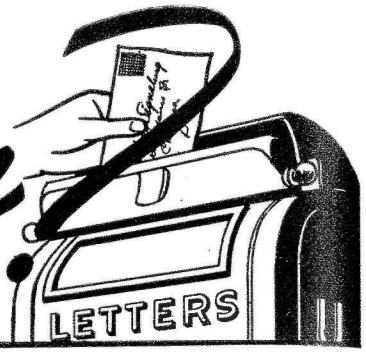
What's the Answer



Fire-Proof Construction

"What special practices have you adopted within recent years to prevent or minimize the damage to signaling facilities which might be caused by fires?"

Steel Frame and Fireproof Siding

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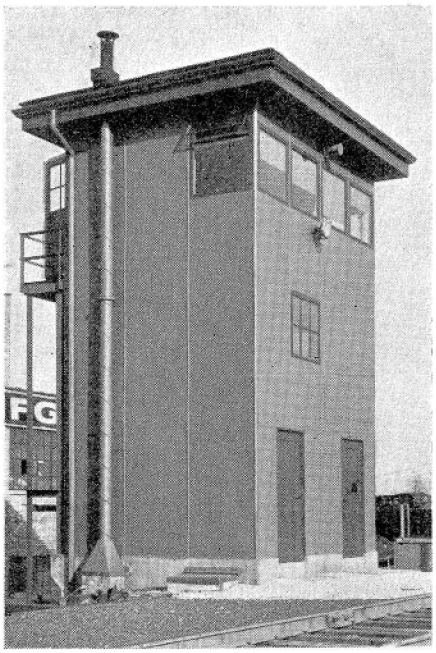
In 1938, when installing car retarders in the freight classification yard at Clearing, we adopted a form of fire



A fire-proof steel tower

resisting construction for the control towers, and this practice has been used since that time for the construction of new interlocking towers as well as for remodeling old ones, on the Chicago & Western Indiana and on the Belt Railway of Chicago.

As Used on New Structures

With respect to new construction, the tower installed in 1941 at interlocking near Ashland avenue on the Belt Railway of Chicago is typical. The foundation and basement are concrete poured in place, the ceiling section of the basement forming a floor at track level for the first story of the three-story tower structure, which is 12 ft. by 16 ft. The frame of the building includes a 4-in. by 4-in. I section and 3-in. by 3-in. angle uprights at each of the four corners, and 3-in. by 3-in. angle uprights every four feet along each wall. These uprights are set on the concrete of the ground floor level and extend to the roof line. At the floor levels for the second and third stories, steel cross beams as required were attached to the upright I-beam members, and crossmembers of lighter weights were provided at the ceiling line of the third story. The concrete floors for the second and third stories were then poured in place.

The walls of the building consist of standard width panels made of insulation material 1 in. thick enclosed on both sides as well as the edges with copper-bearing galvanized sheet metal with all joints sealed moisture proof. The panels are 4 ft. wide and come in different lengths as required.

(Continued on page 380)

To Be Answered in a Later Issue

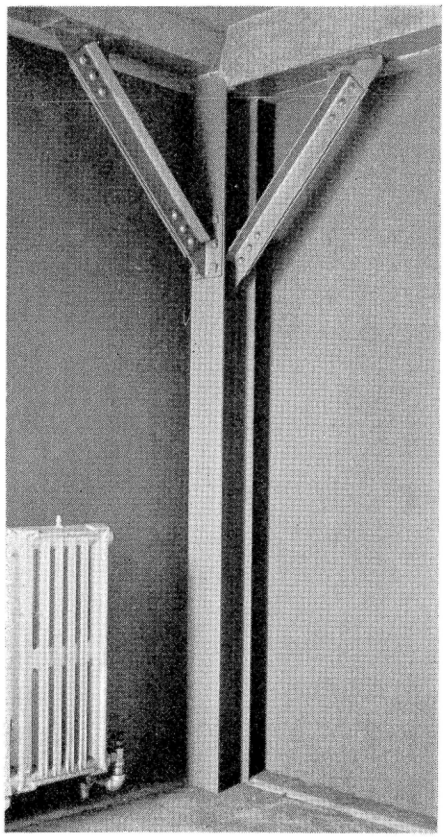
(1) For a proposed centralized traffic control project on an extended mileage of single track, for example 100 miles, would you recommend the use of track-occupancy indications on the passing tracks? Why?

