MSHA Annual Refresher Training

Module 7

Fire Prevention and First Aid Procedures

MSHA Training Requirement:

An introduction to the rules and procedures for preventing fire hazards and providing basic first aid. [Section 46.5(b)(3), Section 46.5(c)(2)].

Learning Objectives:

1. Identify potential fire hazards and preventive safety measures associated with flammable materials found in mining operations, such as fuel, oils, solvents, and gases.
2. Learn the proper firefighting equipment maintenance and inspection schedules to ensure readiness in emergency situations.
3. Understand general firefighting procedures and protocols that you can build upon based on guidance from your mine operator and specific mine worksite.
4. Follow safety measures to mitigate fire hazards during hot work.
5. Define and differentiate between first aid and medical treatment in the context of mining-related injuries.
6. Implement required first aid procedures for possible mining injuries.

Module Sections

- 7.1 Introduction to Fire Prevention and First Aid Procedures
- 7.2 Fire Prevention
- 7.3 Firefighting Equipment and Procedures
- 7.4 Preventing Fires During Hot Work
- 7.5 First Aid Procedures

7.1 INTRODUCTION TO FIRE PREVENTION AND FIRST AID PROCEDURES

Understanding fire prevention and first aid procedures at a mine worksite is critical to ensure the safety of workers and protect equipment. The rules in 30 CFR Part 77 Subpart L (Fire Protection) and Part 56 Subparts C (Fire Prevention and Control) and Q (First Aid) outline specific guidelines that focus on fire prevention and first aid at mine sites.

You will learn how to:

1. Identify potential fire hazards and preventive safety measures associated with flammable materials found in mining operations, such as fuel, oils, solvents, and gases.
2. Learn the proper firefighting equipment maintenance and inspection schedules to ensure readiness in emergency situations.
3. Understand general firefighting procedures and protocols that you can build upon based on guidance from your mine operator and specific mine worksite.
4. Follow safety measures to mitigate fire hazards during hot work.
5. Define and differentiate between first aid and medical treatment in the context of mining-related injuries.
6. Implement required first aid procedures for possible mining injuries.

Module Warmup

Why Fire and First Aid Practices Matter?

In any mining operation, ensuring safety involves being prepared for emergencies and fire hazards. In the event of a fire, prompt evacuation according to established protocols is crucial to safeguarding lives and minimizing damage.

Preventing fires requires several key practices:

- Having properly functioning and maintained firefighting equipment
- Maintaining awareness of your surrounding environment
- Being trained in basic first aid
- Responding swiftly and effectively to injuries
- Ensuring immediate medical attention can be provided to those in need

Integrating these safety practices ensures a comprehensive approach to protecting you and others, as well as maintaining a secure worksite at your mine.

Preventing accidents and injuries involves understanding:

- Fire prevention guidelines
- Equipment inspection protocols

- The importance of handling flammable material properly and safely

Similarly, knowing basic first aid is paramount in case an accident occurs. Immediate and appropriate first aid can significantly reduce the severity of injuries and can potentially save lives. This includes knowing how to treat burns, control bleeding, prevent shock, and administer CPR.

The rest of this module will help you further understand key fire prevention and equipment concepts, why these procedures are important, and how they will help you to stay healthy and unharmed while at a mine site.

7.2 FIRE PREVENTION

Understanding fire prevention and response practices is crucial for your safety and the well-being of everyone on site. At your mine worksite, flammable materials such as fuel, chemicals, and gases are often present, and fire hazards must be carefully managed to prevent accidents and protect lives.

General Fire Precautions

Before looking at specific guidelines for preventing fires at your mine worksite, let's first consider some general principles to keep in mind as you navigate your mine operation.

