American Railway Signaling Principles and Practices

CHAPTER XXIII

Railroad-Highway Grade Crossing Protection

Published by the Signal Section, A. A. R.
59 East Van Buren Street, Chicago 5, Ill.

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RAILROAD-HIGHWAY GRADE CROSSING PROTECTION

General.

Protection at highway grade crossings was first afforded by placing conspicuous signs at the crossing, one sign generally sufficing for a single or two-track crossing, the lettering on the sign conforming with the ideas of various railroad officials, state laws or state authorities. It was required that the engine whistle be sounded at varying distances from the crossing—one-fourth mile being the most favored; the engine bell to ring until the train reached the crossing.

Horse-drawn vehicles traveled at a comparatively slow speed and they had ample time, after hearing a train whistle or bell one-fourth mile away, to stop before reaching the crossing. Furthermore, the radius of travel of a horse-drawn vehicle was in general comparatively short and the drivers knew the location of all the crossings and were usually familiar with the train service over each. For these reasons, accidents were infrequent.

With the advent of the automobile, the situation changed. Drivers were, in many instances, unfamiliar with local conditions. Noises incident to operation of the automobile prevented drivers from hearing the engine whistle or engine bell so that watchmen were placed at certain crossings to warn the public using the crossing of the approach of trains in sufficient time to enable drivers to stop before reaching the crossing. The watchmen were equipped with warning devices such as a red flag in the daytime and red light at night. The presence of these watchmen was frequently ignored so the protection was increased at heavily traveled crossings by the installation of manually operated gates which extended across the roadway and acted as a barrier to approaching vehicles. The gates were originally operated by wire or pipe connections. Later they were operated pneumatically, then by electric motors. The crossings were also equipped with appropriate signs to further call attention to the fact that a railroad crossing existed.

With the invention of the track circuit, automatic protection at crossings became possible and gradually came into use, the first type of which was the highway crossing bell. This bell was operated automatically on the approach of a train, a designated distance from the crossing, and the bell continued to ring until the train had passed. The general use of closed automobiles, however, made the audible warning ineffective and the need for a visual warning became apparent, especially at night.

In order to provide a more distinctive visual indication of the approach of a train than the usual crossing signs, which merely indicated the existence of a crossing, the wig-wag signal was developed to display a moving banner by day with a moving or flashing red light by night. This was the first visual warning signal to come into general use and was operated by an electric motor.

A device using lights for visible warning both by day and by night was first exhibited in 1912. It consisted of a series of six flashing lamps lighted successively to give the impression of a swinging red lantern.

Highway grade crossing protection was beginning to receive considerable attention by state and federal officials so that in 1916 the American Railway Association, predecessor of the Association of American Railroads, considered the matter and adopted certain uniform standards of highway crossing pro-

tection. They covered the painting of crossing gates with black and white stripes; the installation of standard approach signs at a given distance from the crossing; the display of red lights toward vehicular traffic on crossing gates and in the hands of the watchmen, and the use of "STOP" signs by the watchmen during daylight.

At the 1923 Annual Meeting of the Signal Section, American Railway Association, the first standardization of automatic highway grade crossing signals was made by the adoption of the following resolution:

> "*Resolved*, That an electrically or mechanically operated signal, used for the protection of highway traffic at railroad crossings, shall present toward the highway, when indicating the approach of a train, the appearance of a horizontally swinging red light and/or disc."

Due to the attention being given to highway grade crossing protection, it was soon found very desirable to provide uniform signals in the various states to avoid confusion to the drivers of automobiles and trucks. In April 1930 a Joint Committee on Grade Crossing Protection of the Association of American Railroads was organized. This Committee's principal functions were (1) to investigate various types of railroad-highway grade crossing protective devices, with reference to the application of the best methods to the several classes of crossings and to recommend to the Association, standards and practices for the purpose; (2) to review the proposals, concerning railroad-highway grade crossing protection, of other Divisions and Sections of the Association, in order that they might be harmonized and properly represent the opinion of the Association; (3) to maintain contact with federal, state and other public authorities and to keep them informed with respect to these recommended standards and practices, with a view to the establishment of uniformity in aspect and operation of grade crossing protective apparatus.

This Joint Committee has been functioning since that time and railroads in general have adopted their recommendations. The Bureau of Public Roads, Department of Commerce, practically all the state regulatory commissions, and various national organizations have also either adopted or approved them. (The Joint Committee is now known as the Grade Crossing Protection Unit of Train Operation, Control and Signals, A.A.R.)

Visible warning signals.

Two types of visible warning signals are in general use: the flashing light signal and the wig-wag. The A.A.R. recommended flashing light signal consists of two red electric light units, spaced 30 inches horizontally on a cross-arm; the lights are flashed alternately at a rate of between 30 and 45 times per minute, simulating to some extent a signal given by a watchman swinging a red lantern. At a simple crossing, the units are mounted back to back on each mast so that two pairs of flashing light units are shown for traffic in each direction on the highway, one at the driver's right on the near side of the railroad and the other at the driver's left at the far side of the railroad. Additional pairs of units and additional masts are used as required where two or more streets approach one railroad crossing.

In addition to the electric light units, a "RAILROAD CROSSING" sign (commonly called a crossbuck) is mounted near the top of the mast. Where there are two or more tracks, a sign reading "2 TRACKS," "3 TRACKS," etc., is mounted under the crossbuck. The recommended non-reflecting A.A.R. signs are painted white with black legend. In some cases, where required by local regulatory bodies or by railroad preference, these signs are reflectorized.

The recommended A.A.R. reflectorized "RAILROAD CROSSING" signs also have the black legend on a white background and are of two types, one having reflectorized legend by use of reflector buttons, and the other having reflectorized background by use of reflex-reflecting sheet material.

The recommended A.A.R. reflectorized "number of tracks" signs have the colors reversed, that is, the legend is white on a black background and the legend is reflectorized, either with buttons or with reflex-reflecting sheet material.

Auxiliary signs recommended by the A.A.R. are mounted below the flashing light units and are of two types. One type of sign reading "STOP ON RED SIGNAL" has white reflectorized letters on a black background, and is readily visible in daylight and also at night when in the beam from an approaching automobile headlight. Another type of sign consists of a red illuminated word "STOP," arranged vertically, which is illuminated only when the signal is in operation. In some states, preference has been shown for the use of a different type auxiliary "STOP" sign, it being a standard highway type octagonal sign located between the flashing light units and mounted on a vertical shaft to revolve 90 degrees, the shaft turning to present the face of the sign toward approaching highway traffic only when a train is approaching. This sign has a yellow background with black legend, either of which may be reflectorized.

The standard wig-wag signal consists of a banner which, when in operation, swings to resemble the warning given by a flagman. A red light on the banner gives a night indication. Signs used with the wig-wag are the same as with the flashing light signal, except that a reflectorized "STOP WHEN SWINGING" sign is used instead of "STOP ON RED SIGNAL."

Requisites for highway grade crossing signals.

1. A signal used for the protection of traffic at a railroad-highway grade crossing shall present an aspect toward approaching highway traffic conforming to Drawing 1651, 1652, 1653, 1654, 1686 or 1688 (Figs. 1 to 6, inclusive). The operative part of the signal, when indicating the approach of a train, shall present the appearance of a horizontally swinging red light or swinging disc.

2. Either flashing light type or wig-wag type signals may be used, but both should not be used at the same crossing. One signal shall be placed on each side of the track preferably to the right of approaching highway traffic.

3. Bell, when used, should be mounted preferably on the mast supporting the crossing signal, with the face of the gong parallel to the highway. Size and range of bell shall be determined by local conditions.

4. Parts which function as background for light signal indications shall be painted with non-reflecting black. All other parts shall be painted with a finishing coat of white or aluminum when installed.

5. Controls for signal operation shall be in accordance with requisites for control of automatic highway grade crossing signals and devices. (See page 22.)

6. Electric light units on flashing light signals shall be arranged to shine in both directions along the highway. They shall be mounted horizontally, 2 foot 6 inch centers and preferably not less than 7 feet nor more than 9 feet above the surface of the highway. The electric light unit, under bright sunlight conditions with the sun at or near the zenith, shall have a range of 1,500 feet with a 10-volt 10-watt single filament lamp rated at 1,000 hours at 10 volts, when equipped with 30-degree horizontal 15-degree downward deflection roundel through a total angle of not more than 10 degrees either side of axis. Electric lamps shall flash alternately. The number of flashes of each electric lamp per minute shall be 30 minimum, 45 maximum. Electric lamps shall each burn approximately the same length of time. Total burning time of both electric lamps shall be practically the entire operating time.

7. Electric light units on wig-wag signals shall shine in both directions along the highway. Lenses or roundels shall be highway crossing red 5 inches diameter minimum. The electric light unit, when the disc is suspended vertically, shall have a range, at night, of 1,500 feet through a total angle of not less than 20 degrees when a 10-watt lamp rated at 1,000 hours is burned at rated voltage. Movement from one extreme to the other and back constitutes a cycle. The number of cycles per minute shall be 30 minimum, 45 maximum.

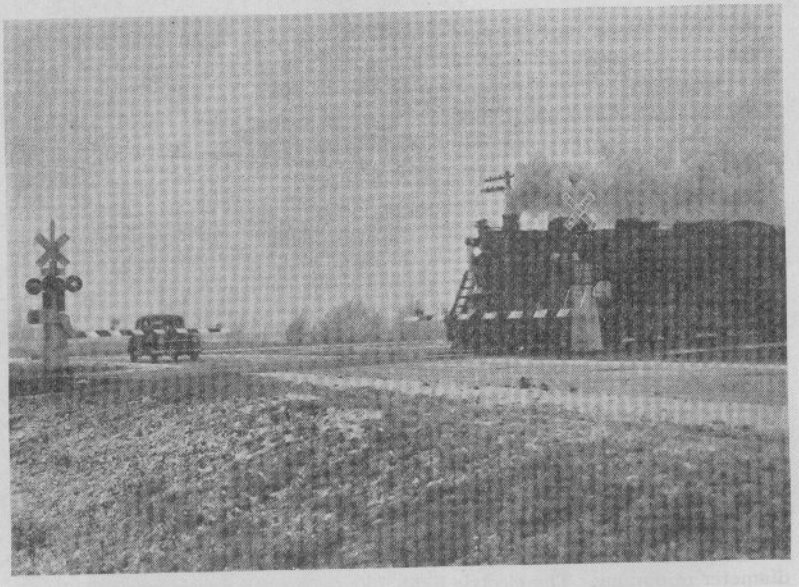
Crossing gates.

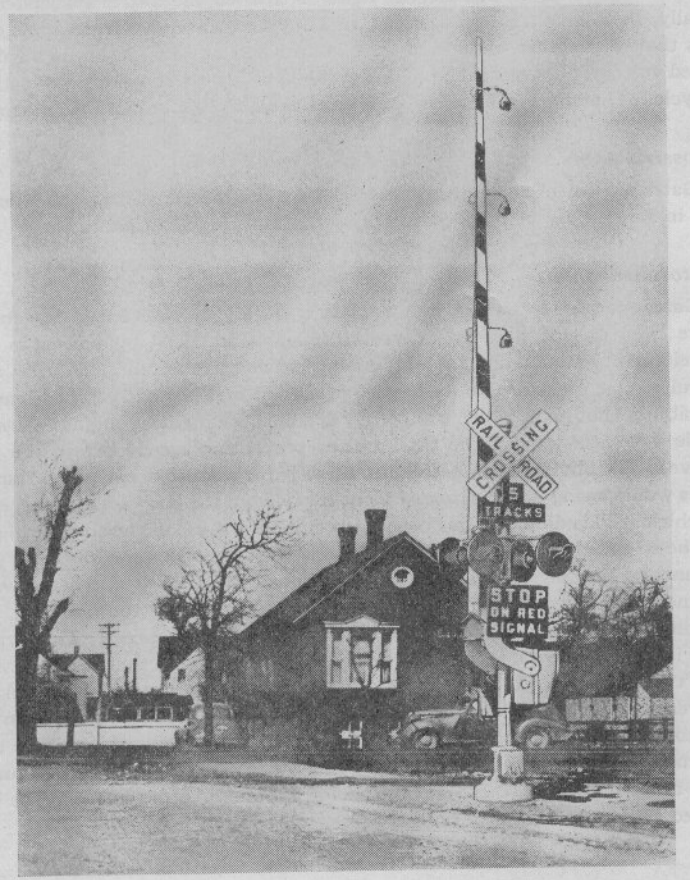
Gates are one of the oldest forms of highway grade crossing protection and are in general use at busy crossings of multiple track railroads.

Automatic gates.

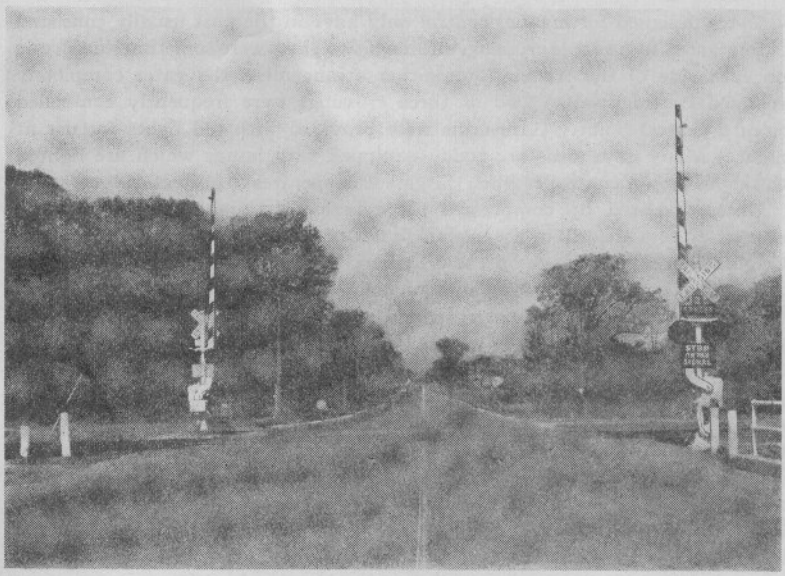
Gates operated by electric motors or by hydraulic cylinders driven by motors have been on the market for years, and around 1924 arrangements were developed for controlling the operation of such gates automatically by track circuits. One objection to automatic operation of these early types was the possibility that gates which completely spanned the highway might be lowered while a vehicle was on the tracks, thus preventing escape before the train arrived. To obviate such accidents, these gates were so constructed that the arms would swing in a horizontal plane away from the tracks when pushed by a vehicle. This difficulty has been overcome by the use of the short-arm gate.

