COMPACTION MANUAL

For Questions or Comments – MHI safety@gov.sk.ca

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Table of Contents

LIST OF FIGURES ....................................................................................................................... 3

Overview ......................................................................................................................................... 5

  Knowledge of an Employee .............................................................................................................. 5
  Skills of an Employee ..................................................................................................................... 5

OH&S Regulations ........................................................................................................................... 6

Introduction ...................................................................................................................................... 7

Self-Propelled Roller ...................................................................................................................... 7

  Pneumatic Tire Roller ................................................................................................................... 7
  Steel Wheel Roller ......................................................................................................................... 8

Pull-Type Packers ............................................................................................................................ 10

Pre-Trip Inspection .......................................................................................................................... 11

  Approach ....................................................................................................................................... 11
  Under the Hood .............................................................................................................................. 11
  Walk Around ................................................................................................................................. 11
  In Cab Checks ............................................................................................................................... 12

Starting the Engine .......................................................................................................................... 12

  Engine Checks ............................................................................................................................. 12
  Ether ............................................................................................................................................... 13

Hydraulic System ............................................................................................................................ 13

  Hydraulic Brakes .......................................................................................................................... 14
  Hydrostatic Drive .......................................................................................................................... 14

Safe Roller Operation ...................................................................................................................... 15

  Tire Safety ..................................................................................................................................... 16
  Rolling ............................................................................................................................................. 17
  Roller Speeds ................................................................................................................................. 17

Park and Shut Down ........................................................................................................................ 17

  Procedure for Refueling ............................................................................................................... 18
  The Idle Roller ............................................................................................................................... 18
  Procedure for Shutting Down ......................................................................................................... 18

Record Keeping ............................................................................................................................... 19
Card Lock System ................................................................. 19
Routine Maintenance ............................................................. 19
Daily Preventative Maintenance ............................................. 19
Operator equipment check sheet and service record .................. 19
Loading Equipment’s .............................................................. 20
Tie-Downs ........................................................................ 20
Transporting Heavy Equipment ............................................ 21
Safety Precautions ................................................................. 22
Tipping Hazard .................................................................. 22
Relatable SOP’s ................................................................ 22
Appendix A ......................................................................... 23
Operator’s Platform ............................................................... 23
Appendix B ......................................................................... 25
WLL for Chain .................................................................. 25
WLL for Chain Hooks ........................................................... 26
LIST OF FIGURES

Figure 1: Self-Propelled roller ................................................................. 7
Figure 2: Pneumatic Tire Roller ................................................................. 8
Figure 3: Steel Wheel Roller ................................................................. 8
Figure 4: Pull-Type Packer ................................................................. 10
Figure 5: Schematic of Hydrostatic Transmission ....................................... 15
Figure 6: 3-Point Contact Entry ................................................................. 16
Figure 7: Stamped and casted markings on tie downs ..................................... 21
NOTE TO THE READER

The information in this manual does not include each and every unique solution that you may encounter while operating or working on the MHI equipment. In the event that a situation is not addressed in this manual is encountered, contact your supervisor if in doubt before proceeding.

Recognizing that some changes on the unit may be made in the future, the information, specifications and illustrations in this manual are based on information that was current at the time of publication. Note that some illustrations are typical and may not reflect the exact scenario in which the employer will be faced.

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Overview
As an employer, the Ministry of Highways and Infrastructure (MHI) must ensure adequate training exists. This manual along with training for new employees and coaching by supervisors will form the foundation of the Ministry program. The course content and format to deem an operator competent in compaction will consist of:

- Review of the MHI Compaction Manual,
- Review of specific equipment manuals,
- Completing compaction E-Learning Module,
- Successfully passing compaction LEARN exam, and
- A practical evaluation of a pre-shift inspection and proper operation of the unit typically done with the employee’s supervisor for a minimum of 16 hours. Some employees could take more than 16 hours to be deemed competent based on prior experience and comfort level with power mobile equipment.

Occupational Health and Safety (OH&S) Regulations states; an employer or contractor shall ensure that only trained operators are required or permitted to operate powered mobile equipment (Section 154). The OH&S definition of a “trained operator” means a worker who has successfully completed a training program that includes all the elements set in Table 14.1 of the OH&S Regulations.

You as an employee must use the procedures outlined in the manual along with the material presented during the training to ensure not only your safety, but those co-workers around you.

