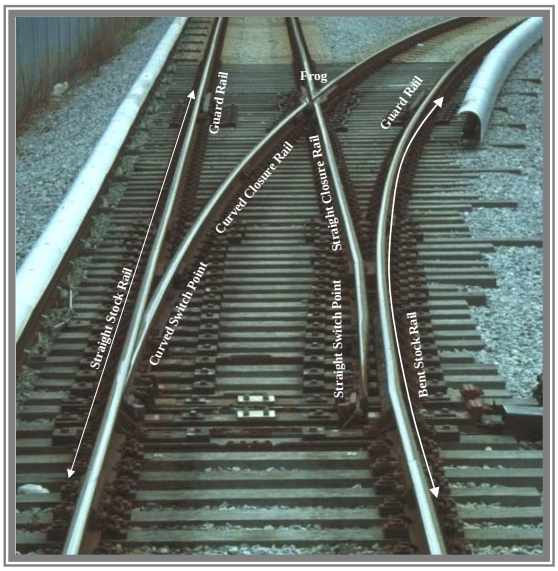
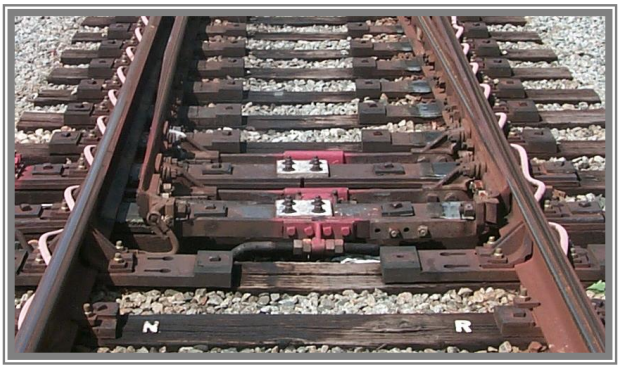
Track & Structures

Track Maintenance Training





SPECIAL TRACKWORK

Module

Installation & Maintenance of Turnouts

Metropolitan Atlanta Rapid Transit Authority

Infrastructure Training

Table of Contents

Introduction

Track Structure training provides a review of MARTA maintenance and railroad standards. At the end of this module, students will be able to describe THE Installation & Maintenance of Switches & Turnouts used at MARTA and demonstrate how to correctly measure different switch dimensions and describe maintenance procedures for MARTA switches.

Requirements

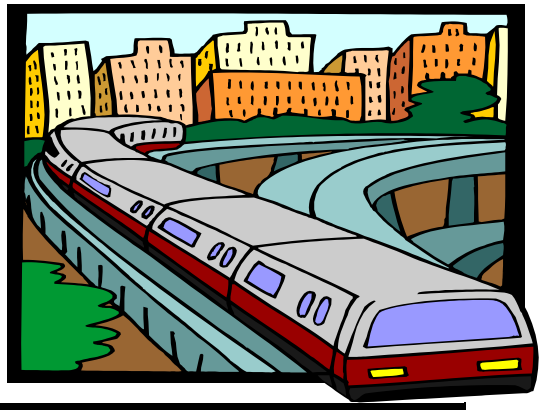
Test scores must be 80% or higher on all written evaluations. Only one retest will be allowed on any written evaluation without additional training. All MARTA Track and Structures personnel must demonstrate knowledge of MARTA Switches and Turnouts.

Each student will be asked to complete a class/instructor evaluation at the end of the class.

Learning Objectives

Class Objective

Demonstrate the ability to correctly describe all turnout components in accordance with MARTA standards and describe their functions.



Section Objectives

1. Identify the stock rails, curved lead, frog, guardrails and closure rails within a turnout.
2. Describe the steel component renewal process within an existing turnout.
3. Describe tie replacement within the turnout.
4. Demonstrate the ability to measure the actual lead and the turnout offsets.
5. Describe the relationship of the switch point to the stock rail along with the importance of a proper fit.
6. Demonstrate the correct way to throw and latch a hand thrown switch and describe the part of that switch that can easily break in a reverse move through that switch.
7. Describe surface problems within a turnout and demonstrate ability to use the MARTA track geometry standards within a turnout including taking the marked measurements.
8. Describe the two types of derails used at MARTA and how they differ from each other.

Installation & Maintenance of Switches & Turnouts

In constructing a turnout, there are four lines of rail and fittings to be formed.

*Two for the straight route and two for the curved or **turnout** route.*

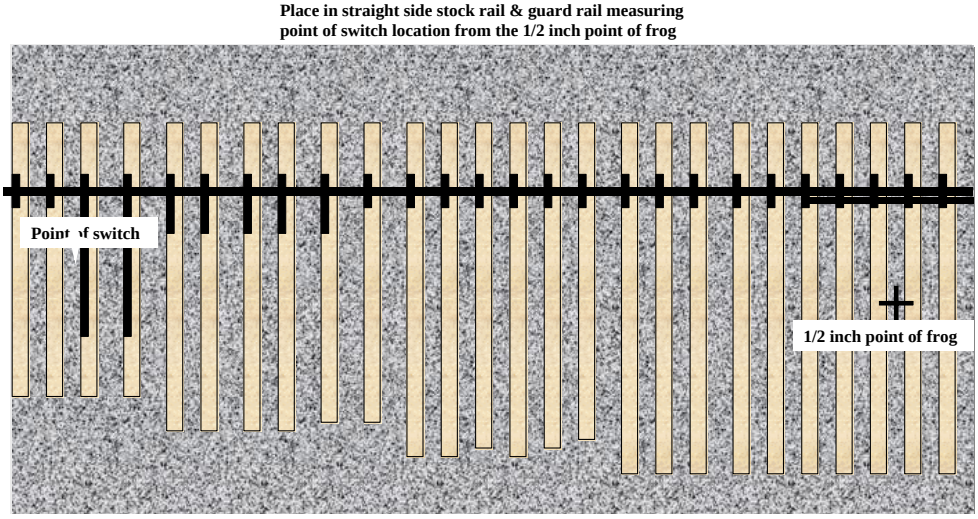
The usual procedure is to form one of these lines of rail first and to secure it to the switch ties.

From this, gauging can reference the other three lines of rail and fittings or measuring offsets at certain intervals can reference the other three lines of rail and fittings.

A. Switch Components

The best line rail to install first is the one on the straight side of the turnout that does not contain the **frog**.

- This is referred to as the **straight stock rail**.

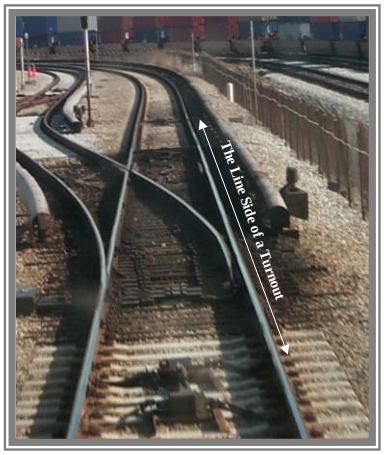


1. Straight Stock Rail

There are certain advantages to this. The straight stock rail can be installed on the switch plates or pads without having to place its **switch point** at this time.

It may be desirable to place the **frog's guardrail** during this operation if plates or pads are common to the guardrail and running rail.

- In most installations, this will be on a straight alignment. **(Line Rail)**
- It will be the easiest part to place with a minimum of line irregularities.
- Also, the switch tie ends adjacent to this line rail are the ones to be located at a uniform distance from the rail.



Installation of this line rail first will simplify the proper alignment of the switch ties.

The other straight line rail and fittings which contains the straight route switch point and the frog can be installed, using, a standard track gauge to properly locate it in reference to the first line rail.

2. Bent Stock Rail

A portion of the **bent stock** is on this route and it should be installed at this time. Again, care must be taken in locating the stock rail so that the point of the switch is accurately established.

Great care must to be taken in locating the rail joints relative to the reference points.

The critical need is to have the **lead** or **closure rails** located so that when the switch point is connected to it, the point will be exactly in the right position.

3. Actual Lead

Accurately maintaining the **actual lead** distance between the 1/2 inch point of frog and the point of' switch is essential if the rest of the turnout is to be constructed properly.

Once this line rail is installed and spiked, lagged and clipped to its proper place on the switch ties and lined to the reference stakes, the remainder of the turnout can be built in relation to its location.

The other straight line rail and fittings which contains the straight route switch point and the frog can be installed, using a standard track gauge to properly locate it in reference to the first line rail.

A position of the bent stock is on this route and it should be installed at this time.

- Again, care must be taken in locating the stock rail so that the point of the switch is accurately established.

It will be necessary to assemble the **heel block** for this side of the switch during this phase of work. In order to more adequately fasten the switch point, it may be decided to install the switch rods at this time.

- In turn, this will necessitate installing the other switch point (the one on the curved route).

Once this is done, adjustment of the switch can progress. This involves;

- Getting all **switch plates**, **pads** and **braces** placed so they provide the support intended by their design.

- The adjustment must also provide the proper fit for the switch points against their stock rails, which maintain gauge, surface and alignment.

