

MSHA Part 46 New Miner Online Training

Module 3

Traffic Control, Transportation, and Equipment Safety

MSHA Training Requirement:

Instruction on the recognition and avoidance of hazards such as traffic patterns and control, mobile equipment (e.g., haul trucks and front-end loaders). [Section 46.5(b)(2)]

Learning Objectives:

1. Understand the importance of adhering to traffic control and equipment operation procedures in mining operation.
2. Apply safe transportation practices for inspecting, operating, and parking to prevent injuries and equipment instability.
3. Ensure that you can transport people and materials securely.
4. Reduce the risk of hazards and injury when loading and unloading.
5. Identify and describe various safety devices used in mining.
6. Understand the basic maintenance procedures for roadways and worksites.
7. Navigate conveyors, elevated structures, and walkways safely.

Module Sections

- 3.1 How to Safely Operate Your Equipment
- 3.2 Equipment Operation Procedures
- 3.3 Transportation of People and Materials
- 3.4 Safety Devices and Procedures for Roadways and Railroads
- 3.5 Roadway and Worksite Maintenance
- 3.6 Travelways and Ladders

Code of Federal Regulations Reference Material

This module covers important topics from 30 CFR 56 Subpart H (Loading, Hauling, and Dumping) and Subpart J (Travelways); and 30 CFR 77 Subpart Q (Loading and Haulage).

CFR Subtopic Regulations: 30 CFR 56 Subpart H (Loading, Hauling, and Dumping)

- 56.9100 Traffic control.
- 56.9101 Operating speeds and control of equipment.
- 56.9102 Movement of independently operating rail equipment.
- 56.9103 Clearance on adjacent tracks.
- 56.9104 Railroad crossings.
- 56.9200 Transporting persons.
- 56.9201 Loading, hauling, and unloading of equipment or supplies.
- 56.9202 Loading and hauling large rocks.
- 56.9300 Berms or guardrails.
- 56.9301 Dump site restraints.
- 56.9302 Protection against moving or runaway railroad equipment.
- 56.9303 Construction of ramps and dumping facilities.
- 56.9304 Unstable ground.
- 56.9305 Truck spotters.
- 56.9306 Warning devices for restricted clearances.
- 56.9307 Design, installation, and maintenance of railroads.
- 56.9308 Switch throws.
- 56.9309 Chute design.
- 56.9310 Chute hazards.
- 56.9311 Anchoring stationary sizing devices.
- 56.9312 Working around drawholes.
- 56.9313 Roadway maintenance.
- 56.9314 Trimming stockpile and muckpile faces.
- 56.9315 Dust control.
- 56.9316 Notifying the equipment operator.
- 56.9317 Suspended loads.
- 56.9318 Getting on or off moving equipment.
- 56.9319 Going over, under, or between railcars.
- 56.9330 Clearance for surface equipment.

CFR Subtopic Regulations: 30 CFR 56 Subpart J (Travelways)

- 56.11001 Safe access.
- 56.11002 Handrails and toeboards.
- 56.11003 Construction and maintenance of ladders.
- 56.11004 Portable rigid ladders.

- 56.11005 Fixed ladder anchorage and toe clearance.
- 56.11006 Fixed ladder landings.
- 56.11007 Wooden components of ladders.
- 56.11008 Restricted clearance.
- 56.11009 Walkways along conveyors.
- 56.11010 Stairstep clearance.
- 56.11011 Use of ladders.
- 56.11012 Protection for openings around travelways.
- 56.11013 Conveyor crossovers.
- 56.11014 Crossing moving conveyors.
- 56.11016 Snow and ice on walkways and travelways.
- 56.11017 Inclined fixed ladders.
- 56.11025 Railed landings, backguards, and other protection for fixed ladders.
- 56.11026 Protection for inclined fixed ladders.
- 56.11027 Scaffolds and working platforms.

CFR Subtopic Regulations: 30 CFR 77 Subpart Q (Loading and Haulage)

- 77.1600 Loading and haulage; general.
- 77.1601 Transportation of persons; restrictions.
- 77.1602 Use of aerial tramways to transport persons.
- 77.1603 Trains and locomotives; authorized persons.
- 77.1604 Transportation of persons; overcrowding.
- 77.1605 Loading and haulage equipment; installations.
- 77.1606 Loading and haulage equipment; inspection and maintenance.
- 77.1607 Loading and haulage equipment; operation.
- 77.1608 Dumping facilities.

3.1 HOW TO SAFELY OPERATE YOUR EQUIPMENT

Understanding safe equipment operations in the mining industry is critical to ensure the safety of workers and protect equipment. The rules outlined in 30 CFR Part 56 Subpart H (Loading, Hauling, and Dumping) outline specific guidelines to prevent accidents and maintain an organized work environment.

In this module you will review the key regulations that focus on managing traffic control and equipment operations at mine sites.

You will learn how to:

1. Understand the importance of adhering to traffic control and equipment operation procedures in mining operation.
2. Apply safe transportation practices for inspecting, operating, and parking to prevent injuries and equipment instability.
3. Ensure that you can transport people and materials securely.
4. Reduce the risk of hazards and injury when loading and unloading.
5. Identify and describe various safety devices used in mining.
6. Understand the basic maintenance procedures for roadways and worksites.
7. Navigate conveyors, elevated structures, and walkways safely.



3.1: Proper traffic control is essential to maintaining both safety and efficiency at a mining work site

Module Warmup

Why equipment operations matter?

Knowing traffic rules and equipment operation procedures is crucial to ensuring your safety. Mines are complex environments with heavy machinery, vehicles, and workers all operating in close proximity. When you understand the procedures for speed, right-of-way, and transportation of people and materials, you can help maintain an orderly and safe flow of traffic. This will minimize confusion, enhance efficiency, and ensure safe evacuation in case of an emergency. Additionally, when you understand how to inspect, operate, and protect your equipment, then you are reducing hazards for yourself and others.

Key Terms: Common Equipment Operations Concepts and Definitions

Let's review some common concepts and definitions.

