Study of fire separations in typical housing subdivisions: a study prepared for the Associate Committee on the National Building Code
Galbreath, M.

NATIONAL RESEARCH COUNCIL

CANADA

DIVISION OF BUILDING RESEARCH

STUDY OF FIRE SEPARATIONS IN TYPICAL HOUSING SUBDIVISIONS

(A STUDY PREPARED FOR THE ASSOCIATE COMMITTEE ON THE NATIONAL BUILDING CODE)

by

M. Galbreath

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PREFACE

Revised regulations governing the fire separation of buildings were proposed for inclusion in the 1960 edition of the National Building Code. The Committee which was assigned the responsibility for preparation of the new Part 9 - Housing, directed that a study should be undertaken to determine what effect the proposed regulations would have on typical housing subdivisions. Accordingly the author, with the cooperation of Central Mortgage and Housing Corporation carried out such a study of a selected number of existing subdivisions for which complete plans were available, and the results are now reported.

The author, an architect and a research officer with the Building Standards Section of the Division, has been engaged in special studies of fire regulations in the National Building Code.

Ottawa,
February 1962

N. B. Hutcheon,
Assistant Director.

STUDY OF FIRE SEPARATIONS

IN TYPICAL HOUSING SUBDIVISIONS

by

M. Galbreath

The spread of fire from building to building carries with it the danger of general conflagration beyond the control of the fire-fighting services. Conflagrations have occurred at one time or another in most large cities and urban areas. They have generally been followed by regulations designed to improve the fire safety of the city.

Masonry fire walls have long been in use as effective fire barriers, and open space has also been recognized as a contribution to fire safety (5). Recent work by the building research organizations in Canada and Britain has led to the development of means whereby the effectiveness of open space as a barrier to fire can be evaluated.

Fire can be transmitted between buildings by flying brands, convection and radiation. The hazard of flying brands is dependent on the wind velocity and on the materials of construction. Convection can only occur within comparatively short distances, and is also much influenced by wind. These can be controlled by regulations governing construction most of which are contained in building bylaws. Ignition by radiation can take place over comparatively long distances. A rise in the temperature of combustible surfaces on an exposed building can take place, almost unnoticed, until conditions are such that combustion will take place.

The radiation hazard is directly related to the size and distribution of the openings in exterior walls and to the clear space between buildings. The prediction of radiation, based on measurements taken during the experimental burning of buildings at Aultsville (1), has been used as the basis of tables included in the National Building Code 1960 (3) which provide a uniform radiation hazard between buildings.

Regulations prepared in the Division of Building Research and intended for inclusion in the 1960 edition of the National Building Code were considered by the Committee on Part 9: Housing, in July 1960. The Committee suggested that a study be undertaken to determine the effect of the proposed regulations on typical housing subdivisions. It was recommended that a number of housing plans should be examined in the light of the proposed separations, and a report prepared. At a

later meeting held at Central Mortgage and Housing Corporation between representatives of the Building Standards Section of the Division of Building Research, and CMHC, it was agreed that the investigations should be conducted by the author who would examine a number of house plans and layouts and report on the effect of the proposed regulations. Mr. Michael Pine of CMHC, as representative of the Corporation, was to procure plans of subdivisions.

Following this directive, plans were obtained from CMHC offices of houses under construction in Ottawa, Scarborough, Don Mills, Ontario, and of low rental projects designed by CMHC architects in Vancouver and in St. John's Newfoundland. The projects were divided in three groups as follows:

Group 1 - illustrated house plans from CMHC booklet "Small House Designs" (2).

Group 2 - detached single-family dwellings in typical subdivisions:
Lynwood Village, near Ottawa
Bel Air Heights, Ottawa
Dorset Park, Scarborough.

Group 3 - row houses:
F.P. Project 6/55 St. John's, Newfoundland
Nanaimo Street Project, Vancouver, B.C.
Flemingdon Park, Don Mills, Ontario.

The regulations prepared for the National Building Code 1960 (3) relate area of windows to clear space between buildings so that during the initial period of a fire, the radiation of adjacent buildings will not exceed a level at which combustible materials would be likely to ignite. The radiation levels selected are such that conditions dangerous to adjacent buildings should not occur for a period ranging from 16 to 25 min after the start of the fire i.e., sufficient time to allow the firemen to come to the site. The separations suggested apply to buildings in municipalities with fire-fighting services. In outlying districts without these facilities, the spaces should be increased at least twice those recorded.

The table setting out the recommended fire separations is presented in Appendix A. To apply this table to buildings, the following information must be obtained:

1. Clear space between the wall of the building and property boundary or mid-point between two buildings.
2. Areas of the building wall exposed to property boundary.
3. Total area of windows in the exposing wall.

4. The shape of the wall measured as the ratio length of wall space to height of wall space.

The area of wall is measured within one fire compartment as it is assumed that the fire will not spread beyond the compartment in which it started at least in the critical development period; e. g., in an apartment building, the area of wall considered would be the face of one dwelling unit since the Code requires one-hr fire separation between each unit.