At this point, the turnout will not be on final grade. Nevertheless, adequate support must be provided for the switch ties at the points to get the switch adjusted.

In new construction, the assembled switch does not have to be connected to the **operating rod, switch machine** or **switch stand** at this time.

Proper adjustment of this portion and securing smooth operation can frequently be best done after the final surface is attained.

4. Installing the Curved Lead

If the frog point and switch points have been properly located, and if the lead rails, also referred to as closure rails, are of the specified length, there should be no problem in fitting the lead rails and other components together.

Should it be necessary to force the lead rails into place because there is excessive gap between rails or a recheck shows an error in the actual lead distance, the reason for the problem should be determined and corrected.

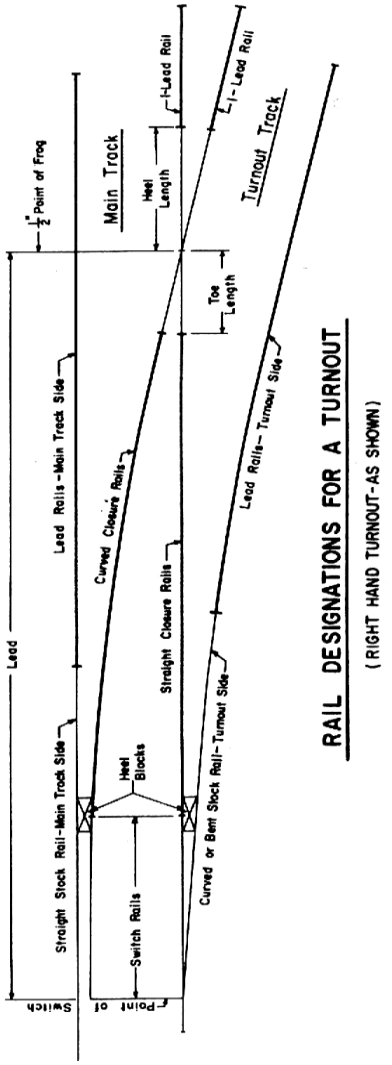
- Measured distance from ½" point of frog to switch point may be to long.
- Measured distance from ½" point of frog to switch point may be to short.

The next phase of work will be to install the rails on the **curved lead**. Once these are set on the plates or pads and the joint bars are applied, it will be necessary to spike-line or use turnbuckles to line these rails to the proper curve.

- The proper alignment is established at the heel of the switch at the heel block.

Likewise, the proper alignment is established at the toe of the frog by the rigidity of the properly placed frog.

- Between these points it will be necessary to have some intermediate reference points.
- Near the top of that plan and several ties behind the heel blocks there is a dimension indicating 29 feet 11 3/4 inches from point of switch (PT). (These charts are located in a separate book of switch and component diagrams)



Below and slightly to the right of that dimension is shown 12-11/32 inches.

Note: That is the distance between the gauge side of the straight rail and the gauge side of the curved lead, at a point on the straight rail 29 feet 11 3/4, inches from the point of switch.

- At this point, the curved lead should be spiked or clipped so as to have the proper offset.

Moving further away from the switch, you will find a distance of 43 feet 5 -1/2 inches from switch point.

Below this you will see that there is to be 21-7/16 inches between gauge lines.

Further back, at a distance of 56 feet 11 ¼ inches from the point of switch, the offset between gauge line is to be2 feet 9 17/32 - inches.

Note: By spiking or lagging to these dimensions, adequate reference points will be established to permit lining by eye between each of these points before spiking or lagging.

After the curved lead is spiked or lagged in place, the other line rail can be installed.

- This will start at the stock rail and be carried past the frog.

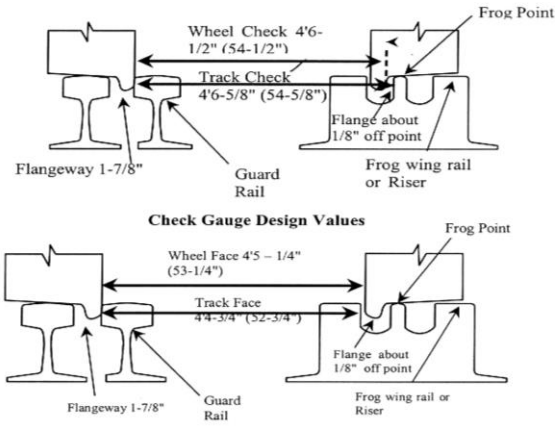
Alignment should be determined by referencing to the Curved lead and frog with a standard track gauge.

Standard gauge of 4 feet 8'-½ inches (56 ½") is used throughout turnouts and other special track work.

5. Frog and Guard Rail

In setting frog guardrails, there is additional gauging to be done.

- The distance between the gauge line of the frog and the guarding face of the guardrail is to be 4 foot 6-5/8 inches. This is known as the **guard check gauge.**



The distance between the face of the frog wing and the guarding face of the guardrail is known as the **guard face gauge**

Standard guard face gauge is 4 foot, 4-3/4 inches.(52-3/4")

6. Other Switch Components

When this basic structure of the turnout is complete, there will be various other items to attend to before the turnout is finished.

Sufficient spikes or lags should be provided to all plates or pads in accordance with MARTA track standards.

- If substantial amount of traffic is expected on the curved side, additional railholding spikes will help in maintaining proper gauge.

Rail anchors should be applied if in the yards. It should be recognized that a major need for anchors usually exist just beyond the limits of the turnout.

- This can prevent the development of track line buckles at locations such as the switch heel blocks and at the heel of' the frog.

The turnout will have to be ballasted, brought to final grade, tamped and lined.

The ballast will have to be dressed, given consideration to the special requirements of switch work.

Ballast should be kept lower than normal in tie cribs between the switch plates on which the switch points slide.

- This will lessen the possibility of fouling the switch point with ballast or foreign material.
- Ballast must be kept well clear of the connecting and switch rods, in the cribs that the rods occupy.

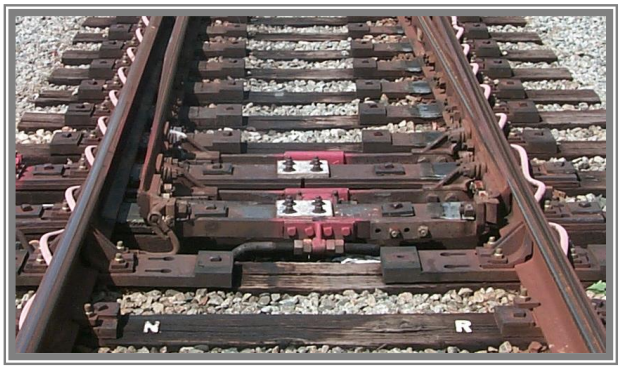
The head-block ties on which the switch stand or switch machine is placed should be adequately supported with the ballast.

It should be recognized that line supervisors, A.T.C. personnel, E.P.& E. personnel and Track Department personnel frequently work around switch work.

- Often in the dark and adverse weather conditions. So that all ballast around a switch needs to be properly dressed out.

The switch stand or switch machine and the connecting rods will have to be installed, as well as any locking devices.

The switch plates will have to be lubricated.



It is essential to check for proper switch point to stock rail fit.

- The switch should be able to throw without any difficulty.

The clearance should be checked between the switch point and the stock rail with each point in the open position.

- This is measured between the gauge side of the stock rail and the backside of the switch point, at a point directly above the #1 switch rod.

For AREMA's standard switches, this should have a gap of **4 ¾ inches.**

B. Renewal of Steel Components in Existing Turnouts

The steel components of a turnout include the rail, switch point, frog, guardrails and fittings, and normally have a relatively long life.

Limits on their life are governed by speed, frequency of rail traffic and tonnage of the traffic which operates over the turnout as well as the quality of maintenance the turnout receives.

- Eventually, the condition of the material will require that it be replaced.
- This may be done along with a general rail renewal through the territory, or the turnout components may be renewed as a separate job or done piece by piece as needed.

There are some things to consider that differ from new installations prior to doing such a job,

1) With the switch ties already in place, make certain that their overall condition is good enough to adequately spike or lag the new material.
2) It could be necessary to replace some switch ties before renewing the steel, but when practical, it is better to replace defective switch ties after the steel has been replaced.
3) Check the alignment particularly on the straight trackside that is opposite to the side replaced first. *This is the alignment that will be reproduced, through the gauging process.*
4) If attempts to correct line irregularities are unsuccessful, it may be necessary to spike or lag the first line rail laid to good alignment. This will produce some temporary variations in gauge.
5) If trains operate before the second side is replaced, make sure the gauge is within the acceptable limits.
6) The job will have to organize to provide for removal of the old material and preparation for the installation of the new material. The latter includes such operations as:
    - Plugging of spike or lag holes
    - Adzing of tie plate or pad seats as necessary

- Removal of any excess ballast.

7) If there is a difference in the height of the rails, vertical runoffs on switch ties must be made by shims under the tie plates.

Aside from these considerations, the renewal of steel in a turnout can be carried out in a manner similar to constructing a new turnout.