(2) With passing tracks at least twice as long as the longest freight train, and with power switch machines in a C.T.C. territory, how much train time can be saved by the use of No. 15 turnouts as compared with No. 10 turnouts, when a train is entering a passing track, or when departing? Say for example that the speed limit is 15 m.p.h. for the No. 10 and 35 m.p.h. for the No. 15 turnouts.

(3) For a single track C.T.C. project, is there an important advantage of providing track occupancy indications which show the direction in which traffic is lined and the direction in which trains are moving?

If you have a question you would like to have someone answer, or if you can answer any of the questions above, please write to the editor.

When the frame of the building was completed as previously explained, the wall panels were fastened along their edges by bolts and metal cover plates to the 3-in. angles of the structure. Thus the joints between the panels are sealed and the wall panels are attached permanently to form a part of the building without drilling through or opening the seal of any of the insulated panels. This form



Steel framework in tower

of insulated wall panel is known as Ferroclad, this material as well as the molding, steel structure members, doors, window frames, etc., being furnished by the Truscon Steel Company. In addition to the fire resisting quality the 1-in. panel is equal to a 15-in. brick wall in heat conductance; weight approximately 2 per cent of the brick wall.

The window and door frames are of angle iron, the doors being sheet metal and the window frames metal. The windows are of the single-pane type, arranged to swing out at the bottom. On the operating floor, windows extend along the entire side facing the track, with one window in each end of the tower. The ceiling of the operating story is sheetrock and the roof is of asbestos shingles. The open stairway, outside the building, is of steel construction and is supported on steel posts entirely independent of the building structure.

One advantage of the type of construction used for this tower is that it is fire resistant, wood being used for roof sheathing and the floor in the operating room which was installed over the concrete not only to minimize dust, but also because a wood floor is less tiring for the leverman. Other advantages of this type of construction are its heat insulating quality, such a building can be erected at low cost, and, furthermore, if at a later date the building is no longer needed at its present location, it can be taken down and erected at some other point without loss of materials other than the foundation.

As Applied for Remodeling

When replacing the old interlockings at 15th street and at 16th street in Chicago, on the Chicago & Western Indiana, the problem was to reconstruct the old tower buildings, which had brick walls for the first story and frame construction for the upper story, wooden floors being used throughout. When reconstructing each of these towers, the brick walls of the first story were retained, but the upper story and wooden floors were removed. Using the one story walls as supporting structures, a concrete slab was poured in place for

Upper story of steel construction

use not only as a floor for the second story, but also as support for the walls and roof of the second story, which are of fire resisting construction, using Ferroclad slabs of insulating material covered with sheet iron, the vertical wall slabs being held by 3-in. steel angles. Heavier corner angles form the main support including that for the steel frame roof structure. Swinging windows with all-metal frames and sashes are used throughout on the new portions of the buildings. Three "I" beams, 8 in. by 5 in., are spaced 3 ft. 4 in. apart in the concrete floor so as to be directly under the machine legs.

The old wooden floors at ground level in the towers were removed and new concrete floors poured on steel beams for supports. Beneath the ground level floor, there is a shallow cable vault, which also is floored with concrete, and is used to bring the underground cables into the tower. This vault is provided with a drain. Each tower is heated with hot water radiators connected to a coal-burning Arcola heater on the ground floor.

Fire risk was also reduced by the use of synthetic in place of rubber insulation for power wires, the underground rubber covered cables being terminated near the first floor level.

Brick, Concrete and Asbestos

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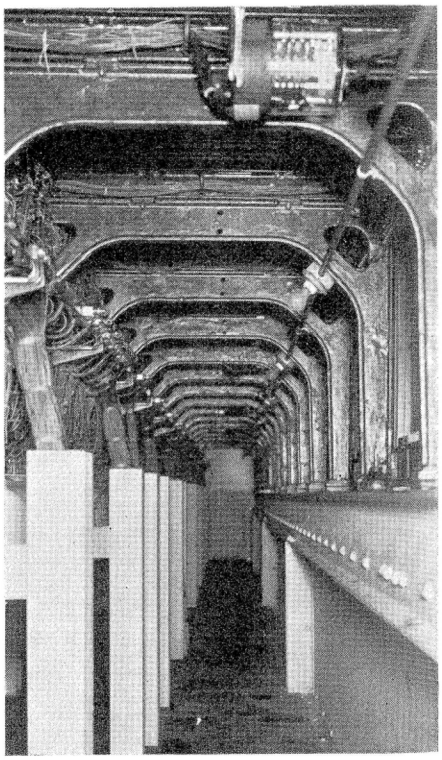
On July 22, 1940, Tower No. 1 at the Union Station in St. Louis, Mo.,

