Operating Techniques

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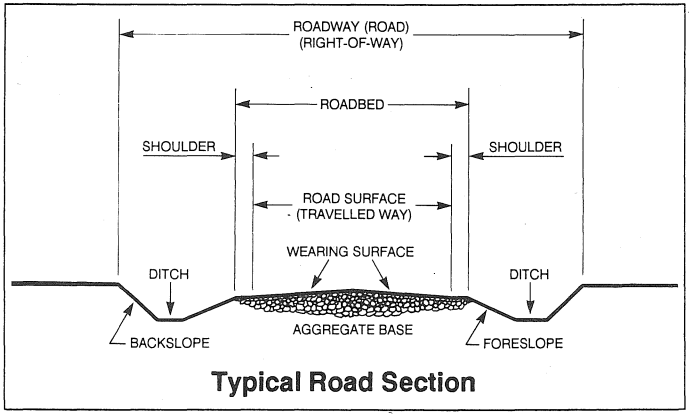
Introduction

Do not operate the grader until you read and understand the warnings and instructions in this manual. Failure to follow the instructions or heed the hazard alerts, safety signs and precautions could result in machine damage, injury or death.

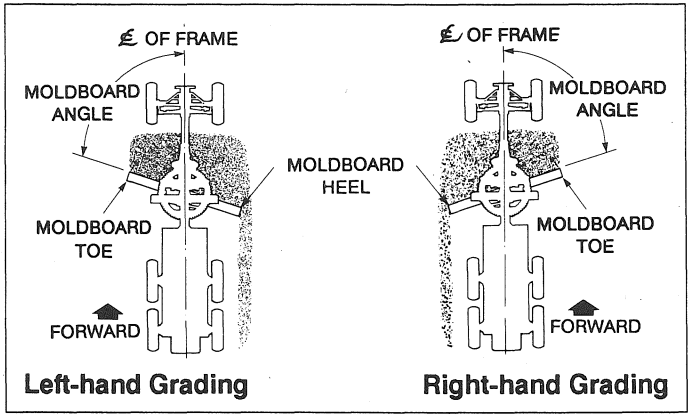
Ensure your grader is properly equipped. Such equipment as lights, flashing beacons, turn signals and warning devices such as flags and a slow moving vehicle sign may be required. Use and position cones and signs to alert traffic while grading highways. Check the local traffic laws for the correct operating requirements.

Operating techniques in this section are basic. Your skills and techniques will develop as you gain knowledge of your grader and its capabilities. This section will help you to understand the operating characteristics of your grader. Read this section carefully. If any questions arise concerning the operation of your grader, consult your supervisor.

Champion graders are equipped with either a rigid or an articulated frame. The rigid frame grader can accomplish virtually all grading operations. A grader equipped with articulation can accomplish the same operations, but some with greater ease. Straight frame operation is usually used for long passes such as road maintenance and snow removal. With an articulated frame grader you can reduce your turning radius, counteract side thrust when grading wet ditches or during ditching applications and have the tandem wheels on solid ground for maximum traction while achieving maximum blade reach.



Typical Road Section



Left-hand Grading **Right-hand Grading**

Moldboard

Moldboard positioning is very important when grading. The moldboard is usually angled 15 to 75 degrees from the center line of the frame. The greater the moldboard angle, the more material is carried across the moldboard allowing for deeper cuts and heavier grading. The earth moved by the moldboard creates a side thrust on the grader. The operator can counteract this side thrust by leaning the front wheels in the direction the material is moving along the moldboard.

Moldboard pitch is also important. For normal grading, the moldboard should be tilted slightly forward from the vertical position. Tilting the moldboard forward allows material to roll for spreading or compacting. Tilting the moldboard backward increases the cutting ability and reduces the rolling action of the material.

Study these illustrations to familiarize yourself with the terms used in this section.

Moldboard Toe - The point of the moldboard closest to the front wheels.

Moldboard Heel - The point of the moldboard farthest away from the front wheels.

Moldboard Angle - The angle of the moldboard as measured from the moldboard toe to the center line of the front frame of the grader.

Turning Around Using Articulation

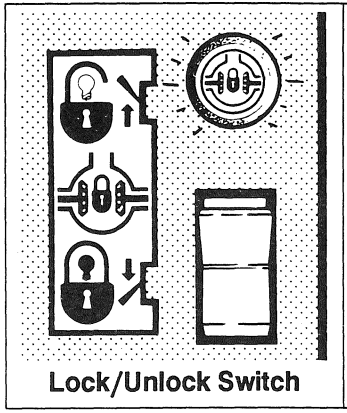
Watch for bystanders and never allow anyone to be under or to reach into the grader and its attachments while operating.

⚠WARNING

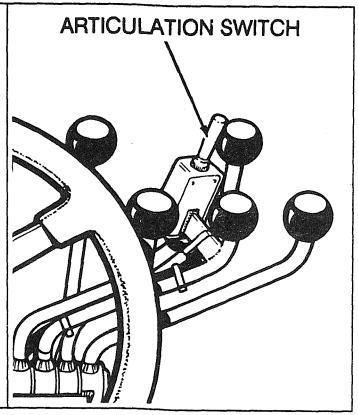
Do not articulate the grader when operating on steep slopes. Grader could roll over. Severe personal injury or death could result.

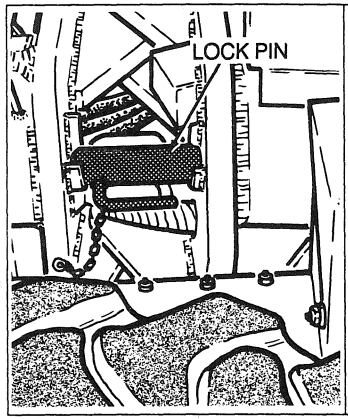
Ensure the control switch for the locking differential is in the 'UNLOCK' position before turning the grader around. This reduces strain on the final drive and reduces tire scuffing. Put the switch in the 'LOCK' position for normal grading.

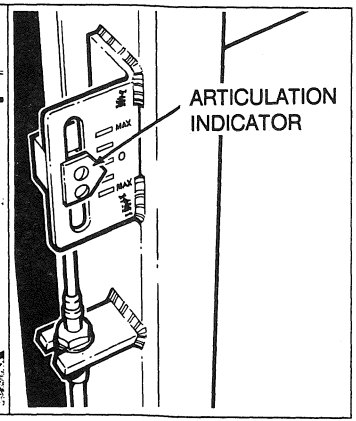
Use the articulation switch to articulate the grader in the direction you wish to turn. Before articulating, ensure the articulation lock pins are removed and stored appropriately. Move the switch to the right to articulate the grader to the right. Move the switch to the left to articulate the grader to the left. The articulation indicator on the left-hand door post, indicates the degree of articulation. If the articulation feature is not used, install the articulation lock pins when traveling in traffic or at high speeds.

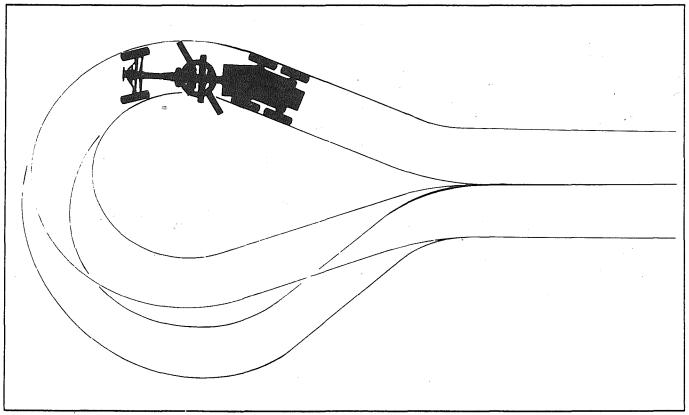


Lock/Unlock Switch





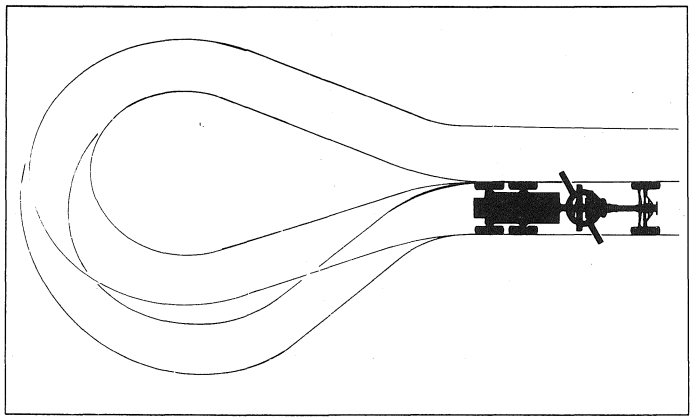




Turning Around Using Articulation continued

Example: Turning Left

- Fully raise the moldboard and attachments, before you turn the grader around.
- Position the moldboard so it will not contact the front or rear tandem tires when articulating as severe damage can occur.
- With the grader moving forward, turn the wheels left and articulate the frame left.



- Upon completing the turn, turn the wheels right and articulate the frame straight.

Making a 'Three (3) Point' Turn

- Watch for bystanders and never allow anyone to be under or to reach into the grader and its attachments while operating.
- Understand and obey the traffic laws, road signs and signals.
- When turning on a narrow road or highway, use your own judgement for the amount of area the grader requires to turn around

Maneuver 1

- Fully raise the moldboard and attachments, before you turn the grader around.
- Lean the wheels slightly in the direction you are turning.
- Travel as far forward as possible.

