NATIONAL TRANSPORTATION SAFETY BOARD
Investigative Hearing
Washington Metropolitan Area Transit Authority Metrorail train 302 that encountered heavy smoke in the tunnel between the L'Enfant Plaza Station and the Potomac River Bridge on January 12, 2015

GROUP	H
EXHIBIT	
28	

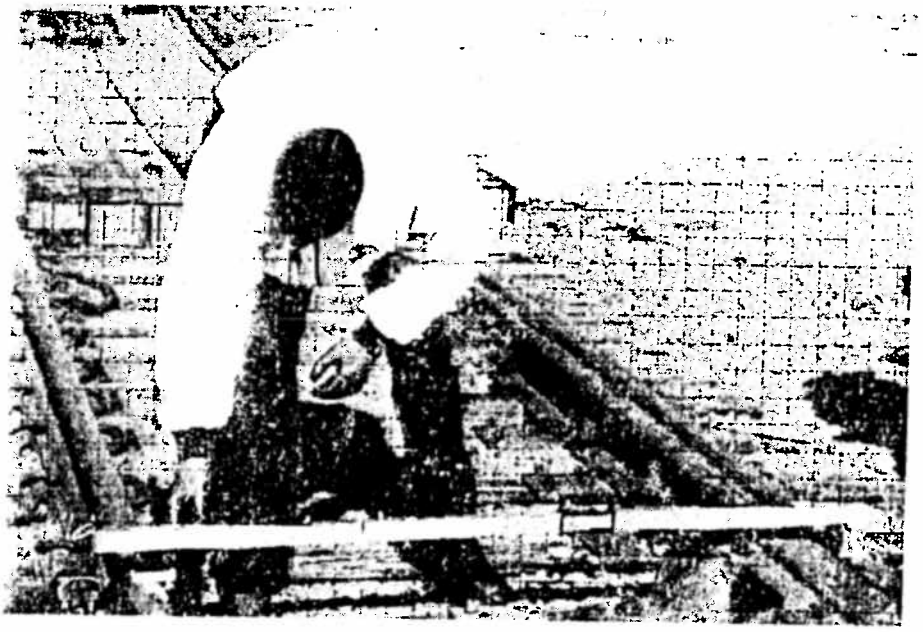
Agency / Organization

Washington Metropolitan Area Transit Authority

Title

Track Walker Entry Level Course 2014

TRACK WALKER ENTRY LEVEL



Washington Metropolitan Area Transit Authority

2014 EDITION

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Class Room Norms

Everyone Participates

Actively contribute, your knowledge, awareness, skills, and energy to the course.

Mutual Respect

Listen fully to each other with care, especially when ideas and opinions are different. We address people by their preferred names. We deal with interpersonal conflicts promptly so they do not interfere with our learning together. In all interaction, we treat everyone with respect.

No Side Conversations

We stay fully involved in the work. We avoid holding side conversation because they tend to disturb the process.

OBJECTIVES

Upon completion of this course, the trainee will be able to:

- Identify basic elements of track geometry
- Use Track Standards to locate and apply information during maintenance operations and inspections
- Identify defects, problems and conditions that may be encountered during inspection of track, turnouts, and Road-way
- State what to inspect for and how to measure switch points, stock rails, flange ways, and frogs
- Identify points where guard-check gauge is measured
- State minimum frequency for various types of track inspections

In writing by answering 76% of the questions correctly

Introduction

This course is a two week formal technical training to keep you up to date with changed rules, policies, and procedures.

The intent is to give the basic information and skills you require to perform the day to day duties as a Track Walker.

The course is designed to give you as much hands on practical experience as possible.

The presentation of material will be done by means of demonstrations, discussions, question and answer sessions, written review exercises, job aids, hands on exercises, and case studies.

All of this is to help make this course a worthwhile learning experience for you and to ensure that you learn the safe, approved, standardized methods of performing your duties as a Track Walker.

It should be noted from the beginning that it is not the intention of the basic track inspection course to provide any level of expertise beyond that of novice. It is not practical or feasible to expect a basic course to contain all possible technical information on any subject .Especially one as subjective as inspecting track. However, those that require or perhaps only desire a basic understanding of the subject will find this basic course a valuable reference.

I hope this course is one of your most enjoyable ones.

Thanks

Track Walker Primary Duties

Track Walker shall perform the following activities:
(Note: These represent the primary areas of focus for the track walker, however he/she is not limited to these functions.)

a) Inspect assigned territory with the required tools, at the designated intervals, making a thorough inspection to see that the track, drainage system, ballasted bridges, aerial structures, and fences are in a safe condition. If, as defined in this Track Standards Manual, the track, bridge, aerial structure or drainage structure is not safe, steps shall be taken at once to protect approaching trains, as required by the Standard Operating Procedures. They must also notify their Immediate Supervisor of the condition, and make the necessary repairs whenever possible.

b) Keep themselves informed of work performed on their assigned territories by contractors or others. Observe the work as part of their inspections. If work is being done that will interfere with the safe passage of trains, take immediate steps to protect approaching trains. Report all unsafe conditions to the Supervisor for further action.

c) Examine main, yard and secondary switches, turnout frogs, crossing frogs, joint bars and bolts, insulated and bonded standard joints, rail, track surface, line and gauge, switch rods, tie and ballast conditions, grade crossings, rail anchors, fasteners, grout pads and anchor bolts, for defects, breaks or conditions that may require correction. Conditions that need to be corrected must be reported to their Immediate Supervisor.

d) Prepare daily records of their inspection and any associated work activities. Maintain the Maximo database by entering and modifying defect records as defects are found and progress in deterioration.

In addition, the following activities should also be performed by the Track Walker while inspecting the track.

e) Give special attention to places where obstructions are likely to occur, examine slopes for the possibility of slides, check drainage conditions, check for debris at bridges and culverts, and correct as many of the conditions as possible, advising their Immediate Supervisor promptly of conditions that must be corrected. Shifting or movement of structures such as the track, fences, poles and pipes which decrease the horizontal or vertical clearance between (a) tracks (and another track) or obstruction must be reported to their Immediate Supervisor promptly..


SAFETY
FIRST

Roadway Job Safety Briefing Form

RWIC: _____ Emp.#: _____

Date: _____ Time: _____ Lone Worker: Y____ N____

Track: 1____ 2____ 3____ CM:_____ to CM _____ Sta. # _____

Track access: GOTR:_____ Emergency:_____ PMI: _____Other:_____

Pwr Outage: None:_____ Supv._____ Red Tag:_____ Red Holder _____

Red Tag Number: _____

Worker Protection

Protection Type: IT____ ETO____ TAW____ FT____ ITD____

Number of workers: _____ Access Guide reviewed: Y_____ N____

Hotspots/No Clearance Zones: Y____ N____

Designated place(s) of safety: _____

Flag person or watchman assigned? Y____ N____ Not Needed_____

Type of work to be performed: _____

Will RMM's be involved in the work? Y____ N____

If yes, have safety issues been discussed?: Y_____ N_____

Are there any piggy-back work gangs?: Y____ N____

How many?: _____

Hazards

Train Movement Y:_____ N:_____	Poor footing Y:____ N__	Poor lighting Y:____ N__	Equipment on track Y:____ N:_____
Debris on track Y:_____ N:_____	No clearance Y:_____ N:_____	Loose cables Y:_____ N:_____	ETS phones inoperable Y:_____ N:_____
Sound hazard Y:_____ N:_____	Restricted view Y:_____ N:_____	Communication Y:_____ N:_____	Ladders Y:_____ N:_____
Drilling Y:_____ N:_____	Obstacles Y:_____ N:_____	Crew distance Y:_____ N:_____	Scaffolds/Ladders Y:_____ N:_____

Crew instructed how to handle hazard(s): Y____ N___

Safe zones have been discussed: Y____ N____

Comments:

_____

_____

_____

RWIC Signature: _____

(Employees must sign reverse side before being allowed to work)

This document must remain on file for 90 days by person who performs briefing

Employee Acknowledgment

I understand all aspects of my on track safety and feel that I am adequately protected against trains and/or on track equipment. I acknowledge obtaining a job safety briefing as stated on the reverse side.

List Gang Leaders	Department	List Gang Leaders	Department

Employee Name	Employee #	Employee Name	Employee #

Safety

- Safety="Quality or condition of being safe; Freedom from danger, risk, injury, damage; security"
- "any of certain devices for preventing accidents"

Safety must be more than a slogan for our industry. It must be part of our every day operation. Safety should not be thought of as an added nuisance during the discharge of duties, but as an essential portion of the duties themselves. Every job should be performed from the beginning in the safest possible manner, and this safety factor should be considered in every job-related activity.

WMATA has published a set of rules that apply to all employees who may walk or work in track areas in the performance of their duties. Section **K** from the **MRSPH.** Safety on the ROAD-WAY.

" SAFETY IS YOU!!!! ALIBIS DON'T EXCUSE ACCIDENTS"

Inspection of track is done during operating hours, you must be safety conscious at all times. For basic safety, Track Walkers should:

- ❑ There shall be a dedicated Watchman/Lookout anytime there is equipment movement within any work zone or when work is conducted on an "active" revenue track. (Cardinal Rule)
- ❑ Be familiar with flagging standards as shown in the MRSPH
- ❑ Look both ways before stepping onto the track. if a train is at the platform, don't assume its going forward it could change direction.
- ❑ Always walk facing normal flow of the revenue train traffic
- ❑ Stay within 10 feet in front of your partner if Watchman/Lookout
- ❑ Watch and listen for trains. Do not rely only on your partner for your safety.
- ❑ Shout "Train or Hot Rail." if a train is coming and get an answer from your partner. Don't assume he or she heard you.
- ❑ If appears that the verbal warning was not recognized, the watchman/Lookout should give long blasts of the whistle until he/she has received acknowledgment that they are aware of the approaching train
- ❑ There shall be no clearing of workers or equipment to any track. (Cardinal Rule)
- ❑ Clear up to a safe place and brace yourself for the buffeting effect of the wind as the train passes.

TYPE OF EQUIPMENT NEEDED WHILE WALKING THE TRACKS

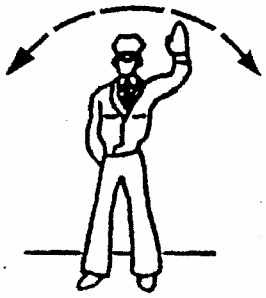
- ✓ safety vest in good condition that can be clearly seen from a distance.
- ✓ good, bright flashlight.
- ✓ properly working two way radio with a fully charged battery.
- ✓ folding ruler that can be used to check rail measurements.
- ✓ pieces of keel to be used in marking the track.
- ✓ pen or pencil and a pocket size notebook to keep inspection notes.
- ✓ if your task for the day is a watchman/lookout you should have a whistle and air horn.
- ✓ third rail tester (hot stick) in good working order.

Hand signals for the movement of trains and track equipment are a way of communicating with a rail vehicle operator.

Hand signals for the movement of equipment should be given from place of safety

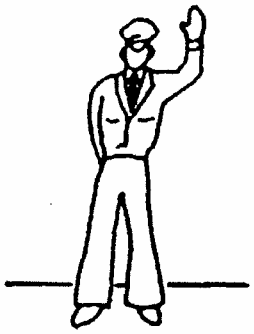
LABEL THE HAND SIGNAL IN THE BOXES

[] Hand signal indications shall be given facing the oncoming vehicle.

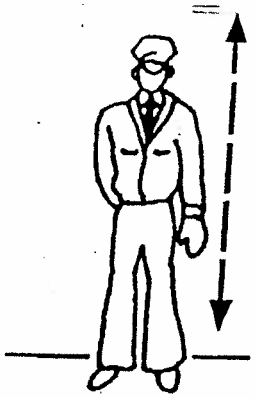


APPLY BRAKES

MOVE FORWARD

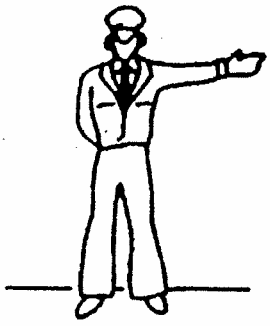


RELEASE BRAKES

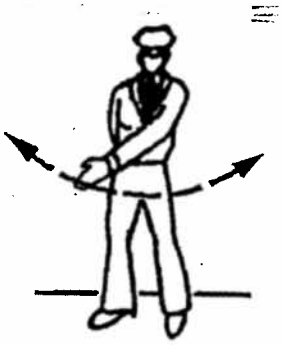


[] Personnel giving the hand signal can assume

[] a different position once the hand signal is acknowledged by the operator



REDUCE SPEED



STOP

THINK ABOUT IT

✓ Where should the employee be standing when giving hand signals to a rail vehicle operator?

PLACE OF SAFETY

✓ What type of equipment should the watchman/lookout have with him/her?

RADIO AND WHISTLE/HORN, FLASHLIGHT VEST, WATCH,

✓ What acknowledgment should the operator of a rail vehicle give to the person giving the hand signal?

TWO SHORT TOOTS OF HORN

HISTORY

To properly inspect Continuous Welded Rail (CWR) it is helpful to understand some of the history of rail.

The earliest record of the use of track for transportation comes from England where in 1604 a railway was constructed. The tracks were made of wooden rails. During the eighteenth century the tracks were originally made of pine or other soft woods. During the middle period of the century iron strips were used to provide a more durable wearing surface. The first steel rail rolled in the U.S. was produced in Johnstown, Pennsylvania, in 1867. By 1900, steel "tee" rail had replace all other types on the railroads in the United States. So you see, rail has gone through many evolution, stating with wood then to wood with iron strips, to iron, and finally steel.

From the earliest days of railroading, one of the greatest problems was service failures of rail. The early iron strap rail frequently broke loose from its wooden stringers and curled up in "snakeheads". Cast iron crystallized and cracked under the strain of severe climate changes or sudden shock loads. Early steel rails also showed a tendency toward brittleness in cold weather. The present day steel rails showed a tendency toward brittleness in cold weather. The present day steel rails manufactured, although vastly superior to the older types of rail in both strength and wearing quality, still develop defects under today's heavy loads and speeds.

In the past one of the biggest jobs in track maintenance was maintenance of jointed rail. To insure the longest life of rail, track must be in good line, gage, surface, and properly elevated. The rail joint was a weak and costly part of the track structure. Most rail wear occurred at the rail joint and it was the source of many other track problems. For these reasons joints were sometimes referred to as the weak link.

Probably the best way to cut down on joints was the introduction of Continuous Welded Rail (CWR)

DEFINITION

CWR is rail welded together in lengths longer than (400ft.).

RAIL

Rail is the most expensive material in the track. So it must not be wasted or needlessly damaged.