At times, the surface condition within the turnout may be relatively poor, prior to replacement of the steel.

A general raise may be planned following the steel renewal, possibly with replacement of switch ties.

- Make certain the conditions that exist after the steel is replaced and before the other work is undertaken does not permit damage to occur to the new steel from excessive wheel impact.

C. Replacing Defective Switch Ties

When switch ties need to be replaced, the most common situation is that only a portion of the switch ties within a turnout are defective.

This situation is similar to the usual one that exists in track supported by cross ties.

- Unfortunately, mechanization of the renewal of switch ties has proved to be considerably more difficult than with crossties.

The ballast removed from adjacent crib using picks and ballast forks or track shovels.

- Spikes and lags are pulled with claw bars, a bolt machine or the spike pulling machine.

- Old switch ties are removed from track using tie tones, tie extractors or tie loader.
- Tie beds are scarified manually (ballast removed and tie bed dug down)
- New switch ties are installed the same way the old ones were removed.
- Spiking or lagging, tamping and restoration of the ballast are all manual operations.

Present day practice does offer the opportunity for at least partially mechanizing the renewal of switch ties.

Spike pullers of the type commonly used in tie crews can be used to mechanize that operation

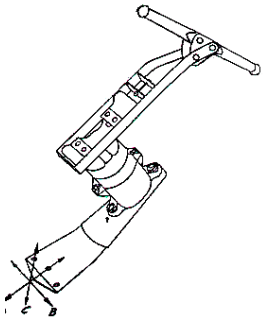
- In order to reach all of the spikes or lags to be pulled, it is necessary to either use two machines or to make two passes, one on the straight side and one on the turnout side.

Some of the machines currently in use for the removal and installation of crossties can be used effectively to perform this function with switch ties.

- Currently, equipment does not exist that will effectively scarify the tie beds within a turnout other than undercutter equipment.
- The need for tie bed scarifying may be reduced or eliminated if a general track raise is to be preformed concurrently with the switch tie renewals.

Spiking or lagging of new switch ties is probably best performed with manual setting for a hydraulic or air drivers because of the diversity of spike and lag configurations within a turnout.

Switch tampers are highly effective at performing that function within a turnout, having been designed primarily for such work. But hand surfacing with the Jitterbugs will also work well. See **Surfacing Track module** for details on the proper way to use the Jitterbugs.



D. Maintaining Switch Points

The proper maintenance of switch points is one of the most critical jobs associated with the care of turnouts and crossovers.

If a switch point fails to guide every wheel of every train to the proper route, a derailment is practically inevitable.

There are numerous conditions that can develop which may result in a wheel not being directed to the proper route.

There are more potential hazards connected with equipment movements made in the facing direction than in the trailing direction.

Whenever any equipment makes a facing, movement through a turnout, both wheels of each axle are first moving on the stock rails.

- One switch point is in the closed position, and the other switch point is in the open position.
- The flange of each wheel on the side with the closed point must be guided to the proper route by that point.
- It is essential that each wheel flange must contact with the gauge side of the switch point. For this guiding action to take place.

Should a wheel flange make contact with the end of the switch point, rather than the gauge side, trouble will result.

1. One thing that can happen when a wheel flange strikes the tip of a switch point is that it can be deflected so that it goes behind the switch point.

   - It this occurs. The tread of the wheel will continue to ride on the stock rail.
2. When the distance between this stock rail and the other stock rail on which the opposite wheel is riding becomes too great, one or both of the wheels will fall inside a stock rail.
   - Another possibility when a wheel flange strikes the tip of a switch point is that of the flange climbing onto the top of the switch point.
   - There is a strong chance of derailment occurring, in this situation.
3. A wheel flange that strikes the end of the switch point may still be deflected to the proper route, along the gauge side of the switch point.
   - When this happens, the movement will continue without derailment.
   - However, the impact of the wheel flanges striking the tip of the switch point can cause rapid deterioration of the point.
   - The end of the point can be battered down. Becoming successively more blunt with each impact until the wheel flange does become deflected to the wrong route.
   - A piece of the switch point could break out suddenly; leaving a blunt exposed surface, which a following wheel flange can climb.
4. A wheel flange might strike a switch point because it does not fit tightly against its stock rail.
   - In other words, the switch point is said to be, **gapped**. There are several conditions that can cause this to occur.
     a) Improper adjustment of the operating rod
     b) Switch stand or switch machine not securely spiked or lagged to the head block ties

c) Stock rail braces loose or worn
d) There may be ballast or debris between the switch point and stock rail.
e) Loose, worn or undersized connecting rod and switch rod holts
f) Worn bolt holes in switch rod fittings

The portion of the plate or pad is designed for the switch point to provides for raising the head of the switch point above the head of the stock rail.

A lip of metal flow may have developed on the gauge side of the stock rail or back of the switch point that should to be removed by grinding.

Switch points can become worn thin because of being located in a curve or because of heavy diverging traffic.

- The top surface of the point can be worn down to a point where the wheel flanges can pass over it.
- Cracks can develop near the tip of the point.
- Chips can break off, either at the end of the point or a short distance behind the point of the switch.

These conditions can result in a wheel flange climbing onto the top of the switch point, just as with a gapping condition.

A method sometimes used to repair very worn switchpoint is to grind off the head portion of the switch point for several inches from the original tip.

- After the defective portion is removed, the adjacent portion of the head is re-tapered and shaped by grinding.
- You should also find out what practices are recommended on your railroad regarding the grinding of switch points.

At MARTA this practice of grinding back a switch point is not done.

Switch points must be inspected regularly to see if any of these defects are developing.

- These inspections should include operating the switch so that the fit of each switch point against the stock rail can be observed.

If any of these defects are approaching a dangerous condition, and if the condition cannot be corrected by methods which have been described, it will probably be necessary to replace the switch point.

- With sufficient damage to the switch point, it may become necessary you slow order the switch. Check with the Track Foreman before any slow order is implemented.)

E. Stock Rails

Usually, when it is necessary to replace a switch point, it is advisable to replace its stock rail as well.

Stock rails are subject to various types of wear.

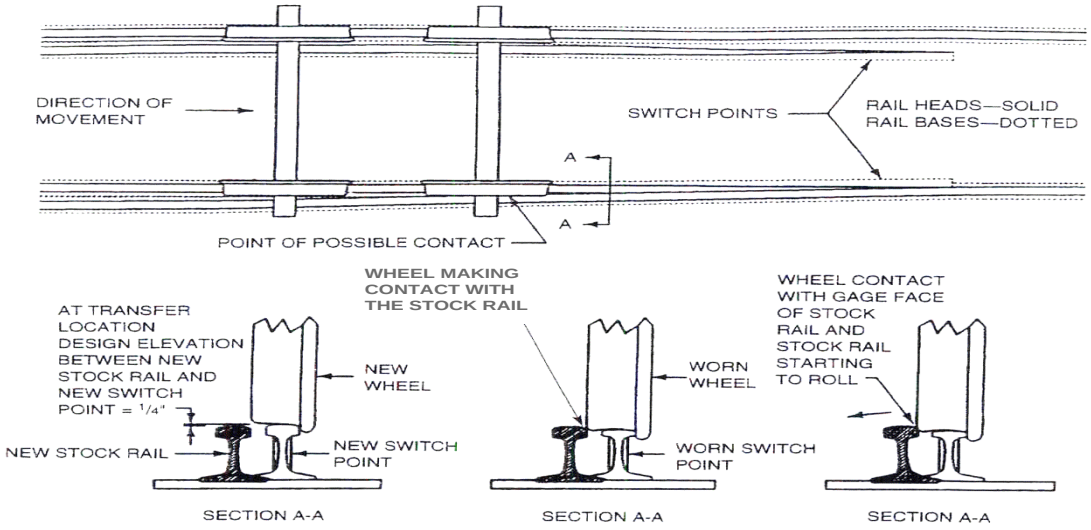
- The formation of a lip of metal flow on the head of the stock rail is one indication of wear.
- The gauge side lipping, which causes problems, can be readily corrected.

However, lipping is an indication of metal flow that is lowering the running surface of the stock railhead.

If a new switch point is placed against such a worn stock rail, the carefully designed riser feature provided by the switch plates and vertical bending of the switch point will have an incorrect relationship.

Stock rails sometimes tend to develop mashed heads in the area where the wheel loads are transferred from the switch point to the stock rail on trailing movements.

- This can lead to severe impact on the switch structure.
  Switch points are generally more costly than stock rails.
  It is good practice to work towards extending switch point life, even if at the expense of some potential stock rail life.
- Many stock rails can be reused as an ordinary rail in a lower class of track.



F. Operation of a Switch

The operation of any switch requires the switch points slide laterally on the surface of the switch plates.

- Because of this, there is always frictional resistance to the operation of a switch.
- Also, there are several ways in which various types of obstructions can interfere with the operation of a switch.

It is standard practice to lubricate switch plates for the purpose of reducing friction. The two principal materials, in general use are graphite and oil.

1. Graphite

Graphite applications require that the switch plates be well cleaned before the initial application.