Group 1 (Appendix B) contains a number of examples of fire separation calculations as they apply to the illustrations of dwellings selected from CMHC booklet "Small House Designs" (2). The illustrations give an indication of how the percentage window area relates to the elevations of typical single-family dwellings. The percentage window area on side elevations varies in the examples chosen from 3 to 29 per cent distributed as follows:

Elevations having window area 0 - 10 per cent of the wall		11 examples
Elevations having window area 10 - 20 per cent of the wall		6 examples
Elevations having window area 20 - 30 per cent of the wall		4 examples

An application of the requirements for space separation contained in the 1960 National Building Code (3) to these examples shows that of the 21 elevations illustrated:

10 would require greater separation than that required by present CMHC standards (4),
8 would require the same separation as required by present CMHC standards (4), and
3 would require less separation than that required by present CMHC standards (4).

An examination of the illustrations shows that where the area of windows is less than 8 per cent of the wall area, the 4-ft setback at present required by CMHC (4) is generally satisfactory. Considering only this limited group, it would appear that the significant area of windows varies between 8 and 30 per cent and that most of these would require, if the NBC tables were applied, separations greater than those now required by CMHC (4). The exceptions are in the two-story houses with small side windows. In these cases, CMHC require a 6-ft side yard; the proposed regulations would only require a 4-ft side yard.

Group 2 (Appendix C) is a study of the separations in a number of selected detached dwellings in typical recently erected subdivisions.

Plans of all the dwellings were available from CMHC offices. The subdivisions were typical builder-developed housing groups in Ottawa and Scarborough, Ontario.

In the 19 examples of side and rear elevations chosen, the proportion of window to wall area varied as follows:

Elevations with a window area	0 - 10 per cent of the wall area	13 examples
Elevations with a window area	10 - 20 per cent of the wall area	5 examples
Elevations with a window area	20 - 30 per cent of the wall area	1 example

In these detached dwellings the separations required by the 1960 Code (3) are compared with those provided in the subdivisions and with those which would be required by present CMHC regulations (4). The results of this comparison are as follows:

2 would require greater separation than that provided in the subdivision
6 would require the same separation as that provided in the subdivision
11 would require less separation than that provided in the subdivision.

5 would require greater separation than that required by present CMHC standards
11 would require the same separation as required by present CMHC standards
3 would require less separation than that required by present CMHC standards.

In these dwellings, all on 40- to 50-ft lots and built under CMHC regulations which insure minimum side yards, there are few examples of separations that might be considered a fire hazard, except in cases where large windows have been introduced on the side walls or where a standard house on a corner lot has been placed so that the rear elevation is parallel and close to a side property line. There are few examples where the window area exceeds 30 per cent of the wall area. There is a general tendency, however, for the CMHC standards to be less than that proposed as a fire separation. On the other hand, it appears that, in general, the builders have provided space about their buildings greater than that required by CMHC.

Group 3 (Appendix D) contains four examples of separation calculations applied to recent row housing. In these examples there are

no side yards; bylaw requirements for fire walls would be met but there is the possibility of spread of fire between facing rows if these are too close together. Of the examples studied the proportion of windows to wall area was as follows:

Elevations with a window area 10 - 20 per cent of the wall area	1 example
Elevations with a window area 20 - 30 per cent of the wall area	2 examples
Elevations with a window area 40 - 50 per cent of the wall area	1 example

In every case the separation provided is greater than that required for fire safety.

The dwellings in Flemingdon Park are of an original design with rows of dwellings facing across a pedestrian mall with underground access to private garages. In these examples the greatest separation required for the radiation hazard is less than the 35 ft provided. This 35 ft may have been dictated by CMHC regulations which require a 15-ft front yard to each dwelling plus 5 ft for the footpath access.

This study should be regarded as a pilot project. More intensive study of a wider range of buildings is required to obtain statistically reliable information. The random selection illustrated does, however, give an indication of certain trends. In the field of housing it may be expected that in many cases the window area would be less than 8 per cent of the wall area and consequently there will be little fire hazard. Most of the problems will occur in the region between 10 and 30 per cent; the tables of fire separation should perhaps be expanded to give more information in this area. In general it appears that there is a tendency to exceed present CMHC standards where the window area exceeds 8 per cent of the wall area for the proposed separation but it also appears that in typical subdivisions, the CMHC requirements are exceeded in practice for reasons other than fire safety. There is reason, therefore, to suppose that the proposed separations would not impose undue hardship on builders but would help to discourage undesirable practices such as provision of picture windows on side elevations.

References

(1) McGuire, J.H. St. Lawrence burns - radiometer measurements. National Research Council, Division of Building Research, Internal Report No. 153, Ottawa, December 1959.

(2) Small house designs. Prepared by Canadian architects for Central Mortgage and Housing Corporation. Central Mortgage and Housing Corporation, Ottawa, October 1958.

(3) National Building Code of Canada 1960. National Research Council, Associate Committee on the National Building Code, Ottawa, 1960. NRC No. 5800.

(4) Housing Standards, National Research Council, Division of Building Research, Ottawa, January 1958.

(5) National Building Code of Canada 1953. National Research Council, Associate Committee on the National Building Code, Ottawa, 1953. NRC No. 3188.