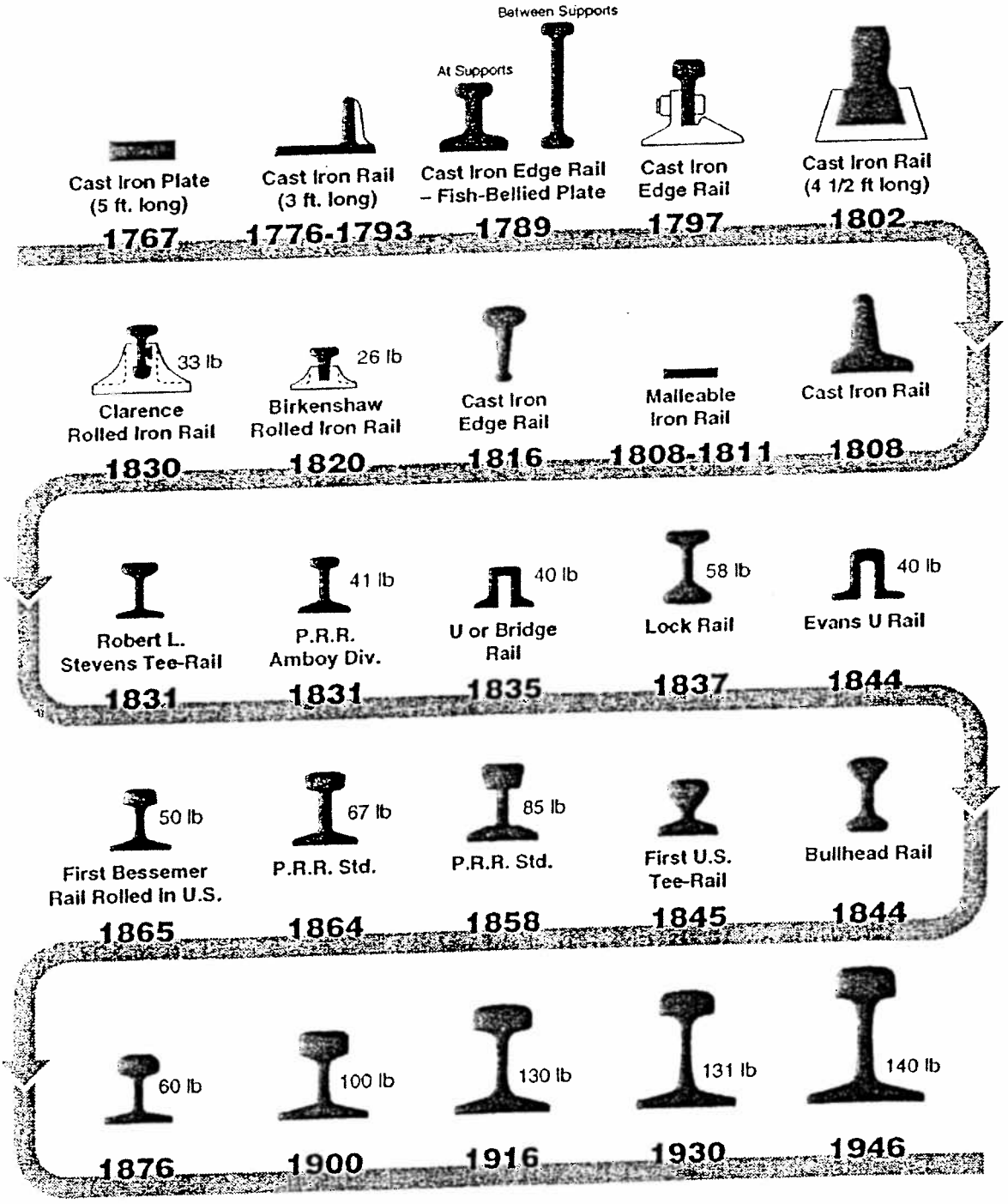
You must know how to recognize the sizes of rail you're working with. Knowing this will help you select replacement rail.

Rail is steel that has been rolled into an inverted "T" shape.

Purpose of rail:
- Transfers train's weight to cross ties.
- Provides smooth running surface.
- Guides wheel flanges.

Rails vary in weight and shape (known as 'section'). This is how rail can be identified.

Rail cross sections down through the years



Identification of Rail

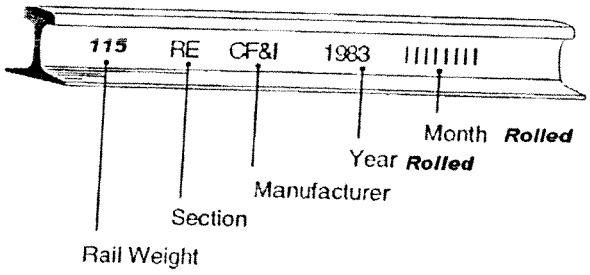
Weight of rail

Identification by weight is based on how much rail weighs in pounds per yard. (e.g.: "100 lb rail" weighs 100 lb per 3 foot length).

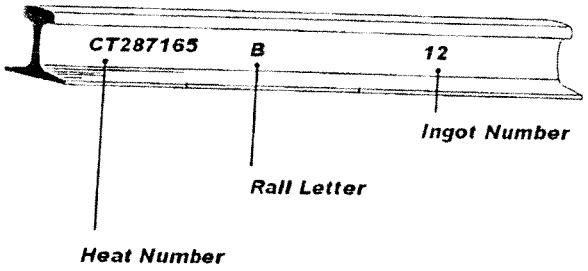
Over the past 200 years, increasingly heavier rail was required to handle the increased tonnage of locomotives and rolling stock and increased traffic volume. The largest rail commonly used is 140 lb.

A rail's weight is rolled onto the web of the rail as a brand.
Rail is branded and stamped at the rolling mill to identify the section and manufacturer

BRANDING



STAMPING



Section of rail

The section of a rail refers to
the shape of the cross-section of a rail.

Rail mills identify the different shapes and types of rails by codes rolled onto the rail's web. The section code appears right after the weight. Section codes signify different dimension and shape standards.

A section code refers to the engineering group which created the design plan (thus, the standard) for that rail section.

For example:

RE:

RE-HF:

ARA-A

ASCE:

American Railway Engineering and Maintenance of Way Association (AREMA)

AREA "head free" section.

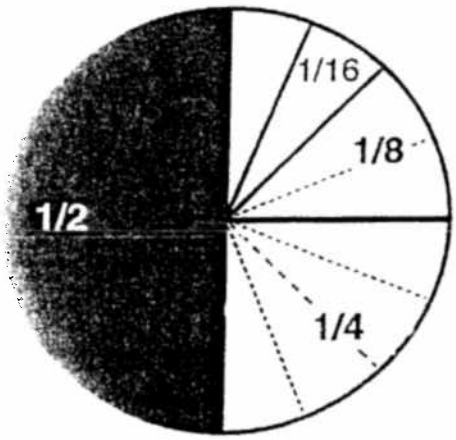
American Railway Association 'A' section.

American Society of Civil Engineers

MEASUREMENTS

This section in not intended to teach you basic math; it is primarily a review of how to add and subtract ruler measurements. Math, sometimes referred to as the science of numbers, is a basic skill required when preforming track inspection. We are always counting or measuring something as part of our day - to - day lives. The most basic function we do is take measurements with a ruler. The ruler we use is marked in 1/16 of an inch.

This system is based on fractions. Remember that fractions are used to describe numbers that are larger than zero but less than one.



Typical imperial measurements are made to 1/16 of an inch accuracy.

The problem is that 2/16ths of an inch equals 1/8th of an inch... 4/16ths of an inch equals 1/4 of an inch... 6/16ths of an inch equals 3/8ths of an inch ... 8/16ths of an inch equals 1/2 an inch...etc.

This can get a little confusing when you have to add 3/16 and 3/4 together!

SOMETHING TO THINK ABOUT

$\frac{1}{16}$	$\frac{2}{16}$	$\frac{3}{16}$	$\frac{4}{16}$	$\frac{5}{16}$	$\frac{6}{16}$	$\frac{7}{16}$	$\frac{8}{16}$	$\frac{9}{16}$	$\frac{10}{16}$	$\frac{11}{16}$	$\frac{12}{16}$	$\frac{13}{16}$	$\frac{14}{16}$	$\frac{15}{16}$	$\frac{16}{16}$
	$\frac{1}{8}$		$\frac{2}{8}$		$\frac{3}{8}$		$\frac{4}{8}$		$\frac{5}{8}$		$\frac{6}{8}$		$\frac{7}{8}$		$\frac{8}{8}$
			$\frac{1}{4}$				$\frac{2}{4}$				$\frac{3}{4}$				$\frac{4}{4}$
							$\frac{1}{2}$								$\frac{2}{2}$
															$\frac{1}{1}$
															1

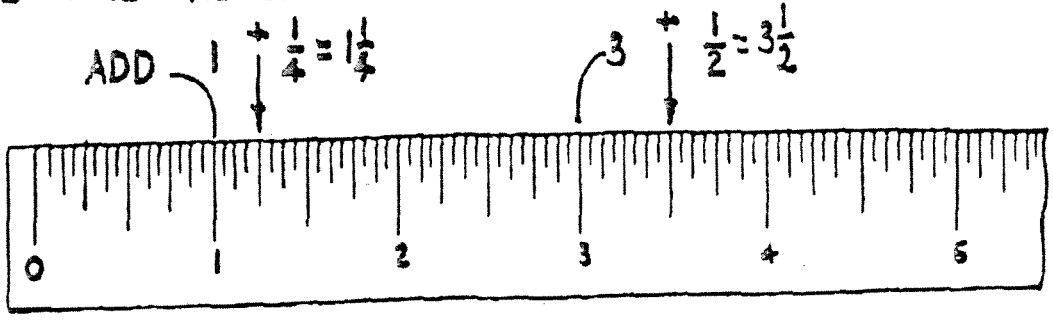
When fractions are added or subtracted from each other, they must have the same denominators.

Frequently we must find the difference between 2 fraction numbers such as when we measure for misalignment on a curve. But when it comes to finding the difference between two fractions, it gets a little more difficult.

$$\begin{array}{r} 8/16 \\ +2/4 \\ \hline 1'' \end{array} \qquad \begin{array}{r} 5/16 \\ +1/2 \\ \hline 13/16'' \end{array} \qquad \begin{array}{r} 3/4 \\ +2/16 \\ \hline 7/8'' \end{array} \qquad \begin{array}{r} 1/4 \\ -5/8 \\ \hline 3/8'' \end{array} \qquad \begin{array}{r} 7/16 \\ -1/2 \\ \hline 1/16'' \end{array}$$

$$\begin{array}{r} 3/8 \\ -2/16 \\ \hline 1/4'' \end{array}$$

TO READ FRACTIONS GREATER THAN 1 INCH, JUST ADD THE PRECEEDING WHOLE NUMBER TO THE FRACTION



PRACTICE TIME

WHAT ARE THE DIFFERENCES BETWEEN THE FOLLOWING NUMBERS?

REDUCE TO THE LOWEST FRACTION

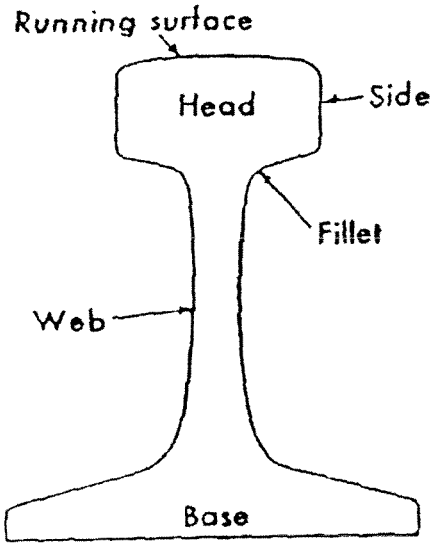
	differences here	
1/8"	1/8"	1/4"
1/8"	7/8"	1"
1/4"	7/16"	11/16"
½"	1/4"	3/4"
1/8"	1/8"	1/4"
1/4"	7/8"	1 1/8"
½"	1/2"	1"
7/8"	5/8"	1 1/2"

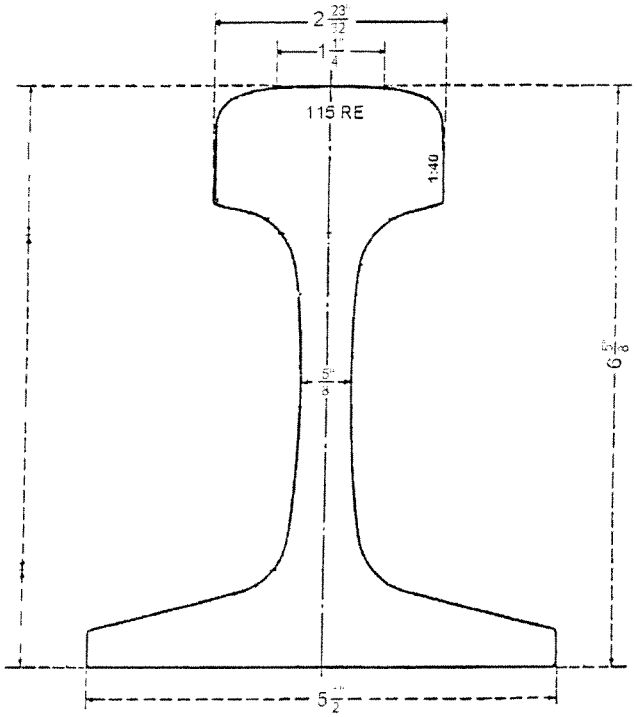
RAIL COMPONENTS

COMPONENTS

RAIL

The next logical track structure component would be the rail itself Rail comes in basic shape that is called "Tee" section consisting of a running surface (ball), side,web and base.





Tee rail comes in many sizes and with some minor variations in shape. Rail is usually identified according to its weight per yard and by shape of its cross section. For example, 115 RE means that a piece of this rail 3 feet is length weighs 115 pounds and that its shape is according to the design recommended by the American Railway Engineering and Maintenance of Way Association

Stock rail A running rail against which the switch point operates.

Switch Points The tapered rail of a switch. A fabricated rail planed to a point.

Curved Closure rail The rail between the switch rail and the frog in a turnout on the curve side

Straight Closure rail The rail between the switch rail and the frog in a turnout on the straight side

OTHER TRACK MATERIAL

BALLAST

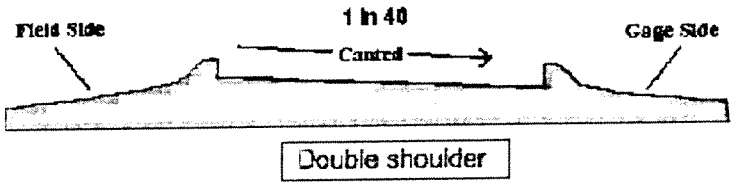
The ballast section of the roadbed is the material on the top of the sub-grade or sub-ballast. It is to be of good quality in accordance with the specification in the maintenance and inspection manual.

Ballast is to provide:

- Uniform bearing for ties
- Distribution of load caused by impact from the trains
- Prevention of lateral movement and to hold good line in the track
- Maintenance of proper surface
- Good tie spacing
- Good drainage

Tie Plates

- are used to support the rail on all ties and shall be used in all ballasted track.
- standard tie plates used on the system are double shoulder 9" X 14" for use with rail having a 5 1/2" base.



Double shoulder

- care must be taken to place the wider toe outside rail.
- typical applications, the rail is canted inward toward the gauge side at an angle (1:40 cant.)