The so-called "short-arm" gate, which is the type now generally used as an adjunct to flashing light signals, is so designed that the arm, when lowered, extends only over the right-hand or approach section of the highway, thus leaving an open pathway for vehicles already on the crossing. This type of gate is used where gates are controlled automatically and their use is favored for "two-train" protection at crossings where there are two or more tracks, to prevent a vehicle which has waited for a train on one track to pass, from failing to wait for the signal to cease operating, and from being struck by a train approaching on another track. Short-arm gates are now used for manual or auto-manual control where protection for a number of streets may be controlled by an operator at a central point.




RAIL ROAD
CROSSING
2
TRACKS
STOP
ON RED
SIGNAL

A special feature of automatic gate installations is that the lamps on the gate arms and the flashing light signals operate for several seconds as a pre-warning before the gate arm starts to lower, thus allowing time for a vehicle to be stopped short of the gate, or, if approaching closely, to proceed over the crossing before the arm is lowered. The gate arm mechanism is so designed that if the gate arm, while being raised or lowered, strikes or fouls an object, it will readily stop and, on removal of the obstruction, assume the position corresponding with the control apparatus.



Requisites for automatic gates.

1. An automatic gate used for the protection of highway traffic at a railroad-highway grade crossing, when indicating the approach of a train, shall present toward approaching highway traffic the aspect of an arm equipped with red lights being lowered across the lane or lanes used by traffic approaching the crossing or at rest in the horizontal position across the lane or lanes.

2. An automatic gate, when installed, shall serve as an adjunct to a highway crossing signal of the flashing light type.

(a) When used as an adjunct to signal shown on Drawing 1653, it shall conform to Drawing 1462 or 1489. (See Figs. 3, 7 and 8.)

(b) When used as an adjunct to signal shown on Drawing 1686 or 1688 (Figs. 5 and 6), it may be separately mounted on an independent pipe post or pedestal located between the signal and the track.

One gate shall be placed on each side of the track preferably to the right of approaching highway traffic.

3. Each gate arm shall be equipped with not less than three red electric light units arranged to shine in both directions along the highway. The gate arm, when in the raised position, shall not obstruct or interfere with highway traffic.

4. Bell, when used, should be mounted preferably on the mast supporting the crossing signal, with the face of the gong parallel to the highway. Size and range of bell shall be determined by local conditions.

5. Pipe, base, pinnacle, supporting arms, brackets, clamps and mechanism case shall be painted with a finishing coat of white or aluminum when installed.

6. Controls for gate and signal operation shall be in accordance with requisites for control of automatic highway grade crossing signals and devices. (See page 22.)

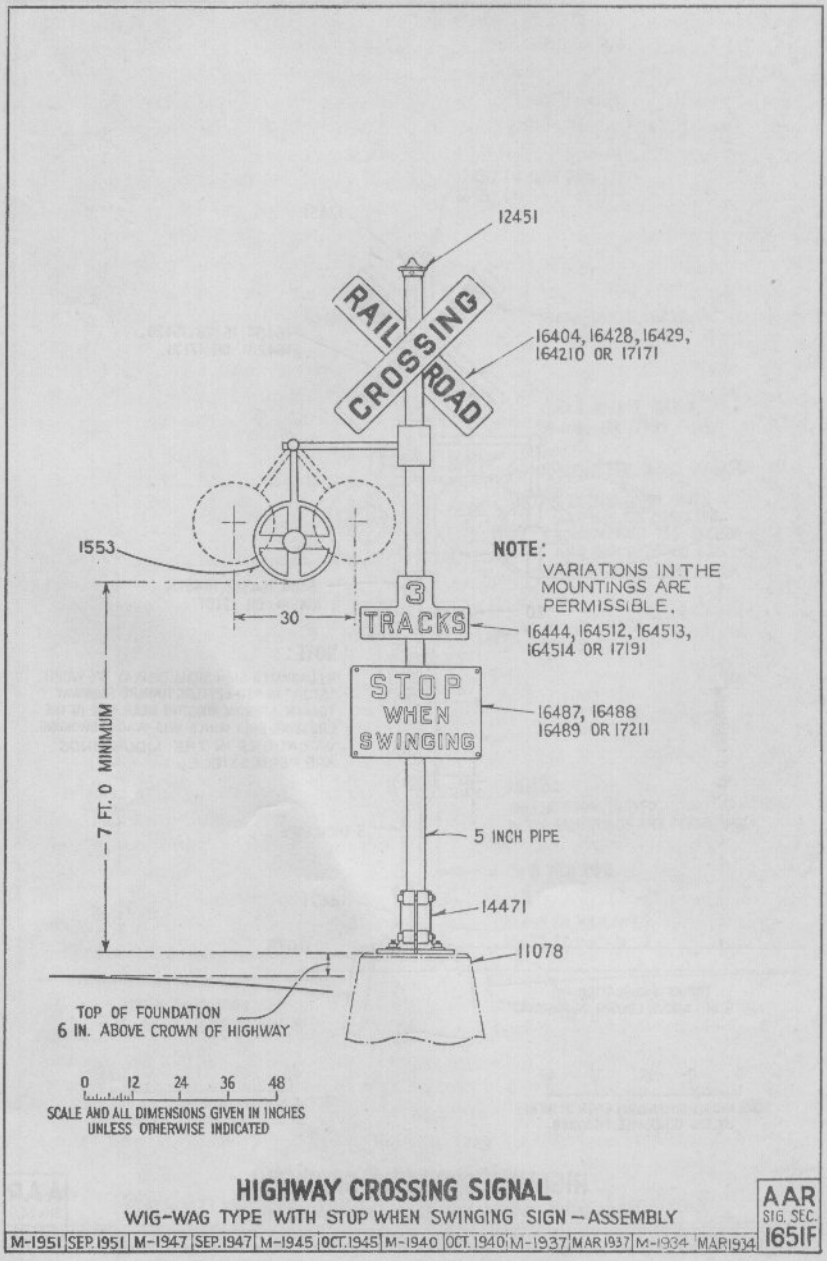
7. The highway traffic lanes in the vicinity of the crossing should be distinctly marked.

Gates designed for manual control only.

Gates designed for manual control only have in the past usually consisted of four gates, at a simple crossing, although two gates were sometimes used, one on each side of the tracks. For either arrangement the gates completely spanned the highway. Two or three crossings were frequently controlled from a central point. Gate arms were provided with red lights for use at night. Many gate arms are today equipped with lamps which are lighted through a circuit controller when the gate arm operates to protect the crossing.

Gates operated by compressed air cylinders or diaphragms instead of electric motors are still in use, although few new installations are being made. Originally such gates were operated by hand pumps, but motor-driven pumps or blowers have largely supplanted hand pumps. By locating the control tower midway between street crossings, one man could handle the gates at two or more streets. Gates manually operated by mechanical means still continue in use at crossings where manual control is necessary and where group control is not feasible.

In recent years, short-arm gates with flashing light signals in accordance with Signal Section, A.A.R. recommended practice have come into general use where there is manual control. Numerous installations have been made where gates at several streets are controlled from a central tower, the operator being provided with a control panel giving necessary information as to the location of trains, etc.



HIGHWAY CROSSING SIGNAL

WIG-WAG TYPE WITH STOP WHEN SWINGING SIGN – ASSEMBLY

AAR SIG. SEC. 1651F

M-1951 | SEP. 1951 | M-1947 | SEP. 1947 | M-1945 | OCT. 1945 | M-1940 | OCT. 1940 | M-1937 | MAR 1937 | M-1934 | MAR 1934

Fig. 1.

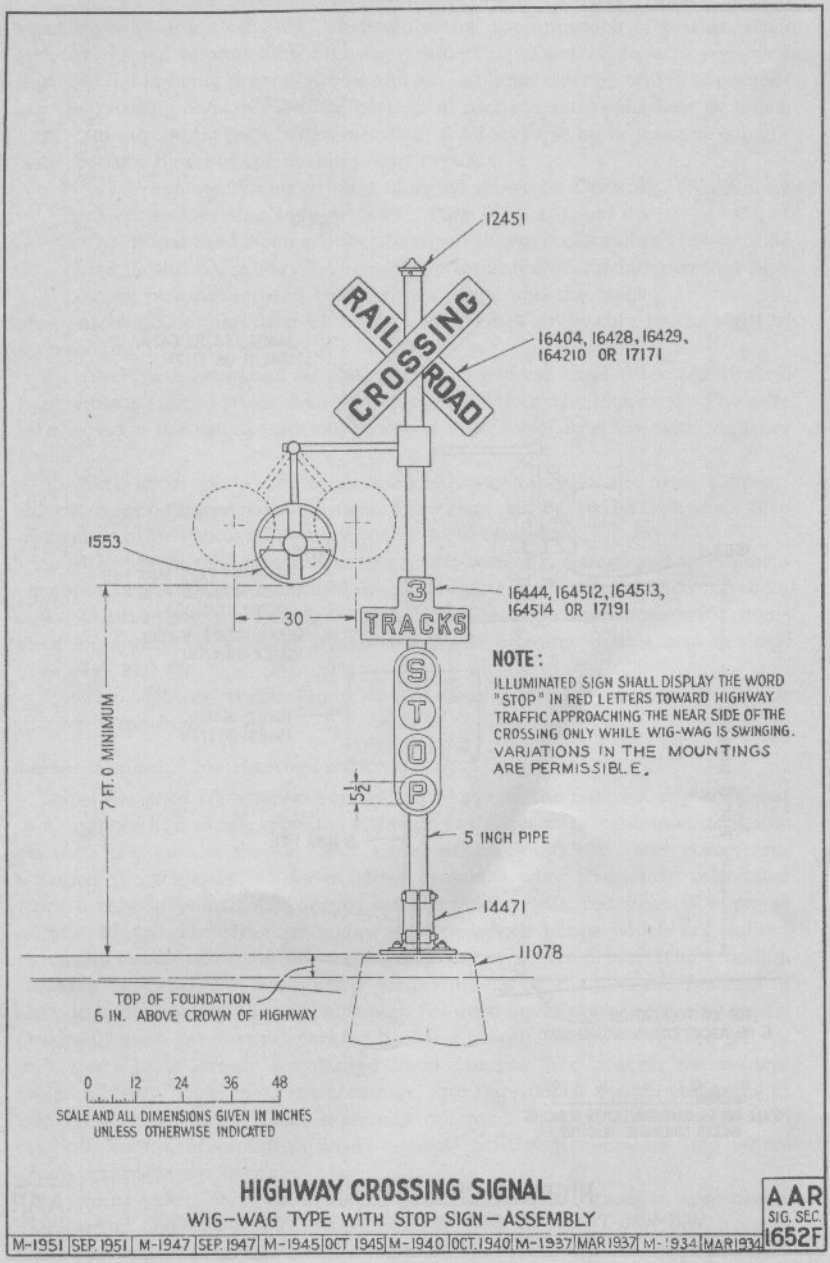

12451
RAIL
CROSSING
ROAD
16404, 16428, 16429,
164210 OR 17171
1553
30
3
TRACKS
16444, 164512, 164513,
164514 OR 17191
NOTE:
ILLUMINATED SIGN SHALL DISPLAY THE WORD "STOP" IN RED LETTERS TOWARD HIGHWAY TRAFFIC APPROACHING THE NEAR SIDE OF THE CROSSING ONLY WHILE WIG-WAG IS SWINGING. VARIATIONS IN THE MOUNTINGS ARE PERMISSIBLE.
STOP
7 FT. 0 MINIMUM
5½
5 INCH PIPE
14471
11078
TOP OF FOUNDATION
6 IN. ABOVE CROWN OF HIGHWAY
0 12 24 36 48
SCALE AND ALL DIMENSIONS GIVEN IN INCHES
UNLESS OTHERWISE INDICATED
HIGHWAY CROSSING SIGNAL
WIG-WAG TYPE WITH STOP SIGN - ASSEMBLY
AAR
SIG. SEC.
1652F
M-1951 SEP. 1951 M-1947 SEP. 1947 M-1945 OCT 1945 M-1940 OCT. 1940 M-1937 MAR 1937 M-1934 MAR 1934

Fig. 2.