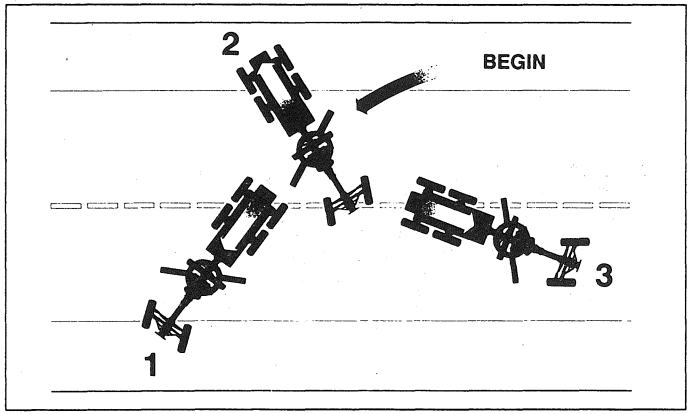
Maneuver 2:

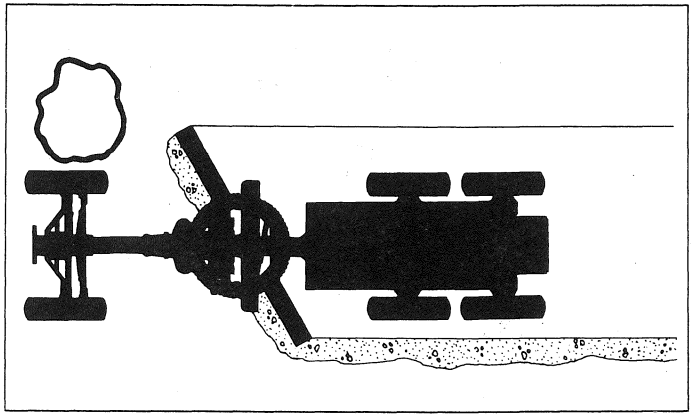
- Lean and turn the front wheels in the opposite direction.
- Select reverse gear and back up the grader as far as possible.

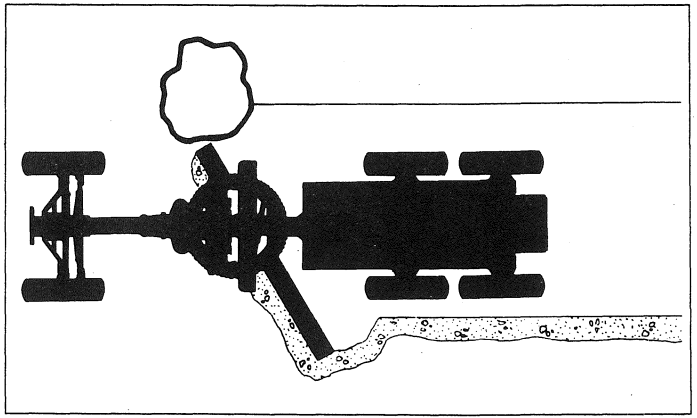
Maneuver 3:

- Lean and turn the wheels to the new travel direction.
- Straighten the wheels after the turn is completed.

Repeat the previous procedures if using an articulated grader. Ensure the articulation lock pins are removed before articulating, and install them when not using the articulation function. Position the moldboard so it will not contact the tires when articulating as severe damage can occur.







Grading Around an Object

- Note and avoid all hazards and obstructions such as overhangs, ledges, slide areas, electrical lines, underground cables, water mains, gas lines, etc.
- When operating close to electrical lines, underground cables, water mains or gas lines, contact the responsible authority and request assistance.

Maneuver 1

- Reduce your speed.
- Use the accelerator/decelerator to slowly maneuver the moldboard around the object.
- Drive as close as possible to the object to reduce the amount of hand shoveling required.

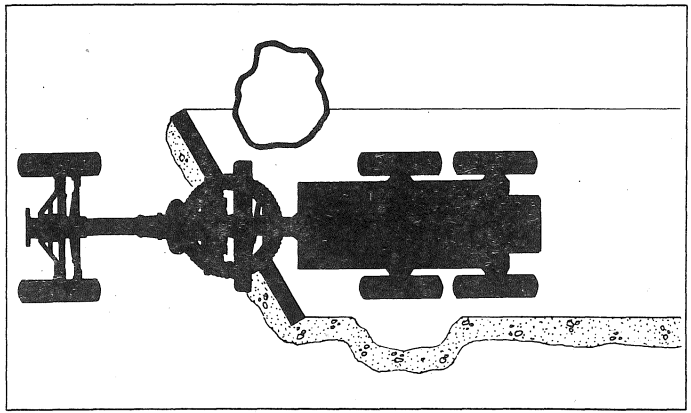
Maneuver 2

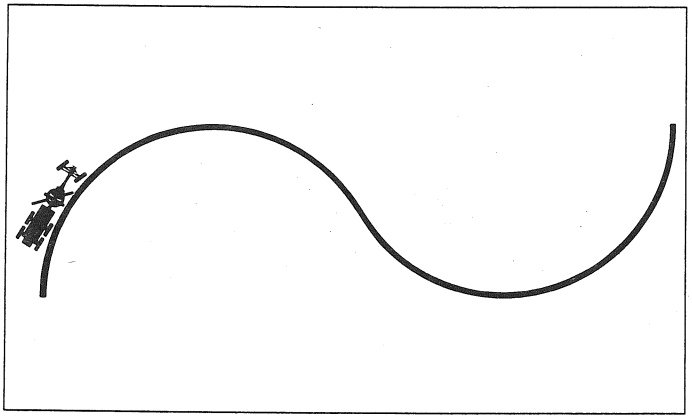
- Use the moldboard slide shift and side shift levers to follow the shape of the object.

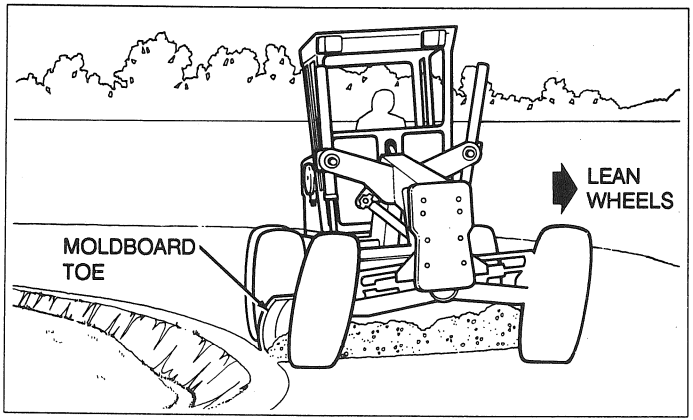
Grading Around an Object continued

Maneuver 3

- Slide the moldboard back to its original position after you have passed the object and continue grading.





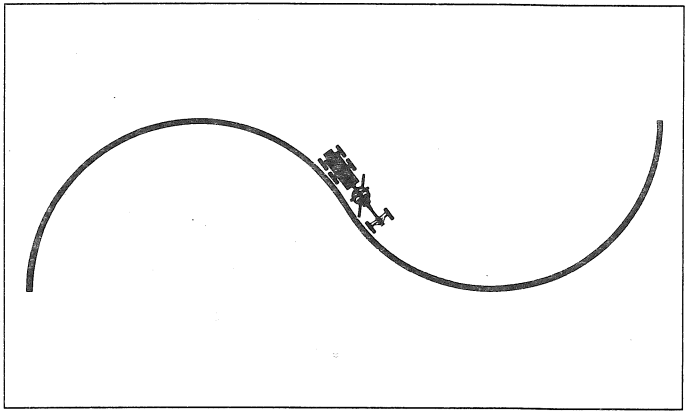


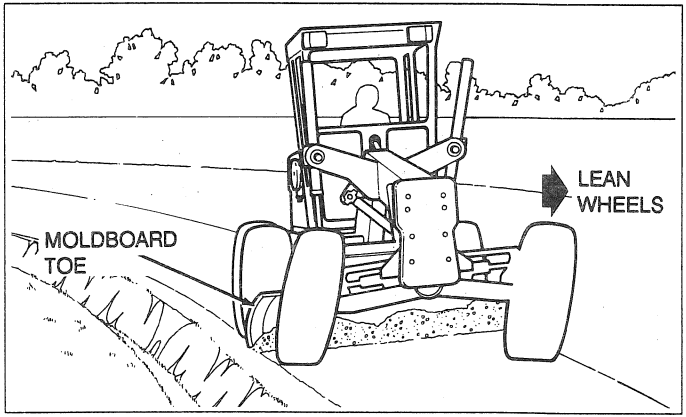
Grading on an 'S' Curve Shoulder

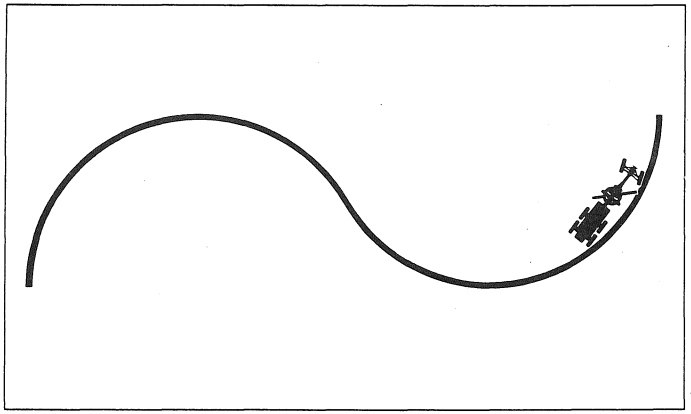
- Slowly approach the first right-hand curve.
- Lean the front wheels slightly to the left to counteract side thrust.
- Turn right and follow the edge of the shoulder nearest the ditch.
- Position the toe of the moldboard behind and outside the front right-hand wheel. Always have the toe of the moldboard positioned on the edge of the shoulder nearest the ditch while grading.

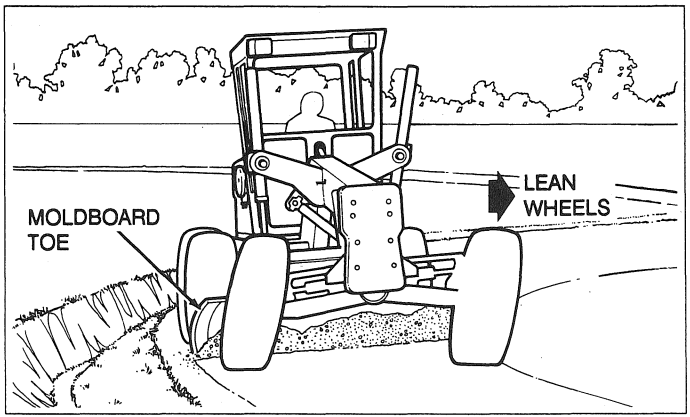
Grading on an 'S' Curve Shoulder continued

- When finishing the right-hand curve, turn straight.







