GRADER OPERATORS’
HANDBOOK
# Table of Contents

## I. SAFETY
- A. Accident Prevention 3
- B. Planning Ahead 3
- C. Accident Checklist 4
- D. Working Alone 4 - 5

## II. GRADER OPERATION
- A. Prestart Checks 5
- B. Start-Up 6
- C. Operating Safety Tips 7
- D. Service & Repair 8
- E. Parking & Disabled Grader 9

## III. MAINTAINENCE STANDARDS
- A. Hazards / Unsafe Conditions
  1. Responsibility 10
  2. Types 10
- B. Gravel Surface Maintenance
  1. Regular Roadway Summer Maintenance 11-12
  2. Intersections 12
  3. Pulling Shoulders 12-13
  4. Regravelling 13-14
  5. Winter Maintenance 14-15
  6. Dust Control 15
  7. Railway Crossing 16
  8. Bridges 16
I. SAFETY

A. ACCIDENT PREVENTION:

1. **Stop Accidents Before They Stop You**
   i. Even the best and safest grader must still be operated with care and knowledge of its capabilities. Common sense, observance of safety rules and alertness on the job will result in “ACCIDENT FREE” days.
   ii. Accidents don’t just happen – they are caused by human error. So the person who has the ultimate responsibility is the grader operator – YOU!

B. PLANNING AHEAD:

1. Records show that a majority of accidents are caused by a disregard for Safety Rules – **OBEY THEM!**
2. If you have questions don’t be afraid to ask your maintenance foreman.
3. **Dress Properly For The Job** – Find out what items are required and wear them. (Safety shoes, hearing protection, safety vests, etc.)
4. **Understand Your Grader** – Read the Operators Manual and know your machines limitations.
5. **Use All the Safety Equipment** your grader is equipped with.
6. **Know Your Working Area**, surface condition, obstructions to visibility, heavy traffic, and traffic pattern.
7. **Eliminate The Element Of Surprise** – you will have fewer emergencies.
I. SAFETY (Continued...)

C. ACCIDENT CHECKLIST

If you come upon an accident or are involved in the accident the following measures should be taken:

1. **Keep Calm**, offer assistance to anyone injured, call police and other emergency help, **make no admissions or take any blame for the accident**, get names, addresses and phone numbers of witnesses, report accident to the Maintenance Foreman as soon as possible.

2. Obtain details of other vehicles involved, driver address, phone, driver’s license, make model and year, license plate, insurance policy number and company insurance agent’s name.

3. Obtain names of other passengers and those injured, addresses, phone, injuries, where taken for treatment.

4. Obtain accident information, date, time, location, describe damage to your vehicle and to others, along with property damage to buildings, guardrails, signs, etc.

5. Obtain Police Officers name, detachment, badge number and phone number.

6. Draw accident scene diagram, indicating length and location of vehicles and skidmarks, signs, lines on road, bridges or railways, obstruction to visibility (trees, shrubs), lighting, etc.

7. Describe road characteristics, surface defects, weather, lighting, signs, vehicle defects, driver actions.

If a pedestrian accident – describe pedestrian’s actions or inactions.
D. WORKING ALONE

1. Operators should ensure that a co-worker or family member is aware of their intent to work late and that they know the general area that they will be in.
2. Operators must use the County radio system or bag phone if available at regular intervals, 4 hourly in summer and 2 hourly in winter to inform other County staff of their whereabouts. Operators are to also monitor the radio's and respond to emergency calls for help when required.
3. Operators with personal cell phones are encouraged to use the cell phones as backup communication devices in the event know one answers the radio or bag phones.
4. As a last resort, operators should place a general call for help over the County radio channel, asking any person hearing the message to call the appropriate person to send help. Phone numbers of emergency personnel should be kept on hand in the graders at all times.
5. Operators should ensure that they have warm winter outerwear and footwear in the grader at all times during winter conditions
6. The operator should remain with his/her machine and avoid travelling any significant distances on foot during severe weather conditions.
7. Flagging down a vehicle to request assistance for emergency transportation is also an accepted practice in emergency situations.

II. GRADER OPERATION

A. PRE-START CHECKS

1. Check Grader and Attachments
   i. Walk Around Check – loose bolts, trash build-up, oil or coolant leaks, damaged tires.
   ii. Visually Inspect –
       • Controls
       • Engine Compartment
       • Cooling System
       • Gear Boxes
       • Linkages
       • Scarifier
       • Blade and End Bits
       • Rim Lugs
       • Hydraulic System
       • Tandem Hosing
   iii. Note – Make sure all safety equipment is working and clean.
II. GRADER OPERATION (Continued...)

