



# Heavy Equipment Operator: Earth Moving, Ditching, and Loading Skills

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# **HEAVY EQUIPMENT OPERATOR: MOVING, DITCHING, AND LOADING SKILLS**

Developed by the  
Curriculum and Instructional Materials Center  
Oklahoma Department of Career and Technology Education  
[www.okcimc.com](http://www.okcimc.com)

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# BACKHOE

## BACKHOE

### Job Sheet 1

**Carry a straight line while excavating a ditch and loading a haul truck.**

#### INTRODUCTION:

Carrying a straight line while excavating a ditch and loading a haul truck are basic operations of the backhoe. This procedure involves following a marked course and moving the backhoe using the backhoe attachment. The backhoe operator must also coordinate the procedure with the driver of the haul truck. This procedure is used in civil, commercial, and residential projects.

#### TOOLS AND EQUIPMENT:

Backhoe  
Haul Truck

#### PROCEDURE:

1. Position the backhoe in a straight line with the marked lines of the proposed ditch.

**NOTE:** *Lines are usually marked with lime.*

2. Position the truck so that it will be loaded over the side. (Figure 1)

**NOTE:** *Always swing the load from the tailgate to the front of the bed, never over the cab.*

**FIGURE 1**



3. Lower the stabilizers until the wheels are off the ground.
4. Lower the loader bucket to the ground to provide a front stabilizer.



5. Engage the bucket arm control to move the bucket to the 5:30 position.
6. Engage the bucket control to position the cutting edge at about a 30-degree angle to the ground.
7. Move the boom control to lower the bucket to the ground.  
**NOTE: Load the bucket quickly and easily with thin slices.**
8. Pull the bucket arm control in, and as the bucket enters the material, manipulate the bucket cylinder control so that the cutting edge is working parallel to the ground.  
**NOTE: Forcing the equipment reduces its efficiency and durability.**
9. Raise or lower the boom control slightly if the bucket arm slows or stops filling the bucket.
10. Pick up the bucket as soon as it is full.  
**NOTE: As the depth of the ditch is reached, move the backhoe, keeping in line with the marked ditch line.**
11. Raise the boom control to clear the cut and the side of the truck; swing the bucket to the truck and gradually spill the load out of the bucket to ease the strain of added weight on the truck. (Figure 2)

**FIGURE 2**



12. Actuate the bucket and bucket arm control levers at the same time for a fast, controlled dump.  
**NOTE: Load the truck from the far side to the near side.**
13. Swing the bucket back to cut and continue the cycle until the ditch is complete or the truck is loaded.  
**NOTE: While waiting for the truck, use the time to move the backhoe or make adjustments, loosen dirt, or clean up the corners of the cut.**

# BACKHOE

## BACKHOE

### Job Sheet 2

*Excavate a tee intersection.*

#### **INTRODUCTION:**

Excavating a tee intersection is a basic operation of the backhoe used in foundation, electrical, fiber optic and all types of utility digging. This procedure involves the basic setup and operation of the backhoe with the addition of making a 90-degree corner.

#### **TOOLS AND EQUIPMENT:**

Backhoe

#### **PROCEDURE:**

1. Center backhoe up over the top of the tee.
2. Start the dig and continue to the end of the marked line at the designated depth using correct backhoe digging procedures. (Figure 1)

**FIGURE 1**



3. Dump the soils to the outside of the tee.

4. Relocate the backhoe perpendicular to the top of the tee, lined up with the marked line on the base of the tee. (Figure 2)

**FIGURE 2**



5. Start the dig, intersecting with the trench on the top of the tee. (Figure 3)

**FIGURE 3**



6. Dump the soils to the side of best removal.
7. Excavate through the marked line.

# BACKHOE

## BACKHOE

### Job Sheet 3

#### *Backfill an excavation.*

#### **INTRODUCTION:**

Backfilling a trench is a basic operation using the front bucket of the backhoe to return the spoils to the trench. This procedure is used in all types of utility digging.

#### **TOOLS AND EQUIPMENT:**

Backhoe

#### **PROCEDURE:**

1. After digging the trench move the backhoe around on the spoils side of the trench.
2. Start at one end of the trench perpendicular or no more than a forty-five degree angle to the spoils pile.
3. Drop the front bucket down flat on the ground without raising the front wheels off the ground.

**NOTE:** *You should be in low gear at this time. (Stop and check.)*

4. In most cases, attempt to push a third to a half of a bucket into the trench. The type of material and the height and width of the stockpile will determine how much to push.
5. Raise the left arms and leave the material in the bucket, it will act as a push blade the next trip.
6. Back up and scoot over.
7. Drop the bucket down to the ground.
8. Push another half bucket into the trench. (Repeat until the spoils have been pushed into the trench.)
9. Take the remainder of the material in the bucket to the opposite end of the trench and dump it into the trench.