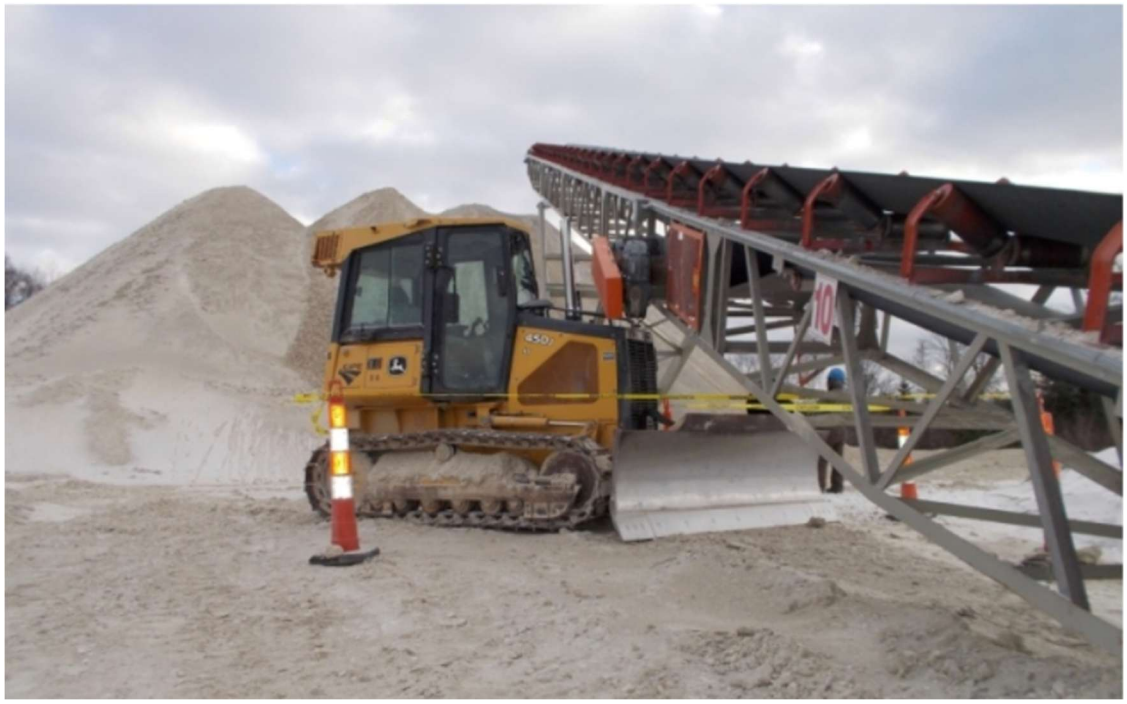
- Ensure that buildings or places where you are working have enough exits so everyone on site can get out quickly if there is a fire. Know exit locations before you begin work!
- Always be mindful of your physical and material surroundings when working. Heat sources that can start fires must be kept *away* from materials that can catch fire easily.
- Be sure there are clearly visible signs that warn against smoking and using open flames if you are working in an area that has a risk of fire or explosion.

Preventing Fire Hazards from Fuel and Electrical Sources

Your mine worksite will likely have a variety of equipment that runs on **electricity** or **fuel**.

Consider these precautions when working around electric or fuel power sources:

1. Safe refueling
2. Disconnecting electric circuits
3. Conveyor belt slippage detection



7.1: Conveyor belt used in above-ground mining operations.

Battery-Charging Stations

Your mine worksite might use fuel or electricity to power battery-charging stations for electric vehicles, tools, and machines to be recharged.

To reduce the risk of fire, be sure to follow these guidelines when working around battery charging stations:

- Adequate fresh air flow
- Distance from flammable material or gases
- Reverse current protection
- Proper warning signage

As your mining operation likely uses fuel and other flammable material on site, it is often **stored** in the work site. Let's look at how to properly store and handle flammable liquids next.

Handling and Storage of Flammable Liquids

A variety of flammable liquids are important to the mining process.

When at your mine site, stay alert and aware of where and when flammable and combustible liquids (like greases) or gases are being *used, moved, stored*, or *handled* and keep these general safety rules in mind:

- Do not smoke or use open flames in areas where flammable or combustible liquids (like greases) or gases are present.
- Clean up flammable liquid spills or leaks quickly or control them so they do not cause a fire.
- Properly dispose of rags or similar cleaning materials that can absorb flammable substances by putting them in a metal can or similar container.

Handling Flammable Liquids Safely

Now that you understand the general precautions for working with flammable liquids, let's look at how you can safely handle them.

