

## CHAPTER 8 TURNOUTS

### 8-1. General.

Turnouts are designed to divert trains from one track to another. Good turnout maintenance is essential for the safe and efficient operation of trains.

Major components of a turnout are the switch, frog, and guard rails. Figure 8-1 shows a typical turnout with the various parts identified.

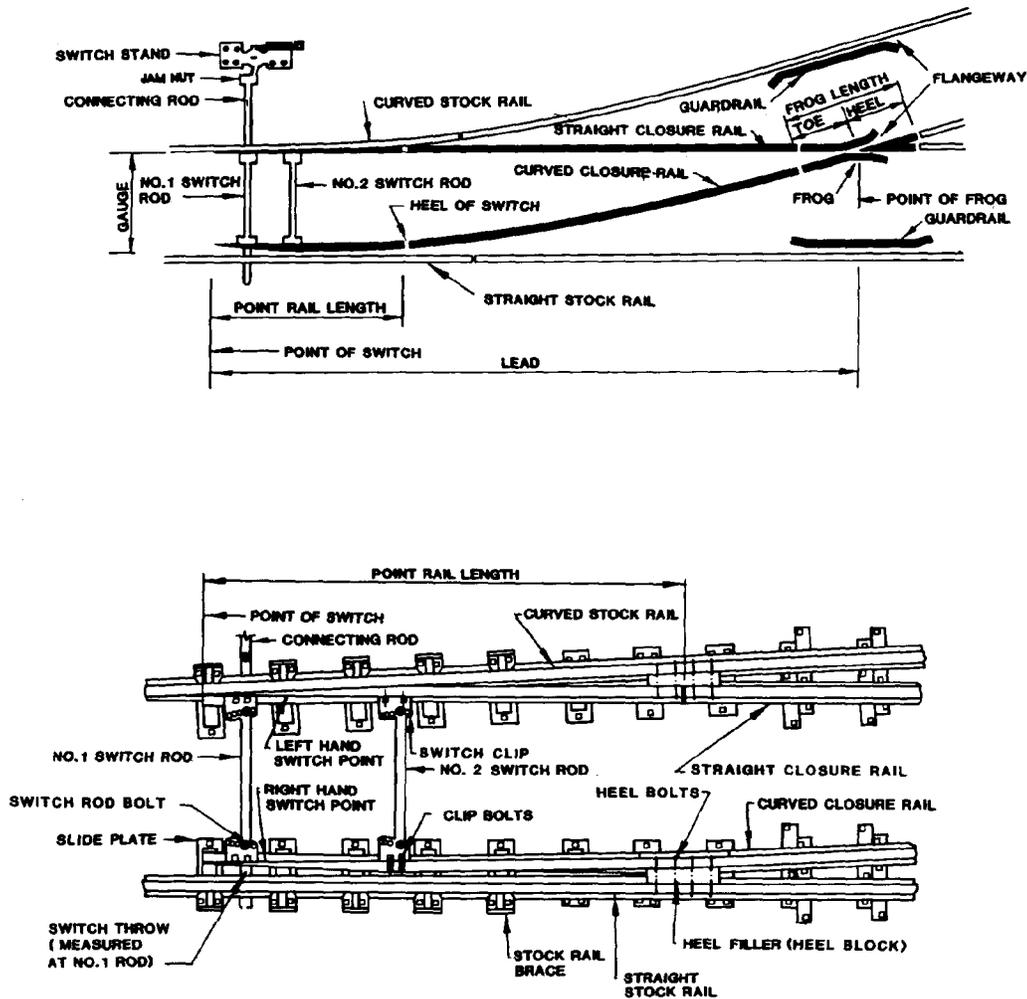


Figure 8-1. Parts of a turnout.

### 8-2. General requirements

a. *Materials.* All materials used within the limits of a turnout shall:

- (1) Be factory designed and constructed.
- (2) Be the proper type and size.
- (3) Be properly installed.
- (4) Not be flame cut or otherwise altered.

b. *Rail.* All rail used within the limits of a turnout shall be of the same weight and section. Compromise joints are not permitted within the limits of a turnout.

c. *Ties.* The standards in chapter 5 of this manual shall apply to ties within the limits of a turnout.

d. *Track geometry.* Turnout track geometry shall conform with the standards in chapter 12 as well as those in this chapter.

e. *Reversing tangent.* It is recommended that the tangent between the frog and any reverse curve past the frog be no less than 50 feet in length as shown in figure 8-2.