**NOTE:** *When you loaded the bucket the first time, very little spoils went into the trench.*

10. Leave the center of the trench slightly mounded for settling.
11. Sometimes, overshooting the trench with the spoils will cause an uneven backfill. To straighten uneven backfill, tilt the front bucket down and use the edge of the blade to push or pull the spoils into place.



# BACKHOE

## BACKHOE

### Job Sheet 4

#### *Straddle a ditch.*

#### **INTRODUCTION:**

Being able to maneuver the backhoe with the backhoe attachment in close proximity to objects such as walls, fences, or buildings is an important skill for an operator to master. In this job sheet we will demonstrate how to maneuver the backhoe into position, centering over the ditch for digging or cleanout. The procedure of straddling a trench is used in foundation, utility, close proximity digging, and using the backhoe for a barricade.

#### **TOOLS AND EQUIPMENT:**

Backhoe

#### **PROCEDURE:**

1. Dig a straight line trench at the desired depth and to the desired length using proper backhoe techniques.
2. Use the front bucket to move spoils and debris away from the edge of the open side of the trench. (Figure 1)

**FIGURE 1**



3. Position the backhoe at a forty-five degree angle to the trench with the back wheel near the edge of the trench and allow enough room to extend the backhoe attachment to the desired starting point that needs excavated.

4. Put the parking brake on.
5. Shift into neutral.
6. Turn seat around to the backhoe attachment.
7. Drop the outriggers down to the bottom of the wheels.
8. Extend the backhoe attachment out to at least three-quarter total extension, curl the bucket all the way out and swing the boom to the opposite side of the trench.
9. Lower the boom down a couple of feet from the trench.
10. Lift the back wheels of the backhoe off the ground.
11. Take the parking brake off.
12. Manipulate the boom, stick, swing controls and steering wheel at the same time to draw the machine smoothly over the trench at a diagonal. (Figure 2)

**FIGURE 2**



13. Once the backhoe is centered across the trench, lower the stabilizers down to secure the machine.
14. Use the correct backhoe procedures to finish the excavation or cleanout.
15. Use the same procedures to get back across, manipulating the controls and steering wheel in the opposite directions.
16. Use this procedure for straddling and crossing back until the excavated area is finished.

# BACKHOE

## BACKHOE

### Job Sheet 5

#### *Straight line dig and move.*

#### **INTRODUCTION:**

Straight line digging and moving is the most basic of backhoe procedures. It is used in constructing foundations, and in electrical, gas, fiber optic and all forms of utility digging. In this job sheet we will demonstrate the basic operation of the backhoe attachment, the basic procedure for digging a trench, and how to move the backhoe using the backhoe attachment.

#### **TOOLS AND EQUIPMENT:**

Backhoe

#### **PROCEDURE:**

1. Center backhoe over perimeter chalk Line.
2. Put the parking brake on.
3. Put the transmission into neutral.
4. Drop the front bucket to the ground flat and raise the front wheels off the ground.
5. Turn the seat around facing the backhoe attachment.
6. Accelerate the hand throttle to one quarter.
7. Drop the down riggers to lift the back wheels off the ground. Level the backhoe side to side.
8. Remove the boom swing pin.
9. Release the boom locking device.
10. Extend the backhoe out to the corner or the beginning point to dig.
11. Extend the stick to about 75% of its travel.
12. Extend the bucket about 30 degrees.
13. Boom down to make contact with the ground. The first pass - called scratching the surface - will take about the first 6". (Figure 1)

**FIGURE 1**





**NOTE:** *The boom, stick, and bucket valves will all be used almost simultaneously and it will be very smooth and fluent motion.*

14. When the bucket is full, curl the bucket up enough to hold the spoils. (Figure 2)

**FIGURE 2**



15. Lift the boom high enough to clear the bucket from the ground.
16. Swing the boom to the designated side to dump the spoils.
17. Discard the spoils at least 24" away from the trench.
18. Curl the bucket to dump the spoils.
19. Return the boom over the trench to resume excavation. (Figure 3)

**FIGURE 3**



20. Complete the second pass, the second pass will remove about half of the projected depth of the trench.

21. Complete the the third pass will remove material down to the projected depth. On this pass, the bucket will need to be flat instead of 30 degrees. This will give the trench a smooth, flat bottom.
22. When the backhoe runs out of stroke, the machine will need to be moved forward. Tilt the bucket all the way out until the teeth of the bucket are straight down.
23. Draw the stick in until the bucket is close to the end of the trench.
24. Drop the boom down into the trench and apply enough pressure on the boom to lift the backhoe up slightly.
25. Turn around with the left hand and raise the front bucket up off the ground. (Figure 4)

**FIGURE 4**



26. Raise the downriggers a little.
27. Release the parking brake.
28. Make sure the backhoe is in the center of the chalk mark and the front wheels are straight.
29. Push the boom lever forward gently and the stick lever forward gently at the same time until the backhoe stick gets about 75% of its full extension.
30. Apply the parking brake.
31. Activate the downriggers and level the backhoe side to side.
32. Drop the front bucket to the ground flat and raise the front wheels off the ground.
33. Repeat steps 10 through 27 again until the trench has been excavated.



