Unit	1020
Title	Move Tower
Document type	Learning resource

Canada

BRITISH COLUMBIA

BC **Forest Safety**

Funding provided through the Canada-British Columbia Labour Market Development Agreement.

In consultation with industry subject matter experts, the BC Forest Safety Council (BCFSC) facilitated the production of this material. Funding was provided by the Government of Canada, the Province of British Columbia, and industry in-kind contributions.

Feedback is welcome and may be sent to training@bcforestsafe.org.

Table of Contents

Unit Introduction

What you will learn in this unit

By the end of this unit, you will be able to demonstrate your knowledge of and ability for:

- Route planning
- Risk assessment
- On and off the low bed
- Equipment inspection
- Communication with crew

Why it's important for you to learn this unit

It is always the responsibility of any person using these materials to inform him/herself about the Occupational Health and Safety Regulations related to the work being conducted. A full list of OHSR related to this unit can be found in the relevant package.

Are you ready to take this unit?

To take this unit, you need to have completed the following units:

- 1002 – Describe Forest Industry
- 1003 – Describe Safe Work Practices
- 1004 – Communication in the Workplace
- 1005 – Recognize, Evaluate, and Control Hazards Related to General Forestry
- 1006 – Describe Workplace Documentation
- 1007 – Describe Emergency Preparedness
- 1008 – Describe and Apply Workplace Attributes
- 1009 – Recognize, Evaluate, and Control Hazards Related to Yarding
- 1010 – Describe Basic Regulations and Standards
- 1011 – Describe and Access Intermediate Regulations and Standards
- 1012 – Describe, Access, and Apply Advanced Regulations and Standards
- 1013 – Describe Rigging Components and Apply Basic Rigging Practices
- 1014 – Describe and Apply Advanced Rigging Practices
- 1017 – Apply Tower Operator Skills

Does this unit apply to you?

This unit applies to you if you are in the following occupation:

- Tower operator

Section 1020-0: Route Planning

What you will learn in this section

By the end of this section, you will be able to demonstrate your knowledge of and ability in the following key points:

1.1 Plan route in accordance with route requirements

1.2 Which equipment is best for the job in accordance with job requirements

Key Point 1.1: Plan Route in Accordance with Route Requirements

The plan for the move should be based on the best route. Keep the following points in mind when planning a route:

- Bridges and culverts should be able to withstand the load stresses
- The road should be wide and solid enough to handle the weight and length of the load
- The route should minimize the need to negotiate adverse and steep downhill grades.
- Drive route and check for overhead or new hazards
- For longer sections of roadway over 10 percent grade, the move plan should include effective pulling, pushing, and snubbing equipment
- The unit will not be overloaded. For example, if its rated capacity is 91,000 kg (200,000 lb.), it will not be expected to transport 114,000 kg (250,000 lb.)
- The tractor pulling the unit is within its power/weight ratio and operated by a qualified operator
- The tractor and lowbed are properly maintained, with particular emphasis on tires and brakes and absence of cracks in the frame
- The centre of gravity of the load is lowered as much as possible to reduce racking (twisting) of the frame
- All equipment operators should be kept aware of the time frame of the move

Width of the road

- Madill 172 Towers are approximately 12’-7” high (not including low-bed) and 59’-3” long
- Madill 124 Grapple Yarder is 13’ high (not including low-bed) and 73’ long when loaded or moving with the boom attached to the machine. Most grapple yarders are designed so the boom and gantry fold up and fit on a 53’ trailer to be shipped separately. If this is the case, then extra planning is needed for the two tractors and two loads
- The width of the road must have enough clearance to turn safely
- Every machine, style and configuration of tires can affect transport road requirements

Traffic

- Two-way radios should always be used in order to communicate between all vehicles
- If necessary, calling ahead will help to understand risks along the route
- Clear communication will help things to move smoothly

Note: Always follow best work practices. Policies and procedures differ depending on the company or if you are operating on a company road or not.

Power lines

High-voltage power lines can come into contact with steel tower yarding units while the machines are transported. Other power line contacts can occur as equipment is walked to the yarding site, or if operators forget to lower the boom or confirm the height of the line.

CAUTION!

Be extra careful when working around powerlines.

Recommended preventive actions

Remember the safe limits of approach. Electricity can arc or “jump” from the wire to a conducting object like a piece of equipment or a