- A properly graphited set of switch plates normally requires follow up applications at less frequent intervals than oiled switch plates.
- Graphited switch plates tend to stay cleaner than oiled plates. Oil should not be applied to switch plates that have been graphited, as the graphite will be destroyed.

Graphite cannot be reapplied in such situations, until the switch plates have had all of the oil removed.

Proper lubrication, with either material, requires application to each switch plate with the switch point in both the open and closed position.

2. Oil

Oil can be applied quickly and does an effective job immediately after its application.

There are several disadvantages to oil as a switch plate lubricant, however.

1. Applications need to be made at frequent intervals, particularly, when there are periods of inclement weather.
2. Oil tends to retain dirt and other foreign materials with which it comes in contact. This can lead to the necessity of thoroughly cleaning the switch plates.
3. Frequent application of oil, with the inevitable slopping that takes place, can adversely affect the life of the switch ties.
4. The use of oil as a switch plate lubricant has been discontinued by many railroads because of concerns of contamination of the ground around the switch.

3. Switch Latches and Locks

Power operated switches have a built-in mechanism that locks the operating rod so the closed switch point will not beadle to open under moving wheels.

For manually operated switches a means is provided to restrain the lever of the switch stand in its extreme position, there've enabling the operating rod to hold the closed point tightly against the stock rail. `

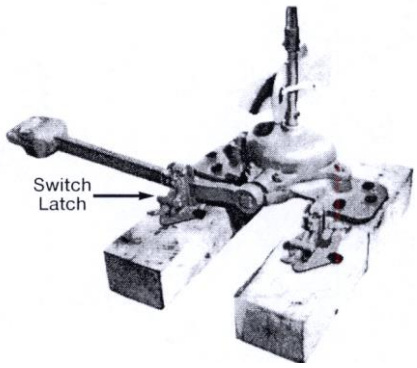
- This is done for both positions of the switch.

The devices that restrain the lever so the switch point will remains closed, are called **switch latches**. One thing that a switch latch must do is to prevent the lever from becoming free unless the latch is opened. Also, latches must work freely and not jam and should be inspected periodically.

Switch Lever Latches

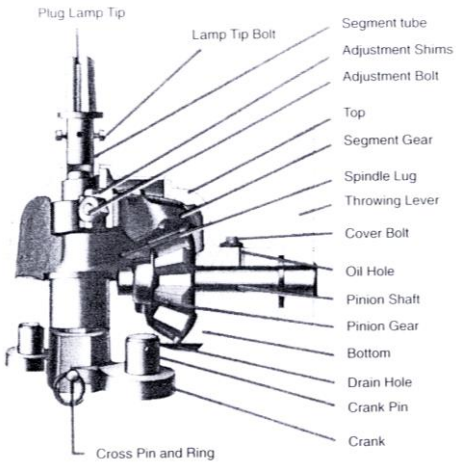
Whenever a switch is located where train movements can be anticipated at a speed where the train may not be able to stop short of the switch if not properly lined, provision must be made for keeping the switch locked.

Here is a picture of a switch stand with latches. Each latch provides for attaching a switch lock, which will prevent tripping of the latch.



Switch can be left in the improper position either erroneously by an employee who used it previously or deliberately by someone intent on malicious mischief.

Latches used in this situation provide for attaching a switch lock. So the switch cannot be operated by anyone without the proper switch key.



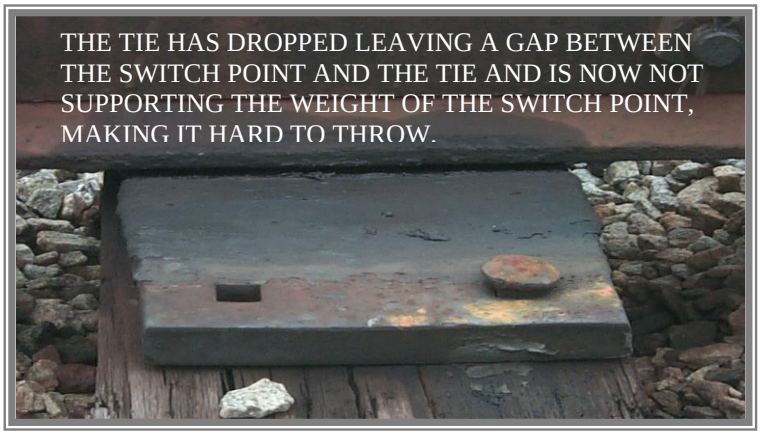
Here shows the internal components included in the switch stand. There are many different designs of switch stands in use. You will probably only have to work with a few. Become familiar with their parts, so you will be able to make adjustments or repairs when necessary

Any adjustment to the switch points on existing turnouts equipped with switch machines, needs to be done with the cooperation of A.T.C personnel.

G. Switch Surface

Much difficulty in throwing a switch can develop because of poor surface of the turnout.

- Under some conditions, most of the load may be carried on a few switch plates
- This can result in one or both of the switch points binding, and being difficult to throw.



Particular attention needs to be given to the switch heel block joints.

- These are hinged joints, and the support they provide is somewhat less effective than with conventional joints

Heel joints need to be watched for a tendency to become low spots in the surface of the track. Loose ties in this area can cause excessive friction on switch plates closer to the point of switch.

There is another hazard caused by loose ties at the heel block joints.

- When a wheel passes over the heel joint and causes further depression, the tip of the switch point can rise up in relation to the stock rail
- Depending on wheel spacing in relation to the length of the switch point, a following wheel can come into contact with an improperly exposed switch point.

H. **Switch Surface Information**

Sight the straight rail (line) from a position approximately 30 ft. In front of the switch points, looking towards the frog, with eyes near the level of the top of the rail. Minor deviation is normal. If deviation is judged to exceed 2”, use 62’ cord to determine the exact deviation. Note measurement on comments page and diagram. Refer to exhibit #15 for remedial action. MARTA geometry standards listed below.

I. Frogs

Crossing frogs, in which the tracks cross at 90-degree angles, or other large angles approaching 90 degrees, have open gaps for the opposing flangeways, which wheel must bridge.

1. Flangeway

These flangeways are about 1-7/8 inches in width.

- This has a similar effect to the condition where a piece is broken out of the end of` the rail, leaving the same opening.

The impact can be considerable, increasing with the loads on the wheels and the speed of the movement.

The situation is somewhat different for flat angle frogs, including turnout frogs. The open flangeway is on a rather flat diagonal angle.

For a wheel of a given contour, it is possible to develop a frog design for which the wheel load will be transferred gradually from the wing portion to the point portion of therefor on a facing movement.

A problem develops since not all wheels have the same contour. Any frog will carry wheels in all stages of wear. As a wheel wears, its shape changes.

In allowing for variations in wheel shapes, it is necessary to design frogs so they are protected against the possibility of wheels striking the tip of the point portion of the frog.

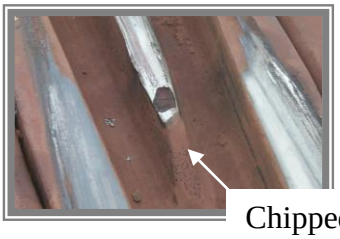
Excessive impact on this relatively narrow part of the frog structure can produce cracking and breakage in a short period of time. There are two ways that this can be avoided.

1. Build the frog, with a slight vertical taper at the point. These results in the top of the point being somewhat lower than the adjacent wing portions. On which the outer edges of the wheel treads ride.

2. Keep the point portion level, but raise the wings in the vicinity of the tip of the point. It is from this design that the wing portions of a frog are sometimes referred to as the **risers**.

The primary purpose of either design is to protect the tip of the frog point. Neither design can provide a perfectly smooth transition of the load across the flangeway for wheels in all stages of wear.

Some impact will inevitably occur. This can produce batter, cracking, chipping or breakage on either the point portion or the wing where the predominate traffic moves.


Chipped Point

Deterioration of these portions of the running surface of the frog increases the amount of impact that accelerates the failure of the steel surfaces.

- This impact also produces excessive wear on the ties under the frog and the track surface. This, in turn, speeds up the general breakdown.

Welding and grinding can restore the deterioration of the running surfaces, except in extreme cases. If the breakage is not too deep, this work can be done after revenue, without removing the frog from the track.

In more severe cases, it is necessary to replace the frog, but sometimes the frog can be restored to good condition by welding after it is removed from the track.

Severe wear on the point and wing of a frog can introduce the possibility of the flangeway not being deep enough for wheel flanges. Minimum required MARTA and the FRA specify flangeway depths is 1-1/2". (Use the Frog Gauge to check)

J. MARTA Standards for Switches and Turnouts

Surface

Sight the straight rail (line) from a position approximately 30 ft. In front of the switch points, looking towards the frog, with eyes near the level of the top of the rail. Minor deviation is normal. If deviation is judged to exceed 2", use 62' cord to determine the exact deviation. Note measurement on comments page and diagram. Refer to exhibit #15 for remedial action.

Crosslevel

Check at locations indicated on diagram and record. All readings should be zero crosslevel. If readings are not zero, refer to exhibit #15 for remedial action.