- **Backguard:** a protective vertical barrier installed on ladders or scaffolds to prevent falls by providing a guard behind the user.
- **Berms:** Raised barriers along roadways to prevent vehicles from overturning or going over the edge.
- **Dumping Facilities:** Specific areas designated for depositing mined materials, which must be inspected for safety.
- **Fixed Ladders:** Permanent ladders installed in the mining area, which must be securely anchored and maintained for safe use.
- **Guardrails:** Safety barriers installed on roadways to prevent vehicles from falling off.
- **Rail Equipment:** Vehicles or machinery that operate on railway tracks within mining operations.
- **Restricted Clearance:** Areas where the space available for equipment or personnel is limited, requiring clear marking and warning devices.
- **Safety Belt:** Protective equipment to prevent falls by distributing the force of impact and stopping the worker from hitting the ground in the event of a fall.
- **Self-Propelled Mobile Equipment:** Vehicles or machinery that can move independently, often used in mining operations.
- **Toeboard:** A barrier along the floor of a platform to provide support; it is typically between 4 and 12 inches high.

Preparing for Learning How to Safely Operate Your Equipment

Many of the federal regulations concerning how to operate your equipment may seem very technical in nature, especially if you are new to mining.

While you may encounter problems with your equipment that require special expertise, there are simple precautions you can take to better recognize and prevent accidents and improve workflow.

When you visit a mine site for the first time, or begin your work for the day, it is smart to:

- Pay attention to the traffic rules and regulations, including speed limits, signs or signals indicating hazards, and right-of-way
- Identify hazardous or potentially hazardous areas, such as wet surfaces, spilled material on roadways, or areas without guardrails
- Inspect your equipment for safety defects and understand how to use it properly
- Recall proper guidelines for the safe transporting of people and materials
- Look for whether safety and warning devices have been installed

The rest of this module will help you further understand key equipment operation and transportation concepts, why these areas are important, and how they will help you to move safely and efficiently at a mine site.

3.2 EQUIPMENT OPERATION PROCEDURES

There are many types of equipment you may encounter when working in a mine. In this section, we will look at some general principles, as well as some specific guidelines for operating machinery such as mobile equipment, tramways, and rail equipment.

General Principles

Before operating any equipment, be sure to inspect it and report any defects to the mining operator. Always check to make sure the area is clear of other workers or machines and be sure to operate your equipment in a safe and controlled manner, adhering to the signs and rules posted at the mine site. You will see this advice many times in this section because it is so important!

Additionally, as you are working and when moving between your various job areas, be sure your equipment is properly secured in the travel position. This often involves things such as lowering attachments safely and ensuring proper braking.

Working With Mobile Equipment

Inspecting

Remember, before you begin operating your mobile equipment, be sure you inspect it thoroughly. Here are some important things to look for in mobile equipment:

1. Ensure cab windows have safety glass or the equivalent and that they are clean and in good condition. Always keep your cab clean and free of clutter.
2. Check that your equipment has adequate brakes. All trucks and front-end loaders must have parking brakes.
3. Confirm that your equipment has audible warning devices. It must also have lights on both ends that should be used when needed, such as in low visibility areas or at night.

Be sure to record and report any defects affecting safety on any equipment to the mine operator; these must be repaired or corrected before you can use the equipment.

Operating

Are you familiar with how to drive a car? If so, you are already familiar with many of the guidelines for operating or driving your equipment. Below are some important principles for operating your machinery at your work site.

1. **Follow Traffic Rules:** Adhere to all posted traffic rules, signals, and warning signs at the mine site. These govern speed, right-of-way, direction of movement, and headlight use.
2. **Maintain Control and Safe Speeds:** Always operate your equipment in a controlled way and at speeds that are safe for the current road conditions, visibility, traffic, and type of

equipment you are using. Some equipment has controls on both the left and right sides, so be sure you are always facing the direction that you're traveling when using the equipment.

3. **Keep a Safe Distance:** Just like on the road, maintain a safe distance from other vehicles. Only pass where it's safe and clear to do so.

Some equipment, known as **self-propelled mobile equipment**, can move independently. As with all equipment, be sure you maintain control of the machinery while it is in motion. Operating speeds must be consistent with conditions of roadways, tracks, grades, clearance, visibility, and traffic, and the type of equipment used.

You may use large machinery that has dippers, buckets, loading booms, or other heavy suspended loads. When doing this, be sure you do not swing heavy loads over the driver's cab of vehicles until the driver has gotten out and is in a safe place, unless the equipment is built to keep the driver safe from falling materials. Similarly, you and other workers should not work, walk, or sit under the heavy loads, buckets, or booms while they are moving.

Sometimes you may use a large mining shovel in your work at the mine. These shovels are often connected by a specific electrical cable for large machines called shovel trailing cables and should not be moved unless you use cable slings or sleds. Slings and sleds are special devices that can safely transport the trailing cable to reduce risk or damage to you and your equipment.



3.2: Whether self-propelled or manually driven, heavy-duty, mobile equipment must always follow the rules listed above to maintain maximum safety

Parking, Towing, and Repairs

When you are finished operating your equipment, be sure to follow these guidelines for ensuring you and your equipment are safe and secure.

- If you are working with a machine that has a moving part attached, such as a dipper or scraper blade, be sure you secure them or lower them to the ground when you are not using them.
- If you leave electrically powered equipment unattended, make sure you turn off the main switch, put all the controls in a neutral position, and set the brakes to stop it from moving. Or, take other steps to keep it from rolling away.
- Be sure you do not leave mobile equipment alone unless you've set the brakes. If it's on a slope, turn the wheels toward a bank or berm. Or use blocks to stop it from rolling.
- When parked equipment could be a hazard for other workers or traffic, put up lights, flares, or other warning signs to let others know it's there.

If your equipment needs to be towed, be sure to use the machine's tow bars and a safety chain with each tow bar.

If your equipment's tires need to be fixed, let the air out first. And when you pump the tires back up, make sure to take measures to prevent the rims from locking. Locking rims can cause accidents because it can lead to overinflation or sudden release of air, potentially causing the tire to burst or explode.

Aerial Tramways

Inspecting

You might encounter an aerial tramway when working at your mine site. These are systems used to transport people and materials in "buckets" that are suspended from cables in areas where typical roads or railways are not possible.

Before you begin operating a tramway, be sure you inspect it thoroughly, and check for the following:

- If you are working with an aerial tramway's loading/unloading system, be sure to check this mechanism every shift.
- Also be sure to check the brakes daily and ensure that they work well and can be operated easily.
- Finally, be sure to inspect the ropes and supports as recommended by the manufacturer or as needed. Check that the cable connections are not getting in the way of the wheels.