Ties
A tie serves many purposes and is an important part of the track structure. It:

- Supports the rail
- Helps hold track to proper gauge
- Distributes the weight of a train over a large area by transferring weight from rail to ballast and ballast to roadbed
- Helps hold rail in place during temperature change
- Helps keep track in proper cross level

Rail joints

- standard track joints
- bonded track joints
- insulated track joints

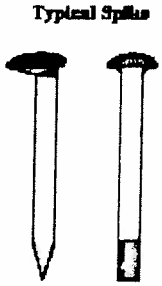
STANDARD RAIL JOINT BAR

Rail anchors

- are applied to the rail to restrain longitudinal movement

Track spikes

- used to secure tie plates to the ties
- AREMA design cut spike 6 inch by 5/8 inch.



Direct Fixation Fasteners

- provide a means of attaching the rail to the concrete invert
- may be adjustable for gauge and provide a resilient cushion and electrical isolation between the rail and the concrete.

Aerial Direct Fixation Fasteners

- include (where directed)a separate polyethylene pad that is situated between the base of the rail and the top plate of the fastener or other approved configuration.
- Aerial fastener clips are different from standard fastener clips. The proper make and type of clip must be used with each fastener unless otherwise approved by the appropriate authority.

Examples of Direct Fixation Fasteners

F17 Fastener	F20 Fastener
Lord Fastener	Hixon Fastener
Cologne Egg Fastener	Landis Fastener
LB Foster Plates with e-clips	ATP SW 31

Examples of Direct Fixation clips

Pandrol ZLR Clip	left hand e-clips
Pandrol "FAST Clip"	right hand e-clips

Track Structure

Direct Fixation Track

- Direct fixation track structure includes tunnel invert and aerial deck structure, grout pads, rail clips, anchor bolts, direct fixation fasteners, rail, welds (shop and field) and rail joints.

Ballasted Track

- Ballasted track structure includes subgrade, sub-ballast, ballast, ties, tie plates, spikes, rail, rail anchors, joint bars (standard, bonded standard and bonded insulated), welds (shop and field), and third rail (contact rail) system.

Special Trackwork

Special trackwork includes turnouts and single and double crossovers and their appurtenances

Switch

- A switch includes, stock rails, switch points, switch rods and switch plates - (Note: Guarded switches will include manganese housings and switch point guard rails).
- The length of switch may be determined by measuring the distance from the point of switch to heel.

Frogs

- Railbound manganese steel frogs of the appropriate number are used in all turnouts and crossovers.
- Frog Guard Rails are used to guide the vehicle wheels through the throat of the frog. One piece manganese guard rails or bolted Tee-type guard rails of the appropriate length are used in ballasted track. Bolted Tee-type guard rails of the appropriate length are used in direct fixation track.

Track Appurtenances - Emergency Guard Rails, Restraining Rails, Bumping Posts and Derails.

- Emergency Guard Rails are used on all main track ballasted bridges and direct fixation aerial structures.
- Emergency guard rail is not used in special trackwork.
- Restraining Rails are installed inside the low rail on all mainline curves with a radius of less than 755 feet.
- Bumping Posts are installed at the end of each stub end track to mark the end of track and to prevent cars from going beyond the end of track.
- Switch Point Protectors - Switch point protectors shall be installed and maintained to the manufacturers specifications.

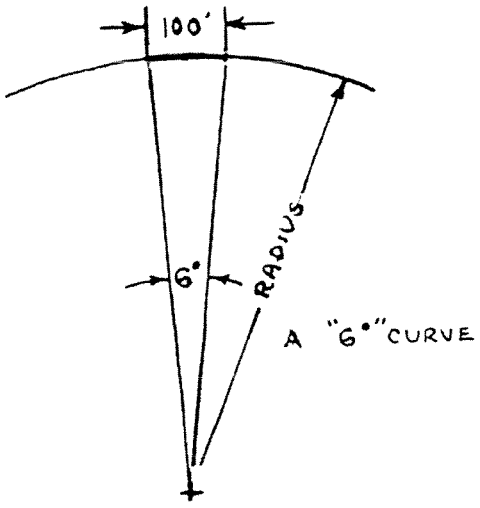
Contact Rails (Third Rails)

- Contact rails (third rails) provide the power (750 volts) to the equipment and must be considered energized at all times unless compliance with provisions of SOP #28 MSRPH have been confirmed.

Geometry
The mathematics of the properties, measurement, and relationships of points, lines, angles, surfaces, and solids.
Now add the word track to the word Geometry

Track Alignment

Railroad civil engineers refer to straight track as "tangent", and use as much of it as possible because it is much easier to build and maintain. The sharpness of curved track is measured by degrees. Here at WMATA 1" of measurement is equal to 1 degree.



A "6°" CURVE

THE DEGREE OR SHARPNESS OF A RAILROAD CURVE IS THE ANGLE THROUGH WHICH THE TRACK TURNS IN 100 FT.

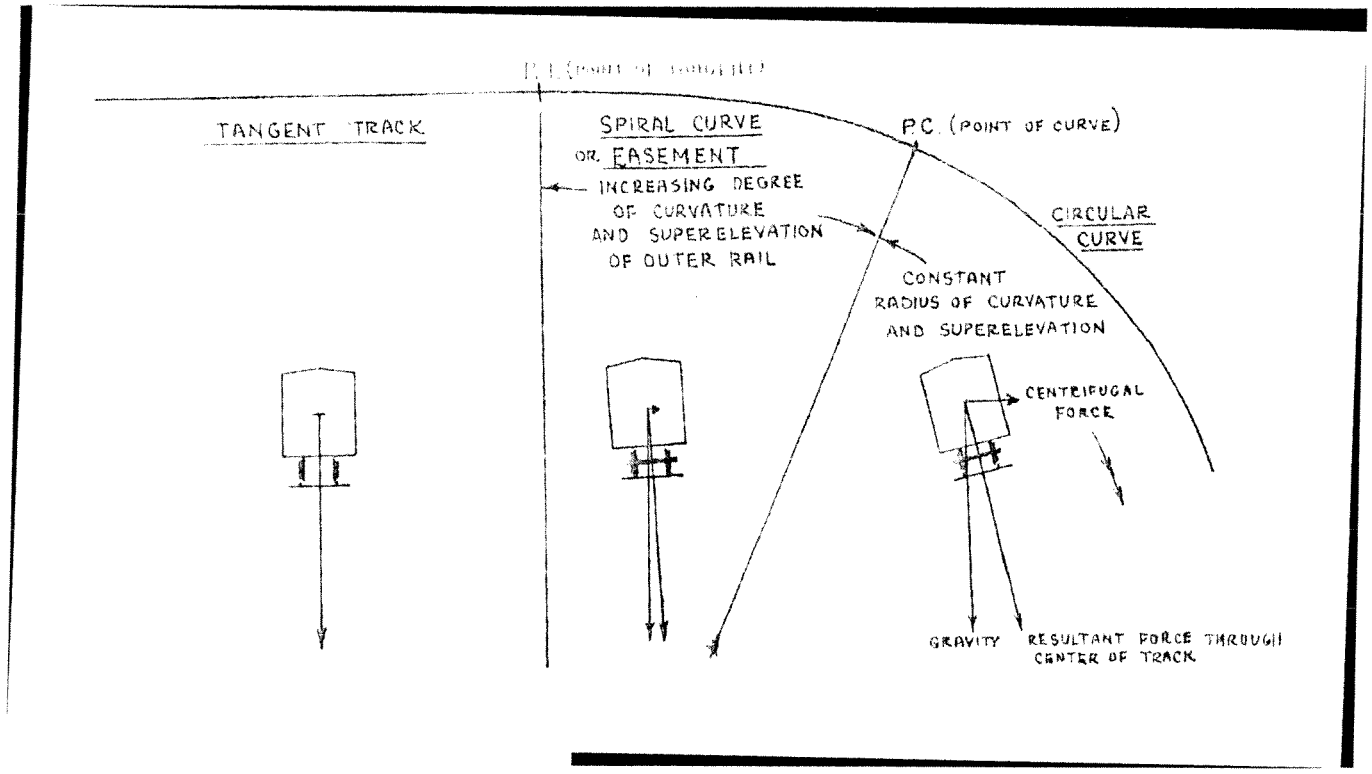
$$\text{RADIUS IN. FT.} = \frac{5{,}729}{\text{DEGREES/100 FT.}}$$

Superelevation

To compensate for effect of centrifugal force, the outer rail on a curve may be super-elevated to tip the cars inward. The difference in elevation between the two rails, also referred to as cross-level.

Reference Rail

The reference rail is the line rail (high rail, outer rail or outside rail) on a curve that is used as a reference point when measuring cross-level.

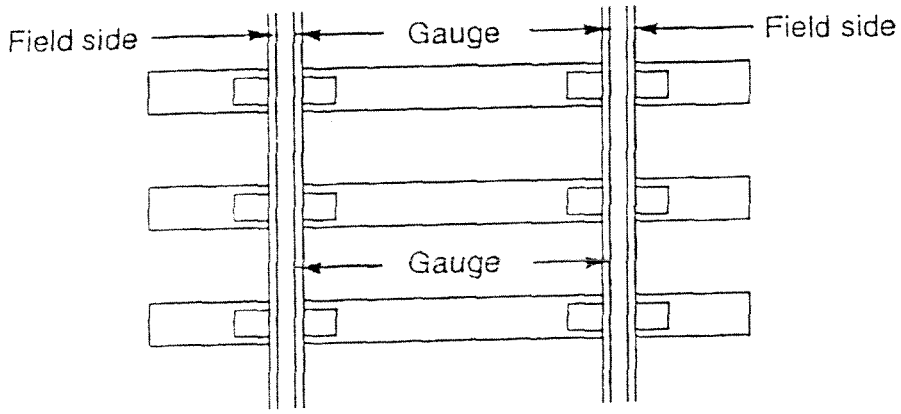


D. McDaniel

Gauge

Gauge is measured with a standard track gauge or other authorized device, between the heads of the rails at right angles to the track in a plane 5/8 inches below the top of the head of rail. Gauge measurements are taken including side wear on the rail head (ref. Table 11-1 Track Inspection Manual)

Gauge

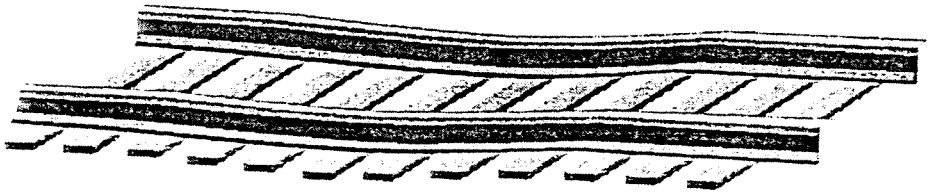


Gauge must be within the limits prescribed as follows – Table 11-1

Tangent Track	56-1/4" on Main Track
	56-½ "" on Yard & Secondary Track
Radius equal to or greater than 1425'	56-1/4" on Main Track
	56- ½" on Yard & Secondary Track
Radius between 350' and 1425'	56-½" on Main, Yard & Secondary Track
Radius less than 350' with restraining rail	57-1/4" on Yard & Secondary Track

Surface

Surface covers the various elements of surface that affect the riding condition and safety of track. The surface of the top of rail may be generally observed by kneeling down and sighting along the top of rail for variations in uniform elevation. It may be checked more closely as noted in Table 11-3. (Track Inspection Manual)



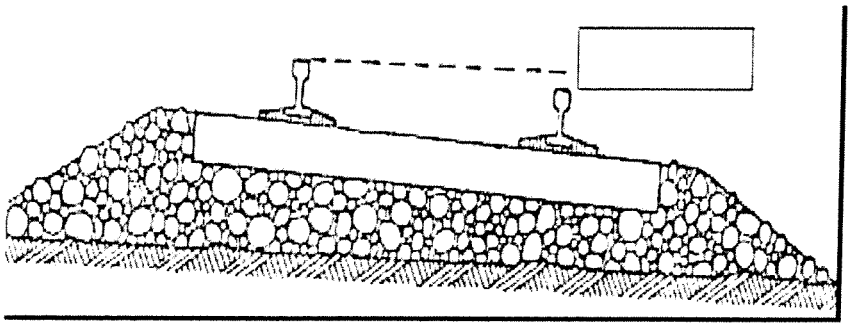
KEY WORDS TO REMEMBER

Surface (track) - The condition of the track as to vertical evenness or smoothness.

Gauge Side- The side of the rail nearest the center of track.

Field Side- The side of the rail farthest from the center of track

Cross Level- The vertical relationship of the top of one running rail to that of the opposite running rail at any point in the track.



There are various types of curves:

Simple Curves: A simple curve is an arc of a circle used to connect two tangents. Which maintains single degree of curvature and radius.

Compound Curves: A compound curve is composed of two arcs with each arc having it's own degree of curvature and radius.

Reverse Curves: A reverse curve is composed of two adjacent simple curves in the opposite direction. Each simple curve has the same radius and short section of tangent separates the two simple curves to allow the train to come to a neutral position before changing directions.

Vertical Curves: A vertical curve provides a gradual, smooth transitions from one grade to another. The vertical curve can be used in conjunction with a horizontal curve.

Curve Elements: The various parts that make up a curve, all of which are inter-related and defined in geometric terms.

Spirals: Spirals or easement curves are used with simple curves to provide a .gradual change of degree and easier riding from tangent to full elevation. Spirals also permit a gradual increase to full lateral acceleration at a comfortable, nondestructive rate.

Full Body: The full body of a simple curve is an arc located between the spirals where the degree of curvature and amount of superelevation are maintained.

Transition Points

Points of a Curve: The points of a curve: identify the key points of a curve there by outlining the curve in geometric terms.

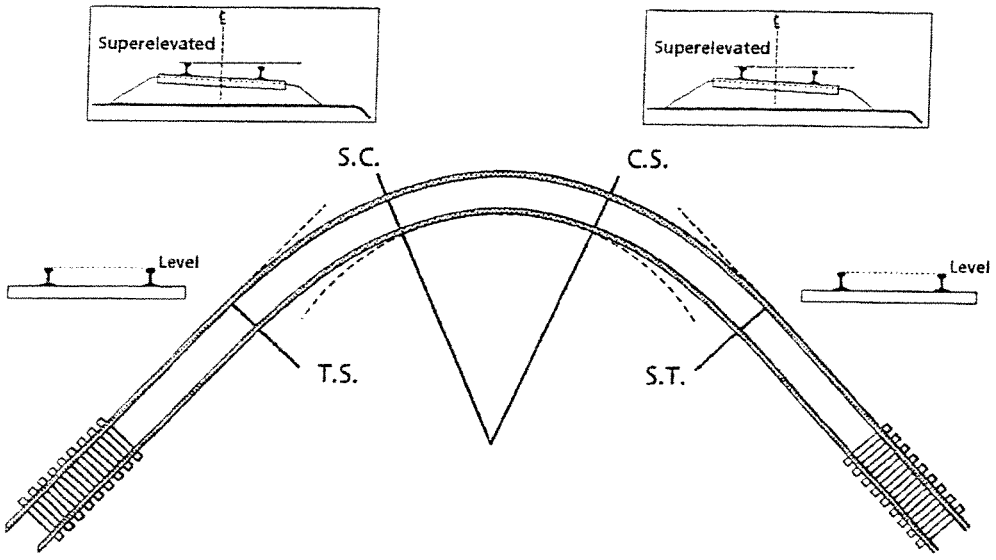
Point of Intersect: The point of intersect is the point where two projected tangent would intersect.