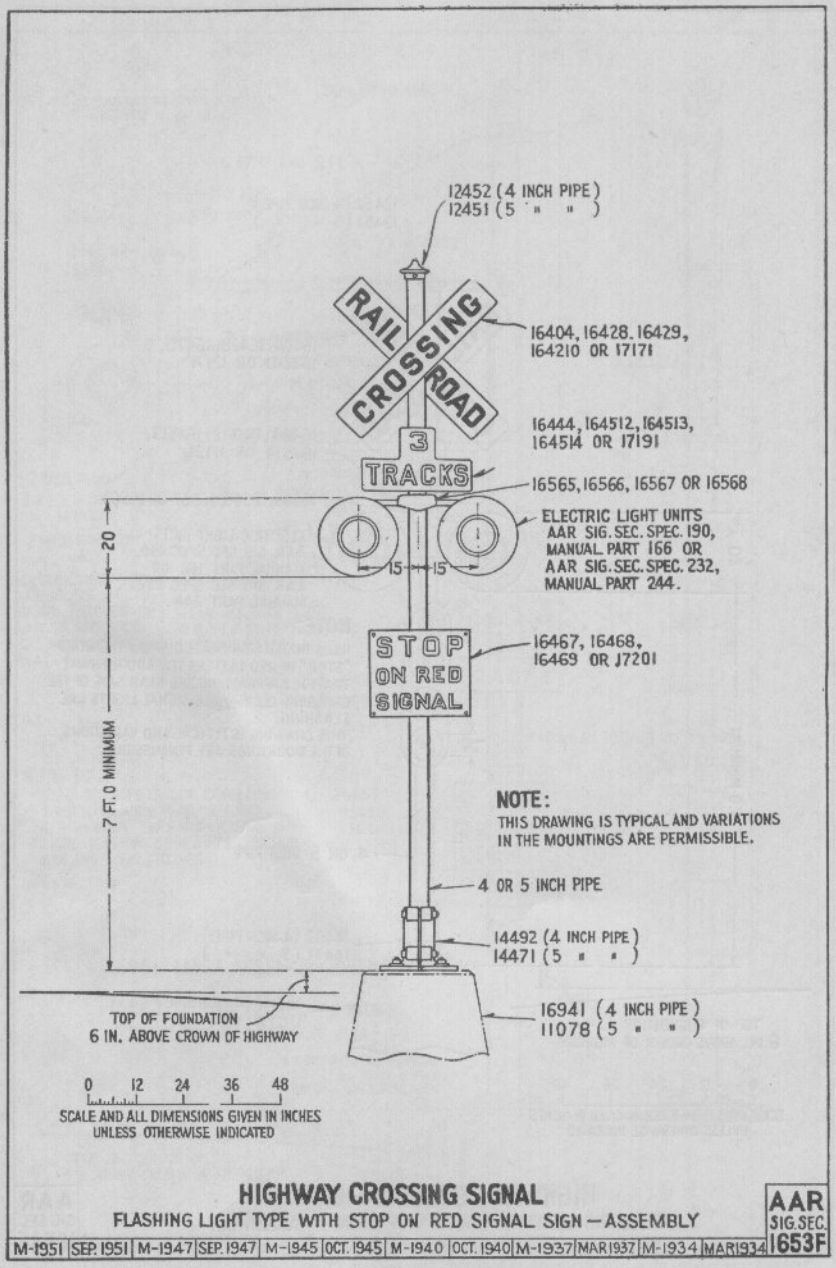

12452 (4 INCH PIPE)
12451 (5 " ")
RAIL ROAD CROSSING
16404, 16428. 16429, 164210 OR 17171
3 TRACKS
16444, 164512, 164513, 164514 OR 17191
16565, 16566, 16567 OR 16568
ELECTRIC LIGHT UNITS AAR SIG. SEC. SPEC. 190, MANUAL PART 166 OR AAR SIG. SEC. SPEC. 232, MANUAL PART 244.
20
15
15
STOP ON RED SIGNAL
16467, 16468, 16469 OR J7201
7 FT. 0 MINIMUM
NOTE:
THIS DRAWING IS TYPICAL AND VARIATIONS IN THE MOUNTINGS ARE PERMISSIBLE.
4 OR 5 INCH PIPE
14492 (4 INCH PIPE)
14471 (5 " ")
16941 (4 INCH PIPE)
11078 (5 " ")
TOP OF FOUNDATION
6 IN. ABOVE CROWN OF HIGHWAY
0 12 24 36 48
SCALE AND ALL DIMENSIONS GIVEN IN INCHES UNLESS OTHERWISE INDICATED
HIGHWAY CROSSING SIGNAL
FLASHING LIGHT TYPE WITH STOP ON RED SIGNAL SIGN — ASSEMBLY
AAR SIG. SEC. 1653F
M-1951 SEP. 1951 M-1947 SEP. 1947 M-1945 OCT. 1945 M-1940 OCT. 1940 M-1937 MAR 1937 M-1934 MAR 1934

Fig. 3.

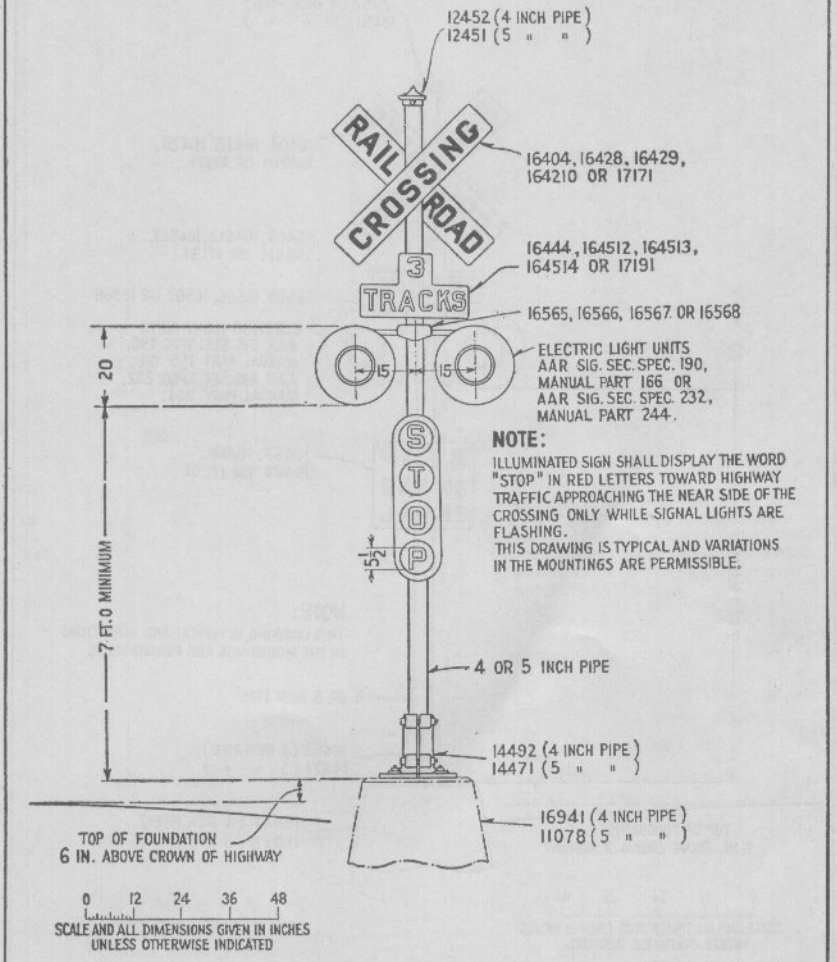

12452 (4 INCH PIPE)
12451 (5 " ")
RAIL ROAD CROSSING
16404, 16428, 16429, 164210 OR 17171
3 TRACKS
16444, 164512, 164513, 164514 OR 17191
16565, 16566, 16567 OR 16568
ELECTRIC LIGHT UNITS AAR SIG. SEC. SPEC. 190, MANUAL PART 166 OR AAR SIG. SEC. SPEC. 232, MANUAL PART 244.
20
15
15
STOP
5 1/2
7 FT. 0 MINIMUM
NOTE:
ILLUMINATED SIGN SHALL DISPLAY THE WORD "STOP" IN RED LETTERS TOWARD HIGHWAY TRAFFIC APPROACHING THE NEAR SIDE OF THE CROSSING ONLY WHILE SIGNAL LIGHTS ARE FLASHING.
THIS DRAWING IS TYPICAL AND VARIATIONS IN THE MOUNTINGS ARE PERMISSIBLE.
4 OR 5 INCH PIPE
14492 (4 INCH PIPE)
14471 (5 " ")
16941 (4 INCH PIPE)
11078 (5 " ")
TOP OF FOUNDATION
6 IN. ABOVE CROWN OF HIGHWAY
0 12 24 36 48
SCALE AND ALL DIMENSIONS GIVEN IN INCHES UNLESS OTHERWISE INDICATED
HIGHWAY CROSSING SIGNAL
FLASHING LIGHT TYPE WITH STOP SIGN — ASSEMBLY
AAR SIG. SEC. 1654F
M-1951 SEP. 1951 M-1947 SEP. 1947 M-1945 OCT. 1945 M-1940 OCT. 1940 M-1937 MAR 1937 M-1934 MAR 1934

Fig. 4.

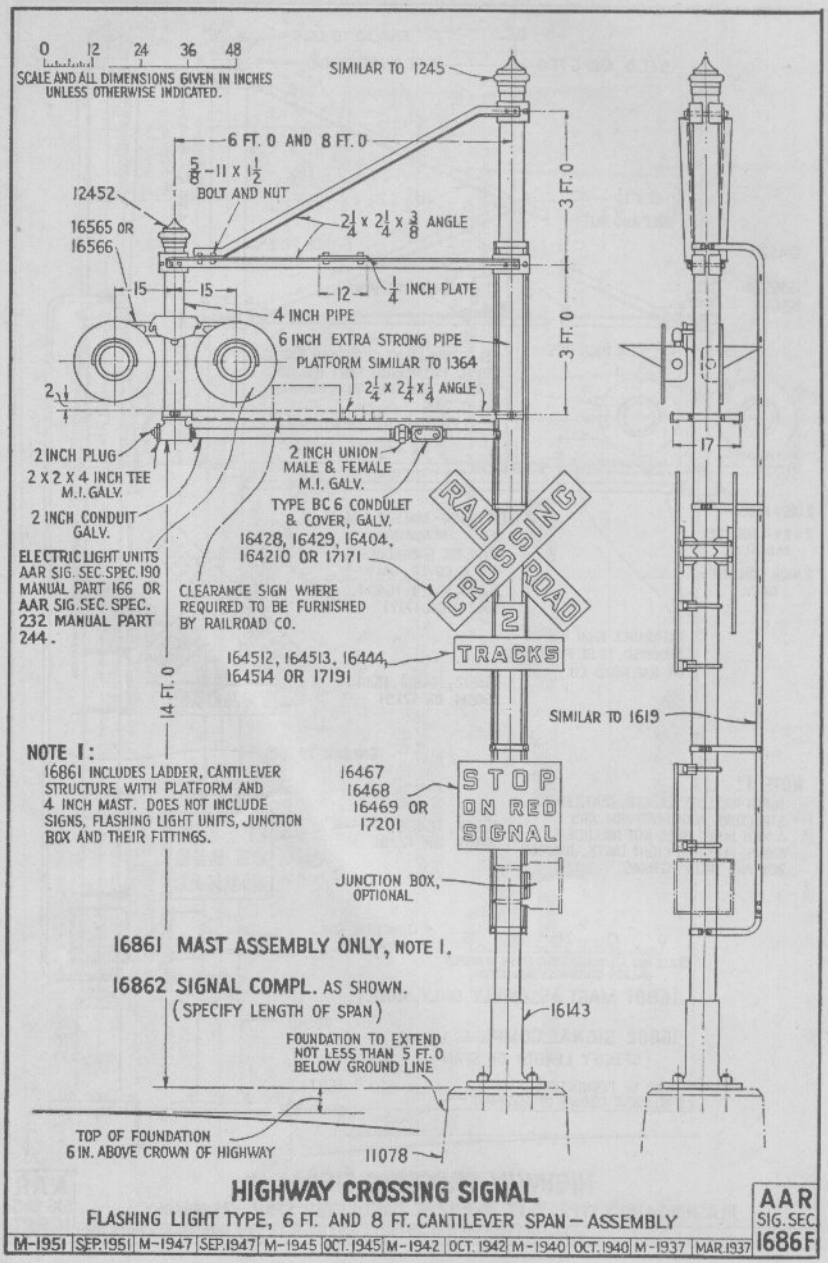

0 12 24 36 48
SCALE AND ALL DIMENSIONS GIVEN IN INCHES UNLESS OTHERWISE INDICATED.
SIMILAR TO 1245
6 FT. 0 AND 8 FT. 0
5/8 - 11 x 1 1/2 BOLT AND NUT
12452
16565 OR 16566
2 1/4 x 2 1/4 x 3/8 ANGLE
3 FT. 0
3 FT. 0
15
15
12
1/4 INCH PLATE
4 INCH PIPE
6 INCH EXTRA STRONG PIPE
PLATFORM SIMILAR TO 1364
2 1/4 x 2 1/4 x 1/4 ANGLE
2 1/2
17
2 INCH PLUG
2 X 2 X 4 INCH TEE M.I. GALV.
2 INCH CONDUIT GALV.
2 INCH UNION MALE & FEMALE M.I. GALV.
TYPE BC 6 CONDULET & COVER, GALV.
16428, 16429, 16404, 164210 OR 17171
ELECTRIC LIGHT UNITS AAR SIG. SEC SPEC. 190 MANUAL PART 166 OR AAR SIG. SEC. SPEC. 232 MANUAL PART 244.
CLEARANCE SIGN WHERE REQUIRED TO BE FURNISHED BY RAILROAD CO.
RAIL ROAD CROSSING
2
TRACKS
164512, 164513, 16444, 164514 OR 17191
14 FT. 0
SIMILAR TO 1619
NOTE 1:
16861 INCLUDES LADDER, CANTILEVER STRUCTURE WITH PLATFORM AND 4 INCH MAST. DOES NOT INCLUDE SIGNS, FLASHING LIGHT UNITS, JUNCTION BOX AND THEIR FITTINGS.
16467
16468
16469 OR 17201
STOP ON RED SIGNAL
JUNCTION BOX, OPTIONAL
16861 MAST ASSEMBLY ONLY, NOTE 1.
16862 SIGNAL COMPL. AS SHOWN.
(SPECIFY LENGTH OF SPAN)
16143
FOUNDATION TO EXTEND NOT LESS THAN 5 FT. 0 BELOW GROUND LINE
TOP OF FOUNDATION 6 IN. ABOVE CROWN OF HIGHWAY
11078
HIGHWAY CROSSING SIGNAL
FLASHING LIGHT TYPE, 6 FT. AND 8 FT. CANTILEVER SPAN — ASSEMBLY
AAR SIG. SEC. 1686F
M-1951 SEP. 1951 M-1947 SEP. 1947 M-1945 OCT. 1945 M-1942 OCT. 1942 M-1940 OCT. 1940 M-1937 MAR. 1937

Fig. 5.