Be sure to record and report any defects affecting safety on any equipment to the mine operator; these must be repaired or corrected before you can use the equipment.

Operating

When operating your aerial tramway, do your best to not start it until the operator has confirmed that everyone is in a secure position.

Rail Equipment

Finally, there may be **rail equipment** at the mine site. Rail equipment includes vehicles or machinery that operate on railway tracks within mining operations. There are several important things to remember when working with this equipment:

- When there are two or more rail vehicles moving on the same track, be sure they're controlled safely.
- You may be designated as a **car dropper**, which is a person who positions railroad or mine cars for loading and unloading. When moving railroad cars, you must wear a safety belt and always be in control by dropping cars safely and at a controlled pace. You want to ensure that you remain safe while working near and moving around the cars.
- Be sure you do not try to connect or separate the railroad cars by hand if they are located on a curve. Unless the train and the cars are specially made to be safe for doing this on curves, it is safer to do it when the tracks are straight, so there's less chance of accidents.
- Railcars shouldn't be left on **side tracks**, or tracks running parallel to the main railway track, unless it's safe for other tracks nearby.
- When railcars are parked, be sure you securely block them, unless the brakes are already holding them effectively. This prevents them from moving unexpectedly and causing accidents.
- If you are working with special tram cars, such as rocker-bottom or bottom-dump cars (which unload from the bottom), be sure you check that they have adequate locks to keep them from moving when they shouldn't.

In summary, if you are working with trains, safety is crucial. Keep control over cars, wear a safety belt if you're moving cars, and don't manually handle cars on curves unless it is safe to do so. Avoid leaving railcars on side tracks, and always securely block parked railcars. Check tram cars for adequate brakes, and always work safely and carefully.

Great! Now, you know a few basic procedures for ensuring your equipment moves safely at your mine site. Next, we will look at using this equipment for transportation of people and materials.

3.3 TRANSPORTATION OF PEOPLE AND MATERIALS

When working at a mine site, you may need to transport people or materials to another location. Following regulations for transporting people and materials will help you to prevent injuries, hazards such as falling materials, or unstable equipment. In this section, we will look at three elements of transportation: (1) transporting persons, (2) loading, hauling, and unloading, and (3), loading and hauling large rocks.

Transporting Persons

In general, it is unsafe to transport people in or on certain equipment at the mine site unless absolutely necessary, and unless you are able to abide by safety measures. It's simply too dangerous!

Let's imagine that you are having to help a fellow miner move materials to another part of the mining site and are now needing to ride with the operator as you transport these items.

How can you do this safely?

First, be sure the mobile equipment or vehicle is not overcrowded. Otherwise, you should not ride in the vehicle until it is safe to do so. Every worker should have a safe position for travel. You may travel in the bed of equipment only if you can do so securely, and you can take measures to prevent accidental unloading, if the equipment has an unloading function. Also know that you cannot ride in the cargo space of dump trucks or vehicles used to haul coal or other material. In short, always maintain a safe position when you are traveling!

Next, even if you are not operating the equipment, you may not ride outside of the driver's or operator's areas (also known as the cab), or outside the beds of equipment, except when necessary for maintenance, training, or testing purposes **and** when you can work securely. This is true whether the equipment is loaded or empty. However, this does not apply to rail equipment. We will discuss rail equipment in the next section!

Remember, the key is to find a safe and secure position for travel. Thus, it is important that you are not being transported in or on machinery, such as on dippers, forks, clamshells, buckets, or shovels, whether they are loaded or empty. The only exception is a specific bucket, known as a shaft bucket, which is a specialized container for a specific job in mining. You may need to access a shaft bucket for explicit duties such as inspecting, maintaining, or repairing shafts or when doing a shaft-sinking operation, which is a particular task that requires careful planning and safety measures.

When traveling, make sure that you are not riding on top of materials or supplies being transported or riding in mobile equipment with materials unless the items are secured or are small enough to fit in your hands. Also, be sure to leave your supplies, tools, and materials behind, unless the transport vehicle is designed to allow for such materials to be taken with you

or if you simply have a small hand tool with you. It is easy for these materials to shift or for you to fall when you or the materials are not secured.

Finally, if you are working in an area that has a conveyor, remember that conveyor belts, chains, and buckets usually cannot carry people unless they are made for that purpose. Do not use the conveyor for transportation of a person unless it's designed to do so safely.



3.3: It is estimated that three to four miners' lives could be saved each year if adequate seat belts were provided and worn. Always buckle up!

Rail Equipment

Let's go back to the scenario of having to transport material alongside a fellow miner.

What if you need to use rail equipment to transport someone?

To do this safely, first remember that only authorized people can ride on trains and must sit or stand safely when they are moving. Also be sure you are not riding, standing, or sitting between train cars, at the front or leading end of a train or single railcar, or other areas of a train where you could be injured by the train moving. You must not try to get on or off moving trains. You may ride in the bed of a railcar only if you can do so securely, and you can prevent accidental unloading if the equipment has an unloading feature.

There are exceptions for special situations such as **car droppers**, who may need to access these areas of railway equipment, but they must do so secured with a safety belt and line to prevent from falling.

Similarly, official workers such as brakemen and trainmen should not ride between cars on moving trains, but they may ride on the front or leading end of a train or other locations when necessary to perform their specific job tasks.

Finally, be sure to check your railroad cars to make sure cargo is packed well, especially if they are loaded higher than the confines of the cargo space. Just like when you are packing a suitcase, and you have too much stuff sticking out of the top, you need to rearrange it so you can close it properly.

Aerial Tramways

If you wish to use an aerial tramway for transportation, be sure you do not ride in a loaded bucket. If you ride in an empty bucket, you must confirm that the tramway meets all of the following features:

1. There are two separate brakes that can each hold the maximum weight.
2. You have direct communication between the start and end points, or terminals.
3. There is backup power in case of emergency and the main power goes out.
4. Your buckets have locks to stop them from tipping or spilling accidentally.