APPENDIX A

MAXIMUM AREA OF UNPROTECTED OPENINGS IN A BUILDING FACE

		LIMITING DISTANCE, ft.									
		4	6	8	10	15	20	30	50	70	100
Area of Exposed Building Face, sq. ft.	Ratio L/H or H/L*	Permissible Area of Unprotected Openings in Exposed Building Face, per cent									
less than 300	less than 3:1	10	13	20	30	63	100	100	100	100	100
	3:1 to 10:1	12	17	25	35	68	100	100	100	100	100
	over 10:1	17	25	35	50	87	100	100	100	100	100
300 and over but less than 400	less than 3:1	9	11	16	24	49	82	100	100	100	100
	3:1 to 10:1	11	15	21	29	54	89	100	100	100	100
	over 10:1	15	21	27	40	70	100	100	100	100	100
400 and over but less than 500	less than 3:1	8	11	15	21	41	68	100	100	100	100
	3:1 to 10:1	11	14	19	25	45	73	100	100	100	100
	over 10:1	14	20	27	36	61	93	100	100	100	100
500 and over but less than 600	less than 3:1	8	11	14	19	36	58	100	100	100	100
	3:1 to 10:1	10	13	17	22	39	63	100	100	100	100
	over 10:1	14	19	26	33	55	82	100	100	100	100
600 and over but less than 800	less than 3:1	7	10	12	15	29	45	94	100	100	100
	3:1 to 10:1	10	12	15	19	32	50	100	100	100	100
	over 10:1	14	15	22	28	46	69	100	100	100	100
800 and over but less than 1000	less than 3:1	7	9	11	14	24	38	80	100	100	100
	3:1 to 10:1	9	10	14	17	28	43	88	100	100	100
	over 10:1	13	16	20	25	42	60	100	100	100	100
1000 and over but less than 1500	less than 3:1	6	8	9	11	18	27	56	100	100	100
	3:1 to 10:1	8	10	13	15	22	32	62	100	100	100
	over 10:1	12	14	18	21	33	46	80	100	100	100
1500 and over but less than 2500	less than 3:1	5	6	8	9	14	19	37	91	100	100
	3:1 to 10:1	6	7	10	12	17	23	41	100	100	100
	over 10:1	11	13	15	17	25	34	67	100	100	100
2500 and over but less than 3500	less than 3:1	4	6	7	8	12	16	28	67	100	100
	3:1 to 10:1	5	7	9	11	15	19	32	93	100	100
	over 10:1	11	12	14	16	22	30	46	100	100	100
3500 and over but less than 5000	less than 3:1	4	5	6	7	10	13	22	50	88	100
	3:1 to 10:1	5	6	8	10	13	16	25	70	100	100
	over 10:1	10	11	13	14	19	24	38	75	100	100
5000 and over	less than 3:1	4	4	6	6	10	12	16	38	68	100
	3:1 to 10:1	4	4	6	8	12	14	20	44	74	100
	over 10:1	8	10	12	14	18	20	30	60	94	100
Column 1	2	3	4	5	6	7	8	9	10	11	12

*L = Length of building face; H = height of building face.

NOTE

For intermediate limiting distances the permissible area of unprotected openings can be obtained by interpolation.

APPENDIX B

Group (1) - CMHC SMALL HOUSE DESIGNS

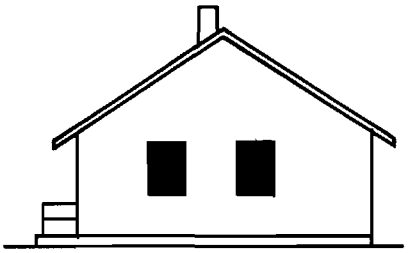
(1) Separations compared with CMHC Standards (Housing Standards, Jan. 1958)

(a)	No. of elevations that require greater separation than that required by CMHC Standards	10
(b)	No. of elevations that require the same separation as that required by CMHC Standards	8
(c)	No. of elevations that require less separation than that required by CMHC Standards	3
	TOTAL	21

(2) Proportion of window to wall area

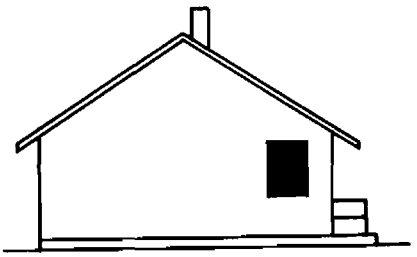
(a)	Window area 0 to 10 per cent of wall area in	11 elevations
(b)	Window area 10 to 20 per cent of wall area in	6 elevations
(c)	Window area 20 to 30 per cent of wall area in	4 elevations
	TOTAL	21

CMHC DESIGN 133



Left Elevation

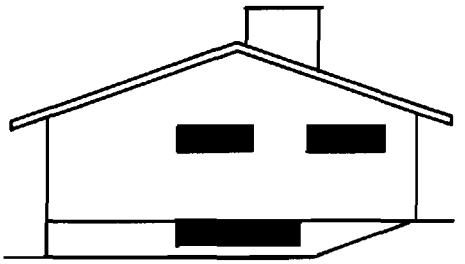
Building Type	Two-Bedroom Bungalow,		No Basement
Wall Area	24'-4" x 9'	=	220 sq ft
Window Area			24 sq ft
Ratio Unprotected Area/Wall Area			11 per cent
CMHC Standards			4 ft
Required Separation			5 ft