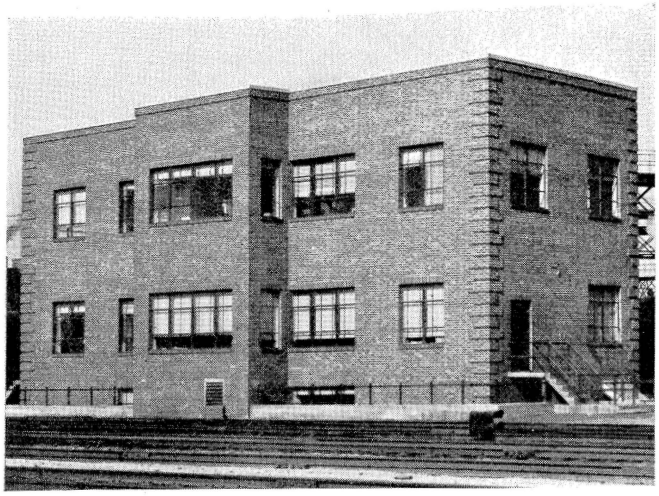


Enclosed pit beneath machine

was destroyed by fire, which started from some unknown cause near the ground floor of the building. This tower, constructed in 1903, had a

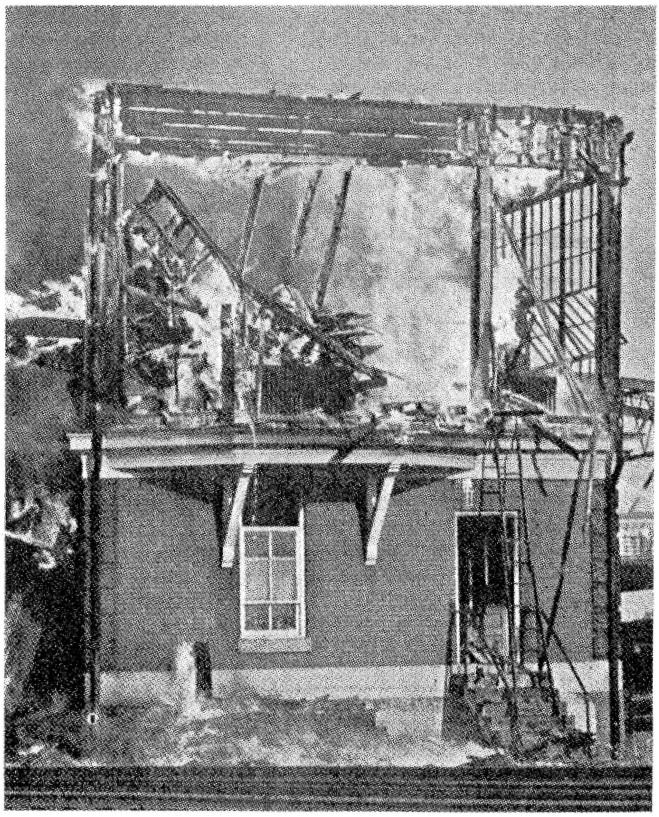
(Continued on page 382)

concrete foundation, with brick wall for the first story. Frame construction, with windows on all four walls, was used for the second story. The floors were wood on wooden beams, and likewise the partitions, stairway, etc., were of wooden construction.



The new tower at St. Louis was built of concrete, brick, steel and asbestos

After the fire, the wreckage of the old tower was removed and a new tower was built using fireproof construction throughout. The foundation and floors are reinforced concrete and the walls are acoustic ceiling material which is fireproof. All partitions, as well as terminal boards are of sheet asbestos on steel uprights. Metal door frames, doors, window frames and sash are used throughout. Even the venetian blinds are made of metal with chain connections.