Transporting Materials

Now that you understand how to use your equipment to transport people, let's look at a few guidelines for moving materials. When at your mine site, you may need to move mining equipment, supplies, or even waste. Whether and how often you move material will depend upon several factors, such as the size of your operation, the type of mining being done, and even your specific tasks. However, here are some important things to keep in mind when loading, hauling, and unloading:

- **Pack carefully:** Be sure to load and pack carefully so that nothing falls or shifts, creating a hazard for you and others.
- **Protect the equipment:** If you are moving equipment, be sure to load and protect it from sliding or spilling.
- **Mark overloaded vehicles:** If anything sticks out more than 4 feet from the back of the vehicle, be sure to mark it clearly with a red flag if it's during the day, and a red light if it's nighttime.
- **Avoid overloading tram buckets:** When working with an aerial tram conveyor, make sure to avoid loading too much into the buckets. Also, be sure to load things in a controlled manner so material doesn't spill out.
- **Secure the equipment:** Remember, as you are working and when moving between your various job areas, be sure your equipment is properly secured in the travel position.

Loading and Hauling Large Rocks

When loading and hauling items, if you see that you need to move large rocks that might cause injury to yourself or others or if the large rocks may make your equipment unstable, you will need to first break the rocks into smaller pieces before moving them. When you are loading trucks or other equipment with materials, be sure to do so carefully so that nothing spills out or shifts and puts you or others at risk.

Excellent work! Now, you are well-prepared for ensuring that people and materials are transported safely. Let's turn to how you can help keep roadways and railroads safe.

3.4 SAFETY DEVICES AND PROCEDURES FOR ROADWAYS AND RAILROADS

The safety devices and procedures for roads and trains are essential at all stages of mining operations. From designing the layout of ramps, dumping sites, and roadways to conducting daily operations and routine maintenance, following these regulations will help you to prevent accidents and injuries, comply with industry safety standards, and ensure operational efficiency. In this section, we will look at the following safety devices and procedures that you may encounter when working at a mine site:

- General Guidelines for Roads
- Berms, Guardrails, and Dump Site Restraints
- Railroad Safety
- Construction and Inspection of Ramps, Dumping Facilities, and Ground Stability
- Truck Spotters and Warning Devices
- Chute Safety

General Guidelines for Roads

Only authorized workers are allowed on roads where trucks and equipment are moving and at places where loading or dumping happens. As we discussed previously, you should find that the traffic rules, signals, and warning signs are the same at every part of the mine and clearly posted for you to see. If there are places on the roads or at loading or dumping areas where you think there is low or narrow clearance, be sure to clearly mark these areas and have warning signs or devices to keep workers safe.

Berms, Guardrails, and Dump Site Restraints

When traveling on a roadway, it is important that barriers, such as **berms** or **guardrails**, are provided and maintained on road edges, especially elevated roadways. This reduces the risk of vehicles tipping over and causing injury or hazard to you and your equipment.

- **Berms:** Raised barriers along roadways to prevent vehicles from overturning or going over the edge.
- **Guardrails:** Safety barriers installed on roadways to prevent vehicles from falling off.

You should find that these barriers are at least as tall as the middle of wheels (or axle) of the largest vehicles being used. You may also see that berms have gaps or openings, which is okay, as long as it is necessary for roadway drainage.

In addition to most roadways, you should also see berms, bumper blocks, safety hooks, or similar devices at dumping locations where there is a risk of vehicles overturning or moving too far. Berms and bumper blocks are placed at the edge of a site to prevent vehicles from going over the edge, whereas safety hooks are designed to secure equipment in place.

If you are traveling a rarely used elevated roadway that is only used by service or maintenance vehicles, then berms or guardrails are not required when all of the following are present:

- **Locked Gates:** Gates at the road entrance are locked.
- **Warning Signs:** There are signs that warn that the road has no barriers.
- **Reflective Markers:** Reflective markers, or **delineators**, are present along the edges of the elevated roadway so that drivers from both directions can always see at least three markers. These help indicate the road's edges and position.
- **Speed Limits:** Speed limits are clearly marked and are based on the road's condition, such as its width, slope, and surface, and the type of equipment, road material, and any hazardous conditions that may exist.
- **Good Traction:** The road surface has good traction. If there's ice or snow, measures must be taken to improve traction.

Do you remember how there were exceptions in the previous section for railroads? The same is true here for berms and guardrails: the above standards do not apply to **rail beds**.

- **Rail bed:** The foundation layer beneath railway tracks, providing stability and support for safe train operation.

Rail Safety

Let's look at some safety procedures for rail equipment, such as railroads, railways, and trams.

First, remember that roadbeds and all elements of the railroad tracks are required to be designed, installed, and maintained to ensure safe operation, especially given the speed and type of transportation used. Be sure that there's always at least 30 inches of space from the farthest projection of moving railroad equipment on one side of the track for workers and equipment to move safely. If that is not possible, mark the area clearly.

Second, when you are working with trams, be sure to put up nets or other barriers to keep things from falling off the tramway and hitting roads, walkways, or buildings below. Similarly, be sure to check for guards that prevent swaying tram buckets from hitting towers.

Next, protect yourself and others from moving or runaway rail equipment. *How should you do this?*

You can begin by confirming that there are barriers such as stopblocks, derail devices, track skates or bumper blocks where needed. **Stopblocks** prevent moving or runaway trains from going past a certain point, and barriers like **bumper blocks** should be provided at all track dead ends where necessary. **D derail devices** are safety mechanisms that intentionally derail or divert a train from its tracks in emergency situations, and they are designed to prevent runaway trains from continuing on a main track, reducing the risk of collision or accidents. **Track skates** help to slow moving cars or hold standing cars still.

Relatedly, there are several components of a railway track that must be protected to prevent injury. There are often gaps in tracks and rails that can catch your foot if you are not careful. By placing barriers or blocks in the track guardrails, lead rails, and frogs, you reduce the risk that your foot could become stuck or wedged. These elements should also be maintained depending upon how fast and what type of train will use them.

- **Track guardrails:** The outermost rails on a railway track that help guide the wheels of the train and prevent derailments.
- **Lead rails:** The rails at the front of a set of railroad tracks that guide the wheels of the train as it enters the track.
- **Frog:** A part of a railway track where two rails intersect or cross each other, allowing the train to smoothly transition from one track to another.

Also, **switch throws** must be installed with enough space to protect **switchmen** from coming in contact with moving trains.

