Track & Structures

Track Maintenance Training

BASIC TRACK TECHNOLOGY

Module Two

Track Tools & Basic Equipment

Metropolitan Atlanta Rapid Transit Authority
Infrastructure Training

Table of Content

TRACK TOOLS AND BASIC EQUIPMENT

Introduction

Track Structure training provides a review of MARTA maintenance and railroad standards. At the end of this course, students will be able to describe basic Track Tools and Equipment used at MARTA and demonstrate how to correctly use them.

Requirements

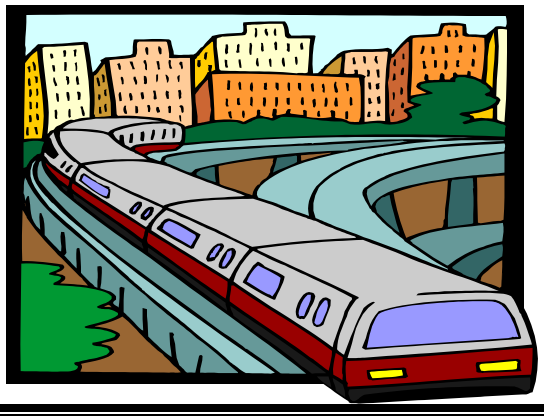
Test scores must be 80% or higher on all written evaluations. Only one retest will be allowed on any written evaluation without additional training. All MARTA Track and Structures personnel must demonstrate knowledge of MARTA Track Tools.

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 safetly use and correctly describe all Track Tools in accordance with the manufacture and MARTA standards.



Section Objectives

1. Identify all tools used for pulling spikes and demonstrate how to correctly use them.
2. Identify all striking tools and describe under what conditions each would be used.
3. Describe the different types wrenches.
4. Describe the function of Tie and Rail handling tools.
5. Demonstrate ability to correctly operate a standard track jack.
6. Describe the function of and demonstrate the ability to use ballast tools.
7. Describe the function of and demonstrate the ability to correctly use the gauge and crosslevel on regular track and in a switch.

TRACK TOOLS AND BASIC EQUIPMENT

This lesson will deal with the basic equipment a track crew needs to perform a normal range of track work.

It will cover the proper use and care of track tools, as well as certain precautions that should be observed.

In present-day practice, mechanized equipment is used to a large extent for various types of track work including rail laying, tie renewal, track surfacing and lining, material handling.

This, of course, has reduced the dependence on hand tools that once existed. It has also led to much more specialization. It is possible for a new employee to be assigned to a specialized crew, stay there for a considerable period of time and only be exposed to a few simple job operations.

Thus, in addition to the new employee who is obviously unfamiliar with the proper use of track tools, it is not unusual to find employees with a fair amount of maintenance service who do not fully understand how to use various track tools.

In spite of the trend towards mechanization, it is not likely that the need for hand tools will be eliminated.

Equipment is not always available to replace:

- Defective rail
- Renew deteriorating tie in switchs or under a rail joint
- Surface a rough spot that might otherwise require a slow order
- Guage a wide spot in a curve
- Replace a cracked joint bar

Or perform other random maintenance jobs that can be done most efficiently with a small crew using hand tools.

The competent track person will assure themself at an early date that they know how to use this tools.

In addition to knowing how to use them, it should be recognized that most people will respond better if they understand why they should do it.

In some cases, the answer is related to the safety of the person using the tool or his fellow workers.

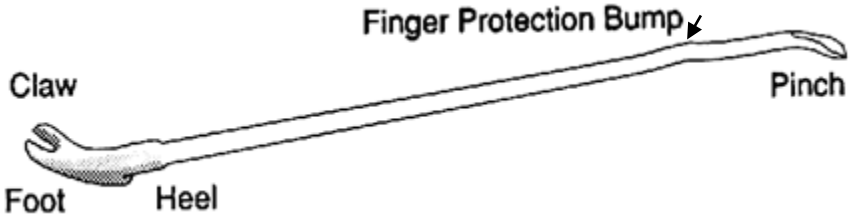
This educational process will have to be repeated for each new person that comes onto the crew, but it will be easier in such cases if the rest of the people are already accustomed to working with tools properly.

A. PULLING SPIKES

The, first group of tools that will be considered are those that are used for pulling spikes. The most important of these is the claw bar.

1. Claw Bar

The claw bar is designed for the claw to fit under the head of a spike in the track if there is normal clearance between the spike head and the rail base or tie plate.



The heel of the claw bar and the long shank handle are designed so that under most conditions one person can develop sufficient leverage to remove a spike.

There are times when a spike is firmly embedded in a tie and it is difficult to break the bond between the spike and the tie.
Under such conditions it may be necessary for two people to use the claw bar in order to get the spike started.

If the spike is still not moving easily after it has been raised a couple of inches, it may be found that a new bearing is required for the heel of the claw bar. In such cases a hammerhead or other convenient object is used to block up the heel of the claw bar.

Another feature of the claw bar is the pinch tip on the end of the shank.

If there is not enough clearance between a spike head and the tie plate for the claw to fit, the spike can sometimes be started by prying the tie plate with the pinch end of the claw bar. If this does not prove successful, the proper way to start such a spike is with a spike lifter.

It is not recomended that the heel of a claw bar be struck in an effort to wedge the claw under a spike head.

For one thing, the heel of the claw bar does not present a surface with which a striking tool can make good contact.

- This can be hazardous to those in the area or lead to damage of the hammer handle
- Also, the claw bar is not desiqned to be struck

If the claw bar is struck, the surface quickly flattens out, lips of flowed metal are formed and there is a danger of further blows causing chips or spalls to break off.

Mushroomed heel of a claw bar

Such spalls of steel can lead to serious injury if they break off due to a blow from a sledge.

- They can fly off in unpredictable directions, at high speed, with sharp edges, leading to serious consequences

When using a claw bar, the proper procedure is to make sure that no one else is standing or working where the bar might come in contact with them during the course of pulling the spike.

After getting a firm grip on the spike, **pick your position carefully.**

- Make sure you have good footing so that you do not slip
- Depending on conditions, your first efforts may consist of a pulling motion or of pushing
- If pulling, you want to make sure that if the claw bar loses its grip on the spike, the end of the bar will not strike you in the face or chest

If pushing, you want to be careful that you don't lose your balance and fall should the claw bar slip.

- The first pull or push should be a light one to determine how tightly the spike is embedded
- It should also be remembered that there is a possibility of the spike head breaking off and flying, if it is old and the throat of the spike is worn

- Another thing to remember as the spike is raised and the shank of the claw bar moves to a lower angle, is that it is possible to injure your hands, should they get caught between the claw bar and an adjacent rail
- The bump towards the end of the Claw bar is a reminder not to place your hand beyond that point

2. Spike Lifter

The spike lifter has a properly treated striking face, presents a more favorable angle for a sledge to strike it and has properly designed claws for wedging the spike head upward under impact.

