Editorial

BEHAVIOR OF CONCRETE IN THE EDISON FIRE.

Probably the most thorough investigation that has ever been given the effect of intense fire upon reinforced concrete construction is that following the fire at the plant of Thomas A. Edison, Inc., at West Orange, N.J., on December 9th, 1914. At one time or other every type of fire-resistive material is called upon to vindicate, as in the above instance, the claims that are made for it, and, in the majority of cases, the lessons learned therefrom have a bearing upon the future practice in construction. In the case of the Edison fire there is much to be learned, particularly with respect to the expansion, as a unit, of a fire-infested building. Another point of great importance is the reported fusion of concrete, owing to the terrific heat developed. It is stated that the temperature in some of the buildings ranged between 2,000 and 2,500 degrees F., in certain stages of the conflagration. Owing to scarcity of water and to abundance of highly inflammable materials, this excessive temperature continued in places for several hours. Evidences of fused concrete were reported. This is a point, however, upon which the U.S. Bureau of Standards is devoting a great deal of exhaustive investigation at the present time, and its report upon the fusion will be awaited with universal interest.

The joint report of the National Board of Fire Underwriters and the National Fire Protection Association contains a very interesting section upon the effects of the fire on the concrete. It should be stated that the report attributes the severe loss to lack of adequate protective measures, in the matter of fire walls, fire resisting door and window construction, automatic sprinklers and water supply. A few items respecting the behavior of the concrete, however, are of particular interest. It states that the concrete panel walls withstood the fire excellently. There was no case of individual collapse, either, of a floor slab, beam, or girder, except in one basement where concrete and reinforcement were apparently melted away causing failure of three beams and a floor slab. All other failures are laid to the columns, and it is stated that their action was not as satisfactory as that of other concrete members. The column failures were largely due to longitudinal floor expansion. Another indication of failure is that the sudden and intense heat produced rapid expansion of the surface concrete, this causing severe internal stresses. Due to expansion of surface material, combined with stresses in different directions, at the junction of concrete members, a buckling effect of the concrete on the corners of the columns, together with shearing stresses in diagonal planes across these corners, resulted in a lengthwise splitting off of the corners, generally along the line of the reinforcing bars.

For the most part, corner columns remained in good condition, due probably to their being more heavily reinforced and possessing greater freedom of bending in the direction of the expansion of the building as a whole. Wall columns fared much worse, and many failed, due, it is thought, to the great difference in temperature between the inside and outside faces of the wall, and to their rigid position vertically which made them less able to resist the building expansion. Square columns in almost every case spalled at the corners, indicating a weakness of this shape of column when attacked by fire. Round columns suffered only minor damage.

While the report deals somewhat in detail with the behavior of the columns, it points out that more columns remained intact than were seriously injured. In summarizing, it observes that whether any other system of construction would have given better results under the same conditions, is problematical. "Reinforced concrete buildings can doubtless be built that would withstand such a fire satisfactorily, but no type of construction should be left to meet such an attack without the assistance of any of the standard fire-resistive measures which should be a part of every first-class building."

It is interesting to note the conclusions of the American Concrete Institute's report upon the disaster. It is in part as follows:—

"The fire fully demonstrated the advantages of monolithic structures. The fact that at five different places several of the wall columns were rendered useless and yet the upper portions of the building stood intact, is evidence of the superior merits of concrete in monolithic construction.

"Considering the extraordinary conditions surrounding this fire, the behavior of the concrete buildings was highly satisfactory and constitutes an excellent demonstration of the merits of concrete as a fire-resisting building material. It is not so surprising that the concrete buildings were damaged as that any material should have so satisfactorily withstood these unusual conditions.

"The end walls in the three upper floors of two buildings extended above the roofs of the adjoining buildings, which were completely destroyed; while this was in the hottest part of the fire, the walls were practically undamaged and are an admirable demonstration of the value of concrete walls as a fire barrier.

"The fused metal found in different parts of reinforced concrete buildings would seem to indicate that the fire reached an intensity of 1,000 degrees F. in all these buildings, and in many cases as high as 2,000 degrees F.

"In the greatest portion of these buildings the concrete remained firm and hard and intact after this severe heat treatment."

Relative to the net loss in the concrete buildings, Mr. Thomas A. Edison, in a letter, states:

"The report of our engineers shows that 87% of the reinforced concrete buildings, which were subjected to a very intense heat, are in good condition, and of the machinery which they contain about 85% can be used, with small repairs. Buildings of other materials, together with contents, were entirely destroyed."

It has been stated that the final revision of the Hudson Bay Railway route from Le Pas to Port Nelson will provide the most direct line in Canada for such a distance. It will be 424 miles long, 240 miles of which is completely graded and 54 miles partly graded. Trains will shortly be run to mileage 214. This year's work will likely complete grading operations to Port Nelson and the whole line will likely be ready for handling its share of the 1916 wheat crop.