

Illinois Central Continuous Train Stop Approved Without Major Exceptions

WASHINGTON, D. C.

WITHOUT any major exceptions, Division 1, of the Interstate Commerce Commission, has approved the first and second installations of the continuous train stop system of the Union Switch & Signal Company on the Illinois and Iowa divisions of the Illinois Central, the former between Champaign, Ill., and Branch Junction, 121.8 miles of double track, and the latter between West Waterloo, Iowa, and Fort Dodge, a distance of 97.5 miles of single track. On the first installation (Illinois division) there are 56 equipped locomotives and on the second, 38, making a total of 94 locomotives fitted with train stop equipment. A brief abstract of the reports covering these two installations follows. For a complete description of the wayside and locomotive equipment used in these installations which are operated without wayside signals, except at head block locations on the single track installation in Iowa, the reader is referred to page 301 of the August, 1926, issue of *Railway Signaling*.

Double Track Installation on Illinois Division

The cost of this installation, as reported by the carrier, covering wayside and locomotive equipment is as follows:

ROADWAY EQUIPMENT:

| | |
|--|--------------|
| Number of road miles equipped..... | 121.8 |
| Number of track miles equipped..... | 243.6 |
| Total cost of roadway equipment of train control installation, less power lines and power apparatus, if any, and less signals or cost of change in existing signal system, less salvage..... | \$109,222.01 |
| Total cost of power lines and power apparatus, if any, less salvage..... | 45,289.08 |
| Total cost of signal system installed in connection with train control, less salvage..... | |
| Total cost of changes in existing signal system made necessary by train control, less salvage..... | |
| Total all other roadway equipment costs, if any.... | 3,368.66 |
| Total cost of roadway installation..... | 157,879.75 |

LOCOMOTIVE EQUIPMENT:

| | |
|--|--------------|
| Number of locomotives equipped..... | 56 |
| Cost per locomotive equipped..... | \$ 2,458.10 |
| Total cost locomotive equipment installed..... | 137,653.60 |
| Total cost..... | \$295,533.35 |

Labor, material and device costs are included in each item.

As a result of this inspection and test, it was found that the installation meets the requirements of our specifications and order in *Automatic Train-Control Devices, supra*, and, therefore, is approved.

The Illinois Central is expected to comply with the following requirements as to maintenance, tests, inspection, reports, etc.

(1) Instructions, reports, and records in effect at the time of the inspection relative to tests of locomotive and roadside apparatus should be consistently observed and continued; all reports to be made on forms provided for that purpose and regularly forwarded by the inspectors to a designated officer.

(2) The forms provided for and used by enginemen in reporting failures of the apparatus and irregularities in the operation of the device should be continued and all such information should be reported in detail.

(3) In this installation, train stop protection for an open switch depends upon the proper operation of the switch box to shunt the train control current. Should the switch box become disconnected or out of adjustment, or should the contact springs be loose, broken or fail to make contact, or should one or both of the shunt wires leading from the track rails to the switch box become loose or broken, the train control track

current might not in some cases, and in other cases would not be effectively shunted so that the train could approach the open switch without receiving an automatic brake application or cab signal warning.

A condition of this kind was found during the final inspection and test, the switch box at the trailing point crossover switch at Watson, Ill., failing to shunt out the train-control track current, due to the contacts not closing. After adjustment, the switch-box shunt imposed a red indication on the locomotive until it was within 132 ft. of the reversed switch.

Further tests developed the fact that when the locomotive occupied the main track with no other train in advance in the block, a switch opened resulted in the display of a red cab signal until the locomotive was within a distance of from 962 to 330 ft. from the open switch, at which time the cab indication changed to green, this green indication being held until the receiver had passed the first lead joint, after which it changed to red. This condition was due to the relative capacities of the shunt imposed by the locomotive wheels and axles and that of the switch-box shunt. After adjustment and cleaning, the distances ranged from 264 ft. to 282 ft.