After lining the spike lifter up with the head of the spike Make sure that

- You are clear of the swing of the hammer
- That you have notified everyone around you that your giong to swing the hammer
- That every blow to the spike lifter hits the striking surface

There are a couple of precautions to keep in mind when using a spike lifter.

1. This is a two-person operation.
2. One person has to hold the handle of the lifter, keeping it in position for each blow.
3. The other person strikes the lifter with a sledge hammer.

A miss or a glancing blow with the sledge could result in injury to the person holding the spike lifter if they are not properly positioned.

It should also be recognized that there is greater danger of a spike head breaking off and causing injury when subjected to this type of impact.

If there is any evidence of wear or corrosion under the spike heads, provide some protection against a flying spike head.

1. A piece of burlap 2. A broom 3. A flat piece of wood

3. Spike Puller

The spike puller is intended for use with a claw bar.

It is intended for use where spikes have to be removed from a location where there is not enough clearance for a claw bar to be used.

This includes spikes between

- Running rails and guard rails
- In the crotches around frogs and switch heels

The jaws of the puller are attached to the spike head and the claw bar is attached to the shaft of the spike puller with the heel of the claw bar bearing against the rail head or other convenient object. (See picture below)

Once attached to the spike head and hooked by the claw bar, small downward pulls are used to lift the spike.

- Before each pull look to see that the spike puller is still attached to the head of the spike.

The greatest danger in this operation is that of the spike puller becoming detached from the spike or the claw bar becoming detached from the spike puller in the process of pulling.

Someone not properly braced and anticipating such an occurence could sustain an injury in one of the ways previously described.

B. USE OF STRIKING TOOLS

The next tools to be considered are the striking tools. The ones that are in general use in track work are the spike maul and the sledge hammer.

1. Spike Maul

The spike maul is designed for the one job which its name indicates, driving track spikes. This uniquely shaped hammer head is designed for performing this particular job.

The long shanks between the handle and the striking faces provide clearance where spiking from the opposite side of the rail is necessary.

- This is not recomended as a general practice, (easy to break the hammer handle) but there are places where it is necessary

One end of the spike maul head is longer than the other.

- The longer end has a smaller diameter than the short end in order to keep the tool balanced as to weight
- Most track people will use the short end most of the time
- However, when it is necessary to spike from the opposite side of a particularly high rail the longer end may be used.

This requires even more skill in the use of this tool to deliver blows accurately.

One of the reasons why spiking from the opposite side of the rail is to be discouraged is that visibility of the spike head may be reduced, particularly as the spike is almost driven home.

Also, a blow that causes the head of the spike maul to glance off the spike head may twist the spike maul enough to permit the handle to strike the head of the rail. This can cause damage to the handle causing it to crack or break.

2. Sledge Hammer

The sledge is the proper tool to use for other track work where a heavy striking tool is required.

A few examples of the jobs for which it is used are:

- Applying rail anchors if they are of the drive on type
- Removing rail anchors
- Removing track bolts
- Loosening joint bars **frozen** to the rail
- Striking a spike lifter, track chisel, track punch or drift pin

Most of these operations require blows which are mainly horizontal in direction. A number of these operations have a greater potential for damage if a blow misses its target.

The greater diameter of the striking face reduces the chance of missing the target, and the sledge is easier to to control than the spike maul on this type of swing.

Sledge hammers are never to be used to drive spikes. With the larger striking surface it is easy to hit the running rail causing damage to the rail.

3. PRECAUTIONS

Anyone preparing to swing a tool such as a spike maul or a sledge hammer should make certain that no one is behind them or in any other position where he could be struck with the tool.

This should include warning anyone who is working nearby that could move into the path of the tool's swing without being aware of the job in progress.

Unfortunately, the obvious is sometimes overlooked, and injuries are caused from such actions.

1. Striking tools need to be inspected periodically.
2. Safety requires that handles be securely applied.
   - Most striking tools are fitted with wood handles
   - Wood handles must be secured with wedges. (wood & steel)
3. Other types of handles have come into limited use because of problems caused by breakage of wood handles.
   - Some of these are made of plastics or fiberglass
   - Such handles generally require epoxy glue to secure them to the tool properly

Another type of handle is constructed of flexible steel strands embedded in rubber.

- These handles are secured by a combination of wedges and epoxy, and are fastened to the tool by the manufacturer

All striking tools should be examined regularly to be certain that the tool is firmly secured to the handle.

- Wood handles should also be checked frequently for cracks

<u>Cracked handles should not be used.</u>

Striking faces can tend to **mushroom** or form lips creating the danger of spalls breaking off under impact.

If properly used, this is not as likely with a spike maul as with a sledge, since spikes are made of soft steel.

This condition can occur with tools used for striking. This includes ;

- Spike lifters
- Track chisels
- Track punches and drift pins

For many years, the standard material used for track tools that are intended to strike other steel objects or to be struck, has been carbon steel.

This type of steel has a greater ability to withstand repeated blows from a sledge hamer.

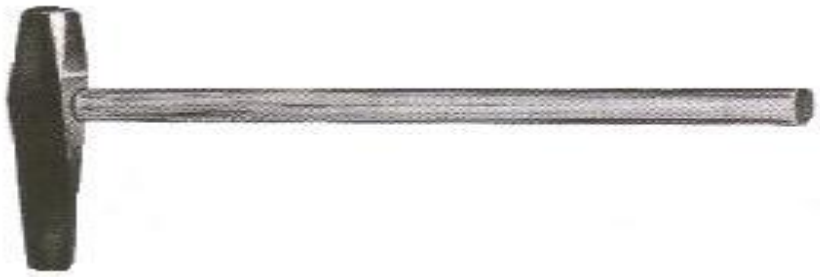
4. Track Chisel

The track chisel is a tool principally used to cut nuts, bolts, cable and even rail.
In addition to periodically checking the striking heads of track chisels, the steel being cut with the chisel must also be watched for developing lips.

- Such flowed metal should be removed or protection provided to prevent spalls from flying
- A coller placed around the striking end helps eliminate spalls from flying off.

At times, track chisels are used to cut **frozen** nuts off bolts.

- The preferred tool for this is the **nut cutter**
- It can be seen that the nut cutter has a straight cutting edge which makes it more effective for this work than the curved cutting edge of the track chisel



Can also be used to cut C-Bonds from the running rails.

- Also used when making thermit welds

Another precaution to observe when using this tool is for the person holding the chisel to be placed where they cannot be struck by a poorly aimed or slipping sledge.

4. Track Punch

Similar precautions should be taken when using a track punch.

Some care still needs to be taken in regard to the material on which the punch is used.

One use of this tool is to dispose of stubs of spikes which are imbedded in a tie with the head broken off.

