

# Turnouts

A turnout is an arrangement of a switch, a frog and closure rails, which diverts rolling stock from one track to another.

Because industrial trackwork often handles lighter loads at slower speeds than mainline railroads, industrial turnouts are constructed with lighter materials and components.

The diagram below illustrates the major components of a turnout.

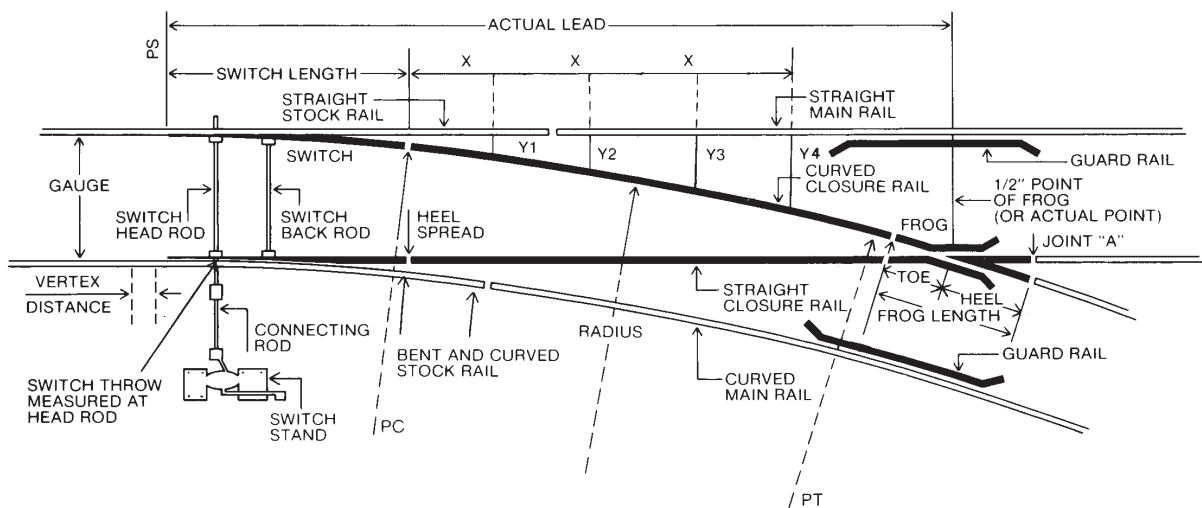


Figure 1

## **FROG**

*Frog Assembly Plates*

## **GUARD RAILS**

*Guard Rails Plates  
(when required)*

## **SWITCH STAND**

*Switch Stand Assembly  
Connecting Rod  
Target Assembly  
(when required)*

## **TURNOUT ACCESSORIES**

*Standard Tie Plates  
Rail Anchors  
Joints*

*Above furnished  
upon request*

## **SWITCH**

*Switch Points with  
Clips and Stops  
Switch Rods  
Braces and Brace Plates  
Gauge Plates  
Slide Plates  
Heel Plates  
Hook-Twin Tie Plates  
Heel Block Assemblies*

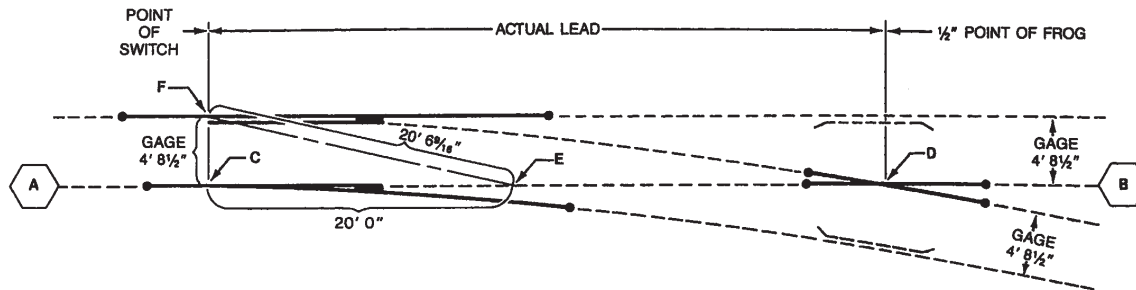
## **Note:**

*Stock, Closure and  
Turnout Rails can be  
supplied upon request*



# Turnout Installation

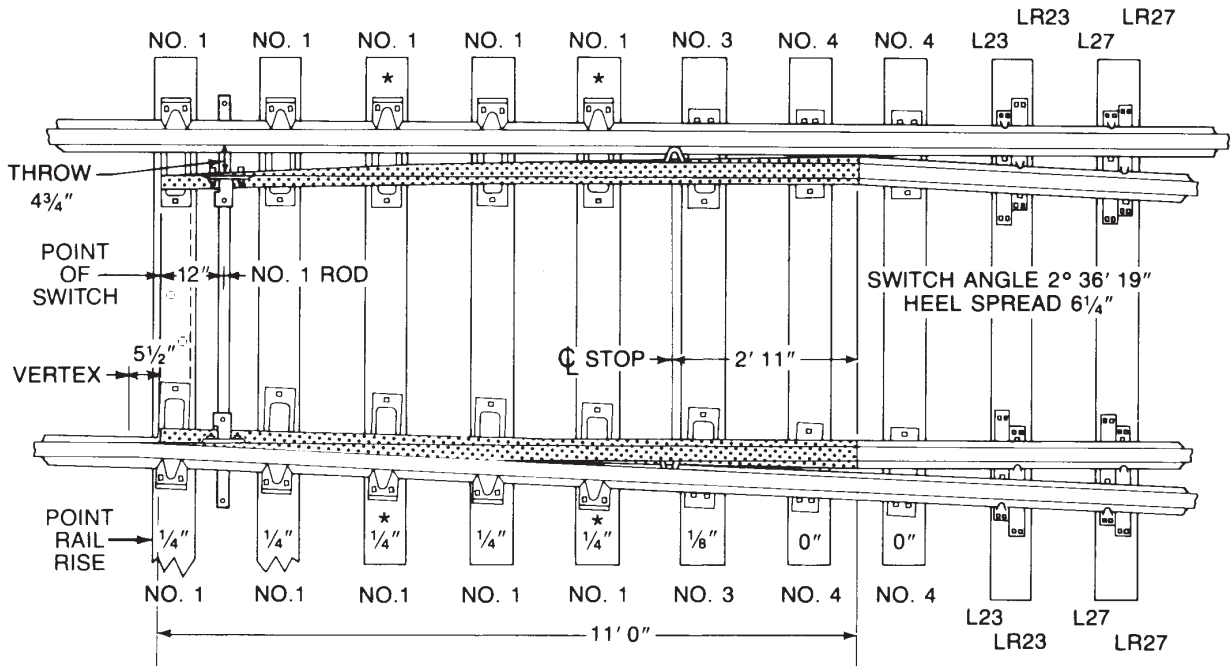
## STRAIGHT GAUGE LINE METHOD NOMINAL 56 1/2