Alignment

Stand 30 ft. In front of switch points, directly over the top of the straight (line) rail and look toward the frog. Observe this rail for any alignment deviations. If deviation is judged to exceed 1-1/2", use a 62' cord to determine the exact deviation. Note measurement on comments page and diagram. If more than 3/4", notify ASAP. For remedial action refer to exhibit #15.

Gauge

Check at locations indicated on diagram, with a crosslevel gauge and record. Check entire switch with a rolling gauge, and record every fifth (5th) reading on the Turnout Gauge Reading form (exhibit #4). Standard gauge is 56 - 1/2 inches. Observe the following:

Guard Rail

All measurements should be made 6 1/2" behind the 1/2" point of frog. (Chisel mark on frog point.)

Check Gauge:

Measure and record. If this less than 4-6 3/8", notify ASAP.

Guard Rail Flangeway:

Measure and record. If this is more than 2" notify ASAP.

Frog Wear

Measure 6 1/2" behind the 1/2" point (chisel mark). Use frog flangeway check gauge (see exhibit #16). If the gauge will not fit into the flangeway, note in comment section that the frog needs to be ground. Note all visible cracks in the casting. Note excessive wear in the wing area.

Frog Bolts

Check all frog bolts. Note loose or broken bolts in comments on the switch inspection report.

Joints (Including heelblocks)

Note all loose or broken bolts, nuts, bars or washers. There must be a minimum of two (2) sound tight bolts in each rail in each joint. If less than two (2) impose a 25 M.P.H. slow order and notify ASAP.

Note all chipped, broken, or battered rail ends. If judged excessive, measure as explained on exhibit #12.

Note all standard joint gaps, which exceed 1/4". Note if gap overflow needs grinding.

Measure gap between the underside of the railhead and the top of the heelblock. If this exceeds 1/16", note in comments. Report any heelblock, which exhibits excessive movement under train traffic. Excessive noise under train traffic is a good indicator of this condition.

Stock Rail

Check stock rails for gauge side overflow in the switch point area, which could prevent proper mating of the stock rail and switchpoint. Check to insure that the rail is properly seated in the switch riser plates. Note excessive rail movement

while switch is operating or while under train traffic. This condition should be reported to the Track Inspection Foreman for referral to Automatic Train Control (ATC) Department.

Rail Fastenings

Rail braces, bolted clips, spring clips, and spikes.

Note any broken or missing components.

Note loose fastening. All loose or broken fastenings should be repaired by the inspector, if it is possible to accomplish without disturbing the running rail.

If five or more consecutive fastenings on the same side of the rail are loose, notify ASAP.

Tie Plate or Fasteners

Check for proper fit between the plate or fastener, the rail and the concrete or tie.

Note lateral or vertical movement, which exceeds 1/4".

Check for adequate lubrication of slide plates.

Always use plate or fastener number, and approximate location when reporting defect.

Note and record locations of all loose, missing or broken anchor bolts and lag screws.

Note and record location of all broken or missing fasteners or plates.

Wood Ties

Note any excessively split or rotten ties. Pay particular attention to the plate or fastener area of the tie. Tie failure is more prominent in the heelblock and frog area. A wood tie is considered failed when it is:

Broken through.

Split or otherwise impaired to the extent it will not hold spikes or rail fasteners, or will allow ballast to work through.

So deteriorated that the tie plates or the base of the rail can move laterally more than 1/4".

Concrete

Note excessively cracked or broken concrete (some hairline cracks are normal). Failure is more common in the pedestals in the switch point area.

Switch Rods

Note any loose bolts or bad insulation. Remove any ballast or debris, which would interfere with the movement of the rod. When reporting indicate rod number.

Switch Machine

Note any defects and comments. Inspect closely the ties or the concrete, which support the switch machine.

Switch Points

Note in comments any broken or badly worn points. Indicate right or left. Any gap between the points and stock rail within the first 6", should be noted and reported to ATC and Track Supervisory Personnel ASAP.

Right and left is determined by standing in front of the switch points, looking toward the frog. If the straight rail is on your left, then the turnout is right-handed. If the straight rail is on your right, then the turnout is left-handed.

K. Turnouts and Track Crossings

Turnouts and track crossings generally.

(a) In turnouts and track crossings, the fastenings shall be intact and maintained so as to keep the components securely in place. Also, each switch, frog, and guardrail shall be kept free of obstructions that may interfere with the passage of wheels.

(b) Classes 3 through 5 track shall be equipped with rail anchoring through and on each side of track crossings and turnouts, to restrain rail movement affecting the position of switch points and frogs.

For MARTA track, this is applicable only in the Yard tracks, rail clips act as their own anchors on mainline tracks

(c) Each flangeway at turnouts and track crossings shall be at least 1 f inches wide.

Switches.

(a) Each stock rail must be securely seated in switch plates, but care shall be used to avoid canting the rail by overtightening the rail braces.

(b) Each switch point shall fit its stock rail properly, with the switch stand in either of its closed positions to allow wheels to pass the switch point. Lateral and vertical movement of a stock rail in the switch plates or of a switch plate on a tie shall not adversely affect the fit of the switch point to the stock rail.

Broken or cracked switch point rails will be subject to the requirements of § 213. 113, except that where remedial actions C, D or E require the use of a joint bars, and joint bars cannot be placed due to the physical configuration of the switch, remedial action 8 will govern, taking into

account any added safety provided by the presence of reinforcing bars on the switch points.

(c) Each switch shall be maintained so that the outer edge of the wheel tread cannot contact the gauge side of the stock rail.

(d) The heel of each switch rail shall be secure and the bolts in each heel shall be kept tight.

(e) Each switch stand and connecting rod shall be securely fastened and operable without excessive lost motion.

(f) Each throw lever shall be maintained so that it cannot be operated with the lock or keeper in place.

(g) Each switch position indicator shall be clearly visible at all times.

(h) Unusually chipped or worn switch points shall be repaired or replaced. Metal flow shall be removed to insure proper closure.

(i) Tongue and Plain Mate switches, which by design exceed Class 1 and excepted track maximum gauge limits, are permitted in Class 1 and excepted track.

Frogs.

(a) The flangeway depth measured from a plane across the wheel-bearing area of a frog on Class 1 track shall not be less than 1 3/8 inches, or less than 1 ½ inches on Classes 2 through 5 track.

(b) If a frog point is chipped, broken, or worn more than five-eighths inch down and 6 inches back, operating speed over the frog shall not be more than 10 m.p.h.

(c) If the tread portion of a frog casting is worn down more than three-eighths inch below the original contour, operating speed over that frog shall not be more than 10 m.p.h.

(d) Where frogs are designed as flange bearing, flangeway depth may be less than that shown for Class 1 if operated at Class 1 speeds.

Frog Guard Rails

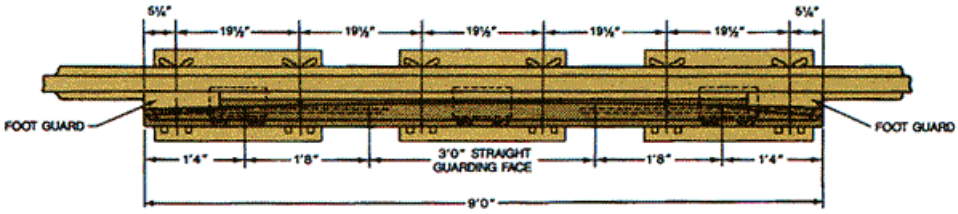
Minimum safe guard check and maximum safe guard face gauges for the various classes of track are specified by the FRA.

Check the MARTA Track Safety Standards for the actual measurements required for the safe operations of trains through any turnout.

It is necessary not only to install frog guard rails to the proper, guard check gauge, but also to be pertain that both the guard check gauge and the guard face gauge are maintained within the acceptable limits.

- This may require re-spiking or re-lagging of the guardrail, the running-rails or the frog.
- Should this be inadequate to hold proper gauges, switch ties will have to be replaced.

Tee type guardrails, attached to the running rails by bolts and filler blocks or with clamps and wedges require attention to keep the fastenings tightened.



Wear on the guarding face of guardrails is not a serious problem in the majority of installations.

- Where is a problem, there is usually a combination of curvature and heavy traffic present.

Occasionally, excessive guard face gauge may be involved. Wear on a guarding face can be a source of concern if it develops to the point that usage limits are threatened or if the mechanical action that produces it loosens the guard rail fasteners.

L. ADJUSTING A SWITCH EQUIPPED WITH A RIGID STAND

1. Preparation

a) Spike the switch points aginst the bent stock rail in the normal position.
b) Remove cotter pins from adjusting bolts on the switch rods and from rod bolts on the connecting rod.
c) Loosen the jam nut on the connecting rod.
    - If difficult to do at this point, do after step e.
d) Remove the connecting rod bolt (on the rigid end of the connecting rod) and disconnect the connecting rod.
    - Lift the switch handle to release pressure on the rod bolt.
e) Remove the switch stand.
f) Disconnect the clevis end of the connecting rod from the crank eye bolt on the switch stand.
g) Plug the spike holes if the headblock ties are to be reu-used and adze as required.