Right Elevation

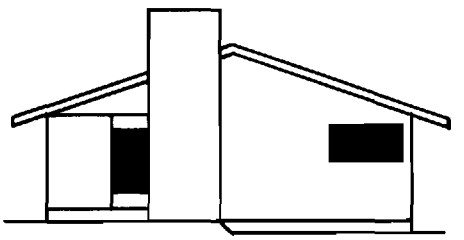
Wall Area	24'-4" x 9'	=	220 sq ft
Window Area			12 sq ft
Ratio Unprotected Area/Wall Area			5.4 per cent
CMHC Standards			4 ft
Required Separation			4 ft

CMHC DESIGN 139



Left Elevation

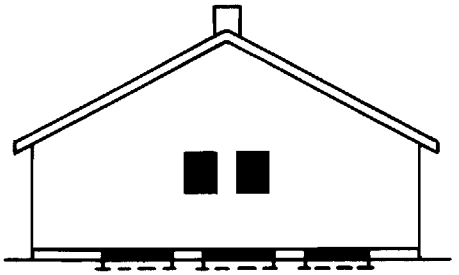
Building Type	Two-Bedroom Bungalow		
Wall Area	30'-4" x 12'	=	365 sq ft
Window Area			48 sq ft
Required Separation			7 ft
CMHC Standards			4 ft
Ratio Unprotected Area/Wall Area			13.5 per cent



Right Elevation

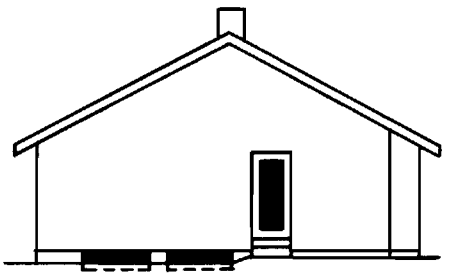
Wall Area	25'-4" x 10'	=	253 sq ft
Window Area			33 sq ft
Required Separation			6 ft
CMHC Standards			4 ft
Ratio Unprotected Area/Wall Area			13 per cent

CMHC DESIGN 218



Right Elevation

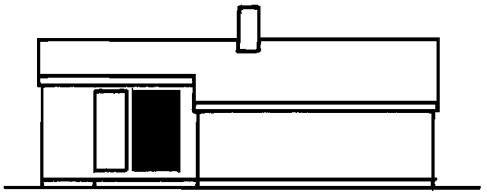
Building Type	Three-Bedroom Bungalow		
Wall Area	32' x 10'	=	320 sq ft
Window Area			28 sq ft
Required Separation			4 ft
CMHC Standards			4 ft
Ratio Unprotected Area/Wall Area			8.7 per cent



Left Elevation

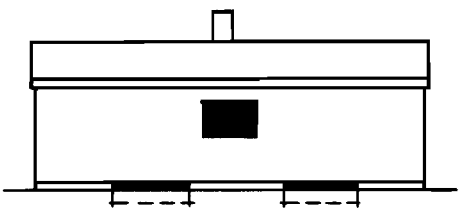
Wall Area	27' x 10'	=	270 sq ft
Window Area			20 sq ft
Required Separation			4 ft
CMHC Standards			4 ft
Ratio Unprotected Area/Wall Area			7.4 per cent

CMHC DESIGN 285



Left Elevation

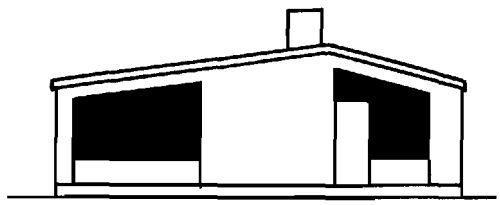
Building Type	Three-Bedroom Bungalow		
Wall Area	32' x 9'	=	288 sq ft
Window Area			28 sq ft
Required Separation			4 ft
CMHC Standards			4 ft
Ratio Unprotected Area/Wall Area			9.6 per cent



Right Elevation

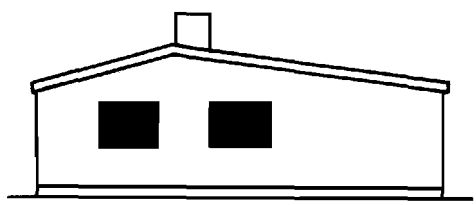
Wall Area	32' x 9'	=	288 sq ft
Window Area			20 sq ft
Required Separation			4 ft
CMHC Standards			4 ft
Ratio Unprotected Area/Wall Area			6.9 per cent

CMHC DESIGN 275



Right Elevation

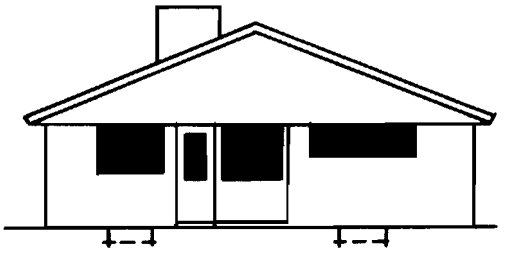
Building Type	Three-Bedroom Bungalow		
Wall Area	35'-5" x 11'	=	390 sq ft
Window Area			96 sq ft
Required Separation			9 ft
CMHC Standards			4 ft
Ratio Unprotected Area/Wall Area			24.5 per cent



