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Fire Research Laboratory— Facilities and Activities

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Fire Research Laboratory* — Facilities and Activities

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Mounting fire losses of life as well as the property and the necessity to reduce them were the main generative factors for the decision to organise fire research activity in India. The Fire Research Laboratory at the Central Building Research Institute represents the current form of the results of efforts made by the Ministry of Home Affairs, the Fire Offices Committee, the Indian Standards Institution etc. to establish National Centre for fire research and testing in India. Increasing trend of fires affecting large Building such as the Raj Bhavan at Simla, the Hindustan Times Building at New Delhi, the Western Army Command building at Simla etc. and involving loss of valuable lives as in the circus fire at Bangalore is causing concern in the public mind, calling for attention from all concerned with the design and construction of buildings and justifying stepping up the fire research and testing activity. The detailing of facilities provided and activities being undertaken in this paper, it is hoped, will draw the attention of architects, engineers, builders, fire safety enforcement officials,

insurance interests etc. to these facilities and encourage them to make fullest possible use of the expertise available in the Fire Research Laboratory.

The objective of the Fire Research Laboratory, like that of its counterparts in other countries, is to contribute through research and testing to the national effort to reduce losses of lives and of materials in fires. Fire loss statistics are not available either in an up-to-date or complete form. Nevertheless, the total annual fire waste is believed to run into Rs. 100 crore (£50 million) per annum in insured property and Rs. 400 crore (£200 million) per annum when indirect losses and losses in uninsured property are considered. Destruction by fire is estimated at as much as a fifth of 1% of the Gross National Product every year. Fire casualties are 5-6 lakhs per annum of which 1 lakh are fatal—8 out of every 10 of these are women and children. It is clearly necessary to investigate the problems of fire and to help to reduce the losses that fire are causing.

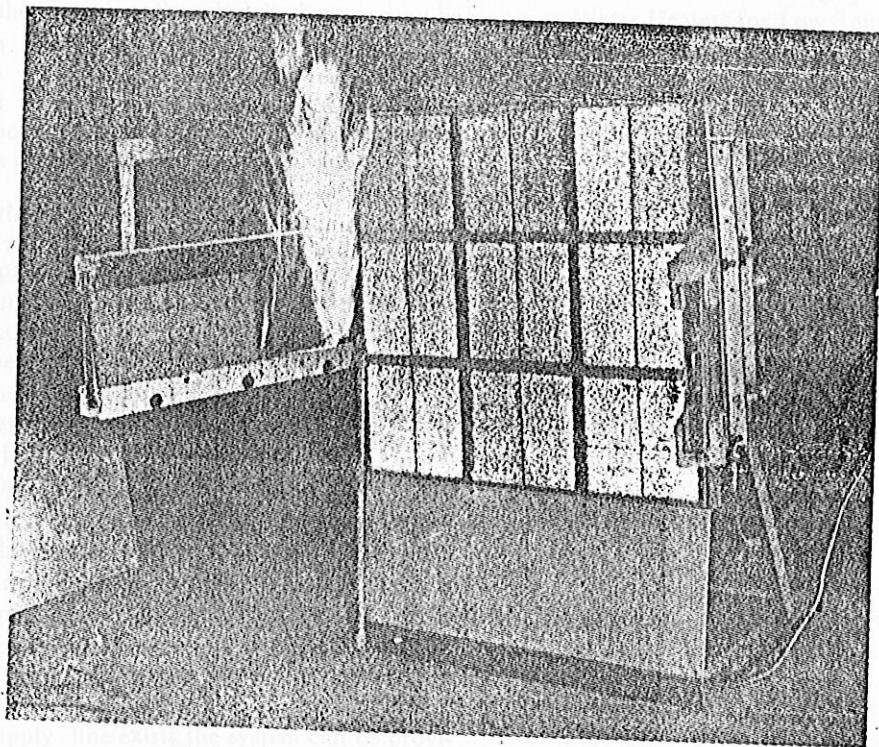


Fig. 1. 'Surface Spread of Flame' Test Apparatus

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The scope of work proposed to be carried out at the Fire Research Laboratory is fairly wide—it embraces all aspects of fires, viz. prevention, protection, detection, limitation, extinguishment etc. Although, as a part of the Central Building Research Institute, its main concern is fires in buildings, the Laboratory has been trying to concern itself with fires in other locations also.