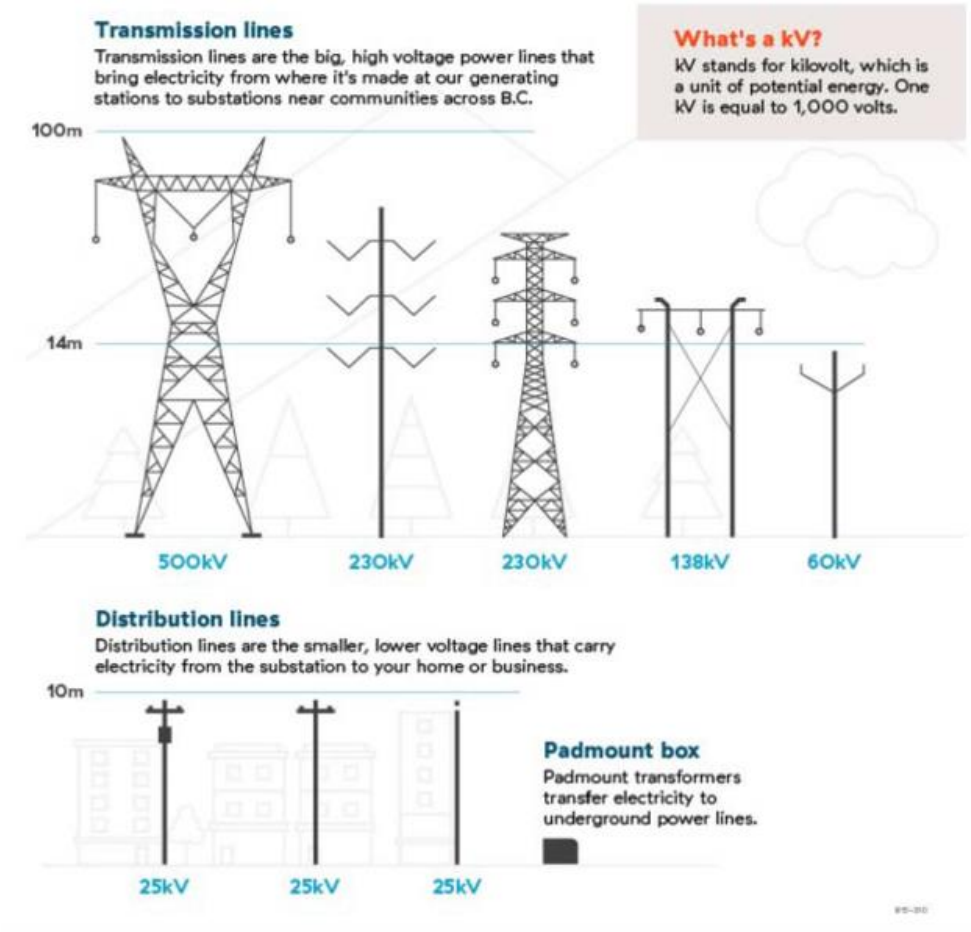
truck. When working around power lines, follow the Minimum Approach Distances from the Occupational Health and Safety Regulations:

Voltage	**Minimum approach distance for working close to exposed electrical equipment or conductors**	
Phase to phase	Meters	Feet
Over 750 V to 75 kV	3	10
Over 75 kV to 250 kV	4.5	15
Over 250 kV to 550 kV	6	20

Care must also be taken when moving equipment parallel to a power line. An arc can occur when equipment is moving parallel to the line and goes within the limits of approach. If your operations are only moving equipment underneath the power lines and not doing any work near the power lines, the following table can be used.

Voltage	**Minimum clearance distance for passing under exposed electrical equipment conductors**	
Phase to phase	Meters	Feet
Over 750 V to 75 kV	2	6.5
Over 75 kV to 250 kV	3	10
Over 250 kV to 550 kV	4	13

The following diagram provides a visual guide for estimating powerline voltage:



Now try the quiz on the next page.

Route Planning and Power Lines—Self-Quiz

1. When should the move plan include extra pulling, pushing and snubbing equipment?

   - ☐ Over 15 percent downhill grade
   - ☐ Over 20 percent downhill grade
   - ☐ Over 10 percent downhill grade
   - ☐ Over 5 percent downhill grade

2. When working close to a power line that is running at 230 kV, what is the minimum distance a worker can be from it?

   - ☐ 4.5 meters
   - ☐ 10 feet
   - ☐ 6 meters
   - ☐ 20 feet

3. When working under a power line that is running at 340 kV, what is the minimum distance a worker can be from it?

   - ☐ 10 feet
   - ☐ 2 meters
   - ☐ 6.5 feet
   - ☐ 4 meters

4. How many kilovolts is typically generated from a 100m tower?

   - ☐ 230
   - ☐ 300
   - ☐ 500
   - ☐ 100

Now check your answers on the next page.

Route Planning and Power Lines—Quiz Answers

1. When should the move plan include extra pulling, pushing and snubbing equipment?

   Answer: **Over 10 percent downhill grade**

2. When working close to a power line that is running at 230 kV, what is the minimum distance a worker can be from it?

   Answer: **4.5 meters**

3. When working under a power line that is running at 340 kV, what is the minimum distance a worker can be from it?

   Answer: **4 meters**

4. How many kilovolts is typically generated from a 100m tower?

   Answer: **500**

Other considerations with safety around power lines

Look up and live

Before you start work, look up and around the site and make sure you and your crew are aware of all overhead lines. Ladders, cranes and pipes are all good conductors of electricity, and remember, it doesn’t need to be touching a power line to become energized.

Parking near power lines

Equipment and vehicles with rubber tires can become energized when parked near high voltage power lines even if they are not in contact with the lines. If someone touches the energized vehicle, this creates a path to ground for the electricity and a shock will result. Usually these shocks are minor, but the severity of the shock depends on the voltage of the lines, how close the vehicle is to the lines and other factors. Avoid this hazard by not parking vehicles or equipment near power line right of ways.

Smoke and weather conditions

Particles from heavy smoke can act as a conductor which can result in electricity from power lines arcing greater distances. Increase the approach distances when there is heavy smoke in the air or postpone the job until the conditions clear.

CAUTION!

Highly humid weather conditions can also create greater arcing distances.

A downed power line is deadly

If you spot a fallen wire, keep at least 10 meters away, even if it doesn't appear to be live. If a wire falls across your vehicle, don't get out. You could become a path for electricity if you touch the ground. If you must get out, hop out clear and land on both feet, then shuffle until you are 10 meters clear of the vehicle.

Be aware of safety hazards below

Call before you dig. Phone the local power company to avoid coming into contact with underground cables and service lines. The call is free and it could save your life.

You hold their lives in your hands

Safety training is critical and as a supervisor or foreman, you hold your workers' lives in your hands. Don't put them at risk. Ensure that they have the critical safety training they need to go home safely to their families.