These cases indicate that since switch boxes and their connections to the track rails constitute a shunt circuit which if open or varied in value may affect the operation of the train control system under the circumstances described, they must, if depended upon, be so constructed, installed, inspected and maintained as to afford safeguards in accordance with the best engineering practice, to the end that the possibilities of a false clear failure may be reduced to a minimum. In other words, the installation must be such at all times that an open switch will cause a red cab signal indication to be displayed, and initiate an automatic brake application at such distance from the switch as to insure protection, maintaining this red cab-signal indication to a point which will afford ample protection. Should this arrangement be found unsatisfactory or impracticable to maintain, other means of protection must be applied.

(4) The conclusion was reached that the false-clear failures in connection with locomotives 1529 and 1962 at Tolono interlocker, on May 3, 1926, were due to the two east rails being short circuited through defective insulation on the switch-box wiring. The presence of stray or foreign current in the track rails could, under certain circumstances, cause serious trouble and this is mentioned here, inasmuch as it will be necessary to watch the matter and, should such trouble develop, to promptly employ adequate means for overcoming the difficulty.

(5) It is suggested that it may be found desirable to provide additional fouling protection at some or all of the industry and house tracks where derrails are used without being pipe connected or provided with switch boxes.

The Illinois Central is expected promptly and currently to inform us as to the progress made in conforming to all of the above stated requirements and recommendations.

Single Track Installation on Waterloo District of the Iowa Division

The cost of this installation as reported by the carrier covering wayside equipment and locomotives is as follows:

***ROADWAY EQUIPMENT:**

| | |
|---|--------------|
| Number of road miles equipped..... | 97.6 |
| Number of track miles equipped..... | 97.6 |
| Total cost of roadway equipment of train control installation, less power lines and power apparatus, if any, and less signals or cost of change in existing signal system, less salvage..... | \$207,107.00 |
| Total cost of power lines and power apparatus, if any, less salvage..... | 43,274.00 |
| Total cost of signal system installed in connection with train control, less salvage. (This includes installation of head block signals at passing tracks and route locking at seven interlocking plants) | 25,725.00 |
| Total cost of changes in existing signal system made necessary by train control, less salvage..... | |
| Total all other roadway equipment costs, if any.... | 5,149.00 |
| Total cost of roadway installation..... | \$281,255.00 |

***LOCOMOTIVE EQUIPMENT:**

| | |
|--|-------------|
| Number of locomotives equipped..... | 38 |
| Cost per locomotive equipped..... | \$ 2,449.18 |
| Total cost locomotive equipment installed..... | 93,069.03 |

*Labor, material, and device costs are included in each item.

The above figures show the cost of this installation as reflected in the accounts as of June 30, 1926, which may be subject to slight changes when the final analysis of the accounts is made. The final analysis of the accounts cannot be completed until all incidental work, such as adjustment of track circuits and guying of pole lines, has been finished.

As a result of this inspection and test, it was found that the installation meets the requirements of our specifications and order in *Automatic Train-Control Devices, supra*, and, therefore, is approved.

The Illinois Central is expected to comply with the following requirements as to maintenance, tests, inspection, reports, etc.

(1) Instructions, reports, and records in effect at the time of the inspection relative to tests of locomotives and roadside apparatus should be consistently observed and continued; all reports to be made on forms provided for that purpose and regularly forwarded by the inspectors to a designated officer.

(2) The forms provided for and used by enginemen in reporting failures of the apparatus and irregularities in the operation of the device should be continued, and all information should be reported in detail.

(3) In this installation, train stop protection for an open switch depends upon the proper operation of the switch box to shunt the train-control current. Should the switch box become disconnected or out of adjustment, or should the contact springs be loose, broken or fail to make contact, or should one or both of the shunt wires leading from the track rails to the switch box become loose or broken, the train-control track current might not, in some cases, and in other cases would not be effectively shunted, so that the train could approach the open switch without receiving an automatic brake application or cab signal warning. Since switch boxes and their connections to the track rails constitute a shunt circuit which if open or varied in value may effect the operation of the train control system under the circumstances described, they must, if depended upon, be so constructed, installed, inspected and maintained as to afford safeguards in accordance with the best engineering practice, to the end that the possibilities of a false-clear failure may be reduced to a minimum. In other words, the installation must be such at all times that an open switch will cause a red cab signal to be displayed and initiate an automatic brake application at such distance from the switch as to insure protection, maintaining this red cab-signal indication to a point which will afford ample protection. Should this arrangement be found unsatisfactory or impracticable to maintain, other means of protection must be applied.

