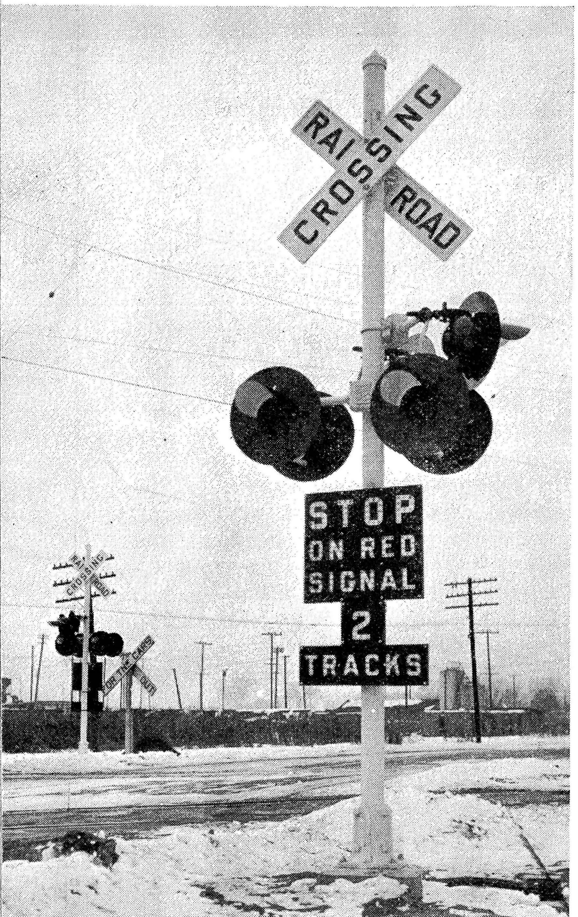


$500,000 Crossing Protection

Federal funds used effectively to provide automatic signals at 264 crossings and reflector crossbuck signs at 420 crossings

THE STATE OF ILLINOIS is now completing an extensive program of highway-railroad grade crossing protection, involving a total of 684 crossings, at a total cost of $500,000. These funds were allocated for this purpose by the Honorable Henry Horner, Governor of Illinois, from money appropriated to the State by the Federal government under the second National Recovery Administration Act. Under the direction of the Governor, the program was formulated and carried out by the cooperative efforts of the Illinois Commerce Commission, B. F. Lindheimer, Chairman, and the Department of Public Works and Buildings, Division of Highways, Ernst Lieberman, Chief Highway Engineer, with official Federal approval of the projects by Thomas H. MacDonald, Chief of the Bureau of Public Roads of the Department of Agriculture. The various railroads cooperated in the project, acting through committees of law and engineering representatives.

Although about 24 other states have similar programs of crossing protection, the Illinois project is by far the most extensive, and includes numerous interesting methods in the choice of crossings to be protected, in the preparation of plans, estimates, the purchase of materials, and the handling of the construction.

The State of Illinois, with 54,991 square miles of area, has 12,262 miles of railroad and 97,614 miles of highways and roads (exclusive of city streets). This network of railroads and highways results in a total of some 18,031 highway-railroad crossings at grade.

Although the railroads at their own expense, either voluntarily or at the order of various governmental bodies, have installed various forms of protection, only some 3,546 crossings had previously been protected by other than fixed crossbuck signs. Of this 3,546 total, gates were in service at about 724 crossings, watchmen full-time at about 83, part-time, less than 24 hours, at 529, while automatically-controlled signals, including bells, wig-wags or flashing-lights, were in service at about 2,210 crossings. Thus of the total of 18,031 crossings, 14,485 were protected by fixed signs only.

General Consideration of the Problem

The extensive programs of improving highways throughout the state during the past decade, coupled with the rapid development of motor vehicles, has resulted in phenomenal growth in the traffic on the highways, and, furthermore, the increased speed of highway vehicles during the past few years has further increased the hazard at highway-railroad crossings.