General information about electricity and yarding

If any part of your machine touches a live power line, then anything in contact with the machine will be energized for some distance. This includes the ground immediately below you. When the electrical flow reaches the ground, it spreads out like ripples in a pool of water. The voltage is highest at the point where the electricity flow reaches the ground; as it spreads out, the voltage drops off.

What should I do if any part of my equipment makes contact with an overhead power line?

- You are safer inside your machine than on the ground
- Do not touch or step onto anything that will provide a path for the current to flow to ground. It is the flow of current through you that kills or burns
- If electrical contact has been made with your machine, only abandon in an emergency such as a fire

Guidelines for a safe escape

- A safe escape can be made by keeping both feet together and making a short jump from your machine
- The goal is to ensure that your entire body clears the machine and that you land on your feet without stumbling
- Stand still with your body clear of the machine and keep your feet together until someone turns the power off
- If you must move away from the machine, hop or shuffle away without moving your feet more than a few centimetres (a couple of inches) at a time
- Keeping your feet together will ensure that you do not straddle two zones with different voltages that would allow the electrical flow to take advantage of a new path

How do I prevent contact with overhead obstructions like power wires?

- Every overhead obstruction must have height indicated plainly on a sign on each side of the obstruction
- The operator should know the height of each machine
- New or altered equipment should be measured for height
- Equipment operators should stop as they approach an overhead obstruction and proceed on signal from a watchman

Note: If a supervisor or operator is not sure of the line energy, the utility company will advise them by telephone or send a line supervisor to the site to provide the necessary guidance.

If you need to work inside a limit of approach, call the power authority controlling the electrical system. BC Hydro can be reached at 1 877 520 1355. They will work with you to determine what steps are necessary to protect you and the electrical system.

What should I NOT do if I make contact with an electrical conductor?

- Do not try to clear the fouled power line by lifting it off or over the machine, by hand or any other means
- Never climb on or off the machine
- Do not touch the equipment and the ground at the same time

Overhead obstructions

On most occasions, equipment makes contact with dangerous overhead obstructions when the obstructions are unfamiliar to the crew.

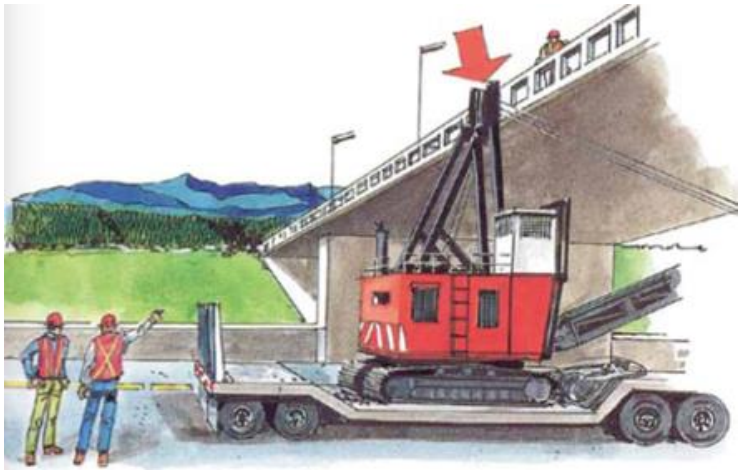
These include:

- Low-voltage power lines and phone lines in and around the camp
- Guylines for gin poles
- Guylines for log dumps
- Electric service lines for dry-land sort lighting
- Doors on service bays in shops

Railway and road overpasses

The height of railway and road overpasses must be known. Accidents have happened where supervisors and operators have forgotten to add the height of the lowbed in the overall height of the load, resulting in the equipment hitting the overpass.

The picture below show a gantry that's too high. The move was inadequately planned and supervised.



Now try the quiz on the next page.

Other Power Line Information—Self-Quiz

1. What is the most important thing to do before we dig into the ground where there could be hidden underground cables?
   - ☐ Put on your boots
   - ☐ Put on your hard hat
   - ☐ Call the local power company
   - ☐ Check site plans
2. Where is the voltage the highest in a situation where your machine touches a live power line?
   - ☐ At the point it touches the machine
   - ☐ At the point where the electrical current reaches the ground
   - ☐ At the highest point in the electrical line
   - ☐ At the centre point of the machine
3. In a situation where your machine is touching a live line, keeping your feet together when jumping off is a very smart idea to prevent getting shocked.
   - ☐ True
   - ☐ False
4. What should a worker not do when trying to escape a machine that is touching a live power line?
   - ☐ Stand still when your body is clear of the machine
   - ☐ Touch the equipment and the ground at the same time
   - ☐ Stay in your machine and wait for help
   - ☐ Keep your feet together when jumping off the machine

Now check your answers on the next page.

Other Power Line Information—Quiz Answers

1. What is the most important thing to do before we dig into the ground where there could be hidden underground cables?

   Answer: **Call the local power company**

2. Where is the voltage the highest in a situation where your machine touches a live power line?

   Answer: **At the point where the electrical current reaches the ground**

3. In a situation where your machine is touching a live line, keeping your feet together when jumping off is a very smart idea to prevent getting shocked.

   Answer: **True**

4. What should a worker not do when trying to escape a machine that is touching a live power line?

   Answer: **Touch the equipment and the ground at the same time**

Key Point 1.2: Which Equipment is Best for the Job in Accordance with Job Requirements.