Knowledge of an Employee
After attending training and then being deemed competent on the compaction equipment’s, employees will be able to do the following:

- Identify hazards associated with the work, including the principles of operations and features of the unit,
- Understand the manufacturer’s specifications related to the operation
- Repeat workplace safety practices and procedures, and
- Understand legislation applying to the work.

Skills of an Employee
The skills to be learned are:

- Pre-operation inspection,
- General operation including starting, stopping, parking, and operating around personnel,
- Safe operating procedures, maintenance, parts list and illustration,
- Hydraulic system
OH&S Regulations
This manual was based off of best practices, Ministry standards and of course, the Occupational Health & Safety (OH&S) Regulations. If you want to understand the reasoning or the legal obligations between both the employer and employee, we recommend you do further reading of the regulations that can be found at www.publications.gov.sk.ca. The OH&S Regulations are broken into four sections that relate to this manual:

- Compact regulations
  - Section 12 – General Duties of Employers
  - Section 13 – General Duties of Workers
  - Section 14 – Employment of Young Persons
  - Section 17 – Supervision of Work
  - Section 24 – Identifying Mark of Approved Equipment
  - Section 25 – Maintenance & Repair of Equipment
  - Section 132 – Designated Signalers
  - Section 153 – “Hours of Darkness” Means
  - Section 154 – Trained Operators for Power Mobile Equipment
  - Section 155 – Visual Inspection
  - Section 156 – Inspection and Maintenance
  - Section 157 – Requirements for Powered Mobile Equipment
  - Section 157.1 – Construction, Repair, etc. of Powered Mobile Equipment
  - Section 158 – Use of Seat Belt
  - Section 160 – Warning of Reverse Motion
  - Section 161 – Roll-Over Protection Structure
  - Section 164 – Dangerous Movements
  - Section 165 – Transporting Workers

- Machine Safety
  - Section 134 – Operation by worker
  - Section 135 – Operating controls
  - Section 137 – Safeguards
  - Section 140 – Cleaning, etc., of machine or other equipment in motion
  - Section 141 – Belts

- Soil Interpretation (Section 257)
  - “type 1 soil”
  - “type 2 soil”
  - “type 3 soil”
  - “type 4 soil”

- Training regulation
  - Table 14.1
Introduction

Compaction is the process by which the volume of air in a mixture is reduced by using external forces to reorient the constituent aggregate particles into a more closely spaced arrangement. This reduction of air volume in a mixture produces a corresponding increase in unit weight, or density. Air voids are often measured indirectly using a portable density-measuring device such as a nuclear density gauge.

Self-Propelled Roller

Self-propelled rollers as shown in figure 1 typically consist of a heavy steel plate, single unit body with built in ballast compartments, a power unit drive train to transfer power to the rear wheels; a hydraulic power steering system and a hydraulic braking system. Rollers of this type are good for small packing jobs or packing seal gravel. As with certification manuals you shall read the operators manual prior to operating any self-propelled roller. The ministry uses 2 different types of self-propelled rollers; a pneumatic roller and a steel wheeled roller. For some jobs, a pull type packer is used for soil compaction; this packer is not self-propelled so it needs to be attached to another unit for usage.

Figure 1: Self-Propelled roller

Pneumatic Tire Roller

The pneumatic tire roller is a self-propelled compaction device that uses air filled tires to compact the underlying Hot Mix Asphalt (HMA). Pneumatic tire rollers employ a set of smooth (no tread) tires on each axle: typically, four on one axle and five on the other. The tire on the front axle as shown in figure 2 are aligned with the gaps between tires on the rear axle to give complete and uniform compaction coverage over the width of the roller. Compactive effort is controlled by varying tire pressure, but will be affected by speed of compaction. Tire pressures are typically set between (60 – 120 psi).
Asphalt binder tends to stick to cold pneumatic tires but not on hot pneumatic tires. A release agent (like water) can be used to minimize this sticking, however if asphalt binder pickup (the asphalt sticking to the tires) is not permanently damaging the mat, it is better to run the roller on the hot mat and let the tires heat up to near mat temperature. For winter maintenance, it is highly important to completely drain the water to avoid freezing or any damage to the part.

