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### Study of performance standards for space and site planning in residential development Galbreath, M.

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# NATIONAL RESEARCH COUNCIL OF CANADA

## DIVISION OF BUILDING RESEARCH

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# TECHNICAL NOTE

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PREPARED BY M. Galbreath

CHECKED BY

APPROVED BY N. B. H.

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PREPARED FOR The School of Architecture, University of British Columbia,  
as a guide for Research Agreement 4-N4-RA-16

SUBJECT STUDY OF PERFORMANCE STANDARDS FOR SPACE AND SITE  
PLANNING IN RESIDENTIAL DEVELOPMENT

The preliminary report on performance standards for space and site planning which was submitted to DBR/NRC in December 1960 set out the following criteria which might be used in determining space standards:

1. fire
2. light
3. air
4. noise
5. motor traffic
6. outdoor living space
7. privacy
8. view

Of these, fire, light, air, noise and motor traffic are all capable of exact measurement though in some cases the means of measurement have not yet been fully developed. Adequate outdoor living space and privacy are more difficult to define and view, perhaps like aesthetics, is a matter of individual preference and hard to incorporate in a standard.

There are two areas of study that appear to be essential to the development of improved standards, field study and literature search. Field study might take the form of an intensive study of a few selected residential areas, for example one which is accepted as a good district and one in an unsatisfactory or slum district. Each area would have to be checked against municipal and provincial regulations and in the light of

patterns of land ownership in order to determine what has contributed to its present development.

The literature search already completed at U. B. C. \* should form the basis of a continuing study directed toward the perfecting of systems of measurement for each of the above criteria that can be used to control future development in a satisfactory manner.

Finally, methods of regulation will have to be devised which take into account the Canadian legal framework, patterns of land ownership and the customs of the building industry.

### Outline of Study

In order to limit this project to a reasonable size, it is suggested that fire safety should be regarded as the primary subject of study both in the field study and in the literature search. There is information available in this field that could be directly applied and the experience gained would be helpful in other problems. This should not, however, prevent consideration of the other criteria where appropriate. The initial efforts therefore might be directed toward a concentrated study of the literature on fire hazards due to radiation, a study of municipal regulations that have controlled the development of one or more selected residential districts, and a survey of these districts to discover the effect of these regulations and to assess fire hazards. It may be found that the field study should be broadened to take into account some or all of the other criteria so that an over-all picture of the development can be obtained.

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\* Oberlander, H. P. and F. Lasserre. Annotated bibliography - Performance Standards for Space and Site Planning for Residential Development. National Research Council, Division of Building Research, Ottawa, August 1961. NRC 6442.

### ADDITIONAL NOTES

The following suggestions relating to fire safety may be helpful in indicating the general scope of study. First we include the following additional references on fire. Some of these have been prepared by the Division of Building Research and others by the British Building Research Station. No. 1 has been published and can be quoted. The remainder are still confidential.

1. Fire and Space Separation,  
G. J. Langdon-Thomas A.R.I.B.A.  
The Builder Nov. 11, 1960, No. 6130, p. 887-893.
2. Spatial Separation of Buildings,  
J. H. McGuire,  
DBR Internal Report No. 187, NRC, Ottawa, Nov. 1959.
3. Radiation from Fires and Building Separation,  
Margaret Law, FR 437/1960.
4. St. Lawrence Burns Summary Report,  
G. W. Shorter and J. H. McGuire,  
DBR Internal Report No. 158, Ottawa, Dec. 1959.
5. The Use in Building Codes of the Insulation Requirement  
of Fire Resistance Tests,  
L. A. Ashton,  
DSIR and JFRO April 1960.

### THEORY OF FIRE SEPARATIONS

#### Radiation Level

The radiation level used in preparing fire separations in the National Building Code is based on the studies of fire separation conducted by J. H. McGuire of the DBR Fire Research Section. Much of the information upon which the radiation levels are based came from studies of burning buildings at Aultsville by the Division of Building Research.

#### Radiation Source

It is apparent that the area of the source of radiation is the significant figure in fire safety. If this area is spread over a large part of the wall surface, the effect on the receiving point is considerably reduced. It follows that a concentration of windows in one part of a wall has to be treated as an individual problem.



### Set-backs and Walls not Parallel to the Property Line

McGuire has set out his suggestions for dealing with walls not parallel to the property line in his paper, "Spatial Separations of Buildings". The British have gone into this problem in greater detail and have made proposals that will probably be included in the new Scottish building code.

### Space Between Buildings

It is impossible to prepare a regulation based on measuring the distance between buildings so long as the land is held in individual units. It has been accepted that for purpose of building regulation, the distance is measured from the building to the property line. This involves a certain degree of inaccuracy which becomes more significant when buildings of greatly differing size are built on adjoining properties.

### Fire Compartment

The area of wall to be considered is that of one fire compartment as it can be assumed that fire walls and floors will contain the fire for the period during which radiation will be significant.

### Presence of Fire Brigade

The radiation levels which have been adopted in the National Building Code assume that fire fighting services will be available from 16 to 25 minutes after the start of a fire. The fire fighters can be expected to reduce the hazard by wetting down surrounding areas. In districts with no fire services, considerably greater separations would be appropriate.

### Flying Brands

Spread of fire by flying brands is another possibility that should be considered in regulations governing building materials and cladding.

### Reduced Hazard

Factors that may be assumed to reduce the radiation fire hazard are wired glass in windows, self-closing shutters with fusible links, sprinkler installations and solid barriers such as fences, boundary walls etc.

### Field Studies

Municipal regulations applicable at the time the district was developed should be examined to determine what effect these have had in

providing fire safety, whether or not these were specifically designed for this purpose. Physical measurement of the buildings in a district would be necessary to determine

- (1) the area of walls exposed to property lines or to rights of way.
- (2) area of unprotected openings in these walls.
- (3) fire hazard of the contents.
- (4) fire endurance of exterior walls.
- (5) nature of the surface of adjacent buildings which may be exposed to radiation.

From this, it could be determined whether the space about each building was more or less than that assumed necessary to reduce the radiation hazard to an acceptable level.

A similar approach can be taken for the other criteria. Taking No. 2, Light, as an example, some means would have to be devised for arriving at an acceptable level of daylight for Canadian dwellings. This might be done by conducting a personal preference poll as has been done in Britain. This would be followed by a compilation of meteorological information available for the principal populated areas across the country. Then a study of the methods of daylight design would be necessary to select a simple procedure suitable for incorporation in legislation.