Take note of the following when choosing which equipment is best for the job in accordance with the job requirements:

- The most important consideration when choosing equipment is that the machine (such as a cat or dozer) doing the pulling needs to have a higher friction co-efficient for weight than the one it is pulling
- Sometimes two to three machines will be required in combination to have the friction co-efficient necessary to pull a low bed with a tower on it
- Straps are used between low-bed and pushing or snubbing machines or between tower and pushing and snubbing machines
- The straps used to secure the tower to the lowbed must be large enough and should be checked beforehand
- Attachment points for straps need to be strong enough for expected load on straps between machines

Section 1020-02: Risk Assessment

What you will learn in this section

By the end of this section, you will be able to demonstrate your knowledge of and ability in the following key point:

2.1 Do a risk assessment of planned route

Key Point 2.1: Risk Assessment

Each year, dozens of preventable incidents occur because the company does not have a well-thought-out policy for assisting a lowbed or a machine up or down a grade.

The decision to snub, push, or pull is usually left to the supervisor, operator or hook tender. The supervisor usually bases the selection on previous experience and the operator's advice.

Problems arise when:

- The supervisor's experience is limited
- Shortcuts are taken to save time
- The operator does not know the limitations or the grade capability of the lowbed or equipment
- Parts of the drive or brake components have deteriorated because of poor operating procedures, poor maintenance, or age

What information is needed to make proper decisions?

The considerations you need to make proper decisions when assisting a lowbed or a machine up or down a grade are listed below.

Lowbeds and tractors

Considerations when choosing a lowbed of tractor includes the following:

- Load capacity
- Condition of the tires
- Braking capacity at normal speeds
- Braking capacity on downhill grades
- Condition of tractor unit (Is it new or used?)
- Power and traction capability of tractor unit on uphill grades
- Effect of any modifications to the lowbed or tractor unit
- Auxiliary equipment such as engine retarders, exhaust brakes (jake brake) and transmission lock-up controls must be checked before the move. These will assist in slowing or holding the tractor back on steep downhill grades

Wheeled or tracked machines

Considerations when choosing a wheeled or tracked machine includes the following:

- Grade capability of machine (Is it suited for uphill and downhill?)
- Condition of the equipment (Is it new or used?)

- Components, including tracks, tires, drive chains, and brakes

CAUTION!

If a decision is made to snub, push, or pull equipment, the capability of the equipment doing the snubbing, pushing, or pulling should be known. The assisting equipment should have sufficient power and traction.

Doing something “because that’s the way we’ve always done it” does not mean it is the best way.

What should the supervisor, operators and hook tender have a clear understanding of?

Supervisors, operators, and hook tender must have a clear understanding of the following when making decisions on assisting a lowbed or a machine up or down a grade:

- The push or pull of a crawler tractor on a firmly packed gravel road
- The holding power of an off-highway truck when it is half-loaded and used to snub a machine down a hill
- The effect of tire wear on holding power
- Whether tire inflation affects the assisting equipment
- The pull capacity of a log truck with trailer
- The push capacity of a log truck with trailer
- The maximum percent grade for snubbing, pushing, or pulling, for crawler tractors or trucks, if the road is frozen or there is ice or snow
- The steep grade assessment. Make sure it has been completed if needed.

This information should be provided in written form to the supervisors, operators, and hook tenders.

The driver of the lowbed or a machine is fully responsible for the safe operation of the equipment. The driver must be trained and certified for the equipment used. This may include air brake certification. The driver mush also be experienced with the specific work practice (snubbing, pushing, or pulling) and aware of the hazards involved.

Other potential hazards

Walking the yarder

On established roads, there may be fewer hazards, provided the road is of sufficient width.

Hazards do develop on newly constructed haul roads.

Often roads or spur roads are constructed barely wide enough for the tracks.

The operator is then forced to “walk” off-centre of the road to the uphill side, with the tracks or tires close to or in the ditch. In that position, the machine can tip sideways.

Roads not adequately benched or built with loose side-cast material could give way under the weight and vibration of the grapple yarder.

When the road is too narrow, the grapple yarder can be off centre and result in sideways tipping

Culverts and bridges

Metal, plastic, and log culverts, if not adequately bedded, can shift and collapse. The yarder must not be turned when it is over a culvert. Plugged culverts can wash out under the road surface and collapse.

Bridges must be inspected periodically to ensure that the structure is capable of withstanding the load.

Bridges must be inspected to ensure they can support the loads imposed upon them

Roads covered with debris or snow

When travelling on debris-covered roads, jill-pokes are common, resulting in air lines being broken and tracks derailed.

CAUTION!

When roads are covered with ice or snow, it is difficult to determine the stability of the road. The road edge may not be visible, or there can be poor traction. Keep the road clear, and be aware of loss of traction from ice buildup between the grousers.

Rock protrusions

Rock protrusions are common on poorly built and poorly maintained roads. These protrusions can cause severe vibration, bounce, and jarring. Such severe movements cause equipment damage and loss of control by the operator.

Walking over road protrusions causes severe shake and can adversely affect the operator

Now try the quiz on the next page.

Risk Assessment—Self-Quiz

1. What is the most common reason why incidents occur when moving a lowbed or other machine?

   ☐ A route that has grades that are too steep is chosen

   ☐ Not enough workers available to assist

   ☐ Workers are not trained on how to operate machines safely

   ☐ A proper policy and plan are not in place for how to transport the machine safely

2. What can directly help to reduce the speed of a tractor on a steep downhill section?

   ☐ Condition of the tires

   ☐ Condition of exhaust brakes

   ☐ Load capacity of the lowbed or tractor

   ☐ Rocks or stumps in the road

3. Established roads frequently have more hazards when moving the yarder than newly constructed spur roads.

   ☐ True

   ☐ False

4. How should details that supervisors, operators and hook tenders need be shared?

   ☐ Verbally at a meeting

   ☐ Verbally on the way to the job

   ☐ In written form, well ahead of time

   ☐ In written form, on the day the move starts

Now check your answers on the next page.

