Standardization of Circuit Plans *for* Highway Crossing Signals

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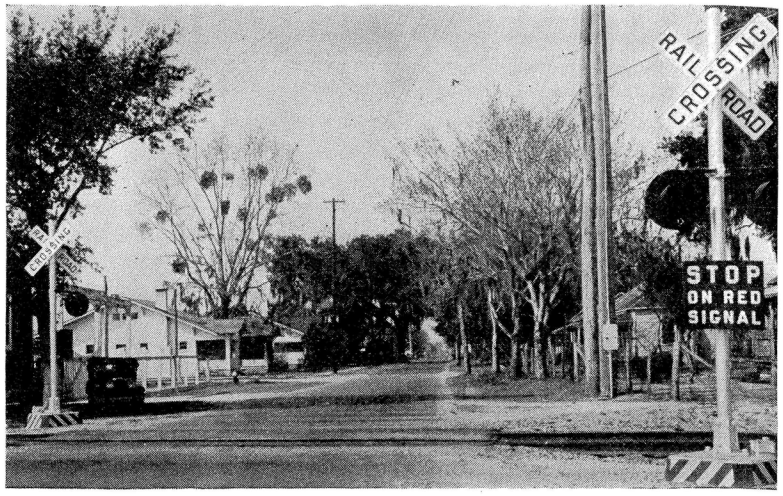


Crossing signal installation at Kissimmee, Fla.

Atlantic Coast Line has systematized the preparation of plans for crossing protection by preparing only one layout for a project and then attaching prints of standards to cover detail wiring and construction

DURING THE past two years the Atlantic Coast Line has studied the subject of highway crossing protection with the purpose of working out a systematic procedure for the preparation of plans, as well as for actual construction. In addition to improving the actual mechanics of design and construction, a number of interesting and practicable circuits have been developed for such purposes as eliminating unnecessary crossing signal operation during switching movements or station stops, safeguarding signals against complete failures or faulty operation, etc. As a result of this study, a series of standard plans embodying these developments, and applicable to almost any local circumstances, are being used to facilitate Public Works Administration projects as well as those initiated by the railroad.

One Basic Plan Used

In planning an installation, a field survey is made and the local situation is systematically recorded on a form, a copy of which appears herewith. With the aid of this survey data, the station and right-of-way maps, and the existing signal circuits, the design of the project is completed before the field work is started. Before selecting the type of control circuits a study is made of all possible train movements, stops and switching over the crossing in the control limits. Wherever it is possible the circuits are so arranged that no warning indications are displayed when no immediate occupancy of the crossing is impending.

Each installation is based on one principle plan, known as the layout-circuit plan, together with the required standard plans, the latter being referred to by number on the layout plan according to the needs of each location. For example, at each instrument case reference is made in the proper places to the standard plans covering all instruments and batteries required.

SURVEY OF HIGHWAY CROSSING

1. Location .....
2. US No. ..... State No. .....
   .....(St) (Ave).
3. No. of tracks & class.....
   .....No. Rail.
4. Speed of trains over crossing.....
   .....Number of trains.....
5. Kind of highway surface (a) Approaching crossing.....
   (b) On crossing.....
6. Width of surface.....
   Angle of crossing.....
7. Show on sketch distance to nearest switch, mile post, or signal.
8. Visibility of crossing from approaches on highway.....
9. Sketch sidewalks, curbing, terraces, etc.
10. Sketch track centers; if tracks are not parallel, give centers on sketch.
11. Condition of track as to ballast, loose joints, planking, joints in crossing, etc. .....
12. Sketch nearest W.U. pole from center of track and center of highway. Condition of pole?.....
13. Same as above for nearest power pole. Condition of pole?.....
14. Advise if better to get power from depot, etc.....
    Give details of building.....
15. Sketch location of instrument case—preferably in corner opposite both signals.
16. Sketch location of signals. (Refer to plan XD-16 sheet 1.)
17. Give reasons for locating other than standard, account wide street, sewers. etc. .....
18. Sketch location of trees, posts, or obstacles which must be moved account interfering with the visibility of the signals.
19. Show on sketch trees, buildings, etc., in each corner of crossing.
20. Reasons for locating lamps other than standard height.....
21. Sketch junctions and roads parallel to tracks which necessitate extra lamp arms.
22. Sketch best place to push pipe under highway.
23. Sketch general run of cables.
24. Locate insulated joints on sketch—check condition of joint ties.
25. Check condition of approach sections for change in rail, ballast, loose joints, etc.
26. Locate on sketch battery boxes for approach sections.
27. Check all switches for insulated front rods, rail sections, compromise joints, rail to be changed, insulated joint ties.
28. Type of existing bonding.....
29. Check location of water tanks and columns.
30. Study switching moves and give a description, such as where locals cut, what moves they make and how often each switch or spur is used.
31. Suggested location of switch stick and trap stick cut sections, account Question 30.....

32. In automatic signal territory, give location of W.U. pole on each side of the signals and from center of track, for two locations on each side of the crossing.
33. Show if these signals have separate lighting battery, and how housed.
34. Show available space for additional relays in signals, relay cabinets, etc.
35. If located near or within interlocking limits show front and back points, resistance, and type of all relays.
36. General remarks: .....

Across the top of the layout-circuit plan is shown a small-scale (1 in. to 400 ft.) layout plan including the territory approximately one mile on either side of the crossing. This plan includes notes of line curvature block signal locations, if in signal territory, and the control limits of the crossing signal, together with the maximum train speed upon which they are based.