Left Elevation

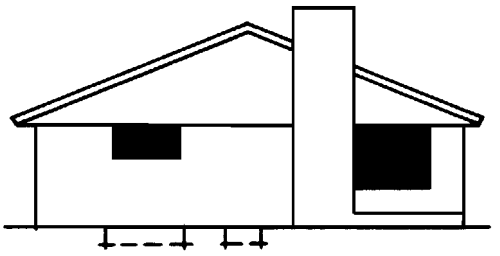
Wall Area	35'-5" x 11'	=	390 sq ft
Window Area			40 sq ft
Required Separation			4 ft
CMHC Standards			4 ft
Ratio Unprotected Area/Wall Area			10.2 per cent

CMHC DESIGN 233



Right Elevation

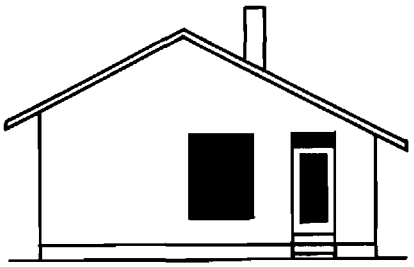
Building Type	Three-Bedroom Bungalow		
Wall Area	35'-1" x 8'	=	281 sq ft
Window Area			75 sq ft
Required Separation			9 ft
CMHC Standards			4 ft
Ratio Unprotected Area/Wall Area			27 per cent



Left Elevation

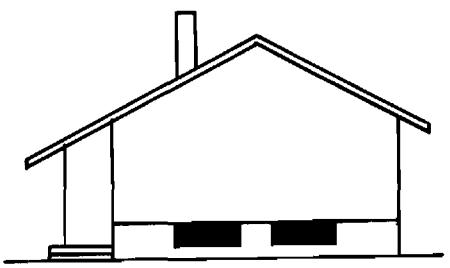
Wall Area	33' x 8'	=	264 sq ft
Window Area			45 sq ft
Required Separation			6 ft
CMHC Standards			4 ft
Ratio Unprotected Area/Wall Area			17.2 per cent

CMHC DESIGN 751



Left Elevation

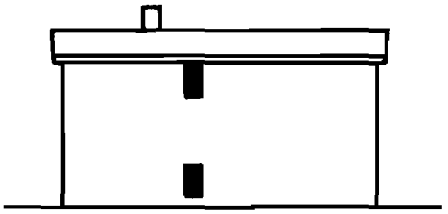
Building Type	Three-Bedroom Split Level		
Wall Area	27'-6" x 12'	=	330 sq ft
Window Area			45 sq ft
Required Separation			7 ft
CMHC Standards			4 ft
Ratio Unprotected Area/Wall Area			13.5 per cent



Right Elevation

Wall Area	23'-6" x 12'	=	282 sq ft
Window Area			24 sq ft
Required Separation			4 ft
CMHC Standards			4 ft
Ratio Unprotected Area/Wall Area			8.5 per cent

CMHC DESIGN 704

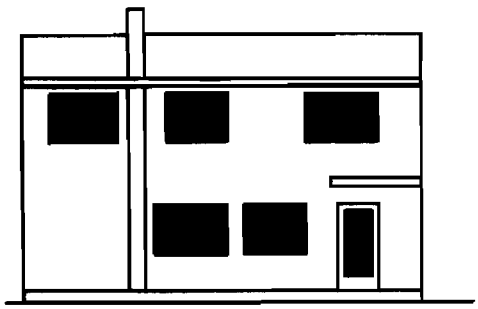


Left Elevation

Building Type	Two-Bedroom Split Level		
Wall Area	26' x 12'-6"	=	325 sq ft
Window Area			10 sq ft
Required Separation			4 ft
CMHC Standards			6 ft
Ratio Unprotected Area/Wall Area			3 per cent

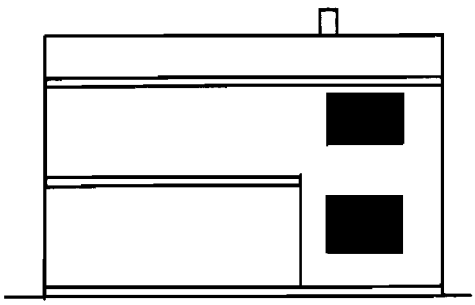
Other Elevation has no Windows

CMHC DESIGN 606



Left Elevation

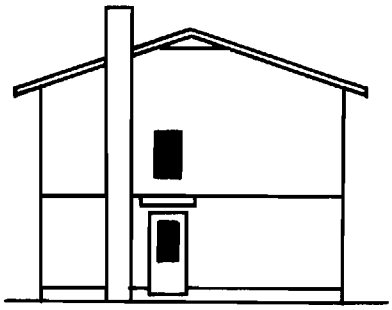
Building Type	Four-Bedroom House		
Wall Area	32'-6" x 18'	=	585 sq ft
Window Area			120 sq ft
Required Separation			11 ft
CMHC Standards			6 ft
Ratio Unprotected Area/Wall Area			20.5 per cent