During the first six months of 1935, there were 166 accidents between highway vehicles and trains at crossings in Illinois, the largest number for any state; Ohio being next, with 157 accidents. Of the accidents in this six months in Illinois, 103 cases, involving trains striking motor vehicles, resulted in death to 48 persons and injury to 115 others. In 63 other accidents, motor vehicles were driven into the side of trains, resulting in death to 18 persons and injury to 106 others. Having considered these problems, the State of Illinois decided that a fair percentage of the money appropriated by the Federal government for the improvement of safety on highways might well be spent for protection at railroad crossings, thereby effecting a greater proportionate improvement in safety than could be accomplished by spending the same amount of money to separate grades at a few locations.

Having an allotment of $500,000 for the installation of protection, the next problem was to choose the most hazardous from some 14,000 crossings in the state not previously protected adequately. To evaluate definitely the hazard at crossings, a method and formula were worked out especially for this project. This formula was proposed by Warren Henry, Assistant Chief Engineer of the Illinois Commerce Commission, and was developed in conference with the general engineering committee representing the railroads and the two state agencies. Numerous applications of the formula showed results that seemed to be fairly well indicative of relative hazard, but nevertheless the index of hazard as determined by this formula was regarded as a guide for judgment rather than as a limitation upon judgment, and the final selections, while very generally in line with the results of the application of the formula, represent also a degree of independent judgment.

Formula Developed for Determining Hazard

The method for determining hazard rests upon these general propositions:

First, that there are two principal elements in the hazard to the public at a grade crossing, (a) that rising from the physical conditions, such as obstructions to view, steep grades, intersecting highways, and sharp curves on the approach, and (b) the volume of traffic both on the highway and on the railroad that passes over the crossing.

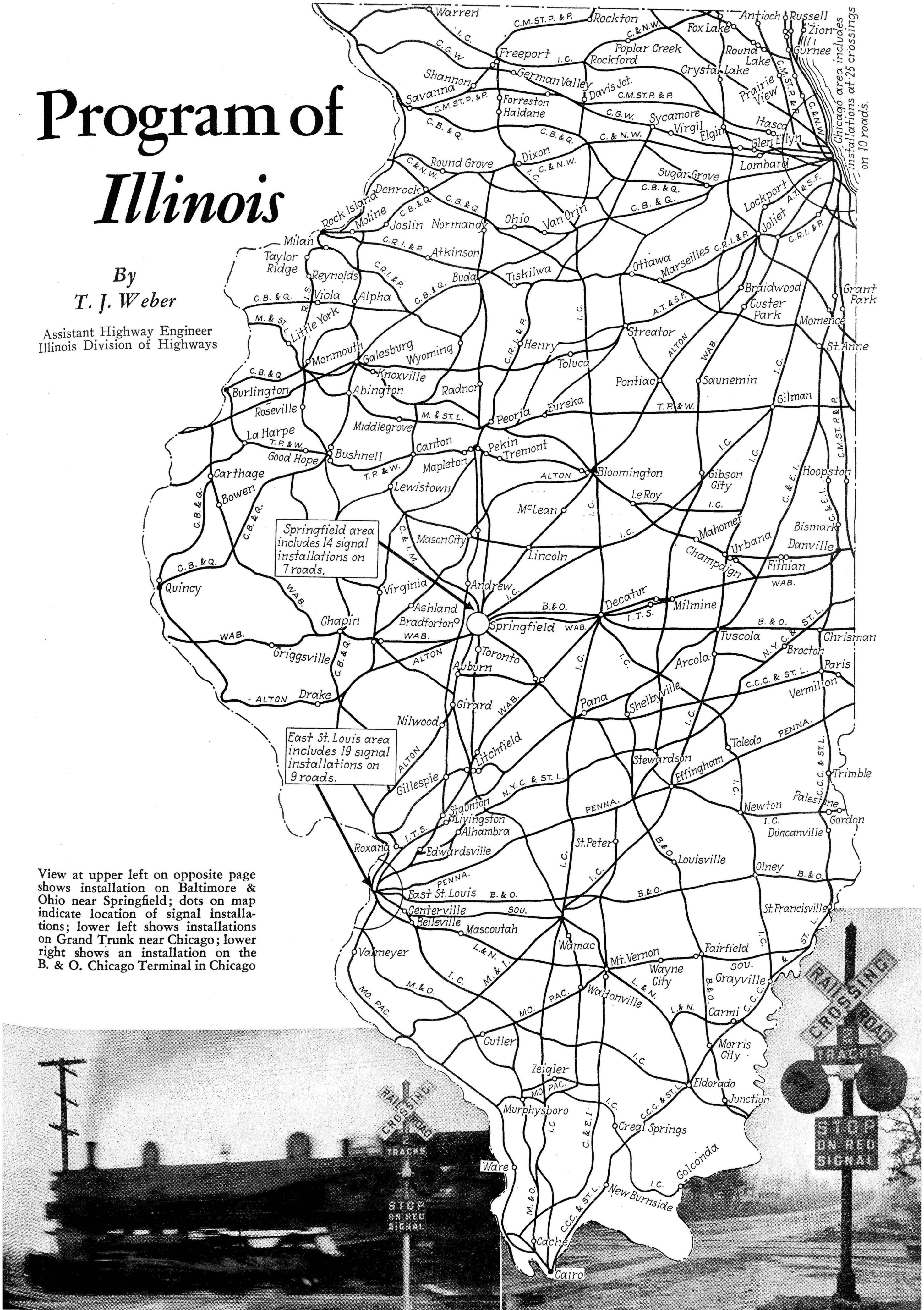
Second, that the degree of hazard to each individual traveler for a given set of physical conditions increases substantially in proportion to the number of trains per day moving over the crossing, and that the danger to the general public increases in proportion to the number of highway travelers per day.

