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NATIONAL RESEARCH COUNCIL OF CANADA

DIVISION OF BUILDING RESEARCH

No.

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TECHNICAL NOTE

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CHECKED BY

APPROVED BY R.F.L.

DATE January 1968

PREPARED FOR Inquiry and record purposes

SUBJECT

A SURVEY OF BUILDING FAILURES IN CANADA

Building failures, of which many occur every year, vary in degree from deficiencies making a building unserviceable, with relatively small economic losses, to major structural collapses involving loss of life and large property damage.

To learn more from building failures, engineers should try to assess the number and distribution of the various types of failures. With this in mind, the Division of Building Research of the National Research Council of Canada uses the Canadian Press Clipping Service to obtain information on "structural failures."

It is obvious that a survey of structural failures based on newspaper clippings cannot be accurate, as only the more "newsworthy" failures are reported. Because of their human interest value, failures involving loss of life are widely publicized, whereas casualty-free failures receive little attention, especially in larger centres. Newspaper clippings are, however, practically the only available source of information about building failures on a nation-wide scale. Any other more deliberate and exhaustive survey would require such an elaborate and expensive organization that it would be

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impracticable, unless perhaps a Civil Defence organization with staff in almost every municipality were given the task. It is with this difficulty in mind that the information available was compiled in this report.

The collected clippings, about 1,000 in all and covering the years 1958 to 1966, were divided into three categories comprised of the following numbers of failures.

Failures due to wind	- 624
Failures due to snow	- 260
General building failures	- 102

The actual total of failures can naturally be expected to be several times larger because many of the smaller, less important failures are not reported.

FAILURES DUE TO WIND AND SNOW

These failures were further divided into types of buildings, yielding the following distribution:

	<u>Failures due to:</u>	
	<u>Wind (%)</u>	<u>Snow (%)</u>
Residential buildings	24	32
Industrial and commercial buildings	16	26
Public assembly buildings	10	20
Farm buildings	41	12
Miscellaneous	9	10
	<u>100</u>	<u>100</u>

GENERAL BUILDING FAILURES

The general building failures were subdivided according to the structure element and type of failure, and showed the following distribution:

	<u>General Building Failures (%)</u>
Failures of roof, floor, and ceiling construction	33
Failures of walls	20
Failures during construction (e.g. erection and form work failures)	18
Foundation failures	8
Failures in farm buildings	8
Miscellaneous	<u>13</u>
	<u>100</u>

CONCLUSIONS

1. The number (not necessarily the dollar value) of failures triggered by wind and snow loads is considerably higher than the number of failures produced by other causes.
2. Failures due to wind loads are most common in farm buildings. This may be attributed to various factors, perhaps mainly that farm buildings are often (a) large structures with few partitions to stiffen them, (b) in exposed locations, and (c) not engineered but simply constructed by traditional methods.
3. Failures due to snow loads are most common in residential buildings (houses, cottages). Considering the relative number of such buildings this result is not surprising. Some large public assembly buildings have also collapsed, with serious loss of life and property damage.
4. In the category of "general building failures" roof, floor and ceiling failures make up the largest portion, with failures of walls and failures during construction operations running in second and third positions.