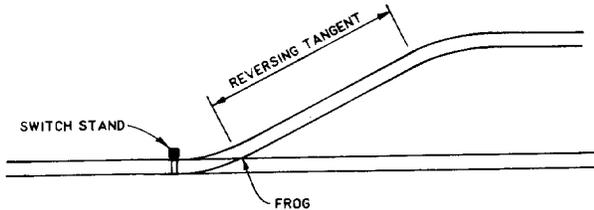


Figure 8-2. Reversing tangent length and switch stand placement.

f. *Switch stand placement.*

(1) The switch stand shall be installed so that when the switch is lined for the normal (main) route, the connecting rod keeps the points closed with a pulling (rather than a pushing) force. In most cases this will mean installing the stand on the diverging side of the turnout as shown in figure 8-2.

(2) When a ground-throw stand is used, the handle shall point toward the frog when the switch is lined for the normal (main) route.

g. *Cleaning, lubrication, and adjustment.* Switches and switch stands shall be cleaned, lubricated, and adjusted at least annually.

### 8-3. Switches and switch stands.

a. Switches shall be inspected for the following defects:

- (1) Switch difficult to operate.
- (2) Gap greater than  $\frac{1}{8}$  (0.125) inch between the switch point and the stock rail. Checked with points in both positions. (See para 8-3b.)

(3) Worn or chipped switch points. (See para 8-3c and fig 8-3.)

(4) Point of switch higher than stock rail. (See para 8-3d(1) and fig 8-4.)

(5) Point rail beyond taper lower than stock rail. (See para 8-3d(2) and fig 8-4.)

(6) Damaged or missing switch stand lever latches or switch point lock. (see para 83e)

(7) Insecure, loose, damaged, or improperly installed switch stand. (See para 8-3f and 8-2g)

(8) Loose, damaged, or missing jam nut at the switch stand end of the connecting rod. (See para 8-3g(3))

(9) Bent, damaged, loose, binding, or improperly installed connecting rod, switch rods, or switch clips. (See para 8-3g)

(10) Loose, damaged, or missing switch clip, switch rod, or connecting rod bolts. (See para 83h)

(11) Loose, damaged, or missing heel bolts; cracked or improper heel joint bars or heel filler. (See para 8-3i)

(12) Loose, damaged, or missing rail braces. (See para 8-3j)

(13) Loose, damaged, or missing slide plates; dirt and debris buildup on slide plates.

(14) Missing cotter keys on switch rod and switch clip bolts.

(15) Debris in flangeways. (See para 8-3k)

(16) Debris obstructing switch rods and connecting rod. (See para 8-3g(1))

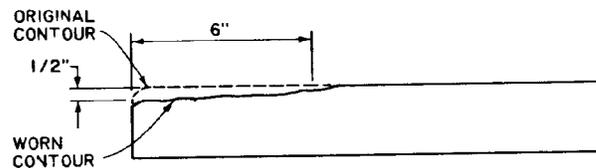


Figure 8-3. Switch point contour.