If you must handle flammable liquids, follow these guidelines to keep you and your mine worksite safe from potential fire hazards:

- Flammable liquids should **not** be used to clean.
- Solvents should **not** be used near open flames, heat sources, or in environments where the temperature could make the solvent catch fire easily**.**
- Combustible materials must **not** gather in places where they could start a fire.
- Until they are properly disposed of, waste or rags with flammable or combustible liquids that could start a fire should not be left out; they must be put in covered metal or similar containers that can handle flames.

Storing Flammable Liquids Safely

Mining operations require easy access to things like fuel, paint, oils, solvents, greases, and other compressed gases to perform mining activities efficiently and effectively. As a result, many of these materials will likely be stored at your mine worksite. Let's look at some ways you can store these properly in order to minimize fire hazards.

Always stay alert for flammable materials at your mine worksite. These materials should be kept away from open flames, heat sources, and dry vegetation in order to reduce the risk of a fire starting.

You are now able to implement key principles for fire prevention, especially when handling flammable material. Next, we will look at proper equipment you should have available to you at the worksite, as well as fire prevention procedures you can expect to learn once you arrive at your assigned location.

7.3 FIREFIGHTING EQUIPMENT & PROCEDURES

To help reduce the risk of fire, your mine worksite will have various firefighting equipment. This section will provide you with the general requirements for maintaining and using your equipment. Be sure to check with your mine operator for specific details on the firefighting equipment your mine worksite uses!

General Equipment Requirements

Every mine is required to maintain equipment and gear to handle fires that could endanger you and others at the worksite. Specifically, your mine operator must provide firefighting gear on site to stop fires early, and appropriate gear for bigger fires, or an agreement with the local fire team to handle such situations.

The firefighting gear should be the correct type, size, and quantity to put out any kind of fire that might start. Additionally, it must be placed in a strategic location that is easy to get to, clearly marked, and ready to use anytime.

Firefighting Equipment in Coal Mines

If you are working in a coal mine, the firefighting equipment that is available might look a little different. For coal mines, your mine operator is required to provide enough equipment to fit the mine's size and conditions on the ground. Ask your mine operator for the specific firefighting requirements in coal mines.

Inspecting your Equipment

Your mine's firefighting equipment needs to be checked on a regular basis.

After each check or test, the person performing the inspection must write down what was done and when. Records of pressure tests should be kept until the fire extinguisher is checked again or not used anymore. Other records should be kept for one year.

Ensuring Proper Firefighting Equipment

In mining operations, particularly in coal mines, areas such as preparation plants, dryer plants, tipples, drawoff tunnels, shops, and other surface areas need to have firefighting equipment available to handle potential fires and ensure safety.

The firefighting equipment required in worksite areas typically includes items such as:

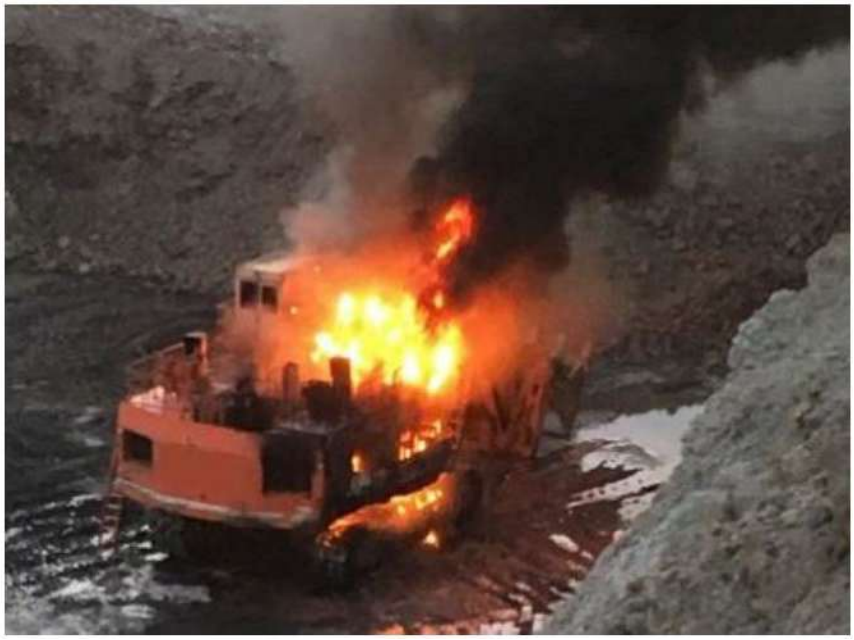
- Fire extinguishers
- Fire hoses
- Water supplies
- Sprinklers
- Other fire suppression systems

The specific requirements can vary based on regulations and the potential hazards present in each area. The goal is to ensure that adequate measures are in place to quickly and effectively respond to any fire emergencies, minimizing risk to personnel and property.

