches to make it more convenient for the building inspector and to match the size of the many standards and specifications to which it refers.

The fourth (1965) edition of the Code includes all the main features of the last (1960) edition since they have been found satisfactory in actual use. The present revision is the first of what are intended to be regular five-yearly new issues, in order to keep the Code abreast of changing building technology. An interval of five years appears to be convenient for this purpose while not being too frequent from the point of view of local municipal requirements. As with all official Canadian documents, the Code is produced in both of Canada's languages, le Code Nationale du Bâtiment coming into steadily wider use in the Province of Quebec.

Arrangement of the Code

As with the earlier editions, the 1965 Code is arranged in separate Parts and Sections, each of which can be revised without affecting the others. It therefore appears in bound and in convenient loose-leaf form. Part 3 is the key to this arrangement. It deals with Use and Occupancy, irrespective of the type of construction of a building. It centres around fire prevention provisions in

building design and equipment, while dealing also with other building features dependent upon the use to which a building is to be put upon completion. Its provisions for "height and area" requirements for different types of occupancies are a notable advance upon the earlier "height and area table" that was featured in so many codes.

Part 4 deals entirely with Structural Design. For convenience it is divided into seven Sections, the first of which sets out the loadings to be used with all designs. Foundations are dealt with in Section 4.2. Then follow Sections on design in Wood, Masonry, Concrete and Reinforced Concrete, and Steel. These are closely related with corresponding documents of the Canadian Standards Association. For the revision of the Reinforced Concrete Code, a joint NBC/CSA committee was established. The new Code includes the results of its four years of work in the form of a completely new reinforced concrete design code incorporating the best of recent advances in American and European practice. The Masonry Section has undergone similar complete revision but general up-dating was found to be all that was necessary for the other Sections, including the seventh on Cladding.

Material requirements are being dealt with in a new manner in this new edition. Previously, Part 5 included a lengthy list of material specifications and test methods (ASTM and CSA in general) but such a list is not really a legal requirement. The list has therefore been relegated to an Appendix with appropriate footnote references in the text. For the convenience of users of the Code, the National Research Council, through its Division of Building Research, is bringing out a Directory of Standards in Building. Supplementing the well-known book of "A.S.T.M. Standards in Building Codes", the new Directory will facilitate quick reference to all existing standards in English that might assist the local building inspector. Correspondingly, the Associate Committee is publishing a companion volume entitled "Canadian Standards in Building Codes".

Parts 6 and 7, dealing with General Building Services and Plumbing Services respectively, were wound to be in need of no drastic revision, so carefully has the 1960 edition been prepared; general updating only has therefore been necessary. The same was true of Part 8 which is unusual (for building codes) in that it deals with Construction Safety Measures. Some have criticized the inclusion of this subject but, on the other hand, the current drive for improving safety standards on construction has won praise for this recognition of a vital aspect of the "safety of the public" to which the entire Code is directed.

Much of the Canadian Code still necessarily remains of the "specification" type, although the development of its Part 3 shows clearly the intention of those responsible to move it in the direction of a "performance" type as quickly as possible. The new Part 9 is the first of the sections of the Canadian Code to reach complete "performance" style. It deals with Housing. Relatively short, it yet covers all essential requirements of residential design and construction in performance terms, while giving enough specific clauses on absolutely vital features to enable a local building inspector to use it by itself for control of housing in his area. It is intended, however, to be used in association with one of the seven Technical Supplements to the Code which are also now available in revised form, two of them being entirely new.

Supplements to the Code

This device of having the legal requirements in the Code, with technical details in a supplementary document that is not a part of the legal by-law when the Code is locally adopted and thus being capable of frequent revision, is the solution followed in the Canadian Code to the continuing problem of rapidly changing technology. It has been found to work well. The new Supplement No. 5, therefore, is a volume of about 200 pages setting out in detail current requirements for Residential Construction. As such it is a combination of the previous Canadian Housing Standards, and Apartment Standards, all types of residential construction now being covered in one book. Since this Supplement is referred to in the Code itself only as a guide to what good practice is, it can be revised every year, if necessary, without any legal difficulty.

This book of Residential Standards is used not only as a Supplement to the National Building Code, but it serves also Central Mortgage and Housing Corporation as its own standards for use in connection with Canada's National Housing Act. This dichotomy has been found to work quite well, even though the requirements of CMHC did not appear at first to be identical with the minimum standards that alone a Code may promulgate. With fine understanding on the part of the Corporation, and with the expert guidance of two broadly representative committees, the combined document has been produced with complete mutual agreement.

Other Supplements deal with Climatic Information for the whole of Canada, by the use of which local climatic variations are easily taken care of in the National Code; with Fire Performance Ratings of Materials; Wind Loads and Shape Factors; and Plumbing Sketches to illustrate the details of Part 7 of the Code. The Supplement on Fire Performance Ratings is entirely new. Instead of presenting, as usual, long tables of test results upon specific assemblages of materials, the new Supplement assigns ratings on a generic basis. It has been possible in the case of frame constructions to develop an analytical approach by which fire resistance ratings up to 1½ hours may be determined by a summation of times assigned to component parts. The need for and use of fire test results is not eliminated but, in the absence of specific tests, ratings (which are of necessity conservative) can be determined for a wide range of constructions.