Right Elevation

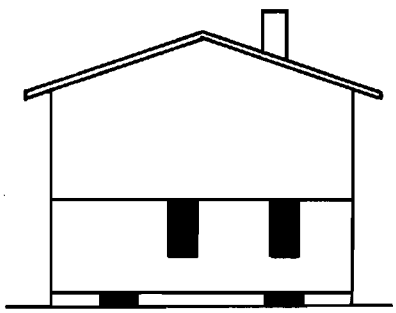
Wall Area	32'-6" x 18'	=	585 sq ft
Window Area			48 sq ft
Required Separation			4 ft
CMHC Standards			6 ft
Ratio Unprotected Area/Wall Area			8.2 per cent

CMHC DESIGN 604



Left Elevation

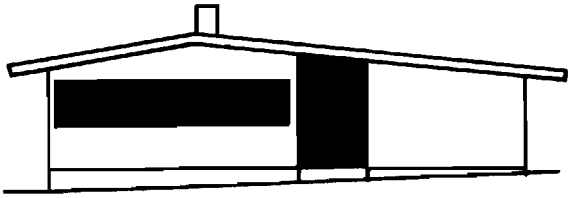
Building Type	Four-Bedroom House		
Wall Area	24'-4" x 17'	=	413 sq ft
Window Area			16 sq ft
Required Separation			4 ft
CMHC Standards			6 ft
Ratio Unprotected Area/Wall Area			3.9 per cent

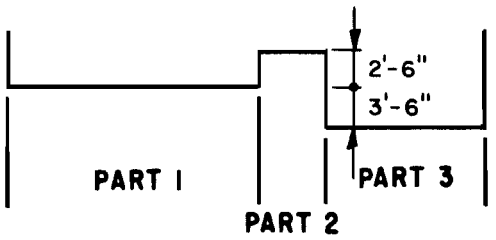


Right Elevation

Wall Area	24'-4" x 17'	=	413 sq ft
Window Area			29 sq ft
Required Separation			4 ft
CMHC Standards			6 ft
Ratio Unprotected Area/Wall Area			7 per cent

CMHC DESIGN 760





Building Type	Three-Bedroom Split Level		
Wall Area	39'-9" x 12'	=	477 sq ft
Window Area			134 sq ft
Ratio Unprotected Area/Wall Area			28.5 per cent
CMHC Standards			4 ft from face of Part 3
Required Separation			11 ft from face of Part 3.

Considering only the parts of the elevation having windows (Parts 1 and 2)

Wall Area	27' x 11'	=	312 sq ft
Window Area			134 sq ft
Ratio Unprotected Area/Wall Area			43 per cent
CMHC Standards			14 ft from face of Part 1
Required Separation			10'-6" from face of Part 3.

Considering each part of the elevation separately,

Part 1

Wall Area	21' x 12'	=	252 sq ft
Window Area			80 sq ft
Ratio Unprotected Area/Wall Area			31.5 per cent
Required Separation			11 ft from face of Part 1.

Part 2

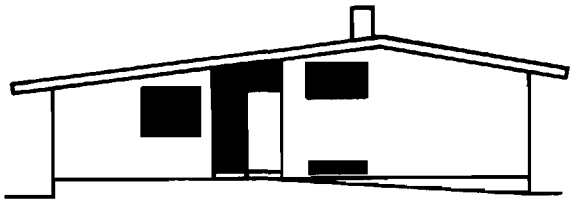
Wall Area	6' x 10'	=	60 sq ft
Window Area			54 sq ft
Ratio Unprotected Area/Wall Area			90 per cent
Required Separation			19 ft* from face of Part 2.

* This figure is not reliable because the tables do not go below a wall area of 300 sq ft.

Part 3 No separation required.

CMHC Standard	4 ft from face of Part 3
Effective Separation	13 ft from face of Part 3.

CMHC DESIGN 760



Left Elevation

Wall Area	39'-9" x 12'	=	477 sq ft
Window Area			72 sq ft
Ratio Unprotected Area/Wall Area			15.3 per cent
CMHC Standards			4 ft
Required Separation			7 ft

APPENDIX C

Group (2) DETACHED DWELLINGS IN TYPICAL SUBDIVISIONS

Lynwood Village, near Ottawa
Bel Air Heights, Ottawa
Dorset Park, Scarborough

(1) Separations compared with those existing

(a) No. of elevations that require greater separation than that provided in subdivision	2
(b) No. of elevations that require the same separation as that provided in the subdivision	6
(c) No. of elevations that require less separation than that provided in the subdivision	11
TOTAL	19

(2) Separation compared with CMHC Standards (Housing Standards, Jan. 1958)

(a) No. of elevations that require greater separation than that required by CMHC Standards	5
(b) No. of elevations that require the same separation as that required by CMHC Standards	11
(c) No. of elevations that require less separation than that required by CMHC Standards	3
TOTAL	19

(3) Proportion of window to wall area

(a) Window area 0 to 10 per cent of wall area in	13 elevations
(b) Window area 10 to 20 per cent of wall area in	5 elevations
(c) Window area 20 to 30 per cent of wall area in	1 elevation