Thus, with respect only to vehicular traffic, the index of hazard (IH) = the product of factors representing

Program of *Illinois*

By
T. J. Weber

Assistant Highway Engineer
Illinois Division of Highways



View at upper left on opposite page shows installation on Baltimore & Ohio near Springfield; dots on map indicate location of signal installations; lower left shows installations on Grand Trunk near Chicago; lower right shows an installation on the B. & O. Chicago Terminal in Chicago

Federal Aid Highway Crossing Signal Projects in Illinois

* Indicates multiple track
† Bell provided

Road and Nearest Town	State Route or Street
Alton	
Ashland†	125
Auburn*†	104
Braidwood*	113
Drake*†	SA 11
Girard*	4
Lockport*	16th St.
Mason City*†	120
McLean	119A
Nilwood*†	4
Pekin	24
Pontiac*	116
Pontiac*	Madison St.
Pontiac*	Washington St.
Pontiac*	Main St.
Springfield*	Ash St.
Alton & Southern	
Madison	SA-9
A. T. & S. F.	
Galesburg*	8 & 14
Galesburg*	Broad St.
Galesburg*	Linwood Rd.
Joliet*	Brandon Rd.
Streator*	Livingston St.
Toluca*	116A
B. & O.	
Bradforton	125
Chrisman*	1
Decatur	121
Fairfield*	15
Junction	13
Lebanon*	150
Louisville	25
Norris City*	140
Springfield*	SA4
Taylorville*	104
Virginia*	78
B. & O. C. T.	
Chicago Ridge*	42A
Cicero*	50
Dolton*	SA184
Evergreen Park*	SA171
Harvey*	49
Phoenix*	53
C. & E. I.	
Bismarck*†	SA15
Grant Park*†	1
Hoopeston†	9
Mt. Vernon*†	142
Pana†	2
St. Peters*†	185
Shelbyville*†	16
C. & N. W.	
Auburn*†	104
Athens† (Barr)	24
Buda*†	SAG
Crystal Lake*†	Crystal Lake Ave.
DesPlaines*†	Oakton Rd.
Dixon*†	89
Glenview*†	SA-173
Mason City†	120
Normandy*†	92
Poplar Grove	76
Radnor*†	174
Richmond*†	173
Round Grove	SA 16
Wadsworth*†	SA 17
Zion	Camp Logan Rd.
C. & I. M.	
Andrew*	SA1A
G. T. W.	
Evergreen Park*	SA 171
Harvey*	49
Lansing*	SA 69
C. B. & Q.	
Alpha	83
Bushnell	9
Bushnell	95
Canton*†	9
Carthage*	9
Chapin	104
Denrock*	3
Joslin*	.....
Knoxville	91
Lewistown†	31
Monmouth	3
E. Moline†	80
Ohio*	80
Quincy	SA 1
Roseville	97
Savanna	80
Sugar Grove*†	47
Waltonville*†	148
Wamac*	2
Wyoming	30
Van Orin	92
Viola†	85
C. C. C. & St. L.	
E. Alton*	3
St. Anne*	1
New Burnside*	166