Risk Assessment—Quiz Answers

1. What is the most common reason why incidents occur when moving a lowbed or other machine?

   Answer: **A proper policy and plan are not in place for how to transport the machine safely**

2. What can directly help to reduce the speed of a tractor on a steep downhill section?

   Answer: **Condition of exhaust brakes**

3. Established roads frequently have more hazards when moving the yarder than newly constructed spur roads.

   Answer: **False**

4. How should details that supervisors, operators, and hook tenders need be shared?

   Answer: **In written form, well ahead of time**

Section 1020-03: On / Off Lowbed

What you will learn in this section

By the end of this section, you will be able to demonstrate your knowledge of and ability in the following key point:

3.1 Load and unload machine off a lowbed including signals

Key Point 3.1: Load and Unload Machine off a Lowbed

Once the plan to move the equipment has been communicated to the crew, the machine can be loaded onto the lowbed.

Here are the guidelines for loading the equipment on the lowbed:

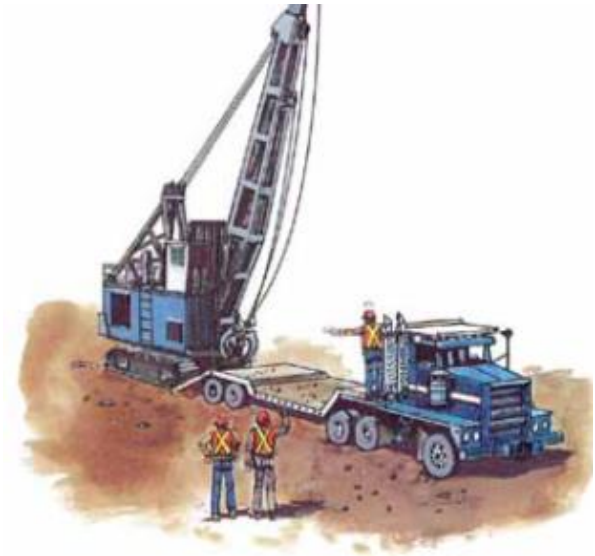
- The ground where the machine is loaded should be as flat and level as possible. That that means no uphill slope and definitely no side slope to the grade

Note: A slight downhill slope is desirable for ease of loading.

- Once the loading ramps have been lowered and cushioned with proper blocking, the machine may be walked onto the lowbed

Note: The walking of the machine onto the lowbed must be under the direction of a qualified supervisor.

- A designated signaler must direct the machine operator. This signaler must be in clear view of the operator at all times. Each movement of the machine is done on a signal from the designated signaler



- The machine must be properly centred on the lowbed
- Once the yarder or loader is properly centred on the lowbed, any part of the machine that can reduce the overall height should be lowered

Note: This reduces the sway when turning around corners, especially on roads with improperly graded crowns.

- The machine must be secured to the lowbed with adequate turnbuckles, cinches, or other suitable rigging, and its parking brakes must be set

Moving equipment to the unloading site

Before the loaded lowbed is moved, the operator of the lowbed and the driver of the pilot vehicle must make a final check of the planned move, using these questions as a checklist:

- Are the radios working properly?
- Have all the overhead obstructions been located?
- Is the road of the intended route capable of supporting the load?
- Has the snubbing equipment been provided at the appropriate locations?
- Is the unloading site suitable?
- Is there a possibility of adverse weather conditions such as snow, rain, or ice?
- Have bridge capabilities been assessed?

Once under way, the pilot vehicle must drive at a speed that respects the road conditions and the safe operating speed of the lowbed tractor.

Unauthorized vehicles encountered en route must be notified of the lowbed's approach and told to clear the roadway. If the unauthorized vehicle does not stop, the move must be halted until the vehicle is cleared.

CAUTION!

Simply pulling off to the side of the road is not acceptable unless it is certain that there is enough room for the wheels of the lowbed and tractor to remain on the solid roadway and the lowbed driver is notified of the location of the vehicle.

The pilot vehicle operator must never assume that, because of road width or familiarity with the area, an oncoming vehicle can pass without incident.

Unloading the equipment

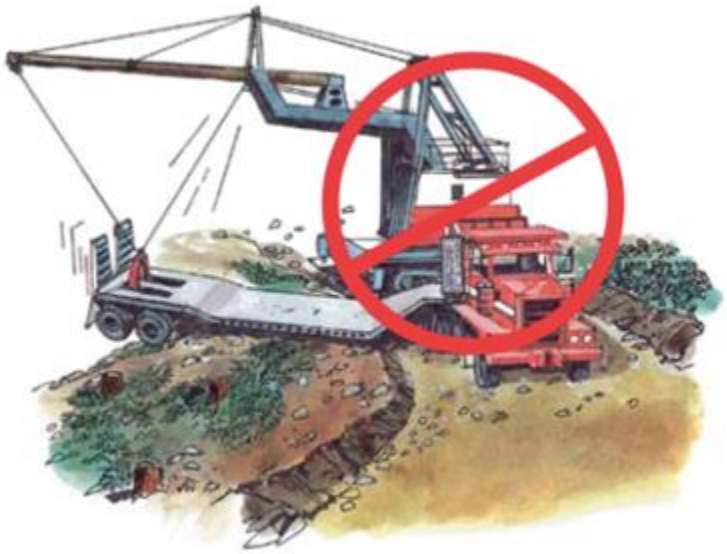
Unloading the equipment is the reverse procedure of loading and must be done under the direction of a qualified supervisor. The following conditions for unloading the equipment must be observed:

- Choose a suitable site with little or no side slope. There must be no uphill grade
- Set the parking and maxi brakes on the lowbed and tractor unit
- Remove the tie-down rigging and place it where it will not be run over or forgotten
- Designate a qualified person to supervise the unloading of the equipment. This person will signal directions to the operator. The operator, in turn, must follow those directions precisely. The signaler must be in clear view of the operator at all times
- Keep all unnecessary crew transportation vehicles and workers clear of the unloading area so that the signaler and operator are not distracted

---

CAUTION!