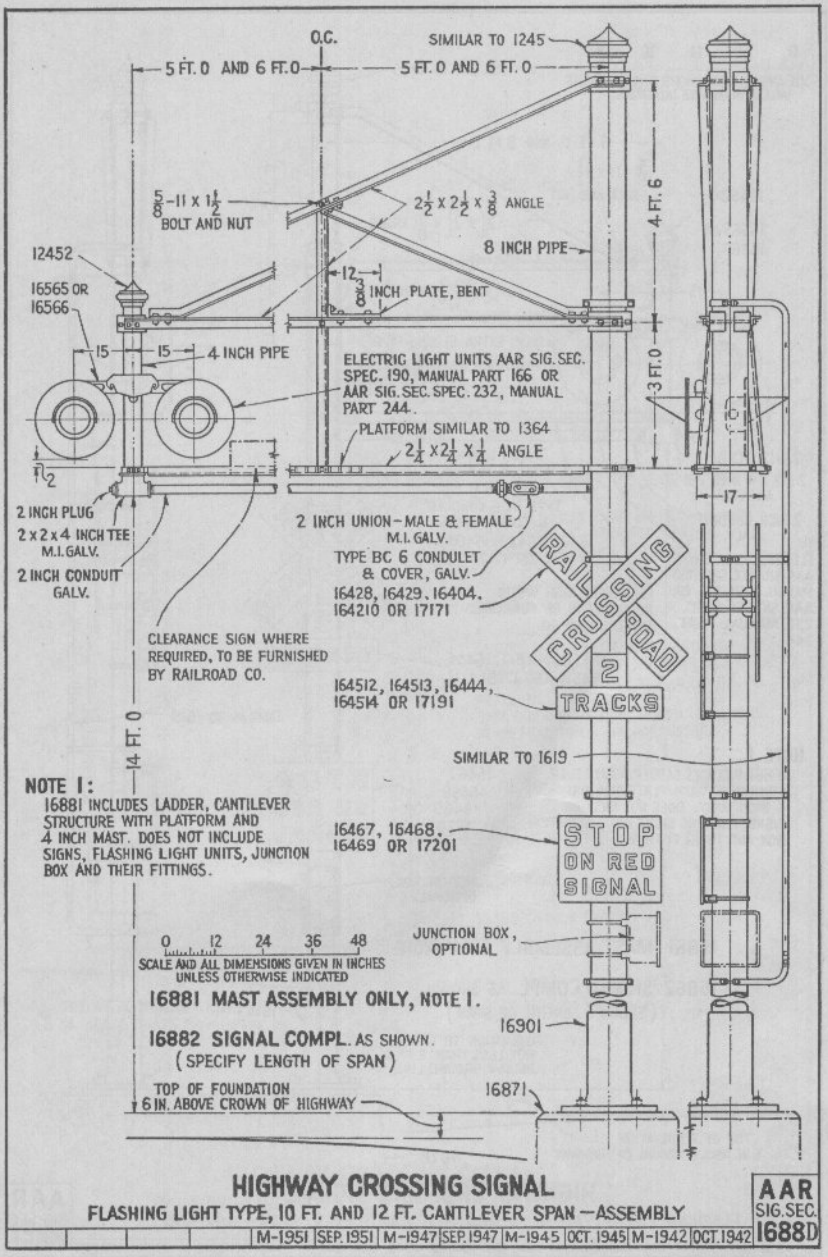

O.C.
SIMILAR TO 1245
5 FT. 0 AND 6 FT. 0
5 FT. 0 AND 6 FT. 0
5/8-11 X 1 1/2 BOLT AND NUT
2 1/2 X 2 1/2 X 3/8 ANGLE
8 INCH PIPE
4 FT. 6
12452
16565 OR 16566
12 3/8 INCH PLATE, BENT
15
15
4 INCH PIPE
ELECTRIC LIGHT UNITS AAR SIG. SEC. SPEC. 190, MANUAL PART 166 OR AAR SIG. SEC. SPEC. 232, MANUAL PART 244.
3 FT. 0
PLATFORM SIMILAR TO 1364
2 1/4 X 2 1/4 X 1/4 ANGLE
1 1/2
17
2 INCH PLUG
2 X 2 X 4 INCH TEE M.I. GALV.
2 INCH CONDUIT GALV.
2 INCH UNION - MALE & FEMALE M.I. GALV.
TYPE BC 6 CONDULET & COVER, GALV.
16428, 16429, 16404, 164210 OR 17171
RAIL ROAD CROSSING
2 TRACKS
CLEARANCE SIGN WHERE REQUIRED, TO BE FURNISHED BY RAILROAD CO.
164512, 164513, 16444, 164514 OR 17191
14 FT. 0
SIMILAR TO 1619
NOTE 1:
16881 INCLUDES LADDER, CANTILEVER STRUCTURE WITH PLATFORM AND 4 INCH MAST. DOES NOT INCLUDE SIGNS, FLASHING LIGHT UNITS, JUNCTION BOX AND THEIR FITTINGS.
16467, 16468, 16469 OR 17201
STOP ON RED SIGNAL
0 12 24 36 48
SCALE AND ALL DIMENSIONS GIVEN IN INCHES UNLESS OTHERWISE INDICATED
JUNCTION BOX, OPTIONAL
16881 MAST ASSEMBLY ONLY, NOTE 1.
16901
16882 SIGNAL COMPL. AS SHOWN. (SPECIFY LENGTH OF SPAN)
TOP OF FOUNDATION 6 IN. ABOVE CROWN OF HIGHWAY
16871
HIGHWAY CROSSING SIGNAL
FLASHING LIGHT TYPE, 10 FT. AND 12 FT. CANTILEVER SPAN — ASSEMBLY
AAR SIG. SEC. 1688D
M-1951 SEP. 1951 M-1947 SEP. 1947 M-1945 OCT. 1945 M-1942 OCT. 1942

Fig. 6.

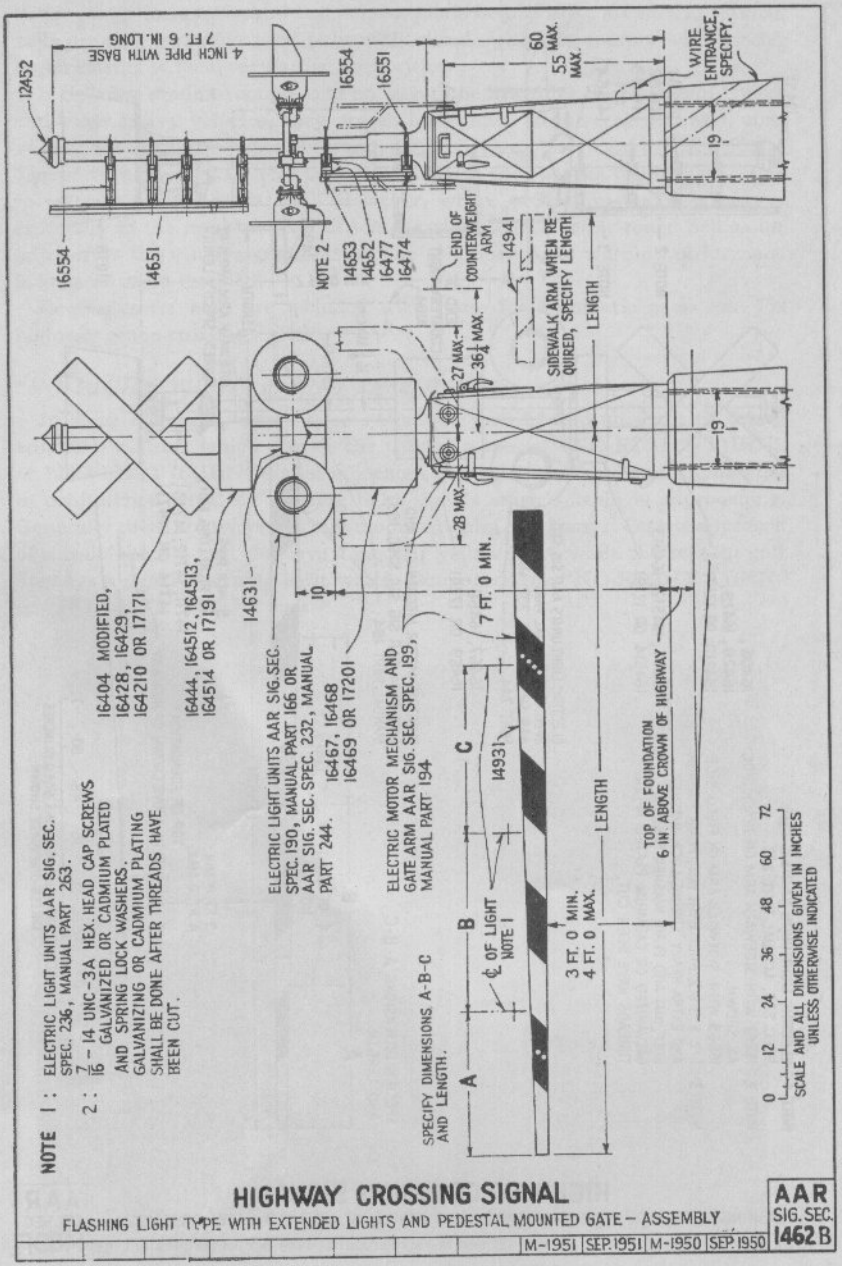

NOTE 1 : ELECTRIC LIGHT UNITS AAR SIG. SEC. SPEC. 236, MANUAL PART 263.
2 : 7/16 – 14 UNC–3A HEX. HEAD CAP SCREWS GALVANIZED OR CADMIUM PLATED AND SPRING LOCK WASHERS. GALVANIZING OR CADMIUM PLATING SHALL BE DONE AFTER THREADS HAVE BEEN CUT.
16404 MODIFIED, 16428, 16429, 164210 OR 17171
16444, 164512, 164513, 16454 OR 17191
14631
ELECTRIC LIGHT UNITS AAR SIG. SEC. SPEC. 190, MANUAL PART 166 OR AAR SIG. SEC. SPEC. 232, MANUAL PART 244. 16467, 16468 16469 OR 17201
ELECTRIC MOTOR MECHANISM AND GATE ARM AAR SIG. SEC. SPEC. 199, MANUAL PART 194
SPECIFY DIMENSIONS A-B-C AND LENGTH.
A
B
C
℄ OF LIGHT NOTE 1
14931
3 FT. 0 MIN. 4 FT. 0 MAX.
LENGTH
TOP OF FOUNDATION 6 IN ABOVE CROWN OF HIGHWAY
7 FT. 0 MIN.
10
28 MAX.
27 MAX.
36¼ MAX.
END OF COUNTERWEIGHT ARM
14941
SIDEWALK ARM WHEN REQUIRED, SPECIFY LENGTH
LENGTH
19
19
60
55 MAX.
MAX.
WIRE ENTRANCE, SPECIFY.
NOTE 2
14653
14652
16477
16474
16554
16551
16554
14651
12452
4 INCH PIPE WITH BASE
7 FT. 6 IN. LONG
0 12 24 36 48 60 72
SCALE AND ALL DIMENSIONS GIVEN IN INCHES UNLESS OTHERWISE INDICATED
HIGHWAY CROSSING SIGNAL
FLASHING LIGHT TYPE WITH EXTENDED LIGHTS AND PEDESTAL MOUNTED GATE – ASSEMBLY
M-1951 SEP. 1951 M-1950 SEP. 1950
AAR SIG. SEC. 1462 B

Fig. 7.