Carmi*	14
Ducanville	1
Eldorado*	142
St. Francisville	137
Livingston*	4
Livingston*	SA-3A
Litchfield	16
Litchfield*	16
Paris*	16
Trimble*	1
Vermilion	Church St.
C. M. St. P. & P.	
Byron*†	Colfax St.
Chaneyville*	9
Deerfield*†	Hazel Ave.
Davis Junction*†	72
Elgin*	SA 13
Freeport	5
Freeport	26
Fox Lake	SA 7
Fox Lake	Oak St.
Glenview*	SA 110
Grays Lake	SA 7A
Gurnee*	SA 20
Hainesville*	20
Itasca*	Walnut St.
Itasca*	Maple St.
Lake Forest*	Conway Rd.
Momence*†	1
Momence*†	114
Medinah*†	SA 24
Round Lake	SA 12
Russell	SA 19
Rockton	2
Shannon	72
Spaulding*	Gravel Road
Wadsworth*	173
Wadsworth*	Main St.
C. R. I. & P.	
Atkinson*†	82
Henry*†	89C
Midlothian*†	SA 189
Milan†	3
Marseilles*†	Glen Ave.
New Lennox*†	SA 52
Orchard Mines*†	9A
Oak Forest*†	U.S. 6
Oak Forest*†	Central Ave.
Oak Forest*†	167th St.
Ottawa*†	Gravel Rd.
Peoria*†	Darst St.
Peoria†	29
Robbins*†	189th St.
Tinley Park*†	Belleview St.
Tiskilwa*	89
C. G. W.	
German Valley	SA 10
Gretna	Bloomingdale Rd.
Glen Ellyn*	.....
Lombard*†	Charlotte
Lombard	.....
Virgil*†	.....
Sycamore	SA 3
Illinois Central	
Tuscola*†	121
Gordon†	1
Grayville	138
Ware*†	146
Effingham†	25
Gilman	8
Decatur†	2
Cairo*†	2 & 150
Alhambra*†	160
Olney†	12
Mason City*	24
Creal Springs*†	166
Lincoln*†	120
Warren†	Burnett Ave.
Springfield*†	10
Arcola*†	133
Newton†	130
Hillside†	SA 16
Toledo†	131
Herrin*†	148
Belleville*	3rd & Monroe St.
Litchfield	126
Springfield*†	SA 11
Pontiac*†	Main St. Ext.
Forreston*†	72
Palestine†	163
Haldane†	77
Golconda	146
Toronto*†	SA 5E
Indiana Harbor Belt	
Chicago*	Crawford—51st
Illinois Terminal	
Bloomington*	122
Decatur	2
Edwardsville	159
Fithian*	49
Gillespie	4
Milmine*	SA 7
Roxana*	159
Springfield*	SA 4
Springfield*†	SA 11
Litchfield & Madison	
Edwardsville*	159
Madison	SA 9
Peters	157
Staunton	4
Louisville & Nashville	
Mascoutah*	150
Michigan Central	
Chicago Heights*	22
Minneapolis & St. Louis	
Middle Grove	97
Abingdon*	41
Little York*	94
M. St. P. & S. Ste. M.	
Antioch	173
Prairie View	SA 22
Missouri & Illinois	
Hoyleton	153
Missouri Pacific	
Dupo*†	3
Cutler†	151
Valmeyer*†	156
Zeigler*	148
Mobile & Ohio	
Cache†	150
Murphysboro*†	144