- **Switch throws:** Devices on railway tracks used to change the direction of trains by adjusting the position of track switches, helping to prevent accidents and ensure safe navigation.
- **Switchmen:** Workers responsible for operating track switches, directing the movement of trains onto different tracks or paths to ensure safe traffic flow.

Finally, at railroad crossings, look for or put up signs or signals to warn when trains are coming. Or, you may guard the crossing when trains are passing. Either option allows you to ensure others are aware when a train is coming.

You also want to be sure that the area between the rails is filled or planked. This ensures a stable surface for vehicles to pass over tracks, which reduces the risks of accidents.



3.4: Internal and external railways make up a huge portion of the mining industry, especially as it relates to coal mining. Always pay attention to the rules and precautions surrounding railway transportation.

Construction and Inspection of Ramps, Dumping Facilities, and Ground Stability

When working at the mine, you may use a ramp to move your machine into or out of pits or over steep grades. Ramps help to provide a gradual slope for your equipment to ascend or descend safely. Be sure your ramp is sturdy, wide and tall enough, and kept clean and clear of spills.

Similarly, you will need to ensure your equipment can access **dumping facilities**, which are specific areas designated for depositing mined materials. Only authorized persons are permitted to be in dumping locations.

First, be sure that any dumping locations you are working with are kept clean of water, debris, and spills. You also want to ensure there are protection devices to prevent falling material from hurting you or other workers at all dumping locations.

Both ramps and dumping locations should be strong enough to hold heavy loads. Barriers like berms, bumper blocks, or safety hooks must be used at dumping sites to prevent vehicles from going too far and overturning. Dumping sites must also be wide and tall enough for equipment

to have clearance when using the facilities. If there is not enough side or overhead clearance at any dumping location, be sure you mark them clearly to ensure the safety of you and others.

Additionally, it is important that you check dumping locations for unstable ground before starting work. You may also have to check your dumping spot again if ground conditions become unstable or unsafe.

If the ground seems like it cannot hold your loaded equipment or dump truck, be sure to dump materials a safe distance away from the edge of the unstable area to avoid accidents or hazards.

Relatedly, when materials or minerals are moved, **drawholes**, or cavities or depressions in the ground formed during mining operations, can form. If you are working around these drawholes, and there is danger that broken rock or material could shift, be sure you are not positioning yourself over the drawholes unless you are using platforms or safety lines.

Truck Spotters and Warning Devices

Just a few more to go!

Sometimes when you are using equipment, you may need a **truck spotter**. These individuals guide and signal trucks into position, ensuring safety during loading and dumping.

If you are working with a truck spotter (or you are the truck spotter), be sure you are in a safe location while the truck is backing up or unloading. Spotters may use signal lights to show the drivers where to go, especially when it's hard to see. If you are working at night, be sure to use the signal lights to direct trucks safely. If the truck driver cannot understand the signals from the spotter, they should stop the truck.

When there are tight spaces or **restricted clearance** for equipment, then warning signs or signals should be installed ahead of the areas. These restricted areas must also be clearly marked for everyone to see.

- **Restricted Clearance:** Areas where the space available for equipment or personnel is limited, requiring clear marking and warning devices.

Chute Safety

Welcome to the last section on safety devices for railroads and roadways! Then, we will look at maintenance procedures.

To review, you can ensure the safety of you and your equipment by ensuring road edges have barriers to prevent accidents and reflective markers for visibility. For railways, be sure to use stopblock and derail devices when necessary. When building ramps and dumping sites, be sure to inspect them before work and as needed to ensure the ground is stable. Finally, when working with a truck spotter, be sure they are able to safely and effectively communicate. If you see that an area has restricted clearance, be sure to provide clear signs for others.

When working with equipment, you may encounter a chute. The purpose of chutes is to ensure that materials can flow safely and efficiently from one point to another, reducing spillage or waste. Let's look at a few guidelines for ensuring chute safety.

Chutes must be designed to ensure the safety of those pulling or loading the chute. Before pulling your chute, be sure to warn anyone who might be in danger and give them time to move away from the area to prevent injuries. If you notice that your chute becomes stuck, you should not try to free the chute unless you are experienced and can use the proper tools to do so.

Occasionally, you may need to use an empty chute for dumping broken rock or material. In these cases, you should either use a guard on the chute or make sure no one is near it to avoid getting hit by flying rocks or materials.

Sometimes chutes are used with equipment called **stationary sizing devices or grizzlies** that sort material or remove unwanted debris. These are often located at dump and transfer points. When using stationary sizing devices, it is important to ensure that they are securely anchored to keep them from moving.

Excellent! You are now well-versed in a variety of safety devices that you might see on the work site. Are you ready to look at roadway and worksite maintenance next? Let's go!

3.5 ROADWAY AND WORKSITE MAINTENANCE

Part of your role as a miner is to help maintain your worksite and roadways for safety and visibility. Keeping your paths of travel and working locations clear of material, free of dust, and ensuring that you are communicating clearly with others can all help reduce the risk of accidents. Let's look at a few maintenance guidelines you should know.

Removing Debris and Trimming Material

As you are working at the mining site, be sure to remove water, debris, or spilled material from roadways to prevent hazards. This can help prevent slips, trips, and falls, as well as equipment accidents. Similarly, it is important to trim your stockpile and muckpile surfaces to prevent hazards to you and your equipment.

- **Stockpiles:** Large piles of materials that are stored for future processing.
- **Muckpiles:** Piles of broken rock or other material that have been excavated in mining operations.

Reducing Dust

Often, dust can build up at the mining site, which can affect visibility. Be sure you are controlling dust in key locations such as muck piles, material transfer points, crushers, and on major haul roads to ensure workers and equipment operators can continue their work safely. This may also reduce your risk of developing respiratory issues from dust inhalation.

- **Crusher:** Equipment that reduces the size of stones, ore, or rocks.

Navigating Equipment

If you are the equipment operator, you should be certain, either through signaling or another way, that all other workers are clear before starting or moving equipment. If you are working with an equipment operator, be sure to tell the person operating the equipment before you get on or off, so that they know you are there. When machines are moving, do not go under big buckets or arms of machines. Be sure you do not try to get on or off moving equipment, unless you are a trainman, brakeman, or car dropper and are required to get off or on slowly moving trains as part of your job.