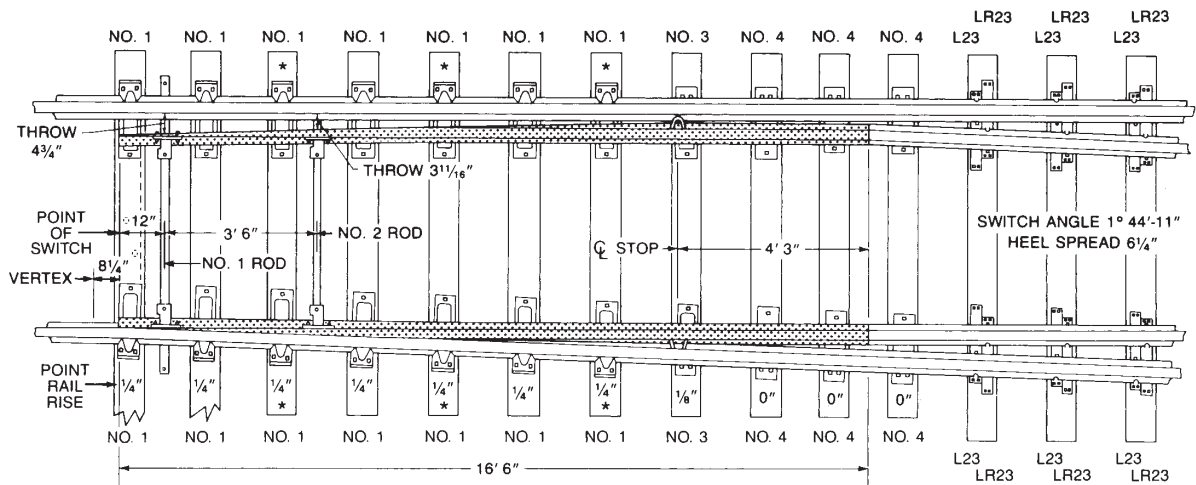
1. Place turnout material in its approximate location.
2. Establish a string line over the straight switch point through the frog - Point A to Point B. This establishes the gauge line of the straight side of the turnout.
3. Place material under the gauge line (string line A-B).
4. Select or locate the Point of Switch, C.
5. Set the straight switch point and the curved stock rail in place.
6. Measure the lead distance and set the 1/2" point frog, D.
7. Square up the other switch point and stock rail assembly as shown in diagram (Points C, E & F). Note: dimensions will vary with change in gauge.
8. Fill in closure, turnout, and guard rails as required.
9. Assemble joints, but do not tighten.
10. Recheck alignment and square for visual appearance.  
Are straight lines straight?  
Are curves smooth?
11. Spike every 4th and 5th tie to decrease movement prior to tightening the joints.
12. Now you are ready for final assembly. Tighten the joints and spike the balance of the turnout.



# 11'-0" Straight Split Switch



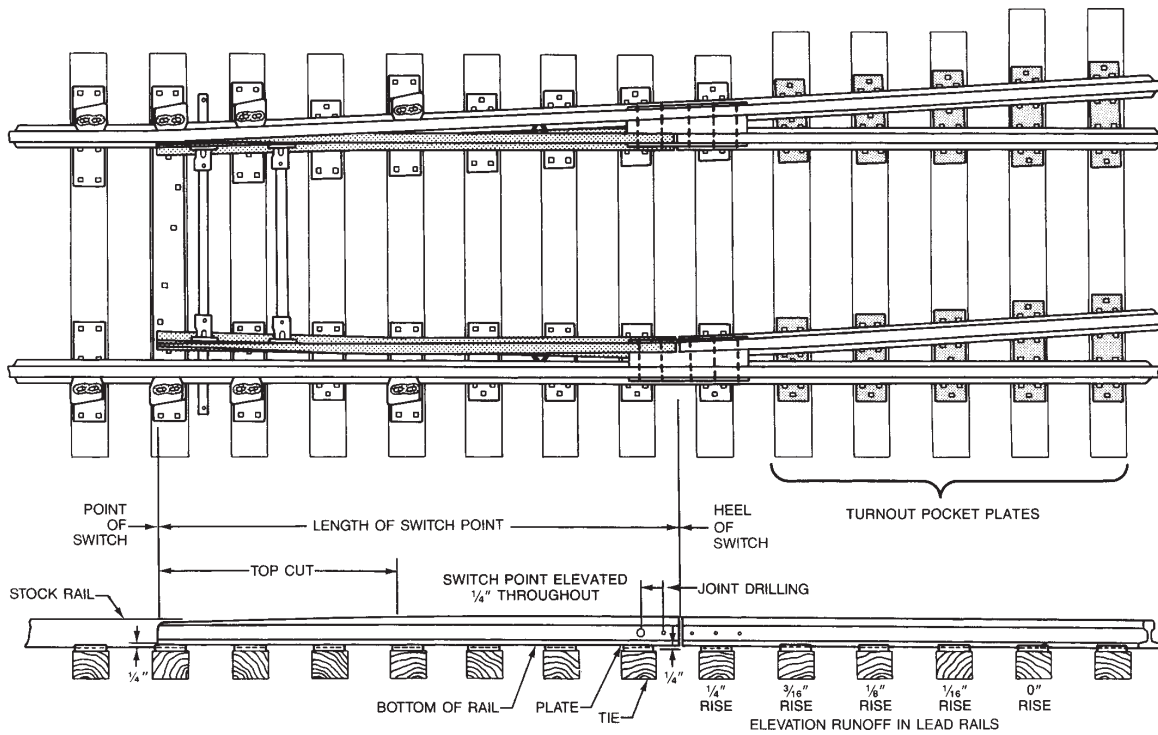
# 16'-6" Straight Split Switch



# Split Switch with Uniform Risers

The switch rails have a uniform elevation for the entire length of the switch (up 1/4"). Turnout plates have decreasing risers to slope the closure rails back down to the same elevation as the stock rails.

## PLAN VIEW OF SWITCH AND PLATE LAYOUT WITH UNIFORM RISERS



**ELEVATION OF SWITCH TO SHOW UNIFORM RISERS**  
 FOR DETAILS OF SWITCH POINT, REFER TO AREA PLAN FOR SWITCH LENGTH REQUIRED.  
 (See below for AREA Split-Switch listings.)

Unitrac produces switches to the following AREA plans:

**111 16'-6" Straight Split Switch with Uniform Risers.**

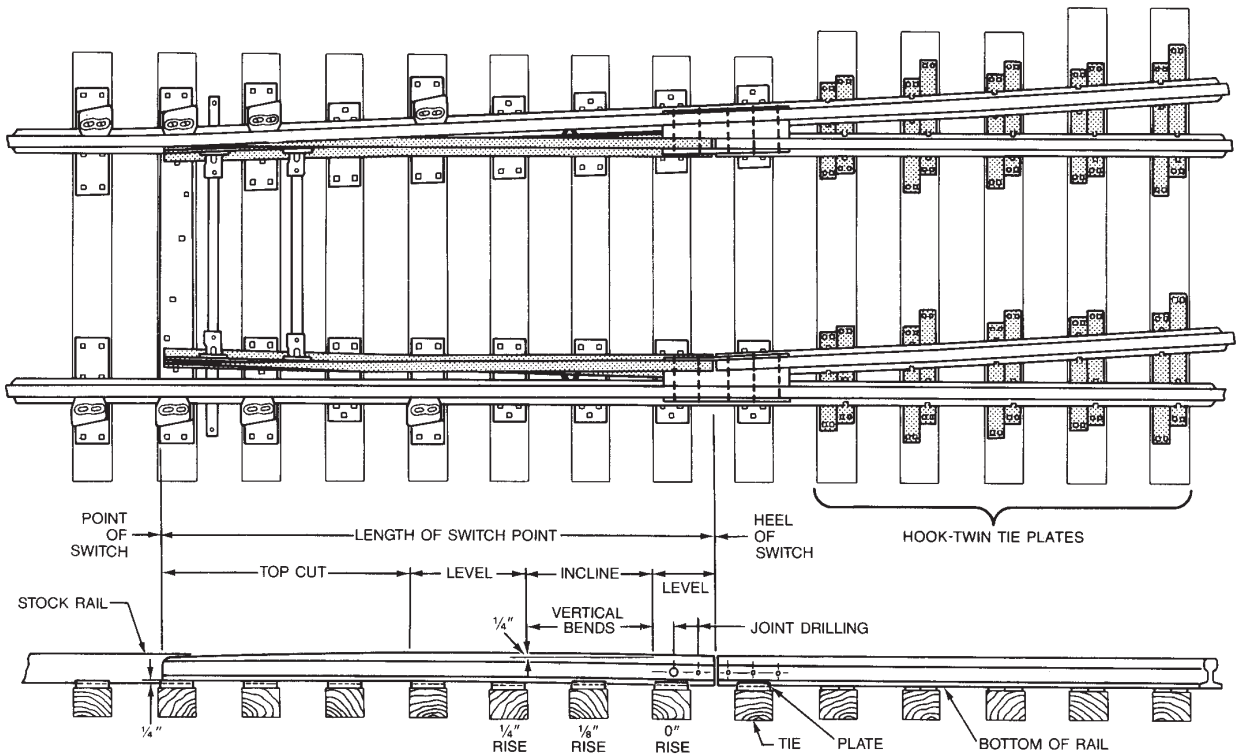
**113 11'-0" Straight Split Switch with Uniform Risers.**



# Split Switch with Graduated Risers

The switch rails are elevated to the required height above the stock rail (up 1/4"), then gradually slope down to 0" at the heel of the switch. Hook twin turnout plates are used.