Plans by Teron Construction

Project:	Lynwood Village, near Ottawa		
Building Type:	Detached Single-Story House (Mayfair 1)		
Elevation 1:	Wall Area 44' x 11'	=	484 sq ft
	Window Area		71 sq ft
	Ratio Unprotected Area/Wall Area		14.7 per cent
	Separation Provided		4 ft
	CMHC Standards		4 ft
	Required Separation		7 ft

Plans by Teron Construction

Project:	Lynwood Village, near Ottawa		
Building Type:	Detached Single-Story House (Tivoli III)		
Elevation 1:	Wall Area 38' x 11'	=	418 sq ft
	Window Area		28.5 sq ft
	Ratio Unprotected Area/Wall Area		6.8 per cent
	Separation Provided		6 ft
	CMHC Standards		4 ft
	Required Separation		4 ft

Plans by Campeau Construction

Project:	Bel Air Heights Subdivision, Ottawa			
Building Type:	Detached Split Level House (Plan B4)			
	House on corner lot rear facing side property line			
Elevation 1 (Rear):	Wall Area	20' x 11' 27' x 15'	=	625 sq ft
	Window Area			93 sq ft
	Ratio Unprotected Area/Wall Area			15 per cent
	Separation Provided			6 ft
	CMHC Standards			4 ft
	Required Separation			8 ft

Plans by Campeau Construction

Project:	Bel Air Heights Subdivision, Ottawa			
Building Type:	Detached Single-Story Bungalow (House Plan B. 18)			
Elevation 1:	Wall Area	38'-6" x 11'-6"	=	442. 75 sq ft
	Window Area			22. 6 sq ft
	Ratio Unprotected Area/Wall Area			5 per cent
	Separation Provided			4 ft
	CMHC Standards			4 ft
	Required Separation			4 ft

Plans by Campeau Construction

Project:	Bel Air Heights Subdivision, Ottawa			
Building Type:	Detached Split Level House (Plan B17)			
	Rear of House facing side property line			
Elevation 1:	Wall Area	21' x 15' 24' x 11'	=	579 sq ft
	Window Area			88.25 sq ft
	Ratio Unprotected Area/Wall Area			15.2 per cent
	Separation Provided			8 ft
	CMHC Standards			4 ft
	Required Separation			7 ft

Plans by Campeau Construction

Project: Bel Air Heights Subdivision, Ottawa

Building Type: Detached Single-Story Bungalow

Elevation 1 (left) :	Wall Area	49' x 11'	=	539 sq ft
	Window Area			97.20 sq ft
	Ratio Unprotected Area/Wall Area			18 per cent
	Separation Provided			10 ft
	CMHC Standards			4 ft
	Required Separation			9 ft

Taking the two parts of Elevation 1 separately.

Elevation (1a):	Wall Area	30' x 11'	=	330 sq ft
	Window Area			31.5 sq ft
	Ratio Unprotected Area/Wall Area			9.5 per cent
	Separation Provided			10 ft
	CMHC Standards			4 ft
	Required Separation			5 ft
Elevation (1b): set back 6.5 ft from wall face	Wall Area	19' x 11'	=	209 sq ft
	Window Area			65.7 sq ft
	Ratio Unprotected Area/Wall Area			31 per cent
	Separation Provided			16.5 ft
	CMHC Standards			4 ft
	Required Separation			10 ft
Elevation 2 (right):	Wall Area	49' x 11'	=	539 sq ft
	Window Area			40.5 sq ft
	Ratio Unprotected Area/Wall Area			7.5 per cent
	Separation Provided			12 ft
	CMHC Standards			4 ft
	Required Separation			4 ft

Plans by Pugh Bros. Construction Ltd.

Project:	Dorset Park Subdivision, Scarborough, Ont.		
Building Type:	Detached Single-Story Bungalow		
Right Elevation:	Wall Area	37'-6" x 9' =	338 sq ft
	Window Area		28 sq ft
	Ratio Unprotected Area/Wall Area		8.3 per cent
	Separation Provided		4 ft
	CMHC Standards		4 ft
	Required Separation		4 ft
Left Elevation:	Wall Area	37'-6" x 9' =	338 sq ft
	Window Area		69 sq ft
	Ratio Unprotected Area/Wall Area		20.4 per cent
	Separation Provided		8 ft
	CMHC Standards		4 ft
	Required Separation		8 ft

Plans by Speiran

Project:	Dorset Park Subdivision, Scarborough, Ont.		
Building Type:	Detached Single-Story Bungalow		
Left Elevation:	Wall Area	46'-3" x 10' =	463 sq ft
	Window Area		45 sq ft
	Ratio Unprotected Area/Wall Area		9.7 per cent
	Separation Provided		4 ft
	CMHC Standards		4 ft
	Required Separation		4 ft
Right Elevation:	Wall Area	46'-3" x 10' =	463 sq ft
	Window Area		20 sq ft
	Ratio Unprotected Area/Wall Area		4.3 per cent
	Separation Provided		8 ft
	CMHC Standards		4 ft
	Required Separation		4 ft

Plans by Speiran

Project:	Dorset Park Subdivision, Scarborough, Ont.		
Building Type:	Detached Single-Story Bungalow		
Left Elevation:	Wall Area	46' x 10' =	460 sq ft
	Window Area		33 sq ft
	Ratio Unprotected Area/Wall Area		7.1 per cent
	Separation Provided		4 ft
	CMHC Standards		4 ft
	Required Separation		4 ft
Right Elevation:	Wall Area	46' x 10' =	460 sq ft
	Window Area		36 sq ft
	Ratio Unprotected Area/Wall Area		7.8 per cent
	Separation Provided		8 ft
	CMHC Standards		4 ft
	Required Separation		4 ft

Plans by Pugh Bros. Construction Ltd.