Point of Tangent to Spiral: **(T.S.)** This point identifies the end of a tangent section of track and the beginning point of the entering spiral.

Point of Spiral to Curve: **(S.C.)** point identifies the end of a spiral and the beginning point of the full body.

Point of Curve to Spiral: **(C.S.)** This point identifies the end of the full body and :he beginning of the exiting spiral.

Point of Spiral to Tangent: **(S.T.)** This point identifies the end of a spiral and the beginning of tangent track on the exiting end of the curve.



Transition Points

Exercise Spirals & Superelevation

What are the four (4) transition points on a curve?

a. TANGENT - SPIRAL

b. SPIRAL - CURVE

c. CURVE - SPIRAL

d. SPIRAL - TANGENT

At what points on the curve should elevation be full? CURVE - SPIRAL

At what points on a curve should elevation be zero (0)? TANGENT - SPIRAL
SPIRAL - TANGENT

INTRODUCTION TO INSPECTIONS

This section covers the basic track inspection requirements for performing the duties of a track walker.

The trackage of a railroads is literally its lifeline. People pay to ride the train and the train rides on the rails. This vital part of the rail system needs not be neglected. A proper track inspection will help the system plan track maintenance, avoid unsafe conditions, and cut down on serious equipment damage.

To properly inspect track, you must be familiar with what to check and minimum acceptable conditions of what you are checking.

We will look at four types of inspections. They are as follows:

Walking Track Inspection

A general inspection of the track structure is to be carried out twice a week on foot. All major elements of the track are to be visually inspected, and exceptions recorded on the Track Walkers inspection form.

Switch or turnout inspection

A specialized inspection of all turnouts, crossover, and crossing diamonds at least once monthly.

Riding Inspection

These inspections are to identify unsafe rail conditions that may occur as a result of extreme weather conditions. These inspections will generally take place between the hours of 1400 hours and 1830 hours when the occurrence of heat stress and heat index of the rail laying temperature can be greatly affected.

WALKING

Track

Inspection

SUBJECT:	Track Inspection	WORK INSTRUCTION NUMBER	REVISION	PAGES
		TKIN-0001	#1	9

WORK INSTRUCTIONS

WASHINGTON METROPOLITAN AREA TRANSIT AUTHORITY
INSPECTION DIVISION

CONDUCTING TRACK INSPECTION

REV	DATE	DESCRIPTION	RLSE NO.	INIT
#1	04/26/2012	REVISION TO STANDARD WORK UNIT PROC #28	TKIN-0001	FM

ORIGINATED BY: Frederick Minniefield DATE: 04/25/2012

APPROVED BY: Darvin L. Kelly DATE: _____

Refer to Work Instruction book for these instruction

WALKING TRACK INSPECTION
MAIN LINE

TABLE OF ITEMS TO CHECK AND WHAT TO LOOK FOR

ITEM TO CHECK	WALKING
Rail	broken, vertical or horizontal split heads, crushed heads, corrugation, wear shelling, engine burns, rail end batter, discoloration, rust streaks, damaged by equipment.
Bars bolts washers	broken, bent, cracked loose, missing, bent missing
Tie plates	broken, bent, badly corroded, missing skewed
Spikes & anchors	high, missing, bent off, loose, away from tie or plate
Ties	broken, split, spike killed, plate cut, damaged by equipment
Ballast Section Ballast	Cribs not full, low shoulder, narrow shoulder. Pumping, hanging ties
Line	Misalignment
Icing Conditions	Ice build up between base of rail and tie plate
Surface	Poor Surface
Cross Level Gauge	Poor Cross Level Irregularities
Drainage	Ditches or Culverts Blocked
Fencing	Damaged, open gates
Clearances	Vertical & horizontal restricted clearances
Fasteners	Defective
Track Signs	Defective or missing
Third rail	End Approaches correct height, cover boards missing or loose, anchor bolts missing or loose, Expansion joint. Lubrication adjustment range, loose bolts, insulators cracked or broken
Grout pads	Broken or cracked

Inspecting

Gauge

GAUGE MEASUREMENTS ARE TAKEN INCLUDING SIDE WEAR ON THE RAIL HEAD (11-2)

RADIUS LESS THAN 1425 FEET
< OR =

MAXIMUM ALLOWABLE SPEED	TIGHT GAGE	DEVIATION (ACTUAL)	GAGE	DEVIATION	WIDE GAGE
M.A.S.	56 1/8"	3/8"	56 1/2"	3/8"	56 7/8"
60	56 1/8"	3/8"	56 1/2"	1"	57 1/2"
35	56"	1/2"	56 1/2"	1/8"	57 5/8"
15	55 7/8"	5/8"	56 1/2"	1 1/4"	57 3/4"

RADIUS GREATER THAN 1425 FEET
> OR =

MAXIMUM ALLOWABLE SPEED	TIGHT GAGE	DEVIATION (ACTUAL)	GAGE	DEVIATION	WIDE GAGE
M.A.S.	56 1/8"	1/8"	56 1/4"	5/8"	56 7/8"
60	56 1/8"	1/8"	56 1/4"	3/4"	57 "
35	56 1/8"	1/8"	56 1/4"	7/8"	57 1/8"
15	55 7/8"	3/8"	56 1/4"	1"	57 1/4"

HOW MUCH OF THE GAUGE READING IS SIDE WEAR?

Note:

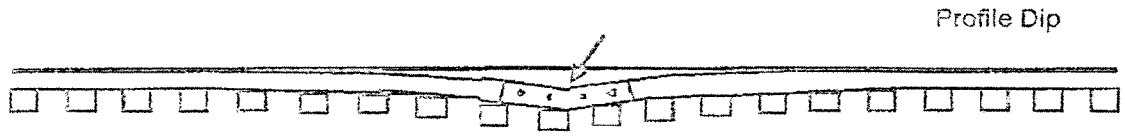
If gauge deviations are within the ranges shown in Table 11-2, restriction must be placed immediately in accordance with standard procedure outlines in (Metrorail Standard Operating Procedure) SOP No. 30 ESTABLISHMENT AND REMOVAL OF A SPEED RESTRICTION DURING REVENUE SERVICE-MAINLINE, Wide gauge may be due to broken or defective grout pads, loose or broken anchor bolts, defective fasteners, loose or broken rail clips or rail-head wear. Attention should be paid to determine cause as corrective actions vary. Be particularly alert to cracks in concrete invert in addition to items listed above. If the problem can be corrected by tightening anchor bolts or rail clips, this must be done immediately and condition reported to proper authority. If the condition of the grout pad, fastener, anchor bolts, or clips is such as to require replacement then temporary measures such as blocking may be used. In the case of rail-head wear, new rail may be required. As an emergency measure, track may be re-gauged by adjusting the fasteners as long as wear limitations outlined in Table 11-2 (Track Inspection Manual)

- Where gauge varies by design, for example because of sharp horizontal curvature or to reduce truck hunting on tangent, then that designed gauge shall be used to determine the allowable deviations specified above. These adjustments to track gauge shall be clearly designated in the transit systems standards.

☹ No operation is permitted when loaded gauge deviation is tighter than -3/8".

☹ No operation is permitted when loaded gauge deviation is more than +1 1/2".

Surface
Profile, Surface, Top Vertical Alignment, Dip, Sag, Hump



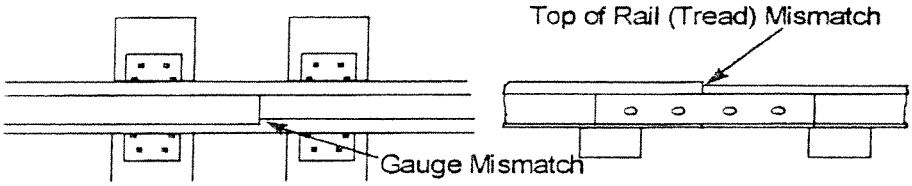
The reference point for track surface is the top of the rail head. On tangent track the tops of both rails should be level with each other . On curves, the outer rail is designed by the engineers, who build the lines to be above the inner rail. It is necessary to be able to recognize a track surface problem in order to take any action.

Ballast Section pg 8-1

- a certain amount of ballast is required under the ties, in the cribs, and on the shoulders.
- Dirty or otherwise fouled ballast will promote excessive pumping and result in poor surface conditions.
- Not enough ballast on the shoulders or in the cribs will allow the track to creep longitudinally or move sideways.

Rail Joints pg 5-26

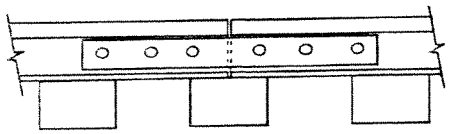
- If rail ends are mismatched over (1/8') on the top or gauge side, a speed restriction must be placed until the rail is ground, welded, or replaced.
- In addition, the track standard states that at no time should mismatch on the gauge side or top of rail exceed 1/4".



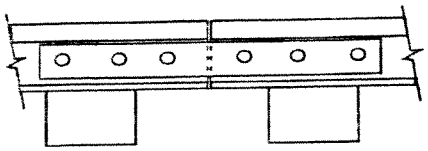
- each rail end should have at least two bolts which equals a minimum total of 4 bolts per joint.
- Since joints are the weak spot in the track, ties under rail joints must be adequately tamped to reduce pumping and ensure proper support
- The center tie and one of the shoulder ties under a supported joint should be non-defective. Both ties under a suspended joint should be non-defective.

- If the center tie in a supported joint is defective, (and two shoulder ties are non-defective) or if one tie is defective in a suspended joint, speed should be reduced to 35 miles per hour.

- If two of three ties in a supported joint or both ties in a suspended joint are defective, speed should be reduced to 15 miles an hour.



SUPPORTED JOINT



SUSPENDED JOINT

Tie Plates and Rail Fastenings pg 7-6

- it's important to check that the rails are adequately secured to the ties to maintain the design alignment and gauge of track.

Rail Anchors pg 7-15

- Rail anchors are installed to limit rail movement from creep forces generated by train operations and thermal forces from rail heating and cooling.
- For rail anchors to restrict rail movement under these conditions, there must be adequate number of anchors properly installed.

Drainage Systems

- "Water is the #1 enemy of the track. The further water can be kept away, the safer the track structure will be."

Direct Fixation Fasteners pgs 7-12

- are considered to be defective when the fastener will not support rail or hold gauge or alignment during the passage of a train.
- All fasteners will deteriorate with age and they will show corrosion, torn and cracked elastomer and bent plates. When any one or combination of these conditions have deteriorated to the point that the fastener cannot function then the fastener is defective.
- Speed restrictions are to be applied only when the fasteners are defective from a safety point of view.

- Any directly opposed two consecutive failed support units (rail fasteners) requires a slow order of 15 MPH and a red condition.

Direct Fixation Rail Support Unit. Table 7-2

- A direct fixation rail support unit consists of the invert or floating slab, grout pad, anchor bolts, direct fixation fastener and its hardware. A support unit is considered defective if any part is defective as described in Sections 7 of the Standard manual.

- All non defective (good) fasteners must be well distributed throughout the 40 feet of rail.

- Maximum of 10 well distributed defective (bad) support units (fasteners) per 40' of Rail.

CROSSTIE pgs 6-9
A timber crosstie is considered defective if it is:

- Broken through - a tie completely broken at right angles. If the break is in the center, the track is center bound. If the break is under the rail, the tie ends will protrude above the adjacent ties. If in the joint area, it is to be properly protected until replaced.

- Split or otherwise impaired to the extent it will not hold spikes or will allow the ballast to work through. A deep split, especially in oak ties, does not mean it is defective unless by close examination, ballast is seen working through. Also, if spikes are not holding, often the other spike hole has enough solid wood to hold a spike so that the tie is not considered defective.

- So deteriorated that the tie plate or base of rail can move laterally more than one-half inch relative to the crosstie. Look for a slick or shiny place on top of tie on both the gage and field side of the tie plate caused by spike hole enlarged or deterioration under the tie plate. Often on the field side, the ties begin to "curl up" at the edge of the tie plate. Gage should be checked and the amount the plate is slipping should be added.

- Cut by the tie plate through more than 40% of its thickness. This is common type of defect, easily seen. The corrective action is to renew sufficient number of ties, properly spaced in order to comply with the requirements for the class of track.

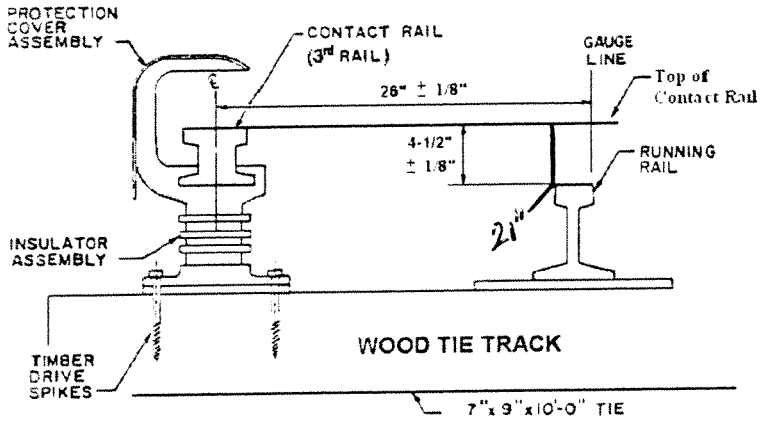
CONTACT RAILS (THIRD RAILS) pg 13-1

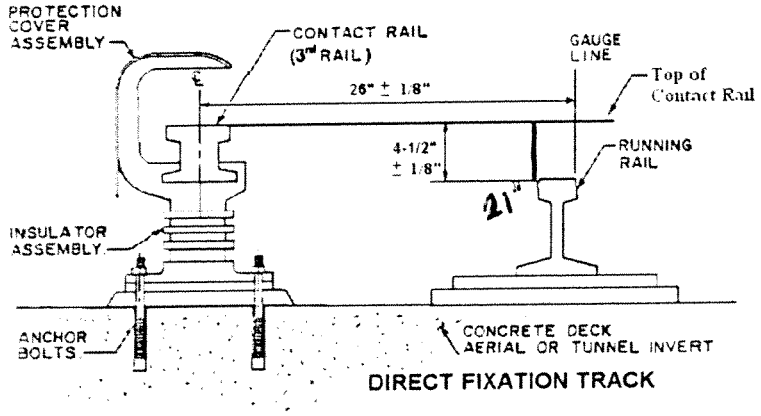
- Sloped end approaches are provided at every opening in the contact rail (third rail) and are 3 feet, 5 feet-6 inches or 11 feet long depending on type of service. They are installed to ease the top riding contact shoes of the equipment into position on the contact rail (third rail). End approaches that show any unusual wear should be replaced as soon as possible.