## PLAN VIEW OF SWITCH AND PLATE LAYOUT WITH GRADUATED RISERS



**ELEVATION OF SWITCH TO SHOW GRADUATED RISERS**  
 FOR DETAILS OF SWITCH POINT, REFER TO AREA PLAN FOR SWITCH LENGTH REQUIRED.  
 (See below for AREA Split-Switch listings.)

Unitrac produces switches to the following AREA plans:

- 112 16'-6" Straight Split Switch with Graduated Risers.
- 114 11'-0" Straight Split Switch with Graduated Risers.

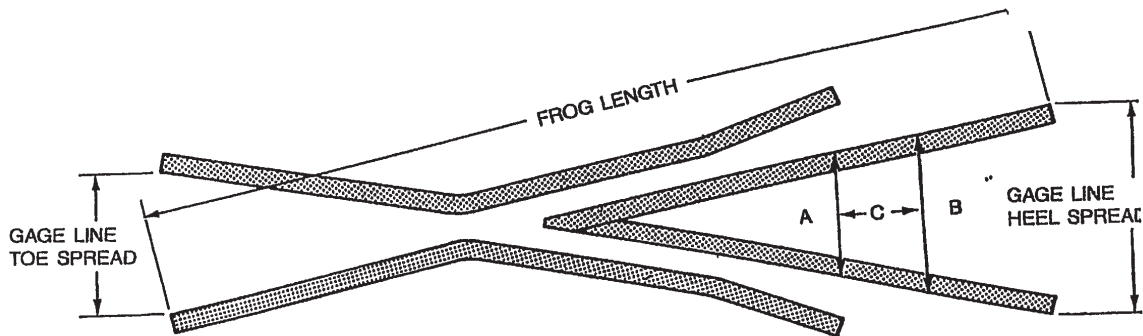


# Frogs

Frogs permit wheel flanges to cross opposing rails in turnouts and crossings, while providing support for the wheels. The end of the frog nearest the switch is the toe of the frog, the other end is the heel.

Frogs are referenced by angle which is converted to a number. For example, a number 8 frog creates an angle of 7 degrees 9 minutes and 10 seconds or an angle of 1-8. To put it more simply, for every increase of 8" on the gauge line, the spread or distance between gauge lines increases 1"

## HOW TO DETERMINE FROG NUMBER FOR STRAIGHT FROGS ONLY



### METHOD 1

The frog number is the ratio of its length to its width.

Formula (all dimensions in inches)

$$\frac{\text{Total frog length}}{\text{Gauge line toe spread} \div \text{Gauge line heel spread}} = \text{Frog Number}$$

Example: For an AREA 623, No. 10:

$$\frac{16\text{ft. } 6 \text{ in.}}{7 \frac{3}{16} \div 12 \frac{5}{8}} = \frac{198 \text{ in.}}{19 \frac{13}{16} \text{ in.}} = 10$$

### METHOD 2

The frog number is the ratio of its length to spread in the heel section of the frog.

Step 1. Measure the spread at any point on the heel. Mark the gauge line, A.

Step 2. Mark a second gauge line, B, where the spread is one inch greater than at A.

Step 3. Measure the distance, C, from A to B to get the frog number.

Example

Spread A = 5 in.

Spread B = 6 in.

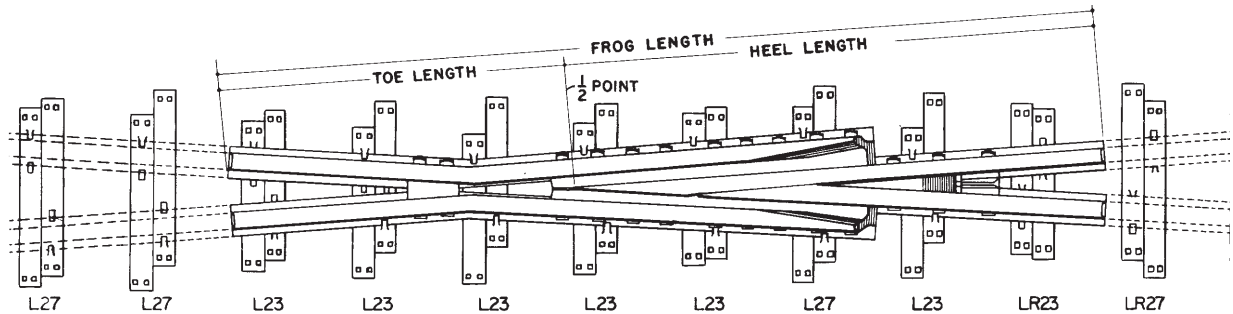
Distance C = 10 in.

Therefore, the frog is a No. 10



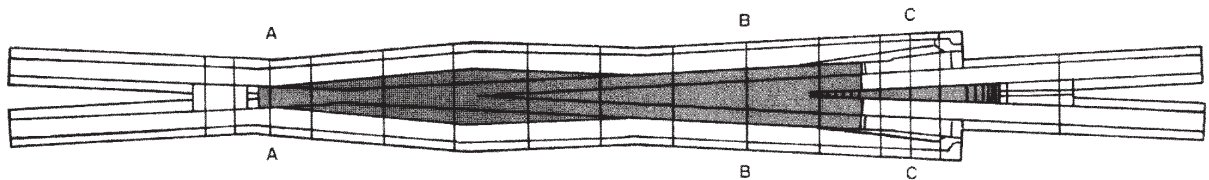
## BOLTED RIGID FROG

A low relative cost frog recommended for yard and other medium speed applications where heavy duty performance is not required.



## RAILBOUND MANGANESE FROG

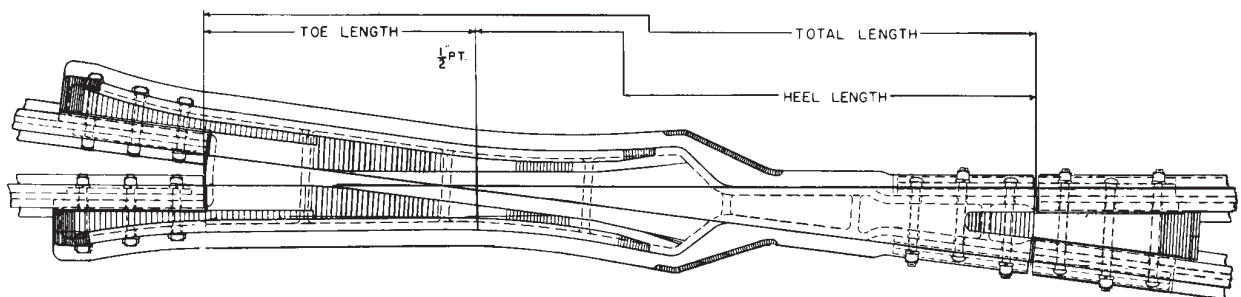
Railbound manganese frogs are recommended for main line turnouts and crossovers subject to high speed and heavy traffic. By using manganese steel in the critical areas this design provides high resistance to wear and impact. These frogs can be furnished explosion and/or high integrity hardened upon request.