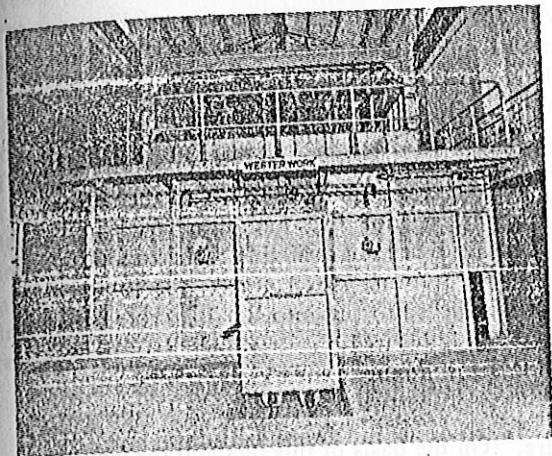


Fig. 2. 'Floor' Furnace.

The programme of work at the Fire Research Laboratory is quite comprehensive and covers collection and analysis of fire statistics for purposes of problem location and identification and subsequently of evaluation of efficiency of methods recommended; ignition, growth and spread of fire; behaviour of materials in fires and determination of their fire behaviour properties; structural protection and fire resistance grading and research; flame retardation and fire extinguishment leading to development of fire retardant treatments and of extinguishing materials; problem of fires in hi-rise buildings such as smoke/toxic gas movement and their control, life safety alike of fire service personnel and of occupants of buildings; investigations of special problems such as panic, arson, incendiaryism, etc; post-fire

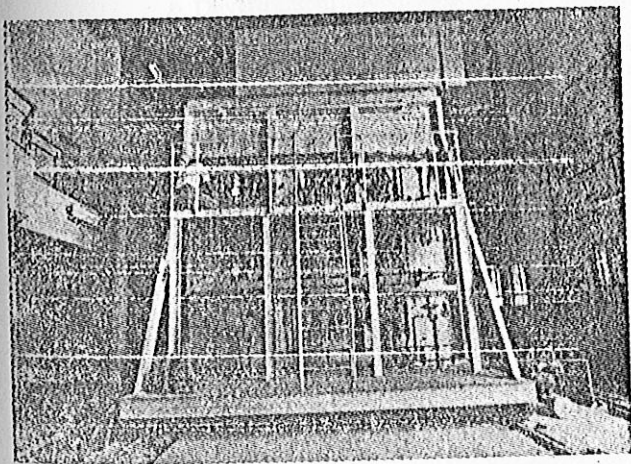


Fig. 3. 'Wall' Furnace.

problems such as problems of smoke damage, water damage, salvage, post-fire investigations etc. and finally of industrial hazards and safety measures with emphasis on fire hazards of electricity, flammable gases, flammable liquids, flammable dusts etc. etc.