The upper story of the old tower was of frame construction and was destroyed quickly. Picture by St. Louis Post-Dispatch

Approximately 200,000 ft. of No. 16 flexible insulated wire was required for interconnections inside the tower. This wire is insulated and protected by a 2/64-in. layer of synthetic rubber with no braided covering, and this material will not support combustion. About 400,000 conductor feet of 19 conductor cable was required, for replacement, between terminals in the tower and the new terminal boxes located approximately 50 ft. from the tower, these runs being in underground pipe conduits. The conductors have 3/64-in. Okolite and 1/64-in. Okoprene insulation and are cabled with braided asbestos overall.

Inside the tower the wire chases are made up of sheets of asbestos board bolted to angle iron. Under the interlocking machine there is a pit about 3 ft. deep and full width and length of the interlocking machine. This pit provides easy access to practically all electrical apparatus and connections in the machine and provides an effective barrier to fire from without.

At the present time others are being fireproofed.

Wooden towers are being protected with asbestos sheeting inside and out, asbestos sheeting is being applied to ceilings in brick towers, all wooden wire ducts are being replaced with asbestos and steel, and tower terminal cases are being lined with sheet asbestos.

As Applied to Existing Frame Towers

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Superintendent Telegraph & Signals
Norfolk & Western
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During the latter part of 1941, the Norfolk & Western made an analysis of the possible fire hazard in various types of buildings including interlocking towers of frame construction, of which there are about 30 on this railroad. Early in 1942, a program was adopted to make these buildings as nearly fireproof as practicable. The work was completed at three of the towers in 1942, and the program is being continued.

The first among the interlocking towers to be fireproofed was that on the main line at Walton, Va. Since this is typical, both in character of original construction and methods of fireproofing, a description of the work done at this location will suffice to give an idea of the practices used. However, several items of the work at Walton involved the use of metal, which, because of war time shortages could not be repeated elsewhere, and had to be revised or omitted. These exceptions will be noted in the text.

The interlocking tower at Walton is a two-story structure, 17 ft. 8 in. by 23 ft. 8 in. in plan, and has a gable-type roof. The first floor and the foundation are of concrete but otherwise the tower is of frame construction throughout. On the exterior the walls, prior to being fireproofed, were covered with 1-in. by 6-in. pine lap siding, while on the interior the walls and ceiling consisted of 7/8-in. by 2-in. tongue-and-groove material. The second story had a maple floor on a pine sub-floor laid on 3-in. by 10-in. joists, while

(Continued on page 384)

the roof, consisting of tin on 1-in. by 6-in. sheathing, is supported by 2-in. by 6-in. rafters. Access to the second floor is obtained by means of an outside stairway at one end of the building, which, before the fireproofing work was done, was of wood construction with a timber enclosure at the second-floor landing. All window sash in the structure were of wood.

Method of Fireproofing

In fireproofing this tower, all of the old siding on the exterior walls was removed and replaced with asbestos shingles laid on slaters felt and with a felt backer strip behind each vertical joint. Since the roof was already covered with tin, this was considered to be adequate protection against fire and no changes were made in this part of the structure. On the interior, the existing wood walls and ceilings were removed and replaced with ¼-in. asbestos board and, for decorative purposes, a quarter-round wood strip was inserted in the fillet at the base and top of each wall surface. A measure of the thorough manner in which the fireproofing was carried out is given by the fact that all exposed surfaces of the window frames, inside and out, were covered with ⅛-in. Transite. In addition, a strip of exterior wood trim at the top of each window was covered with tin flashing.

As a further measure of protection, the spaces between the studs in the walls and partitions were filled with rock wool, and a four-inch layer of the same material was inserted between the ceiling joists on both the first and second floors. In addition, the old maple floor on the second floor was taken up and a layer of sheet tin was applied over the subfloor, after which a new maple floor was put down. In subsequent projects it has been the practice, because of the shortage of tin, to use a ¼-in. thickness of asbestos board for this purpose. An additional feature of the fireproofing work was the replacement of all the wood sash with steel sash, those in the second floor windows being of the double-hung type while in the first floor windows the sash are horizontally pivoted. Here again wartime material shortages have forced a change in policy; in carrying out more recent fireproofing projects, the existing wood sash have not been changed out.

