



NRC Publications Archive Archives des publications du CNRC

New Canadian Fire Research Laboratory
Legget, R. F.

This publication could be one of several versions: author's original, accepted manuscript or the publisher's version. /
La version de cette publication peut être l'une des suivantes : la version prépublication de l'auteur, la version
acceptée du manuscrit ou la version de l'éditeur.

Publisher's version / Version de l'éditeur:

Nature, 183, pp. 653-655, 1959-03-01

NRC Publications Record / Notice d'Archives des publications de CNRC:

<https://nrc-publications.canada.ca/eng/view/object/?id=606fa067-456f-4078-bd9d-59526cedd99c>
<https://publications-cnrc.canada.ca/fra/voir/objet/?id=606fa067-456f-4078-bd9d-59526cedd99c>

Access and use of this website and the material on it are subject to the Terms and Conditions set forth at

<https://nrc-publications.canada.ca/eng/copyright>

READ THESE TERMS AND CONDITIONS CAREFULLY BEFORE USING THIS WEBSITE.

L'accès à ce site Web et l'utilisation de son contenu sont assujettis aux conditions présentées dans le site

<https://publications-cnrc.canada.ca/fra/droits>

LISEZ CES CONDITIONS ATTENTIVEMENT AVANT D'UTILISER CE SITE WEB.

Questions? Contact the NRC Publications Archive team at

PublicationsArchive-ArchivesPublications@nrc-cnrc.gc.ca. If you wish to email the authors directly, please see the first page of the publication for their contact information.

Vous avez des questions? Nous pouvons vous aider. Pour communiquer directement avec un auteur, consultez la première page de la revue dans laquelle son article a été publié afin de trouver ses coordonnées. Si vous n'arrivez pas à les repérer, communiquez avec nous à PublicationsArchive-ArchivesPublications@nrc-cnrc.gc.ca.



Ser
TH1
N21t2
no. 61
c. 2
BLDG

614-8425001-5 (7)

**NATIONAL RESEARCH COUNCIL
CANADA
DIVISION OF BUILDING RESEARCH**

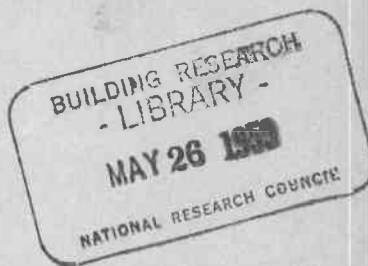
NEW CANADIAN FIRE RESEARCH LABORATORY

By R. F. LEGGET

ANALYZED

(Reprinted from Nature, Vol. 183, pp. 653-655, March 7, 1959)

**TECHNICAL PAPER No. 61
OF THE
DIVISION OF BUILDING RESEARCH**



Price 10 cents

**OTTAWA
March 1959**

N.R.C. 5101

3718173

This publication is being distributed by the Division of Building Research of the National Research Council as a contribution towards better building in Canada. It should not be reproduced in whole or in part, without permission of the original publisher. The Division would be glad to be of assistance in obtaining such permission.

Publications of the Division of Building Research may be obtained by mailing the appropriate remittance (a Bank, Express, or Post Office Money Order or a cheque made payable at par in Ottawa, to the Receiver General of Canada, credit National Research Council) to the National Research Council, Ottawa. Stamps are not acceptable.

A coupon system has been introduced to make payments for publications relatively simple. Coupons are available in denominations of 5, 25, and 50 cents, and may be obtained by making a remittance as indicated above. These coupons may be used for the purchase of all National Research Council publications including specifications of the Canadian Government Specifications Board.

CISTI/ICIST



3 1809 00211 4418

NEW CANADIAN FIRE RESEARCH LABORATORY

By R. F. LEGGET

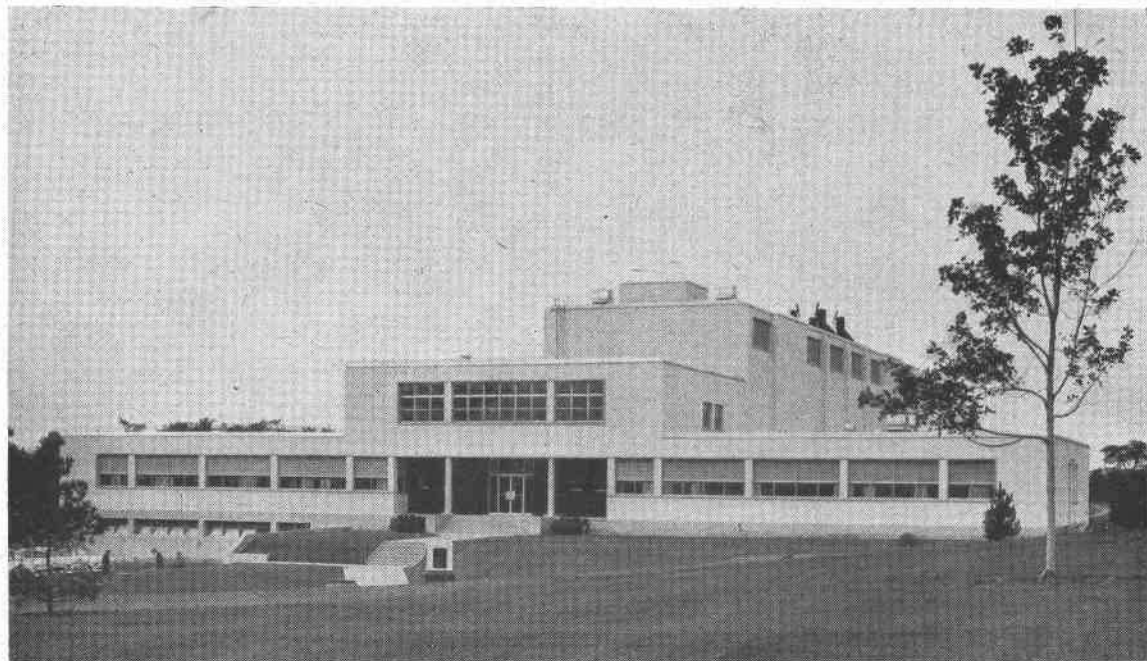
Director, Division of Building Research, National Research
Council of Canada