B. START-UP

1. Check
   i. All Signals and Flashing Lights
   ii. Rotating Dome Light
   iii. Wing Lights
   iv. Tail and Stop Lights
   v. Back Up Beeper
   vi. Headlights
   vii. Blade Lights
   viii. Flags on Mould Board and Cab
   ix. Slow Moving Vehicle Sign

   Note: It is the operator’s responsibility to ensure that motorists are given as much warning as possible.

2. Fueling
   i. Use Caution – never refuel while engine is running.
   ii. Ground the filler spout against the filler neck to avoid spark.
   iii. Put out cigarettes before checking or adding fuel.

3. Coolant Check
   i. Loosen radiator cap slightly, pause to relieve pressure slowly, then remove cap.
   ii. Never pour cold coolant into the radiator if the engine is hot.

4. Check the Area
   i. Walk completely around and make sure there is no one next to, under, or on the machine – warn others if you start up.

5. Starting
   i. Check Grader for Warning Tags
   ii. Controls in Neutral
   iii. Park Brake Set
   iv. Sound Horn
   v. Check Gauges After Engine Start
   vi. Shut Down if Gauges Show Improper Reading
   vii. Test All Controls
   viii. Test Brakes
   ix. Test Steering
   x. Test Engine Governing, Control and Accelerator
   xi. Listen and report unusual noises
   xii. Recheck Lights, Back-up Alarms and Other Warning or Safety Devices
II. GRADER OPERATION (Continued...)

6. Notes
   i. Never operate electric starter for more than 30 seconds. Allow 2 minutes for cooling before starting again.
   ii. An overheated starter could cause a fire.
   iii. In cold weather starts, starting fluid may be required.
       - Remember - this fluid is flammable – Use With Care!!

Report Necessary Repairs – if daily check uncovers an item that needs attention, repair, replacement, or adjustment – Report It Now! Even a minor problem could cause a very large one if the grader is operated.

C. OPERATING SAFETY TIPS

1. Look behind the machine before and while backing up.

2. Be aware of overhangs, electric wires, slide areas or other dangerous conditions.

3. Match speed with job conditions.

4. Know traffic pattern of job site, obey flag person, road signs and signals.

5. Stay in proper gear when traveling downhill, never coast in neutral, use engine R. P. M. to help maintain control.

6. Use parking brake when parking at all times.

7. Always operate controls from the operator station.

8. Get help for jobs such as adjusting links if necessary.

9. Use proper hitch equipment and technique when towing the grader.

10. Watch out for bridge abutments, guard railings and other obstacles.

11. No riders are permitted anywhere on the grader except in the cab.

12. When stopped lower all raised equipment (mould bar, scarifier).

13. When using a tow cable, ensure everyone is away from potential “whip” area should the cable snap.
II. GRADER OPERATION (Continued...)

D. SERVICE AND REPAIR

1. EMERGENCY SERVICE AND REPAIR
   i. Read and understand the grader Maintenance Manual.
   ii. Keep hands and clothing away from moving parts.
   iii. Wear eye protection – fluids (fuel, oil) can damage your eyes.
   iv. Wear a hard hat and safety shoes.
   v. Be sure engine is stopped before cleaning, servicing, checking belt tension, adjusting brake or clutch or working on hydraulic system.
   vi. If engine must be run – set brakes, transmission in neutral, block the wheels, have one man at the controls and the other working on the engine.
   vii. Battery gas is explosive – do not smoke near the battery or have open flame near it.

2. BLOCKING EQUIPMENT
   i. If any equipment must be raised before servicing, the equipment must be blocked securely and the grader wheels must be blocked.
   ii. When jacking up a vehicle, use a suitable jack and block the wheels.
   iii. Before working under or on a jacked vehicle, support the vehicle securely on axle stands or other rigid supports.

3. PRESSURIZED SYSTEMS
   i. Relieve all pressure (water or hydraulic) before opening or removing any caps, lines, valves or fittings.
   ii. Hot oil can be dangerous.
   iii. Lower all hydraulically activated equipment before servicing the hydraulic system.

4. ELECTRICAL SYSTEMS
   i. Observe all cautions for battery installation and booster connections.

5. BRAKES
   i. Follow manufacturer’s instructions exactly when adjusting the brakes.
   ii. Improper adjustment can lead to accidents.
   iii. Block wheels before bleeding wheel cylinders.
   iv. Air trapped in brake lines will cause erratic performance.
   v. Use only brake fluid type recommended by manufacturer.
II. GRADER OPERATION (Continued...)

E. PARKING AND DISABLED GRADER

1. Parking Precautions
   i. Select level ground where possible.
   ii. Roads are not parking areas and should not be used for this purpose.
   iii. If possible, park on an approach or in a ditch or field – keep all parts of the grader as far away as possible from the traveled portion of the roadway.
   iv. If the grader is disabled and cannot be moved from the roadway – put out flags and flares (flares are mandatory at night and during periods of poor visibility).
   v. Use flashing lights on the grader.
   vi. If the grader is disabled in a location where its location cannot be seen by motorists, additional warnings must be given (signage, flagperson).
   vii. Have the grader removed from the roadway as soon as possible.