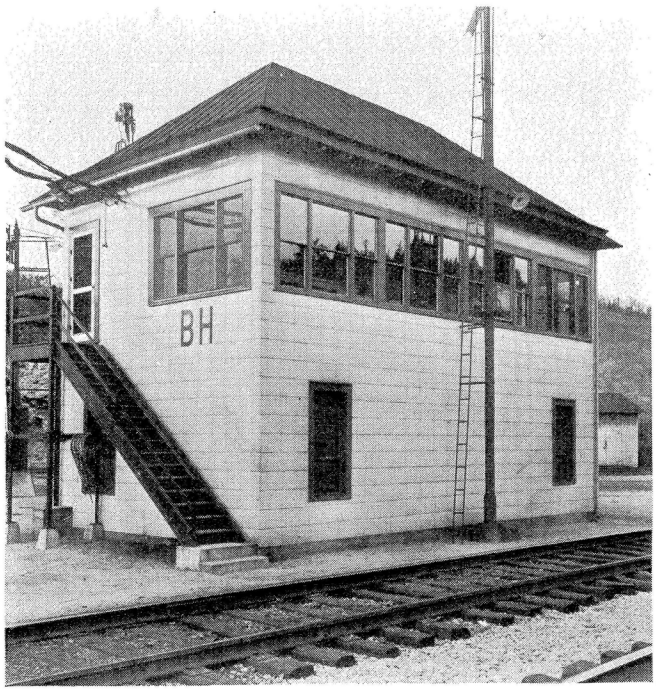
Still another phase of the fireproofing work at the Walton tower was the replacement of the outside wood stairway with one of all-metal construction. In the new stairway the horses are of 10-in. channels, with metal treads and risers, and the hand-rail, including the posts, is made of structural angles. At their upper ends, the stair horses frame into a structural tower, embodying four posts made of angles, which also carries the landing. The latter consists of a metal plate deck supported on 10-in. channels spanning between the posts, and has a handrail of steel angles along its two exposed sides. Concrete foundation piers were provided for the tower posts and at the lower ends of the stair horses.

When the fireproofing work had been completed, the Walton tower was attractively painted inside and out. On the exterior the color scheme consists of a light gray body with brown trim; on the interior the walls are light tan and the ceilings ivory. Since this is the standard color scheme on the Norfolk & Western, it is, of course, being followed on all the other fireproofing projects.

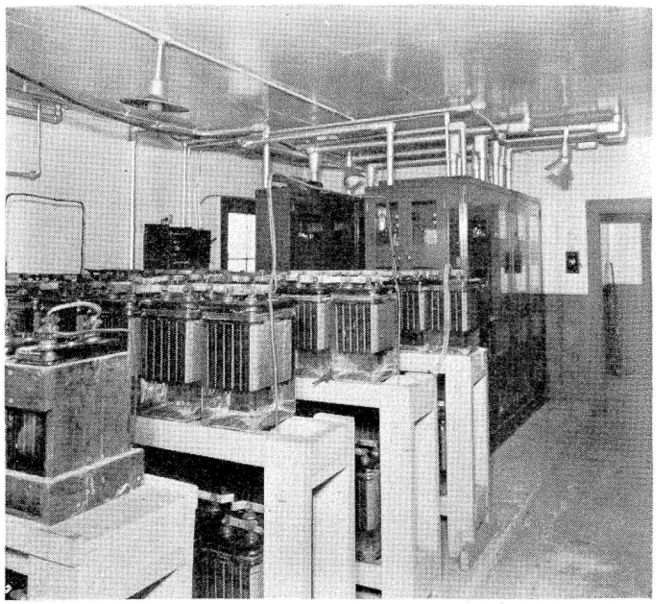
It is apparent from the foregoing description that the fireproofing work is being done in such a manner as to effect a definite enhancement in the appearance of the structures, although this result is entirely incidental to the primary objective.

Several years ago, the Railway Company started a modernization program involving automatic signals and interlocking. Where this modernization has been completed, rigid metal conduit or metal ducts are used to enclose all signal wiring in the tower between the interlocking machine and the instrument cases. All instruments are placed in sheet metal cases with glass window doors. The equipment is thus protected from dust and dirt and also from a minor fire which might originate in the tower.

By treating its interlocking towers in the manner described in this article, the N. & W. is convinced that it is rendering them virtually invulnerable to destruction by fire. The program is being carried out under the general supervision of W. P. Wiltsee, chief engineer, A. B. Stone, assistant chief engineer, and W. L. Young, bridge engineer. All of the work involved is being done by Norfolk & Western forces.



Reconstructed tower at Walton



Interior of ground story showing the new sheet-metal relay cases