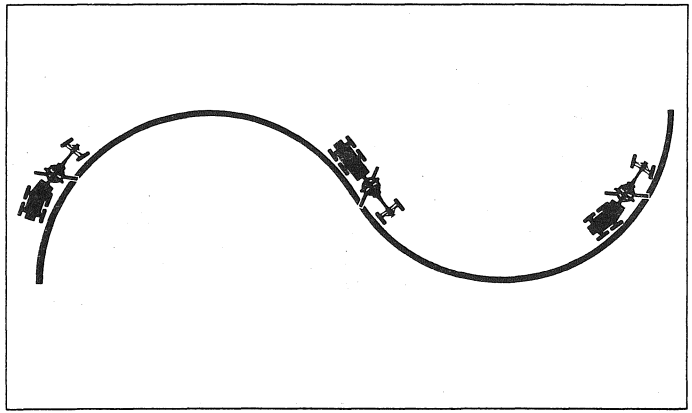


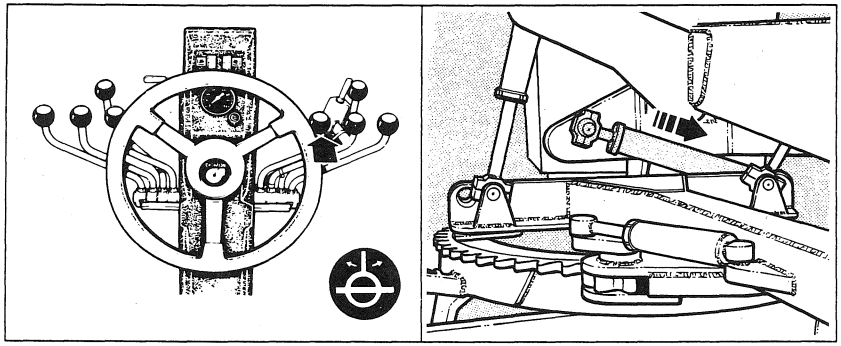
Grading on an 'S' Curve Shoulder continued

- As you approach the second curve, follow the edge of the shoulder nearest the ditch and turn left.
- Complete the curve and continue grading.
- If a windrow has been created, make a clean-up pass to remove the windrow and reshape the shoulder.

Grading on an 'S' Curve Shoulder continued

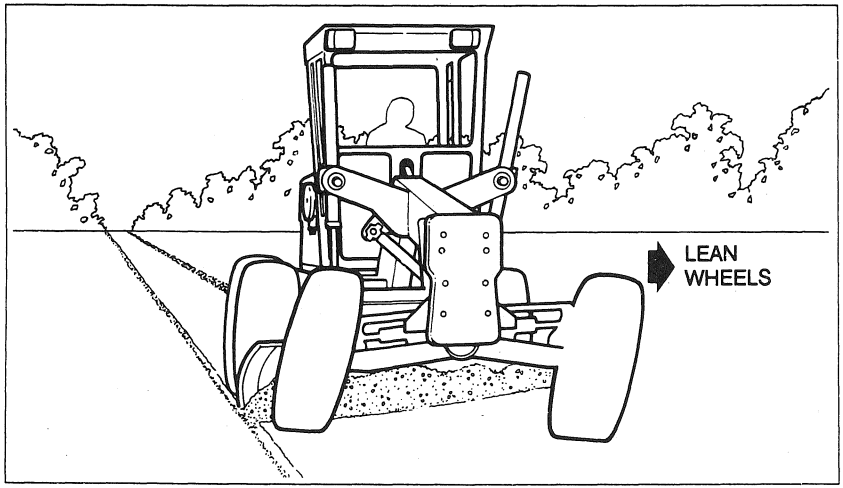
If using an articulated grader, ensure the articulation lock pins are removed before articulating, and install them when not using the articulation function. Articulate the grader in the direction of the curve and follow the edge of the shoulder nearest the ditch. Slide and position the moldboard as required. Do not allow the moldboard to contact the tires when articulating.





Right-hand Leveling

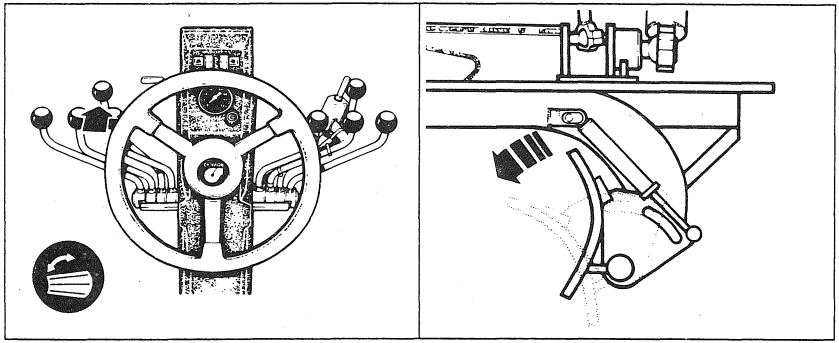
- Use the circle shift lever to offset the circle and drawbar slightly to the left of the frame.



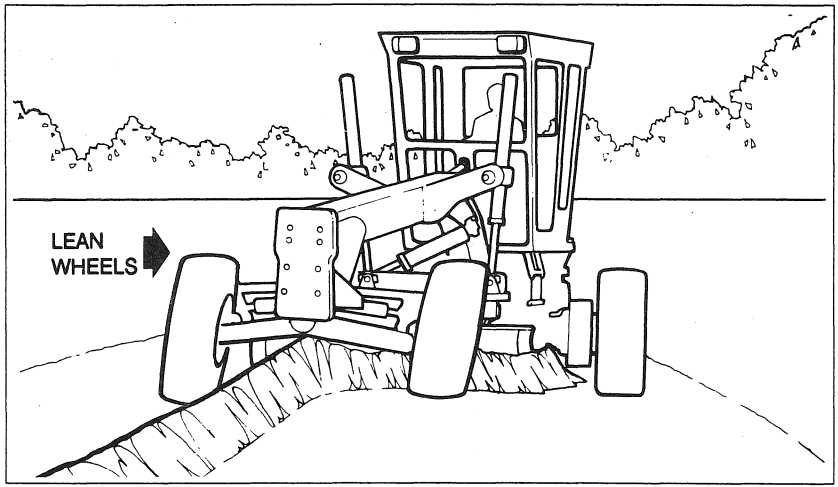
- Position the moldboard horizontally at the desired depth of the cut and deposit the windrow outside the left-hand tandem wheels.
- Lean the front wheels to the left to overcome the side thrust.

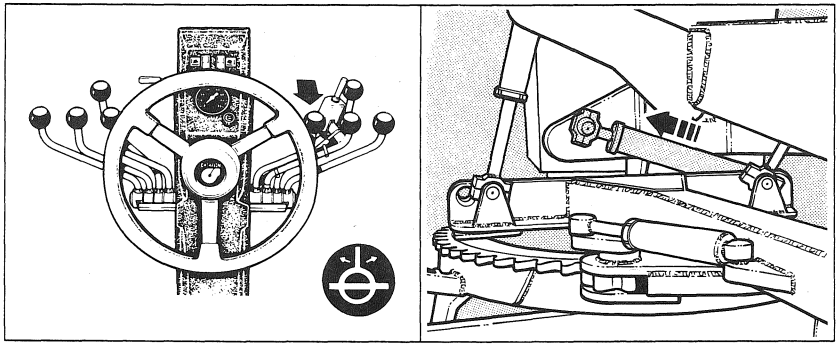
Right-hand Leveling continued

- Tilt the moldboard forward until the material constantly rolls off the moldboard.



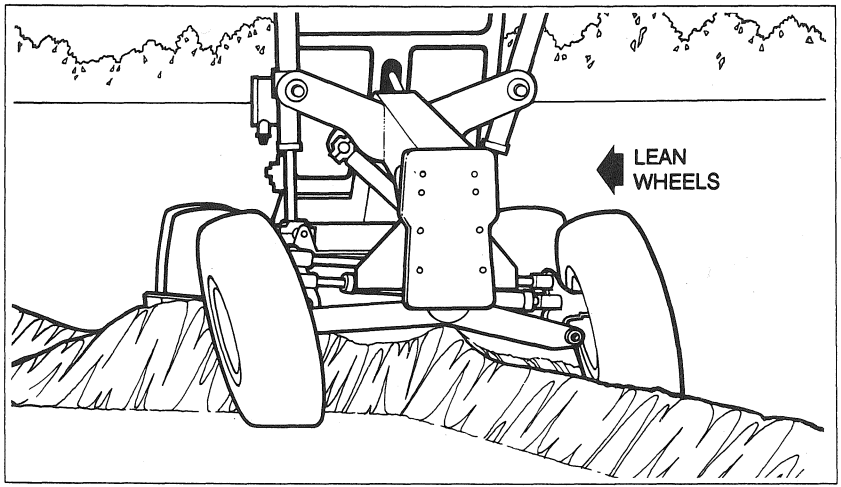
If using an articulated grader, ensure the articulation lock pins are removed before articulating, and install them when not using the articulation function. For right-hand leveling articulate the frame to the right. If the drive wheels lose traction, then reduce the articulation angle. This will decrease the cutting angle and side thrust allowing the drive wheels to regain traction. Deposit the windrow between the tandem wheels. Spread the windrow over the new surface until it is smooth.





Left-hand Leveling

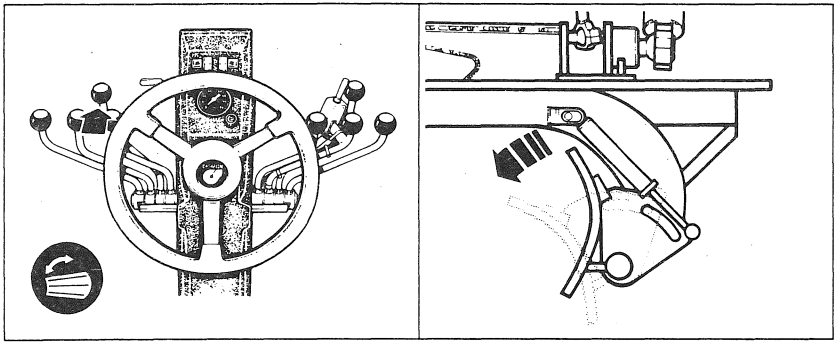
- Use the circle shift lever to offset the circle and drawbar slightly to the right of the frame.