- Contact Rails (Third Rails) must be continuous between end sections and expansion joints. For any separation or break in the contact rail (third rail), traffic must be stopped immediately until repairs are made.

- Insulator assemblies must be considered defective if they are no longer able to support the contact rail (third rail) in proper position. This may be due to broken or deteriorated grout pads, broken or displaced insulators or ineffective clips on porcelain insulator or tabs on plastic insulator. Assemblies are spaced a maximum of 10 feet apart. If two (2) adjacent insulator assemblies are found to be defective, they will be replaced or repaired as soon as traffic permits. No speed restriction is necessary.

- Contact rail (third rail) is installed in relation to running rail as shown:





- If the maximum horizontal gauge to nearest running rail deviation exceeds + or - 5/8" then the maximum allowable speed is 15 mph and supervise operations
Table 13-2

GAUGE MEASUREMENT
EXERCISE

1. You are walking on a line where the trains speed is 60 MPH. You obtain a gauge measurement of 57 1/2" for 100', on a curve with a radius less than 1425' and more than 350 on main line. What immediate action would you take?

NONE - ACCORDING CHART 11-2 TRAIN CAN RUN AT 60MPH.

2. You are walking on a line where the trains speed is 60 MPH. You obtain a gauge measurement of 56 1/16" for 100', on a curve with a radius of 1475' on main line. What immediate action would you take?

SPEED RESTRICTION OF 15MPH

3. You are walking on a line where the trains speed is 40 MPH. You obtain a gauge measurement of 56 3/16" for 100', on a curve with a radius of 1525' on main line. What immediate action would you take?

NONE. ACCORDING TO CHART 11-2 TRAIN CAN RUN AT 40MPH

4. You are walking on a line where the trains speed is 60 MPH. You obtain a gauge measurement of 57 1/2" for 100', on a curve with a radius of 1325' and more than 550' on main line. What immediate action would you take?

NONE - ACCORDING TO CHART 11-2 TRAIN CAN RUN AT 60MPH.

SURFACE PROFILE EXERCISE

1. You are walking in a 15 MPH section of the system and you obtain a midpoint offset surface measurement of $1^{1/2"}$. What immediate action would you take?

   a. None, deviation does not exceed limits
   b. Speed must be restricted to
   c. Stop train in area

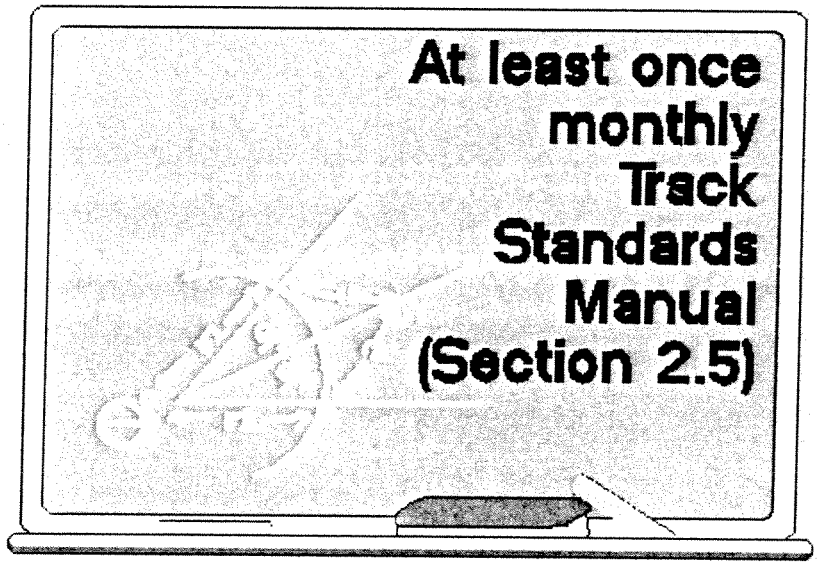
2. You are walking in a 75 MPH section of the system and you obtain a midpoint offset surface measurement of $1^{1/2"}$. What immediate action would you take?

   a. None, deviation does not exceed limits
   b. Speed must be restricted to ~ 35 mph
   c. Stop train in area

3. You are walking in a 60 MPH section of the system and you obtain a midpoint offset surface measurement of 1". What immediate action would you take?

   a. None, deviation does not exceed limits
   b. Speed must be restricted to
   c. Stop train in area

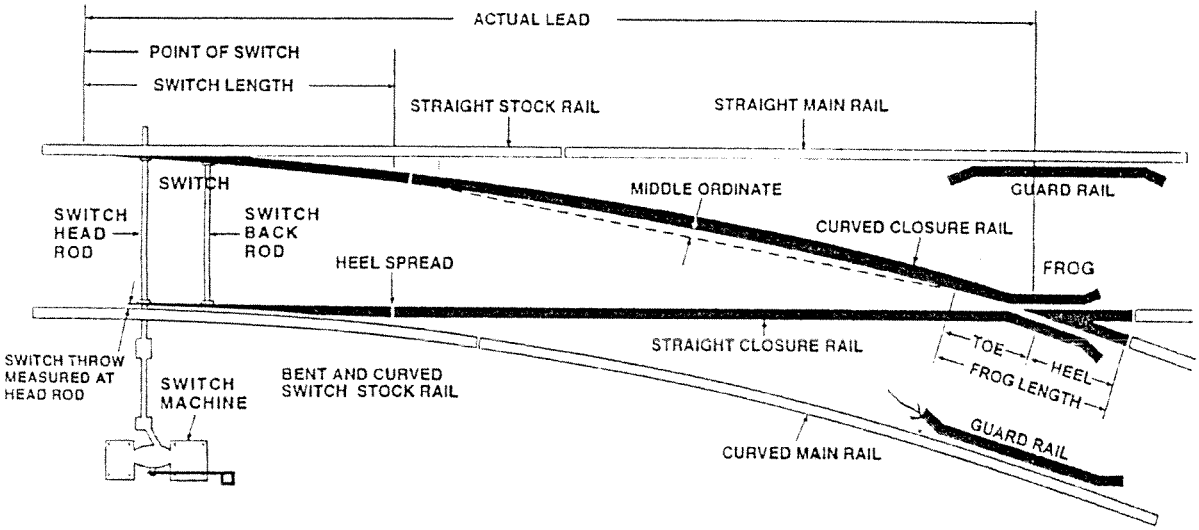
Switch Inspection



SWITCH OR TURNOUT INSPECTION
TABLE OF ITEMS TO CHECK AND WHAT TO LOOK FOR

ITEMS TO CHECK	WALKING SWITCH OR TURNOUT INSPECTION
Ballast and drainage	cribs not less than three quarters full except for switch point area for drainage as required in winter months. Ballast shoulder not less than (12"). No standing water, or indications of it.
Line, gauge, surface, side wear and cross-level	use turnout inspection report
Ties	Sound and holding spikes. Properly spaced and square to track. Firmly tamped for 16" on each side of mainline and turnout rails.
Ties Plates	None broken. None missing Not worn in excess of 1/8"
Rails (including switch rails, closure rails, stock rails and) Stock rails securely seated in switch plates, not canted by badly adjusted rail braces.	No visible defects such as rust streaks, ordinary breaks, vertical or horizontal split heads, engine burns, broken bases, crushed heads. End batter or mismatch not exceeding 1/8" at toe of frog and heel of frog and switch.
Castings	No broken castings (heel blocks, anchor blocks, rail braces, etc.)
Bolts	None broken/missing. All tight Spring washers, flat washers or cotter pins present as required.
Fasteners	Fully spiked (except hook twin tie plates which will have only one spike per plate end) or fastened with tie screws and Pandrol clips. Spikes fully driven, or tie screws with double spring washers driven until the double helical spring washer is compressed but not flattened
Rail Anchors	Fully anchored on both tracks through trunouts switch points). Fully anchored for 200 ft. both directions beyond the turnout. On other tracks, sufficient number of rail anchors to restrain rail movement affecting switch points and frogs
Points	Points not overhanging gauge plate no more than one inch back from front edge. At least first half fits tight against stock rails. Point of switch rail not less than ½" below top of stock rail. No sharp kinks, loose bolts or rivets. No broken or bent clips. No switch rods or connecting rods to be bent or broken or corroded to a depth exceeding 1/8".

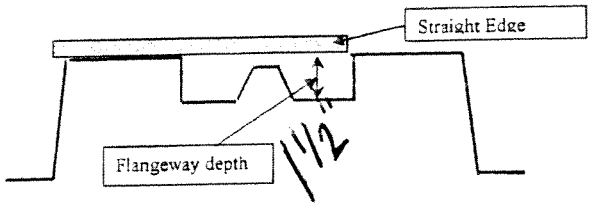
ITEMS TO CHECK	WALKING SWITCH OR TURNOUT INSPECTION
Heel of Switch	No missing, loose, bent or broken bolts.
C-BONDS	missing, loose or broken



FROG AREA

9.22
The flangeway depth, measured from a plane across the wheel bearing area of the frog, may not be less than 1 1/2 ". If this depth is reached, an immediate reduction in speed to 15 MPH should be enforced until the problem is corrected.

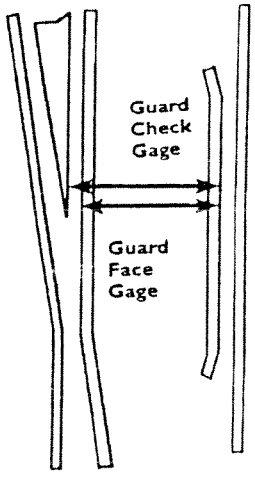
If a frog point is chipped, broken or worn more than 5/8" down and 6" back, operating speeds for facing moves over that frog may not be more than 15 MPH and all operations must be supervised.



If the tread of a frog casting is worn down more than 3/8" below the original contour, operating speeds over that frog may not be more than 15 MPH.

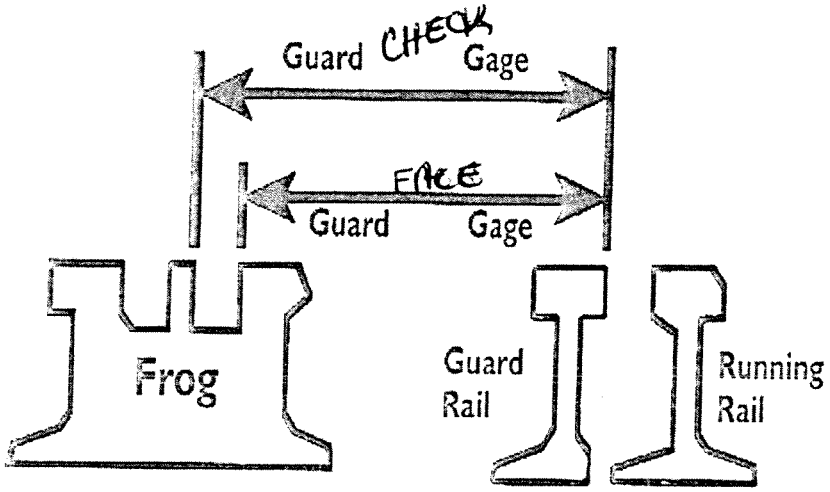
Guard rails 9.13

- The dimension from the gauge of the frog point to the face of the rubbing side of the guard rail (called the guard check gauge) must always be kept at a standard of 4'-6 1/4" or less. (54 1/4")
- If the guard check gauge is greater than 4'-6 1/4"or less or the wheel flange on the frog side would strike the throat of the frog and guardrail. (54 1/4")
- Guard face gauge is the distance between the guard lines of the guardrail and the guard line of the frog.



✓ Label guard check gauge

✓ Label guard face gauge



SWITCH OFFSET MEASUREMENTS

Design and construction plans denote that offset measurements from the line side rail to the curve closure rail be used in the construction of all turnouts. The offset method is the only acceptable means for maintenance and inspection personnel to determine if a turnout has the proper radius and curvature.

DISTANCE: Offset distance is measured from the heel of the switch towards the frog on the straight stock rail.

OFFSET: Offset measurements are measured from the field side of the straight stock rail to the field side of the curved closure (lead) rail.

NOTE: Offset measurements in a EQUILATERAL are more of a spread measurement between the two curved closure/lead rails. Spread measurements are taken from gauge side of one curved closure to the gauge side of the other curved closure.

OFFSET MEASUREMENTS

FIRST MEASUREMENT IS TAKEN FROM THE HEEL OF THE SWITCH POINT

#6 EQUILATERAL TURNOUT

#1 @ HEEL	=	8-3/4"	(8 3/4in.)
#2 @ 7'0"	=	1'-3 3/4"	(15 3/4in.)
#3 @ 7'0"	=	2'-1 1/32"	(25 1/32in.)
#4 @ 7'0"	=	3'-0 1/4"	(36 1/4in.)

#6 TURNOUT GUARDED

#1 @ 7'0"	=	1'- 4 7/16"	(16 7/16in.)
#2 @ 7'0"	=	2' 1 7/8"	(25 7/8in.)
#3 @ 7'0"	=	3' 1 3/8"	(37 3/8in.)

#8 TURNOUT STANDARD

#1 @ 11' 3-3/4"	=	0'- 11 5/8"	(11 5/8in.)
#2 @ 11' 3-3/4"	=	1' - 8 1/4"	(20 1/4in.)
#3 @ 11' 3-3/4"	=	2' - 8 1/4"	(32 1/4in.)

#8 TURNOUT GUARDED

#1 @ 8' 0"	=	0' -9"	(9in.)
#2 @ 8' 0"	=	1' - 3"	(15in.)
#3 @ 8' 0"	=	1' - 10 1/2"	(22 1/2in.)
#4 @ 8' 0"	=	2' -7 9/16"	(31 9/16in.)
#5 @ 8' 0"	=	3' - 6 1/8"	(42 1/8in.)

#10 TURNOUT STANDARD

#1 @ 13'0"	=	1' - 0 7/8"	(12 7/8in.)
#2 @ 13'0"	=	1' - 10 1/16"	(22 1/16in.)
#3 @ 13'0"	=	2' - 9 3/4"	(33 3/4in.)

#15 TURNOUT STANDARD

#1@ 18'8 3/4"	=	1' - 1 7/16"	(13 7/16in.)
#2@ 18'8 3/4"	=	1' - 10 15/16"	(22 15/16in.)
#3@ 18'8 3/4"	=	2' - 10 11/16"	(34 11/16in.)