# BACKHOE

## BACKHOE

### Job Sheet 6

***Excavate a ninety degree corner.***

#### INTRODUCTION:

Excavating a ninety degree corner requires the basic setup and operation of the backhoe. Ninety degree corners are used in constructing foundations, electrical, gas, fiber optic, and all types of utility digging.

#### TOOLS AND EQUIPMENT:

Backhoe

#### PROCEDURE:

1. Center the backhoe over the perimeter line. (Figure 1)
2. Use the correct backhoe digging procedure.
3. Start the dig with half the bucket width past or over the perimeter line. (Figure 2)

**FIGURE 2**



**FIGURE 1**



4. Dig the trench at the desired depth and keep centered on the perimeter line with the machine and bucket.
5. Make sure that the spoils are discarded to the outside of the excavation perimeter.
6. Dig on the perimeter line until the line changes directions.
7. Do not dig through the next corner at the end of the line.

**NOTE:** *You need the corner to line up on the next trench.*

8. Line up perpendicular to the excavated trench. (Figure 3)

**FIGURE 3**



9. Start the dig at the wall of the excavated trench.
10. Make sure that the corner is completely excavated to the correct depth. If not, readjust to correct this matter.
11. Dig the trench at the desired depth and keep centered on the perimeter line with the machine and bucket.
12. Make sure that the spoils are discarded to the outside of the excavation perimeter.
13. Dig on the perimeter line until the line changes directions.
14. Do not dig through the next corner at the end of the line.

**NOTE:** *You need the corner to line up on the next trench.*

# BACKHOE

## BACKHOE

### Job Sheet 7

*Load and lash equipment.*

#### INTRODUCTION:

In order to move a backhoe over long distances efficiently, you will need to use a truck and trailer. In this Job Sheet we will demonstrate the proper procedures for setting up the truck and trailer for loading, loading the backhoe on and off the trailer safely, and securing the backhoe for safe transportation.

#### TOOLS AND EQUIPMENT:

Backhoe  
Truck  
Equipment trailer  
Chains and boomers

#### PROCEDURE:

1. Park the truck and trailer on dry level ground if possible.
2. Clean the trailer surface if it has debris on it.
3. Apply the parking brake and shift the transmission into neutral.
4. Turn the key off and take it with you.
5. Exit the truck using the three point method.
6. Scotch block the trailer wheels. (Figure 1)

**FIGURE 1**



7. Lower the trailer ramps.
8. Center the backhoe as you drive toward the back of the trailer.
9. Make sure the backhoe is in the lowest gear before making contact with the trailer.

10. Drop the front bucket until it barely clears the ramps.
11. Start up the ramps at a slow steady speed. (Figure2)

**FIGURE 2**



12. Once the front bucket clears the top of the trailer, drop the bucket down to lower the center of gravity.
13. Once the backhoe is on top of the trailer, reduce to an idle and start braking.
14. Drop the front bucket down close to the trailer surface and move forward until the front bucket is at the front of the trailer.
15. Brake and drop the front bucket down flat on the trailer. (Figure 3)

**FIGURE 3**



16. Apply the parking brake and shift the transmission into neutral.
17. If clearance height is a problem, you will have to lower the backhoe boom and adjust the bucket flat on the trailer bed.

18. Make sure all loose debris or work items are taken out of the operator's area.
19. Turn the key off, take the key with you and exit the machine using the three point method.
20. Inspect the chains, hooks, and boomers for any defects before using them to tie down the backhoe.
21. Chain the backhoe down on all four corners using the cross brace method. (Figure 4)

**FIGURE 4**



22. In some cases it may be necessary to chain the backhoe attachment bucket down.
23. Raise the ramps and secure them.
24. Remove the scotch blocks from the wheels.
25. Perform one last walk around the trailer checking chains, connections, wheels on the trailer, etc.





# BULLDOZER

## BULLDOZER

### Job Sheet 1

*Load a bulldozer from the rear.*

#### INTRODUCTION:

A vital skill not related to operating a piece of heavy equipment is safely transporting it to and from the worksite. The operator must be able to control the equipment despite uneven ground or slick operating conditions. The operator must also be able to properly lash the equipment to the trailer in order to ensure safety on the highway.

#### TOOLS AND EQUIPMENT:

Bulldozer  
Trailer  
Ramps  
Blocks  
Chains  
Load binders

#### PROCEDURE:

1. Don personal protective equipment.
2. Drop ramps to the ground; place substantial supports under the ramps if necessary.
3. Pull the bulldozer up to the ramp, being sure to check that the tracks line up with the ramp.