The sixth Supplement is a set of recommended standards for Farm Buildings, except for farm houses. It appeared in 1964 as a pioneer document in this special field and has already won wide acclaim. The remaining Supplement (No. 7) is entirely new. It deals with the provisions in building design necessary to make buildings convenient for handicapped citizens. One in every seven Canadians suffers from some physical disability, or infirmity associated with age. It is easy to modify building design details to accommodate these citizens but up to this time there has been no guide for designers as to what to watch for, or what limiting dimensions to include for such items as wide doors to accommodate wheeled chairs. This information is given in the new Supplement which is expected to be widely used.

Preparation of the Code

All the work in connection with the new edition of the Canadian Code and its seven Supplements has been carried out by volunteer committees of experts in the respective fields covered, drawn from all parts of Canada, and selected from all parts of the construction industry. Architects, engineers, contractors, house builders, public officials, suppliers of materials and trade unionists have combined their efforts in this national task. Co-ordination and overall policy direction is given, for the National Research Council, by the Associate Committee on the National Building Code. Members of all committees give their time and experience freely, the National Research Council paying only travelling expenses when this is necessary. It is difficult to measure the full extent of this great voluntary effort but it certainly represents many thousands of man-days of top building talent.

The several committees, and the Associate Committee itself, are serviced with secretarial and technical support by the staff of the Division of Building Research of the National Research

Council. Apart from the fact that the Chairman of the Associate Committee is Director of DBR/NRC, no NRC staff are members of any committee so that the National Building Code of Canada is not "written by the Council", as is sometimes suggested. All that the Council does is to provide the framework and the necessary financing for what is a major national voluntary effort, carried out really by the construction industry of the country.

Close association with the work of the Division of Building Research naturally assists the technical development of the Code. Problems encountered in the work of revision are passed to the Division for study and report as soon as staff and resources permit. Correspondingly DBR/NRC, through its world-wide connections, can bring to the committees the latest international information in any area of building technology under study. Illustrative of this mutual benefit is the matter of snow loads. The 1953 edition of the Code introduced a new method of determining snow loads. The Associate Committee thought that it might be too conservative and asked that a study be made of actual snow loads. This has been done by DBR/NRC with the aid of over sixty volunteer observers all across Canada. After the first five years of observations it was possible for the Associate Committee to make a twenty per cent reduction in previous values, on the basis of the report given to it. The saving in the cost since then probably far exceeds the entire operating cost of the Division of Building Research. It is not often that such a direct result of building research is so definable, but it is merely one example of many that have developed in this Canadian Code work.

Use of the Code in Canada

The results of all this work are shown by the way in which the Code has come into use throughout Canada by voluntary adoption by municipalities and other agencies. It is mentioned specifically in six of the ten provincial Municipal Acts, and is therefore widely used by Provincial Governments for their own purposes. The results of a recent survey show that the Code is being used in one way or another by 138 of the 161 cities in Canada. The same survey showed that today at least 65 per cent of the urban population of this country resides in organized areas the building by-laws of which are either based on or are themselves the National Building Code of Canada. Accordingly, Canada is within sight of having reasonable uniformity in building regulations from coast to coast, all by having available a good national Code so arranged that it can be readily adopted for local use when so desired. The voluntary character of this progress must be stressed since there is so much misconception about the use of the term "a national code". To many this expression connotes a "Federal Code", something that is imposed upon local areas by federal edict. The National Building Code of Canada is the direct reverse of this. Its strength today depends not only on the national voluntary effort that has been devoted to its preparation and study improvement but also upon the entirely voluntary character of its local adoption.

Conclusion

Canada has therefore today a national advisory building code, so flexible in arrangement that it can be kept in close accord with all major advances in building practice, its servicing based upon valuable experience with municipal use of the earlier editions of the Code. Any municipality in Canada may now have its own local building regulation merely for the cost of the necessary printed copies, all expenditure on the revision of its own document or on the preparation of a new building by-law being eliminated by the service provided through the National Building Code. With every local adoption of the Code one more step is taken in the elimination of senseless, and usually minor, variations in building practice between municipalities.

Further economy is being achieved by the widespread use of the National Building Code by departments of the Federal Government for their own building design work, the Code thus acting as an interdepartmental standard. The more the Code is used, the clearer will become those problems which should be the subject of intensive building research. During the last quarter of a century building has changed from being the erection of relatively simple types of shelter with a minimum of special features to the construction of buildings which are technically complex and which are expected to contain specialized equipment bringing its own special technical problems. It is therefore apparent that the best and most flexible controls possible should be available for use in connection with all building in Canada in order that the safety of the public may be ensured and due economy in building achieved. It is the firm belief of the Associate Committee on the National Building Code that the widespread use throughout this country of the National Building Code does achieve these ends.

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