The unloading area must provide sufficient room to turn the lowbed around without having to back it into or over a bank, through slash, or over saplings.



Lowbed trailers are frequently damaged by using this method to turn

Watch the Unloading off lowbed video which shows the unloading of a Madill 044 Grapple yarder off a lowbed. The machine is 65 feet tall and weighs 110 tons.

Signals when loading and unloading

Two-way radios are essential in these situations. Those in different vehicles and in different roles need to be in constant communication.

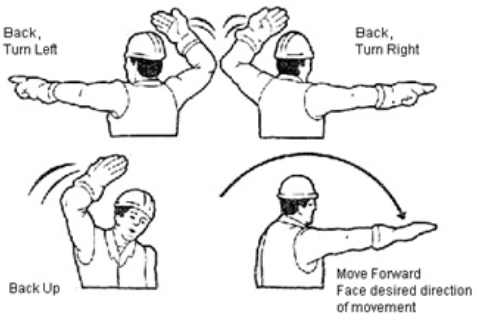
Communication differs in different types of towers

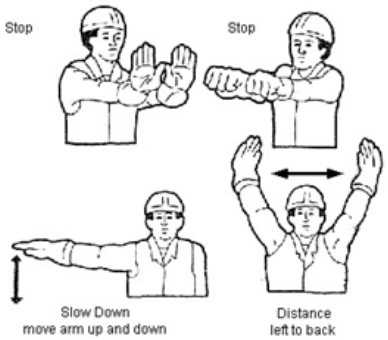
- In a 71-72 foot mini tower, the operator sits in the same cab when it is being unloaded as when operating it. There should be a radio in it for communication
- In a 90-foot tower, there is a separate driver cab (without a radio in it). In this situation, a portable radio is necessary

Using a spotter or guide

If a spotter is required to load or unload the equipment, remember that it is critical that all signals be made by hand and not by shouting instructions. The signaler must have a clear view of the machine and the operator but must stand offside and not directly behind the machine.

Standing off to the side toward the rear, to be seen either directly by the operator or the spotter gives positive and strong hand signals for steering, slowing and stopping.





Responsibilities of the spotter

The spotter must:

- Be constantly aware of the surroundings while performing this function
- Be constantly looking and listening for other vehicles and people entering the path of the backing vehicle
- Either stop the oncoming hazard or stop the machine being backed up
- Be aware of objects and direct the operator safely around them
- Not only look at the ground level for obstructions, but also look up for overhead hazards such as wires, etc.
- Use hand signals to direct the driver. These hand signals should be somewhat exaggerated so that the driver can be clear as to what the spotter is signalling
- Be alert for his or her own safety

Watch the Travel to yarding position video which shows a Madill 120 putting the cab up and how they bring the gantry and boom up from travel position to yarding position.

Now try the quiz on the next page.

On/ Off Lowbed—Self-Quiz

1. What kind of slope needs to be absolutely avoided when preparing the lowbed to be loaded?

   - ☐ A side slope
   - ☐ An uphill slope
   - ☐ A downhill slope
   - ☐ A muddy slope

2. According to 1020-03, what is the biggest reason to lower the boom or any part of the yarder/loader that can reduce the overall height?

   - ☐ It is easier to secure
   - ☐ It reduces the sway when going around corners
   - ☐ It makes it easier to see what is behind
   - ☐ You can fit more on the lowbed

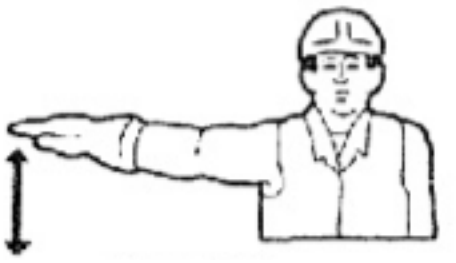
3. Pulling off the side of the road is permitted only if you can keep the wheels on a solid roadway.

   - ☐ True
   - ☐ False

4. Where should a spotter be located when assisting to load or unload equipment?

   - ☐ In front and to the side
   - ☐ In front and straight ahead
   - ☐ Directly behind the machine
   - ☐ To the side and behind

5. What does the following signal mean?



- ☐ Slow down
- ☐ Back up
- ☐ Move forward
- ☐ Stop

Now check your answers on the next page.

On/ Off Lowbed—Quiz Answers

1. What kind of slope needs to be absolutely avoided when preparing the lowbed to be loaded?

   Answer: **A side slope**

2. According to 1020-03, what is the biggest reason to lower the boom or any part of the yarder/loader that can reduce the overall height?