**Steel Wheel Roller**
Steel wheel rollers are self-propelled compaction devices that use steel drums to compress the underlying asphalt. They can have one, two or even three drums, although tandem (2 drums) rollers are most often used. The drums can be either static or vibratory and usually range from 35 to 85 inches in width and 50 to 20 to 60 inches in diameter. Roller weight is typically between 1 and 20 tons. Figure 3 is an example of a steel wheel roller used for operation.
Safety:

- Ensure all warning lights are activated.
- Ensure all components are working properly before commencing work.
- When climbing on or off unit use three-point stance and use proper hand rail(s).
- Ensure seat belts are always worn as this will keep you in the Roll Over Protective Structure.
- If unit is not equipped with a manufactured enclosed cab, hardhat must be worn.
- Adjust road speed to minimize bounce while traveling in road gear.
- Caution due to hydrostatic drive design, braking of this type of unit is minimal and is not designed for quick stops.
- Due to the high center of gravity of these units, sharp, fast turns or travel too close to edge of shoulder should not be made.
- Extreme caution must be used when operating articulating packers, due to quick turning and tipping hazard of unit.
- If packer is operated too close to shoulder and packer begins to tip, operator should stop immediately.
- Caution by packer operator is required to ensure that the operator is aware of all traffic, equipment and personnel that may be in the work area.
- Proceed down steep grades very slowly in lower gear.
- Ensure that unit is parked on approach or stable, level ground when arriving at work site prior to commencing operations.
- Use approaches to turn around.
- Never turn around on side slope.
- Come to a full stop before reversing direction.
- Avoid packing on fresh oil and windrows.
- Stay close to main operation to accommodate motoring public.
- If leaving the unit at the work site overnight, park unit in a secure, level location and apply park brakes.
Pull-Type Packers
This type of compaction device is not self-propelled; it is often attached to another unit which pulls the packer through the soil for compaction. Hence, its generic name as a “Pull-type packer”. This unit can be attached to numerous vehicle for usage. Often time it will be attached to another tractor. Multiple packers can be attached after one another (about 2-3) it will depend on the purpose and the objective of the job. These packers can be filled with rocks, sand and gravel to add weight for compaction. Figure 4 is an image of a packer used in the ministry. When using this type of packer, it is important to properly attach it using appropriate chains and hooks.

![Pull-Type Packer](image)

**Figure 4: Pull-Type Packer**

Safety:

- Ensure adequate pulling unit size for weight and number of packers being pulled to maintain steering and braking control.
- Use two people when possible for hooking up unit.
- Utilize an attached screw jack or chain to position hitch on packer at proper tractor hitch height. If utilizing jack use caution.
- At no circumstances should you manually install hitch into position.
- Ensure safety chains are hooked up properly.
- Operator must travel at a slow rate of speed to maintain braking and to control unit for turning (not to rip mat, break tire bead).
- Care is required for turning, check for equipment and traffic continuously, and only turn when safe to do so.
- Whenever possible use approaches to turn around and park on, avoid turning around on a side slope.
- Caution and communication with other work zone equipment/ operators/ flag persons is required to perform the packing safely and efficiently.
- When packer is unhooked, park in level location and ensure that tires are blocked to prevent inadvertent movement of the unit.
Pre-Trip Inspection

As with any other vehicle or piece of equipment, a proper pre-trip inspection must be completed before beginning to operate for the day. This manual will show you how to care for your unit by doing proper pre-trip inspection and includes a four step process.

Approach

- Visually inspect the roller to make certain it is in good general working order
- Inspect the equipment for leaks underneath that may indicate a problem (coolant, engine oil, transmission fluid or gear oil)
- Inspect the unit for any act of vandalism
- Ensure the tires are of good pressure and not flat

Under the Hood

- Check Engine Oil Level and top up as needed
- Check coolant level and top up as needed
- Check all belts for proper tension and condition
- Check fuel pump sediment bowl and fuel filters; if water is present, remove it
- Make sure radiator is clear of obstruction
- Check air cleaner and filter gauge
- Check exhaust system, making certain that pipes manifolds and muffler are securely attached and undamaged
- Check air intake system making certain air filter and pipes are securely attached and undamaged

**SAFETY NOTE IS TO NEVER START AN ENGINE BEFORE DOING UNDER HOOD CHECKS.**

Walk Around

- Check all tires for proper inflation and ensure that wheel rims/lug nuts are in good condition
- Inspect for Roll Over Protective Structure (ROPs)
- Make sure all lights and reflectors are clean and operational
- Check unit/attachments for defects
- Grease and lubricate all high wear points daily as per lubrication chart
- Check hydraulic system for broken hoses and that hydraulic tank is securely attached and undamaged
- Check hydra static oil
In Cab Checks

- Adjust the seat, mirrors and steering wheel
- Remove/secure all loose objects
- Keep glass clean
- Proper operation of all switches and gauges
- On units with individual wheel brakes, ensure an effective braking and parking device
- Be familiar with transmission and controls
- Ensure horn and audible back up alarm are functioning

Starting the Engine

Prior to starting a piece of equipment, insure you know how to shut it off. This is very important in case something goes wrong. The operator must be familiar with all controls before starting the unit. For a descriptive image of controls for the SP-912 and SP-915 models, see Appendix A.