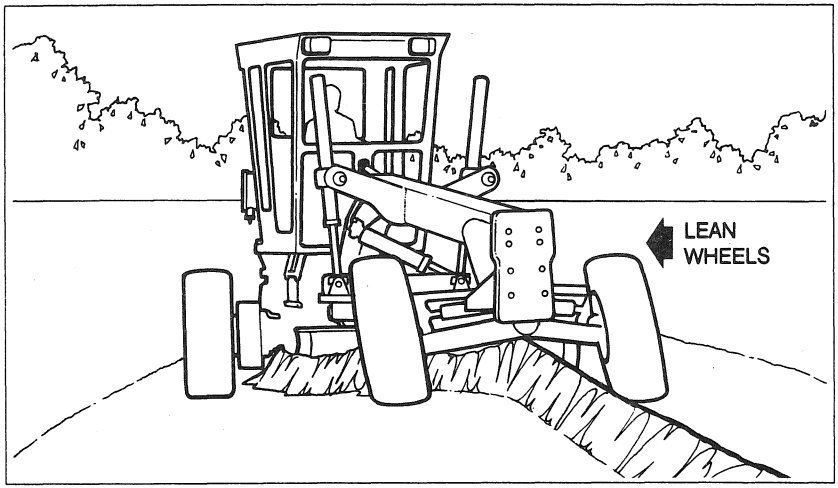
- Position the moldboard horizontally at the desired depth of the cut and deposit the windrow outside the right-hand tandem wheels.
- Lean the front wheels to the right to overcome the side thrust.

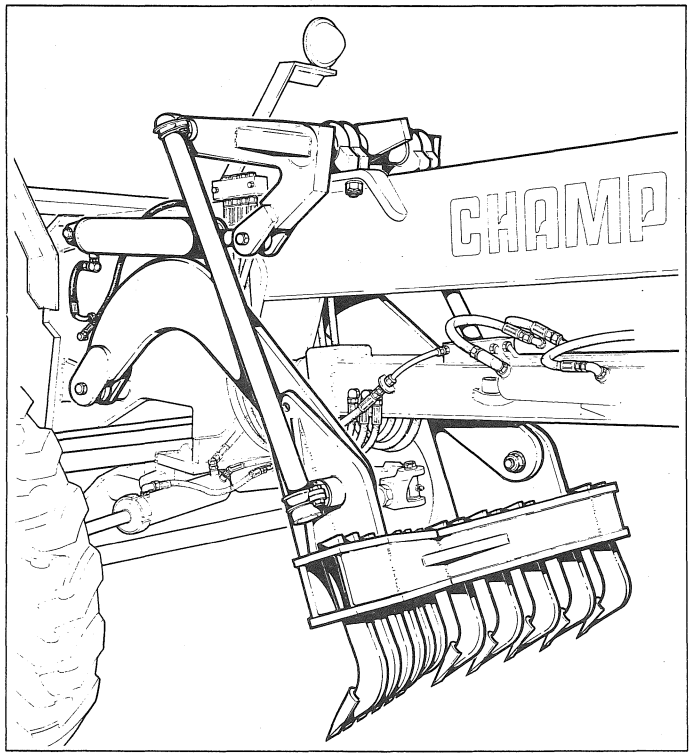
Left-hand Leveling continued

- Tilt the moldboard forward until the material constantly rolls off the moldboard.



If using an articulated grader, ensure the articulation lock pins are removed before articulating, and install them when not using the articulation function. For left-hand leveling articulate the frame to the left. If the drive wheels lose traction, then reduce the articulation angle. This will decrease the cutting angle and side thrust allowing the drive wheels to regain traction. Deposit the windrow between the tandem wheels. Spread the windrow over the new surface until it is smooth.





Scarifier and Ripper Operation

- When operating close to electrical lines, underground cables, water mains or gas lines, contact the responsible authority and request assistance.
- When scarifying or ripping across a slope, keep the moldboard parallel with the front axle, centered to the frame and lowered close to the ground to provide protection against rolling over.

A Champion scarifier or ripper is useful for breaking up hard surfaces such as asphalt, rocky subgrade and ice to ease grading

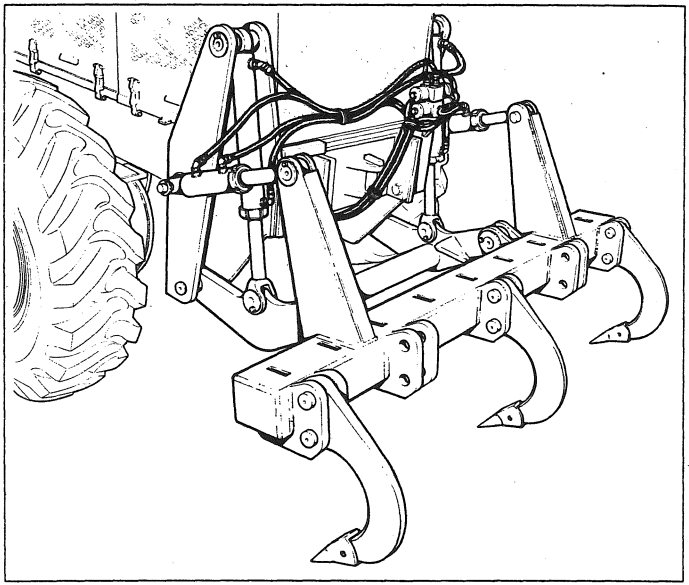
Scarifier: The scarifier is mounted behind the front wheels and is hydraulically operated from inside the cab. Refer to the section - **Operating the Controls - Control Lever for Scarifier, Dozer Blade or Snowplow** page 9-9. The scarifier can be used with other front mounted attachments.

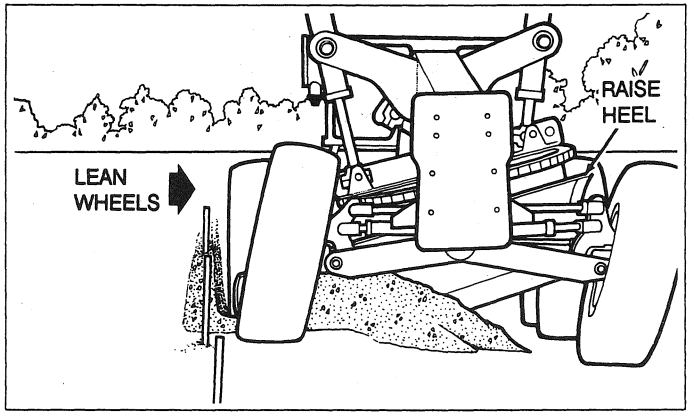
The scarifier is a equipped with up to eleven teeth that are adjustable and replaceable. Use the scarifier to break up surfaces that are too hard to cut with the moldboard. For especially hard surfaces, reduce the number of teeth. Always lower the scarifier teeth into the material slowly while the grader is moving at a low speed. Do not skid the teeth along hard sufaces such as large rocks or pavement. Do not use the scarifier when turning or articulating. This places side loads on the scarifier teeth and may result in equipment damage.

Scarifier and Ripper Operation continued

Ripper: The ripper is very useful for breaking up asphalt pavement, large rocks and tree stumps. The ripper can be equipped with five ripper teeth or nine scarifier teeth. The ripper is controlled by a hand-held attachment controls switch box located in the cab. Refer to the section - **Controls and Instruments - Attachment Controls Switch Box** page 6-11.

When using the ripper, lower the teeth into the ground with the grader in motion. If the rear wheels lose traction, raise the ripper until the wheels regain traction. For especially hard surfaces, reduce the number of teeth. To break old pavement, lower the teeth under the pavement and raise the ripper. Avoid the use of the ripper when turning, this reduces wear on equipment.



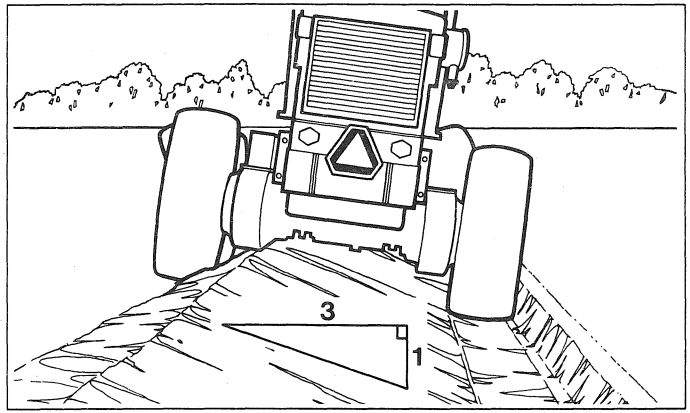


Road Construction - Right-hand 'V' Ditching

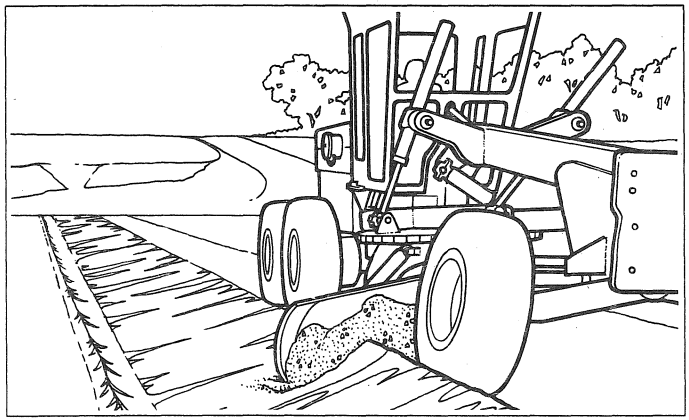
- Place a line of stakes to define where the ditch will be constructed.
- Position the moldboard with the toe just outside the front right-hand wheel and the moldboard heel just ahead of the left-hand tandem wheels.
- Tilt the moldboard back and raise the heel to carry the material inside the left-hand tandem wheels.
- Lean the front wheels left to counteract side thrust.
- Make the marking pass slowly.
- If using an articulated grader on a firm surface, keep the frame straight.
- If the surface is loose, articulate the frame to keep the drive wheels on firm ground. Remember to remove the articulation lock pins before articulating the grader. If the articulation feature will not be used, install the articulation lock pins.

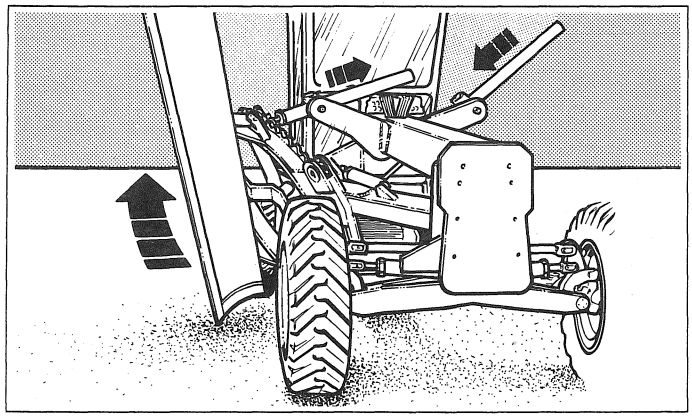
Right-hand 'V' Ditching continued

- Make the second pass with the front right-hand wheel on the bottom of the first cut. Cut a 3 to 1 slope at a slightly higher speed.