- The usual procedure is to drive the spike stub through the tie using the track punch

Failure to use the punch properly, leaving the stub flush with or just below the top of the tie can create a hazardous condition, should it be necessary to adzee the tie.

Another operation sometimes requiring a track punch is the removal of bolts which will not come out free and easily.

- A track bolt which must be removed with the use of a sledge, with or without a punch, can fly with considerable force, injuring anyone unfortunate enough to be in its path
- Also used to drive out cut off Huck Bolts from a rail joint

5. Drift Pin

Description: Rail drift pins are tapered steel pins 12 in to 18 in long. They are available in various diameters.

Function: The purpose of a drift pin is primarily to align bolt holes at joints.

Connect track bolts to one end of the rail joint, through the running rail then the other joint bar. (keep the bolt loose so that the joint bars can be moved back and forth, but do have the nut securly on the bolt)

- Place a second track bolt in that same end of the rail joint.

Now use the drift pin to line the bolt holes in the joint bar with the holes in the running rail on the other end of the joint bar.

There may be times when the drift pin will have to be driven through the bolt holes with a sledge hammer.

Once the bolt holes are lined up, put the remaining track bolts into the joint bar.

- Remove the drift pin and add a track bolt to that hole.

Make sure that all track bolts have a lock washer before the nuts are tightened.

C. TIGHTENING AND LOOSENING NUTS

1. Track Wrench

The next group of tools to be considered is the wrenches.

In order to develop the considerable force necessary to bring a bolt the size of a track bolt to proper tension, such wrenches have a long shaft and are designed to be used on track joint installations by a person in an upright position.

Some track wrenches have jaws at one end only, while others can accomodate two sizes of nuts by having jaws on each end.

Whether tightening or loosening a nut on a track bolt, there is generally a choice of pulling or pushing on the wrench depending on how the jaws of the wrench are positioned on the nut.

The preferred method is to pull, as there is less chance of losing one's balance should the wrench slip off the nut.

- It is important to get a good footing to prevent slipping or losing one's balance while making a heavy pull
- It is advisable to avoid standing in a direct line with the direction of pull
- Should the wrench slip, it could strike the person using it if this precaution is not followed

2. Speed Wrench

The speed wrench looks very similar to the track wrench except for having one shorter jaw, and the jaws are slightly curved in.

- This allows the wrench to turn a nut with the long jaw but disengage when turned back
- The action needed to tighten or loosen a nut then is just a swinging motion back and forth

Care must be taken when using the speed wrench in that this wrench is to be used to quickly tighten or loosen a nut

The Speed wrench should not be used to tighten the nut to full torque.

The wrench is not strong enough to be used in full torque and may let go or break under load.

3. Short-handled wrenches

Short-handled wrenches may be used for several jobs around switches.

- These are usually open-end wrenches, either of fixed jaw or adjustable design
- These are used in areas such as operating-rod adjustment, switch rod bolts and switch clip bolts

- The important precaution in using such wrenches is to avoid positions that can lead to injured knuckles
- Also, adjustable jaw wrenches should always be turned towards the open end of the jaws

Another type of wrench sometimes used in track work is a socket wrench with a T-handle.

- One use of such a wrench is to install and remove lag screws used in grade crossing timbers
- It is also used to remove drive spikes when they are used for similar purposes

Lag screws have a relatively flat pitch to the threads, whereas drive spikes have a steep pitch.

While drive spikes are intended to be installed with a spike maul, it is important to avoid such tools when installing lag screws.

- They are intended to be screwed into position, and they will loose much of this holding power if hammered into place.
- Also, some types of adjustable stock rail braces have bolts for which this type of wrench is suited

This type wrench can be used by two people if necessary in order to develop additional torque.

- Even more force can be developed with a pipe extension on one end of the handle

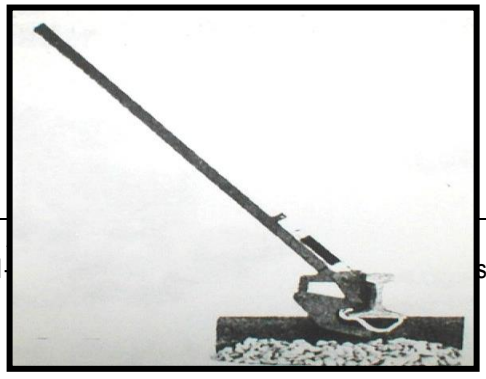
4. Rail Anchor Wrench

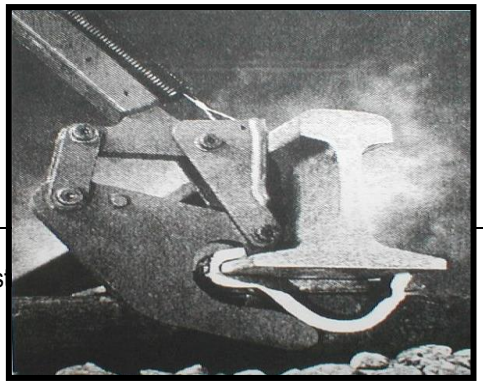
One other tool which is called a wrench is the so-called **Rail Anchor Wrench.**

This tool is not used for turning nuts on bolts. Its only use is to apply certain types of rail anchors to the base of a rail.

- These types of rail anchors are known as the **spring types**

The position which the person using this tool assumes is quite similar to that required to use a claw bar.





The principal concern when using the rail anchor wrench is to assume a position which is firm of footing and well balanced, in case the tool should slip off the rail anchor.

There are two principal types of spring rail anchors in use.

If both types are in use on your transit, it must be remembered that each manufacturer provides a wrench that is suitable only to this type of rail anchors.

The two types of rail anchor wrenches cannot be used effectively to install the competitor's type of rail anchors.

D. Rail & Tie Handling Tools

1. Rail Tongs

Another important group of track tools is designed for handling material. Included in this group are the **rail tongs** Two people are required to use one set of rail tongs.

One advantage of the design of the rail tongs is that when attached to a rail at ground level, the handles of the tongs are at a good height for making a heavy lift.

The length of the handles is another good feature because it permits those using the tongs to keep this feet clear of the rail being handled.

An important point in the use of rail tongs ís the necessity of teamwork among all who are assigned to handle the rail.

This requires that one person, and only one person, give orders related to moving the rail.

They should position each pair of people properly, prior to any lifting.

In addition, before a lift is made, all involved should know just where the rail is to be moved on that particular lift.

This decision should be based on the weight of the load in relation to the number of people lifting, obstacles in the way, such as another rail or a ballast shoulder and whether some of the people will have to move backward over obstacles.

When all understand what is to be done, give clear comands to lift, carry and set down the rail, care should be given so all can work in unison.