#6 Turnout
1 st - 7' 10 1/4" - 12 1/8"
2nd - 7' 10 1/4" - 20 13/16"
3rd - 7' 10 1/4" - 2' 8 3/8"

#8 Turnout
1st - 11' 3 3/4" - 11 5/8"
2st - 11' 3 3/4" - 1' 8 1/4"
3st - 11' 3 3/4" - 2' 8 1/4"

#10 Turnout
1st - 13' 0" - 1' 0 7/8"
2nd - 13' 0" 1' 10 1/16"
3rd - 13' 0" 2' 9 3/4"

TURNOUT INSPECTION FORM

TURNOUT INSPECTION FORM

INSPECTOR/WATCHMAN(s) (PRINT OR TYPE) DATE:

TRACK IDENTIFICATION: *TURNOUT IDENTIFICATION:* LH RH Equal
FROG NUMBER: _____ FROG TYPE: **RBM** WMATA ACCEPTABLE: _____YES _____NO

GENERAL

ARE FLANGEWAYS CLEAR OF DEBRIS?	YES	NO	NOTE _____
ARE CRIB AREAS CLEAR OF DEBRIS?	YES	NO	NOTE _____
SURFACE AND ALIGNMENT	GOOD FAIR	POOR	NOTE _____

TIES

TOTAL NUMBER DEFECTS: _____
MAXIMUM NUMBER OF CONSECUTIVE DEFECTS: _____
NUMBER OF CLUSTERS OF DEFECTIVE JOINT TIES: _____

SWITCH AND STAND

Gauge Just Ahead of points: Measurement: Straight Side _____Turnout Side_____

Switch operates without difficulty Yes: _____No: _____Explain: _____
Switch stand: OK:____Insecure:_____Damage:_____Notes:_____
Point Lock/Lever Latches: OK:____Missing: _____Damage:_____Notes:_____
Point Gap – Left None:__Less than 1/8":__1/8" or Greater:_____¼" or Greater:__Notes:_____
Point Gap – Right None:__Less than 1/8":__1/8" or Greater:_____¼" or Greater:__Notes:_____
Is point LOWER than stock rail? Left Yes ___No____Notes:_____
Is point rail beyond taper HIGHER than stock rail? Right Yes ___No____Notes:_____
Switch rods: OK ____Bent___Damage _____Loose__Notes:_____
Switch clips OK ____Bent___Damage _____Loose__Notes:_____

CLOSURE RAILS
Gauge at Joints: Measurement Straight Side _____Turnout Side_____

FROG

POINT Ok ____Worn_____Chipped _____Broken_____Notes:_____
TOP SURFACE: Ok ____Worn_____Chipped _____Broken_____Notes:_____
BOLTS: Ok ____Worn_____Chipped _____Broken_____Notes:_____
WING RAILS Ok ____Worn_____Chipped _____Broken_____Notes:_____
GUARD FACE (SELF) Ok ____Worn_____Chipped _____Broken_____Notes:_____
Gauge at Point: Measurement Straight Side _____Turnout Side_____
Gauge at toe: Measurement Straight Side _____Turnout Side_____
Gauge at hee:l Measurement Straight Side _____Turnout Side_____
Flangeway Width: Measurement Straight Side _____Turnout Side_____
Flangeway Depth: Measurement Straight Side _____Turnout Side_____

GUARD RAILS

Position – Strait OK____Improper_____**Turnout** OK____Improper_____Notes:
Condition – Strait OK____Insecure _____Broken_____Damage _____Notes:_____
Turnout OK____Insecure _____Broken_____Damage _____Notes:_____
Flangeway Width: Measurement Straight Side _____Turnout Side_____

LUBRICATION

OK____Needed _____Applied_____

Notes: **Priority Code**_____**Notify Supervisor**_____**Notify Maint. Mgr.**_____

*Notify Time and Name

MONTHLY TURNOUT INSPECTION FORM

INSTALLATION: | REPORTING ORGANIZATION | INSPECTOR/WATCHMAN (PRINT OR TYPE/SIGNATURE)

TRACK IDENTIFICATION: | TURNOUT IDENTIFICATION: | DATE:

POINT LENGTH: | POINT TYPE: B ent or Straight | FROG NUMBER: | FROG TYPE: | WMATA ACCEPTABLE: _____YES _____NO

GENERAL

DO THE POINTS AND RISERS MATCH? YES NO Riser = G. or U. Pt.= S or B

IS RAIL SAME WEIGHT AND SECTION? YES NO NOTE _____
ARE FLANGEWAYS CLEAR OF DEBRIS? YES NO NOTE _____
ARE CRIB AREAS CLEAR OF DEBRIS? YES NO NOTE _____

SURFACE AND ALIGNMENT GOOD FAIR POOR NOTE _____
LEAD LENGTH: _____

FROG

POINT:	OK	____WORN	____CHIPPED	___BROKEN	NOTE____
TOP SURFACE:	OK	____WORN	____BROKEN	__DAMAGED	NOTE____
BOLTS:	OK	____LOOSE	___DAMAGED	___MISSING	NOTE____
WING RAILS	OK	____LOOSE	___DAMAGED	___MISSING	NOTE____
GUARD FACE (SELF GUARDED FROG ONLY)	OK	____WORN	____BROKEN	__DAMAGED	NOTE____

TIES

TOTAL NUMBER DEFECTIVE: _____ NOTE_____
MAXIMUM NUMBER OF CONSECUTIVE DEFECTS _____ NOTE_____
NUMBER OF OCCURENCES OF DEFECTIVE JOINT TIES: _____ NOTE_____
IS AVERAGE TIE SPACING LESS THAN 22 INCHES? YES NO NOTE_____

GUARD RAILS

Position - Strait	OK	IMPROPER	NOTE _____			
Turnout	OK	IMPROPER	NOTE _____			
Condition - Strait	OK	INSECURE	_____BROKEN	____DAMAGED	NOTE _____	
Turnout	OK	INSECURE	_____BROKEN	____DAMAGED	NOTE _____	
Fillers - Strait	OK	___LOOSE	_____BROKEN	____DAMAGED	NOTE _____	
Turnout	OK	___LOOSE	_____BROKEN	____DAMAGED	NOTE _____	
Bolts - Strait	OK	___LOOSE	_____DAMAGED	_____MISSING	NOTE _____	
Turnout	OK	___LOOSE	_____DAMAGED	_____MISSING	NOTE _____	

SWITCH AND STAND

Switch operates without difficulty? YES NO (Describe Problem) NOTE_____
Switch stand: OK INSECURE DAMAGED NOTE _____
Point Lock/Lever Latches: OK MISSING DAMAGED NOTE _____

Point Gap - Left	NONE	LESS THAN 1/8"	1/8" OR GREATER	¼" OR GREATER	NOTE _____
Right	NONE	LESS THAN 1/8"	1/8" OR GREATER	¼" OR GREATER	NOTE _____
Point Condition - Left:	OK	WORN	CHIPPED	BROKEN	NOTE _____
Right:	OK	WORN	CHIPPED	BROKEN	NOTE _____

Is point LOWER than stock rail? LEFT YES NO RIGHT YES NO NOTE _____
Is point rail beyond taper HIGHER than stock rail? LEFT YES NO RIGHT YES NO NOTE _____

Connecting Rod:	OK	____BENT	___DAMAGED	___LOOSE	___BINDING	NOTE _____	
Jam Nut:	OK		___DAMAGED	___LOOSE	___MISSING	NOTE _____	
Switch rods:	OK	____BENT	___DAMAGED	___LOOSE	___BINDING	NOTE _____	
Switch clips:	OK	____BENT	___DAMAGED	___LOOSE	___BINDING	NOTE _____	
Connecting Rod Bolt:	OK	____LOOSE	____DAMAGED	____MISSING		NOTE _____	
Nut on Top?	YES	NO	COTTER KEY IN PLACE?	YES	NO	NOTE _____	
Switch Rod Bolts	OK	____LOOSE	____DAMAGED	____MISSING		NOTE _____	
Nut on Top?	YES	NO	COTTER KEY IN PLACE?	YES	NO	NOTE _____	
Slide Plates:	OK	____LOOSE	__DAMAGED	___MISSING	___DIRTY	NOTE _____	
Rail Braces Straight Side	OK	____LOOSE	____DAMAGED	____MISSING		NOTE _____	
Turnout Side	OK	____LOOSE	____DAMAGED	____MISSING		NOTE _____	
Heel Filler (if present):	OK	____INSECURE	____CRACKED	____BROKEN		NOTE _____	
Heel Bolts:	OK	____LOOSE	____DAMAGED	____MISSING		NOTE _____	
Heel Joint Bars/ Shoulder Bars	OK	____LOOSE	____CRACKED	____BROKEN		NOTE _____	

MEASUREMENTS

	Straight Side	Turnout Side
SWITCH		
Gauge Just Ahead of Points:	_____	
CURVED CLOSURE RAILS		
Gauge at Joints	_____	_____
		_____
FROG		
Gauge at Point:	_____	_____
Gauge at toe:	_____	_____
Gauge at heel:	_____	_____
Flangeway Width:	_____	_____
Flangeway Depth:	_____	_____
GUARD RAILS		
Guard Check Gage:	_____	_____
Guard Face Gage:	_____	_____
Flangeway Width	_____	_____
CROSS LEVEL:		
Switch Point	_____	
Heel Block	_____	_____
Center Closure	_____	_____
Frog Toe	_____	_____
Frog Heel	_____	_____

NOTE:

TURNOUT INSPECTION FORM

INSPECTOR (PRINT OR TYPE/SIGNATURE)
TRACK IDENTIFICATION:

WATCHMAN (PRINT OR TYPE/SIGNATURE)
TURNOUT IDENTIFICATION:
DATE:
FROG NUMBER: FROG TYPE: WMATA ACCEPTABLE: _____YES _____NO

GENERAL

ARE FLANGEWAYS CLEAR OF DEBRIS? YES NO NOTE _____
ARE CRIB AREAS CLEAR OF DEBRIS? YES NO NOTE _____

SURFACE AND ALIGNMENT GOOD FAIR POOR NOTE _____

FROG

POINT: OK _____WORN _____CHIPPED ___BROKEN NOTE____
TOP SURFACE: OK _____WORN _____BROKEN __DAMAGED NOTE____
BOLTS: OK ____LOOSE ____DAMAGED ____MISSING NOTE____
WING RAILS OK ____LOOSE ____DAMAGED ____MISSING NOTE____
GUARD FACE (SELF GUARDED FROG ONLY) OK _____WORN _____BROKEN __DAMAGED NOTE____

TIES

TOTAL NUMBER DEFECTIVE: _____ NOTE_____
MAXIMUM NUMBER OF CONSECUTIVE DEFECTS: _____ NOTE_____
NUMBER OF OCCURENCES OF DEFECTIVE JOINT TIES: _____ NOTE_____

GUARD RAILS

Position - Strait OK IMPROPER NOTE _____
Turnout OK IMPROPER NOTE _____
Condition - Strait OK INSECURE _____BROKEN _____DAMAGED NOTE _____
Turnout OK INSECURE _____BROKEN _____DAMAGED NOTE _____

SWITCH AND STAND

Switch operates without difficulty? YES NO (Describe Problem) NOTE_____
Switch stand: OK INSECURE DAMAGED NOTE _____
Point Lock/Lever Latches: OK MISSING DAMAGED NOTE _____

Point Gap - Left NONE LESS THAN 1/8" 1/8" OR GREATER ¼" OR GREATER NOTE _____
Right NONE LESS THAN 1/8" 1/8" OR GREATER ¼" OR GREATER NOTE _____
Point Condition - Left: OK WORN CHIPPED BROKEN NOTE _____
Right: OK WORN CHIPPED BROKEN NOTE _____
Is point LOWER than stock rail? LEFT YES NO RIGHT YES NO NOTE _____
Is point rail beyond taper HIGHER than stock rail? LEFT YES NO RIGHT YES NO NOTE _____
Switch rods: OK ____BENT ___DAMAGED ___LOOSE ___BINDING NOTE _____
Switch clips: OK ____BENT ___DAMAGED ___LOOSE ___BINDING NOTE _____

PRIORITY CODE
Notify Supervisor
Notify maintenance Mgr.

MEASUREMENTS

	Straight Side	Turnout Side
SWITCH		
Gauge Just Ahead of Points:	_____	
CURVED CLOSURE RAILS		
Gauge at Joints	_____	_____
FROG		
Gauge at Point:	_____	_____
Gauge at toe:	_____	_____
Gauge at heel:	_____	_____
Flangeway Width:	_____	_____
Flangeway Depth:	_____	_____
GUARD RAILS		
Flangeway Width	_____	_____

NOTES:

Riding

Inspection

SUBJECT:	Severe Weather Riding Inspection Mainline	WORK INSTRUCTION NUMBER	REVISION	PAGES

WORK INSTRUCTIONS

WASHINGTON METROPOLITAN AREA TRANSIT AUTHORITY
INSPECTION DIVISION

REV	DATE	DESCRIPTION	RLSE NO.	INIT
#1	04/27/2012	REVISION TO STANDARD WORK UNIT SWRI-01	TKIN-0002	FM

ORIGINATED BY: Frederick Minniefield DATE: 04/27/2012

APPROVED BY: Darvin L. Kelly DATE: _____

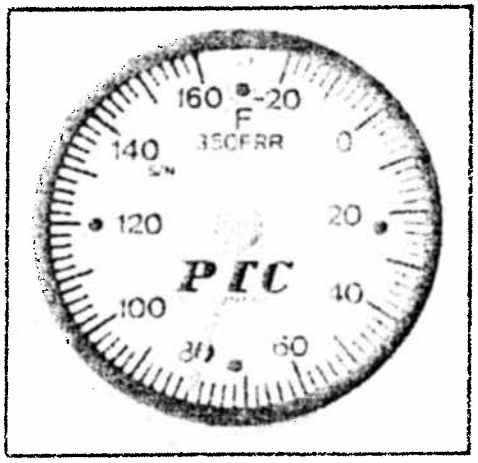
Refer to Work Instruction book for these instruction

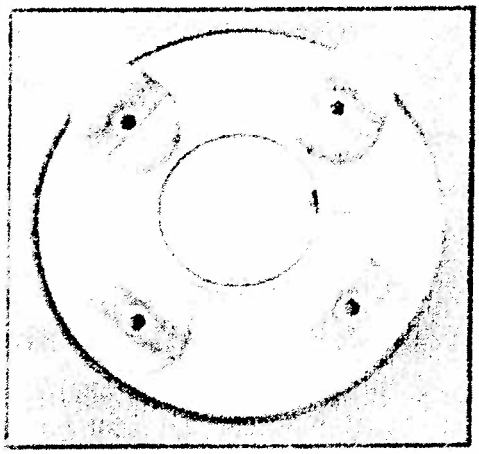
Severe weather could be Heavy Rains, Snow or heat. We will look at the extreme heat related conditions of the severe weather riding inspection.

- ☐ the riding inspections will consist of two-person teams
- ☐ the RWIC shall ride the lead cab of the revenue car making their observations
- ☐ the designated Watchman/Lookout shall ride the trailing end of the revenue car making their observations from that end of the train
- ☐ every hour get off the train and take the ambient temperature and the rail temperature
- ☐ use the Four Magnet Mount Industrial Railroad Surface Thermometers Model 350 FRR

The thermometer features Fahrenheit-readings, a 4-magnet base, calibrated dial and red pointer for easy read-out. Weight 1 lb.