- Ensure park brake is engaged
- Check that transmission shift lever is in neutral position (Centre position)
- Check shuttle (forward and reverse) lever is on neutral
- On gas engines, if cold, pull the choke fully out
- Turn engine switch to start, until engine begins running
- On gas engines only if choke was pulled out, slowly push choke in until engine runs smoothly
- If starting a diesel engine, reference preheat process
- Allow ample time for engine to warm up. This is a great opportunity to fill out the pre-trip documentation

DO NOT HOLD IGNITION IN START POSITION FOR MORE THAN 10-20 SECONDS AT A TIME TO PREVENT STARTER DAMAGE.

ALWAYS WAIT 1-2 MINUTE, GIVING STARTER TIME TO COOL.

Engine Checks

Immediately after starting, check all engine instruments

- Fuel gauge indicates sufficient fuel in take
- Water temperature gauge indicates coolant temperature between 110-190 degrees F.
- Oil pressure gauge should indicate a high pressure immediately after stating; this should gradually drop to a normal idle speed reading of approximately 15 PSI as engine warms up.
- Normal rated speed pressure reading is approximately 40 PSI which usually register in 3-6 seconds
Ether
This is a volatile liquid that is highly flammable and used as a starting aid for different units, including the rollers. This liquid is usually used in extremely cold temperature when the roller’s engine is having trouble starting; usually when it’s cranking. These are the things you should know about ether as a starting aid

1. Always use ether in small quantities:
2. Use ether only when engine is cranking; and
3. Never use ether after the engine has fired up.

There are also several kind of pre-heating devices. Some heat the cylinder; others heat the air entering the intake manifold. Most pre-heating devices get turned on by the key and you need to wait for the indicator light to go out before attempting to start the engine.

If the engine fails to start, remember that the starter should never be used for more that 10-20 seconds at a time. You should allow the starter to cool down for 1-2 minutes between attempts. As soon as the engine starts up you have to make sure that all vital functions are in good working order. The items you need to check are as follows.

- Oil Pressure – Make sure the oil pressure gauge or the indicator light registers within a few seconds after the engine has fired up. If the engine is cold, it may take 3-6 seconds
- Alternator – Ensure the voltmeter or the indicator light registers. This will take place immediately after the engine has fire up.
- Backing up alarm – if the backup alarm does not work, the packer is to be taken out of service and repaired before using.

Hydraulic System
The hydraulic system requires little maintenance. This is a seal system and should not require addition of fluid. The only instance where fluid would be added is because there is a leak that needs to be repaired. The hydraulic oil level can be checked frequently for leaks by simply viewing the sight gage. Add oil as required to keep the level approximately 1” below the top of the tank. Caution must be taken to wipe the filler cap and neck clean before removing the cap. The hydraulic oil filter should be changed after the first 20 hours of operation on a new machine; and a minimum of 500 hours thereafter. The hydrostatic system will become sluggish when the filter becomes clogged. At this point it must be changed to prevent damage to the pump and motor.
• Hydraulic fluids are used to power motors and lifting rams by a pump
• Hydraulic tank stores and helps cool fluids
• Cleanliness is a must when dealing with hydraulics
• Use card board to check for leaks
• Ensure all leaks are repaired with caution because hydraulics may be under high pressure
• Hydraulic fluid is flammable
• Before removing cap, shut down engine and make sure oil is cool
• Use funnels with filters and screens
• Do not overfill tank

USE ZERO ENERGY WHEN DOING ANY REPAIRS!

Hydraulic Brakes
The rollers are furnished with self-adjusting hydraulic brakes. Check the hydraulic lines and fitting at the beginning of each work shift, also check the fluid level in the master cylinder. Be sure to remove dirt and grit from the fill port before removing the plugs. Check the brake lining wear once every 6 months when the wheel bearings are cleaned and repacked. To adjust the brake, back the rollers and apply the brakes several times until the desire feel is made. For specific service to the master cylinder or air filters, refer to the manufactures service manual. Repairs to the brake system should only be completed by a fleet technician.