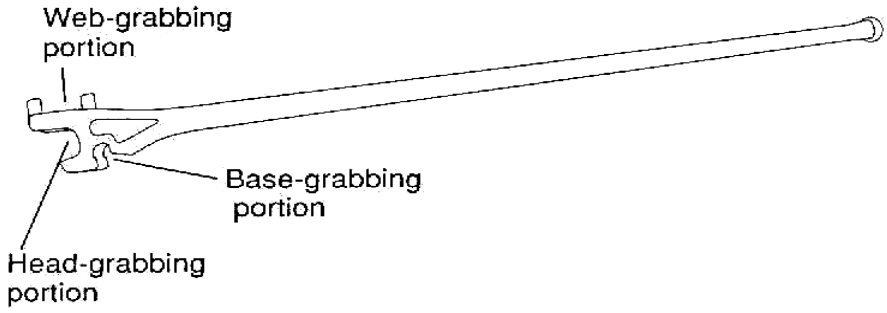
At times an actual lift of the rail can be avoided by rolling the rail.

2. Rail Fork

The rail fork is capable of grasping either the head, web or the base of the rail, depending on its position at the moment.
By pulling on the end of the shaft, the torque that can be developed in many cases is sufficient for one person to roll the rail.

Under some conditions it may be necessary to use two people, each with a rail fork, one at each end of the rail, in order to roll the rail.

- Again, it is necessary that anyone using this tool be careful of this position in order to prevent falling or twisting this back if the rail fork slips.



It is also necessary to be alert to the movements of others in the vicinity so that the rail is not rolled onto someone's font.

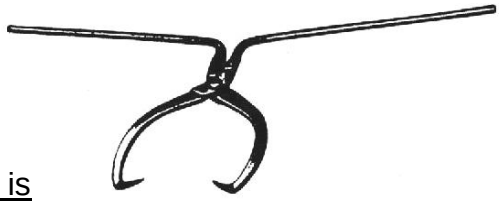
3. Handling Ties and Timber

The correct name for the tool is **tie tongs.** The tie tongs are designed as a one-person tool. Or tie tongs as a two-person tool.

The tie tongs will generally be used for minor adjustments in the position of a tie or possibly re-moving ties from track if they can be pulled out easily.

Tie tongs will frequently be used with teams of four people using two pairs of tongs to carry ties when they have to be moved greater distances.

Two person tie tongs



- For this type of operation, coordination is required comparable to that described for the use of rail tongs

Tie tongs will only retain this grip on the tie being handled as long as a lift is being made on each of the handles.

- Furthermore, this grip will only be effective if the points are capable of biting into the wood

Tie tongs will not work well with Azobie ties, the wood is too hard for the tongs to bite into. And will not work at all with the concrete ties.

For this reason it is essential that sharp points be maintained. This is best done by grinding as necessary.

E. TRACK JACKS

There are a great many uses for the track jack, but the most frequent ones are for surfacing and lining track.

1. Manual Jacks

Function: Track jacks are used to lift the track when surfacing, to lift heavy objects and to line track.

There are two sizes of jacks in general use.

1. The smaller is intended for lining track and for small lifts such as spot tamping.
   15 Ton Capacity
   5¼" Stroke with a toe lift area of 2½" X 3¼"
   Weighs just 30 LBS.

2. The large track jack is suitable for higher lifts that may be required in a general raise of a track and for manual track lining.

15 Ton Capacity

13" Stroke with a toe lift area of 2½" X 3¼"

Weighs just 50 LBS.

The Quick Trip Mechanism Allows Track Jacks to be Instantly Tripped <u>While Under Load.</u>

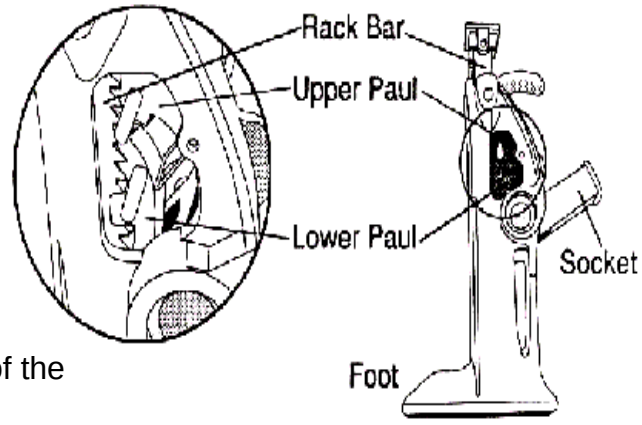
Solid cast base for extra strength.

Jacks are essential tools in track work, but there are quite a few precautions that need to be followed in this use.

<u>An improperly used jack may be hazardous to the person using it, to this fellow workers, or even to trains and equipment.</u>

It should be recognized that anyone who does not use care in handling a jack can easily sustain an injury.

Safety Precautions:



- Report defective jacks to the Foreman
- Do not oil or grease the ratchet teeth
- Keep fingers clear of pinch points
- Avoid getting hands caught in any of the moving parts
- Never leave the jack bar in the socket when the jack is not actually being raised or lowered

Always place track jack on the field side of the rail unless the third rail is in the way

Jacks have a number of moving parts.

- Getting a finger caught in such parts could be painful and perhaps result in amputation.
- Jacks are heavy and awkward to handle if they have to be moved any distance

The latches and notches of track jacks should be kept clean and oiled.

This is not always as easy as it may seem.

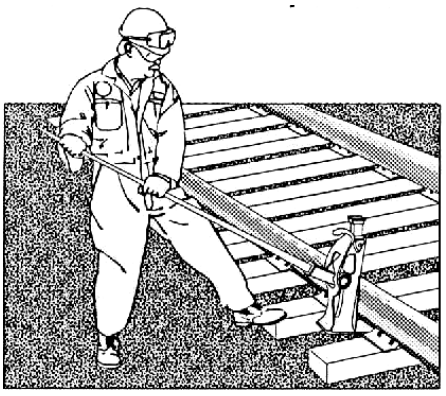
- The large jacks, if stored in an upright position can be bumped and fall onto someone's foot
- This presents no particular problem if a safe storage point is provided in the tool cage or truck

Out on the job, it becomes another matter. The need to keep the essential parts of jacks clean and the need to keep the presence of the jacks from becoming a hazard to those nearby may conflict

a) Procedures for Proper Use on the Job:

Lifting track

1. Dig a hole under the rail where the track jack is to be placed.
2. Place the foot of the track jack under the base of the rail.
3. Install the track jack square to the rail and in a vertical position.
4. Fix the jack into position by either lifting on the rack bar or pumping the socket by hand until the lifting portion of the rack bar contacts the base of the rail.
5. Put the square end of a jack bar into the socket of the track jack.
6. Stand on the same side of the rail as the track jack with both feet on one side of the jack bar.