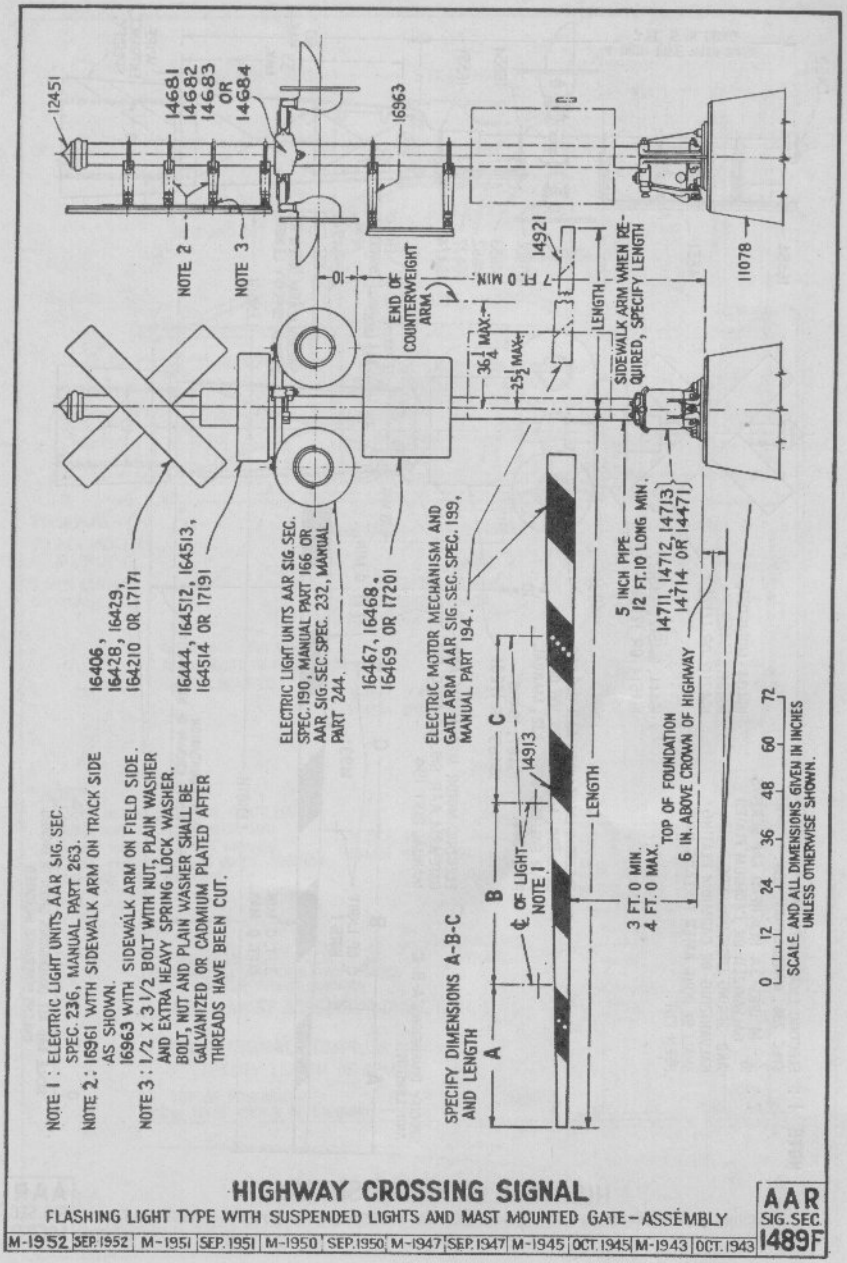

NOTE 1 : ELECTRIC LIGHT UNITS AAR SIG. SEC. SPEC. 236, MANUAL PART 263.
NOTE 2: 16961 WITH SIDEWALK ARM ON TRACK SIDE AS SHOWN.
16963 WITH SIDEWALK ARM ON FIELD SIDE.
NOTE 3: 1/2 X 3 1/2 BOLT WITH NUT, PLAIN WASHER AND EXTRA HEAVY SPRING LOCK WASHER. BOLT, NUT AND PLAIN WASHER SHALL BE GALVANIZED OR CADMIUM PLATED AFTER THREADS HAVE BEEN CUT.
16406, 16428, 16429, 16210 OR 17171
16444, 164512, 164513, 164514 OR 17191
ELECTRIC LIGHT UNITS AAR SIG. SEC. SPEC. 190, MANUAL PART 166 OR AAR SIG. SEC. SPEC. 232, MANUAL PART 244.
16467, 16468, 16469 OR 17201
ELECTRIC MOTOR MECHANISM AND GATE ARM AAR SIG. SEC. SPEC. 199, MANUAL PART 194.
SPECIFY DIMENSIONS A-B-C AND LENGTH
A
B
C
℄ OF LIGHT NOTE 1
14913
LENGTH
3 FT. 0 MIN. 4 FT. 0 MAX.
TOP OF FOUNDATION 6 IN. ABOVE CROWN OF HIGHWAY
5 INCH PIPE 12 FT. 10 LONG MIN.
14711, 14712, 14713 14714 OR 14471
12451
14681 14682 14683 OR 14684
NOTE 2
NOTE 3
16963
10
END OF COUNTERWEIGHT ARM
7 FT. 0 MIN.
36¼ MAX.
25½ MAX.
14921
LENGTH
SIDEWALK ARM WHEN REQUIRED, SPECIFY LENGTH
11078
0 12 24 36 48 60 72
SCALE AND ALL DIMENSIONS GIVEN IN INCHES UNLESS OTHERWISE SHOWN.
HIGHWAY CROSSING SIGNAL
FLASHING LIGHT TYPE WITH SUSPENDED LIGHTS AND MAST MOUNTED GATE – ASSEMBLY
AAR SIG. SEC. 1489F
M-1952 SEP. 1952 | M-1951 SEP. 1951 | M-1950 SEP. 1950 | M-1947 SEP. 1947 | M-1945 OCT. 1945 | M-1943 OCT. 1943

Fig. 8.

Audible signals.

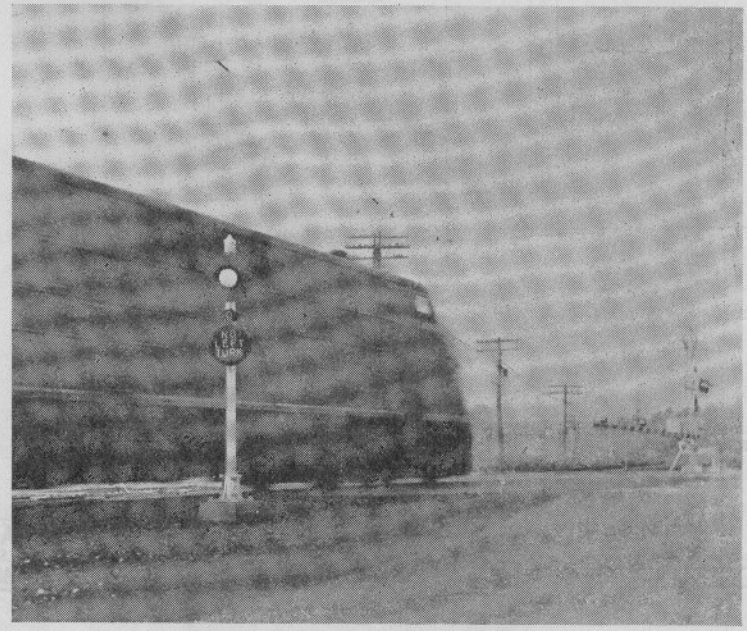
Electrically operated bells are practically the only audible signals in use. While many installations of bells alone, made before 1920, are still in service, bells are now generally used only with visual signals to comply with special requirements of local regulatory authorities.

If bells are made to sound loud enough to be heard by the drivers of trucks and other heavy vehicles, they are an annoyance to the residents and, conversely, if not loud enough to be annoying, they cannot be heard by the drivers. Therefore, as a protection for automobile traffic, they are not of sufficient value to warrant their installation. However, where pedestrian traffic is heavy, especially in the neighborhood of schools, the use of a softer-toned bell as an adjunct to the visual signal and for the sole purpose of warning pedestrians is in some cases justified.

Requisites for bells are included with those for automatic gates and for highway grade crossing signals.

"NO RIGHT TURN" or "NO LEFT TURN" signals.

In some instances, where streets that are parallel and adjacent to tracks approach a street which crosses the tracks, a special "NO RIGHT TURN" or "NO LEFT TURN" signal is located on the side streets and illuminated in conjunction with the flashing light signals when a train is approaching. Generally there are two vertically mounted units on a mast. On the approach of a train the top unit displays a flashing yellow light, while the bottom unit displays a steady burning light which illuminates the "NO RIGHT TURN" or "NO LEFT TURN" sign.



"NO LEFT TURN" Signal.

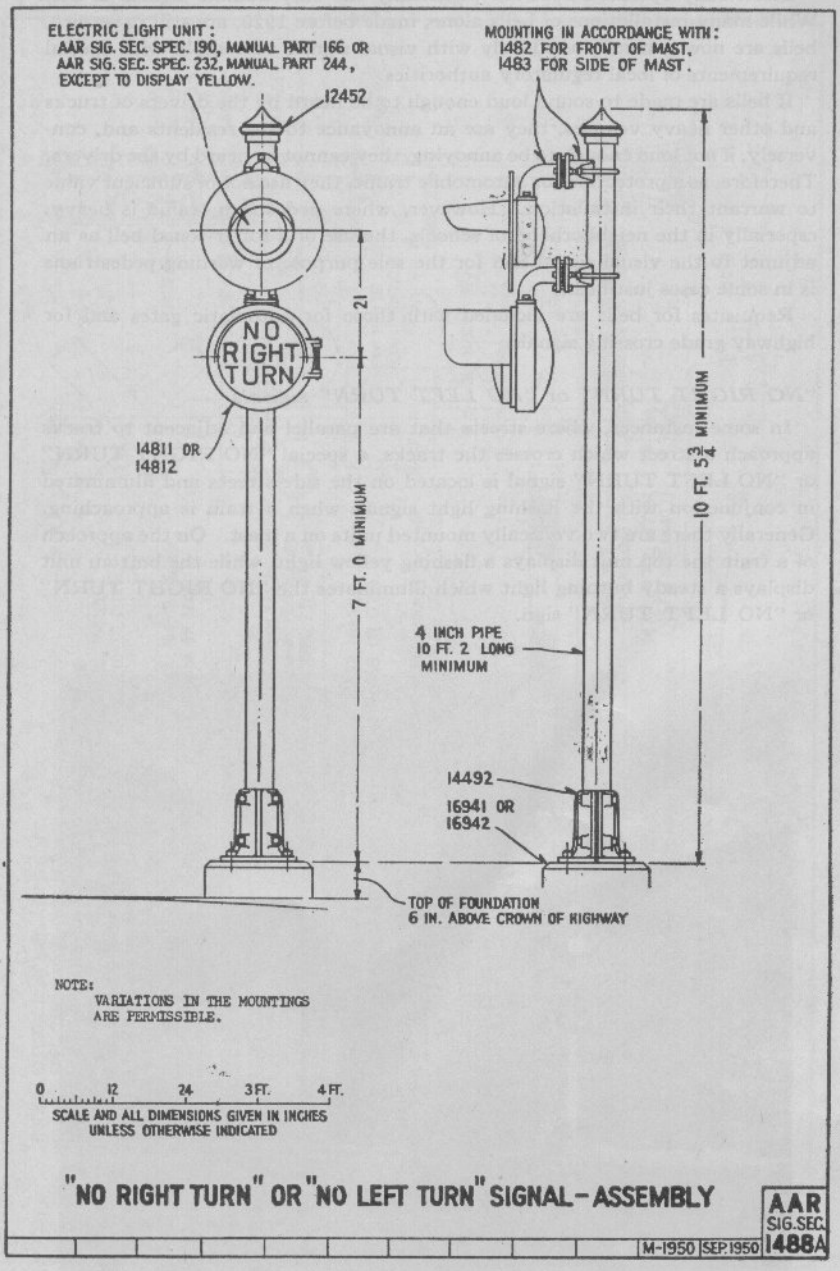

ELECTRIC LIGHT UNIT:
AAR SIG. SEC. SPEC. 190, MANUAL PART 166 OR
AAR SIG. SEC. SPEC. 232, MANUAL PART 244,
EXCEPT TO DISPLAY YELLOW.
12452
NO RIGHT TURN
14811 OR
14812
21
7 FT. 0 MINIMUM
MOUNTING IN ACCORDANCE WITH:
1482 FOR FRONT OF MAST.
1483 FOR SIDE OF MAST.
10 FT. 5 3/4 MINIMUM
4 INCH PIPE
10 FT. 2 LONG
MINIMUM
14492
16941 OR
16942
TOP OF FOUNDATION
6 IN. ABOVE CROWN OF HIGHWAY
NOTE:
VARIATIONS IN THE MOUNTINGS
ARE PERMISSIBLE.
0
12
24
3 FT.
4 FT.
SCALE AND ALL DIMENSIONS GIVEN IN INCHES
UNLESS OTHERWISE INDICATED
"NO RIGHT TURN" OR "NO LEFT TURN" SIGNAL-ASSEMBLY
AAR
SIG.SEC.
M-1950 SEP. 1950
1488A

Fig. 9.

Requisites for "NO RIGHT TURN" or "NO LEFT TURN" signals.

1. On highways adjacent to and approximately paralleling a railroad, which intersect or join another highway that crosses the railroad, signals displaying the legend "NO RIGHT TURN" or "NO LEFT TURN" on the approach of a train may be used to supplement the highway grade crossing signals which are located at the crossing.

2. The aspect shall be that of an illuminated sign bearing the legend "NO RIGHT TURN" or "NO LEFT TURN" surmounted by a flashing yellow marker light.

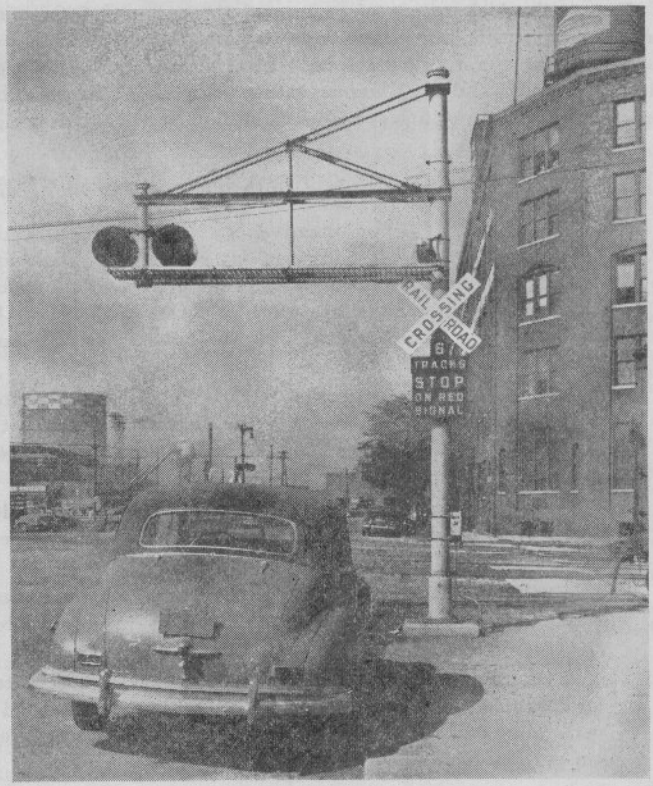
3. Signal shall be placed preferably to the right of the parallel highway approaching the crossing and as close to the intersection as practicable. The center of the sign shall be not less than 7 feet nor more than 9 feet above the surface of the highway, and the center of the marker shall be approximately 2 feet higher. Signal shall conform to Drawing 1488 (Fig. 9).