Hydrostatic Drive
Hydrostatic drives are common and excellent means of power transmission when variable output speed is required. A hydrostatic transmission consists of a hydraulic pump, hydraulic motor and a full valve system. The pump and motor package delivers precise reliable power with a responsive single-lever control. In other words, one level controls both speed and braking for positive braking action. Unlike gear transmissions, hydrostatics have a continuous power and they can increase available torque without shifting gears. These systems are more expensive but for their applications, they are used in the different units across the ministry.
Figure 5 is a schematic of a generic hydrostatic transmission. The labels are also included above. Key things to know are as follows;

- Pressurized oil indicated by the red color flows from the pump to the motor.
- The motor rotates in the opposite direction as pump, depending in the position of the lever.
- When the lever is pulled, the pumps rotation direction is not changed.
- When control lever is completely vertical (neutral position) there is no oil filter flow to the motor resulting in the motor rotation to stop.

**Safe Roller Operation**

When entering and exiting the unit, use 3-point contact facing the machine (see related SOP). Always use a three-point contact as shown in figure 3 to enter or exit the unit in order to minimize the chance of slips and falls;

- ✓ Always keeping 3 points in contact with the vehicle;
  - I. One hand and two feet;
  - II. Two hands and one foot
- ✓ Always face the equipment
- ✓ Do Not Jump from unit
- ✓ Scan ground for uneven surfaces
It is important for every operator to **always have their seatbelts on**, there is no exception to this when operating any MHI unit. When operating a roller consider the following:

- Never make adjustments or implement without first shutting down the unit
- Never attempt to start the engine until properly seated and you have reviewed the operator’s manual to ensure you understand equipment specific controls.
- Operate at a controlled speed
- Do not operate the roller on excessively steep grades
- Never attempt to climb steep or straight out ditches
- Turn down the slope if the roller becomes unstable
- Use proper hitch pins when towing equipment
- Heavy loads make braking and steering less responsive

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**ROTARY LIGHTS ARE TO BE USED WHEN OPERATING ON OR NEAR PUBLIC ROADWAYS**

**Tire Safety**

- DO NOT re-inflate a tire that has been run flat without inspecting the tire, tube, flap, rim and wheel assembly
- DO NOT hammer on rims or components with steel hammers
- Always block the tire and wheel on the opposite side of the vehicle before you get the jack into position
- Put hardwood under the jack when lifting
- Always block the vehicle in case the jack slips
- DO NOT overload or over-inflate tire and rim assemblies
- DO NOT run a vehicle on one tire of a dual assembly, the carrying capacity of the single tire and rim is dangerously exceeded
- DO NOT complete the repair of the tire. Most compactors have a split rim, which are extremely dangerous and will require a tire technician to complete the repair.
Rolling

- Keep roller tires moist to prevent material sticking
- Move a slow, uniform speed, not more than 8 km/hr (5 mph)
- DO NOT make sudden changes in direction or line or travel. Sudden changes cause displacement of the asphalt
- DO NOT allow heavy equipment to stand on asphalt until completely set
- Keep tire pressures as high as possible but not so high to cause mix displacement
- Start rolling on the low side of the road
- Continue rolling until the machine is on previously compacted material

Roller Speeds

<table>
<thead>
<tr>
<th>Type of Roller</th>
<th>Breakdown</th>
<th>Intermediate</th>
<th>Finish</th>
</tr>
</thead>
<tbody>
<tr>
<td>Static Steel Wheel</td>
<td>3.2 – 5.6 km/h</td>
<td>4.0 – 6.5 km/h</td>
<td>4.8 – 8.0 km/h</td>
</tr>
<tr>
<td></td>
<td>(2.0 – 3.5 mph)</td>
<td>(2.5 – 4.0 mph)</td>
<td>(3.0 – 5.0 mph)</td>
</tr>
<tr>
<td>Pneumatic</td>
<td>3.2 – 5.6 km/h</td>
<td>4.0 – 6.5 km/h</td>
<td>6.4 – 11.2 km/h</td>
</tr>
<tr>
<td></td>
<td>(2.0 – 3.5 mph)</td>
<td>(2.5 – 4.0 mph)</td>
<td>(4.0 – 7.0 mph)</td>
</tr>
<tr>
<td>Vibratory Steel Wheel</td>
<td>3.2 – 4.8 km/h</td>
<td>4.0 – 5.6 km/h</td>
<td>not used</td>
</tr>
<tr>
<td></td>
<td>(2.0 – 3.0 mph)</td>
<td>(2.5 – 3.5 mph)</td>
<td></td>
</tr>
</tbody>
</table>

Operating at lower speeds allows the roller to remain in contact with a particular mat location longer than it would at higher speeds. The results are more compression per roller pass and therefore increases compactive effort. Speed also affects the magnitude of shear stress developed. Lower speeds result in the shearing force between compressed and uncompressed areas being applied for a longer period of time for a particular area (giving a lower shear rate), which results in a higher shear stress. The higher the shear stress, the better able it is to rearrange aggregate into a denser configuration. Therefore, as roller speed decreases, shear stress increases and compactive effort increases.