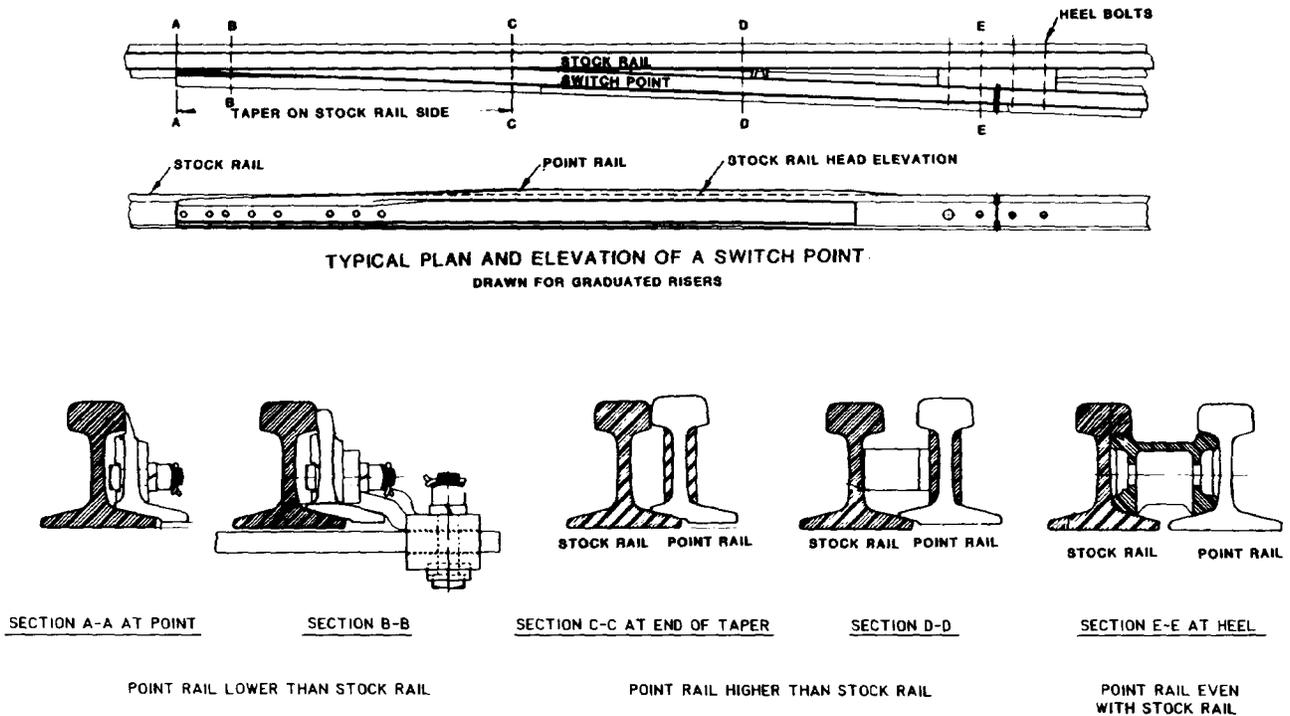


Figure 8-4. Switch point plan and elevation.

*b. Switch point gap.*

(1) If the switch can be thrown and locked in either direction with a  $\frac{1}{8}$  (0.125) inch spacer between the switch point and the stock rail, operations through the turnout shall not exceed 10 mph.

(2) If the switch can be thrown and locked in either direction with a  $\frac{1}{4}$  (0.25) inch spacer between the switch point and the stock rail, operations through that side of the turnout shall not be permitted.

*c. Switch points.* A switch point shall be restored or replaced if the point is chipped, broken, or worn more than  $\frac{1}{2}$  (0.50) inch down and 6 inches back from the point. (See fig 8-3). Metal flow shall be removed to ensure proper closure. If a switch point is worn or damaged beyond these limits, operations through the turnout shall not exceed 10 mph.

*d.* Figure 8-4 shows the proper elevation of the switch point and point rail with respect to the stock rail.

(1) If the top surface of the switch point is higher than the top of the stock rail, operations through the turnout shall not exceed 5 mph.

(2) If the point rail beyond the taper is lower than the stock rail, operations through the turnout shall not be permitted.

*e.* Switch stand lever latches and point locks. Switch stand lever latches or switch point locks shall be installed on all switches. Where latches or locks are missing, damaged, insecure, or otherwise inoperative, operations through the turnout shall not exceed 10 mph.

*f. Switch stand.* The switch stand shall be fully secured to the headblock ties to prevent any unintentional movement of the switch points. Where operations through the switch result in visible lateral movement of the switch stand or opening of the switch points (point gap), operations through the turnout shall not be permitted.

*g. Connecting rod, switch rods, and switch clips.*

(1) These parts shall be installed and maintained to allow unobstructed motion when the switch is thrown. Rod ends and clips shall not contact adjacent ties. Damaged parts shall be replaced, and improperly installed parts shall be adjusted. Washers or similar spacers shall not be permitted between the switch clip and the switch point.

(2) If the connecting rod, switch rod, or switch clip is insecurely fastened or is damaged, operations through the turnout shall not be permitted.

(3) The jam nut at the switch stand end of the connecting rod shall be kept tight against the switch stand clevis.

(4) Where washers or similar spacers are between the clip and switch point, operations through the turnout shall not exceed 10 mph.

*h. Connecting rod bolts, switch rod bolts, and clip bolts.* Connecting rod and switch rod bolts shall be installed with the nut on top and cotter keys in place. Clip bolts shall have cotter keys. All bolts shall be kept tight.