(Figure 1)

**NOTE:** *Raise the blade high to help with your line of sight.*

**FIGURE 1**



4. Select low gear and start up the ramp very slowly and cautiously.
5. Continue moving up the ramp until the center of gravity is reached. As you travel up the ramp lower the blade to within six inches of the dovetail. (Figure 2)

**FIGURE 2**



6. Continue moving forward very cautiously to avoid too much of a jar.
7. Continue moving forward and aligning the bulldozer on the trailer.
8. Continue moving to the front of the trailer and correct position for lashing; lower the blade to the deck and apply the brakes. (Figure 3)

**FIGURE 3**



9. Lower all attachments to the trailer floor.

10. Fasten two chains from the drawbar to the D loops toward the rear of the trailer on each side. (Figure 4)

**FIGURE 4**



11. Fasten a chain to each side of the blade and run it to the blade and run it to the D rings on the opposite sides of the trailer in an cross x pattern. (Figure 5)

**FIGURE 5**



12. Use load binders to snug chains.
13. Cover exhaust pipe with a plastic bag and tape to prevent damage to the turbo if so equipped.



# BULLDOZER

## BULLDOZER

### Job Sheet 2

*Unload a bulldozer from the rear.*

#### **INTRODUCTION:**

Loading and unloading equipment can be dangerous operations if the proper procedures are not followed. A bulldozer operator must be able to move the equipment in a safe and efficient manner.

#### **TOOLS AND EQUIPMENT:**

- Bulldozer
- Trailer
- Ramps
- Blocks
- Chains
- Load binders

#### **PROCEDURE:**

1. Don personal protective equipment.
2. Remove the load binders, chains, and blocks and plastic bag and tape from exhaust pipe. (Figure 1)

**FIGURE 1**



3. Start the bulldozer.

4. Select low reverse gear, raise blade slightly, and start moving backwards. (Figure 2)

**FIGURE 2**



5. Continue moving backwards cautiously to the end of the trailer while aligning the bulldozer with the ramps.
6. Raise the blade and attachments and continue moving very cautiously over the center of gravity. (Figure 3)

**FIGURE 3**



7. Continue moving down the ramp to the ground.

8. Move the bulldozer completely off the ramps and away from the trailer. (Figure 4)

**FIGURE 4**



9. Secure the bulldozer and dismount.





# BULLDOZER

## BULLDOZER

### Job Sheet 3

*Perform ditching and spreading.*

#### **INTRODUCTION:**

This procedure is used in the initial preparation of a construction site and in road building. The operator will construct a v-shaped ditch using several passes with the bulldozer. Grade markers may or may not be used.

#### **TOOLS AND EQUIPMENT:**

Bulldozer with an angle blade

#### **PROCEDURE:**

1. Raise the blade to the travel position.
2. Release the brake and the transmission lock.
3. Shift to the appropriate gear and travel to the work area.
4. Select forward gear and begin tilting down the leading cutting edge.
5. Lower blade to the ground and begin the ditch. (Figure 1)

**FIGURE 1**



6. Raise the blade slightly to allow the machine to level out as the bulldozer tracks walk into the cut.

7. As the machine levels out, lower the blade to continue ditching. (Figure 2)

**FIGURE 2**



8. Tilt the blade to allow material to be sidecast up the sides of the ditch.
9. After one side of the ditch is cut, turn the bulldozer around and repeat the cycle on the return pass. (Figure 3)

**FIGURE 3**



# BULLDOZER

## BULLDOZER

### Job Sheet 4

*Remove a large boulder.*

#### INTRODUCTION

Large boulders and rocks are often found when preparing a building site or roadway. The bulldozer operator should follow these procedures to remove the obstacle efficiently and without damaging equipment.

#### TOOLS AND EQUIPMENT:

- Bulldozer
- Large boulder

#### PROCEDURE:

1. Raise the blade off the ground to avoid obstacles.
2. Release the brake and the transmission lock.
3. Select the first forward gear and travel to the work area.
4. Approach the large rock and tilt the blade to make contact with the ground at the edge of the boulder. (Figure 1)

**FIGURE 1**



5. Push the rock at full power to dislodge it. (Figure 2)

**FIGURE 2**



6. Once the rock has turned, stop and reverse direction.
7. Stop and select the first forward gear; line blade up on rock.
8. Lower the blade to the ground and push the rock out of the way.
9. If the rock is too large to push all at once, line the bulldozer up on one end; push it forward and lift the blade slowly.

**NOTE:** *The rock should roll out on one end.*

10. Reverse direction and line up on the other end.

# BULLDOZER

## BULLDOZER

### Job Sheet 5

*Perform ripping operations.*

#### INTRODUCTION

The rippers at the rear of the bulldozer are used to loosen the ground surface so it can be removed or graded. This attachment is often needed in the preparation of a building site.