2. Shutdown Procedure
   i. Lower all equipment to the ground.
   ii. Reduce engine speed.
   iii. Transmission neutral.
   iv. Set park brake.
   v. Allow engine to cool gradually.
   vi. Stop engine.
   vii. Secure machine to prevent unauthorized starting and movement.
III. MAINTENANCE STANDARDS

A. HAZARDS / UNSAFE CONDITIONS

1. Responsibility

YOU ARE THE EYES OF THE MUNICIPALITY

i. Hazards or unsafe conditions you have seen and know about are conditions that your municipality should know about!

ii. It is your responsibility to repair hazards immediately and to warn motorists if the hazard is serious.

iii. Normal grading operations may be able to correct some problems but, if they cannot be corrected immediately, warnings must be given to motorists and the Maintenance Foreman must be contacted.

2. Types

i. Obscured, damaged or missing signage

ii. Obscured intersections

iii. Loose gravel, very soft shoulders

iv. Oil spills

v. Potholes

vi. Plugged, damaged or exposed culverts

vii. Ditch blockages

viii. Frost heaves

ix. Water ponding on roads

x. Settled utility cuts

xi. Edge ruts

xii. Intersections requiring sweeping

xiii. Damaged bridge decks

xiv. Damaged guard rails

xv. Weed, tree and vegetation encroachment onto road surface

xvi. Non-existent or poor signage at a construction site
III. MAINTENANCE STANDARDS (Continued...)

B. GRAVEL SURFACE MAINTENANCE

1. Regular Roadway Summer Maintenance
   Regular roadway inspections should be carried out to ensure the required level of service is maintained.
   i. Standards
      To establish the frequency of blading to maintain the required level of service, traffic volume, weather and general road conditions will all have to be considered.
   ii. Procedures
      a) The entire roadway should be bladed to remove all pot holes, washboards and ruts. When blading, shoulders should be kept FREE OF GRASS AND RIDGES to prevent moisture build-up. Shoulder trimming and shaping should normally take place in the spring or fall. Sod lumps should be worked across the roadway to separate gravel material and break up lumps.
      b) The finished roadway should have a uniform crown of approximately 4 percent.
      c) All curves must be bladed in such a manner as to maintain the designed superelevation.
      d) Minor repairs on small holes and soft areas may be performed by scarifying the area and blading out the material, drying, and then relaying it into the excavation.
      e) The operator shall remove all large rocks that may be pulled up and onto the roadway during regular blading. The rocks are to be removed from the road right-of-way.
      f) During the summer, grade lengths of road which will allow completion during the work day.
      g) AT NO TIME is a windrow to be left on a roadway overnight unless its location is clearly visible by the use of barricades or signage.
      h) When traffic backs up, pull over to allow vehicles to pass safely.
      i) Stop when school bus approaches in either direction and let it pass safely.
      j) Graders should operate on the right side of the road and proceed in the same direction as other traffic.
III. MAINTENANCE STANDARDS (Continued...)

B. GRAVEL SURFACE MAINTENANCE (Continued...)

k) If a section of road requires grader operation in the opposite direction to traffic on any road in which the grader may not be easily seen YOU MUST ensure that all lights are visible and operational.
l) It may be necessary to reduce the length of each pass on hilly or curvy roads so it will be practical and safe.

2. Intersections
   i. When blading intersections, caution must be used when backing into and out of the intersections.
   ii. Roadways should be bladed through intersections, with the material spread back evenly to eliminate ridges and provide a smooth surface. The crown on the main roadway should be maintained through the intersection, while the crown on the intersecting roadways should be feathered back.
   iii. At no time is a windrow to be left in an intersection as traffic approaching the windrow at 90 degree angle may not see it – hitting the windrow at driving speed could cause loss of control.
   iv. The gravel from a gravel road should not be bladed onto the paved roadway where these two types of roads meet.

3. Pulling Shoulders
   Pulling Shoulders (shoulder maintenance) may be required to redefine and reshape roadway shoulders to an acceptable cross section.
   i. Standards
      Pulling shoulders may be required when the shoulders of the roadway push out; the crown rate of the roadway becomes flatter than 1 percent; or the cross section is wider than designed and not properly draining. Prior to any regravelling, roadways should be inspected to determine whether pulling shoulders is required.
   ii. Procedures
      a) Engineering surveys may be needed to re-establish shoulder line.
      b) To minimize damages, the ends of culverts should be marked and affected signs removed.
III. MAINTENANCE STANDARDS  (Continued...)