Also, remember to follow all procedures for inspecting, operating, and parking your equipment. Doing this will ensure your roadway and worksites remain well-maintained and safe for you and others.

Nice work! You are now aware of some basic maintenance procedures to keep your work site and roadways safe and clear.

3.6 TRAVELWAYS AND LADDERS

When you are working at a mine site, you will need to ensure secure access to work areas to reduce the risk of falls or injury. This section covers procedures for navigating elevated areas, crossing conveyor systems, and using ladders during routine tasks.

Safe Access and Walkways

Ensuring safe access to walkways is crucial to protecting you from accidents in the mining environment.

General Guidelines

In general, you should always find a safe and well-maintained means of access to all working places. Frequently used walkways or travelways should be cleared of snow and ice, either by sanding, salting, or removal, as soon as possible.

Conveyors

When working with conveyors, be sure you use crossovers where it is necessary to cross conveyors.

What if the conveyor is moving?

Then, you should look for designated crossover points if you must travel over a moving conveyor.

Additionally, you might see walkways alongside conveyors that are elevated off the ground. These walkways must always have a railing on the outer edges – these keep you and others safe. If you see that a conveyor belt does not have guards or protective barriers and has walkways next to it, then you should see emergency stop buttons or cords along their entire length so you can quickly stop them in an emergency.

If the walkways alongside conveyors have a slope or incline, then they should have surfaces that are non-skid. Or, you must be provided with cleats to cross them. By taking these precautions, you can reduce your risk of slipping or falling.

If the conveyor belt itself goes uphill, you should check that it has brakes or backstops to prevent it from accidentally moving backward, which could be dangerous to you and others.

When operating conveyors, first check to see whether you can see the whole conveyor belt from where you start it. If you can, check to make sure no one is on or near it before turning it on. If you can't see the entire conveyor belt, there must be a loud sound or a flashing light to warn people that the conveyor is about to start.

Elevated Structures, Stairs, and Clearances

Whether you are accessing a crossover, elevated walkway, elevated ramp, or stairway, you should find these to be in good condition, of substantial construction, and equipped with a handrail. When necessary, there should also be **toeboards**.

- **Toeboard:** A barrier along the floor of a platform to provide support; it is typically between 4 and 12 inches high.

When working on stairs, be sure there's at least seven feet of space above the stairs.

What if there is not enough space?

If there is less than seven feet, you will need to ensure there is a warning sign to indicate that space might be tight, or clearance is low.

Relatedly, if you notice an area where there's not enough space or clearance, and you think it is a hazard for you or other workers, be sure to mark it clearly.

Finally, any holes or gaps above, below, or near where you and others walk or move materials should have railings, barriers, or covers to keep workers and things from falling or tripping. If you find that installing such a barrier is not possible, put up warning signs to let others know that a gap or hole is there.

Ladder Safety Standards

Construction, Installation, and Maintenance

You might have noticed a theme so far: your equipment and workspace should always be well-constructed and maintained. The same goes for your ladders as well! Always check your ladders to ensure they are in good working condition.

If you are using a portable, rigid ladder, be sure you use a sturdy base to securely place your ladder. If you are using a fixed ladder, be sure you firmly anchor it and provide at least 3 inches of space for your toes. Your fixed ladder should also stick out at least 3 feet above the landing, or where the ladder ends, or there should be something to hold onto above the end.

- **Fixed Ladders:** Permanent ladders installed in the mining area, which must be securely anchored and maintained for safe use.

Finally, be sure you do not paint the wooden parts of your ladders, except with a transparent finish. This will help to maintain your ladder's structural integrity and ensure it does not become slippery.

Safe Use and Protection Measures

Now that you know how to install and maintain your ladders, let's look at a few guidelines for safely using ladders when at your work site.

First, when using ladders, be sure you are facing them directly and have both of your hands free for climbing and descending. This will reduce your risk of falling or slipping when using the ladder. Also, be sure that your fixed ladder is leaning forward, not backward, to ensure safe climbing.

To ensure you have stability and a place to rest during your climb, be sure your fixed ladder has a sturdy platform with railings every 30 feet. If you do not have a railing, then you must use other safety measures like **backguards** or **safety belts**.

- **Backguard:** A protective vertical barrier installed on ladders or scaffolds to prevent falls by providing a guard behind the user.
- **Safety belt:** Protective equipment to prevent falls from heights by distributing the force of impact and stopping the worker from hitting the ground in the event of a fall.

Finally, when you use your ladder to reach an elevated area that is difficult to access vertically, you may angle your ladder for better reach. Fixed ladders that are angled between 70 and 90 degrees and are at least 30 feet tall need protection like backguards or cages, starting within seven feet from the ladder's bottom. This will help you to ensure stability and ease of use.

Scaffolds and Platforms

Similarly, when working on an elevated structure, you may use scaffolds to provide stability. Scaffolds and working platforms need to be well-constructed and maintained, with handrails for you to hold onto. The floor boards should be put together correctly and securely, and you should be careful not to put too much weight on them. If needed, there should be toeboards to prevent things from falling off.

Super! Implementing these guidelines will help you to navigate travelways, ladders, and platforms safely and efficiently.

Safely Operating Your Equipment Conclusion: Let's Review What You've Learned!

You learned a lot of new information in this module. Some concepts might be completely new to you, or, you might have been familiar with some of the concepts or terms.

Either way, take a minute to review what you should now be able to do after completing this module.

You can now:

- Apply safe transportation practices for inspecting, operating, and parking to prevent injuries and equipment instability.
- Ensure that you can transport people and materials securely.
- Reduce the risk of hazards and injury when loading and unloading.
- Identify and describe various safety devices used in mining, such as berms, guardrails, stopblocks, derail devices, and frogs.
- Explain the role of truck spotters and chute guards in ensuring safety during mining operations.
- Conduct basic maintenance procedures for roadways and worksites, including debris removal, dust control, and communicating with equipment operators.
- Navigate conveyors, elevated structures, and walkways safely.
- Inspect ladders, scaffolds, and platforms for safety.

If you are confident that you can accomplish these tasks above, proceed to the Quiz.

If you want more time to review and reflect on these tasks, return to the specific pages you want to review. You can also review additional expanded content in the Module Resource Materials.