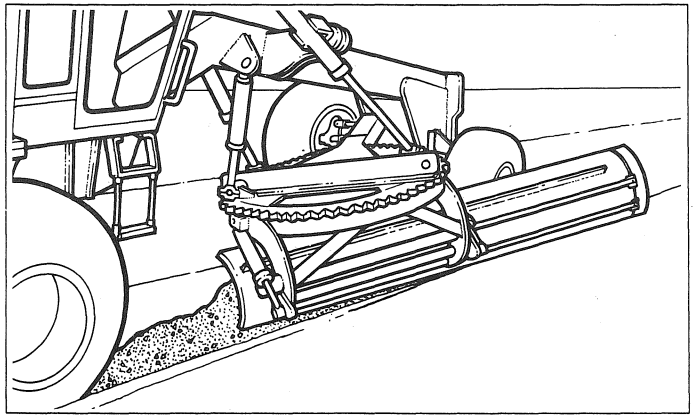
- A clean-up pass may be required as the windrow builds up on the roadside. Side shift the circle towards the ditch. Carry the material well inside the toe of the moldboard to prevent spillage back into the ditch.





Right-hand 'V' Ditching continued

- Cut the ditch back slope by Hi-Lifting the moldboard to the right-hand side of the grader. Rotate the circle counter-clockwise and lower the left Hi-Lift cylinder while the circle is rotating. Refer to the section - **Operating the Controls - Moldboard Hi-Lift** pages 9-12 and 9-18.

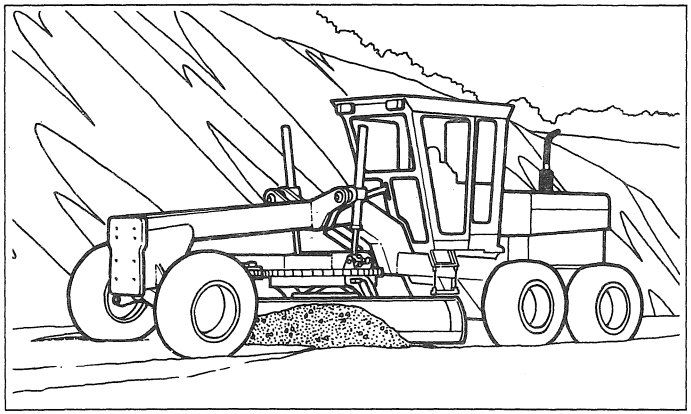


- Center the moldboard heel in front of the right-hand tandem wheels. Drive the grader with the tandem wheels in the ditch. Deposit the material in the ditch.
- When you have completed the back slope procedure, position the moldboard to complete the clean-up pass. This spreads the windrow created by the back slope, and builds up the road surface.

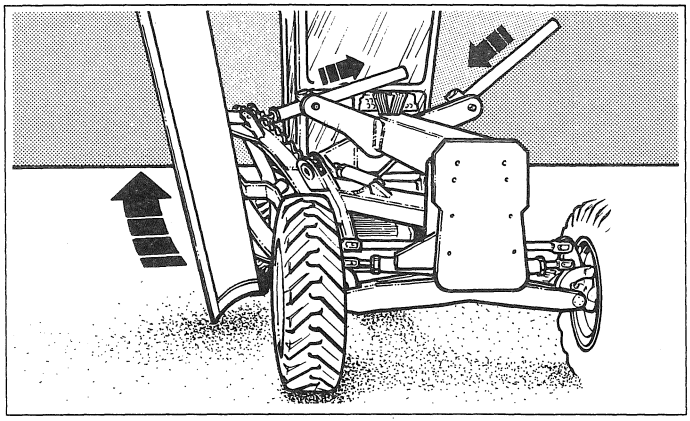
Repeat these procedures to cut the ditch on the other side of the road.

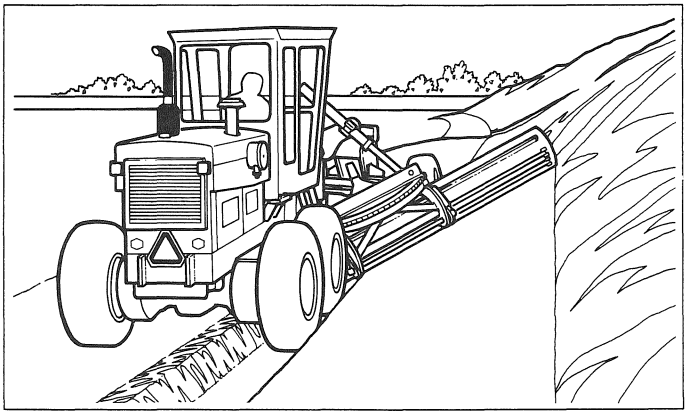
High Bank Cutting

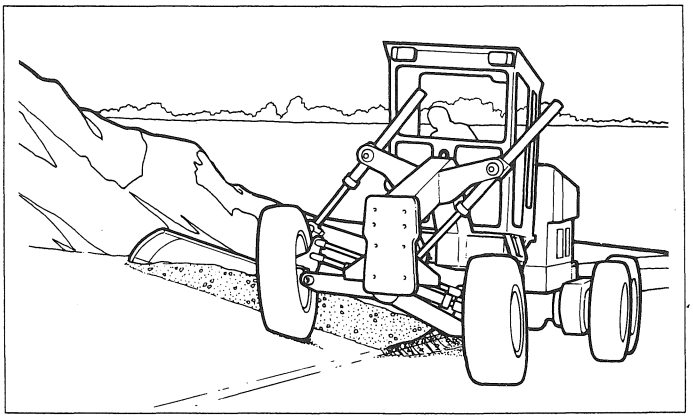
- Establish a level platform surface for grader operation.
- If the platform surface is hard, make a pass cutting into the platform. This pass should slope slightly towards the bank to stop the grader from sliding away while cutting into the bank slope.



- Prepare your grader for cutting the bank slope by side shifting the circle and moldboard as far as possible to the side of the grader you will be working with.
- Rotate the circle and moldboard counterclockwise and lower the left Hi-Lift cylinder at the same time. Refer to the section - **Operating the Controls - Moldboard Hi-Lift** pages 9-12 and 9-18.







High Bank Cutting continued

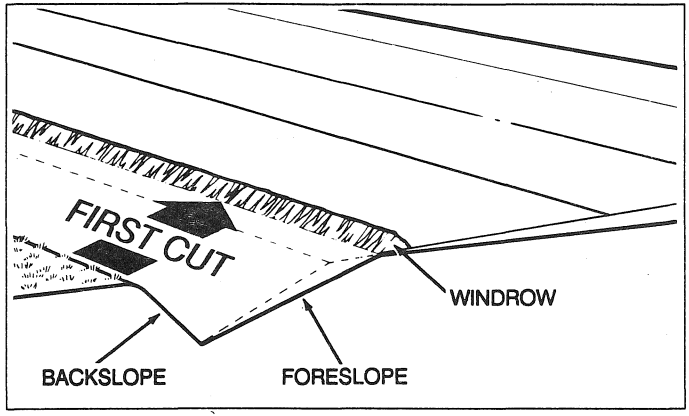
- Lower or raise the drag link cylinder to position the heel of the moldboard at the bottom of the bank slope and in-line with the inner edge of the tandem wheels.
- Move the grader slowly towards the bank. Check to see if the moldboard is angled correctly before actually cutting into the bank.
- While cutting the slope, ensure tandem wheels are near the base of the bank slope.
- The depth of cut or degree of slope required can be accomplished easily by raising or lowering the moldboard, tilting the moldboard, or leaning the front wheels.
- Keep your platform surface clean by moving the windrow after each pass on the bank slope.

If using an articulated grader, ensure the articulation lock pins are removed before articulating, and install them when not using the articulating function. On the level platform surface articulate the front frame towards the bank slope and allow the front wheels to ride the bank slope and position the moldboard as required. The tandem wheels must be kept on the level platform surface.

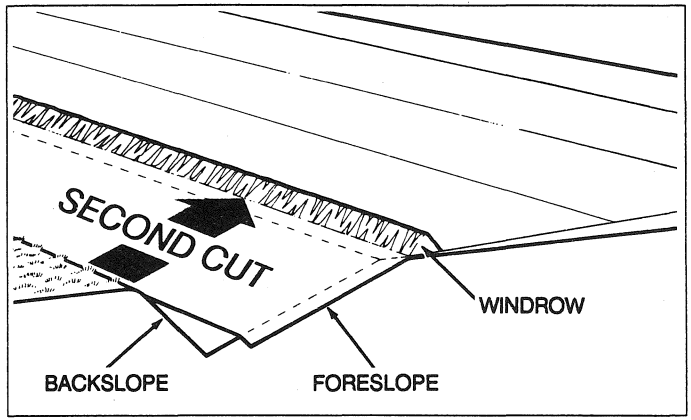
Flat Bottom Ditching - Gravel Roads

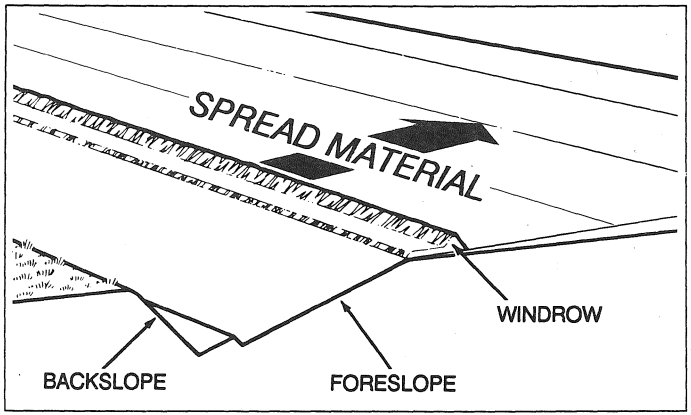
If no 'V' ditch exists, see this section - **Right-hand 'V' Ditching** page 10-22, and cut a ditch to the desired depth.

- The first step is to cut the ditch foreslope.
- With the frame straight, operate the grader with the right-hand wheels riding at the bottom of the 'V' ditch.
- Position the moldboard toe behind the front right-hand wheel, and the heel outside and in front of the left-hand tandem wheels.
- Tilt the moldboard forward.
- Lower the moldboard toe to the bottom of the ditch.
- Raise or lower the heel to the required ditch foreslope and lean the front wheels to the left.
- Deposit the material onto the shoulder.