2. Adjust Switch Rods

a) Loosen bolts used to adjust switch rods so that the point won't bind while adjusting.
b) Adjust front rod to provide a standard throw as indicated on the standard plan.
c) Adjust the back rod, using 2 track jacks placed back-to-back.
    - The planed portion of the points must fit evenly along the stock rails in both the normal and reverse positions.
d) Adjust any intermediate rods, if so equipped.
    - Take clearance, or throw, between the point and the stock rail is normally 5 in, measured at the first rod of a turnout.
    - 4 ¾" throw for spring and power operated turnouts.

3. Initial Settings

a) Turn the clevis on the adjustable rod until the threaded end of the rod protrudes through the clevis 1 ½".
   - This permits adjustment of up to 1 ¼ in. in either direction.

b) Screw the crank eye bolt into the spindle so that the eyebolt is under the operating lever.

c) Adjust the crank eyebolt until the distance between the center of the hole to the near face of the spindle is 2 ½ in.

d) Connect the clevis end of the connecting rod to the crank eyebolt.
   - **Do not** reverse the orientation of the connecting rod!

e) Place the stand in an upright position on the head block ties.

f) Attach the rigid end of the connecting rod to the front switch rod.
   - While adjusting, drop the bolt in from the top.

g) Open the points and install wedges to hold them open one half the standards throw distance.

h) Square the switch stand on the head block ties with the throw lever in the center of its stroke.

i) Spike or bolt the stand to the head block ties.

4. Final Settings

a) Remove wedges and throw the switch to the reverse and normal positions.

b) Hand tightens the jam out.

c) Shorten or lengthen the connecting rod by turning the rod in the clevis until and equal throw is obtained on both sides.
   - I.e., points are equally too loose or too tight.

d) **To set the correct tension** turn the crank eyebolt clockwise or counter clockwise:
   - If points are too tight, tighten or screw in the eyebolt.

- If points are too loose, loosen or unscrew the eyebolt.

e) **To check the tension adjustment** on a rigid switch stand:
   - Place a 1/8" shim between the point and stock rail at the first switch rod.
   - If the throw lever cannot be placed in the lock position with **normal pressure**, then the switch is in proper adjustment.

f) If necessary, make fine adjustments on the connecting rod or eyebolt to provide equal throw and required tension.

5. Final Connections:

a) Ensure that the bolt on the clevis end of the connecting rod is installed from the top.
b) Install a spring washer and nut on bottom and secure with a cotter pin.
c) Set the rod bolt on the rigid end in from the bottom.
d) Install spring washer and nut on top and secure with a cotter pin
e) Tighten the jam nut on the connecting rod against the clevis face
f) Install all other cotter pins as required.

6. Final check

a) Turn the switch from the normal to reverse position
   - Switch should move freely, if not, lubricate switch plates.
b) Secure the switch in the normal position
   - Lock or hook must be in good condition
c) Verify that the switch target, if so equipped, and tip assembly is properly oriented.
d) Clean up work site.

M. Derails

Their purpose is to prevent the uncontrolled movement of equipment from a sidetrack onto a mainline track. The hazards of a possible collision of such equipment with a train on a mainline track is so great, that it is preferred to deliberately derail uncontrolled equipment before it blocks the mainline track.

1. Rail Head, Derail

There are two basic types of derail in general use.

The most common type is placed on the head of one of the rails of the sidetrack.

- This device raises the wheels above the rail so the wheel flanges can be directed diagonally across the railhead.
- As each wheel flange passes beyond the field side of the railhead, it derails.
- This in turn causes the other wheel on the same axle to full off the other rail to the gauge side.

This type of derail is normally attached to the rail of the sidetrack, furthermost from the mainline track.

- It must be located so the equipment will not interfere with mainline track clearance, either before or after derailing.

The purpose of a derail is to safely derail rolling equipment to stay clear of and away from the track it is intended to protect.

a) Derails must be installed:
    - Where there is any possibility of equipment that has been left standing on tracks other than main tracks or sidings being moved by gravity so as to obstruct a main track or siding.
    - On tracks on which an industry will move cars or equipment.
    - On mine and other bulk loading facility tracks where cars are dropped by gravity toward the main or other track that is to be protected.
    - At tracks used to tie up locomotives on a regular basis. Through tracks so used must be equipped with derails at both ends. Locations used to tie up power will be specified by the Transportation Department.
    - At entrances and exits of Main and Running Repair Shops. Derail must be applied to each track not less than 40 feet from doors.

Here at MARTA we use derails behind the MOW shop to keep track equipment from infringing on Yard tracks and where the CSX track connects to the Yard track to keep their trains from entering the Yard.

b) Only approved types of derails are to be installed (examples include):
    - Hinge and sliding type derails may be used where the speed of the equipment to be derailed will not exceed 15 mph. A derail wheel crowder must also be installed where any of the following conditions apply:
    - Derailing speed could exceed 9 mph;
    - The derail is installed on the inside of a curve.

2. Switch Point Derail

a) Switch point derails are to be used when speed of the equipment to be derailed could exceed 15 mph.

Where switch point derails are used, adequate rail anchorage must be provided to prevent rail creep.

- To eliminate the possibility of cars running over hinge and sliding derails without derailing, they must be the proper model, size and hand to fit the running rail.
- In the derailing position the derail block must cover the ball of the rail and lie flat on the top of the rail throughout the underside of the derailing block surface.
- The direction of movement of a car to be derailed determines whether a right or left-hand derail is required.
- A right-hand derail is installed on the right-hand rail and derails toward the right; a left-hand derail is installed on the left-hand and derail toward the left.
- The correct size of derail to be used on various rail sections is as follows:
- Size 5: up to 85 LB
- Size 6: 100 LB & *115 LB
- *Size 7: *115 LB and larger*

*On worn 115 LB rail a Size 6 derail should be used.

- A plywood or steel shim of the correct thickness with holes punched or drilled for all fasteners may be necessary under the derail to ensure the block lies flat on the top of the rail.
- If the rail at the derail location is relayed, the derail should be replaced with one of the correct size for the rail.

b) Operating stands of a rigid type (31B, 36D or 112E) must be used with switch point derails. Rigid stands or Hayes operating stands must be used with sliding type derails.

- Throw of switch point type derails is 5”
- Throw of sliding type derails is 6 ¼”

- The switch stand for a switch derail will be painted black similar to any other switch stand.

c) ***Hinge and sliding*** derails must be painted yellow.

- All derails not equipped with high operating stands shall have a derail sign mounted on a separate post.
- All derails equipped with high operating stands shall have a derail sign mounted on the mast of the operating stand.
- When derail signs are mounted on the mast of high operating stands, they shall be attached to the mast so that they are parallel to the track when the derail is in the non-derailing position, and at right angles to the track when the derail is in the derailing position.
- Targets and target tips, whether reflective or not, shall not be used in connection with derails.
- Tracks equipped with a derail shall have the switch stand lever painted yellow.

d) Derails must be installed in such a way that equipment will derail away from the track being protected.

- Location for a derail is governed by local conditions such as grade and length of track, but shall never be located less than 20 feet behind the fouling point and installed so as to derail cars away from the track being protected. Sufficient distance should be allowed so that the derailed car cannot continue to move and foul the track being protected.
- When the derail must be located close to the clearance point, a **bent type guard rail** must be installed between the rails, to provide additional assurance that the derailed equipment will not foul the track being protected.
- Derails should not be installed on the inside of curves if it can be avoided. If necessary to install a hinge type or sliding type derail

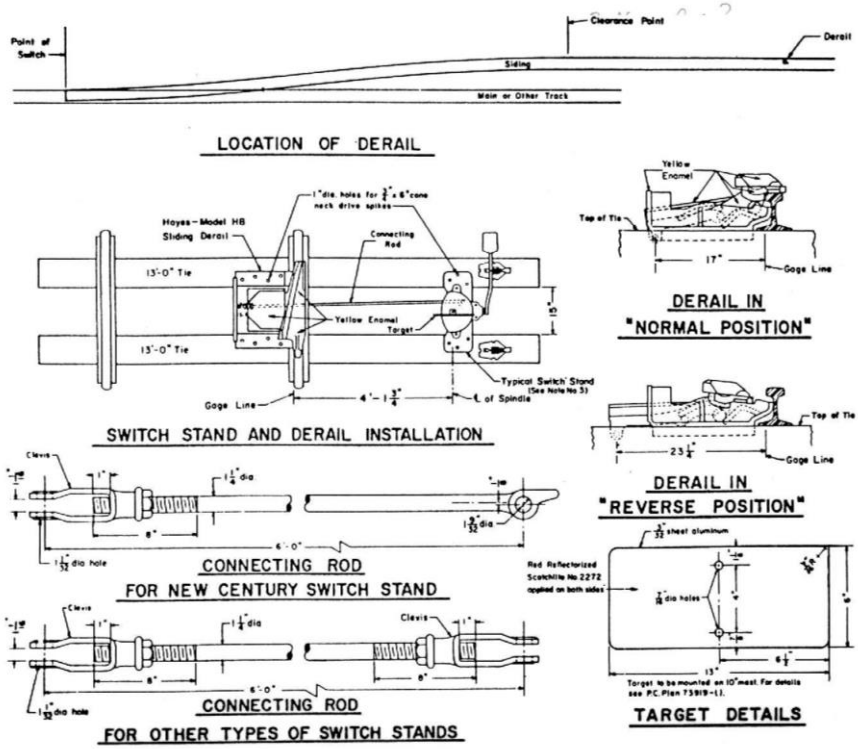
on the inside of a curve, a derail wheel crowder must be installed on the outside rail on the same ties.