7. Apply downward pressure using body weight until the upper pawl notches into the next position on the rack bar.
8. Lift up the jack bar until the lower pawl notches into next position on the rack bar.
9. Continue jacking by repeating steps 7 and 8 until desired height is reached.

If two workers are required to pump a jack, the workers should be on opposite sides of the bar and on signal, pump together.

Good judgment needs to be exercised depending on local conditions.

When placing a jack in preparation for a lift, a good foundation should be provided.

The jack should work straight against the load to be lifted. If the jack starts to tilt, it should be lowered and the foundation adjusted.

The exception to this is found in track lining operations where the jacks are deliberately set on an angle.

- The small jacks designed for this operation have a specially notched head to fit the base edge of the rail while in this position

A proper handle should be used for operating jacks. **A claw bar is not a proper handle.**

A **jack bar** has a square end which is inserted into the socket.

- Frequently, a pointed-end lining bar is used. (Make sure that it is a snug fit into the jack.)
- A loose fitting bar will have a tendency to pull out of the jack possibly causing an injury

When making a downward pull on a jack handle, all of the precautions previously explained about footing and position should be followed.

It should be remembered that until the latch engages, the jack handle is going to be under pressure to spring back up.

The operator of the jack should keep this head clear of the line of travel of the jack handle.

If one person cannot exert enough force to make the jack latch, someone else should help them.

He/she should not attempt to sit on or step on the jack handle.

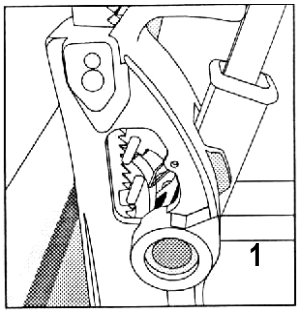
If two people cannot exert enough force, then a second jack should be used.
Once a load has been jacked to the desired position, if it is desired to hold the jack under load, the jack handle should be removed.

- No one should put any part of this body in a position where it would be caught should the jack drop unless the load is safely blocked
- As an added precaution, no one should trip a jack before warning everyone in the vicinity and making certain they are clear

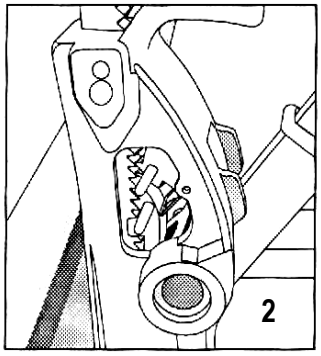
When jacking a track, the jacks should be placed on the field side of the rails unless an obstruction makes this impossible.

The exception to this is track-lining operations where one rail will be jacked from the guage side and the other rail from the field side.

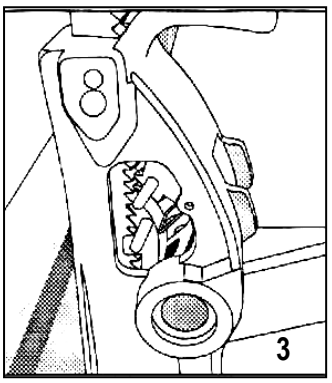
b) Dropping a track jack



a. Notify other workers that the track jack is being dropped.
b. Be sure everyone is standing clear
c. Lift up on the jack bar to disengage lower pawl from the rack bar.(1) Pull back and hold the pin on the lower pawl.



(2) Slowly lower the jack bar under the lower pawl engages the notch in the upper pawl. (3) Apply downward pressure to the jack bar to drop the jack.



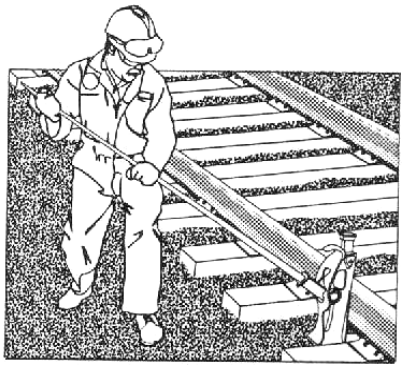
Lowering a track jack one notch at a time. Stand on the same side of the rail as the track jack with both feet on one side of the bar.

c) Walking down the jack

1. Put the square end of the jack bar in the socket of the track jack.
2. Lift up on the jack bar.
3. Disengage the lower pawl from the rack bar.
4. Lower the jack bar at same time as you engage the lower pawl into the next higher notch on the rack bar.
5. Apply downward pressure on the bar.
6. Disengage the upper pawl from the rack bar when it is loose.
7. Slowly lift up on the jack bar at the same time as you engage the upper pawl into the next higher notch on the rack bar.
8. Repeat steps 3 through 8 as required.

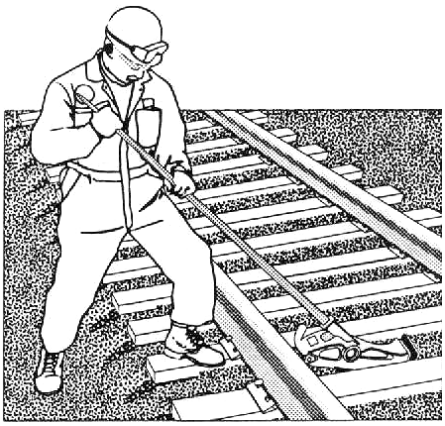
d) Shaking a track jack to drop it.

1. Put the square end of the jack bar in the socket of the track jack.
2. Stand on the same side of the rail as the track jack with both feet on one side of the bar.
3. Holding the jack bar, shake the track jack by moving the jack bar from side to side.
4. Twist the track jack out from under the rail.



e) Lining track (This procedure requires at least two people and two jacks).

1. Dig out the ends of the ties in the direction to be lined.
2. Dig two holes in the ballast between the ties about a jack length long, one hole between the rails and the other on the field side of the rail opposite end from where the tie ends have been dug out.
3. Dig the holes deep enough so that when each jack is put in its hole, the top of the jack its against the base of the rail.
4. Ensure both jacks will push the track in the desired direction.
5. Brace the base of each jack to prevent plowing. (A tie plate may be used for this purpose).
6. Workers pump jacks together on signal.
   Note: When operating the jack in this position, workers must push on the bar. Care must be taken to ensure adequate footing and to maintain proper balance.
7. Drop or shake the jacks loose when the track has shifted the required amount by following the procedures previously listed.



2. Jack Bar

This tool has one primary use, that is it's use in conjunction with a track jack. This bar has a larger shank that fits tightlly into the section of the jack used for raising or lowering the jack.

Also with the wedge shape at the end of the bar allows it to be used to nip up the rail.

3. Lining Bar

This tool has a number of uses. Prior to mechanization of track work, much newly raised track was lined by crews equipped with lining bars.

At such times the track is sufficiently loose to be moved small distances laterally by this method and it could be done more quickly than by jacking.