FIRE research in Canada advanced significantly with the opening on October 3 of the new Fire Research Laboratory of the National Research Council of Canada at Ottawa. The new building forms part of the Building Research Centre of the Council's Division of Building Research. It is situated on the extensive property of the Council known as the Montreal Road Laboratories, an area of about 400 acres in which the three engineering research divisions of the National Research Council and some other Council establishments are situated.

The official opening of the building was performed by Dr. F. M. Lea, director of the British Building Research Station, assisted by Mr. Dennis Lawson, the newly appointed director of the British Joint Fire Research Organization, both of whom had come to Ottawa especially for the occasion. The Canadian Division of Building Research has close liaison with both these British research organizations, the debt to which in the development of its work and in the planning of the new building was acknowledged by the director during the opening ceremony.

The opening of the new building followed a two-day conference on fire research and fire prevention, at which statements were presented regarding the work of all the major fire-prevention agencies of Canada. Speakers from the United States, Britain and Canada gave a review of fire research throughout the world. Some details of Canadian fire research were given to the conference, including preliminary results from full-scale burns of eight buildings in the small town of Aultsville, abandoned because of flooding caused by the construction of the international power dam on the St. Lawrence.

The fire research building (Fig. 1) has basically the shape of a large T, with offices and laboratories in the front wing, and the large furnace laboratory and a burn area for model studies in the rear wing. One-story additions have been erected on either side of the furnace laboratory to provide storage and workshop facilities, garage space for the station



(Photograph : National Film Board of Canada)

Fig. 1. Fire Research Building of the Division of Building Research, National Research Council, Ottawa

wagon used in field investigations, a control room for the operation of the fire-resistance furnaces, and additional laboratory facilities for hydraulic testing.

The building covers an area of 20,000 sq. ft. and has a total volume of more than 550,000 cu. ft., of which nearly half is made up of the volume of the 40-ft. high structure housing the furnace laboratory and the burn area. The total contract price, including all extras, which amounted to less than 4 per cent of the original cost, was \$20,000 dollars, or a cost per cubic foot of less than 1.50 dollars.

The building, founded throughout on solid rock, consists of a structural steel frame supported on reinforced concrete. The outside walls, built of structural clay tile, are finished with stucco on metal lath on the outside and with glazed tile on the inside.

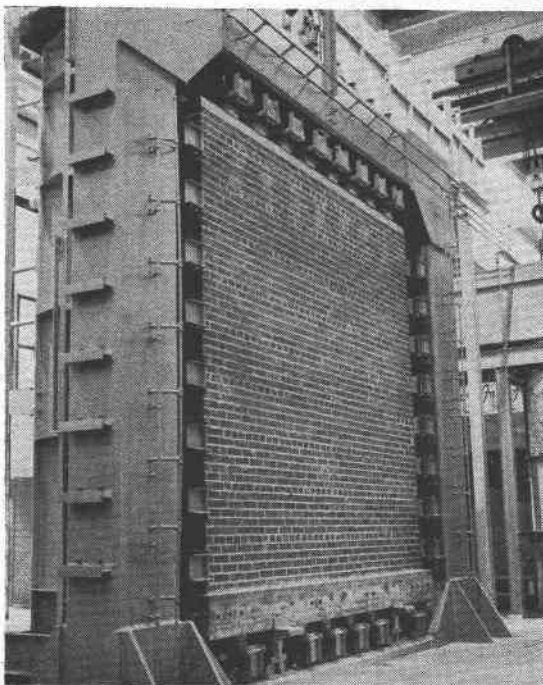
The area to the rear of the Fire Research Building was the site of an old quarry. Its rocky floor, which is approximately 5-10 ft. below the level of the surrounding area, provides an excellent outdoor experimental site on which to conduct large-scale tests on extinguishing fires.