For undertaking investigations into problems of fires in general, the Fire Research Laboratory has, right from its inception, striven to equip itself with standard test equipment and facilities. This is as much to put itself in a position to undertake development of materials and structural designs with desired fire behaviour or reaction properties as to evaluate products of commerce from the fire hazard angle and to make appropriate recommendations to users. Equipment or facilities which have been provided include apparatus for making tests such as (a) non-combustibility, (b) ignitibility, (c) surface spread of flame, (d) fire propagation, (e) external fire roof exposure, (f) early fire hazard (g) the Steiner fire tunnel, (h) smoke/toxic gases from materials, (j) flame retardance of textiles, (k) fire retardance of paints (l) flammability of plastics in different forms, (m) evaluation of automatic sprinklers, (n) automatic fire detectors of different types, (o) fire fighting/fire protection equipment and accessories etc. etc. The most important facility made available is, however, the two fire research/rating furnaces. These will permit the fire resistance of elements of structures such as walls and floors to be determined. While the floor and wall furnaces have been conceptually modelled after the furnaces at the Division of Building Research, National Research Council of Canada, features such as (i) an induced draft system which requires handling of only cold air by the fan, (ii) a time-temperature programmer which is not "tied only to the 'standard' time-temperature curve but which is flexible enough to allow the furnaces to be programmed to any desired time-temperature pattern making them truly 'research' furnaces (iii) a certain measure of control over the furnace pressure—an advantage specially when subjecting door and window assemblies to a fire test in the wall furnace (iv) adaptability of the floor furnace for testing of beams, etc. have been incorporated into the furnaces. These have cost the Laboratory—together with ancillary facilities in the form of 30-ton E.O.T. crane, flat-cars to handle specimens etc. approximately Rs. 35 lakhs (£0.175 million). The other major facility is a Mock-up building—3-storeys in height with capability to reproduce conditions in buildings of multiples of 3-storeys height—where problems of smoke movement in hi-rise buildings can be studied and remedial control measures such as pressurisation, extraction etc. recommended. The Mock-up facility has been adapted also for studying large-scale fire behaviour in corridors, for evaluating performance of detectors and sprinklers (the room provided for this purpose measure 7m x 7m x 4.8m with a variable height ceiling) of different types, for obscura-

tion of vision studies, for studies of evacuation rate etc. etc.

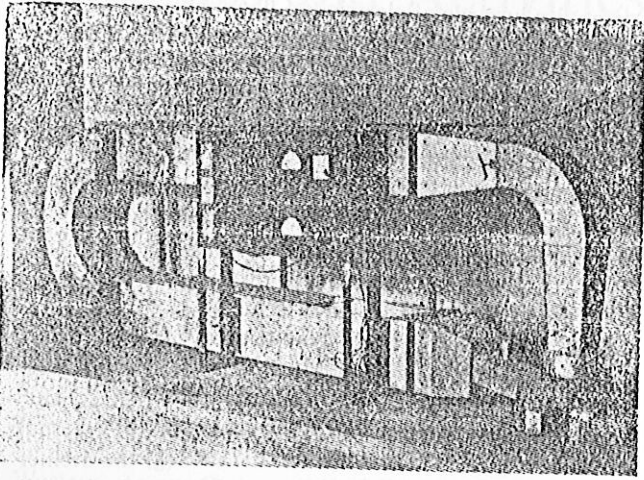


Fig. 4. Closed circuit Wind Tunnel for Auto Sprinkler / Detector Tests.

The third important facility is a 3.66m diameter spherical vessel for investigating flammability characteristics of gases/vapour/dusts (limits of flammability, minimum ignition energy, maximum explosion pressure, rate of pressure rise, limiting oxygen concentration etc.) at, above and below, atmospheric pressures.

The furnaces and other sophisticated equipment either already provided or planned to be provided confers the distinction on India of being the third country-next only to Japan and Australia—in the Australasian region to possess a [fully-equipped Fire Research Testing

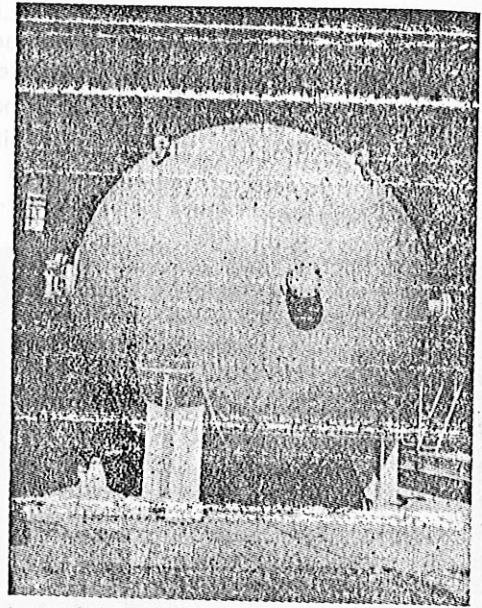


Fig. 5. Spherical Vessel (for gas/vapour/dust (flammability Studies).