Road and Nearest Town	State Route or Street
N. Y. C. & St. L.	
Edwardsville	159
Peters*	157
Alhambra*	160
Madison	SA 9
Stewardson	129
Brockton*	49
Penna.	
Millersburg*	11
Dolton*	SA 187
Burnham*	SA 187
Peoria & Eastern	
Bloomington	122
Fithian	49
Leroy	119
Mahomet*	47
Pekin	24
Tremont	121
Rock Island Southern	
Taylor Ridge*†	84
Reynolds*†	3
Southern	
Belleville†	159
Belleville†	15
Brooklyn*†	4
Centerville	157
Fairfield†	140
Mt. Vernon†	15
Scott Field	SA1
Wayne City*†	142A
St. Louis Terminal	
Dupo	3
E. St. Louis*	12
Granite City	3 & 4
Monsanto*	3
Venice	3 & 4
T. P. & W.	
Orchard Mines*	9A
Bushnell	9
Mapleton	9
LaHarpe	95
El Paso*	2
Good Hope	3
Eureka*	117
Wabash	
Jacksonville*	78
Urbana	25
Bowen*	99
Gibson City	47 & 48
Bement*	10
Milmine*	SA 7
Griggsville*	107
Saunemin*	116
Edwardsville*	112
Custer Park	113
Litchfield*	126
Springfield*†	Enos Ave.
Springfield*	Laurel St.
Springfield*	Reynolds St.
Champaign*†	Market St.
Champaign*	Washington St.
Jacksonville*†	Clay St.
Urbana	Main St.
Chicago*	87th & Crawford
Taylorville*	Michael St.
Urbana	Green St.

three things, namely, the number of highway vehicles, the number of trains, and the hazard arising out of physical conditions.

With respect to the hazard arising out of physical conditions (with respect to vehicles) this is considered to be the sum of four general elements which make for hazard. These are the inherent hazard, always present at every grade crossing, the view factor (F1) or danger arising by reason of obstructions to view, the attention factor (F2), being the conditions which may affect the attention of the driver, and the user factor (F3), which covers in particular, manner of use of the crossing either by the railroad or by the highway traveler which affects the hazard.

These four factors are given maximum weights as follows: Inherent factor 1, view factor 4, attention factor 4, user factor 1,—total 10. The number of vehicles and the number of trains were assigned weights according to their volume up to a maximum of 10 in each case.

The formula for vehicular traffic is then as follows: Index of hazard (IH) = VT (1 + F1 + F2 + F3), where V is the volume of vehicular traffic and T the volume of train traffic. The numeral I, being the first term within the parenthesis, represents the inherent hazard. Theoretically, the maximum values that could be assigned would be as follows: IH = 10 × 10 × (1 + 4 + 4 + 1) cr 1000, however in practical application very few crossings are found to have an index above 200, and most of them are below 100.

The hazard for pedestrian traffic is determined separately, and the amount so determined added to the vehicular hazard. The formula is derived in similar manner, being the product of factors representing the number of pedestrians and the number of trains multiplied by the sum of factors representing the inherent hazard and any special pedestrian hazard (F4). The formula for pedestrian hazard is IH = PT × (1 + F4) where P is an index representing the number of pedestrians and T represents the volume of train traffic as before.

In selecting the crossings to be protected, a study of the situation indicated that if the list of crossings selected for protection be confined to those now wholly without any protection whatever, it would be necessary to omit many of the most dangerous crossings in favor of other crossings of comparatively small hazard.

Therefore, a number of the new signal installations are at crossings previously protected manually part time, while at certain crossings inadequate automatic protection, such as bells, were replaced by signals. Where the signals replace watchmen, the railroads are under obligation to transfer these men to other crossings, thus affording full-time protection, where such was not the case previously, or to provide improved safety at crossings not previously protected.

A total of 700 crossings were selected for special investigation, traffic studies and photographs being made at these crossings by the district engineers of the Division of Highways, the count being based on 48-hour periods, covering week days, Sundays and holidays. Allowances based on previous records were made for seasonal variations. Further crossings were proposed for study by the railroads and by various public bodies and officers.

Tentative estimates made by the state showed that $500,000 should provide signals at 275 crossings. When applying the formula to the field data, 264 crossings having a hazard index ranging from 40 to 420 were selected for the installation of signals, and it was decided that $25,000 of the appropriation be spent to improve safety at 420 of the remaining crossings by installing two new improved type crossbuck signs equipped with button-type reflectors at each crossing. The final selection of crossings to be protected was made by engineers of the Illinois Commerce Commission and the Highway Division in cooperation with representatives of the railroads. The crossings selected, while not deliberately apportioned, either among the railroads or the counties, are well distributed. The signaling and sign installations are located on 33 railroads in 94 counties.