In addition to ensuring that worksite areas have fire-fighting equipment, you will also need to ensure that you have proper fire extinguishers and protections *on* or *around* your tools and machinery.

Self-Propelled Equipment

You will likely use a variety of **self-propelled equipment,** such as bulldozers, dump trucks, drill rigs, transport vehicles, or other specialized equipment. These have their own fire risks and hazards because they can generate heat, may have limited ventilation, and run on fuel or electricity, which can leak or become faulty.



7.2: Active fire in self-propelled equipment.

Firefighting, Evacuation, and Rescue Procedures

So far, we have focused primarily on the equipment that you must have available and ready in case of a fire. However, additional aspects to firefighting that can help protect you against fire hazards include procedures for evacuation and rescue.

When beginning your work at the mine, there are some additional procedures you can expect to learn on site that will help prepare you for evacuation and rescue. This includes training, fire plans, fire alarms, fire alarm maintenance, and fire drills.

Now, you know a few basic guidelines for ensuring firefighting equipment is supplied and utilized correctly at your mine site. Let's now look at how to prevent fires during 'hot work' in mining.

7.4 PREVENTING FIRES DURING HOT WORK

Welding, soldering, cutting, grinding, and more are common processes in mining. This may also be known as **hot work**, or any work that produces sparks, flames, or enough heat to initiate a fire or flames during operation.

What's unique about 'hot work'?

Hot work is a *constant* fire hazard because the heat that comes from this work can ignite nearby flammable material immediately.

Take the following precautions to ensure safety during and around hot work:

1) Confirm you have the correct fire extinguisher
2) Check and monitor your surroundings
3) Ensure proper storage and cleaning

Let's put this all together in a small scenario.

Imagine you have just finished using a cutting torch to slice through some metal in a mine. Before you move on to your next task, make sure you *turn off the torch, and close the valves* on both the oxygen and acetylene tanks. This action stops any remaining gas from escaping, which could mix and ignite, causing a fire or explosion. Additionally, *ensure that your tanks are still in a clean, dry area away from flammable substances*, and *check that the meters and controls are clean and free of any oil or grease* before you start your next job. By following these steps, you significantly reduce the risk of fire hazards in the mining environment for yourself and others who may work in this area after you.

Now, you know important safety precautions to prevent fire hazards during hot work.

Let's now look at how to manage basic first aid procedures.

7.5 FIRST AID PROCEDURES

As you may have noted thus far, mining can be dangerous, with risks of cuts, falls, burns, and other injuries. While following safety procedures, such as the ones you are learning in this course, can help reduce your risk of injury, it is also important to be equipped with the knowledge to handle minor injuries and respond effectively in emergencies. This section will introduce you to essential first aid principles tailored specifically for the challenges you might face at a mining site.

First Aid Versus Medical Treatment

If you encounter a fellow miner having a medical issue at your worksite, they may need basic first aid or further medical treatment, depending upon the severity of the injury. Thus, it is important that you understand the difference between medical treatment and first aid, as you are only expected to know and provide first aid when necessary.

First aid is basic, immediate, usually temporary, and intended for minor injuries. In contrast, medical treatment is advanced, often ongoing, and intended for more serious injuries or illnesses requiring professional healthcare intervention.

Let’s look at some specific differences.