Centre. On the basis of this fact and the fact that problems of fires in India resemble those in other developing countries in this region, a proposal has been put forward to recognise the Fire Research Laboratory as the ESCAP (hitherto ECAFE) Regional Fire Research Centre. Such recognition, if and when accorded, will allow countries of the area to make full use of the facilities available for both research and testing, to draw on information and expertise that will be collected and finally to obtain technical assistance in setting up their own fire research and test cells.

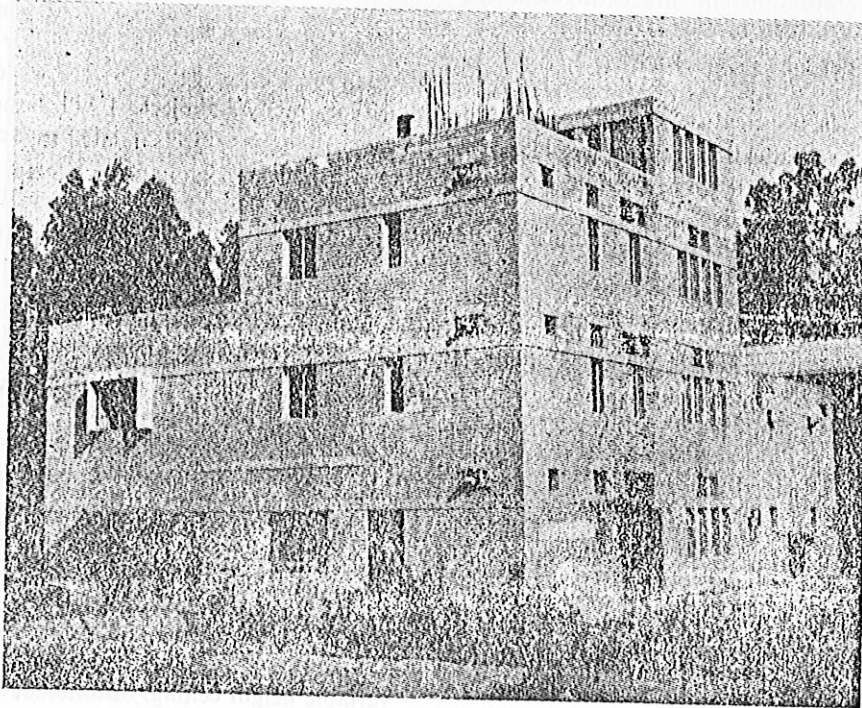


Fig. 6. 'Mock-up' Facility.

Work currently in progress includes (i) development of fire-retardant treatments for combustible and easily ignitable materials such as cellulose, plastics, rubbers etc., (ii) development of dry powders for extinguishment of fires in hydrocarbon fuels, metals etc. (iii) development of fire detectors of simple, robust, efficient and cheap types and of fire activated or initiated release devices (iv) evaluation of burning behavior properties of different types of building materials (v) determination of fire resistance (vi) verification of compliance with applicable standards of a variety of fire fighting/protection equipment and accessory fittings (vii) investigation of fire hazards of electrical appliances and electrical wiring and installations (viii) study of room fire behaviour, temperature, intensity, radiation etc. (ix) study of factors influencing fire properties with a view to development of more realistic small-scale tests etc. (x) leakage charac-

teristics of doors and windows (xi) study of smoke retardance (xii) investigation of auto or spontaneous ignition of materials etc. etc. Fires in buildings presenting interesting features are also investigated to determine the cause as well as to understand factors responsible for growth and spread or for their limitation.

Among the achievements of the Institute so far should be counted development of (a) a method fire-retardant treatment of thatch (b) an automatic sprinkler of the soldered link type (c) a particulate extinguishing agent for liquid fuel fires (d) an extinguishant for metal fires etc.

The Fire Research Laboratory seeks greater 'involvement' in the war against fires and invites all those interested in fire loss minimisation to avail the facilities provided and available.

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