Drawings in Convenient Scales

The central portion of the layout plan shows all facilities within the control limits of the crossing signal. It also shows the detail location of all housings, track circuits, cable runs, battery and relay connections, line wires and lightning arrester boxes. Cable keys show the number of conductors and the circuits contained in the cables. An insert describes the actual crossing location on a 1 in. to 30 ft. scale, showing the limits of street pavement or other surface, surrounding buildings affecting the view of the crossing, exact location of the signals, track centers and other pertinent notes and dimensions.

The lower portion of the layout-circuit plan shows the control of the interlocking relay or relays controlling the flasher relay, the polarized line control of the automatic signals and the relay arrangement for the instrument case at the crossing with standard plan reference numbers relating to each control group. The usual procedure, therefore, is to provide the one basic layout plan applicable to the one installation, and to supplement it in detail with the standard plans.

Plans Cover All Cases

The standard plans are listed by their general titles as follows:

1. Instrument case and terminal arrangement
2. Power-off and under-voltage-release relay
3. Rectifier-operating and track batteries
4. Flasher relay and battery
5. Open track circuit for passing track over highway
6. Interlocking relay and controls for northward track
7. Interlocking relay and controls for southward track
8. Interlocking relay and controls for single track
9. Circuit plans for cut sections
10. Switch-stick cut section
11. Trap-stick cut section
12. Neutral track relay at automatic signal
13. Focusing of front and back lights
14. Location of crossing signals

The installations that have been made involve certain notable features. For example, where there is a station or passing track at the crossing in addition to the main lines, a short track circuit extending to the clearance points on both sides of the crossing provides a warning whenever the short track circuit is occupied. If there are two or more additional tracks, the short sections are connected in multiple. This track circuit is of the normally-open type, using a 9-ohm quick-acting DN-11 relay, which controls the flasher relay independently.

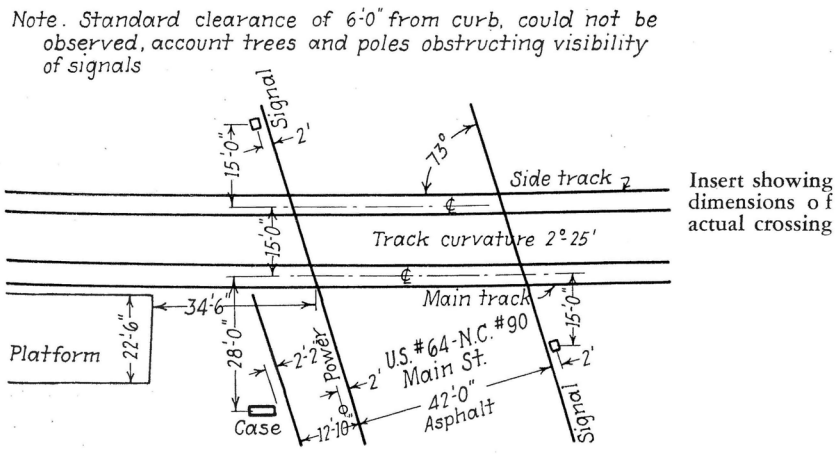
The power-off relay, with the rectifier and battery combination, serves to forestall power failures. The flasher relay is wired in such a way that each operating contact feeds one side of each flashing signal unit. In this manner a failure of one contact would still allow one light on each side of the street to flash. As an additional safety precaution, the circuit controlling the flasher relay and the circuit supplying the lamps, from the power supply to the flasher relay, are in duplicate. Test switches are housed on the outside of the instrument case at the crossing.

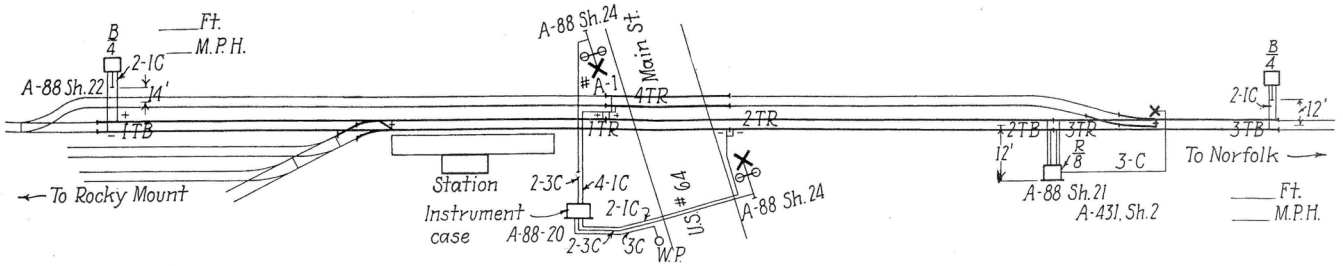
Flashers Controlled Across Highways

In single-track non-automatic territory, two insulated joints are used at each location and are staggered over the crossing. In double-track non-automatic territory, each track is considered as single track. This arrangement, in combination with a cut-around wiring of the track relays through the interlocking relay, insures continuous warning until the rear of a train, in either direction, actually clears the crossing.

In single-track automatic territory, a short track section over the crossing controls both sides of the interlocking relay. In double-track automatic territory, the approach circuit for the normal direction of traffic is continued over the crossing. Normally energized double shunts, through track relays, are provided on all polarized signal-control circuits.

Power supply for these signals is of the a-c.—storage; a-c.—primary, or straight primary type, dependent upon local conditions and the distance from maintenance headquarters.





Center portion of layout-circuit plan showing cables and references to the standard wiring and construction plans at each location