Medical treatment includes things like:

- Stitches for any wound
- Treating broken bones
- Putting on casts or other ways to immobilize an injured body part
- Treating infections from injuries
- Draining blood from bruises
- Surgically removing dead or damaged skin, such as from a burn
- Amputation or permanent loss of use of any body part
- Treating second and third-degree burns

First aid includes:

- Applying a one-time treatment for minor injuries like scratches, cuts, burns, and splinters
- Using ointments, salves, antiseptics, and dressings for minor injuries
- Ensuring safety of a burned or injured person until help arrives
- Watching for signs of shock and treating until the person reaches emergency personnel

Steps to Provide First Aid at a Mine Worksite

Now that you understand what basic first aid is (and is not), let's look at the steps to providing first aid at a mine worksite.

Step One: Patient Assessment

When someone appears injured at your mine worksite, you should conduct a thorough assessment of both the scene and the individual *prior to* administering any first aid. This initial evaluation helps you to identify any life-threatening conditions and other medical issues quickly, ensuring the person gets the necessary medical care promptly.

Often, your assessment will lead you to conclude that the person needs some basic first aid treatment until emergency medical services arrive. Let's look at how to provide treatment to cuts, burns, shocks, and other injuries, as well as how to administer CPR.

Step Two: First Aid Treatment

There are many types of injuries that can happen in the mining environment, such as burns, cuts, broken bones, sprains, heart problems, and shock. Remember that you are administering basic first aid in these situations, not medical treatment. After your initial assessment leads you to these injuries, follow the steps for providing care to the injured person.

Controlling Bleeding

You and other miners can sustain cuts from sharp tools, machinery, or even rocks. You could encounter an impalement injury if there is an accident with drills, picks, or other sharp tools. When working at your mine site, there is always the risk of injury from a fall, collision, explosion, or collapse. These accidents can result in severe bleeding from wounds, lacerations, and other physical trauma.

If you see that someone is injured and bleeding, be sure you prioritize controlling the bleeding. Blood loss can be serious, leading to your fellow miner suffering shock or even death if not managed properly.

To stop bleeding:

- Place a clean cloth on the wound and apply firm pressure with your hand or hold in place with something like a belt, bandage, or necktie until the bleeding stops.
- If possible, elevate the wound above the injured person's heart to help slow the bleeding.
- Once bleeding has stopped, do *not* remove the cloth over the wound; this can disrupt the clotting process and could make the injury begin to bleed again.

Treating Burns

Burns can happen in different ways: from heat, chemicals, electricity, or direct contact with hot objects. No matter the type, the first aid you provide is often the same.

Always prioritize cooling the burn and ensuring the person's safety and stability until professionals can provide further care.

Treating Shock

Shock can happen as a result of several injuries, such as the ones mentioned above. If you experience significant blood loss, physical or emotional trauma, or even dehydration, the body can go into shock and fail to get enough blood or oxygen to function properly.

What is shock?

Shock: When the body does not get enough blood or oxygen to its vital organs and tissues.

Even if the injury itself is not fatal, a person can go into shock and die if not treated correctly and quickly. Signs of shock include pale or bluish skin that feels cold or clammy, nausea, vomiting, dull and sunken eyes, shallow breathing, and unusual thirst.

Shock needs medical treatment, but you can help prevent it from getting worse. Here's what you can do if you notice a person in shock:

- Keep their airway open so they can breathe.
- Control any obvious bleeding.
- If possible, elevate their legs about 12 inches to improve blood flow.
- Keep them warm by covering them with blankets.

Managing Other Injuries

In addition to cuts, burns, and shock, you may encounter broken bones, sprains, strains, and dislocations of joints. Let's look at each of these and how to provide basic first aid to help ensure timely and effective healing for the injury.

Strain

A muscle **strain** refers to an injury affecting a muscle or tendon, the connective tissue linking muscles to bones. You will likely experience pain, tenderness, bruising, limited range of motion, muscle spasms, swelling, and muscle weakness depending upon the severity or the strain. Understanding these symptoms is crucial for proper diagnosis and timely treatment.

Initial first aid (and self-) treatment for strains typically includes the R.I.C.E. approach:

- Rest

- Ice
- Compression
- Elevation

These measures will help reduce swelling and promote healing. Mild strains can often be managed effectively at home, while severe cases may require surgical intervention for repair.

Sprain

In contrast, a **sprain** involves damage to the ligaments that connect bones together. It occurs when a ligament is stretched too far or torn, affecting its ability to hold joints in place. **Ligaments** are tough bands that connect bones to each other.