(4) The red cab-signal indications noticed on locomotives on May 18 and May 26, 1926, and which were attributed to low alternating current track energy due to heavy leakage between the track rails on account of wet weather, emphasizes the necessity for promptly overcoming this condition.

The Illinois Central is expected promptly and currently to inform us as to the progress made conforming to the above stated requirements and recommendations.

D. L. & W. Train Control Approved

WASHINGTON, D. C.

DIVISION 1 of the Interstate Commerce Commission has approved, with certain exceptions, the installation of the two-speed continuous induction train control system of the Union Switch & Signal Company on the Buffalo division of the Delaware, Lackawanna & Western, between Elmira, N. Y., and East Buffalo, 141 miles of double track, including the equipment of 69 locomotives. An abstract of the report giving principally the features of the wayside construction fol-

lows. Portions of the report describing the operation of the locomotive apparatus, similar to several descriptions published previously, are here omitted on account of a lack of space.

The cost of this installation, as reported by the carrier, covering wayside and locomotive equipment is as follows:

ROADWAY EQUIPMENT:

| | |
|--|--------------|
| Number of road miles equipped..... | 141 |
| Number of track miles equipped..... | 282 |
| Total cost of roadway equipment of train control installation, less power lines and power apparatus, and less signals or cost of change in existing signal system; less salvage..... | \$120,372.26 |
| Total cost of power lines and power apparatus, less salvage..... | 58,986.32 |
| Total cost of signal system installed in connection with train control; less salvage..... | |
| Total cost of changes in existing signal system made necessary by train control; less salvage..... | 155,342.13 |
| Total all other roadway equipment costs..... | 6,354.47 |
| Total cost of roadway installation..... | 341,055.18 |
| Number of locomotives equipped..... | 69 |
| Cost per locomotive equipped..... | \$3,458.98 |
| Total cost locomotive equipment installed..... | 238,669.62 |
| Total cost of installation..... | 579,724.80 |

The automatic block signal system on this division is of the normal clear, two-arm two-position lower-quadrant oil-lighted ground type, mounted on concrete foundations. The signals are of the Union Switch & Signal Company's Style -B and are operated from 16 cells of caustic soda battery, housed in wooden battery boxes.

Turnout and crossover switches are equipped with switch boxes that shunt the main track. The switch boxes on the turnouts and hand operated derails shunt the main track through two No. 6 insulated copper wires with an extra bootleg soldered to each wire, and with both legs bonded into the rail. Crossover switches shunt both main tracks by means of two No. 6 insulated copper wires with an extra bootleg soldered on each wire and bonded into each rail. Fouling protection at all switches consists of two No. 6 insulated copper wires run in trunking, and bonded directly into the main track rail and into the outside lead rail, midway between the insulated joints in the outside lead rail.

Double-arm two-position lower-quadrant normal-clear train-order signals are located at telegraph offices, but are not connected into the automatic signal or train-control circuits. Power for the train control system is furnished from sub-stations at East Buffalo, N. Y.; Dansville, and Elmira. These sub-stations are so arranged that should the supply at any station fail the adjoining station will instantly come into service to take the load. The power is transmitted at 550 volts, 60 cycles single phase. The transmission line consists of two No. 6 hard drawn weatherproof copper wires, extending from Elmira to East Buffalo. These are carried on distinctive light-yellow porcelain insulators supported on the two field pins on the top signal cross-arm, located just below the Western Union cross-arms on the poles.

At signal locations a 5 v. a. line transformer is mounted on the pole line cross-arm, and furnishes power at 110 volts to the primary of the track transformers. A bracket for supporting the transformer and fused cutouts is fastened to the cross-arms under the 550-volt line. The lightning arresters are installed in a two-way wooden box, fireproof lined, fastened on the line pole at the top of the signal cross-arm. All signal and train control wires are terminated on the arresters. The ground wire runs down the pole and