Procedure of Program

With the program thus established, the next steps were to determine uniform standards, prepare estimates and plans, and obtain necessary approval of Federal authorities, then to make purchases of materials and contracts for the construction of the signals, and to make inspections. The necessary formal orders were issued by the Illinois Commerce Commission, and the details of the purchase of materials and awarding of contracts were carried out by the Division of Highways. The general engineering work in connection with the entire project was promoted by a joint committee of railroad* and state engineers.

The specification was based on the use of the standard A.A.R., Signal Section flashing-light signal with "Stop on Red Signal" reflector sign as shown on page 11 of Bulletin No. 2 of the A.A.R. Joint Committee on Highway Grade Crossing Protection. However, the Illinois specification went further as to details. Standard full-size lamp units with a 8⅜ in. lenses were required for the back lights as well as the front lights on each signal. The lamp, using a silvered glass reflector, is so designed that the focal point is located forward of the outer edges, the purpose being to provide adequate spread, range and

*Editor's Note—The committee of signal engineers included Messrs. Wyant, Gault, Morgan, Porter, Sheets, Stoltz and Zane.

a minimum of sun phantom. Based on the fact that many of the highways approach tracks at angles, it was specified that the lamp units have a reasonably uniform distribution of light over an area of 15 degrees on each side of the axial line of the lamp, this 15 degrees being considerably in excess of the A.A.R. requirement of 3 degrees. When using a 10 watt bulb, each lamp unit must have a range of at least 800 ft., when observed on a clear day with a bright sun at or near the zenith.

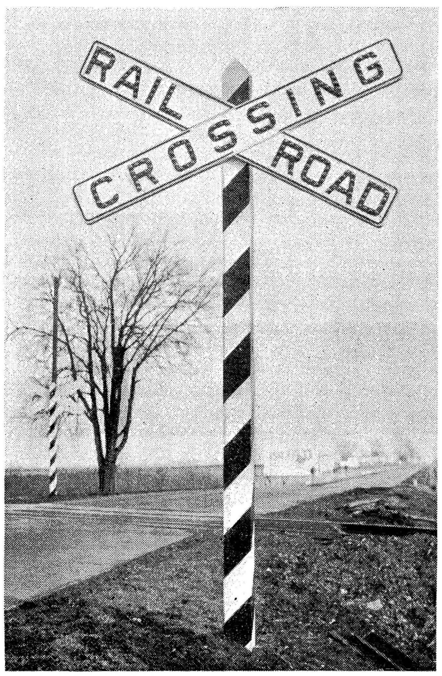
Each lamp unit is equipped with 1¾-in. clear glass peep holes in each side. The masts are 4 in. standard weight pipe, not less than 12 ft. 10 in. high, set in cast-iron bases on concrete foundations. A bell is provided on one signal at only such crossings as in the judgment of the railroads, and as approved by the state, pedestrian traffic will be afforded protection by this auxiliary warning. Of the 264 crossings protected by signals, bells are furnished for 90 crossings.

All control circuits are designed to provide a minimum of 20 seconds operation of the signals prior to the arrival of the fastest train at a crossing. The signals operate for trains run in either direction, on any track of multiple-track main lines. The signals continue to operate until the rear of the train clears the crossing, this result being effected by staggered insulated joints where practicable, but in automatic block territory a separate track circuit was provided over a crossing. Where passing tracks or sidings parallel the main line, separate track circuits were provided so as to operate the signals when the crossing is occupied by cars on these sidings This provision was omitted in the case of unimportant tracks, where switching is done entirely in day time, and movement protected by train crews.

Standard track circuits were provided for the control of the signals with the exception of those of one road, and even on electric lines, track circuits, including the expense of impedance bonds, were used in preference to trolley contactors. On the A.T. & S.F., the use of rail-depression controllers was permitted in lieu of track circuits in some cases, because of the high cost of introducing track circuits in the train-control cab-signaling system.

