A National Building Code

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by

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National Research Council

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The proposal that the preparation of a national building code for Canada be undertaken is not a new one. Some 15 years ago work on the preparation of such a code was actually begun by a group who believed that it would be of inestimable assistance to various municipalities in the preparation of their regulations and would, at the same time, have the effect of improving standards throughout the country. The work, however, was never completed, chiefly because its sponsors reached the conclusion that the lack of standard specifications and classifications of materials in this country would prove too great an obstacle to the drafting of an authoritative code.

The question of a national code has come to the fore again at this time largely because of the activities of the Dominion Housing Administration. In its position as a creditor of those whose construction projects it is financing, the administration has, as a matter of good business, established certain minimum requirements as a pre-requisite to the provision of financial assistance. These requirements, which are not intended to be severe or unduly restrictive, have nevertheless thrown considerable light upon the situation in respect of building codes in various municipalities throughout the country.

In serving as safeguards of the government's investment, these regulations are undoubtedly benefiting the property owners. In so doing, they become in some respects a logical development of government activities in the field of assisted construction generally. European governments have been active in the housing field since the demobilization days after the war when the shift of population towards cities first became pronounced. In more recent years activity became intensified owing to prevailing business conditions. Governmental action, generally speaking, has had a threefold purpose: first, to facilitate re-employment of the class of labour that normally is engaged in construction; second, to stimulate the provision of needed living accommodation where, for one reason or another, private initiative was not doing so; third, to promote an improvement in the standard of housing of those sections of the population that were at or near subsistence level. Raising the standard of housing has been attempted in two ways: by rent subsidies to the tenant, and by actually financing or otherwise assisting construction of a higher standard than normal conditions of demand would bring about. It is evident therefore that, aside from zoning or

planning considerations, minimum standards of construction are closely bound up with minimum standards of housing. Mention is made of this because any activity of the Canadian Government in the field of low cost housing would undoubtedly create a demand for more comprehensive standards of construction.

Present Situation.

This view is borne out by consideration of what has happened in the United Kingdom and the United States. In the United Kingdom the National Government has been active in the housing field with greater or less intensity for a number of years. Their chief approach to municipal authorities in respect of construction standards has been through the Ministry of Health. As an example, the Housing Act of 1935 provides that all subsidized houses shall be provided with a bath-tub, and there are rather detailed provisions respecting allowable occupancies. However, they have gone considerably further than this. Among other things, the government, a number of years ago, undertook to provide some leadership in improving standards of construction by the creation, under the Department of Scientific and Industrial Research, of the Building Research Station. The work of this station has steadily expanded, and it is difficult to estimate today how great a part it has played in the technical side of the widespread building operations that have been carried on during the past five years. A significant clause in the Building Act provided that if local authorities refused without valid reasons to allow the use of duly approved methods of construction, the contribution payable by the Minister could be reduced.

The inter-relations of federal, state and municipal authorities in the United States are quite similar to those existing in Canada and many of us are familiar with the energetic efforts that have been made in that country to give municipal authorities assistance, purely on a voluntary basis, in preparing authoritative and comprehensive building codes. The work of the U.S. Bureau of Standards and, more recently, the American Standards Association, in preparing recommendations and advisory codes, has been bearing fruit for a number of years and at the present time is making itself felt in all parts of the country.

In Canada, municipal authorities, particularly in the smaller centres, have had little technical advice, still less co-operation from other municipalities, and no master code or recommendations designed primarily to meet Canadian conditions. Credit is due to the Dominion Housing Administration for initiating what may prove to be the beginning of such co-operative work. I should mention the fact that the provincial departments of health do exercise some supervisory powers within the terms of their own acts.

Scope of a Code.

The functions of any building code have been defined as follows:

(1) The provision of a safety factor in structural design.

(2) The provision of adequate safeguards against fire, both in plan and construction.

(3) The provision of minimum requirements respecting sanitary conditions and health safeguards in the light of the knowledge available.