4. Pipe, base, pinnacle, brackets and clamps shall be painted with a finishing coat of white or aluminum when installed.

5. Controls for the operation of the signal shall be in accordance with requisites for control of automatic highway grade crossing signals and devices. (See page 22.)

The location of crossing signals.

The present practice with reference to the location of crossing signals is to place one signal at the right of the highway for each direction approaching the



tracks. Light units on each signal are directed in both directions along the highway so that if the view of one of the two signals is obstructed, an approaching driver may see the other.

At locations where automobiles or trucks are frequently parked in positions to obstruct the view of signals on masts, cantilever arms are used to extend the signals out over the road. The former practice at such locations was to place the signals on large concrete foundations in the center of the road, but experience showed that many accidents were caused by vehicles being driven into the foundations in such locations, and this practice has, therefore, been discontinued on new installations.

Flashing light signals are usually located about 6 feet from the edge of paved highways where curbs are not involved. On highways having curbs, they may be only far enough from the curb to permit a vehicle at the curb to clear. They should be as close to the railroad as required clearance for passing trains will permit, but at an oblique crossing they must be far enough away to permit a vehicle standing opposite the signal and at the right of the center line of the highway to clear a train on the nearest track. The same principles apply to the location of wig-wag signals and short-arm gates.

Control of Highway Crossing Protection

The control of highway grade crossing protective devices is usually effected automatically by track circuits actuated by the presence of an approaching train. Due to the high speeds of trains and the necessity for minimizing delays to highway traffic where excessive operation of the devices may result from various local operating conditions, control circuits may extend over a considerable distance and may become rather complex. This situation has resulted in the necessity for a very high standard of control circuit design.

Requisites for control of automatic highway grade crossing signals and devices.

1. *General.*

(a) Signals and devices which indicate the approach of a train shall be so controlled that they will operate for such period of time before the arrival of any train operated over the crossing as is reasonably required to afford protection.

(b) Controls shall be in accordance with Requisites for Automatic Block Signaling Circuits in so far as they apply, and as far as practicable shall be so designed that in the event of failure of any part, the required operating time of the signals and devices will be assured.

(c) Where means are provided for cutting out the protective devices during intervals when trains make regular operating stops or perform switching operations on approach circuits:

1. Controls shall be so designed as to insure required operating time of protective devices, when the train again proceeds toward the crossing.

2. Automatic control of the protective devices actuated by approaching trains other than the train that has stopped or is performing switching operations, shall take precedence over any cut-out features.

(d) Where manual supervisory control of protective devices is provided in addition to automatic controls:

1. Automatic control actuated by approaching trains other than that for which manual control has been made effective shall take precedence over the manual control.

2. Means shall be provided to insure restoring of the controls to automatic operation.

3. Means shall be provided to prevent manual operation by unauthorized persons.

2. *Controls for highway grade crossing signals.*

(a) Where the distance from the most remote signal to the clearance on the highway for the farthest track on which trains operate at medium or higher speed, as measured parallel to the center line of the highway, is 35 feet or less, the signals shall operate for not less than 20 seconds before the arrival of any train on such track. Where this distance is more than 35 feet, the 20 seconds time should be increased by an amount equal to the additional travel time required for slow moving highway vehicles which use the particular crossing, to clear the farthest track.

(b) For trains in either direction on main tracks over which trains normally operate in either direction, and for trains moving with the current of traffic on main tracks over which trains normally operate in one direction only, signals shall operate until the rear of the train clears the crossing.

(c) Where reverse running is frequent on main tracks, consideration shall be given to meeting the same requirement as where trains normally operate in either direction on main track.

(d) Where train speeds on a given track vary considerably, a single operating circuit of such length as to provide adequate warning of the approach of trains at the higher speed may produce too long a warning time for slower trains. In such cases, additional operating circuits may be provided with timing devices so arranged that a warning time, not too long for the slower trains, will be automatically selected.

(e) Bell, when used, shall sound a warning from time signal lights start to operate at least until head end of train has passed the crossing.

3. *Controls for automatic gates.*

(a) Gate arm lights shall operate in conjunction with the highway grade crossing signal, as follows:

1. Lights shall operate at all times when the gate is in position to obstruct highway traffic.

2. Light nearest the tip of arm shall burn steadily.

3. Two lights shall flash alternately and in unison with the lights on the signal.

(b) Gate arm shall start its downward motion not less than 3 seconds after the signal lights start to operate.

(c) Gate arm shall reach full horizontal position before arrival of any train on a main track and shall remain in that position until the rear of the train has cleared the crossing.

(d) Circuits shall be so arranged that a failure of the gate mechanism to operate as intended will not prevent the lights on gate arm and signal from operating on the approach of a train.

(e) Bell, when used, shall sound a warning from the time the signal lights start to operate at least until the gate arm has descended to within 10 degrees of the horizontal position.

4. *Controls for "NO RIGHT TURN" and "NO LEFT TURN" signals.*

(a) Sign shall be illuminated without flashing during period that the crossing signals are operating.

(b) The yellow marker located above the sign shall flash in synchronism with the crossing signals.

Directional controls.

One of the important features in the control of automatic highway grade crossing protection is the use of directional controls. These are required where trains are operated in either direction on a given track and it is becoming general practice to provide controls on this basis in multiple track territory to provide adequate protection for even infrequent reverse movements. In general, two schemes of directional control are available: the directional stick relay and the interlocking relay. The interlocking relay is described in Chapter VI—Direct Current Relays.

While many crossing protection installations now in service employ interlocking relays, quite a few railroads prefer the use of directional stick relays. The stick relay scheme is basic in railway signaling in that it is capable of determining a condition (in this case, direction) and registering that condition until its registry is no longer required. The registry is accomplished by causing the relay to remain energized over its own front contact.

Special controls.

Few major highway grade crossing protection projects today are installed without some form of additional control, there being many additions or modifications available to accommodate local operating requirements. These arrangements can be classified as special controls and can be roughly grouped into two general categories: (1) manual or auto-manual and (2) automatic.

Under the first classification, manual or auto-manual, are the arrangements whereby push buttons or other types of circuit controller are used to cut out operation of the protective devices during train stops or switching movements. This classification would also include the various methods for providing auto-manual supervisory control where a watchman, provided with model board and suitable controlling devices, operates a group of crossing protection installations during a certain portion of the day. Where auto-manual controls are provided and the watchman is not on duty the controls revert to automatic operation. In this arrangement, provision must be made so that automatic control actuated by an approaching train other than the train for which the cut-out is effective will take precedence over any cut-out feature. Figure 10 illustrates a manual supervisory control model board.

The automatic classification can be subdivided into the following: (a) automatic timing; (b) combination timing and manual cut-out (switch cut-out) and (c) selective speed control.

Automatic timing is applicable where trains make regular operating stops and it is desirable to cut out the crossing protection if an approach track section is occupied for a predetermined length of time. At very busy crossings and where there is a large variance in speed between the fastest and slowest trains

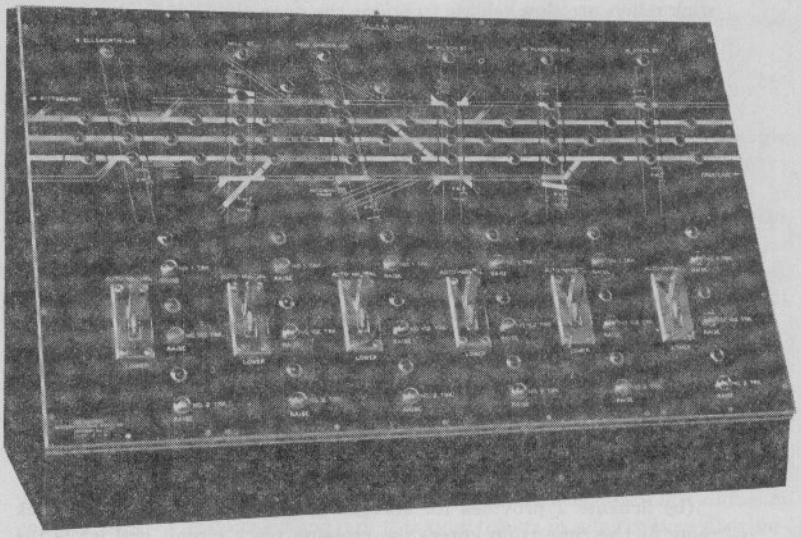


Fig. 10.
Manual Supervisory Control Model Board.

operated over a given crossing, a variation of this arrangement is used as indicated by the second item, selective speed control. Here the cut-out feature is dependent upon the measured speed of trains approaching the crossing. Combination timing and manual cut-out (switch cut-out), would include schemes where automatic timing is employed in conjunction with circuit controllers actuated by the operation of hand-throw track switches in territory where numerous switching moves are made. The requirements concerning precedence of through movements and of restart arrangements indicated under manual cut-outs apply to automatic schemes as well.

Typical circuits. (See four folded sheets at back of this chapter.)

Typical circuits for a complete crossing protection installation are shown on A.A.R. Sig. Sec. 8011 (two sheets), and include alternate arrangements of warning signals and auxiliary devices such as the vertical illuminated and rotating disc stop signs, flashing lights and automatic flagman.

1. Directional stick relay arrangement.

   (a) When a train occupies an approach track circuit section and proceeds over the crossing, the approach relay will not become energized until train clears the crossing track circuit, due to the stick control of the approach relays. This feature is designed to provide proper operation of the directional stick relays for closely following train movements. Timing circuit is shown to cut out a portion of the westward approach when occupied for more than a predetermined length of time.

   (b) The stick relay circuit as shown provides for the energizing of receding directional stick relay when train enters the crossing track circuit and while the approach track circuit is occupied and receding approach circuit is unoccupied. This prevents establishing direction due to an inadvertent shunting of crossing track circuit. Directional

stick relays are slow release to bridge the open circuit time that may be caused by the movement of a high-speed short train and contact transfer time of receding approach relay.

2. Interlocking relay arrangement.

(a) When a train occupies an approach track circuit section and proceeds over the crossing, the approach portion of the interlocking relay will remain de-energized until the train clears the crossing track circuit. This is accomplished by selecting both controls of the interlocking relay through the crossing track relay. A circuit is provided to cut out a portion of the eastward approach section for switching movements. A method of superimposing manual control is provided.

Typical circuits for an automatic crossing gate installation are found on A.A.R. Sig. Sec. 8053 which provides two different directional stick relay schemes.

1. Direction control circuits.

(a) Scheme 1 provides for energizing of receding directional stick relay at the time train enters the approach circuit and the receding approach circuit is unoccupied.

(b) Scheme 2 provides for energizing of receding directional stick relay at the time train enters the crossing track circuit and while the approach track circuit is occupied and the receding approach circuit is unoccupied.

(c) Directional stick relays are slow release to bridge the open circuit time that may be caused by the movement of a high-speed short train and contact transfer time of receding approach relay.

2. Gate control circuits.

(a) Relay XGNR controls the crossing lights in such a manner as to provide for the lighting of the flashing lights and gate arm lights when a train enters and occupies the approach track circuit. This lighting is retained while the crossing track circuit is occupied, and until the gate arms reach their approximate normal vertical position.

(b) Gate control relay XGNPR is slow release to provide a time delay between lighting of lights and lowering of gate arm.

Typical circuits illustrating one method of obtaining selective speed control in which the operating time of the protective device is dependent upon the speeds of approaching trains as measured by means of a timing track section, are shown on A.A.R. Sig. Sec. 8052. On this plan, one measuring section differentiating between two general speed groups, *i.e.*, high and low, is shown. The plan provides a means of reducing the approach warning time of the crossing protection for a slow or medium speed train in high-speed single direction running territory. The circuit shown provides a separate start for maximum speed and lower speed trains by means of timing section 1T which initiates the start of a timing relay. This timing section is in approach to the maximum speed start and if a train consumes greater time than the predetermined time of the lower speed train in this timing section, the timing relay completes its cycle of operation and energy is maintained to the control relay ETPR until train enters 3T track section. The circuit provides for a complete time cycle for the timing relay by means of the use of the 1TECPSR relay or selection of the roadway signal circuit through the check contact of the timing relay. When this circuit arrangement is used in non-signaled territory a means of checking the proper operation of 1T track circuit should be provided.

Consideration should be given to acceleration, variation in train speeds and reverse running when using this plan.

Roundels for Flashing Light Signals

A "spreadlight" roundel distributes light uniformly through the entire angle indicated, one-half the angle being on each side of center. A most common example is a roundel with 30-degree horizontal spread.

A "deflecting" roundel distributes a portion of the light from the main beam to one side of the center and in the direction of the arrow on the roundel.

A roundel having both spreadlight and deflecting features is so made that the deflection is at right angles to the spread. Examples of such roundels are:

30-degree horizontal spread, 15-degree downward deflection roundel
20-degree horizontal spread, 32-degree downward deflection roundel

These two roundels are most commonly used, the first on mast-mounted signals at standard height, 7 to 9 feet, and the second on cantilever-mounted signals and mast-mounted signals higher than 9 feet.

A "diffusion-deflection" roundel spreads the light beam horizontally both ways from the center and also deflects the beam downward. The diffusion characteristic of a typical roundel of this type results in a fairly even distribution of the light in a horizontal beam about 40 degrees wide at a vertical angle 6 to 8 degrees below the center. This type of roundel is sometimes used for cantilever-mounted signals and mast-mounted signals higher than 9 feet.