## SOLID MANGANESE SELF-GUARDED FROG

This one piece manganese self-guarded frog is recommended for locations subject to heavy traffic and slow speeds.

- Standard rail lengths and hook twin tie plate quantities are in accordance with latest A.R.E.A. recommended practices or as specified by purchaser.



# Hook Twin Tie Plates for Frogs

TYPICAL APPLICATIONS OF HOOK-TWIN TIE PLATES. Refer to AREA frog plans for required quantities of plates.

Frog design, frog size and type of connecting rails will determine the quantity of hook-twin tie plates required. Connecting rail types are listed at right.

TYPE I Rail - Rails having base up to 5 3/16" and head 2 9/16" inclusive

TYPE II Rail - Rails having base up to 5 1/2" and head 2 3/4" inclusive

TYPE III Rail - Rails having base up to 6" and head 3" inclusive

\*Formerly 641-55

## QUANTITIES OF BOLTED RIGID FROG HOOK TWIN TIE PLATES

FROG NO.	TYPE I RAILS					TYPE II RAILS					TYPE III RAILS				
	L-23	L-27	LR-23	LR-27	LR-31	L-23	L-27	LR-23	LR-27	LR-31	L-23	L-27	LR-23	LR-27	LR-31
4	4	4	2	0	0	4	4	2	2	0	4	4	2	2	0
5	8	4	2	0	0	8	4	2	2	0	8	4	2	2	0
6	10	2	2	2	0	8	4	2	2	2	6	8	2	2	2
7	10	4	4	2	0	10	6	2	2	2	8	8	2	2	2
8	12	4	2	2	0	12	6	2	4	2	10	8	2	4	2
9	14	4	4	2	0	14	6	2	4	2	12	8	2	4	2
10	16	4	4	2	0	14	6	4	4	2	14	8	4	4	2

## QUANTITIES OF RAIL BOUND HOOK TWIN TIE PLATES

FROG NO.	TYPE I RAILS					TYPE II RAILS					TYPE III RAILS					PLAN NO.
	L-23	L-27	LR-23	LR-27	LR-31	L-23	L-27	LR-23	LR-27	LR-31	L-23	L-27	LR-23	LR-27	LR-31	
4	4	4	2	0	0	2	6	2	2	0	2	6	2	2	0	611-55
5	6	4	4	0	0	4	6	4	2	0	4	6	2	2	0	611-55
6	10	2	2	2	0	4	8	2	2	2	4	10	2	2	2	612-55
7	12	4	2	2	0	8	8	2	2	2	10	6	2	2	2	612-55
8	12	4	2	2	0	8	10	2	4	2	8	10	2	4	2	612-55
9	16	4	2	2	0	10	10	2	4	2	10	10	2	4	2	613-55
10	16	4	4	2	0	12	8	4	4	2	12	10	4	4	2	613-55
11	18	6	4	2	0	14	10	4	2	2	12	14	4	2	4	613-55
12	18	8	4	4	0	14	12	4	4	2	12	14	4	4	4	614-55
14	22	8	4	4	0	16	14	4	6	2	14	16	4	6	4	614-55
15	24	8	4	4	0	16	18	4	6	2	16	18	4	6	4	614-55
16	26	8	6	2	0	16	18	6	6	2	16	20	6	6	4	615-55
18	26	12	6	4	0	18	22	6	8	2	18	22	6	8	4	615-55
20	32	10	6	6	0	20	24	6	8	4	16	28	6	8	6	615-55

## QUANTITIES OF SOLID MANGANESE HOOK TWIN TIE PLATES

FROG NO.	TYPE I RAILS					TYPE II RAILS					TYPE III RAILS				
	L-23	L-27	LR-23	LR-27	LR-31	L-23	L-27	LR-23	LR-27	LR-31	L-23	L-27	LR-23	LR-27	LR-31
4	2	4	0	0	0	2	4	0	0	0	2	2	0	0	0
5	4	2	0	2	0	4	2	0	2	0	4	2	0	2	0
6	4	2	0	2	0	4	2	0	2	2	4	2	0	2	2
7	4	4	2	2	0	4	4	2	2	2	4	2	0	2	2
8	6	2	2	4	0	6	4	0	4	2	4	4	0	4	2
9	8	2	2	4	0	6	4	2	4	2	4	4	0	4	2
10	8	2	4	4	0	6	4	2	4	2	6	4	2	4	2

FROG NO.	TYPE I RAILS				TYPE II RAILS				TYPE III RAILS			
	H-23	H-27	H-31	H-35	H-23	H-27	H-31	H-35	H-23	H-27	H-31	H-35
4	4	2	0	0	4	2	0	0	4	2	0	2
5	4	2	0	2	4	2	0	2	4	2	0	2
6	4	2	0	2	4	2	0	2	4	2	0	2
7	2	4	0	2	2	4	0	2	4	4	2	2
8	2	4	2	0	4	4	2	0	4	4	2	2
9	2	4	2	0	4	6	0	2	6	6	2	0
10	4	6	0	0	6	6	2	0	6	6	2	0

\*Formerly 641-55



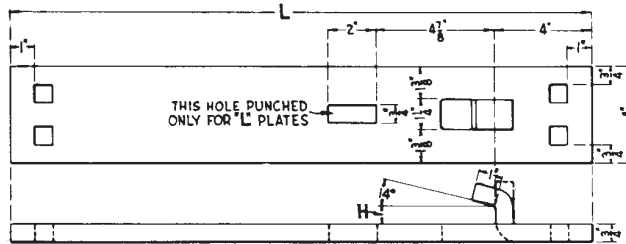
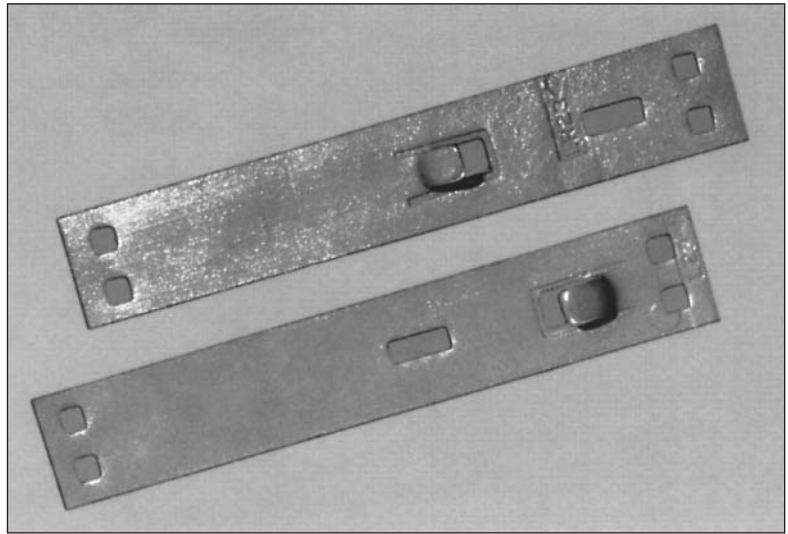
# Hook Twin Tie Plates

Unitrac hook twin tie plates are made in accordance with AREA Plan. 241 for use under frogs, and beyond the heel where standard tie plates cannot be placed without cutting. Quantities to be furnished are listed in this catalog for various units illustrated. Dimensions of several types of rails are stated below.