There are other considerations that probably should not come within the scope of legislative enactment. These consist of features of construction exceeding the minimum requirements of safety, such as the provision of economical thermal insulation, adequate heating equipment and sound design of mechanical equipment generally, - matters that if handled in an inadequate manner cause rapid depreciation of buildings and loss of the owner's capital. Without advocating detailed regulation of such factors by municipal or other authorities, it is evident that a code constructing organization would be in an excellent position to fill this gap in Canada and provide, in readily available form, advice respecting good practice in such matters as thermal insulation, roof construction, water-proofing, heating, plumbing and planning of buildings generally. It is worthy of mention that the Dominion Housing Administration has recognized this need in placing before prospective builders recommendations respecting a number of such topics.

In some respects there is no sharp dividing line between the scope of a building code proper and zoning or planning regulations. Consideration of the merits of a national code is considerably simplified if it is limited to the three considerations mentioned above. Thus the code proper need not deal with the advisability or non-advisability of constructing frame buildings. It need merely define the requirements applying to the construction of a frame building in those places where zoning regulations permit it to be erected.

Insofar as any code should permit the use of all proven methods of construction, eliminating only those that are definitely undesirable, it is evident that under ideal conditions municipal regulations would, theoretically, approach one another. It would be unreasonable to expect that such a condition could come about without some model to constitute a guide to sound practice. The function of a national code is therefore twofold: first, to provide common ground towards which municipal authorities can work in the interests of uniformity; second, to provide for municipalities the reference

material they need for the preparation of comprehensive and workable codes. Building laws, as other laws, should not anticipate or create new customs but should, rather, reflect and define practices that have been found economical or desirable. To do this two things are necessary:

(1) Adequate and reliable information regarding the suitability of the material or method of construction for the conditions to which it must apply.

(2) Broad enough provisions in the enactment to permit advantage to be taken of such information on the most rational basis, without unreasonable limitation of freedom of design.

One of the chief complaints respecting municipal codes has lain in the fact that without readily available knowledge concerning all types of materials, there has been a tendency towards the "specification" type of code. By this is meant, for example, the requirement that a bearing wall shall be made of a certain thickness of brick or equivalent construction. This term "equivalent construction" places upon the architect, contractor or manufacturer, the onus of proving to municipal authorities, individually, the merits of a product, and of then awaiting amendments to regulations. The specification type of code is definitely a deterrent to improved methods of construction and it can be avoided only if each building authority has access to technical information in a form in which it can be used.

The testing of materials and the rating of them in terms of physical constants and performance characteristics is properly the function of laboratories, either governmental or private, of established reputation,- and, in the drafting of requirements based upon such findings, the co-operative efforts of the best technical brains in the country are necessary. As an elementary example, the wall referred to could be required to have a certain bearing strength and a certain fire rating in the standard test of the Underwriters' Laboratories, the American Society for Testing Materials, the British Standards Institution or their Canadian counterpart when set up. The determination of what materials would qualify under such requirements is properly the function of Canadian standardizing and testing bodies such as the Forest Products Laboratories, the Bureau of Mines, the National Research Council, the Canadian Engineering Standards Association and possibly, also, some of the larger universities and commercial testing laboratories.

Need for a National Code.

In brief, a national building code would serve the following purposes:

(1) It would provide a workable model that could be used with a minimum of difficulty by municipalities that, because of the expense involved or the lack of technical advice, have no code at the present time.

(2) It should serve to improve the standard of some of the weaker codes existing in the country at the present time.

(3) It would promote uniformity of all codes in the country.

Advocates of a national building code for Canada fully appreciate the work that has gone into the codes enforced by the larger cities. On the other hand, while no figures are available, it is known that in many smaller centres, where codes exist at all, they are often inadequate and prepared without the benefit of competent technical advice. Furthermore, between the codes existing in the larger centres, it is not difficult to find anomalies and vagueness of requirements. Architects, builders and manufacturers complain not only about unsatisfactory regulation within cities but also that what one city says is good practice another says is not. This has tended to restrict freedom of design for the architect and to raise costs for the contractor, whereas manufacturers of building materials claim that their products have to fulfil conflicting regulations throughout the country. In discussing the same question in the United States an author has aptly remarked that if the automobile industry had been required to observe conflicting standards of construction in all of the 48 states, its position would have been a hopeless one.

This is not a suitable occasion for detailed comparison of existing building codes. One or two examples, however, may serve a useful purpose. Of two Canadian cities having approximately the same population, one requires flue linings in chimneys; one does not. I have no comment as to which is the better regulation, but I am informed that the city requiring linings had 16 chimney fires in one year; the other had 186. Some codes specify a certain minimum window area. This area, however, depending upon the design and type of sash, may consist of as little as 50% of glass area. Again, in another centre - and I believe this is a common occurrence - the municipality has a building code but, lacking a system of permits, it has no means of checking up on construction to see whether the requirements are being met.