#### TOOLS AND EQUIPMENT:

Bulldozer with multiple ripper attachments

#### PROCEDURE:

1. Pull throttle to high engine speed and decelerate with the decelerating pedal.
2. Raise the blade to clear obstructions.
3. Release the brake and transmission lock and select the travel gear.
4. Release the pressure on the decelerator pedal and travel to the area to be ripped.
5. Select the first forward gear; begin lowering the rippers as you approach the work area.

(Figure 1)

**NOTE:** *Use the hand control or foot pedals to lower the rippers.*

**FIGURE 1**



6. Lower rippers into material until engine begins to lug and bulldozer starts to spin tracks.

**NOTE:** Never try to steer bulldozer with rippers lowered.

7. Raise rippers to ease the strain on the machine and the rippers.

**NOTE:** *To aid in the breakout of materials, some prefer to raise and lower slightly on the move.*

8. Raise the ripper to full "up" and decelerate the engine as the bulldozer reaches the end of the area.

9. Move transmission from first forward gear to first reverse gear.

10. Return to starting area, being careful to look behind and watch where you are going.

11. Repeat cycle until area is ripped.

# BULLDOZER

## BULLDOZER

### Job Sheet 6

*Cut and build a gentle slope bench.*

#### INTRODUCTION

Bulldozer operators begin to use all of their skills in constructing a slope bench. The operator will need to use these skills in operating the blade, moving the machine and maintaining the slope ratio.

#### TOOLS AND EQUIPMENT:

Bulldozer

#### PROCEDURE:

1. Pull the throttle to high engine speed and decelerate with the decelerator pedal.
2. Raise the blade to clear obstructions.
3. Release the brake and the transmission lock and select travel gear.
4. Release pressure and decelerator pedal; travel to the top of the hill.

**NOTE:** *If slope stakes are used, approach them at the top of the bench.*

5. Lower the blade and begin cutting down the hill maintaining the slope ratio.
6. When the blade becomes full and the bulldozer stalls, raise the blade and lose the material.
7. Place the machine in reverse and return to the top of the hill.
8. Shift forward and lower the blade; continue cutting, maintaining the proper slope ratio.

(Figure 1)

**FIGURE 1**





9. When the blade becomes full, begin to raise the blade gradually to allow the front of the machine to begin leveling. (Figure 2)

**FIGURE 2**



10. Lower the blade to maintain level grade, and as the machine begins to level out, lose the material.
11. Place the bulldozer in reverse and return to the top of the bench.
12. Move the bulldozer over one blade width and continue the cycle until the bench is the proper depth.

**NOTE:** *When making a cut, be sure to maintain the slope ratio.*

# BULLDOZER

## BULLDOZER

### Job Sheet 7

*Perform excavation work in a confined area.*

#### INTRODUCTION

Many times the bulldozer operator must work a confined space. Follow these procedures to perform excavations in a safe and efficient manner.

#### TOOLS AND EQUIPMENT:

- Bulldozer with tilt blade
- String line staked on two sides between obstructions

#### PROCEDURE:

1. Line up bulldozer blade edge on the inside of the stringline.
2. Lower the blade to the ground keeping the bulldozer well back from the edge of the excavation to allow for ramping down into the excavation.
3. Select first forward gear and begin cutting a shallow lift of material. (Figure 1)

**FIGURE 1**



4. When the blade becomes full, raise the blade to ground level and push the material to the outside of the excavation.

**NOTE:** *Ride load over undug ground.*

5. Raise the blade and shift to reverse. (Figure 2)

**FIGURE 2**



6. Return to the area where the blade was lifted.
7. Lower the blade to the ground and shift to first forward gear.
8. Repeat the cycle until the first layer is cut.
9. Raise the blade gradually to begin ramping out on the opposite end. (Figure 3)

**FIGURE 3**



10. To maintain a smooth slope, lower the blade as the tracks begin climbing out.
11. Raise the blade gradually to lose material.
12. Shift to reverse and return to the opposite side.
13. Continue the cycle until the proper depth is reached.

# BULLDOZER

## BULLDOZER

### Job Sheet 8

*Perform finish work.*

#### INTRODUCTION

Finish work is when the bulldozer operator turns attention to the final irregularities that may still remain on a work site. This procedure may be used in construction or mining reclamation.

#### TOOLS AND EQUIPMENT:

Bulldozer with tilt blade

#### PROCEDURE:

1. Lower the blade to the ground observing ahead of the machine for high spots and gullies.
2. Raise and lower the blade very slightly to maintain a level footing for the tractor. (Figure 1)

**FIGURE 1**



3. Tilt and steer the machine to skim materials from high spots to low areas.
4. Raise the blade gradually to lose material. (Figure 2)

**FIGURE 2**



5. Shift to reverse and travel back to the starting point.
6. Move the bulldozer over one blade width. (Figure 3)

**FIGURE 3**



7. Repeat the cycle until the area is cleaned up.
8. Move the machine to the edge of the area and lower the blade.
9. Select the first reverse gear and place the blade in the “float” position.
10. Back up over the area to be smoothed. (Figure 4)

**FIGURE 4**



11. When the area has been traversed, raise the blade to the travel position.
12. Select travel gear and steer the bulldozer to the opposite edge.
13. Move the bulldozer over three-quarters of a blade width.