**TYPE I Rail** - Rails having base up to 5 3/16" and head 2 9/16" inclusive

**TYPE II Rail** - Rails having base up to 5 1/2" and head 2 3/4" inclusive

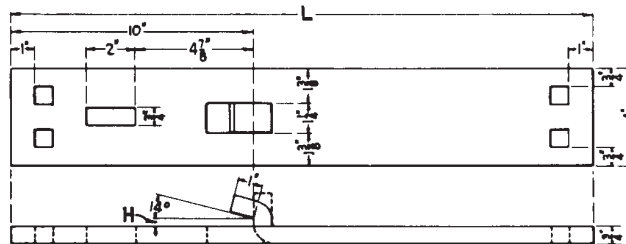
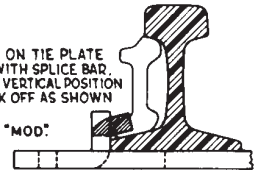
**TYPE III Rail** - Rails having base up to 6" and head 3" inclusive



MARK	L	H
L 23	23'	9 1/16"
L 27	27'	9 1/16"
L 31	31'	9 1/16"
H 23	23'	15 1/16"
H 27	27'	15 1/16"
H 31	31'	15 1/16"
H 35	35'	15 1/16"

ALL SPIKE HOLES 3/4" SQUARE EXCEPT WHERE OTHERWISE SHOWN.

WHERE HOOK ON TIE PLATE INTERFERES WITH SPLICE BAR, BEND HOOK TO VERTICAL POSITION OR BURN HOOK OFF AS SHOWN BY SHADING. DESIGNATED "MOD."



MARK	L	H
LR 23	23'	9 1/16"
LR 27	27'	9 1/16"
LR 31	31'	9 1/16"



# Switch Clips and Switch Rods



## SIDE JAW CLIP

This design is non-adjustable. Jaw opening and drilling per AREA or customer specifications.



## ADJUSTABLE SIDE JAW CLIP

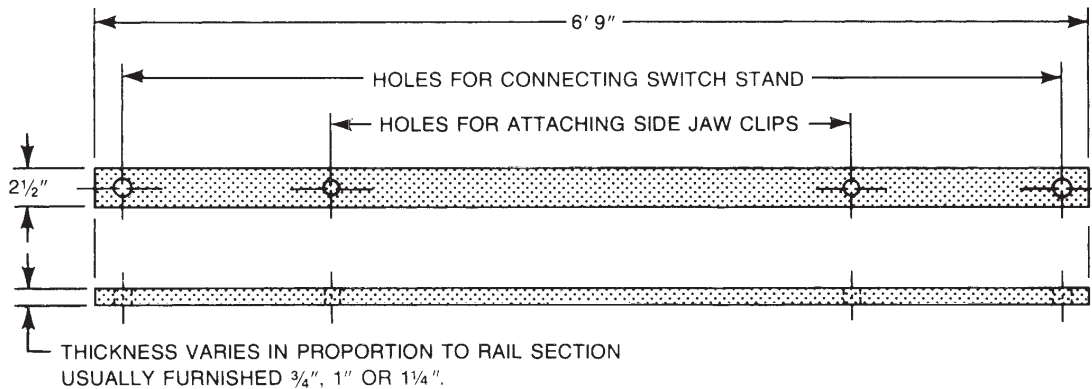
This design can be adjusted in order to maintain desired spacing between switch points. Jaw opening and drilling per AREA or customer specifications.



## TRANSIT CLIP

Design provides for adjustment in order to maintain desired spacing between switch points. Drilling per AREA or customer specifications.

## NO. 1 ROD OR HEAD SWITCH ROD

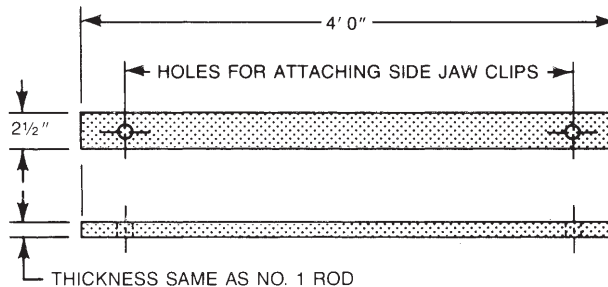


A switch rod is a steel bar that connects left-hand and right-hand switch points so that both points move in unison. Thus when one switch point is open, the other is closed.

Switch rods are sized according to rail section.

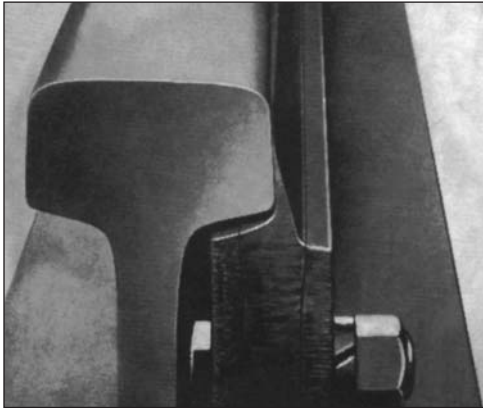
A switch usually has one rod that is connected to the throwing mechanism or switch-stand assembly. This rod is called the Head Switch Rod or Operation Rod. The other rod is the Back Switch Rod.

## NO. 2 ROD OR BACK SWITCH ROD



# Switch Points

## END VIEW OF COMMON STANDARD KNIFE-BLADE SWITCH POINT

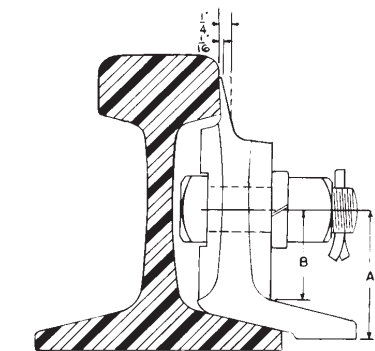


Knife blade points may be used for normal track use.

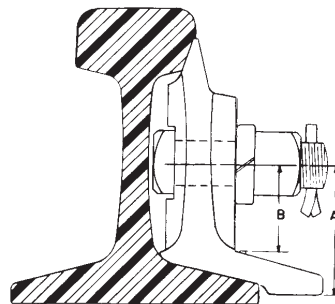
## END VIEW OF SWITCH POINT CLOSED                      OPEN



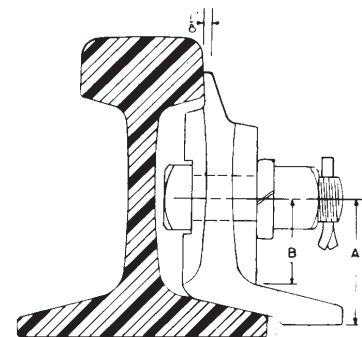
Unitrac Samson switch points and stock rails are used for heavy duty applications where knife-blade points may break down.



**CHAMFERED DESIGN**



**SAMSON DESIGN**



**STANDARD DESIGN**

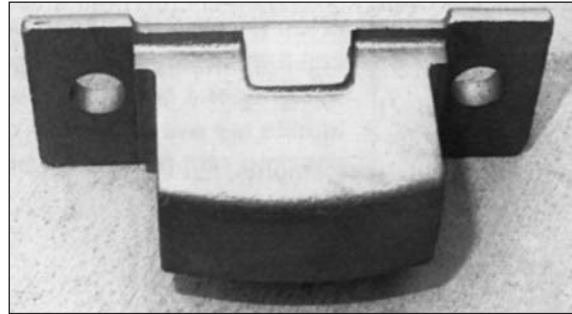


# Heel Blocks

## HEEL BLOCK ASSEMBLIES

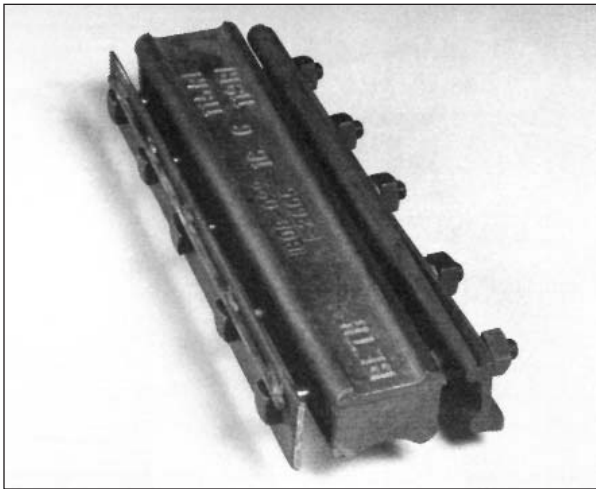
A heel block is a spacer that maintains the position of the switch point to the stock rail and closure rail. It is also the pivoting point of the switch point.