The problems of municipalities in regulating construction materials that have been in use for generations are rapidly becoming intensified by the change that is taking place at the present time in materials and methods of construction. There are some people who believe that the house of the future will contain neither masonry nor wood. There are others again, who think that when all the talk has subsided we shall have possibly some improvements in design, but otherwise little change. Whoever is right, there is no doubt that experimentation is going on today on a more intensive basis than ever before and new products are appearing almost daily.

Last year the air-conditioning industry in the United States did a business of over $50,000,000 - ten times what it was a few years ago. Thermal insulation of buildings is now common practice and to meet this demand there are such products as slag and glass wool, foil insulators, insulating concrete and other masonry materials, insulating ceramic bodies,- along with a wide range of vegetable fibres. Problems of condensation within thermal insulators are being attacked and we now have vitrified and metal facings upon porous structural materials. Interior finishes of synthetic silicates, etched and dyed metals are available. Positive weather resistance is afforded by glass brick and fused and cast masonry products generally; by vitreous enamelled metal and glazed ceramic bodies. New methods of construction embracing monolithic concrete, new designs of steel frame and panel members, and various combinations of structural members with thermal insulation are all undergoing the process of trial and error at the present time. Fire-proofed wood, after many vicissitudes, seems to be coming into its own. A dozen brands of synthetic plastics are now used in construction. New binders such as sodium silicate and other silicate products are being used for fibrous materials. New floors of composition material, metal and rubber, with or without abrasives, are being used. Nickel and chromium (both as alloys and as plate), copper, and copper alloys are familiar materials for plumbing and hardware. Aluminum alloys and stainless steels for architectural trim and structural purposes are among the available materials.

Some of these products will pass out of the picture. Out of some of them will evolve methods that will be of major importance in future building operations. All of them require adequate appraisal before any regulation limiting or prescribing their use can be drafted.

In advocating that municipal authorities and specialists in the testing of materials pool their efforts with a view to working out uniform practice, there is no thought that by so doing they should in any way delegate any of their present responsibilities. The enforcement of codes

and the interpretation of them are of necessity a function of municipalities just as surely as town planning and zoning regulations are. A national code, it is worth repeating, would be a model document available for reference and - its sponsors might be justified in hoping-for use in its entirety whenever local conditions permitted.

Difficulties in the way.

It seems that nearly everyone concerned believes that a national building code would be desirable for Canada, but not everyone is convinced that it is a practical possibility. Obstacles that are considered by some to stand in the way of such a code include the following:

(1) Variations in the types of construction made necessary both by climatic conditions in different parts of the country and by differences in the types of material available.

(2) The belief that the requirements of larger communities are so different from those of smaller centres that no uniform practice could be worked out.

(3) The conflict of interest between manufacturers, builders and municipal authorities that would militate against any concordant recommendations.

(4) The very magnitude of the task involved in Canada.

In considering these, it should be stressed again that a code covering construction requirements can be kept a thing apart from zoning or planning regulations. If we keep within the threefold function of structural design, fire safety and minimum health requirements, the first two difficulties are much more capable of solution. Furthermore, if the code is truly a performance code and not one of a specification type, the difficulties once more are minimized. Thus there could be left to zoning regulations the question of whether frame or masonry construction should be used within a certain area and the code could be confined to laying down the minimum requirements for frame, masonry, steel or other construction. Subdividing the topics still further, the code should not state what kind of wood should be used for safe construction but, rather, specify the minimum bearing strength and fire-resistance rating. To the extent that safe construction in wood has the same minimum in British Columbia as in Nova Scotia or Ontario, one minimum standard could apply in these places.

As to the conflict of interest in Canada, it is admittedly very great but, in the words of a member of the Building Code Committee of the American Standards Association, it is not one-tenth as great as what has been faced with a great measure of success in the United States. As to the magnitude of the task involved, one thing is certain, and that is that the task will never become any easier as time goes on.

Recommended Approach.