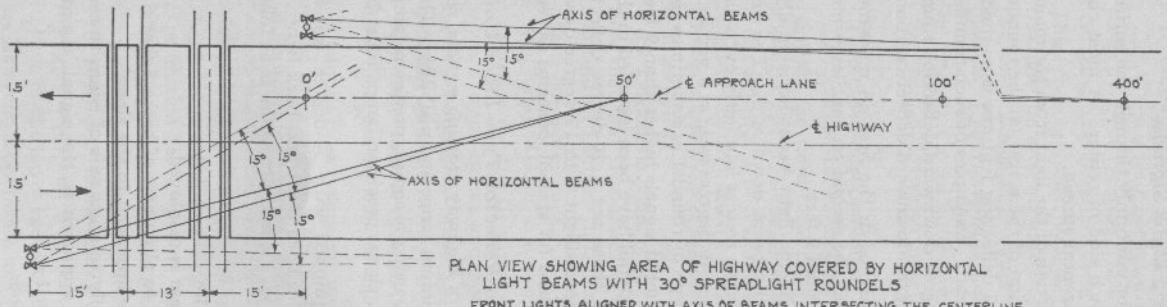
Other roundels than those described in detail have been installed in the past and many are still in service. Some of these are a 20-degree deflecting, a 70-degree spreadlight, and a 160-degree spreadlight with 12-degree downward deflection. Such roundels are now only used for special locations as required.

Aligning Highway Crossing Signal Reflector Type Light Units

Proper aligning of flashing light units of highway crossing signals, reflector type, is very important in providing maximum range and visibility. The light units are focused by the manufacturer, using a signal precision lamp. To obtain the range and efficiency intended, signal precision lamps must be used for replacements.

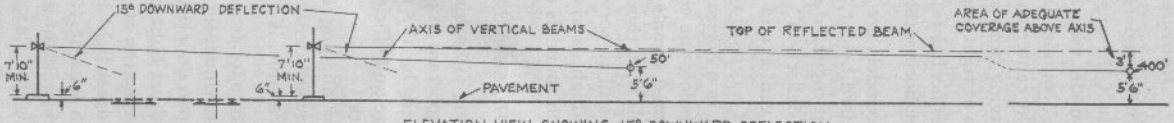
A method of aligning light units equipped with 30-degree spreadlight 15-degree downward deflection roundels in both front and back lights, where two men are available, is illustrated in Fig. 11, and procedure is as follows:

1. Procedure for front light units.
   (a) Continuously light one lamp.
   (b) Open door wide so clear beam is displayed.
   (c) Adjust light unit vertically to align axis of beam 5 feet 6 inches above pavement at 400 feet in the approach to the signal.
   (d) Adjust light unit horizontally to align axis of beam to center of approach lane at 400 feet in the approach to the signal, maintaining vertical alignment as in paragraph 1-c.
   (e) Tighten clamps and close door.
   (f) Repeat paragraphs 1-a to 1-e, inclusive, on other front light units.
2. Procedure for back light units.
   (a) Continuously light one lamp.
   (b) Open door wide so clear beam is displayed.
   (c) Adjust light unit vertically to align axis of beam 5 feet 6 inches



PLAN VIEW SHOWING AREA OF HIGHWAY COVERED BY HORIZONTAL LIGHT BEAMS WITH 30° SPREADLIGHT ROUNDELS

FRONT LIGHTS ALIGNED WITH AXIS OF BEAMS INTERSECTING THE CENTERLINE OF APPROACH LANE 400 FEET IN APPROACH TO FRONT LIGHT SIGNAL LOCATION.
BACK LIGHTS ALIGNED WITH AXIS OF BEAMS INTERSECTING THE CENTERLINE OF APPROACH LANE 50 FEET IN APPROACH TO FRONT LIGHT SIGNAL LOCATION.



ELEVATION VIEW SHOWING 15° DOWNWARD DEFLECTION

AXIS OF FRONT LIGHTS TO BE ADJUSTED FOR VERTICAL ALIGNMENT OF 5'6" AT 400 FEET.
AXIS OF BACK LIGHTS TO BE ADJUSTED FOR VERTICAL ALIGNMENT OF 5'6" AT 50 FEET.

Fig. 11.

above pavement at a point 50 feet in the approach to the signal on opposite side of track.

(d) Adjust light unit horizontally to align axis of beam to a point 50 feet in the approach to the signal on opposite side of track and in center of approach lane, maintaining vertical alignment as in paragraph 2-c.

(e) Tighten clamps and close door.

(f) Repeat paragraphs 2-a to 2-e, inclusive, on other back light units.

3. After units have been aligned, clamps tightened and doors closed, they must be checked with lights flashing to make certain that maximum visibility is obtained at 400 feet and adequate visibility at 1,500 feet for front light units, and that maximum visibility is obtained at 50 feet and adequate visibility at 400 feet for back light units.

Wherever a device is used to minimize the possibility of a phantom indication, the beam candlepower is reduced to the extent that higher than normal wattage lamps may be required to obtain adequate visibility.

Local conditions which limit the speed of approaching traffic or the distance at which the signals can be seen by drivers of vehicles approaching the crossing may make it desirable to align the signal light units in a manner differing from that shown in Fig. 11, and in addition may require the use of other roundels than the 30-degree horizontal spreadlight type with 15-degree downward deflection. In such cases the matter should be referred to the proper authority and roundels used and alignment made as instructed.

The alignment of the signal light units and the choice of roundels should in all cases be such that the approach lanes are fully covered by usable light continuously up to a point opposite the near signal, without having dark areas.

Explanatory.

Following the method described in the foregoing paragraphs, adequate visibility to meet requisites for highway grade crossing signals (see page 6), is obtained at 1,500 feet in approach to the crossing unless sharp curves or obstructions in the approach interfere. These conditions must be treated as special cases, keeping in mind the procedure outlined.

Dark glasses are an asset for the man observing the alignment of the units with the door open, particularly at the short distance from which back lights are observed. The use of a device to minimize the effect of phantom indications will ordinarily be desirable only on signals facing in an easterly or westerly direction. Signals at such locations may be affected when the sun is rising or setting, but the degree of phantom depends on the topography.

The foregoing information was drawn up after a study of previously reported methods, and after considerable field work to determine a desirable uniform and practical arrangement. The reasons for establishing the height and distances specified are stated here as a matter of interest:

1. The center of the approach lane at 400 feet is determined as the alignment point for the following reasons:

(a) 400 feet is approximately twice the stopping distance for an automobile traveling at 50 miles per hour.

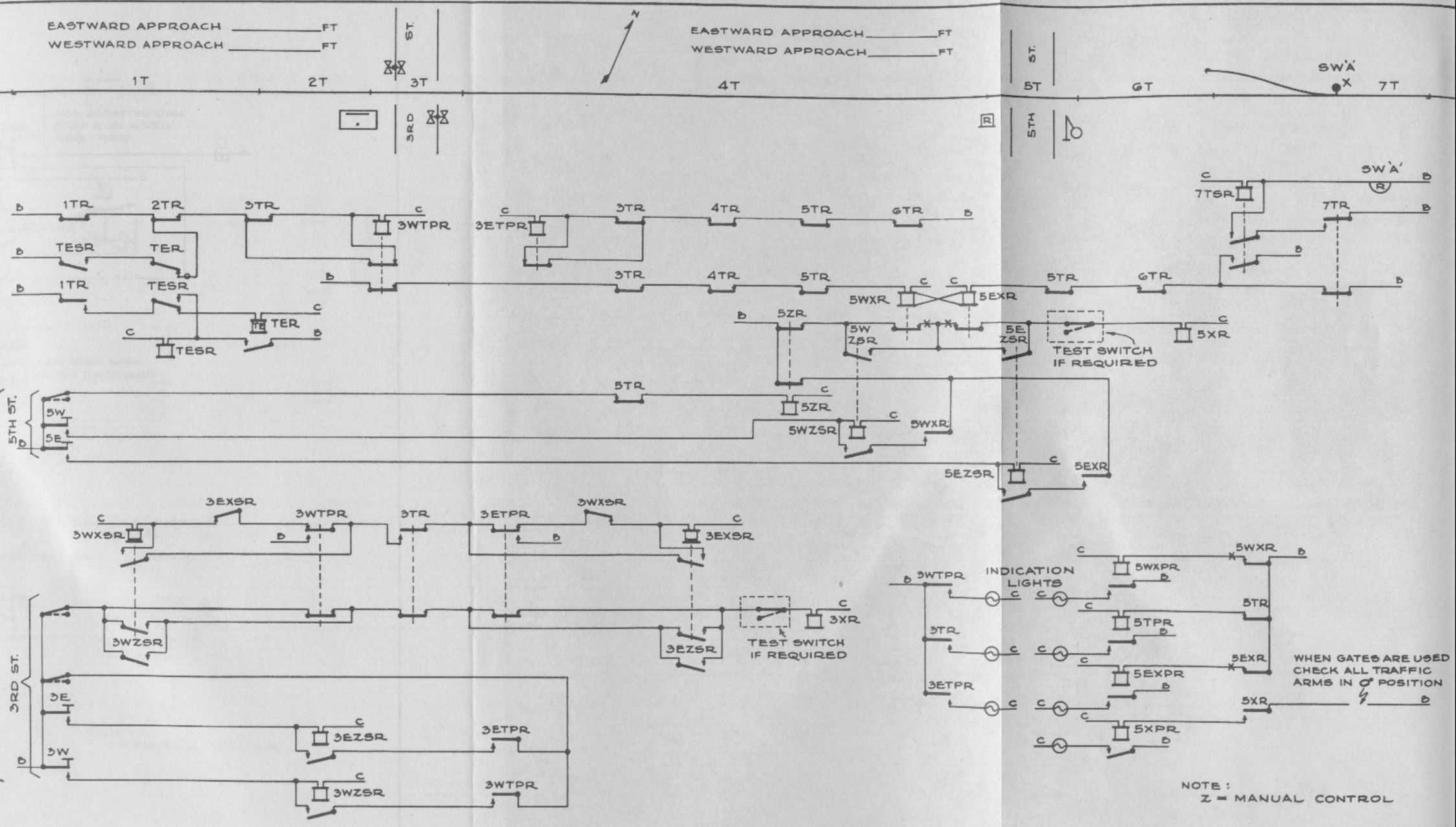
(b) The alignment point is in close proximity to the crossing so that two men working together can call or signal to each other for instructions.

(c) The clear light adjustment at 400 feet allows a distinct red flashing indication at 1,500 feet in approach to the crossing if the physical characteristics along the highway will permit.

(d) More universal use can be made of the method specifying the shorter distances.

2. The axis of the back light beams is aligned to a point 50 feet in approach to the front light signal location to which the back lights are attached, and for the center of the approach lane to obtain a good close indication, it being recognized that the close up back light indication is not satisfactory when such units are aligned for a longer range.

3. The vertical alignment is determined at 5 feet 6 inches above the pavement at the horizontal alignment points to obtain the best indication at these critical points as well as to prescribe a simple means of getting this adjustment from points already established. Tests have indicated that the 15-degree downward deflection provides for a good indication to the crossing with this alignment while the tolerance above the axis of the clear light beam causes the red signal to be adequate for the vision of drivers in big motor trucks and buses.