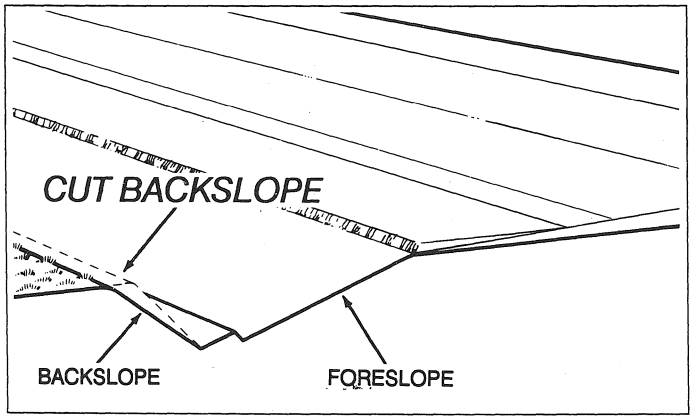
- Reposition the moldboard to cut a second 'V' ditch closer to the road and not as deep as the first 'V' ditch cut. Deposit the material onto the shoulder.





Flat Bottom Ditching - Gravel Roads continued

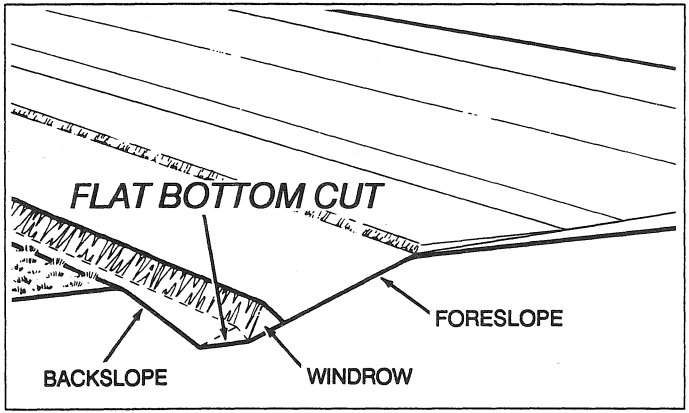
- Reposition the moldboard to make a clean-up pass for the material built up on the road shoulder. Side shift the circle towards the ditch. Carry the material well inside the toe of the moldboard to prevent spillage back into the ditch.
- Spread the material to the center of the road to create a crown. See this section - **Crowning a Road** page 10-30.



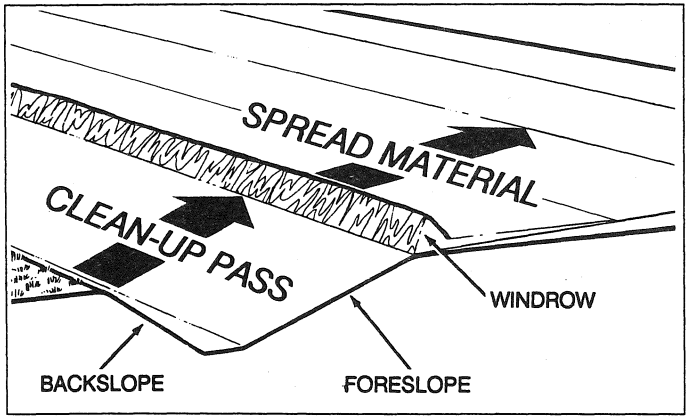
- If the backslope is insufficient or if you are building a new road make a pass to cut the backslope. See this section - **Right-hand 'V' Ditching** page 10-22.

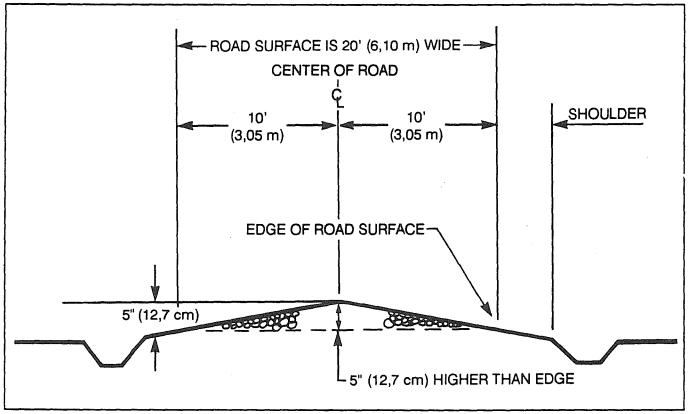
Flat Bottom Ditching - Gravel Roads continued

- To begin a flat bottom cut operate the grader with its right-hand side wheels riding in the first 'V' ditch cut.
- Position the moldboard toe at the bottom of the ditch backslope and the heel at the bottom of the ditch foreslope.
- Tilt and lower the moldboard for the required depth.
- Make a horizontal cut and lean the front wheels to the left.



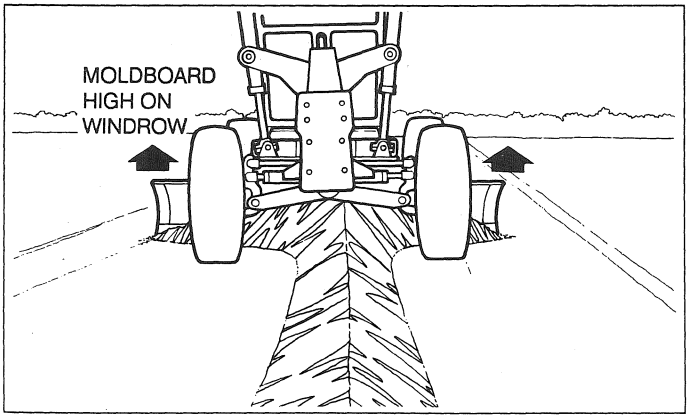
- Reposition the moldboard to make a cleanup pass to spread the windrow created by the flat bottom cut up onto the shoulder. Spread this material and finish the final grade.





Crowning a Road

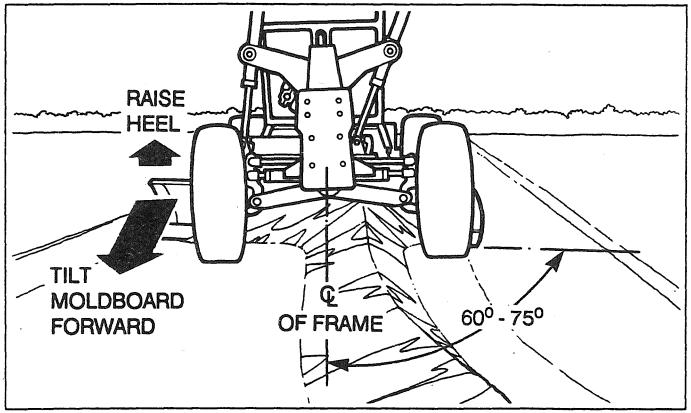
Crowning a road is simply constructing a road surface so that the center of the road is higher than the road edge. This allows water to drain into the ditches as quickly as possible. If the crown is not built properly, water will be trapped and break up the road crust producing potholes and washboards. The amount of crown is the amount of slope on the road. For good drainage, a road should have a crown of 1/3 in. (8,4 mm) to 1/2 in. (12,7 mm) for every foot (305 mm) of width measured from the center of the road to the outside edge where the road meets the shoulder.

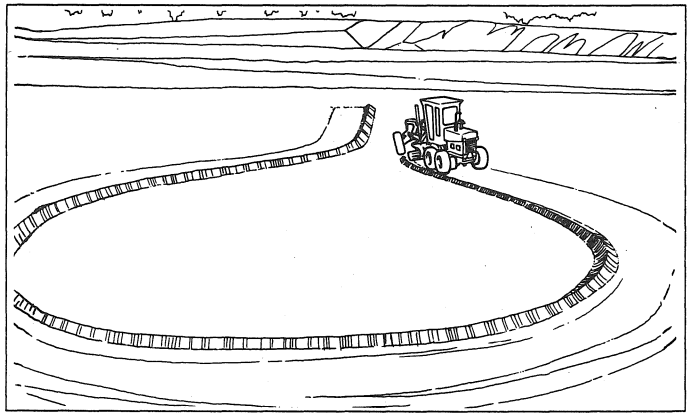


- After the ditches have been constructed, grade the excess material to the center of the road, creating a windrow.
- Position the moldboard parallel to the front axle.
- Drive the grader straight down the center of the windrow, keeping the moldboard high on the windrow to feather the material to both sides of the grader.

Crowning a Road continued

- Construct the crown slope by tilting the moldboard forward and position it between a 60 and 75 degree angle. Place the transmission in a higher gear to increase your speed. Raise the heel of the moldboard slightly to allow the material to be feathered. Work both sides of the road constructing the slope at the same time.
- When you reach the shoulders, align the heel of the moldboard with the tandem wheels, to compact the excess material.





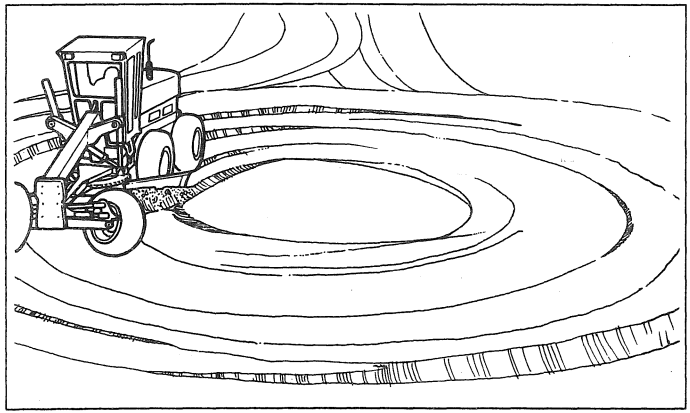
Cul-de-sac Using Articulation

Cul-de-sacs can be constructed by rigid or articulated frame graders. In this situation, grading with an articulated frame grader is an asset.