Project:	Dorset Park Subdivision, Scarborough, Ont.		
Building Type:	Detached Three-Bedroom Bungalow		
Right Elevation:	Wall Area	45' x 10' =	450 sq ft
	Window Area		28 sq ft
	Ratio Unprotected Area/Wall Area		6.2 per cent
	Separation Provided		4 ft
	CMHC Standards		4 ft
	Required Separation		4 ft
Left Elevation:	Wall Area	45' x 10' =	450 sq ft
	Window Area		22 sq ft
	Ratio Unprotected Area/Wall Area		4.9 per cent
	Separation Provided		8 ft
	CMHC Standards		4 ft
	Required Separation		4 ft

Plans by Pugh Bros. Construction Ltd.

Project:	Dorset Park Subdivision, Scarborough, Ont.		
Building Type:	Detached Three-Bedroom Bungalow for corner lot		
Rear Elevation:	Wall Area	45' x 10' =	450 sq ft
	Window Area		48 sq ft
	Ratio Unprotected Area/Wall Area		10.7 per cent
	Separation Provided		4 ft
	CMHC Standards		4 ft
	Required Separation		4 ft

Plans by Pugh Bros. Construction Ltd.

Project:	Dorset Park Subdivision, Scarborough, Ont.		
Building Type:	Semi-detached Two-Story House		
Side Elevation:	Wall Area	26' x 18' =	468 sq ft
	Window Area		22 sq ft
	Ratio Unprotected Area/Wall Area		4.7 per cent
	Separation Provided		19 ft
	CMHC Standards		6 ft
	Required Separation		4 ft

Plans by Pugh Bros. Construction Ltd.

Project:	Dorset Park Subdivision, Scarborough, Ont.		
Building Type:	Detached Four-Bedroom - $1\frac{1}{2}$-Story House		
Right Elevation:	Wall Area	36' x 18' =	648 sq ft
	Window Area		12 sq ft
	Ratio Unprotected Area/Wall Area		2 per cent
	Separation Provided		6 ft
	CMHC Standards		6 ft
	Required Separation		4 ft
Left Elevation:	Wall Area	34' x 18' =	612 sq ft
	Window Area		22 sq ft
	Ratio Unprotected Area/Wall Area		3.6 per cent
	Separation Provided		8 ft
	CMHC Standards		6 ft
	Required Separation		4 ft

APPENDIX D

Group (3) ROW HOUSING PROJECTS

F.P. Project 6/55 St. John's, Newfoundland
Nanaimo St. Project, Vancouver B.C.
Flemingdon Park, Don Mills, Ontario

(1) Separations compared with those existing

(a) No. of elevations that require greater separation than that provided in the subdivisions	0
(b) No. of elevations that require the same separation as that provided in the subdivisions	0
(c) No. of elevations that require less separation over that provided in the subdivisions	4
TOTAL	4

(2) Proportion of window to wall area

(a) Window area 10 to 20 per cent of wall area	1 elevation
(b) Window area 20 to 30 per cent of wall area	2 elevations
(c) Window area 30 to 40 per cent of wall area	0
(d) Window area 40 to 50 per cent of wall area	1 elevation

CMHC Plans

Project:	Nanaimo Street Project, Vancouver, B.C.		
Building Type:	Row House		
Elevation A:	Wall Area	22' x 18' =	396 sq ft
	Window Area		69.25 sq ft
	Ratio Unprotected Area/Wall Area		17.5 per cent
	Separation Provided	30 ft to adjoining building	15 ft
	Required Separation		9 ft

CMHC Plans

Project:	F.P. Project 6/55, St. John's, Newfoundland		
Building Type:	Row House		
Elevation A:	Wall Area	23'-4½" x 17'-6" =	408 sq ft
	Window Area		110 sq ft
	Ratio Unprotected Area/Wall Area		27 per cent
	Separation Provided	35 ft to next building	17.5 ft
	Required Separation		12 ft

Plans by Irving Grossman, Architect

Project:	Flemingdon Park, Don Mills, Ontario			
Building Type:	Row House B			
Elevation 1:	Wall Area	16.5' x 18'	=	297 sq ft
	Window Area			86.8 sq ft
	Ratio Unprotected Area/Wall Area			29 per cent
	Separation Provided	35 ft to adjoining property		17.5 ft
	Required Separation			10 ft

Plans by Irving Grossman, Architect

Project:	Flemingdon Park, Don Mills, Ontario			
Building Type:	Row House A			
Elevation 1:	Wall Area	14.5' x 18'	=	261 sq ft
	Windows			109.45 sq ft
	Ratio Unprotected Area/Wall Area			42 per cent
	Separation Provided	35 ft to adjoining building		17.5 ft
	Required Separation:			12 ft