The fire-resistance test facilities consist of two furnaces, complete with auxiliary equipment, together with the associated facilities for constructing, handling, conditioning and disposing of large test specimens. The design of the special facilities contained in the laboratory was carried out concurrently with the design and construction of the building itself, by a separate firm of consultants, Ewbank and Partners (Canada), Ltd., working in co-operation with the architects and engineers for the building.

The wall furnace (Fig. 2) consists essentially of a movable burner assembly open at the front, with the burners situated in the rear wall of the unit. The combustion chamber is completed when the front face of the burner assembly is fixed to the specimen under test. In this position the top of the furnace is immediately under the flue used for removing the combustion gases.

The size of the specimen exposed to the combustion chamber is 12 ft. by 12 ft., although the loading frame itself will accommodate a specimen 14 ft. by 14 ft. The heat in the combustion chamber is supplied by 100 burners having a capacity of 50 cu. ft. of gas per hour at a pressure of 25 lb./in.². The fuel used is propane, having a gross heating value of approximately 2,500 B.T.U./cu. ft.; thus the maximum total heat input is approximately 12,500,000 B.T.U./hr.

The floor furnace (Fig. 3), in contrast to the wall furnace, is a fixed installation. The burners are installed in the two long sides and the two flues are permanently connected to the common flue used for



(Photograph : National Film Board of Canada)

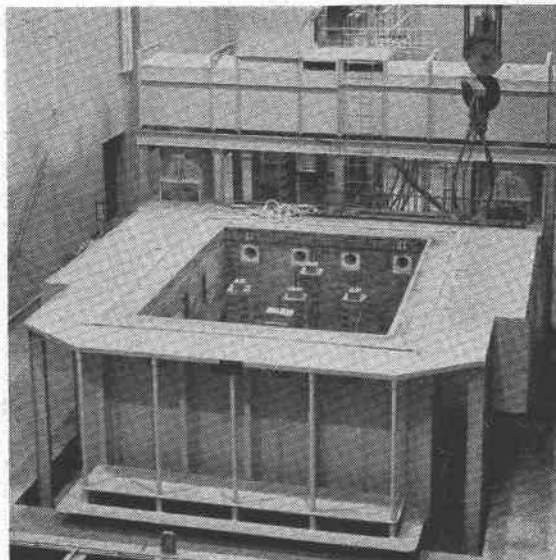
Fig. 2. Loading frame with wall specimen in wall furnace in the furnace laboratory

conducting the flue gases from the building. The combustion chamber is completed when the specimen is laid on top of the furnace.

The furnace at present will allow a floor specimen to have an area of 12 ft. by 15 ft. exposed to heat. When using this furnace for testing beams it will be possible to extend a beam past the furnace wall and load this portion of the beam as well.

Heat is supplied by means of thirty burners (fifteen on each side), each burner having a capacity of 220 cu. ft. of gas per hour at a pressure of 25 lb./in.². As in the case of the wall furnace, propane will be the fuel, so that the gross heat input is approximately 16,500,000 B.T.U./hr.

Liquid propane is stored in a 1,750-gallon tank situated outside the building. When operating the furnaces, the liquid is passed through three vaporizers, each capable of vaporizing 70 gallons of propane per hour at 25 lb./in.². The gas is then piped underground in a 4-in. pipe to the building. Inside the building the propane then passes through a diaphragm motor



(Photograph : National Film Board of Canada)

Fig. 3. Floor furnace in the furnace laboratory

control valve, which closes if there is a failure of the control air. There is a pilot flame by-pass valve in the line before the motor control valve, and two shut-off gas cocks immediately after this valve direct the flow either to the floor or to the wall furnace. The wall furnace has ten banks of burners with ten burners in each bank, while the floor furnace has five banks of three burners each on each side. Each group of three burners is fitted with a solenoid-actuated shut-off valve and pressure gauge.

The combustion control for both of the furnaces is furnished by a potentiometric temperature-programme controller which follows the time-temperature curve designated in the current U.S. Standard (ASTM *E119-57*, Standard Methods of Fire Tests of Building Construction and Materials).

The two large furnaces will be put to use immediately for carrying out tests upon the fire-resistance of building materials in current use in Canada. These tests must be done since the furnaces are unique in Canada, but they involve an element of research, and the furnaces will be used for research investigations whenever possible. In the laboratories, studies will continue on the properties of foam as an extinguisher of fire, into the problems of radiation from fire and on more detailed questions such as those

related to the burning characteristics of materials. The results of all work will be made available to the committees responsible for the National Building Code of Canada for incorporation into successive revisions. The Code is an advisory document published by the National Research Council of Canada, and has legal effect only when adopted by municipalities for their own local use. It is already in legal use in this way for well over one-third of the population of Canada. As its adoption spreads, the results of the fire research programme will therefore be of direct effect to a large proportion of the people of the Dominion.

A list of all publications of the Division of Building Research is available and may be obtained from the Publications Section, Division of Building Research, National Research Council, Ottawa, Canada.