Unitrac can supply heel blocks in various designs including welded, cast and floating as shown. Unitrac provides heel blocks with bent and beveled bars and new bolts with nuts and heavy duty lockwashers. Specify type, rail section, drilling and length of switch when ordering.

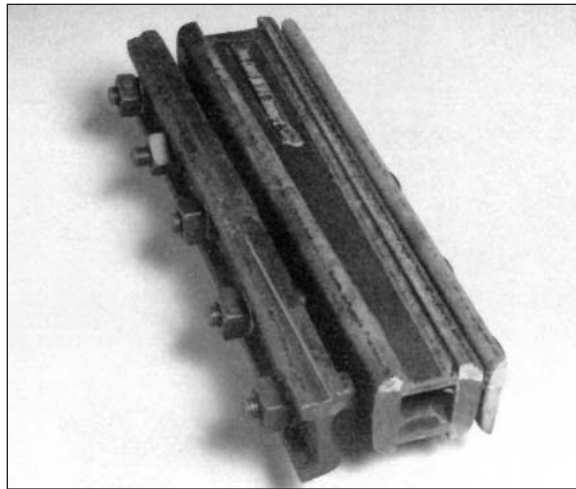


### FLOATING HEEL BLOCK

Primary used in high speed, long length switch operations.



### CAST IRON HEEL BLOCK ASSEMBLY

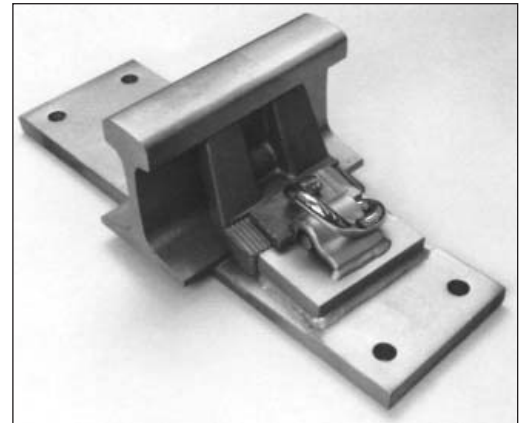


### WELDED HEEL BLOCK ASSEMBLY



## Switch Plates and Braces

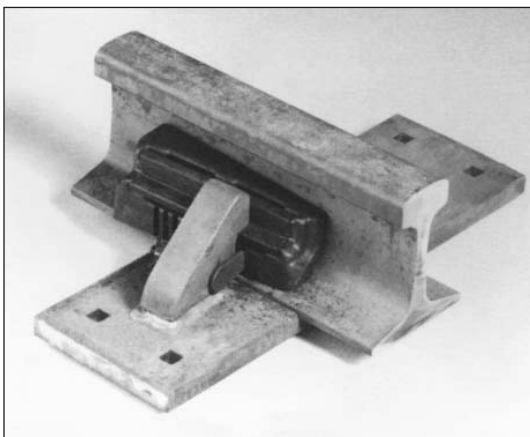
Braces are designed to restrain movement of the stock rail when a switch is opened or closed. Unitrac can furnish forged steel rigid braces similar to AREA Plan 223. We can furnish a number of adjustable brace designs that will fill your most common or unusual requirements. (Available in the 811 design or the AREA Plan 224 Type A design as shown below.) Also available is Bethlehem SureFit Boltless Adjustable Brace. Available in both new and relay, all braces are checked with rail prior to shipping to insure a correct fit.



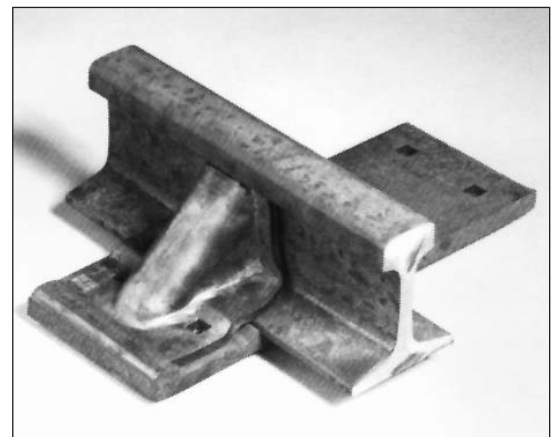
**Bethlehem SureFit  
Boltless Adjustable Brace**



**Area Design 224  
Type A Adjustable Brace**



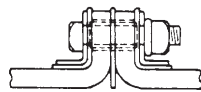
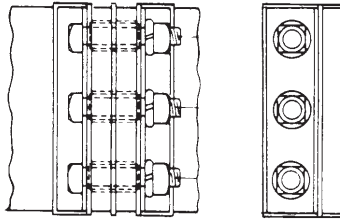
**Design 8-11  
Adjustable Brace**



**Forged Rigid Brace  
Per Area 223**

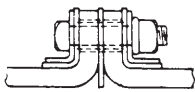
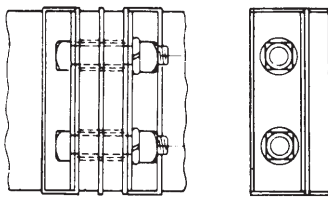
# Switch Plates and Rigid Rail Braces

Unitrac manufactures a comprehensive range of switch plates and braces for applications, manufactured from steel by fabrication methods to suit the individual customer requirements.

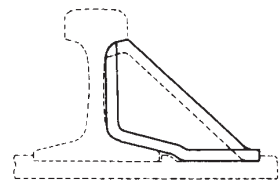
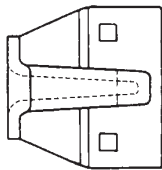


DETAIL 4103

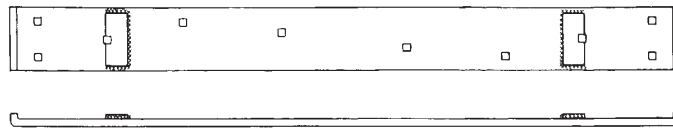
GAGE PLATE INSULATION



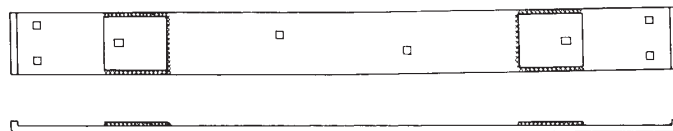
DETAIL 3103



RAIL BRACE-DETAIL 6023



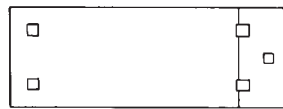
GAGE PLATE FOR TIE AHEAD OF POINTS



GAGE PLATES FOR TIE UNDER POINTS



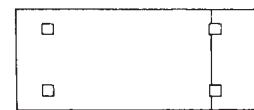
SOLID BASE SLIDE PLATES



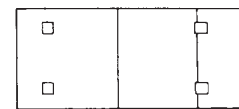
SHOULDER SLIDE PLATES  
NO RISER



SHOULDER SLIDE PLATES  
WITH RISER



SHOULDER HEEL PLATES  
FOR LEVEL HEEL JOINTS



SHOULDER HEEL PLATES  
FOR OFFSET HEEL JOINTS

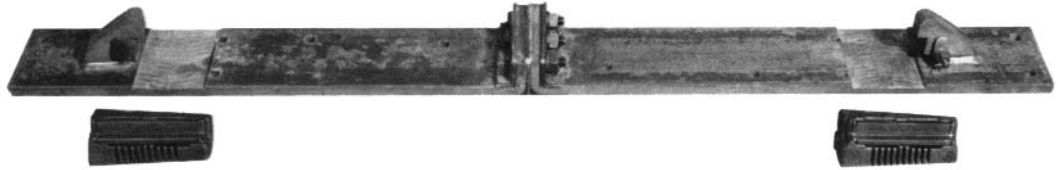


# Switch Plates

A Plate is a section of rolled steel that supports a rail or other track structure. Plates are sized to conform to AREA designs, unless specified otherwise.