Plans and Estimates

Based on these specifications the signal department of each railroad prepared a track plan, circuit diagram, and estimate of material and labor for each of the proposed installations. The next problem for the Division of Highways was to get all of these 264 sets of track and circuit diagrams in a standard form for submission to the Bureau of Public Roads. To redraw those 528 plans on standard 18 in. by 22 in. tracings would have caused a serious delay in the execution of the program. The problem was solved by preparing two sets of plans. One plan 18 in. by 22 in., to show the location of all the crossings involved in a project, included a small sketch showing the location of the signals with respect to the track at a typical crossing, and a map of Illinois with dots to show the locations of the proposed installations. The second plan, on the same size sheet, included a small sketch of a completely assembled flashing-light signal, and seven separate circuit diagrams, each typical for application



Face side of cross-buck sign with button reflectors

under certain conditions as to number of tracks, with or without automatic signaling in service, use of staggered joints or the short track circuit at the crossing, etc. These two standard size plans were accompanied by explanatory sheets listing each installation by number, together with an explanation as to the number of tracks involved at the crossing, and a statement as to whether a bell was to be used as auxiliary protection.

Three sets of plans, prepared as just explained, were required because the entire program was divided into three projects, one for the installations located at crossings on primary state highways, crossings on primary and state highways located within municipalities, and crossings located on secondary roads. Thus the entire proposition to be submitted by Illinois, Division of Highways, to the U.S. Bureau of Public Roads consisted only of the three sets of two plans each, together with a combined list of materials and labor for the entire program.

Purchase of Materials

Having received approval from the Bureau of Public Roads, the next step was the purchase of materials and arrangement for construction. Based on the theory that the state could purchase materials in large quantities more cheaply than the separate roads could do so in small quantities, the state decided to buy the major items of material.

All materials of a similar character, such as the signals, were assembled into one master estimate, and various manufacturers were asked to submit bids on the total number of each unit required for all of the installations. The contract to furnish the signals complete with mast, base, pinnacle, "STOP ON RED SIGNAL" sign, etc., was awarded to the Western Railroad Supply Company. On some items, such as relays, rectifiers, transformers, etc., where the prices quoted by two or more companies were equivalent, each railroad was permitted to have its choice so as to conform with its standard practice, this business being about equally divided between the Union Switch & Signal Company and the General Railway Signal Company. Alternating-current was available at a large percentage of the locations and the majority of roads preferred to use the a-c. floating system of power supply for the signals and these roads were permitted to choose between Exide lead storage cells and Edison iron-alkaline cells. Furthermore, some roads, such as the Southern, preferred to use the a-c. primary system, and were allowed to make such a choice. At a considerable number of the locations no alternating-current power supply was available, so the straight primary system of power supply was used; for example, at Haldane on the I.C. On two of the project groups, the Edison primary battery was furnished while on the third group Waterbury primary battery was furnished.

The underground cable was furnished according to A.A.R. Signal Section specification No. 14532, but without lead sheath. The multiple-conductor cable has metal tape protection in the covering, but the single-conductor for track connections has no metallic protection. Several manufacturers quoted about the same price for the cable and other insulated wire for case wiring, and, in order to distribute the money as much as possible, the orders were divided about equally between the following manufacturers: Okonite, Habershaw, General Cable, and General Electric.

On account of the variations in sizes and types, as well as the uncertainty as to quantities required, certain materials were furnished direct by the railroads from their stocks; these included insulated rail joints, concrete materials, terminals, arresters, tags, etc. The original estimates included an amount for these materials, and when the installations are all complete each road is to render an account for these items and be reimbursed by the State.

Construction by Railroad Forces

A study of the situation showed that the railroads were well prepared with trained men and special equipment peculiar to this class of work, to perform the field construction, and could, no doubt, handle this work more efficiently than any contractor. An important consideration was the element of safety in train operation requiring men familiar with the hazard of working on tracks under traffic. Furthermore, there was the factor of safe train operation where crossing protection circuits were being introduced in block signal territory. Therefore, each road was authorized to proceed with the construction of its installations on a "force account, actual cost" basis. The manufacturers which had been awarded contracts for materials were then directed to ship the required quantities to each road, one central receiving point being established for each road.