   Answer: **It reduces the sway when going around corners**

3. Pulling off the side of the road is permitted only if you can keep the wheels on a solid roadway.

   Answer: **True**

4. Where should a spotter be located when assisting to load or unload equipment?

   Answer: **To the side and behind**

5. What does the following signal mean?

   Answer: **Slow down**

Section 1020-04: Inspect Equipment

What you will learn in this section

By the end of this section, you will be able to demonstrate your ability in the following key points:

4.1 Inspect equipment to ensure machine is secure on low bed for trip

4.2 Check function of brakes and demonstrate knowledge of capabilities of brakes on equipment in accordance with manufacturer's specifications

4.3 Lock out equipment in accordance with manufacturer's specifications

Key Point 4.1: Inspect Equipment to Ensure Machine is Secure on Lowbed for Trip

The machine car bodies should be secured to the lowbed with adequate turnbuckles, cinches, or other suitable rigging, and the brakes should be set.

Note: All yarders are unique, and inspections differ depending on the size of yarder, as well as what lowbed and truck it is on. Refer to the manufacturer's instructions when inspecting and securing the tower to the lowbed.

Key Point 4.2: Check Function of Brakes and Demonstrate Knowledge of Capabilities of Brakes on Equipment in Accordance with Manufacturer’s Specifications

All yarder towers have different braking systems, and it is essential to follow manufacturer’s instructions when checking their function and capabilities.

Key Point 4.3: Lock out Equipment in Accordance with Manufacturer's Specifications

The key point on locking out equipment presented here in 1020-04 is also presented in the following units:

- 1017 (Apply Tower Operator Skills)
- 1018 (Set up Tower)
- 1019 (Take Down Tower)

WorksfaeBC regulations require using lock or locks during repair and maintenance work to render machinery or equipment inoperable or to isolate an energy source.

Guidelines on locking equipment

- When using a start/stop switch for checking that the equipment has all power sources disconnected, ensure that the switch is left in the stop or off position
- Personal padlocks and one key will be supplied to all workers required to lock out. Only padlocks supplied by the company can be used. Each personal lock will be identified to the person to whom it is issued
- Each worker is responsible for attaching his lock and for removing his lock
- When a job continues over a shift change, workers coming on shift must place their personal locks on all control devices before the workers going off shift remove their locks
- All locks placed on control devices may only be removed by the person who applied the lock
- In the event a personal lock is left on after a job is completed, or the worker has left the site, it may be removed in an emergency

A thorough investigation is required by the foreman and safety representative to ensure that no workers will be endangered by the removal of the personal lock. Any breaking of the lockout procedures must be recorded and the worker whose lock was removed notified.

Many yarders do not have lock out tags. When there is a shift change or when maintenance is required, they MAY be used, but not in all situations. Flagging ribbon is also used to mark/indicate what is broken, needs welding or any other maintenance.

Yarders frequently have a sheet on the dash where messages can be left when there is a need for maintenance. Verbal communication over radio or otherwise are also common when maintenance is required.

Why is it important to shut down the machine properly?

Hazards for machine operators are highest when entering or exiting the machine. Some machines may require the operator to start the machine from beside the motor.

CAUTION!

Operate only from a safe area recommended by the manufacturer.

If required, you may need to hold the low oil pressure over-ride switch on until the motor gets enough oil pressure to negate the use of the switch. Also, never exit the machine without shutting down and securing all hazardous energy completely.

Machine shutdown

Observe the following safety procedures:

1. Lower blades, grapples, masts, or attachments to the ground or other stable surface. All moving parts must come to a complete stop.
2. Disengage winches or place transmission in neutral.
    - This helps to safely start the engine the next day. Sometimes the winches will engage when started by operator standing at the engine.
3. Shut down the engine.
4. Engage brakes to prevent movement.

Guidelines for what to do before maintenance is conducted

- Secure all parts and attachments against inadvertent movement
- Make sure the pressure or stored energy in pneumatic and hydraulic storage devices that move machine elements is discharged
- Remove ignition keys and place them in your pocket
- Put lockout tags over control devices, clearly saying “DO NOT OPERATE” or “DO NOT START” or another appropriate warning

CAUTION!

Check the work area before lockout tags are removed to be sure all tools have been removed, guards are in place, and workers in the clear.

Now try the quiz on the next page.

Lock Out Equipment—Self-Quiz

1. Lockout tags are always used on yarder towers.

   ☐ True

   ☐ False

2. We need to check the work area after the lockout tags are removed.

   ☐ True

   ☐ False

3. When are hazards highest for machine operators (as mentioned above)?

   ☐ When starting the machine

   ☐ When entering or exiting the machine

   ☐ When shutting the machine down

   ☐ When removing lockout tags

4. It is permitted at any time to remove locks for other operators should they not be available to do so.

   ☐ True

   ☐ False

Now check your answers on the next page.

Lock Out Equipment—Quiz Answers

1. Lockout tags are always used on yarder towers.

   Answer: **False**

2. We need to check the work area after the lockout tags are removed.

   Answer: **False**

3. When are hazards highest for machine operators (as mentioned above)?

   Answer: **When entering or exiting the machine**

4. It is permitted at any time to remove locks for other operators should they not be available to do so.

   Answer: **False**

Section 1020-05: Communication with Crew

What you will learn in this section

Note: This section on Communicate with Crew is presented in the context of moving a tower. It also presented in 1018-05 (for setting up tower) and 10019-04 (for taking down tower).

By the end of this section, you will be able to demonstrate your ability in the following key point:

5.1 Communicate with crew to facilitate the safe movement of tower including signals

Key Point 5.1: Communicate with Crew to Facilitate the Safe Movement of Tower Including Signals

Note: Signal systems are different from site to site. The signal systems you use on any given day will be discussed at your safety meetings. This key point provides an overview of the signal systems.

CAUTION!

Before work can commence, all frequencies being used must be approved. See WorkSafeBC regulation 26.34 (12).