MODULE RESOURCE MATERIALS

List of Hazard Concepts and Definitions

- **Backguard:** a protective vertical barrier installed on ladders or scaffolds to prevent falls by providing a guard behind the user.
- **Berms:** Raised barriers along roadways to prevent vehicles from overturning or going over the edge.
- **Bumper blocks:** buffers added to railroad track dead ends to prevent overtravel.
- **Car Dropper:** A person who positions railroad or mine cars for loading and unloading.
- **Chutes:** Channels or passages used to guide mined material from one location to another safely.
- **Crusher:** Equipment that reduces the size of stones, ore, or rocks.
- **Derail Devices:** Safety mechanisms that intentionally derail or divert a train from its tracks in emergency situations
- **Dumping Facilities:** Specific areas designated for depositing mined materials, which must be inspected for safety.
- **Fixed Ladders:** Permanent ladders installed in the mining area, which must be securely anchored and maintained for safe use.
- **Frog:** A part of a railway track where two rails intersect or cross each other, allowing the train to smoothly transition from one track to another.
- **Guardrails:** Safety barriers installed on roadways to prevent vehicles from falling off.
- **Lead rails:** The rails at the front of a set of railroad tracks that guide the wheels of the train as it enters the track.
- **Muckpiles:** Piles of broken rock or other material that have been excavated in mining operations.
- **Rail Bed:** The foundation layer beneath railway tracks, providing stability and support for safe train operation.
- **Rail Equipment:** Vehicles or machinery that operate on railway tracks within mining operations.
- **Restricted Clearance:** Areas where the space available for equipment or personnel is limited, requiring clear marking and warning devices.
- **Safety Belt:** Protective equipment to prevent falls by distributing the force of impact and stopping the worker from hitting the ground in the event of a fall.
- **Self-Propelled Mobile Equipment:** Vehicles or machinery that can move independently, often used in mining operations.
- **Side Tracks:** Additional tracks adjacent to the main railway track within the mining area, often used for loading/unloading or allowing trains to pass.
- **Stationary Sizing Devices (also known as grizzlies):** device that sorts and classifies material or removes unwanted debris.
- **Stockpiles:** Large piles of materials that are stored for future processing.

- **Stopblocks:** Protective devices used to prevent moving or runaway trains from going past a certain point.
- **Switch throws:** Devices on railway tracks used to change the direction of trains by adjusting the position of track switches, helping to prevent accidents and ensure safe navigation.
- **Switchmen:** Workers responsible for operating track switches, directing the movement of trains onto different tracks or paths to ensure safe traffic flow.
- **Toeboard:** A barrier along the floor of a platform to provide support; it is typically between 4 and 12 inches high.
- **Track guardrails:** The outermost rails on a railway track that help guide the wheels of the train and prevent derailments.
- **Track skates:** Safety devices that help to slow moving cars or hold standing cars still.
- **Truck Spotters:** Individuals who guide and signal trucks into position, ensuring safety during loading and dumping.

Simplified Hazard Rules and Corresponding Code of Federal Regulations Listing

- **Traffic control.** Each mine must have rules for vehicle speed, who has the right-of-way, the direction vehicles should move, and when to use headlights. Warning signs must be placed in dangerous areas. [56.9100]
- **Operating speeds and control of equipment.** Operators must control their vehicles and adjust their speed based on road conditions, visibility, and traffic. [56.9101]
- **Movement of independently operating rail equipment.** When more than one rail vehicle is on the same track, their movement must be managed safely. [56.9102]
- **Clearance on adjacent tracks.** Railcars must not block traffic on nearby tracks. [56.9103]
- **Railroad crossings.** Railroad crossings must have warning signs, signals, or guards when trains pass. The area between the rails must be filled or covered. [56.9104]
- **Transporting persons.** People must not ride in unsafe areas like buckets, on top of loads, or in overcrowded vehicles. They must be in safe, secure areas, like inside cabs or secure beds of vehicles. [56.9200]
- **Loading, hauling, and unloading of equipment or supplies.** Equipment and supplies must be loaded, transported, and unloaded safely to prevent them from falling or shifting. [56.9201]
- **Loading and hauling large rocks.** Large rocks must be broken up before loading if they could be dangerous. Vehicles must be loaded carefully to avoid spills. [56.9202]
- **Berms or guardrails.** Berms or guardrails of appropriate height and drainage must be installed and maintained on roadways where a drop-off could cause a vehicle to overturn or endanger people. Elevated roads rarely used by service vehicles do not need berms under certain conditions. This rule does not apply to rail beds. [56.9300]
- **Dump site restraints.** At dump sites where there is a risk of vehicles going over the edge or overturning, berms, bumper blocks, safety hooks, or similar devices must be used. [56.9301]
- **Protection against moving or runaway railroad equipment.** Stopblocks, derail devices, or other safety measures must be in place to protect people from runaway rail equipment. [56.9302]
- **Construction of ramps and dumping facilities.** Ramps and dumping areas must be built strong enough to handle the loads they will bear. They must be wide and tall enough to safely accommodate the vehicles using them. [56.9303]
- **Unstable ground.** Before dumping, the ground must be checked to ensure it can support the vehicles. If the ground is unstable, dumping should be done safely away from the edge. [56.9304]
- **Truck spotters.** If truck spotters are used, they must stand clear while trucks are backing up or dumping. Spotters should use signal lights in areas with limited visibility. If the driver cannot see the signals, the truck should stop. [56.9305]
- **Warning devices for restricted clearances.** When there are hazards due to restricted space, warning devices must be placed ahead of the restricted area, and the area must be clearly marked. [56.9306]