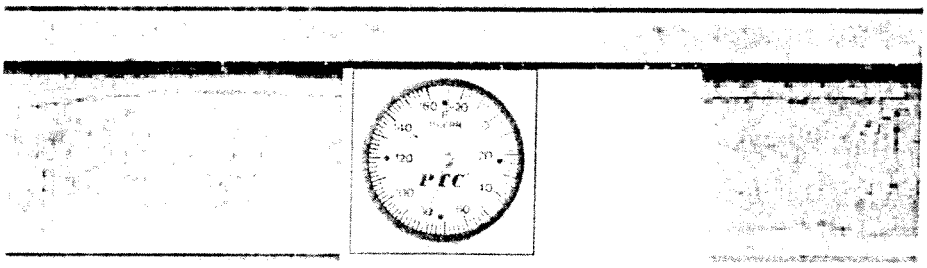
Model 350 FRR temperature ranges from -20° F to +160° F





OPERATING INSTRUCTIONS

Your task is to measure the rail's temperature. Rail temperature means the temperature of the rail, measured with a rail thermometer.
Place the Thermometer on the web of the rail surface so the magnets can hold the thermometer in place.
Allow approximately 3 minutes for the thermometer to reach stability. Use the red indicating pointer to read the numbers on the dial.



- ☐ call the supervisor so the temperatures may be record and document
- ☐ refer to the severe weather riding inspection work instruction TKIN 0002. For appropriate immediate action

Inspecting Rail **(Go to Sperry manual) OR TRACK STANDARDS MANUAL SECTION 5**

The next most obvious track component that must be checked whenever inspecting the track is the rail.

Rail defect conditions include:

- Transverse defects,
- Engine Burn defects,
- Horizontal Split Head defects,
- Vertical Split Head defects,
- Head & Web Separation,
- Split Web,
- Bolt Hole Crack,
- Piped Rail,
- Broken Base,
- Crushed Head defects
- Rail Head Surface Collapse.

LOADS IMPOSED ON TRACKS

When ever you are walking track, you need to take into consideration the many forces that affect the track structure as a train moves over it. There are numerous factors that affect the forces that occur between the train and the tracks. Those loads are imposed on tracks are called:

VERTICAL LOAD = DOWNWARD FORCES

Pitch occurs when one end of a vehicle goes down while the other end goes up. The result is a varying transfer of vertical load between the truck assemblies, resulting in repeated high vertical loads. Defects in track geometry such as:

- poor surface
- cross level
- excessive warp
- twist
- runoff

and discontinuities in the running surface such as:

- bad joint
- switch points
- frogs

also affect vehicle movement. These conditions vary the vertical loads. Poor surface can promote bounce and pitch because of the change in uniform level profile.

LATERAL LOAD = SIDEWARD FORCES

as train speed, weight and track curvature increase, so does the lateral loads on the outer, or high rail of curves. Track geometry can produce lateral forces as well. Primarily through changes in alignment. When a vehicle enters a spiral, the trucks must be turned to follow the track. The forces to the turn trucks are generated by the lateral loads between the wheels and the rail. Track geometry defects can also induce lateral loads as well. Primarily through poor alignment or variation in gauge.

LONGITUDINAL LOAD =LENGTHWISE

Rail also tries to move lengthwise or creep, "forcing ties and switches out of line and developing stresses tending to make the track buckle sideways. Therefore, all ballast track is equipped with rail anchors or anti-creepers. They are snap onto the base of the rail and come up against the tie to restrain motion. As many as four per tie may be required in places where temperature charges, grades and train braking, conspire to make the rail "run".

THERMAL EXPANSION

The first thing to remember is that nearly all materials, including rail, expand and contract with changes in temperature.

That means that when the temperature of the rail goes up, the rail wants to get longer and when the temperature of the rail goes down, the rail wants to get shorter.

If a rail is free to expand (get longer) and contract (get shorter) with changes in rail temperature, it will behave in a predictable manner.

RAIL STRESS

The main problem with CWR is that it cannot be allowed to expand or contract. An effort must be made to try to prevent it from moving. However, when this is done other stresses are introduced into the rail and these can be very high.
When a string of CWR is load and anchored, it is stress free (no tension, no compression). But for every change of 1 degree F, either up or down, in the temperature of the rail from the stress free temperature, a unit stress of 200 lbs. per square inch is introduced into the rail.

When inspecting track look for the various ways in which potential track buckling or pull apart can be detected.

I. Rail

A. Rail break

- This may be an end result of too much tension combined with a defect in the rail which lessens the rail's ability to withstand the force applied to it.

B. Buckle

- This is the result of too much compressive force for the track structure to withstand.

C. Lateral or vertical movement when the rail temperature is more than 20 degrees F above the Preferred Rail Laying Temperature (PRLT).

- Kinky rail or rising rail (lifting the ties with it) is caused by too much compression.
- When the rail temperature is 20 degrees F above the PRLT and you start to see these signs, it means that the stress free temperature is well below the PRLT.

D. Crowding shoulder on high side of tie plates on curves.

E. Crowding shoulder on low side of tie plates on curves.

F. Canting toward high side (spring/summer) on tie plates.

G. Canting toward low side (fall/winter) on tie plates.

- Both canting and crowding are caused by the rail being under stress. The rail wants to make itself longer or shorter.
- Crowding is the first indication.
- Canting is a more extreme indication of stress.

H. Riding up or out of the tie plates

- All of these are caused by the rail being under stress. The rail wants to make itself longer or shorter.

- Crowding is the first indication.
- Canting is a more extreme indication of stress.

I. Scrape marks on base of rail caused by spike contacting the running rail

- Rail has been moving in both directions.

J. Longitudinal movement of switch point to the stock rail indicated at the point of switch at the gauge plate (scrape marks on plate)

- CWR is causing the point to move.
- The end of the switch point is not at its normal location (there is not always a scrape mark).

K. Irregular gauge

- Same as kinky rail but only on one rail.

II. Rail Joint Areas

A. Joints closed at less than 20 degrees F above the PRLT or joints remain closed at low temperature

- Indicates too low a stress free temperature, or frozen joint.

B. Wide joints and pull-aparts

- These are the end result of too much tension caused by:
- insufficient number of anchors
- stress free temperature not within the PRLTR
- 4 holes versus 6 holes

C. Track bolts that are, bent, worn or broken

- Rail contracting and putting more force on the bolt than it was designed to withstand.
- When joints have opened to the extent that the track bolts are bent, corrective action must be planned.

III. Fastenings (Ballast and Direct Fixation)

A. Anchors that are missing or away from tie on one side and tight on the other

- Missing anchors means nothing is restraining the tension or compression in the rail.

- Anchors away from ties indicate that the rail is pulling or pushing in one direction.

B. Clips loose or missing

- Nothing is restraining the tension or compression in the rail.

C. Displaced or damaged tie pads

- Rail may be creeping under traffic.

D. Lifted spikes

- The rail is lifting.

IV. Ties

A. Skewing or moving and bunching from longitudinal movement

- Caused by the rail running and the anchored ties being unable to withstand the stress.

V. Ballast Section

- insufficient ballasts

KEY WORDS

Preferred Rail Laying Temperature (PRLT). = is the zero thermal stress temperature that the rail was layed.

Establishment of a speed restriction during revenue service-mainline

Establishment of a speed restriction during revenue service-mainline

Cause of establishment

A speed restriction may be established for the following reasons:

- To protect work crews engaged in work that can obstruct safe passage of trains through the work area.
- To ensure the safety of trains in area where the track or other conditions require that trains be operated at lower than normal line speeds.

When a condition exists which require a speed reduction then a speed restriction shall be imposed as directed in SOP #30, ESTABLISHMENT AND REMOVAL OF A SPEED RESTRICTION DURING REVENUE SERVICE-MAINLINE.

The person who discover the track or other condition(s) which require that trains be operated at lower than normal line speed must notify the ROCC of:

- The line and location and the reason for the speed restriction.
- The track numbers of the tracks affected.
- The area affected (limits of restriction).
- The reduced speed that should be established through the area until the condition(s) is corrected.

The person imposing the speed restriction must verify compliance of the restriction after speed couplers are in place and trains are running in Automatic Train Operation (ATO).

Speed Restrictions

What does the phrase, speed restriction mean to you, as a track walker?

SLOW TRAINS DOWN THROUGH A SPECIFIC AREA OF TRACK IN THE SYSTEM WHEN A OUT OF TOLERANCE DEFECT IS PRESENT.

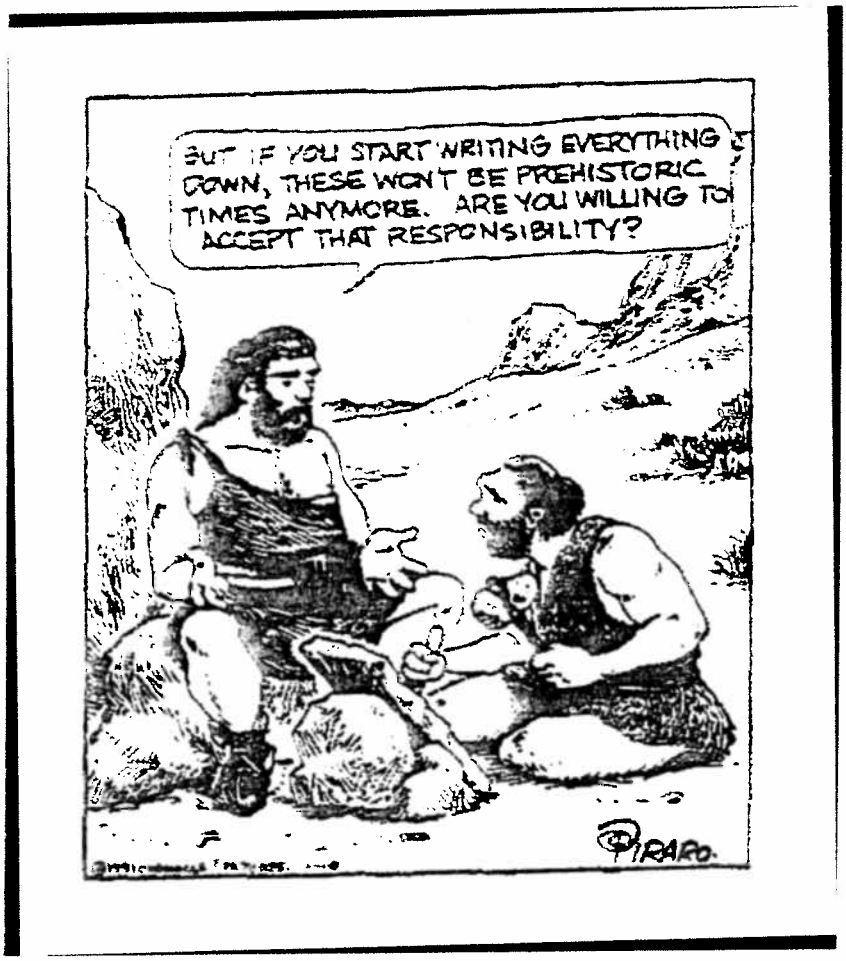
Why would a track walker place a speed restriction on a section of the rail system?

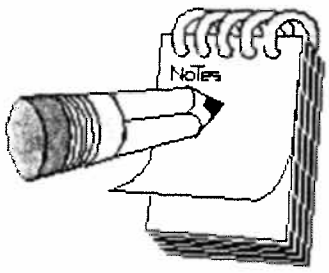
TO ENSURE SAFE PASSAGE OF A TRAIN THROUGH A DEFECTIVE AREA.

How would you place a speed restriction on a section of track?

* NOTIFY ROCC (LOCATION, TRACK #, REASON)
* NOTIFY MOC (TURN DOWN SPEED COUPLERS)
* VERIFY RESTRICTION INSTALLED (RIDE TRAIN THROUGH AREA)
* NOTIFY SUPERVISOR OF RESTRICTION

Writing Inspection Field Notes



Writing inspection  **field notes**

Walk and inspect track facing the normal flow of the revenue train traffic.

When you write your field notes, think and write with the normal flow of the revenue train traffic on your mind.

What do you write down?

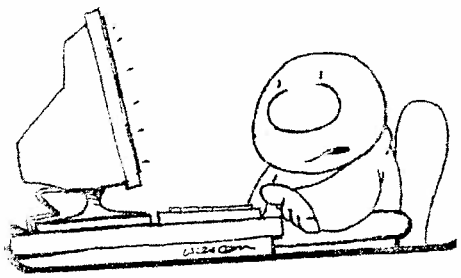
Where you are in the system?

What is out of place or missing

What is the condition? Safe or unsafe

What happens to your field notes?

This is Maximo
enter daily data



2.12 Degree of Serviceability

Fully Operational (Green) (Minimal wear)

This condition of serviceability exists when the track structure is maintained well within the limits of track tolerances. Such a condition implies that the majority of all components are intact and wear is minimal. To insure that this condition does not deteriorate, inspection is needed to monitor and report any adverse changes or additional deterioration and maintenance is needed to rectify the conditions which could lead to weakening of the track structure, resulting in damage and eventual failure of the structure. These items are maintenance items and should be corrected before conditions worsen. This will be denoted on subsequent charts and reports as "G" for "satisfactory" and indicated, if necessary, by the color Green.

Operational (Yellow) (Damage and/or wear)

This condition of serviceability exists when damage or wear exists such that one or more of the components of a section of track have broken down or worn to the point of rapidly approaching tolerance or is at tolerance but does not exceed tolerance. This condition necessitates the correction or replacement (if necessary) of those components, which are near or at the tolerances as prescribed herein. This condition is not to be considered as immediately dangerous or threatening and does not lead to loss of revenue, loss of life, injury or property damage if it is rectified before an out of tolerance condition develops. This will be denoted on subsequent charts and reports as "Y" for "needs attention" and indicated, if necessary, by the color Yellow.

Restricted Operations (Red) (Exceeds tolerances)

This condition of restricted serviceability (operations) exists, when one or more components in a section of track have failed or exceeded tolerances to an extent that could cause revenue service interruptions, derailments, and/or damage, and/or injury. This will be denoted on subsequent charts and reports as "R" for "immediate remedial action" and indicated, if necessary, by the color Red.

Safety Hazard (Black)

This condition exists, when something out of the norm in the track structure could lead to instantaneous service interruptions, derailment, loss of life, injury or property damage. This condition can exist at any level of serviceability and must be addressed immediately. This will be denoted on subsequent charts and reports as "B" for "immediate remedial action" and indicated, if necessary, by the color Black.