14. Repeat the cycle until the area is smooth and free of loose dirt, piles, or grouser prints.  
(Figure 5)

**FIGURE 5**





# FRONT-END LOADER

## FRONT-END LOADER

### Job Sheet 1

*Perform digging operations.*

#### **INTRODUCTION:**

Moving and clearing materials are some of the primary jobs of the loader operator. This task requires smooth and fluid operation of the controls.

#### **TOOLS AND EQUIPMENT:**

Front-end loader with bucket  
Stockpile

#### **PROCEDURE:**

1. Raise the bucket 12 to 18 inches above the ground (travel position).
2. Pull the bucket control lever to tilt the bucket.
3. Release the hand brake.
4. Shift to the appropriate gear.

**NOTE:** *Preset the throttle for a track loader.*

5. Press the accelerator pedal down and proceed to the job site.
6. Lower the bucket to the ground and move forward. (Figure 1)

**Important:** Never spin the wheels or the tracks.

**FIGURE 1**





7. Manipulate the bucket until it is loaded. (Figure 2)

**FIGURE 2**



8. Place the bucket and the boom control levers on "hold" when the bucket is filled.
9. Shift the gears to reverse and back the loader.
10. Position the bucket in the travel position (12 to 18 inches above the ground) and proceed to the dumping area. (Figure 3)

**FIGURE 3**



11. Move the bucket control lever forward to dump the bucket, and at the same time pull the boom control lever to the rear to retract the bucket. (Figure 4)

**FIGURE 4**



12. Pull the bucket control lever to retract the empty bucket, and at the same time back the loader away from the pile.
13. Position the bucket in the travel position and return to the excavation.
14. Repeat the cycle until the excavation is completed.



# FRONT-END LOADER

## FRONT-END LOADER

### Job Sheet 2

*Perform loading operations.*

#### INTRODUCTION:

Moving material from a stockpile onto a truck must be done safely. As you gain experience, you will be able to perform this operation quickly, which is an important job requirement.

#### TOOLS AND EQUIPMENT:

Front-end loader with bucket  
Dump truck  
Stockpile

#### PROCEDURE:

1. Raise the bucket to the travel position (12 to 18 inches above the ground).
2. Pull the bucket control lever to tilt the bucket.
3. Release the hand brake.
4. Shift to the appropriate gear.

**NOTE:** *Preset the throttle for a track loader.*

5. Press the accelerator down and proceed to the job site.
6. Drive the loader into the stockpile.
7. Adjust the controls and the brake pedal as required to fill the bucket.
8. Place the bucket and boom control levers on "hold" when the bucket is filled.
9. Shift the gears into reverse.
10. Back away from the stockpile.
11. Position the bucket in the travel position (12 to 18 inches above the ground) and move the loader to the truck. (Figure 1)

**FIGURE 1**



12. Center the loader with the truck bed and raise the bucket to clear the side of the truck.
13. Move the bucket over the truck bed; move the bucket control lever forward to dump the bucket, and at the same time pull the boom control lever to the rear to retract the bucket.
14. Pull the bucket control lever to retract the empty bucket; back loader away from the truck as soon as the bucket is empty. (Figure 2)

**FIGURE 2**



15. Lower the bucket to the travel position and return to the stockpile.

**NOTE:** *After the truck leaves, spend your downtime sweeping spillage with the bucket and straightening up the stockpile before the next truck arrives.*

16. Repeat the cycle until the truck is loaded.

# FRONT-END LOADER

## FRONT-END LOADER

### Job Sheet 3

*Perform bulldozing operations.*

#### **INTRODUCTION:**

Although not designed to be a bulldozer, the front-end loader is used for this task. It is generally done when maintaining an area around a stockpile.

#### **TOOLS AND EQUIPMENT:**

Front-end loader with bucket  
Excavation area  
Stockpile

#### **PROCEDURE:**

1. Raise the bucket to the travel position (12 to 18 inches above the ground).
2. Pull the bucket control lever to tilt the bucket.
3. Release the hand brake.
4. Shift to the appropriate gear.
5. Press the accelerator pedal down and proceed to the job site.
6. Move the bucket control lever to adjust the bucket to the bulldozer position.
7. Shift to the appropriate gear.
8. Press the accelerator pedal down and proceed forward into the stockpile. (Figure 1)

**FIGURE 1**



9. Push the material to fill the area with the bucket, adjusting the controls as necessary for the appropriate blade level. (Figure 2)

**FIGURE 2**



10. Return to the stockpile and repeat the cycle until the fill is complete.

# GRADER

## GRADER

### Job Sheet 1

*Make a windrow.*

#### **INTRODUCTION:**

A windrow is created when the excess dirt, or spoils, falls to the side of the moldboard when smoothing a surface. The operator will perform this operation when smoothing out a rough area or cutting down an area that is too high.