NOTE:
Z = MANUAL CONTROL

TYPICAL CIRCUITS FOR HIGHWAY GRADE CROSSING SIGNALS

AAR SIG.SEC 8011A

SEPT. 1947

SHEET 1 OF 2 SHEETS

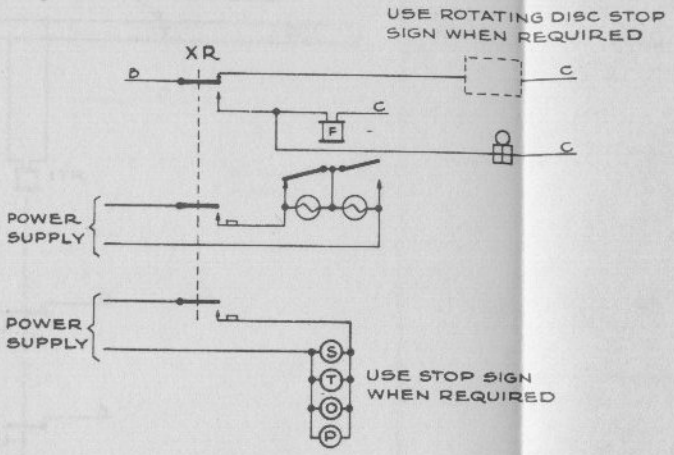


FIG. 1

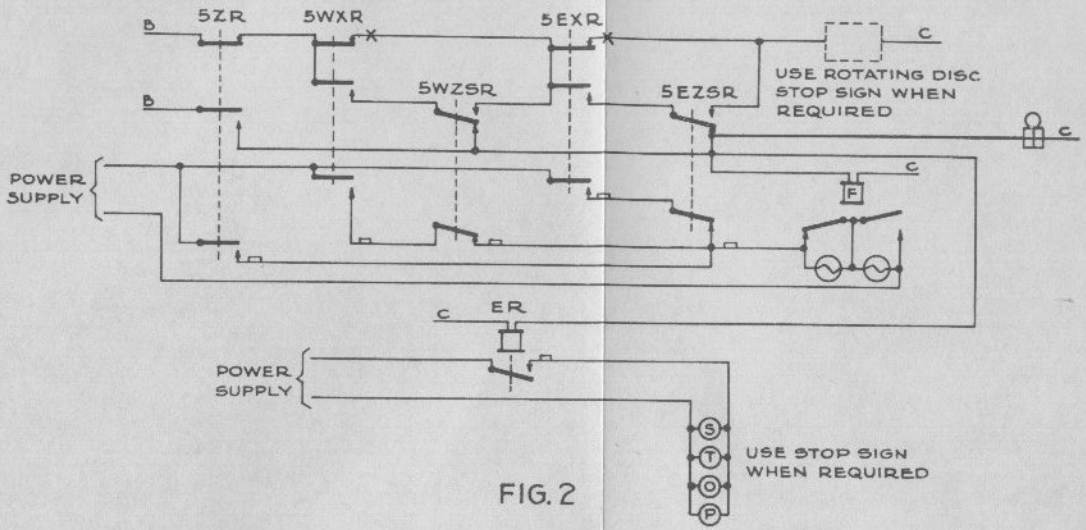


FIG. 2

FLASHING LIGHT SIGNALS

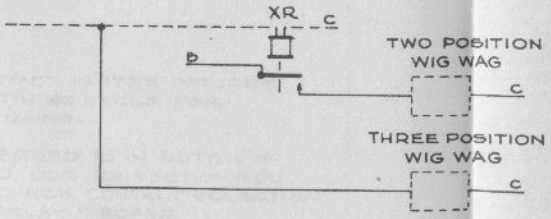


FIG. 3

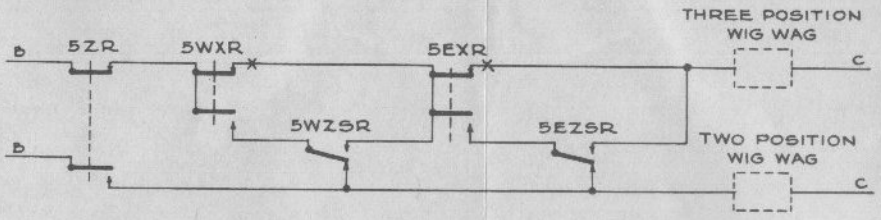
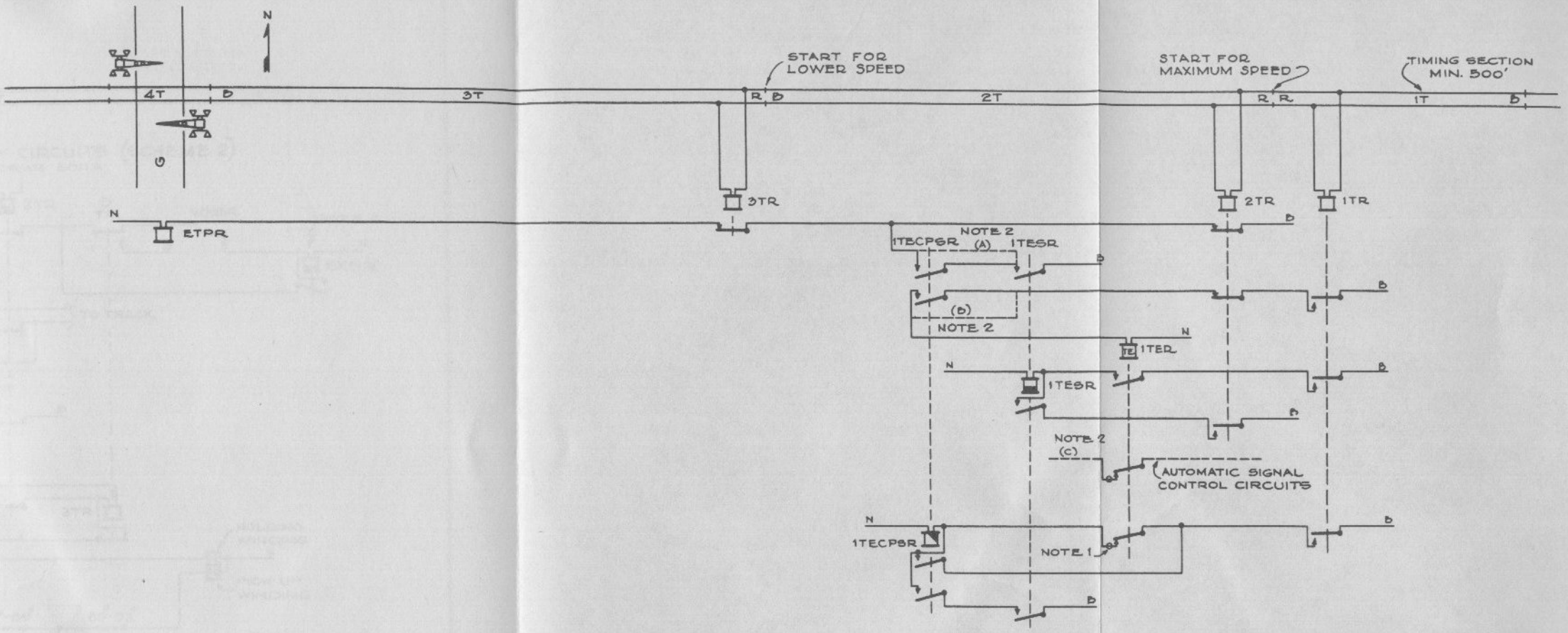


FIG. 4

NOTE :
Z = MANUAL CONTROL

AUTOMATIC FLAGMAN

TYPICAL CIRCUITS FOR HIGHWAY GRADE CROSSING SIGNALS



NOTE 1. CHECKING CONTACT IN 1TER INSURES A COMPLETE TIMING CYCLE FOR FOLLOWING TRAINS.

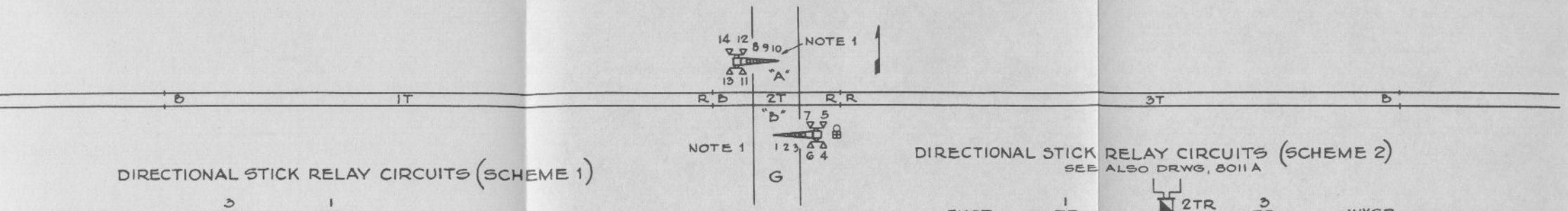
NOTE 2. IF CHECK REFERRED TO IN NOTE 1 IS NOT REQUIRED, USE CONNECTIONS (A) AND (D), AND CHECK CONTACT SELECTION (C) AND OMIT RELAY 1TECPSR.

TYPICAL CIRCUITS FOR SELECTIVE SPEED CONTROLS

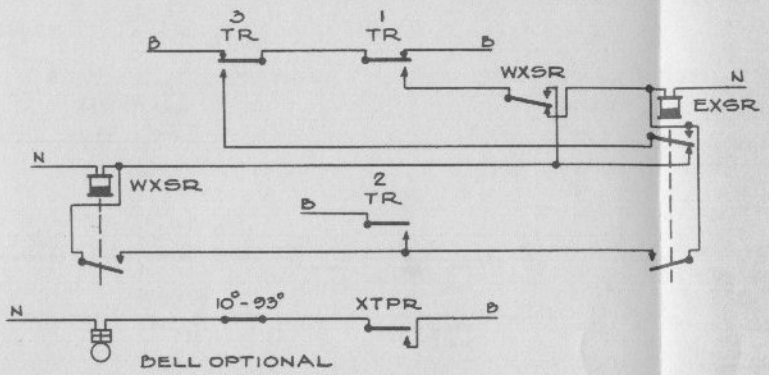
AUTOMATIC HIGHWAY CROSSING SIGNAL PROTECTION

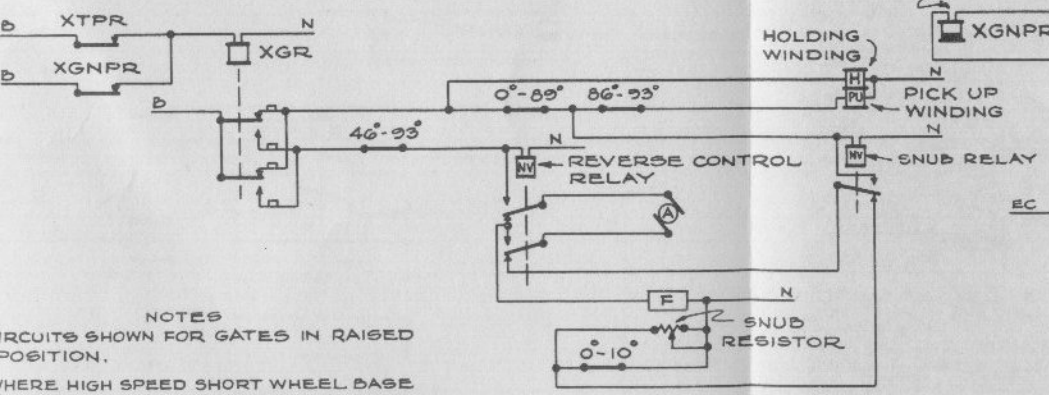
SEPT. 1950

AAR SIG.SEC. 8052A



DIRECTIONAL STICK RELAY CIRCUITS (SCHEME 1)





NOTES

CIRCUITS SHOWN FOR GATES IN RAISED POSITION.

WHERE HIGH SPEED SHORT WHEEL BASE TRAINS ARE INVOLVED, IT MAY BE NECESSARY TO MODIFY SCHEME 2 CIRCUITS & PROVIDE FOR QUICK PICK UP OF RELAYS EXSR & WXSR.

DETAIL CIRCUITS FOR GATE CONTROL WILL VARY WITH TYPE OF GATE MECHANISM EMPLOYED.

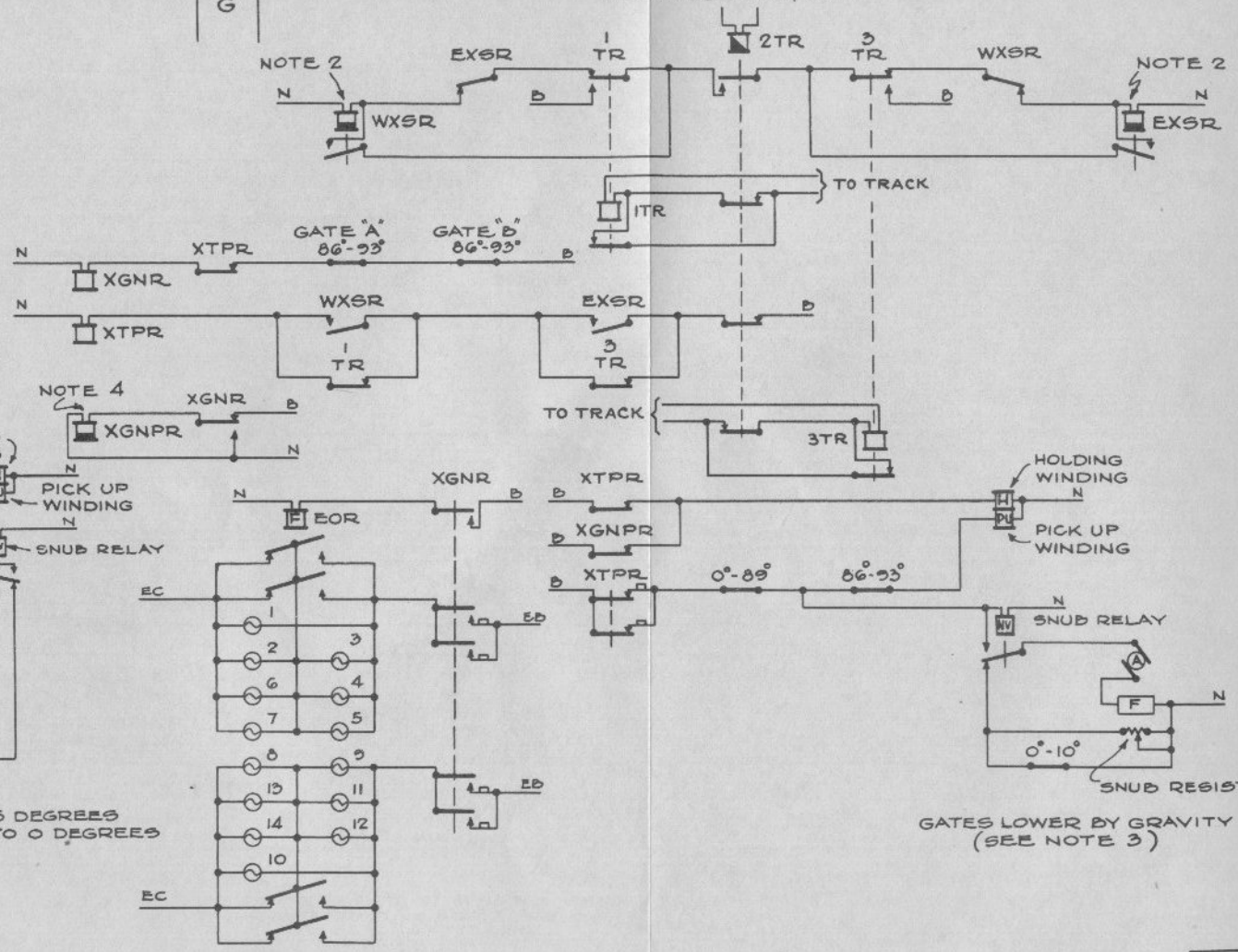
RELAY XGNPR TO HAVE MINIMUM RELEASE TIME OF 3 SECONDS.

(ALTERNATE)

GATES LOWER BY POWER TO 45 DEGREES AND BY GRAVITY 45 DEGREES TO 0 DEGREES (SEE NOTE 3)

DIRECTIONAL STICK RELAY CIRCUITS (SCHEME 2)

SEE ALSO DRWG. 8011 A



GATES LOWER BY GRAVITY (SEE NOTE 3)

TYPICAL CIRCUITS FOR AUTOMATIC HIGHWAY CROSSING GATES

AAR SIG. SE 8053	SEPT. 1953	SEPT. 1950