## Gage Plate

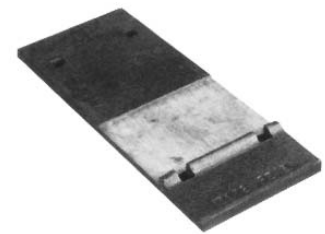
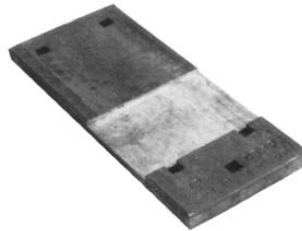
Maintains gage at the point of switch. Available either insulated or non-insulated.



## Shoulder Slide Plate

Holds the stock rail in position and allows the switch point to slide as required.

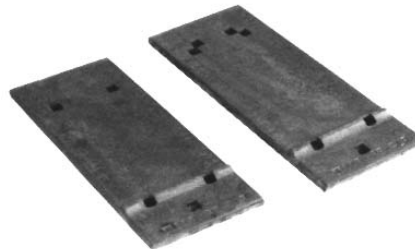
## Slide Plate with Milled Pocket for Shoulder



## Slide Plate with Milled Pocket and Rolled Shoulder

## Shoulder Heel Plate

Fits under the heel block.

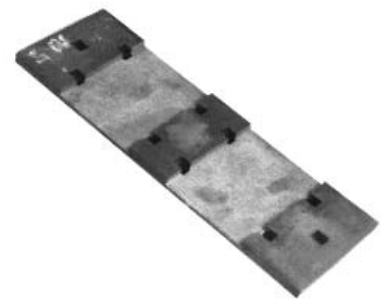
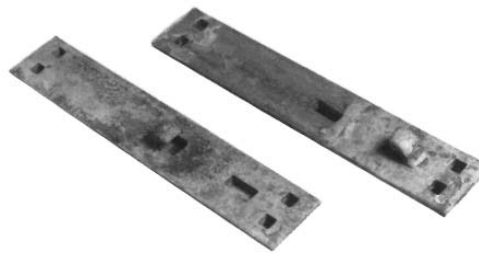


## Standard Plates for single-tie installation

## Hook-Twin Tie Plate

Used in graduated-riser applications beyond the heel of a switch. Fits all switch lengths, rail sections, and turnouts.

Most economical plate to use beyond the heel of a switch. Available for quick delivery.



## Turnout Pocket Plate

Used in uniform-riser applications beyond the heel of a switch. Assists in maintaining rail gage. Must be manufactured for specific switch length, rail section and turnout alignment.



# Guard Rails

A Guard Rail is a rail laid parallel with the running rails to hold the wheels in correct alignment. Guard rails prevent derailments and protects the points of turnout frogs, crossing frogs and switch points. Unitrac furnishes guard rails in three basic designs:

## Tee-Rail (AREA 504)

### Hook- Flange

Design 750

Design 751

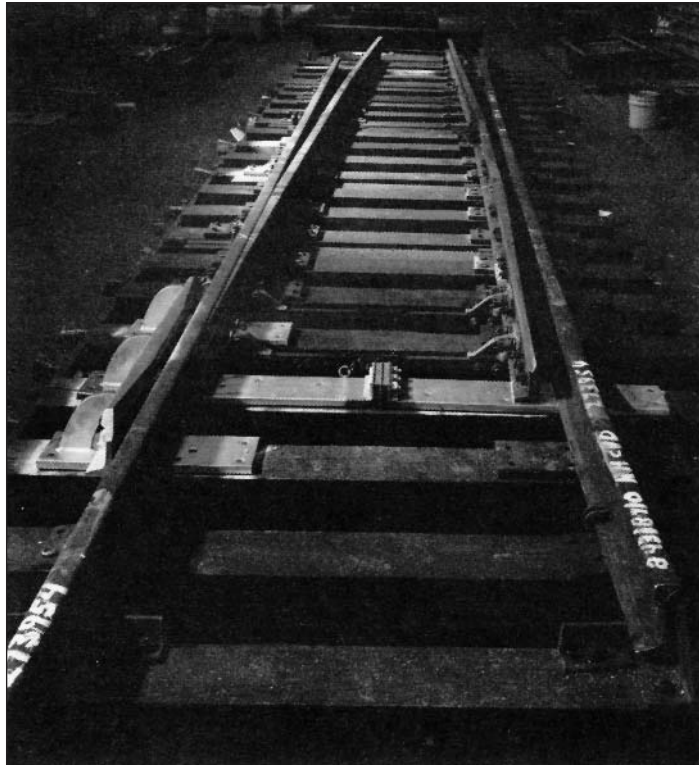
Design 752

### Switch-Guards

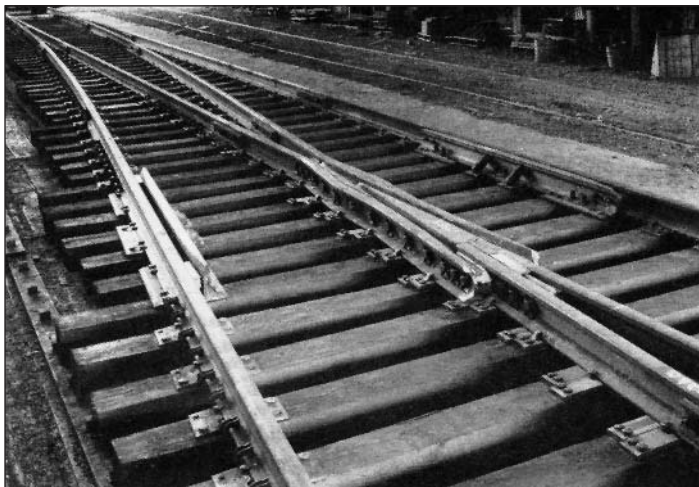
Model 755

Model 755-G

Model FM



***A panel switch with a 4'-9" Switch Point Guard Rail, Model 755, that will prolong the service life of the switch point.***



***In this panelized turnout , two Hook Flange Guard Rails, Design 751, will protect the point of the frog from traffic on either side.***



# A.R.E.A. Guard Rails

This guard rail conforms to A.R.E.A. plans and specifications and is furnished complete with separator and end blocks, bolts and shoulder tie plates as illustrated.

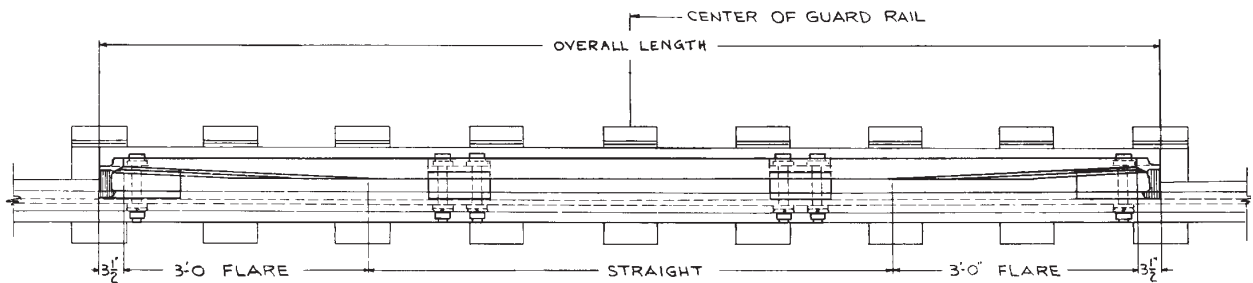
## SETTING OF TEE RAIL GUARD RAILS

- Guard rail flare to be opposite the frog wing rail flare for all angles.
- **Bolted Rigid & Rail Bound Frogs.** The parallel portion of the guard rail is to extend 15" minimum beyond the throat.