Mechanized lining equipment has largely replaced this practice. Still, the lining bar remains an important tool. It is effective in lining rails to guage prior to spiking.

It can also be used to roll a rail when a rail fork is not available. But great care must be taken, the lining bar can snap back apon the worker causing injury.

This is done by placing the handle end of the lining bar in a bolt hole and twisting the rail.

- Care must be exercised in this operation for once the rail passes the balance point, the bar must be quickly restrained or removed.

This operation should only be performed by experienced people, and should be avoided and preference given to the use of a rail fork if available.

Another use of the lining bar is that of nipping up a tie end as the tie is being tamped, spiked or cliped. In this operation, avoid sitting or standing on the lining bar.

F. TOOLS FOR BALLAST WORK

One series of tools used in track maintenance consists of those used for digging and handling ballast and other loose materials compaction is attained.

1. Pick

A type of pick is the clay **pick** which is pointed on one end and has a chisel type edge on the other end..

Sometimes picks are furnished with points on both ends. These types of picks can be used in general digging operations as well as for loosening ballast that requires further handling.

There are certain precautions to be followed in any type of pick work.

- It is always necessary to make sure that no one is within or likely to move within the swing of a pick
- A person not accustomed to working with a pick should be watched closely to make sure that they do not have this feet placed where they might strike themself with a misdirected swing
- If the material being worked is of a nature that particles are likely to fly off when a pick is used, then goggles will be necessary to protect the eyes of the work force.

2. Ballast Fork

The basic tool used to move stone ballast is the **ballast fork**.

Ballast forks usually come in two sizes.

- The smaller has ten tines
- The wider one has fourteen tines

The ten-tine fork is particularly suited to work within the restricted clearances of tie cribs or for digging moderately compacted ballast which does not require loosening with a pick.

The larger capacity fourteen tine fork is more efficient at moving larger volumes of relatively loose ballast.

Ballast forks are also used at times as tamping tools. They are effective where relatively large voids must be filled under the ties

- A high degree of compaction is not obtained with this type of tamping

3. Ballast Shovel

Track shovels have a square edge, moderately flat sides and are not particularly large.

- They may be available with either short or long handles depending on local preference.

Various other shovels are also in common use particularly with larger scoops intended for handling volumes of loose material. Shovels designed for removing snow from the cribs of switches.

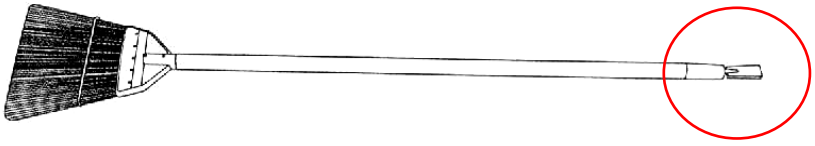
One particular note of caution should be observed when laying down any shovel or ballast fork.

Always lay it on the ground with the sharp edge downward. Someone who might not see it could end up with a nasty cut on the leg.

4. Track Broom

A useful track tool is the broom. Track brooms are considerable stiffer than household brooms as they are subjected to much more rugged usage.

They are particularly effective in removing snow from between switch points and stock rails. They are also useful in sweeping spills or other materials from switch plates.



Sometimes the end of the broom handle is provided with a steel chisel point tip.

- This can be useful in scraping ice or other materials adhering to switch plates, points and stock rails; but such a tip needs to be treated with respect when using the broom end of the tool.

G. HAND TOOLS FOR CUTTING TIES

Track crews are usually provided with various tools for cutting operations.
One of these is the **track adze**.

1. Track Adze

When, because a tie has become plate-cut, a new seat must be cut in the tie to provide adequate bearing for the tie plate, the track adze may be used.

This tool can be particularly dangerous in the hands of an inexperienced person who does not have a proper understanding of what can happen.

1. In the first place, the cutting stroke with this tool is made toward the direction in which the user is standing.

2. Secondly, the cuts made with this tool are frequently at a flat angle.

This can result in glancing blows. It is of great importance that anyone using this tool have a constant regard for the position of this feet in relation to the area in which cuts are being made. A well controlled swing is also necessary.

H. GAUGE AND CROSS-LEVEL TOOLS

The next group of tools is the one which is used primarily by the foreperson, track inspector or anyone measuring track gauge..

It should be noted that the points which bear against the guage sides of the rails are 5/8-inch below the top of the rail head.

- This is the proper location at which to measure track guage

If using a tape, rule or some other device to measure guage, it should always be measured between points **5/8-inch below the top of the rail head**.

- It can be seen that this tool also has provision for properly setting a frog guard rail in relation to the frog (the guard-check guage).

1. TRACK GAUGE

Description: Track gauges come in several different shapes and models from a steel pipe with Lug & Tee to an automated, computerized continuous gauge measurement system.

The GEISMAR Multi-Gauge (shown below) is a combination track gauge and level. (type used here at MARTA)

Features:

- Weight – 5 ½ pounds, made of aluminum channel section
- Measures track elevation and track gauge with two graduated dials protected in plastic
- Elevation measurement from –1” to +8”
- Both fixed and telescopic supports are insulated
- Balanced carrying handle
- Star type knobs for ease of adjustment
- The gauge pulls apart for easy storage and transport.

Function: A track gauge is used to measure the distance between the rails of a track and to check the crosslevel and elevation of the track.

a) Using The Track Gauge

1. Set the gauge dial to zero and measure with a tape measure the distance between the outer edge of the single wheel lug and the out edge of the double wheel lug. If this distance is not exactly 56 ½”, loosen the Allen set screw holding the single wheel lug and adjust the distance.
2. Place the track gauge between the rails.
3. Set the double wheel end snugly against the gauge side of the rail head on one rail.
4. Rock back and forth on the double wheel end to ensure the gauge is square to the rail.
5. Set the single wheel end down against the gauge side of the other rail.
6. Turn the star knob until the single wheel is tight against the gauge face of the rail and read the gauge from the graduated dial labeled **GAUGE**.
7. Always measure track gauge **5/8" below the top of the rail**.

b) The Guard Rail Gauge

1) Having already checked the gauge for accuracy, the guard rail gauge can be used.
2) This gauge is used to measure the **Guard Check Gauge** at a frog.
3) Place the double wheel lug against the frog insert and the single wheel lug between the running rail and the guard rail.
4) By moving the same star knob used to measure gauge so that the single wheel is tight against the guard rail face, the guard check gauge is read off the **Guard Rail** dial.

c) The Flangeway Gauge

1) Place the RCA on the track so that the double wheel lug rests against the frog insert as above.
2) Pull the brass pin back (toward the other rail) until the single central wheel is tight against the guard face of the wing rail.
3) Read the flangeway gap from the flangeway dial.
4) By subtracting the flangeway gap from the Guard Check Gauge, the **Guard Face Gauge** is determined.