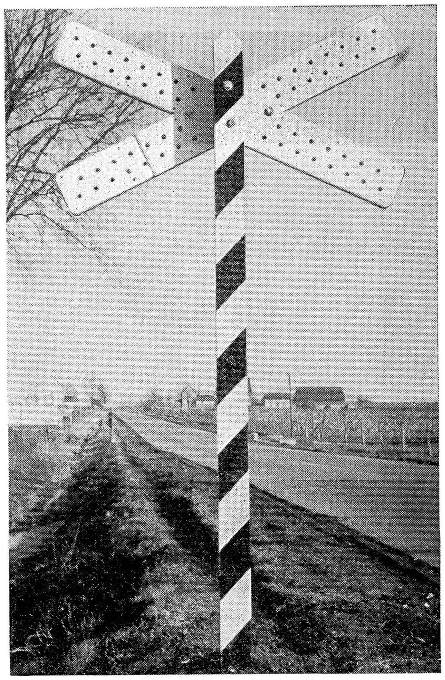
The abnormal and extended cold weather has delayed construction forces. However, about 50 per cent of the signaling installations are now in service.

Legislation to Force Observance of Signals

Heretofore, there has been no particular requirement of law placing obligation upon drivers to observe highway-railroad crossing signals. At the last session of the Illinois legislature, the motor vehicle act was amended so as to require the driver of a vehicle to come to a stop short of a crossing wherever an automatic signal or device indicates the approach of a train, and not to proceed until it is safe to do so. Observation of the indication given by the signals is, therefore, obligatory, the same as at a state highway, a boulevard, or a traffic signal.

Reflector-Type Cross-buck Signs

As mentioned previously, $25,000 of the appropriation was used to install reflector type crossbuck signs of new design at 420 crossings where further protection was needed but where signals either were not appropriate or could not now be furnished because of a lack of funds. Two signs are erected at each crossing, one at the right of the highway approaching the track from each direction.



Rear side of sign showing reflector buttons

These reflector type signs are purposely similar in aspect to the familiar painted wooden crossbuck signs used for many years at railroad crossings, but they include several features which provide additional protection. The design is the outcome of extensive tests made by engineers of the Commerce Commission. The outstanding features are the liberal use of reflector buttons, giving a brilliant night indication by reflection of the beams of automobile headlights, and the fact that each sign gives such an indication in both directions along the highway. The latter feature apparently is novel in such signs. Three reasons are advanced for the two-way night indication as a result of the experimental work: First, that the marking of the crossing is more conspicuous and attention-getting with an illuminated crossbuck on each side of the highway, giving something the aspect of a gateway; second, the view of a single sign to an approaching motorist may be obstructed by a truck or other vehicle ahead of him, and the rear indication of the other sign then affords a warning; third, at many points where a dark train is moving over the crossing at night the motorist gets a flash from the reflectors on the further crossbuck, through the spaces between ends of cars, and thus may be apprised of the presence of a dark train before he picks it up with his headlights. Numerous accidents have occurred through such a dark train being discovered by a motorist too late to stop.

Full-sized experimental models of these signs were put to many tests before the final design was accepted, and these tests show that the new signs provide an effective day and night marking of the crossings. The blades of the sign, which are formed of No. 16 gage copper-bearing sheet steel, are 9 in. wide and 6 ft. long and set at an angle of 50 degrees. The letters are black on a white background 6 in. high with 1-in. stroke, and narrow black striping extends around the edges of the sign. The corners of the sign are rounded. The letters are set with button type reflectors at standard spacing, 175 such buttons being used in the face of the sign. In addition, 60 such reflector buttons are inserted in the rear of each sign, these buttons being arranged in two rows and approximately 4 diameters apart with staggered spacing. The buttons are of clear glass, the large size being approximately ¾ in. diameter at the face of the sign. These signs, complete with reflector buttons, were furnished by the Peerless Manufacturing Company, Louisville, Ky.

Each sign is attached by two ¾-in. bolts to a 6-in. by 6-in. by 14-ft. post made of yellow pine treated with Wolmar salts preservative. The signs were installed by the forces of the Division of Highways, proper caution being taken to locate the signs at the proper height and angle to be most effective. Each sign installed complete cost about $27. Where the crossing includes more than one track, a button-type reflector sign, such as "2 TRACKS," is mounted just below the crossbuck, the additional cost being about $7.

Results to be Checked

Through the engineers of both state agencies, inspectors and highway police, a constant test and check of the effectiveness of the new crossing protection is being made. A detailed report is made of each accident, and from these records, further studies are to be made as to the most effective methods of improving safety at railroad-highway grade crossings.