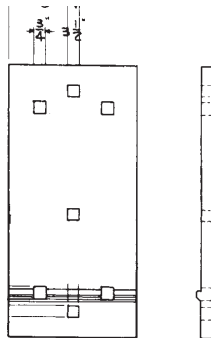
## MINIMUM LENGTH OF GUARD RAILS CONFORMING WITH THE ABOVE SETTINGS

- Bolted rigid & Rail Bound Frogs
 

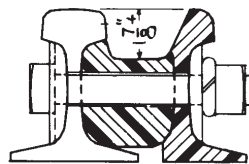
Length of Guard Rail	Frog No's
13'-0"	8.9 & 10
16'-6"	11, 12, 14 & 15
20'-0"	16 & 20



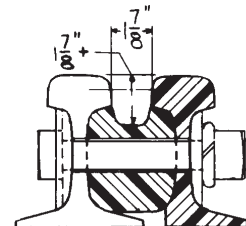
## AREA 504



**Guard Rail Tie Plate**



**Section Thru End Block**



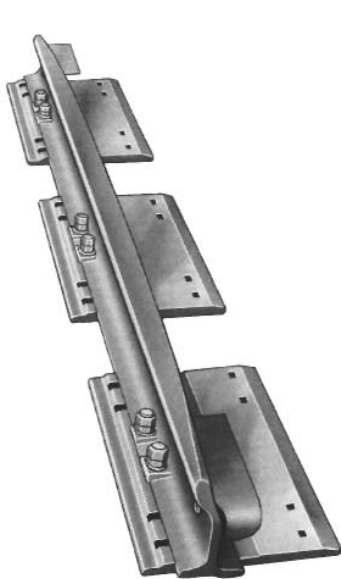
**Section Thru Separator Block**



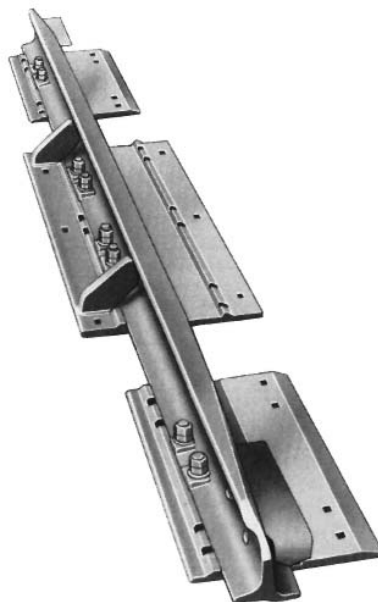
# Hook Flange Guard Rails

Hook-Flange Guard Rails are constructed from custom-rolled rail sections. One flange is lowered to fit under the base of the running rail. Compare any of the three Hook-Flange designs to conventional T-rail and you'll see several advantages:

- **Selection.** Choose from 9'-0", 11'-0", 13'-0" and 16'-6" standard length.
- **Convenience.** All guard rails, tie plates and foot guards are shop assembled. Each units ships in one piece, ready to install.
- **Lower Installation Cost.** No need to drill holes in the running rail, no need to adze the ties for the tie plates, and no need for special tools at the job site.
- **Stability.** Each tie plate spans two or more ties. A shoulder on the guard-rail side of the tie plate provides locking against lateral movement.
- **Reduced Maintenance.** No checks or separator blocks to vibrate loose.



*Design 750*



*Design 751*



*Design 752*



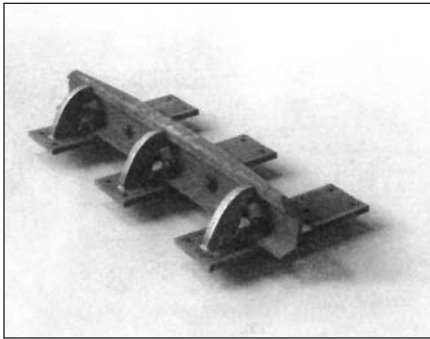
# Switch-Point Guard Rails

Switch-Point Guard Rails protect the switch point, prolong the life of stock rails, reduce flange cutting, prevent wheel climbing, and help to prevent derailments at the switch.

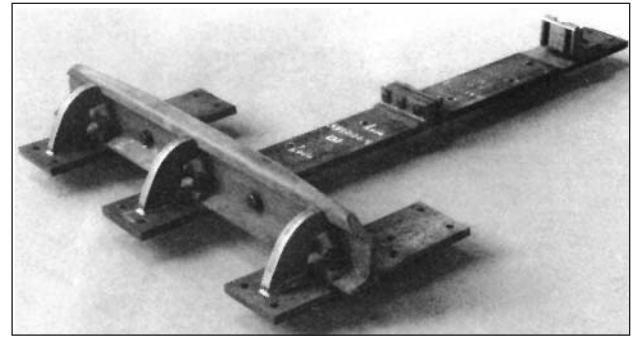
The guard rail is heat treated for extra long life.

Guard rail, plates, braces and filler blocks are shipped assembled, ready for installation.

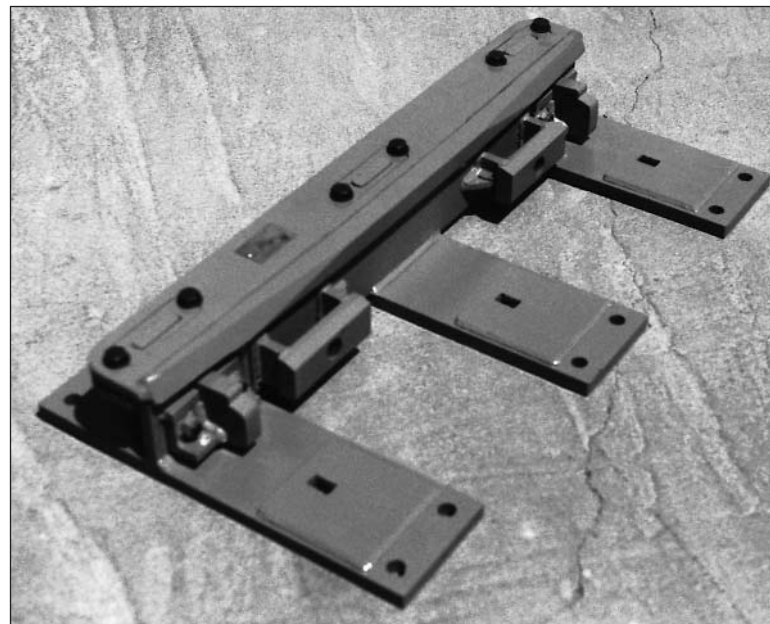
No special tools are required at the job site.  
Switch-Point Guard Rails are practically free of maintenance expense.



**Model 755**  
Switch-Point Guard Rail



**Model 755-G**  
Furnished with gage plate



**Model FM**

# Switch Point Derail

A switch point derail will derail rolling stock in an emergency. Some useful locations may be a siding leading into a chemical loading area, or if an uncontrolled car can get from a side track onto a main track. Available in 11' single (as shown below) or in 16'6". Both are available as a double switch point derail. Unitrac can provide these in new, or fully reconditioned, complete per your bill of materials.

## HOW TO ORDER

Please specify (in addition to the usual switch information):

1. Whether switch point is left-hand or right-hand.
2. If stock rail is required, include:
  - a. Length. b. Stagger. c. Joint drilling.

## TYPICAL LAYOUT

11'0" SWITCH FOR RIGHT-HAND TURNOUT FOR ILLUSTRATION ONLY.

CAN BE FURNISHED TO CUSTOMER'S DESIRED LENGTH, ALIGNMENT AND ACCESSORIES.