2. The Track Level

a) Before using the level portion of the gauge, check it for accuracy. Set the elevation dial to **zero** by turning the star knob to the correct setting.
b) Place the level on a portion of relatively level track as you would in order to measure gauge (make sure the wheel lugs are not on top of the rail head).
c) **Note**: Where the bubble comes to rest, pick the gauge up and turn it end for end then place it in the track again. Once again check the position of the bubble. If the bubble comes to rest at the same position, the gauge is in calibration. If the bubble is in a different position, turn one adjustment screw on the bubble level until the bubble moves ½ the distance between it's first position and it's second position.

Pick up the gauge and turn end for end again and repeat this process until the bubble always returns to the same position. The gauge is now calibrated.

d) To use the track level, place the gauge on the track as you would in order to measure track gauge (making sure the single wheel lug is on the lower rail)
e) Turn the star knob beside the **Elevation** dial until the bubble is centered in the glass.
f) Read the elevation off the Elevation dial noting which rail is higher.

3. Tape Measure

This can be used to check an occasional guage point when a track guage is not readily available, as well as a number of other measurements

A foreperson or other track personnel will have to measure the lengths of rails at various times; sometimes a rail will have to be cut in order to it at a certain location.

For such work a longer tape line will be needed. The most practical length for track work is a 50-foot tape.

There are three basic types in general use.

1. **Cloth tape**. Advantages of this are its relative economy and lack of electrical conductivity.

- The latter quality can be important in track territory where there are signal circuits within the rails that could be shunted by a tape which will conduct electricity and areas where third rail power exists.

Although these are low voltage circuits, completing a circuit with a metal tool or tape will give the same signal indications that a train at that location would.

Also, the cloth tape will not conduct electricity when it comes in contact with the **Third Rail**.

A disadvantage of the cloth tape is the limited accuracy due to its tendency to stretch, particularly when wet.

2. **Cloth metallic tape**. This is a cloth tape containing metallic strands which reduce the tendency to stretch. This type must be used with care to avoid fouling signal circuits.
    - The advantages are that it is still fairly economical, and if it is kinked it is not likely to break

3. **Steel tape**. These are relatively expensive and if kinked are likely to break. This type is most likely to foul signal circuits if it touches both rails at the same time or if it touches rails on either side of an insulated joint at the same time

Also if this tape comes in contact with energized 3rd rail serious injury or harm can occure

If properly cared for, it can be the most durable. If it gets dirty or greasy, it is the easiest to clean.

Any tape that gets wet should not be allowed to remain in its case in this condition for any length of time.

Cloth and metallic tapes should be left out of the case to dry overnight. Steel tapes should be dried off, cleaned and lightly oiled as quickly as possible.

I. MISCELLANEOUS TOOLS

There are other measuring tools that you may be expected to have. If your duties include classifying rail, which is removed from track for reassignment, you may need special calipers or guages to measure wear on the rail head.

1. Rail Thermometer. Rail temperatures can differ appreciably from air temperatures, particularly in direct sunlight. Rail temperatures are important in working with welded rail. This subject will be covered in another lesson.

Rail temperatures are measured on the web/base of the rail that is out of direct sunlight. Keep it on the web/base for 10 minutes. (If measured in direct sunlight the rail thermometer will heat up because of the sunlight, causing an inaccurately high reading).

Do not remove thermometer from the rail to read the temperature. Read temperature as it sits on the web/base of the rail.

2. Turnbuckle

1. Tool is designed to work in turnouts and tangent track giving employees the ability to push or pull rail on component parts.
2. Safer and more efficient than a lining bar or track jacks.
3. Allows employee to move rail or track components easily to exact location, then holds until fasteners are applied.
4. Works great with timber, concrete, or steel turnouts.
5. Preferred alignment tool by many as head of rail canting compensation need not be used as with a top of rail alignment tool.

3. Gauge Rods

Gauge rods are used to help maintain proper track gauge but are not a substitute for good track maintenance and good tie or pad conditions. Used on:

(1) Sharp curves where there is difficulty holding the gauge.

(2) In turnouts just ahead of the switch points and on the curved closure rails.

a. Spacing. Where gauge rods are used in sharp curves, two to four rods should be installed for each rail length. Rods should be installed at evenly spaced intervals along the rail length.

b. Application. Gauge rods should be installed at right angles to the rail with the jaws firmly gripping the base of the rail.

c. Inspect the gauge rods for cracks, loose or missing bolts or missing or damaged insulation. Insulation missing on a gauge rod will drop a track circuit causing a disruption in service.

4. The Track Liner:

1. With a lining bar, this device is used to align tangent and curve track.
2. These liners allow for controlled lining of track.
3. No digging at end of ties is necessary.
4. Light and compact - liner weighs just 28 lbs.

You may not have occasion to use every tool which has been discussed in this lesson, but every track person will have occasion to work with most of them. It would be possible to add to the list of tools considered in this lesson, but this would include tools of limited use.

- Most of the precautions that would be applicable to such specialized tools would be similar to those already described.

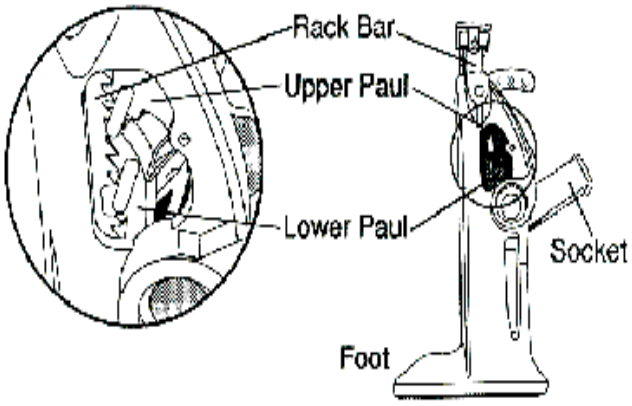
J. TOOL CARE

It should always be remembered that an improperly used tool or a defective one can be hazardous. The proper use of tools requires education and supervision of those who use them. The elimination of defective tools requires regular inspection.

A competent person plans in advance so that if a tool becomes defective, it can be set aside and another one will be available to replace it.

- They also take advantage of opportunities for inspecting tools and for carrying out repairs which the crew can make.

Most tools can be sharpened at the M.O.W. building. Some may be sharpened on the job. Cracked handles can be replaced by the crew. Jacks must be cleaned regularly and oiled as necessary. waiting for use of track to perform the job at hand.



These things can be done during periods of rain, or while waiting to get on the track.

Those tools which cannot be repaired locally should be placed in a designated location, so they are not mixed with usable tools. If you are not aware of the proper disposal of such tools, you should inquire.

The area in which tools are stored, either at the M.O.W. shop or on your means of transportation should also receive your attention.