*i. Switch heel (bolts, fillers, and joint bars).* The heel of the switch shall be secure and the supporting switch ties solidly tamped. The inside joint bar (nearest and track center) should be a bent bar per AREA design. If any heel bolts are loose or missing, or the heel is otherwise not fully secure, operations through the turnout shall not exceed 5 mph.

*j. Rail braces.*

(1) Rail braces are essential to provide proper lateral support to the stock rails. Rail braces shall be fully secured to the tie and tight against the

outside of the stock rail on both sides of the turnout.

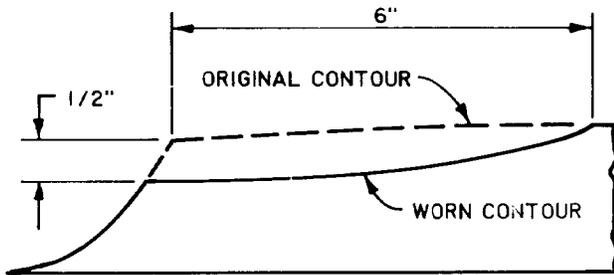
(2) It is recommended that rail braces be installed on each tie from the point of switch to within two ties of the switch heel.

(3) If there are less than four rail braces fully secured to the tie and tight against the outside of each stock rail, operations through the turnout shall not exceed 5 mph.

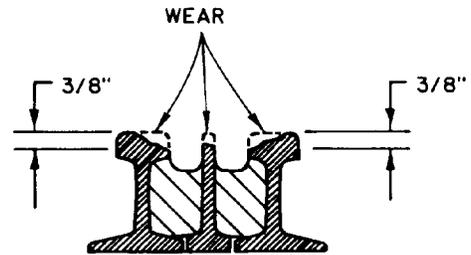
*k. Debris in flangeways.* Flangeways shall be kept clear of debris. Any obstructions, including ice and packed snow, shall be removed.

**8-4. Frogs.**

*a. Frog point.* A frog shall be restored or replaced if the point is chipped, broken, or worn more than 1/2 (0.50) inch below the original top surface and 6 inches back from the original point location. (See fig 8-5)



**DETAIL OF FROG POINT ELEVATION**

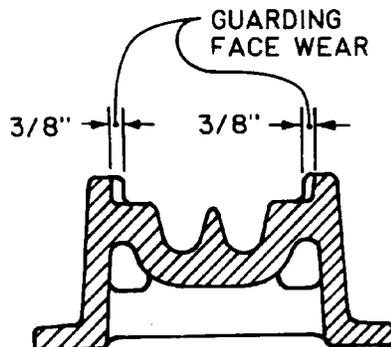


**SECTION THROUGH 1/2" POINT SHOWING SURFACE WEAR**

*Figure 8-5. Frog point and tread contours.*

*b. Frog surface.* A frog shall be restored or replaced if the tread surface is worn more than 3/8 (0.375) inch below its original contour. (See fig 8-5)

*c. Guarding face of self guarded frogs.* The raised guarding face on a self-guarded frog shall not be worn more than 3/8 (0.375) inch. (See fig 8-6)



*Figure 8-6. Allowable wear on guarding face of self-guarded frog.*

d. *Repairing self guarded frogs.* If repairs are made to a self-guarded frog without removing it from service, the raised guarding face must be restored before rebuilding the point.

e. *Frog bolts.* All frog bolts shall be in place and tight.

f. *Flangeway width.* Standard frog flangeway width is  $1\frac{7}{8}$  (1.875) inches. Where existing flangeway width is less than this amount, the restrictions in table 8-1 shall be applied. (See fig 8-7)

Table 8-1. Measurements and operating restrictions for frogs and guard rails

Parameter	Measurement			
	Standard (New or Fully Restored)	Operating Restrictions		
		10 mph	5 mph	No Operations
<b>Frog flangeways:</b>				
Width	1-7/8 in. (1.875 in.)	LT 1-5/8 in. (1.625 in.)	--	LT 1-1/2 in. (1.50 in.)
Depth	GE 1-7/8 in. (1.875 in.)	LT 1-1/2 in. (1.50 in.)	--	LT 1-3/8 in. (1.375 in.)
Guard check gage	54-5/8 in. (54.625 in.)	LT 54-1/4 in. (54.25 in.)	--	LT 54-1/8 in. (54.125 in.)
Guard face gage	52-3/4 in. (52.75 in.)	GT 53-1/8 in. (53.125 in.)	--	GT 53-1/4 in. (53.25 in.)
<b>Guard rail flangeway:</b>				
Width	1-7/8 in. (1.875 in.)	LT 1-5/8 in. (1.625 in.)	--	LT 1-1/2 in. (1.50 in.)