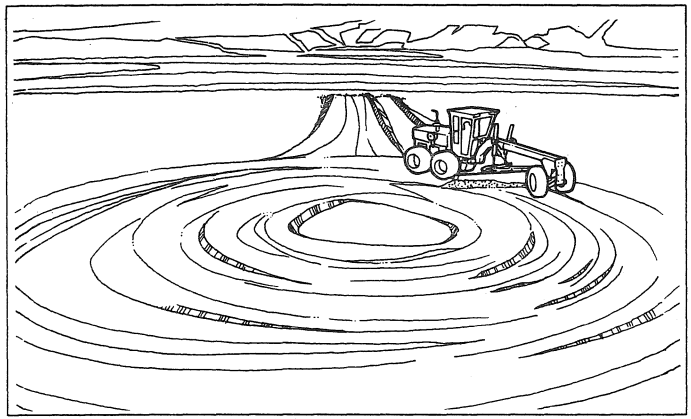
- Start grading at the perimeter of the cul-de-sac in a circular pattern and work the material towards the center. Angle the moldboard to deposit the material outside the tandem wheels.

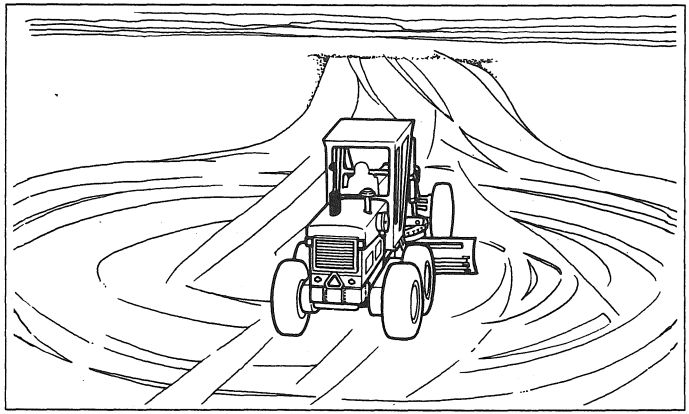
Cul-de-sac Using Articulation continued

- Articulate the frame and lean the wheels in the direction you are turning to increase steering control as you approach the center of the cul-de-sac.



- To begin the finished grade of the cul-de-sac, drive the grader opposite to the direction you were previously operating at the outside edge and form a windrow towards the center.
- Tilt the moldboard forward and move the windrow towards the center of the cul-de-sac.
- Check the slope as you grade the windrow towards the center, making the center the highest point.





Cul-de-sac Using Articulation continued

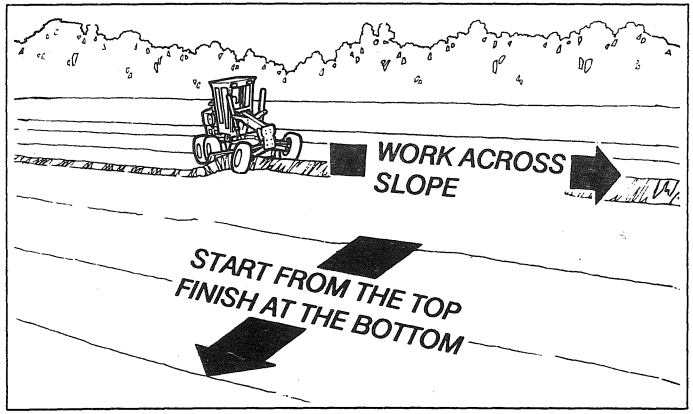
- When you have completed circling, grade the excess material out the cul-de-sac entrance.

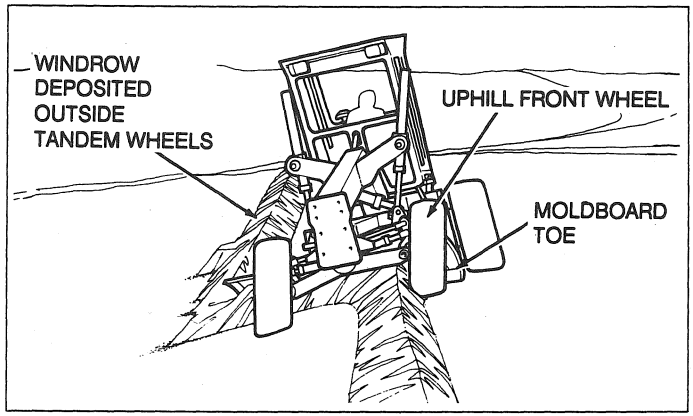
Finishing a Gradual Slope Using Articulation

⚠WARNING

Do not articulate the grader when operating on steep slopes. Grader could roll over. Severe personal injury or death could result.

- It is best to start from the top and finish your grading at the bottom of the slope, if possible.
- Work back and forth across the slope.
- Always extend the moldboard down slope.



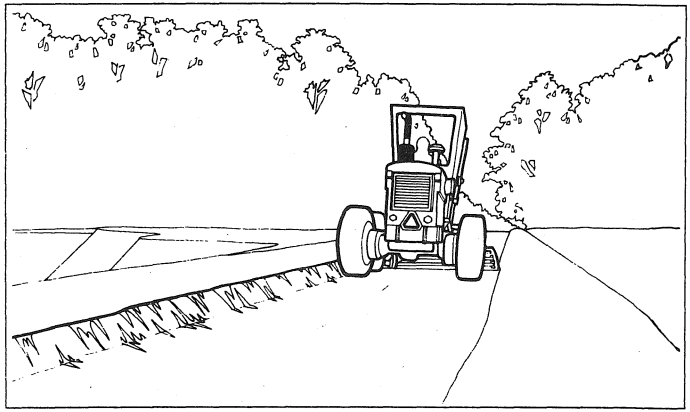


Finishing a Gradual Slope Using Articulation continued

- Ensure the articulation lock pins are removed before articulating and install them when not using the articulating function.
- Articulate the grader. Keep the tandem wheels on the level surface.
- Lean the front wheels vertically and position the uphill front wheel on the edge of the windrow created from the previous pass. This provides stability and allows you to create an even grade.
- Position the toe of the moldboard outside and behind the uphill wheel so that the heel of the moldboard deposits the material outside the downhill tandem wheels.
- When you have completed grading the slope, spread the remaining material to make a smooth finished grade.

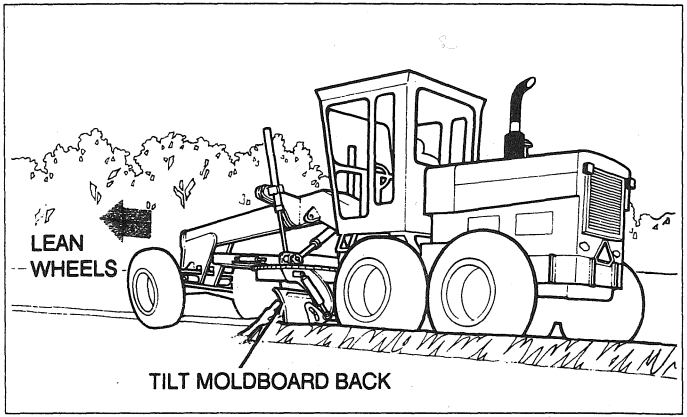
Road Maintenance - Gravel Roads

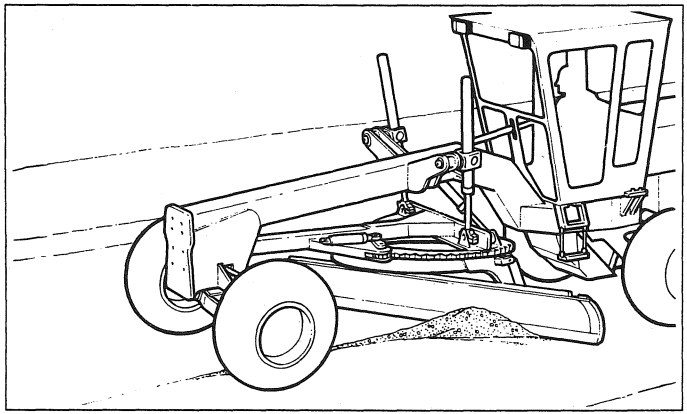
Check the road surface material. If it is dry, use water to dampen it, resulting in a better finished surface. Washboard road surface or potholes need reshaping because of the effects of weather and traffic. Reshaping involves cutting and remixing aggregates and fines.



- Start at the edge of the shoulder and cut the material into a windrow. Deposit the material towards the center of the road outside the tandem wheels.

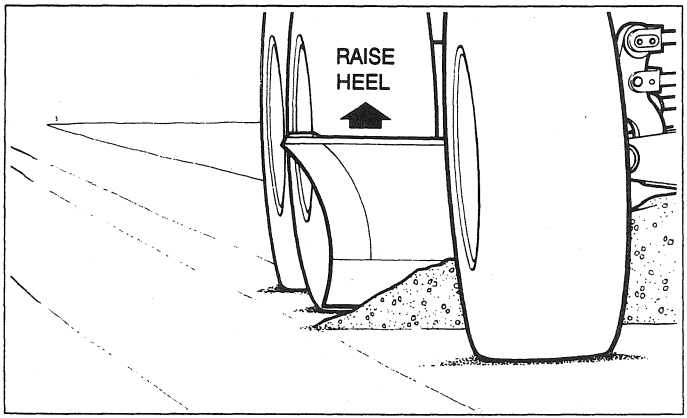
- Ensure the circle is centered and the moldboard is angled at 30 degrees to the frame center line.
- Tilt the moldboard back for maximum cutting to remove the ridges and potholes.
- Lean the front wheels towards the heel side of the moldboard as you work towards the center of the road.
- Repeat these procedures for the other side of the road surface.
- Generally, tilt the moldboard forward for grading and back for ditching.





Gravel Roads continued

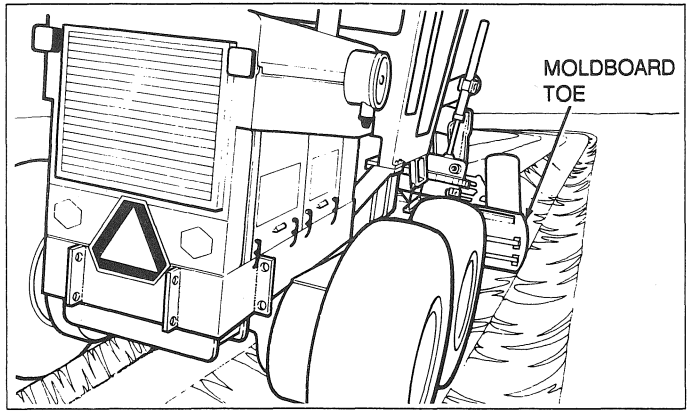
- Build the road surface by moving half the windrow towards the shoulder. Feather the material over the road surface as you check the crown and work towards the shoulder with each pass.