- **Design, installation, and maintenance of railroads.** Railroads must be designed, installed, and maintained for safe operation based on the speed and type of traffic. [56.9307]
- **Switch throws.** Switches must be installed with enough space to keep switchmen safe from moving trains. [56.9308]
- **Chute design.** Chute-loading areas must be designed to provide a safe place for people pulling chutes. [56.9309]
- **Chute hazards.** Before pulling a chute, warn people in the area to clear out. Only experienced and knowledgeable people should work on stuck chutes, using proper tools. When dumping broken rock or material into an empty chute, use a guard or keep people away from flying debris. [56.9310]
- **Anchoring stationary sizing devices.** Grizzlies and other stationary sizing devices must be securely anchored. [56.9311]
- **Working around drawholes.** Do not stand over drawholes without platforms or safety lines if there is a risk of material being withdrawn or bridging. [56.9312]
- **Roadway maintenance.** Water, debris, or spilled materials that create hazards on roadways must be removed. [56.9313]
- **Trimming stockpile and muckpile faces.** Stockpile and muckpile faces must be trimmed to prevent hazards. [56.9314]
- **Dust control.** Dust must be controlled at muck piles, material transfer points, crushers, and on haulage roads to prevent visibility issues that could be hazardous. [56.9315]
- **Notifying the equipment operator.** When getting on or off mobile equipment, notify the operator if they are present. [56.9316]
- **Suspended loads.** Do not work or walk under buckets or booms of loaders in operation. [56.9317]
- **Getting on or off moving equipment.** Do not get on or off moving equipment, except for trainmen, brakemen, and car droppers who may need to do so while the train is moving slowly for work duties. [56.9318]
- **Going over, under, or between railcars.** Do not go over, under, or between railcars unless the train is stopped and the operator is notified and acknowledges the notice. [56.9319]
- **Clearance for surface equipment.** There must be at least 30 inches of clearance from the farthest projection of moving railroad equipment on at least one side of the tracks where possible, or the area must be clearly marked. [56.9330]
- **Safe access.** Safe ways to access all work areas must be provided and maintained. [56.11001]
- **Handrails and toeboards.** Crossovers, elevated walkways, ramps, and stairways must be well-built, have handrails, and be kept in good condition. Toeboards must be installed where needed. [56.11002]
- **Construction and maintenance of ladders.** Ladders must be strong and kept in good condition. [56.11003]
- **Portable rigid ladders.** Portable rigid ladders must have secure bases and be placed safely when in use. [56.11004]

- **Fixed ladder anchorage and toe clearance.** Fixed ladders must be securely anchored and have at least 3 inches of space for toes. [56.11005]
- **Fixed ladder landings.** Fixed ladders must extend at least 3 feet above landings, or have strong handholds above the landings. [56.11006]
- **Wooden components of ladders.** Wooden ladder parts should not be painted, except with a clear finish. [56.11007]
- **Restricted clearance.** Areas with restricted clearance that pose a hazard must be clearly marked. [56.11008]
- **Walkways along conveyors.** Walkways with railings must be provided alongside elevated conveyor belts where people need to walk. Inclined walkways must be nonskid or have cleats. [56.11009]
- **Stairstep clearance.** There must be at least seven feet of vertical clearance above stair steps, or warning signs must be posted if the clearance is less. [56.11010]
- **Use of ladders.** When using ladders, face the ladder and keep both hands free for climbing and descending. [56.11011]
- **Protection for openings around travelways.** Openings near travelways where people or materials could fall must be protected by railings, barriers, or covers. If these cannot be installed, adequate warning signals must be used. [56.11012]
- **Conveyor crossovers.** Crossovers must be provided where it is necessary to cross over conveyors. [56.11013]
- **Crossing moving conveyors.** Only cross moving conveyors at designated crossover points. [56.11014]
- **Snow and ice on walkways and travelways.** Regularly used walkways and travelways must be sanded, salted, or cleared of snow and ice as soon as possible. [56.11016]
- **Inclined fixed ladders.** Fixed ladders should not tilt backwards. [56.11017]
- **Railed landings, backguards, and other protection for fixed ladders.** Fixed ladders, except on mobile equipment, must be offset and have railed landings every 30 feet unless backguards or other safety features like safety belts are used. [56.11025]
- **Protection for inclined fixed ladders.** Fixed ladders that are 70 to 90 degrees from horizontal and 30 feet or longer must have backguards, cages, or similar protection starting no more than seven feet from the bottom. [56.11026]
- **Scaffolds and working platforms.** Scaffolds and working platforms must be strong, have handrails, be kept in good condition, and not be overloaded. Toeboards should be added when necessary. [56.11027]
- **Loading and haulage.** Only authorized persons are allowed on haulage roads and at loading or dumping sites. Traffic rules, signals, and warning signs must be consistent and posted at each mine. Areas with hazardous side or overhead clearances must be clearly marked and may need warning devices. [77.1600]
- **Transportation of persons; restrictions.** People are not allowed to ride or be transported in/on dippers, shovels, buckets, forks, clamshells, the cargo space of dump trucks, outside cabs and beds of mobile equipment, chain, belt, or bucket conveyors (unless designed for passengers), or loaded buckets on aerial tramways. [77.1601]

- **Use of aerial tramways to transport persons.** Only maintenance workers can ride empty buckets on aerial tramways unless there are two independent brakes, direct communication between terminals, emergency power, and buckets with positive locks to prevent accidents. [77.1602]
- **Trains and locomotives; authorized persons.** Only authorized persons can ride on trains or locomotives, and they must ride safely. People should not get on or off moving equipment, except trainmen may do so on slowly moving trains. [77.1603]
- **Transportation of persons; overcrowding.** Transport vehicles must not be overcrowded, and all riders must be in safe positions. Supplies, materials, and tools (except small hand tools) should not be transported with people unless the vehicle is designed for it. [77.1604]
- **Loading and haulage equipment; installations.** Cab windows and mobile equipment must be in good condition with safety features like brakes, lights, and warning devices. Tramways need protective measures for safety, while ramps, dumps, and railroads must be designed to prevent hazards and protect workers. [77.1605]
- **Loading and haulage equipment; inspection and maintenance.** Mobile loading and haulage equipment and aerial tramways must be inspected regularly by qualified personnel. Any safety defects must be recorded, reported, and fixed before use. [77.1606]
- **Loading and haulage equipment; operation.** Vehicles should maintain safe distances, and operators must ensure full control and clear areas before starting. Keep equipment speeds safe, cabs uncluttered, and loads secured. Use warning devices for hazards, deflate tires before repairs, and ensure safety for conveyors and railcars. [77.1607]
- **Dumping facilities.** Keep dumping areas and haulage roads clear of debris. Dump trucks should stay back from unstable edges, and protections should be in place to guard against falling material. Secure sizing devices and ensure truck spotters are clear, using lights at night. [77.1608]