2014 MAXIMO CODE SHEET

Component Codes

200	TRACK AND STRUCTURES
200-A00	AERIALS
200-A01	DRAINS- AERIALS
200-A02	STRUCTURE-AERIALS
200-B00	**TUNNEL**
200-B01	DRAINS-TUNNEL
200-B02	INVERT (TRACKBED)-TUNNEL
200-B03	STRUCTURE-TUNNEL
200-B04	FLOATING SLAB-TUNNEL
200-B06	SHAFT-TUNNEL
200-B07	SIGNAGE-TUNNEL
200-C00	**CONTACT RAIL**
200-C01	INSULATOR
200-C02	COVER BOARD
200-C03	COVER BOARD BRACKET
200-C04	COVER BOARD PINS
200-C05	THIRD RAIL
200-C06	END APPROACH
200-C07	ANCHOR ARM
200-C08	THIRD RAIL EXPANSION JOINT
200-C09	THIRD RAIL MEGA CABLES
200-C10	INSULATOR SHIMS
200-C11	INSULATOR EARS
200-C12	INSULATOR BOLTS
200-F00	**FASTENERS**
200-F01	LORD
200-F02	LANDIS
200-F03	HIXON
200-F04	WMATA F17 OR F20
200-F05	CLIPS
200-F06	STUDS
200-F07	FASTENER SHIMS
200-F08	SW-31
200-F09	COLOGNE EGG FASTENER
200-G00	**GROUT PADS**
200-G01	SINGLE-GROUT PADS
200-G02	CONTINUOUS-GROUT PADS
200-L00	**LEAKS**
200-L01	STATION-LEAKS
200-L02	TUNNEL-LEAKS
200-L04	ROOM-LEAKS
200-M00	**TRST MISCELLANEOUS**
200-M01	CHAIN MARKERS
200-M02	ETS BOXES/LIGHTS
200-M03	INVERT COVERTS
200-M04	HAND RAILS
200-M05	GAUGE RODS
200-M06	OPEN JOINTS
200-M07	GRAFFITI
200-M08	CATCH ALL TRASH BASKETS
200-M09	SAFETY WALK
200-M10	TUNNEL GRAB BAR
200-M11	FIRE EXTINGUISHER
200-P00	**PLATES**
200-P01	STANDARD TIE PLATE
200-P02	PANDROL TIE PLATE
200-P03	"P" FILLER PLATE
200-P04	SWITCH PLATE
200-P05	FROG PLATE
200-Q00	**RIGHT OF WAY**
200-Q01	FENCE-RIGHT OF WAY
200-Q02	GATE-RIGHT OF WAY
200-Q03	VEGETATION-RIGHT OF WAY
200-Q04	BALLAST-RIGHT OF WAY

200-R00	RAIL
200-R01	RUNNING RAIL
200-R02	GUARD RAIL
200-R03	RAIL JOINT BAR
200-R04	RESTRAINING RAIL
200-R05	RAIL LUBRICATOR
200-R06	RAIL ANCHOR
200-R07	JOINT BAR BOLT
200-R08	INSULATED JOINT
200-R09	RESTRAINING RAIL BRACE
200-R10	RAIL JOINT
200-R11	PORTEC JOINT
200-S00	**STATION**
200-S01	DRAINS-STATION
200-S02	INVERT (TRACKBED)-STATION
200-S03	STRUCTURE-STATION
200-S05	ROOM-STATION
200-S06	DOME RELIEF-STATION
200-S13	DO NOT USE
200-T00	**TURNOUTS/SWITCHES**
200-T01	STOCK RAIL
200-T02	LEAD OR CLOSURE RAIL
200-T03	SWITCH POINT
200-T04	SWITCH POINT GUARD
200-T05	SWITCH POINT GUARD BOLTS (HOUSE TOP)
200-T06	FROG
200-T07	HEEL BLOCK BOLTS
200-T08	SPACER BLOCK
200-T09	FROG GUARD
200-T10	FROG GUARD SHIMS
200-T11	FROG BOLTS
200-T12	SPACER BLOCK BOLTS
200-W00	**WELDS**
200-W01	BOUTET
200-W02	CONTACT RAIL
200-W03	CAD WELDS
200-W04	FACTORY/FIELD
200-W05	FLASHBUTT
200-W06	THERMITE
200-X00	**TIES**
200-X01	CROSSTIES 8'6"
200-X02	SWITCH TIES
200-X03	DAP TIES
200-X04	THIRD RAIL / SUPPORT TIE 10'
200-X05	CONCRETE-STANDARD 8 FT 3IN
200-X06	CONCRETE GUARDED RAIL
200-X07	CONCRETE LOCK NUTS
200-X08	CONCRETE G10 PADS
200-X09	CONCRETE BUSHING W/G10 WASHER
200-X10	CONCRETE WASHER
200-X11	CONCRETE COVER PLATE
200-X12	CONCRETE BASE PLATE
200-X13	CONCRETE END PLATE
200-X14	CONCRETE REINFORCED BAR
200-X15	CONCRETE BOLTS,A325LE 3/25 IN X 1 1/8 IN
200-X16	CONCRETE BOLTS A325N 4 1/2 IN X 1 1/8 IN
200-X17	CONCRETE TIE RAIL SEAT PAD
200-X18	CONCRETE SHOULDER INSULATOR BLUE
200-X19	CONCRETE SHOULDER INSULATOR WHITE
200-X20	CONCRETE SHOULDER INSULATOR GREEN
200-X21	CUT SPIKE
200-X22	SCREW SPIKE
200-X23	CROSSTIE EXTENDER
200-X24	CONCRETE (EGR) EMERGENCY GUARD RAIL 8 FT 6 IN
200-X25	CONCRETE RESTRAINING RAIL 8 FT 6 IN
200-X26	CONCRETE INSULATOR 8FT 6IN

Defect Codes

D01	BATTERED
D02	BLOCKAGE
D03	BROKEN/SHEARED
D04	POOR SUPPORT
D05	CHIPPED / PITTED
D06	CORRODED
D07	CORRUGATED
D08	WHEEL BURNS
D09	CRACKED / SPLIT
D10	MUD CONDITION
D11	DETERIORATING
D12	WRONG PART
D13	IMPROPER FLANGEWAY
D14	FOULED (BALLAST)
D15	FROZEN / SEIZED / JAMMED
D16	INSUFFICIENT BALLAST
D17	GROOVED
D18	HARDWARE MISSING
D19	RUNNING (CREEPING)
D20	ICE CONDITION
D21	LATERAL MOVEMENT
D22	LOOSE / SLACK
D23	MISSING
D24	MISMATCH
D25	IMPROPER CROSSLEVEL
D26	OUT OF GAGE
D27	OUT OF LINE
D28	OUT OF RISER
D29	OUT OF SURFACE
D30	BURNT (LUMBER)
D31	PLATE CUT (TIES, TIE BLOCKS)
D32	PUMPING
D33	ROTTED
D34	HIGH SPIKES
D35	SKEWED
D36	SPIKE KILLED (POOR HOLDING)
D37	SHOULDER WORN (PLATES)
D38	SETTLED
D39	SNOW CONDITION
D40	SHELLED
D41	TIGHT
D42	WATER CONDITIONS
D43	
D44	SIDE WEAR (RAIL)
D45	TOP WEAR (RAIL)
D46	WORN BEYOND TOLERANCE
D47	ARCING
D48	LEAKING
D49	VEGETATION (EXCESSIVE GROWTH)
D50	HEADCHECKING
D51	RAIL CAVITY
D52	TRASH AND DEBRIS
D53	BROKEN COLLECTOR SHOES
D54	LONGITUDINAL MOVEMENT
D55	SAFETY HAZARD
D56	TRANSPOSED RAIL
D57	ALLOY RAIL
D58	
D59	NEEDS WELDING
D60	HAND RAIL DEFECTIVE
D61	NEED LUBRICATION
D62	MISSING/DAMAGED HARDWARE
D63	DEFECTS CORRECTED
D64	HEAT KINK
D65	ERT
D66	ESCORT
D67	
D68	Frayed
D69	
D70	TRANSVERSE DEFECT COMPOUND (TDC)
D71	TRANSVERSE DEFECT DETAIL (TDD)
D72	DEFECTIVE WELD-FIELD (DWF)
D73	DEFECTIVE WELD-PLANT (DWP)
D74	ENGINE BURN FRACTURE (EBF)
D75	HORIZONTAL SPLIT HEAD (HSH)
D76	VERTICAL SPLIT HEAD (VSH)
D77	SPLIT WEB-OPEN (SWO)
D78	SPLIT WEB-JOINT (SWJ)
D79	HEAD-WEB SEPERATION-OPEN (HWO)
D80	HEAD-WEB SEPERATION-JOINT (HWJ)
D81	BOLT HOLE CRACK-JOINT (BHJ)
D82	BOLT HOLE CRACK-OPEN (BHO)
D83	BROKEN BASE (BRB)
D84	ORDINARY BREAK-OPEN (BRO)
D85	ORDINARY BREAK-JOINT (BRJ)
D86	NON-TESTABLE AREA (NTA)
2367	MISC/OTHER

Priority Staus Codes

G-Green	Priority 3
	Condition exists but within tolerance.
Y-Yellow	Priority 2
	Near, at or exceeds tolerance. Requires maintenance or speed restriction.
R-Red	Priority 1
	Immediate impact to revenue operation.

HAND HELD RADIO

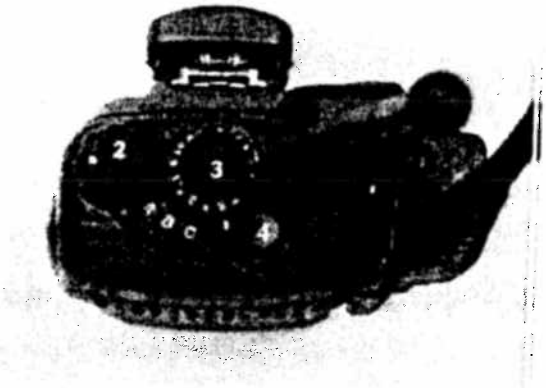
Radio Operation
The radios that track repairers use is the **XTS-1500.**

1. Battery
At the beginning of your shift, you should make sure the battery is fully charged. This is indicated by a GREEN light on the battery charger. If the light is RED or AMBER, the battery is not fully charged and should not be used. To replace the battery, see next page..

2. On/Off Volume Knob
To turn on the radio, turn the On/Off Volume knob clockwise until the radio is on. Adjust the volume to an appropriate level.

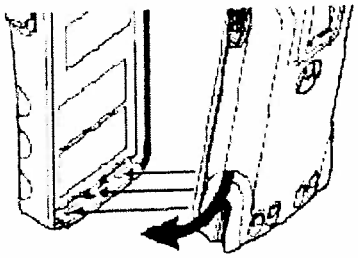
3. Selector Knob
There are two switches used to select the proper talk group. The outer ring, the Zone Selector Knob, is used to select the proper zone. Zone A is for maintenance, zone B is for operations, and zone C is for yards. The Talk Group Selector knob is used to select the specific talk group within each zone. The name of the talk group selected will be displayed on the LCD display.

7. Push-to-Talk Button
The Push-to-Talk button is used to transmit communications. While transmitting, the radio will not receive any communications. Release the Push-to-Talk button when transmission is complete.

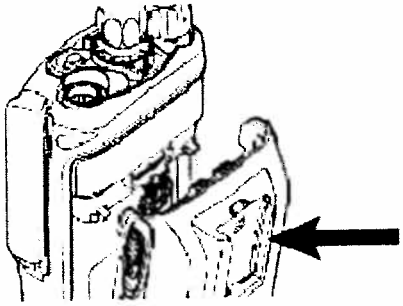


Battery Installation and Removal

Attach the Battery

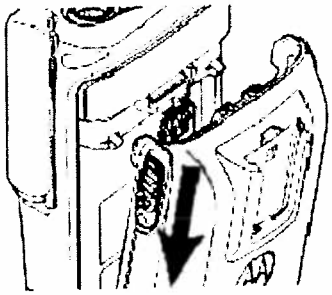


Radio off, fit the 3 extensions into the bottom slots of the radio

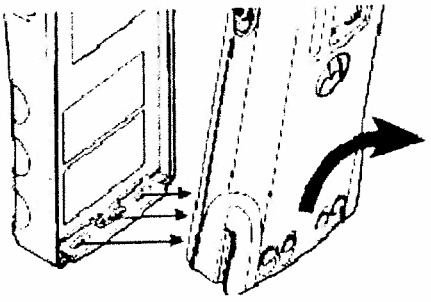


Press battery against radio

Remove the Battery

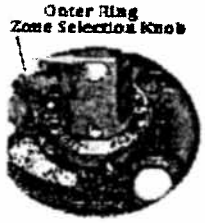


Radio off. Slide down the latches on the sides of the battery



Pull the top of the battery away from the radio

To communicate with the ROCC select zone B and the correct talk group/channel for the line you need. To communicate with the yard tower turn to zone C and select the yard with the talk group selector knob according to the chart below.



TALK GROUP SELECTOR KNOB

	ZONE A	ZONE B	ZONE C
TALK GROUP SELECTOR KNOB	**MAINTENANCE**	**OPERATIONS OPS**	**YARDS**
1	DISPATCH	1	SHADY GROVE
2	ATC	2	GLENMONT
3	COMM	3	BRENTWOOD
4	POWER	4	NEW CARROLLTON
5	PLANT		ALEXANDRIA
6	TRACK		GREENBELT
7	AFC		BRANCH AVE
8	ELES		WEST FALLS CHURCH
9	GEN-1		
10	GEN -2		
11	INC-1		
12	INC-2		
13	INC-3		
14	TALK AROUND		
15	MAINTENANCE ANNOUNCEMENT		
16	FLAG PERSON		

Radio Transmissions

As a radio user, you are responsible for the use of your assigned radio in accordance with FCC rules and regulations and any special instructions issued by WMATA.

Test your radio to ensure that it is in good operating condition. Immediately notify your supervisor if your radio is not operable.

You must monitor the WMATA network before attempting to transmit a message so as not to interfere with any current transmissions.

Speak across the face of the microphone rather than directly onto the diaphragm of the microphone (which causes a "blasting" sound to be transmitted at the beginning of each word). Use an ordinary tone of voice when transmitting; the volume in your transmitter is preset, so shouting will not make the message any louder, just more difficult to understand.

When communicating with Central Control:

Radio Users: Identify themselves by their radio ID number

Turn on radio
Select the proper talk group/channel
Select the proper Zone.
Depress the PTT button, release and Wait to be acknowledged.
Respond with your ID, and reason for calling

Putting Your Radio Message Together

RADIO DO's	RADIO DON'T's
• Know what you want to say	• Do not mumble
• Press the button	• Do not shout
• Hesitate an instant	• Do not talk too fast
• Speak distinctly	• Do not become excited
• Be brief	• Do not attempt to break into another transmission
• Be concise	

Radio Protocol

The following procedure is established for use between the Rail Operations Control Center (ROCC) and radio users.

RADIO USERS: identify themselves by their personal ID.

Transmission Format and Content
- **INTRODUCTION** (Identification – Location – Acknowledgment
- **REASON FOR MESSAGE** (Trouble or Condition)
- **CLOSING** (Identification)

PROTOCOL	SAMPLE RADIO TRANSMISSION
1. After the caller identifies his/her identity and location, he/she must always wait for a response.	"Central, this is track unit 3033."
2. After the call is acknowledged, indicate the condition, trouble or reason for the call.	"Central, this is track unit 3033." Requesting a radio check, how do you copy.
3. The recipient should repeat the message as they understand it and close by repeating their identity.	"Roger, Central, this is track unit 3033." I copy, you hear radio check loud and clear.
4. The recipient then transmits his/her own message/information if relevant.	"Roger, Central, this is track unit 3033." My partner 3036 and I will be inspecting track from Metro Center to Union Station Track 1.

Get permission from ROCC to enter track bed