Note: GE = greater than or equal to, LT = less than, GT = greater than.

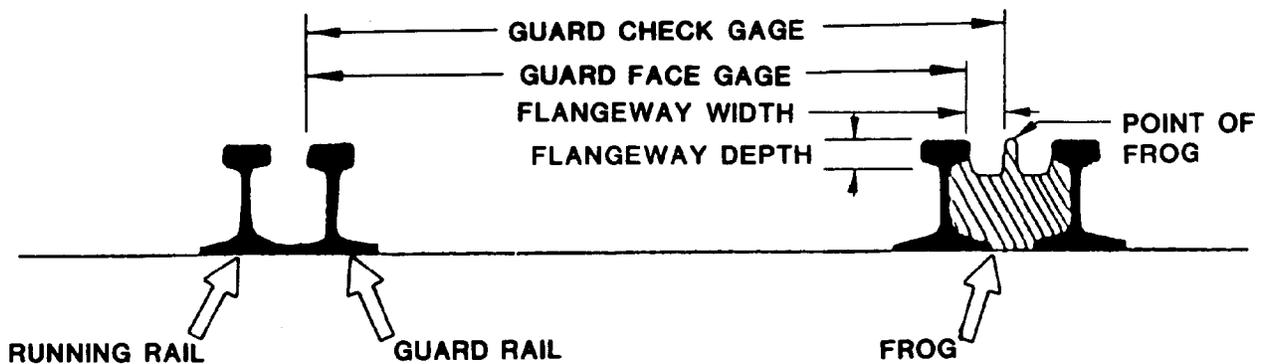
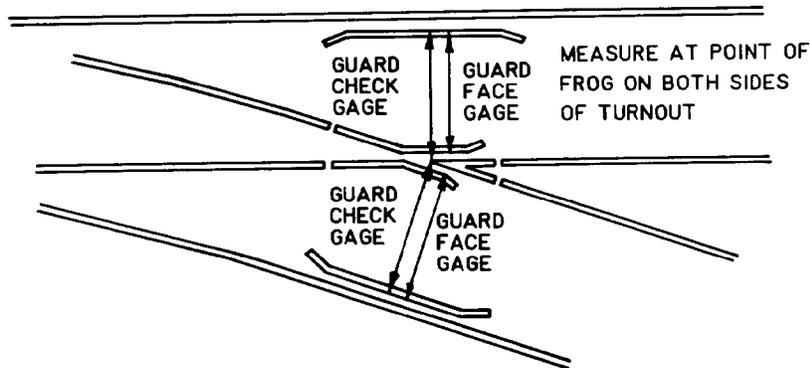


Figure 8-7. Measurement of flangeway width, flangeway depth, guard check gage, and guard face gage.

g. *Flangeway depth.* Standard frog flangeway depth is  $1\frac{7}{8}$  (1.875) inches. Where existing flangeway depth is less than this amount, the restrictions in table 8-1 shall be applied. (See fig 8-7)

**8-5. Guard rails.**

a. Guard rails shall be in place, properly positioned, and fully secured.

b. Guard rails shall be installed so that the straight guarding face (the portion of the guard rail parallel with the running rail) extends in advance of the frog point a distance at least equal the values given in table 8-2.

c. *Guard check gage.* Standard guard check gage is 54% (54.625) inches. Where guard check gage measures less than this amount, the restrictions in table 8-1 shall be applied. (See fig 8-7)

Table 8-2. Minimum length of straight guarding face in advance of frog point

Frog Number	Length
4, 5, 6, 7, 8, 9, 10 .....	14 in.
11, 12, 14 .....	18 in.
15, 16 .....	26 in.
18, 20 .....	30 in.

d. *Guard face gage.* Standard guard face gage is  $53\frac{3}{4}$  (52.75) inches. Where guard face gage measures more than this amount, the restrictions in table 8-1 shall be applied. (See fig 8-7)

e. *Flangeway width.* Standard guard rail flangeway width is  $1\frac{7}{8}$  (1.875) inches. If the flangeway width is less than this amount, the restrictions in table 8-1 shall be applied. (See fig 8-7).