In this field, as in so many others, Canada is in the fortunate position of being able to observe the results of a vast amount of spade work that has been going on in the United States. Geographical and climatic problems in Canada are duplicated in many parts of the United States and materials available for construction purposes in Canada, if not actually American developments, are almost universally the duplicate of corresponding United States products. For these reasons the considered opinion is offered, that any code building authority in Canada could do no better than adhere to the procedure followed by American authorities and take advantage of their recommendations. It would of course be under no obligation to limit itself to them. Some simplification would undoubtedly be possible owing to the less complex structure that we have in this country in respect of the number of private and public bodies concerned and the diversity of industrial products.

On this basis some indication of the set-up in the United States may be of interest.

The Department of Commerce Building Code Committee was formed in 1921 as a result of the report of a senate committee calling attention to the lack of uniformity in building regulations throughout the country and to the waste that resulted. The Building Code Committee did not undertake to prepare a complete national code at the outset, but adopted the policy of attacking those topics which were considered to be most pressing. Its tentative recommendations were subjected to criticism and review by authorities throughout the country and ultimately final recommendations were published. The following reports were prepared on this basis:

Recommended Minimum Requirements for Small Dwelling Construction;
Recommended Minimum Requirements for Plumbing;
Recommended Minimum Requirements for Masonry Wall Construction;
Recommended Live Loads Allowable for Use in Design of Buildings;

Recommended Practice for Arrangement of Building Codes;
Recommended Building Code Requirements for Working Stresses in Building Materials;
Recommended Minimum Requirements for Fire Resistance in Buildings; and
Design and Construction of Building Exits.

Subsequently this work was turned over to the American Standards Association but I am informed that these reports have been used in whole or in part by at least 350 municipalities.

In taking over the work the American Standards Association* established a building code correlating committee. The weight behind this committee is shown by the following list of organizations represented, which is worth giving in full:

American Institute of Architects
American Municipal Association
American Public Health Association
American Society of Civil Engineers
American Society for Testing Materials
Associated Factory Mutual Fire Insurance Companies
Associated General Contractors of America
Building Officials Conference of America
Federal Housing Administration
Forest Products Laboratory, U.S. Dept. of Agric.
International Association of Governmental Labor Officials
National Association of Builders' Exchanges
National Association of Building Owners and Managers
National Association of Real Estate Boards
National Board of Fire Underwriters
National Bureau of Standards
National Fire Protection Association
National Safety Council
Pacific Coast Building Officials Conference
Supervising Architect's Office, U.S. Treasury Dept.
United States Public Health Service
Members-at-large

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*The American Standards Association is a non-governmental body designed primarily to co-ordinate the work of numerous standardizing organizations and embraces both industry, government and consumer representatives.

At the present time this correlating committee has under its jurisdiction the following sectional committees, all of which are actively engaged:

Administration
Light and Ventilation
Chimneys and Heating Appliances
Fire Protection and Fire Resistance
Fire Extinguishing Equipment
Excavations and Foundations
Iron and Steel.

Recommendations emanating from these committees will be prepared and issued in a uniform manner so that they will fit together and eventually form the framwork for a complete series of regulations covering all topics necessary to a building code.

Finally, mention should be made of the building codes of the National Board of Underwriters, and of the Pacific Coast Building Officials Conference. Both of these organizations are taking part in the project of the American Standards Association, but in the past both have issued codes of the performance type which have exerted a profound influence on building codes in general throughout that country. A feature of the code of the Pacific Building Officials conference, which, by the way, is used as far from the Pacific as the State of Rhode Island, is a compilation which it gives in a separate volume of accepted material standards and test methods to which reference can be made in the section of the code dealing with specific requirements. The arrangement of the code differs somewhat from the recommendations of the United States Department of Commerce, but the principle of applying performance standards, rather than detailed specifications, is followed.

In conclusion, I may say that the following resolution of the Dominion Fire Prevention Association has been received by the National Research Council:

> "With a view to the establishment of more uniformly adequate building requirements throughout Canada, the Executive Council of the Dominion Fire Prevention Association hereby requests the National Research Council of Canada to undertake the formulation of suitable standards of fire-resistance and the testing and classification of all available construction materials in order that future regulatory measures may be based upon the authoritative findings of the Council."

This resolution opens up the whole question of building code work insofar as the Research Council is concerned, and the Council will be assisted very greatly in formulating its policy by the tenor of the discussion at this meeting today.