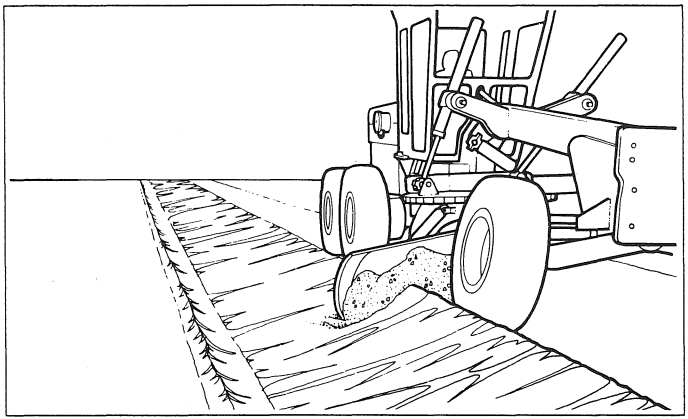
- As you make a final pass at the edge of the shoulder, raise the heel of the moldboard to feather the material and use the tandem wheels to compact any remaining material.

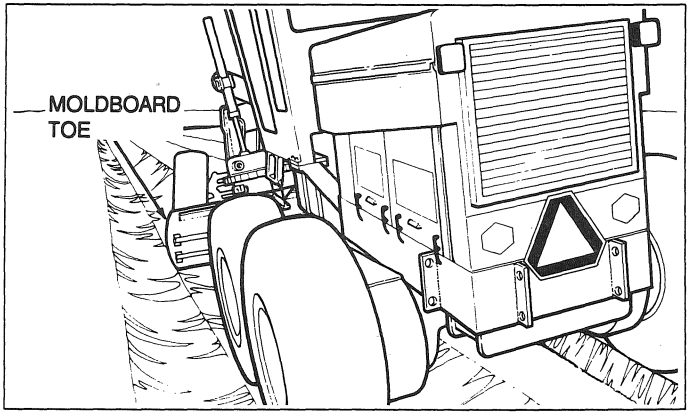
Right-hand Ditch Clean-up

- Position the moldboard right end behind the right front wheel.
- Lower the right-hand Hi-Lift cylinder to position the moldboard to the depth of the ditch.
- Move the left-hand Hi-Lift cylinder to position the heel of the moldboard to deliver the material onto the foreslope between the tandem wheels, without cutting the foreslope.
- Lean the front wheels slightly left to counteract side thrust.



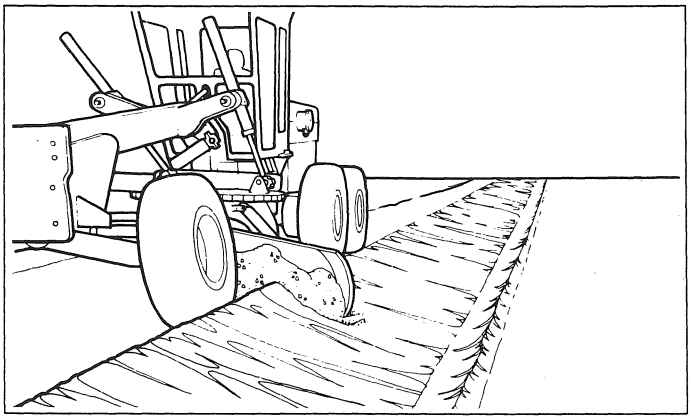
- For the next pass, reposition the moldboard as required to move the material up the foreslope and onto the shoulder.
- On the next pass spread the material to finish the shoulder grade.





Left-hand Ditch Clean-up

- Position the moldboard left end behind the left front wheel.
- Lower the left-hand Hi-Lift cylinder to position the moldboard to the depth of the ditch.
- Move the right-hand Hi-Lift cylinder to position the heel of the moldboard to deliver the material onto the foreslope between the tandem wheels, without cutting the foreslope.
- Lean the front wheels slightly right to counteract side thrust.



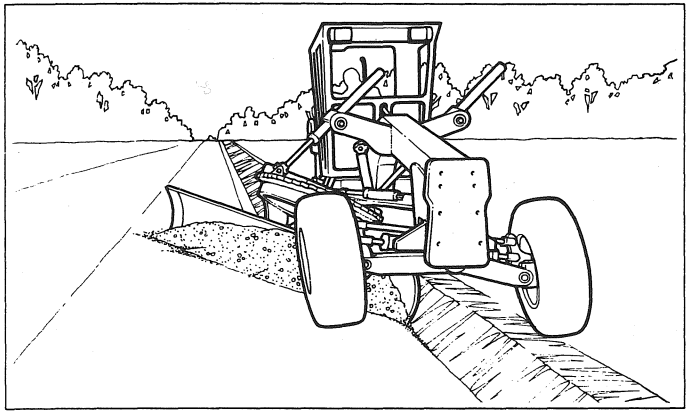
- For the next pass, reposition the moldboard as required to move the material up the foreslope and onto the shoulder.
- On the next pass spread the material to finish the shoulder grade.

Cleaning a Wet Ditch

This application can be completed with a rigid frame grader, although an articulated grader may make the operation easier under some circumstances.

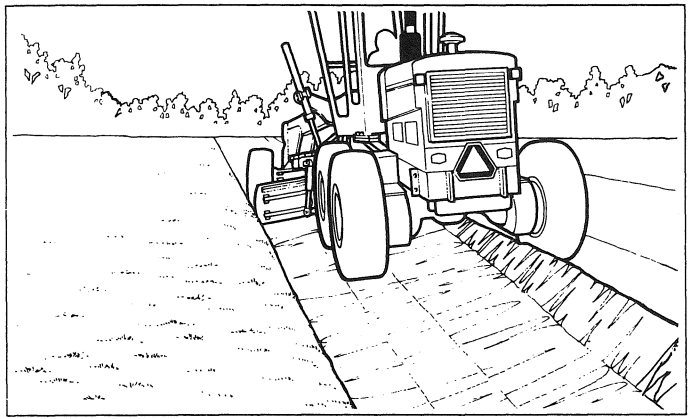
If you are using a rigid frame grader to clean a wet ditch, it is best to straddle the ditch. Straddling allows you to keep all the wheels on a dry surface.

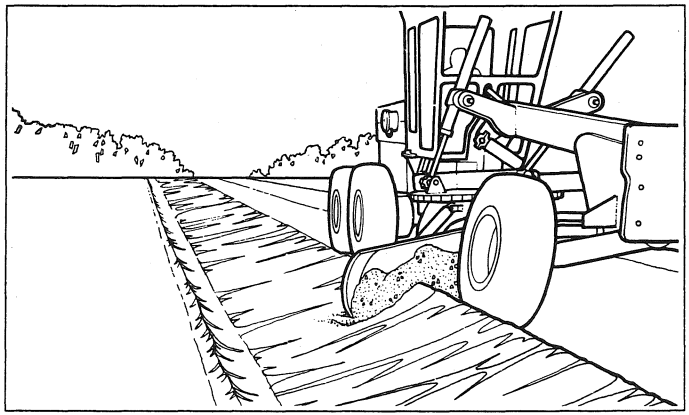
- Position the moldboard toe at the bottom of the ditch and move the material out of the ditch onto the shoulder outside the tandem wheels.
- Make the next pass by spreading the wet material over the shoulder.



If using an articulated grader, ensure the articulation lock pins are removed before articulating, and install them when not using the articulating function.

- Articulate the grader so that the front wheels are in the ditch.
- Keep the tandem wheels on the shoulder to prevent wheel slippage in the wet or soft material of the ditch.
- Side shift the circle and drawbar assembly towards the ditch.
- Tilt and angle the moldboard as required to move the material out of the ditch and to deposit it between the tandem wheels.





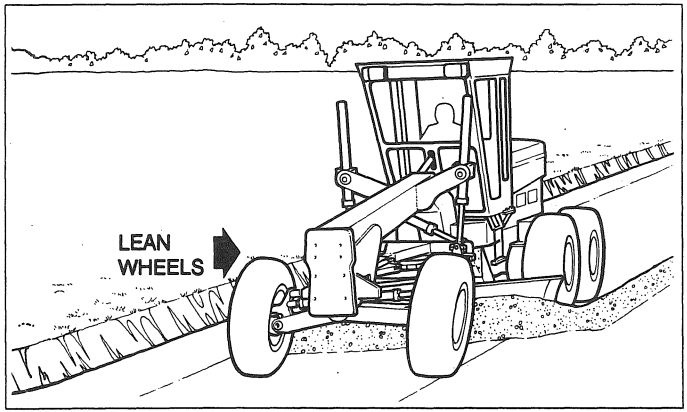
Cleaning a Wet Ditch continued

- For the next pass straighten the frame, side shift the circle and drawbar assembly and center it under the frame. Position and angle the moldboard as required to spread the wet material over the shoulder.

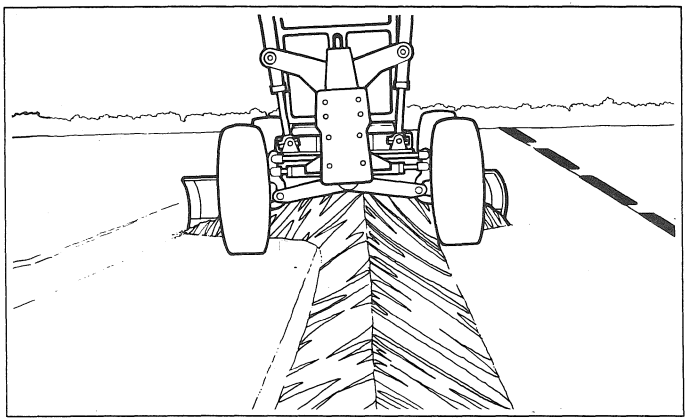
Dragging a Shoulder (right-hand side)

Check the material you will be grading. If it is dry, use water to dampen it, resulting in a better finished surface.

- Position the right end of the moldboard in-line with the outer edge of the front right-hand wheel.
- Angle the moldboard 30 to 45 degrees from the center line of the frame and tilt it forward to drag the material, not to cut it.
- Lean the front wheels to the left to counteract side trust.
- Deposit the material outside the left-hand tandem wheels onto the edge of the road.



- On the next pass, collect the windrow from the edge of the road and feather the material back onto the shoulder surface. Remember to adjust the moldboard to create a gentle slope towards the ditch.
- Ensure you clean up the road surface before allowing traffic to use the road way.



Descriptive procedures and illustrations shown are for right-hand side grading. For left-hand side grading, lean the front wheels and position the moldboard opposite to the description and illustrations shown.