#### **TOOLS AND EQUIPMENT:**

Grader

#### **PROCEDURE:**

1. Mount the machine using the three point method.
2. Secure your seat belt.
3. Raise the blade approximately 20" off the ground.
4. Release the parking brake and transmission lock.
5. Select the first forward gear and move to the area to be graded.
6. Circle to the left to position the toe of the blade behind the right front tire.
7. To avoid driving over the windrow, slide the blade shift so that the heel is clear of the left tandem drive wheel.
8. Lower the toe and heel of the blade to begin cutting the material. (Figure 1)

**FIGURE 1**





9. Continue making the windrow until reaching the end of the cut. (Figure 2)

**FIGURE 2**



10. Raise the blade clear of the ground and stop.
11. Select reverse and back up, observing what is behind the machine, until you've returned to the starting point.
12. Stop and shift to the first forward gear.
13. Move the machine to the left to position the right front tire to the left of the previous windrow.
14. Lower the blade to the ground to make a light grading pass while observing the material flowing to the left heel of the blade.
15. As the windrow becomes larger, the grader's front tires should lean toward the windrow to counteract the sidedraft of the grader. (Figure 3)

**FIGURE 3**



16. Continue the process until the windrow is the desired size.

# GRADER

## GRADER

### Job Sheet 2

#### *Cut a firebreak.*

#### **INTRODUCTION**

The grader is the ideal machine for creating firebreaks. It is able to clear vegetation down to the dirt in order to bring a grass fire to a halt. A grader is able to perform this function at a relatively fast speed.

#### **TOOLS AND EQUIPMENT:**

Grader

#### **PROCEDURE:**

1. Mount the machine using the three point method.
2. Secure your seat belt.
3. Raise the blade approximately 20" off the ground.
4. Release the parking brake and the transmission lock.
5. Select your travel speed and proceed to the area where the firebreak is to be made.
6. Downshift to a working speed and position the circle to sidecast the material.
7. Lower the blade to the ground and begin stripping material from center to outside. (Figure 1)

**FIGURE 1**



8. Continue cutting the firebreak making any adjustments necessary to keep the machine moving and sidecasting the material.

9. When the end of the lane is reached, turn the grader around and line up to sidecast from the center to the opposite side. (Figure 2)

**FIGURE 2**



10. Lean the wheels in the opposite direction of the blade to counteract sidedrift.
11. Continue the return cut, making any adjustments.

# GRADER

## GRADER

### Job Sheet 3

*Blend and spread material on a roadbed.*

#### INTRODUCTION

This operation is performed when resurfacing a roadway. Two or more types of material will be dumped along the road. It is the job of the grader operator to work his machine back and forth until the material is of a uniform mix. Once the mix is satisfactory, the operator will spread the mix evenly across the surface.

#### TOOLS AND EQUIPMENT:

Grader

#### PROCEDURE:

1. Proceed to your work area.
2. Start the first pass, windrowing the material. (Figure 1)

**FIGURE 1**



3. Continue windrowing and blading the material back and forth until the mix is uniform.
4. After obtaining the designated mix, angle the blade 20 to 30 degrees and spread the material on the road by windrowing back and forth across the road. (Figure 2)

**FIGURE 2**



# GRADER

## GRADER

### Job Sheet 4

*Perform V-type ditch construction.*

#### **INTRODUCTION**

The grader operator will perform V-type ditching when creating a ditch alongside a roadway. The ditch creates a place for water to run away from the road. The grader operator may also perform this operation when there is a need to channel water away from a particular area, such as a construction site.

#### **TOOLS AND EQUIPMENT:**

Grader

#### **PROCEDURE:**

1. Interpret the data on the ditch stakes.
2. Operate the sideshift to the extreme left.
3. Rotate the circle until the point of the blade is directly behind the right front wheel.
4. Raise the left lift cylinder to the full "up" position or lift the heel of the blade to the full "up" position.
5. Lower the right blade lift cylinder to set the blade tip for the desired depth of cut.
6. Lean the front wheels to the left and make a 4" to 5" marking cut.
7. Continue cutting to the desired depth, keeping the front tire in the bottom of the ditch.
8. Continue ditching and bringing successive cuts in from the edge of the bank slope.



# GRADEWORK

## GRADEWORK

### Job Sheet 1

*Set up and adjust a level.*

#### INTRODUCTION:

The level is a precision instrument used to measure fine differences in angles and elevation. The operator must use care and follow these procedures in order to get accurate measurement.