B. GRAVEL SURFACE MAINTENANCE (Continued...)

  c) Utilities must be located prior to commencement of work.
  d) Graders or other suitable equipment should be used to windrow material from the sideslope onto the roadway.
  e) Material should be broken up and then spread over the roadway. The use of a pulvimeter or tractor disc may be required for this operation.
  f) Foreign objects and other debris should be removed before the material is spread, watered, and compacted.
  g) This process may need to be repeated until an acceptable cross-section is obtained.
  h) The roadway should then be regravelled.
  i) Damaged culverts should be repaired and all necessary signs re-installed.

4. Regravelling
   Excess loss of gravel from a roadway results in a loss of traction, a reduction in strength, rutting, and deterioration of the roadway and sideslopes. Regravelling of a roadway improves the riding quality, stabilizes and strengthens the roadway, and restores an all weather driving surface.

i. Standards
   Gravelled roadways usually require regravelling once every four years. Some roadways may require gravelling more frequently and others less frequently. Information on the condition of the roadways should be collected early in the spring to determine where regravelling is required that year. A roadway should be considered for regravelling when it exhibits any of the following characteristics:
   a) excessive loss of surface gravel
   b) numerous bald or shiny spots
   c) clay balls on the shoulders after blading
   d) excessive rutting

ii. Procedures
   a) Roadway Preparation
      - Prior to regravelling, the roadway must be reshaped to the proper crown and width. Sometimes it may be necessary to “pull shoulders”.

III. MAINTENANCE STANDARDS  (Continued...)

B. GRAVEL SURFACE MAINTENANCE (Continued...)

   b) Spreading Gravel
   - The spread distance for each load of gravel should be marked on the roadway by the gravel checker.
   - Gravel dumped on the roadway should be equalized by windrowing before it is spread over the surface.
   - On roadways with an Average Annual Daily Traffic (AADT) higher than 50, the gravel should be spread to the shoulders.
   - On roadways with an AADT less than 50, the gravel should be spread from one meter from the shoulders.
   - Care should be taken to maintain the crown and superelevation of the roadway.
   - Windrows or unspread gravel should not be left on the roadway overnight.

   c) Gravel Haul Roads:
   - During gravel hauls, the haul roads must be regularly maintained to provide reasonably smooth and safe roadways for the motoring public.
   - The haul road should be checked at least twice per day to ensure that maintenance operations are effective.
   - Appropriate signs indicating that trucks are working should be erected along the haul route.

5. Winter Maintenance
   i. Standards
   Plowing of gravel surface roadways should be commenced before snow accumulations reach 10 to 15 cm on the roadway. However, if drifting conditions prevail, plowing operations may be commenced sooner. In general, winter maintenance schedules are determined by weather conditions.
III. MAINTENANCE STANDARDS (Continued...)

B. GRAVEL SURFACE MAINTENANCE (Continued...)

ii. Procedures

a) During the first snow fall, it is desirable to mix enough snow into the loose gravel to stabilize the surface material when it freezes. This minimizes future gravel loss from snowplowing.
b) Ice blading may become necessary if the roadway becomes slippery due to compacted snow or ice. Ice blading roughens the surface for improved traction. Care must be taken to minimize gravel loss.
c) Winging of snow down into ditch will be necessary before plowed snow accumulates to a depth of 30 cm along the shoulder edge.
d) The wing should be raised at approaches to feather out the snow, thus preventing the formation of a windrow.
e) Location of culverts should be noted so that no damage occurs to ends of culverts when winging snow into ditch.
f) Problem culverts during spring time runoff should be noted so that problems can be rectified.
g) Culvert ends should be kept clear of debris. This may involve physically cleaning culvert ends with shovel.

NOTE: Winging for snowplow truck safety of snow down into the ditch on paved secondary highways will be required as directed by the Maintenance Foreman.

6. Dust Control

The purpose of dust control is to minimize the health and safety hazards caused by severe dust conditions on gravel roadways.

i. Standards

Dust control material must be applied to the roadway as directed by the Maintenance or Construction Foreman. The roadway is to be inspected periodically and dust control material re-applied if required.

Dust control material may be applied at intersections, on hills, in front of residences and other public places.
III. MAINTENANCE STANDARDS  (Continued...)

B. GRAVEL SURFACE MAINTENANCE (Continued...)

7. Railway Crossings
   i. Stop blading the road 50 cm away from the railway track.
   ii. Spread all material before reaching the crossing.
   iii. DO NOT allow the blade to come into contact with the rails or planks.
   iv. If gravel or rocks are pulled onto the tracks, or if blade contact is made, tracks should be cleaned or the Maintenance Foreman should be informed as soon as possible.

8. Bridges
   i. When blading bridge approaches, material should be carried up to the edge of the deck. Excess material should be back bladed to keep the deck free of excess material.