- Where there are insulated joints, derails must be placed far enough behind the insulated joints so that equipment derails before fouling the track circuit.

e) Straight guard rails will be required where the derailing point is;

- On a high embankment
- Near structures that could be struck by derailed equipment
- On a sharp curve
- Derails and locks must be kept lubricated and adjusted to maintain ease of movement.

De-rail and Crowder



Occasionally there are instances where this type of derail, is not completely effective. Reasons for this include improper adjustment on the railhead and deteriorated ties which permit the derail to be torn loose.

Even without these conditions, a heavy car that has picked up considerable speed prior to contacting the derail will occasionally tear a derail loose.

3. Typical layout of split switch point derail

Sometimes when thin possibility is anticipated such as with a substantial descending grade toward the mainline track connection, a switch point derail is installed. Usually this is a single switch point and snick rail, located in a similar position to the rail head type of derail. This is located behind the M.O.W. shop where CSX connects to MARTA.
It may be necessary to locate a derail near the clearance point.

- If there is a possibility of derailed equipment fouling the mainline track a deflecting rail may be used.

This is a length of scrap rail spiked to the ties in a diagonal position between the running rails.

- This is intended to guide the wheels that have derailed on the gauge side of the rail away from the main track.

Derails are normally kept set in the derailing position. It is necessary to operate a derail so it will be in a non-derailing position when movements are to be made into or out of the sidetrack.

There are various ways in which derails may be operated. The rail head type is sometimes grasped directly and moved to or from the railhead. This type may be guided by a hinge or sliding mechanism.

Either type of derail may be attached to a switch stand located adjacent to the de-rail. These de-rails are operated by throwing a switch lever, just as switches are

operated. Sometimes, the derail is connected by a system of pipes, cranks and rollers so when the switch is operated, the derail is operated also.

- Where switches are power operated, the derails are also power operated.

Where derails are operated separately from the switch conditions at many locations require the derail be kept locked in the derailing position with a switch lock except when equipment is moving to or from the sidetrack.

- It is essential that such a lock will eliminate the possibility of moving the derail to a non-derailing position.

It is also essential that derails be readily visible to train crews or track personnel working in the vicinity. A lamp, target or a signal sometimes accomplishes this, similar to those used for switches, but displaying the colors prescribed for derails.

Sometimes, the procedure with the rail head type is to paint the derail itself, using a highly visible color prescribed by the individual railroad. It is also necessary to control vegetation and debris so as not obscure the derail.

4. FRA standards for de-rails

(a) Each derail shall be clearly visible.

(b) When in a locked position, a derail shall be free of lost motion which would prevent it from performing its intended function.

(c) Each derail shall be maintained to function as intended.

(d) Each derail shall be properly installed for the rail to which it is applied. (This paragraph (d) is applicable September 21, 1999.)

N. Miscellaneous Maintenance

Most turnouts and crossovers have substantial curvature on the diverging route. The nature of these track layouts makes it impractical to provide superelevation on the curved route.

These conditions severely limit the speeds at which equipment can safely be operated over such a route.

- In most installations, only a relatively small amount of excess speed can place considerable stress on the track.

At locations where such tendencies exist, one part of the turnout that must be watched carefully, is the curved lead.

- Under severe usage, a curved lead can develop severe flange wear on the gauge side of the railhead.
- The outward thrust of the wheels can also tend to cause an outward movement of the rail, particularly if the switch ties are nearing the end of their useful life.

Where there are indications of these conditions, the lead area needs to be watched closely for the development of wide gauge.

Most leads have a rail joint somewhere between the heel of the switch and the toe of the frog.

This is frequently the most critical location if wide gauge is a problem.

Turnouts and other special track work have a variety of sizes and types of bolts. In addition to regular track bolts, they usually are:

1. Connecting rod bolts
2. Stock rail Brace bolts
3. Frog bolts
4. Switch Clip bolts
5. Guard rail bolts
6. Switch Rod bolts
7. Heel block bolts

Each must be properly maintained to perform its function. Periodic tightening and lubrication should be performed.

- If any bolt breakage is taking place, replacements should be installed promptly and efforts made to determine and correct the cause of breakage.

The types of track work that has been investigated in this lesson usually cost several times as much to install or replace as an equivalent footage of conventional track.

Sound practice dictates that such facilities should receive preferential treatment, if necessary, to secure a proper return on such investment.

- Also, these installations can potentially present many more ways that train operations can be interrupted than conventional track.

This Lesson has dealt with a wide variety of maintenance and construction functions. You most certainly will not have to make use of all the information that this Lesson contains at once.

However, it is recommended that you do not set this Lesson aside and wait for the day you will have to perform a specific job. Study the types of' facilities in your- areas. Look for signs of defects that this Lesson has discussed.

Check resources that are available. Consider how to carry out the various maintenance and construction operations when needed.

O. Diamond Crossings

1. Crossings must be installed and maintained to the plans supplied for each crossing.

2. Sub-grade under crossings must be well drained. Clean crushed rock or slag ballast must be maintained.

3. (a) Track gauge and flangeways in the crossing must be maintained in accordance with the plan of the crossing.
   (b) Guard check gauge and guard face gauge shall be maintained as prescribed.
   (c) If the tread portion of a casting is worn down more than 3/8” below the original contour (below level corners where diamond crossing corner pads have been off), operating speed over that crossing may not be more than 10 mph.

4. Crossing must be fully bolted. All bolts must be provided with spring washers or hardened steel flat washers as indicated on the manufacturer’s plan, and must be kept tightened to the torque prescribed.

5. Crossings must be spiked or otherwise fastened as prescribed by the railroad.

6. Metal flow on frogs shall be kept ground off to maintain proper gauge and to prevent chipping.
   (a) When necessary, repairs by welding shall be made in accordance with approved methods.
   (b) Reversible crossing inserts must be transferred between corners to equalize wear.

7. Movable point crossings must be adequately lubricated with an approved lubricant.

8. Crossings must be kept free of snow, ice and other obstructions.

9. All ties under crossings must be sound and firmly tamped for 16 inches on either side of both rails on both routes of the crossing.

10. Line, surface and gauge of track approaching crossings must be accurately maintained.

11. Sufficient rail anchors must be applied on all approach tracks to the crossing to prevent rail creep and skewing of the crossing.

12. Inspections of all crossings shall be conducted as follows:
   (a) Every time the crossing is passed it shall be visually inspected for defects.
   (b) Crossings shall be inspected at least monthly on foot measuring gauge and observing overall condition.
   (c) Crossings shall be inspected annually (unless otherwise directed by the Head of Engineering), looking closely at the condition of all components.
   (d) Items to check and minimum acceptable maintenance conditions are listed in the following Table.

13. (a) All unacceptable conditions must be either corrected or reported to the Track Supervisor.

(b) All unsafe conditions which cannot be corrected immediately must also be reported to the Rail Traffic Controller and proper action taken to protect traffic on all routes.

14. Crossings must be adequately protected at all times with spare components to ensure continued operation.

ITEMS TO CHECK	MINIMUM ACCEPTABLE MAINTENANCE CONDITIONS
1. Ballast and Drainage	(a) Cribs not less than three-quarters full. (b) Ballast shoulder not less than 10 inches. (c) No standing water or indications of it.
2. Line, gauge, surface, cross-level	.
3. Ties, fasteners.	(a) Sound and holding (b)Properly spaced and aligned.
4. Plates	(a) None broken (b) None missing (c) All stops and shoulder firmly welded on. (d) Not worn in excess of 1/8 inch
5. Rails (including wing rails, closure rails, guard rails and frog rails)	(a) No visible defects such as rust streaks, ordinary breaks, vertical or horizontal split heads, engine burns, broken. (b) End batter or mismatch not exceeding 0.040 in.
6. Castings	(a) Manganese Inserts not cracked or broken (b) Metal flow ground off (c) No broken castings (blocks and rail braces, etc.) (d) If the tread portion of a casting is worn down more than 3/8"below the original contour, operating speed over that crossing may not be more than 10 mph.
7. Rail Fasteners	(a) Fully spiked. (b) Spikes fully driven (c) Tie screws tight, double spring washers compressed. Pandrol clips in place, shoulders not broken

8. Rail Anchors	Sufficient anchors properly adjusted to prevent movement of crossing.
9. Bolts	(a) None missing (b) All tight. (c) Proper length and diameter.
10. Insulation	In place and not visibly damaged.
11. Flangeways	(a) Not more than 2” wide (b) Not less than 1 ¾” wide (c) Not less than 1 ½” deep (d) Clear of foreign objects

APPENDIX I

Glossary of Terms

Installation and Maintenance of Switchwork

Actual lead - The distance between tile actual switch point and half-inch frog point along the centerline of the tangent track in a lateral turnout. In a curved turnout, the lead is measured along` the centerline of the curve with the longer radius. Also known as Lead Straight.