You should seek immediate medical attention if you experience:

- Inability to bear weight on the injured leg
- Joint instability
- Numbness
- Severe pain directly over the bones

Similar to strains, initial treatment often involves the R.I.C.E. approach: rest, ice, compression, and elevation to reduce swelling and promote healing. Healing times vary, and over-the-counter pain relievers like ibuprofen or acetaminophen can help manage pain during recovery.

Dislocation

A **dislocation** occurs when the bones in a joint are forced out of their normal position, often due to a fall, equipment accident, or injury involving contact. To administer first aid care for a joint dislocation, be sure to:

- Seek medical help promptly; delaying care can worsen the injury.
- Immobilize the joint with a splint to prevent movement until medical assistance is available.
- Avoid attempting to manipulate or force the joint back into place, as this can cause further damage to surrounding tissues such as muscles, ligaments, nerves, or blood vessels.
- Apply ice to the injured joint to reduce swelling and control any internal bleeding. Ice helps prevent fluid buildup in and around the injured area.

Fractures

Fractures, or broken bones, require immediate medical attention, especially if they result from significant trauma or injury.

Administering CPR

Cardiopulmonary resuscitation (CPR) is a vital technique used in emergencies where someone's breathing or heartbeat has stopped, such as during a heart attack or near drowning incidents. It is important to take *immediate action* when performing CPR.

Before you Administer CPR: Assess the Person and Call 911

Imagine a fellow miner has fallen from a great distance and at first glance, they appear to not be moving. *What should you do first?*

Before initiating CPR, be sure you:

- Confirm that the environment is safe for the person needing assistance. In other words, be sure they (and you) are not in the way of falling material or other hazards.
- Assess whether the person is conscious or unconscious.
- If unconscious, gently tap or shake their shoulder and loudly ask, "Are you OK?"
- If there is no response, and you have someone nearby who can assist, instruct one person to call 911 or the local emergency number and retrieve the AED if available, while the other person begins CPR.
- If you are alone and have access to a phone, call 911 or your local emergency number immediately before starting CPR.

Overview of the Protocol

For those trained and confident in CPR, the protocol involves checking the person for a pulse and breathing, followed by chest compressions and rescue breaths, if necessary.

If unsure or rusty in CPR skills, focusing solely on *continuous chest compressions at a rate of 100 to 120 per minute* is recommended. We will look at these procedures in more detail below, but remember, to learn CPR effectively, you should take a certified or accredited first-aid training course that covers CPR techniques and the use of automated external defibrillators (AEDs).

If you feel hesitant or unsure about performing CPR correctly, remember that most 911 operators can walk you through the steps. If you are totally alone with no way to reach emergency personnel, know that taking action is always preferable to doing nothing at all. The decision to act could mean saving someone's life.

You can use the letters C-A-B to help you remember the sequence for performing CPR:

C: Compressions

A: Airway

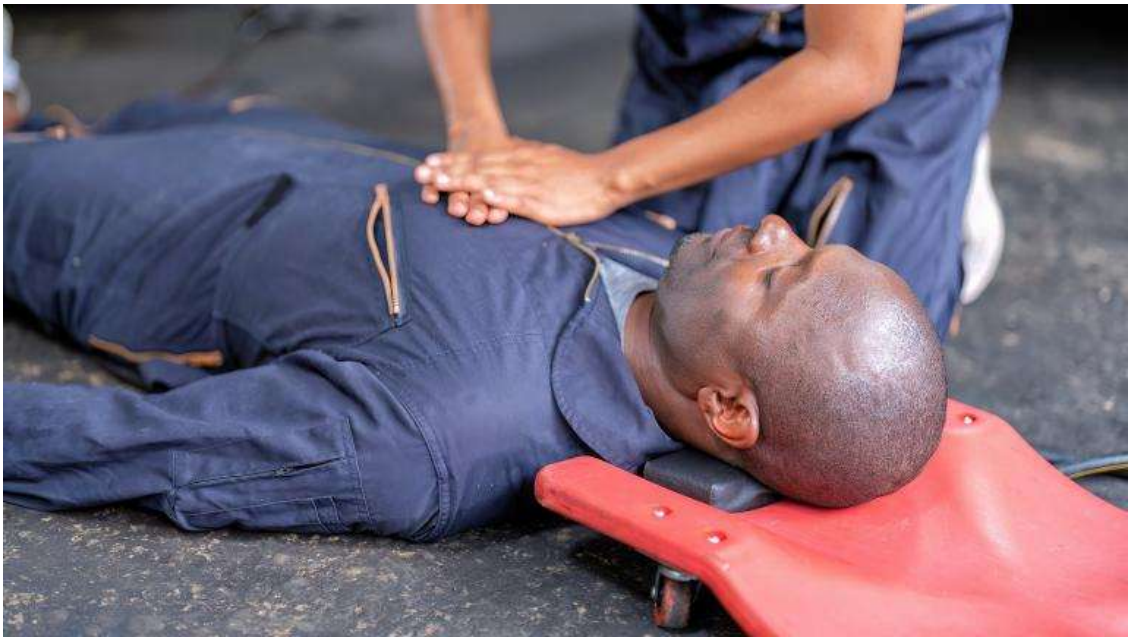
B: Breathing

Let’s look at each of these step by step.

C: Compressions

Once you have confirmed that the person is unconscious, has no pulse and is not breathing, begin to administer compressions. If you can confirm that the person has a pulse, but is not breathing, you may skip this step and proceed to the next portion of CPR, airway.

If a person has a pulse but you cannot determine if they are breathing: Use both of your hands to push down forcefully on the center of the person's chest, aiming for a depth of at least 2 inches (5 centimeters) but no more than 2.4 inches (6 centimeters). This action should be performed at a rate of 100 to 120 compressions per minute. You can use the beat of the song "Stayin' Alive" for rhythm consistency. The focus on compressions is critical, as it helps restore blood flow to vital organs.



7.3: Every mine operator and miner must be prepared to know and carry out basic CPR protocol.

If you have not been trained in CPR or you are uncomfortable with your skills, you can stop here. Otherwise, proceed to the next step, opening the person’s airway.

A: Airway

Once 30 compressions have been completed, open the person's airway using the head-tilt, chin-lift maneuver. This involves gently tilting the head back while lifting the chin forward to ensure an open airway. This will also ensure your rescue breaths are easier and more effective.

B: Breathing

If trained and confident, prepare to administer rescue breathing. This can involve mouth-to-mouth or mouth-to-nose techniques, depending on the circumstances and the condition of the person's airway.

Here's what to do to administer rescue breathing:

- After ensuring the airway is open with the head-tilt, chin-lift maneuver, proceed by pinching the nostrils shut for mouth-to-mouth breathing and creating a secure seal over the person's mouth with yours.
- Prepare to deliver two rescue breaths, each lasting about one second. Watch for the chest to rise after each breath.
- If the chest rises, give a second breath.
- If it does not, repeat the head-tilt, chin-lift maneuver and attempt another breath.
- Remember, each CPR cycle consists of thirty chest compressions followed by two rescue breaths. Be careful not to breathe too forcefully or too often.
- Maintain a steady rhythm of chest compressions to restore blood flow.

What if I detect a pulse?

- If you find that the person's pulse comes back during compressions, but they have not started breathing again, this means that they are likely in respiratory arrest. You can continue the rescue breaths, but continue to check for a pulse, because they can enter into cardiac arrest at any moment, and you will need to return to your C-A-B rhythm.
- *Should I use an automated external defibrillator (AED), or what if I don't have one?*
- If an automated external defibrillator (AED) becomes available, apply it as soon as possible, following its prompts. Administer one shock if advised, then resume chest compressions for two minutes before considering a second shock. If you are unfamiliar with using an AED, contact a 911 operator or another emergency medical provider for guidance.
- If an AED is not accessible, continue CPR until there are signs of movement or until professional medical assistance arrives.

In summary, when in an emergency, be sure to first ensure the safety of *both yourself and the injured person* by noting the scene around you. Try to call EMS, as well as others around you to help. Assess what is needed for the situation and act quickly, confidently, and according to the above protocol.

You are now equipped with critical concepts for administering basic first aid and CPR.