#### TOOLS AND EQUIPMENT:

Level  
Leveling Rod

#### PROCEDURE:

1. Set leg shoes of the two nearest tripod legs firmly in the ground about three feet apart. (Figure 1)

**NOTE:** *Always place two tripod legs on the downhill or uneven.*

**FIGURE 1**



2. Tighten the leg thumb nuts if the tripod is so equipped.



3. Check the head plate to ensure that it is level. (Figure 2)

**FIGURE 2**



4. Remove the instrument from the carrying case by lifting it by the level bar.

**NOTE:** *Never grasp the instrument by the telescope barrel.*

5. Attach the instrument to the tripod. (Figure 3)

**FIGURE 3**



6. Remove the dust cap from the instrument and place it in the carrying case.

**NOTE:** *Attach a sunshade to the instrument if it is not a permanent attachment.*

7. Align the telescope barrel directly over one pair of leveling screws.

8. Rotate the screws under the leveling head by moving your thumbs in opposite directions until the leveling bubble is centered in the leveling tube. (Figure 4)

**NOTE:** *Be sure not to overtighten these screws.*

**FIGURE 4**



9. Turn the instrument clockwise ninety degrees to align the barrel over the other pair of leveling screws.
10. Rotate the screws under the leveling head by moving your thumbs in opposite directions until the leveling bubble is centered in the leveling tube.
11. Do this in all four directions until the instrument is completely level. The leveling bubble should stay in the center regardless of the direction the telescope is pointing. Avoid touching the tripod after the instrument is level.

**NOTE:** *If the instrument creeps off level or is bumped during use, immediately stop and relevel the instrument and start again from the last known good benchmark.*



# GRADEWORK

## GRADEWORK

### Job Sheet 2

*Use a level to check elevations.*

#### INTRODUCTION:

The level is a precision instrument used to measure fine differences in angles and elevation. The operator must use care and follow these procedures in order to get accurate measurement.

#### TOOLS AND EQUIPMENT:

Level  
Leveling Rod  
Fieldbook

#### PROCEDURE:

1. Establish setup number one for the level.

**NOTE:** *Do not set up more than 150 to 200 feet from each point, but be certain that points A and B can both be seen through the level.*

2. Set up and adjust the level at setup number 1.
3. While your work partner holds the rod at point A, sight through the level and take a reading on the leveling rod. (Figure 1)

**FIGURE 1**



4. Record the reading in the field book. (Figure 2)
5. Move the leveling rod to point B.
6. Sight through the level and take a reading on the leveling rod at point B. (Figure 3)
7. Record the reading in the field book.
8. Record the plus or minus reading in the field book.

**NOTE:** *Plus sight is the rod reading from the point to the line of sight. Minus sight is the rod reading from the line of sight to the point.*

9. Repeat these steps as necessary until all elevations points have been read.
10. Put away all equipment and supplies.
11. Have your instructor check your work.

**FIGURE 2**



**FIGURE 3**



# GRADEWORK

## GRADEWORK

### Job Sheet 3

*Use a level to perform differential leveling.*

#### INTRODUCTION

Determining the elevations of different points around a construction site is one of the first operations to be performed. It is extremely important to get accurate measurements since all cut and fill operations will be based on this data.

#### TOOLS AND EQUIPMENT:

Level  
Leveling Rod  
Fieldbook

#### PROCEDURE:

1. Set up and adjust the level.
2. While your work partner holds the rod at the first check point, sight through the level and take a reading on the leveling rod. (Figure 1)

**FIGURE 1**



3. Have your work partner use keel to record any difference between the reading and the correct elevation, marking "H" for high or "L" for low.
4. Have your work partner move the rod to the next check point.
5. Adjust the level to focus on the next check point.
6. Sight through the level at the leveling rod and take a reading. (Figure 2)

**FIGURE 2**



7. Have your work partner record any difference between the reading and the correct elevation, marking "H" for high and "L" for low.
8. If necessary, repeat steps for each check point.
9. Put away all equipment and supplies.
10. Have your instructor check your work.

## SKILL TEST RECORD

### PRODUCT EVALUATION

**Evaluator note:** Rate the student on the following criteria by circling the appropriate numbers. Each criterion must receive a rating of "3" or higher to demonstrate student mastery. (See Key below.) A student who is unable to demonstrate mastery should review the material and try again.

Criteria:

Followed proper and safe procedure	4	3	2	1
Used tools and equipment properly	4	3	2	1
Product/result meets current industry standards	4	3	2	1
Returned tools and equipment to proper storage	4	3	2	1

### AVERAGE RATING

**Evaluator note:** To obtain an average rating for the Profile of Training Mastery, total the points in Product Evaluation and divide by the total number of criteria. Circle the rating on the Key.

### KEY

- 4 Skilled** — Can perform job with no additional training
- 3 Moderately Skilled** — Has performed job during training program; limited additional training may be required
- 2 Limited Skill** — Has performed job during training program; additional training is required to develop skill
- 1 Unskilled** — Is familiar with process, but is unable to perform job

### EVALUATOR'S COMMENTS

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May be duplicated for student use.