Basket rod - A switch rod with sleeve-like appliance for connection to all operating rod.

Center frog - Two diamond frogs at opposite end, ref the short diagonal of a track crossing. See, End frog.

Connecting rod - A switch rod that connects a switch stand or auxiliary device such as target stand to a switch. The connecting rod usually attaches to the end of the head rod as compared to an operating rod, which usually connects to the basket rod.

Curve, lead - The curve comprising the turnout track between the switch heel and frog toe.

Derail - A safety apparatus strategically located that intentionally guides run-a-way rolling stock off a side track to protect against collisions on the mail) trick.

End frog - The two frogs in a track crossing opposite to the long diagonal.

Flangeway - The space between a running rail and a guardrail or between a running rail and a guard timber which provides a passageway for flanges.

Frog plate - A tie plate specifically designated to be placed under a frog of a turnout.

Frog point (point of frog) - Where the two rails converging into the frog intersect.

Guardrail - A track work component. frequently made from tee rail and placed next to a running rail. A working Guardrail guides rolling stock by maintaining contact with the backside of the wheels. A **passive** or **non-working** guardrail does not normally contact wheels.

Guard Rail, frog - A guardrail placed adjacent to the running rail across from a frog to wide wheels through the frog.

Half-inch frog point - The projected frog point where the Gauge lines are half-inch apart. The half-inch frog point is obtained by taking one-half the frog number in inches and measuring back toward the frog heel from the theoretical frog point. Frog points made of manganese steel have the half-inch frog point indicated by a mark on the casting.

Heel block - steel or iron filler placed between the stock rail and switch rail at the switch heel and held in position with through bolts. The heel block maintains the space between the stock rail and switch rail, holds track gauge, and provides a hinge-like apparatus, which allows the switch to change position.

Lead (or closure) rail - file rail that connects the frog rind heel block. The lead rail on the straight side is referred to as the straight lead or straight closure rail. The lead rail on the turnout side is referred to as the curved lead or curved closure rail.

Operating rod - A switch rod connecting the switch to the switch stand or switch machine. Usually the operating rod is connected to a basket rod as opposed to a connecting rod, which is connected to the end of the head rod. The switch stand or switch machine throw action is transmitted to the switch rails through the operating rod.

Parent track - A track which a turnout is constructed.

Running rail -The rails which rolling stock and on-track equipment runs directly on as opposed to guardrail or third rail.

Running surface (of' rail) - The top portion of the rail head where rail/wheel tread contact occurs. Also called rail tread.

Stock rail - The rail against which a closed switch point contacts in a switch. The stock rail on the straight side of the turnout is often referred to as the straight stock rail. The stock rail on the turnout side is often referred to as the turnout stock rail.

Superelevation - The banking of track by raising or superimposing the high rail above the low rail at a curve. File desired speeds and curve degree or curve radius determine the amount of superelevation.

Switch heel - The end of a switch rail closest to the frog.

Switch heel joint - The end of a switch rail closest to the frog. Usually the joint between the switch rail and the closure rail.

Switch latch - A device, which secures the switch lever in place. Often provides a means for applying a switch lock.

Switch point - The end of a switch rail formed into a sharp point for diverting rolling stock and on-track equipment wheels from one track to another. The entire switch rail is commonly called the switch point.

Switch rod - General term describing the various steel rods that connect the components of a switch.

Tee rail - The typical rail shape used in track construction. The tee rail consists of a railhead; rail web and rail base, and is so called because of the inverted **T** shape it assumes.

Tie plate - A metal plate placed between the rail base and tie to distribute the weight of trains over a larger surface, thereby reducing tie damage. Tie plates also give lateral stability to the rail by restraining movement.

Tie plates, standard - The tie plate normally found in track not involving a turnout, track crossing, or other special track layout.

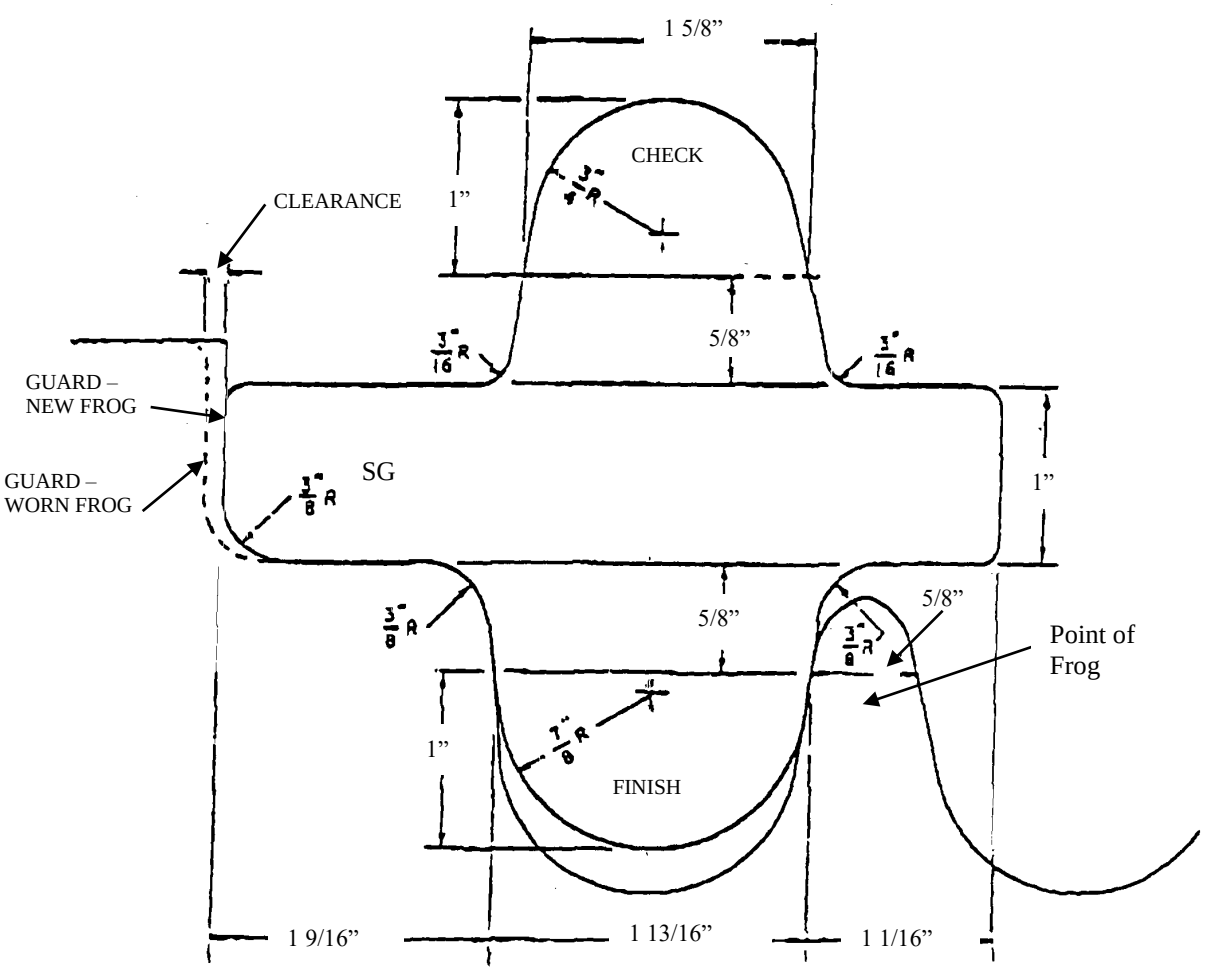
Turnout - A particular grouping of two tracks joined together with a frog and switch, so arranged as to allow for the transfer of rolling stock and on-track equipment froth one track to another.

Turnout steel - A general referral to the components within a switch or turnout excluding the switch cross ties. This would include stock rails, lead rails, switch rails, frogs, guardrails, and sometimes rods and fastenln`0S.

Turnout, straight side - The side of the turnout which is not the diverging- or the turned outward side.

Wing rail - The toe rails of a frog so called because of the wing shape it assumes as it passes around the center portion of a frog. It opens up to a flare to accept wheel flanges as they pass through the frog.

FROG AND CROSSING FLANGE WAY CHECK GAGE



CHECK GAGE: To inspect, apply in flangeway of frog or crossing and

1. Grind top corners and flangeway walls if necessary to permit entry and
2. Restore top surface if bottom of gage contacts flangeway floor.

FINISH GAGE: Apply after grinding flangeway of frog or crossing

For checking maximum wear of guard on self guarded frogs, apply at actual 5/8” point, SG as illustrated above and restore surface of guard when clearance is greater than ¼”.