A jumbled pile of tools may be a difficult situation for finding the proper tool. Extracting the proper one from the heap could be hazardous and such a practice could also lead to problems such as broken wood handles, damaged tools or chipped cutting edges.

K. TRANSPORTATION VEHICLES

The safe operation and reliability of this vehicle is essential to the efficient operation of the track crew.

Generally, care in operation and maintenance is much more important than age of the vehicle in attaining these goals.

An employee who operates a Hi-rail vehicle or any other maintenance equipment on a track must first pass the necessary examination in the company's operating rules.

Such examination procedures are invariably well defined and need not be covered here. In addition to such requirements there are other matters related to the use of such equipment to consider.

If highway equipment with rail-wheel attachments is involved, there will be special instructions for the operation and maintenance of such equipment issued either by the manufacturer or by MARTA.

In all on-track operations of maintenance equipment, there is a tendency to go from point A to point B and later to return to point A.

It should always be remembered, whether a rail-bound or a hi-rail vehicle is involved, that the radiator is not being cooled while moving in reverse.

- Except for short moves, it is necessary to head the vehicle in the opposite direction so that it will be moving forward.

L. VEHICLE OPERATION ON TRACK

Care must always be exercised in the operation of rail-bound and hi-rail vehicles to avoid derailing. In comparison to locomotives and rolling stock, maintenance vehicles are lightweight and of relatively short wheel-base.

Frequently the construction is such that the axles are mounted without springs.

These factors make such equipment more vulnerable to derailments under certain conditions. Hi-rail accesses with foreign material in the flangeways are such a case. Irregular track surface can derail such equipment.

Operators of on-track equipment need to be constantly aware that when a derailment occurs they have no steering control.

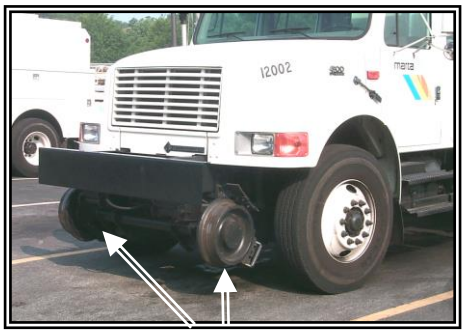
A derailment at even a moderate speed can have disastrous consequences, particularly if it occurs at a bridge, aerial structure, tunnel or other such location.

- Also a derailment can dump the rail-bound or hi-rail vehicle into ether the third rail, which may be energized, or into live track (with train traffic)

Another condition which must always be considered in the operation of on-track equipment is the stopping distance.

The braking capability of a steel wheel on a steel rail is substantially less than that of a rubber tire on a paved highway

A distance which is adequate for braking under normal conditions can become completely inadequate in another situation.



High-rail wheels

<u>A descending grade, wet or greasy rails or an increase in load can drastically increase the distance required to stop</u>

Loads must be considered in a number of ways. Frequently, loads will consist of a combination of personnel, tools, equipment, materials and supplies.

- All of these things must be considered in determining the total load in the vehicle

- Know the legal load limit of highway vehicles with which you work
- Know the capacity of on-track equipment such as hi-rail vehicles and trailers

In order to use this knowledge effectively, it would be well to have some notes available for ready reference on materials and equipment you may have to haul.

Find out and make notes on the weight of a rail, a tie, a joint bar, an acetylene cylinder, a track jack and so forth. Then if a question comes up as to a load, you can readily estimate it.

Loads must also be arranged so that they do not shift or fall off the vehicle.

- Where it is necessary to haul both personnel and equipment, the personnel must not be exposed to any potential hazard from the equipment
- Know your-state laws and any safety rules your company may have concerning the transportation of materials such as gasoline and acetylene

When moving equipment on track, one or more trailers may be coupled to the propelling equipment.

While such trailers can be either pushed or pulled by the propelling equipment, it is generally preferable to pull it.

- Pushing tends to increase the possibility of derailment
- Moreover, if a derailment should occur, the hazards are greater in a pushing situation

For example, visualize the dangers in volved if a trailer hauling rail is pushed by a vehicle hauling personnel. Should the rail-hauling trailer derail, it is entirely possible for rail ends to enter the personnel compartment

The following practices are recomended in the operation of such trailers:

- Pull the trailers whenever possible

- If it is necessary to begin a movement by pushing, take advantage of the first available turnout to shift the equipment to a pulling situation, unless the distance involved is short
- If necessary to push, operate at slower than normal speed, paying particular attention to possible hazards ahead such as flangeways, curves and turnouts

M. OPERATORS MUST BE RELIABLE

Whether the vehicle involved is a highway vehicle, hi-rail vehicle or rail-bound equipment, there will normally be an assigned operator.

The operator must understand that he/she is responsible for both the safe operation and maintenance of the equipment.

Responsibility for maintenance does not mean that the operator will be required to make major repairs.

They should be required to make regular inspections to assure proper operation and availability of such things as fuel, motor oil, coolant, brakes, battery, windshield wipers, tire condition and pressures, flagging equipment and lights. They should be required to keep the vehicle clean and orderly.

All personnel are to be safely located before moving.

Personnel should know, and not just assume, that it is safe to back up before doing so.

- At times this may involve requesting someone to get off the vehicle and give hand signals

This lesson is not intended to be an operation manual for having hi-rail or rail-bound equipment on the track.

This type of operator training are offered in the " ON-TRACK EQUIPMENT OPERATOR CERTIFICATION" training course, which is offered as a separate lesson.

In addition to the hand tools and basic facilities available to most track crews, which have been discussed in this lesson, there are personel power tools available and a great variety of larger types of specialized equipment used in track work.

It is not the purpose of this lesson to deal with this mechanized equipment.

This lesson should provide you with a working knowledge of the basic equipment used in a wide variety of track maintenance, construction and inspection work.

If you apply this knowledge toward the goal of training yourself to be competent in the use of these tools and equipment, you will be ready when you are to tackle the most complex tasks in trackwork.

Review Questions for Track Tools & Basic Equipment

1. Name five jobs that track tools may be required.

2. Name the five parts of a claw bar.

3. Will a cracked or broken hammer handle effect the hammers ability to preform its job safely and why?

4. What is the tool used to drive down spile stubs and drive out huck bolts from joint bars?

5. Name the three parts of a rail fork used to turn rail.

6. Why wont tie tongs work on azobe and concrete ties?

7. What part of the track jack should never be oiled?

8. A track adze is used for what purpose?

9. Name the three parts of a level board.

10. Decending grades, wet or greasy rail ro an increase in load can cause what to happen to a hi-rail vehicle?

11. Name the tool used to pull spikes in an area wher a claw bar cannot reach.

12. Tool used to drive down spikes.

13. Tool used to lift a load and to line track.

14. Explain the difference between a lining bar and a jack bar.

15. Describe how to measure track gauge.