Signal systems when moving

The whistle can be used to convey information to the operator when moving or loading the machine on a low-bed, such as:

- whistle means **stop**
- 1 and 1 pause 1 and 1 means **back-up**
- 1 and 1 and 1 means **go ahead**

Any right or left turns would be signaled by the spotter pointing which way the yarder should go.

Converting the whistle signals to hand signals is the same as high lead hand signals: go ahead, skinner back, stop and dog brakes.

A voice-type radio is the best for giving instructions for moving yarders.

VHF and UHF radios

The two acceptable means of controlling the movement of lines on cable yarding systems, other than hand signals are very high frequency (VHF) radio whistle signaling devices and ultra-high frequency (UHF) voice radios.

Very high frequency (VHF) radio whistle signaling devices

These are radio transmitters, usually worn around the waist, that activate a whistle on the yarder when a button is pushed. Each required movement of the line has a specific audible whistle signal, which is the same on every yarding site in the province. The unique

combinations of short and long whistles ensure controlled movement of yarding lines at all times.

Ultra high frequency (UHF) voice radios

A worker tells the operator what line movement is required. The worker directing line movement must use WorkSafeBC-approved verbal commands, which describe the VHF radio whistle signals.

When a voice radio is used, any worker who may be affected by the line movement must be able to hear the verbal command. If a worker cannot hear, radio whistles must be used.

To meet this requirement, there are three alternatives:

- All workers are equipped with radios
- An amplifying speaker is mounted on the outside of the yarder; the speaker clearly broadcasts each verbal command
- The operator repeats each verbal command with a radio whistle signal

Radio signaling devices, either hand-held transmitters or equipment-mounted radios used in logging operations, must be clearly marked with the name of the manufacturer, serial number, assigned operating frequency, and specified tone frequency.

Radio signaling devices must have the following:

- Power limits of ¼ watt for grapple yarder radios
- Power limits of ½ watt for high-lead radio whistles
- A permanently enabled tone-encoded squelch

There should be only one frequency per radio. Where multi-channel radios are used, the selection switch must be disabled so that only an authorized person can change the operating frequency.

CAUTION!

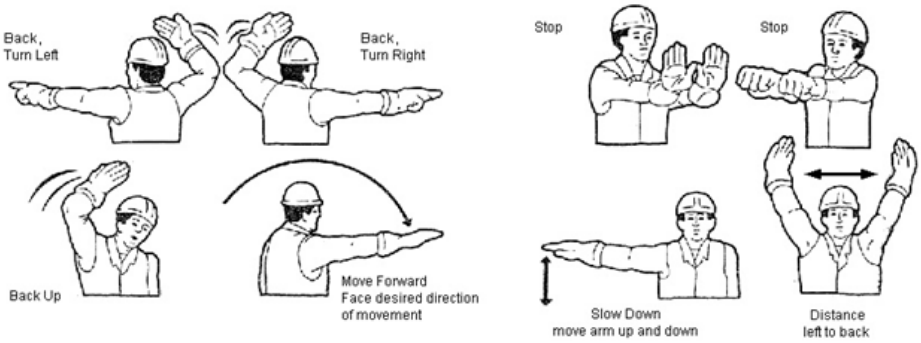
Radio signals replace audible signals for the movement of equipment in logging. Interference by other radios on the same frequency can seriously endanger workers.

Additionally, minerals in the ground can impede the operation of VHF radio whistle systems, causing missed or incorrect whistles to come out. UHF is considered “line of sight,” so being behind obstacles or in a vehicle can impede the signal as well.

Using a spotter or guide

If a spotter is required to load or unload the equipment, remember that it is critical that all signals be made by hand and not by shouting instructions. The signaler must have a clear view of the machine and the operator but must stand offside and not directly behind the machine.

Standing off to the side toward the rear, to be seen either directly by the operator or the spotter gives positive and strong hand signals for steering, slowing and stopping.



Responsibilities of the spotter

The spotter must:

- Be constantly aware of the surroundings while performing this function
- Be constantly looking and listening for other vehicles and people entering the path of the backing vehicle
- Either stop the oncoming hazard or stop the machine being backed up
- Be aware of objects and direct the operator safely around them
- Not only look at the ground level for obstructions, but also look up for overhead hazards such as wires, etc.
- Use hand signals to direct the driver. These hand signals should be somewhat exaggerated so that the driver can be clear as to what the spotter is signalling
- Be alert for his or her own safety

Now try the quiz on the next page.

Communication—Self-Quiz

1. Match the following signals with what they mean:

1 whistle	Back up
1 and 1 and 1	Stop
1 and 1 pause 1 and 1	Go ahead

2. A voice type of radio is the best for giving instructions when moving yarders

   ☐ True

   ☐ False

3. Where are VHF type radios usually worn?

   ☐ On the wrist

   ☐ Attached to the helmet

   ☐ Clipped to your vest

   ☐ Around the waist

4. What must not be enabled when radios are using many different channels at a worksite?

   ☐ The whistle function

   ☐ The selection switch

   ☐ The voice function

   ☐ A tone-encoded squelch

Now check your answers on the next page.

Communication—Quiz Answers

1. Match the following signals with what they mean:

1 whistle	**Stop**
1 and 1 and 1	**Go Ahead**
1 and 1 pause 1 and 1	**Back up**

2. A voice type of radio is the best for giving instructions when moving yarders.

   Answer: **True**

3. Where are VHF type radios usually worn?

   Answer: **Around the waist**

4. What must not be enabled when radios are using many different channels at a worksite?

   Answer: **The selection switch**