Park and Shut Down

One of the main task before parking and shutting down the unit is to fuel up. It is best to fill up the tank at the end of the night when the engine is cooled to avoid condensation of water in the tanks. Under normal conditions, the air space in a tank holds some moisture. In the winter time, this moisture has a tendency to condense and freeze. When water freezes in fuel lines, premature injection pump and injector failure occurs. If the tank is kept full, there is little or no air space for condensation and freezing to occur.
In contrast, it is important to not overfill your vehicle’s tank, especially if the unit will be parked in a warmer environment. If the tank if filled to the brim in cold weathers and left in the garage overnight, you would see quite a bit of fuel on the ground the next morning. Besides the waste, this situation presents a fire hazard. As soon as the automatic release on the nozzle shuts off, you should stop filling.

**Procedure for Refueling**

Follow these steps when filling the tank of your unit:

- Shut down engine
- Select appropriate fuel grade (gas or diesel)
- Fill tank to initial automatic nozzle release
- Make sure area around filler cap is wiped clean
- Tightly secure tank cap
- Place nozzle back in place
- Record fuel used accordingly

**The Idle Roller**

It is common practice to leave the roller engine running. This practice is wrong, especially for rollers running on diesel. By leaving a diesel to idle for a long period of time, you are actually cooling it down too much. Diesel engines are at their best when they are operating at maximum rpm. Idling a diesel engine results in uneven distribution of heat in the engine block, distortion of cylinders and severe engine damage. A roller should not be left to idle for more that 10-15 minutes between jobs. If roller is left unattended, make certain that the transmission shift lever and the shuttle lever are in ‘neutral’ and that the parking brake is “set” and ignition switch is off.

**Procedure for Shutting Down**

Most diesel engines should be allowed to cool down for at least 5 minutes before they are parked and shutdown. This is very important for engines equipped with turbo charges. Some diesel engines will not shut down when you turn the key. There is often a separate shutdown lever or knob which cuts supply of fuel to pump. Make sure you know how to shut down your diesel engine properly.

**THE KEY SHOULD ONLY BE SHUT OFF AFTER THE FUEL SHUT OFF HAS BEEN ACTIVATED**
Record Keeping

Card Lock System
The card lock system is simple to operate. As an operator you will be issued a card with your own security number. This is the main process for purchasing fuel however there are also company specific cards for units that don’t have card lock. After filling your unit, press clear and the five-digit number on the back of the card, this will get you a receipt.

Routine Maintenance
Rollers like any other piece of equipment have to be washed. Nothing looks worse than a unit working in a maintenance situation covered in dirt and buildup of asphalt.

Daily Preventative Maintenance
Preventative maintenance should be part of the operator’s circle check since preventative maintenance has to be done to extend the life of the equipment. It is important to familiarize yourself with the different points which have to be greased. The purpose of grease is to prevent metal-to-metal contact and to prevent dirty and gritty material from coming between moving parts. Always consult the operator’s manual for proper daily lubrication points. You must memorize all the points so that you don’t neglect any. Don’t forget that some high wear point has to be greased more than once a day if you are working in adverse conditions (in sand or wet muddy terrain, etc.).

SAFETY TIP IS TO NEVER SERVICE THE UNIT WHILE THE ENGINE IS RUNNING (ZERO ENERGY)

Other components of the roller that should be maintained regularly are listed below. Refer to manufacturers service and operator’s manual for specific details;

- Air Cleaner (Dry Type Only)
- Driveline
- Differential/Transmission
- Drive Chain

Operator equipment check sheet and service record
Servicing is the responsibility of the operator for most MHI equipment’s. Routine servicing will be entered on an operator’s equipment check sheet and service record. Oil changes should be done when the engine is hot in order to flush out suspended dirt in the oil.

- Remove the oil pan drain plug and let oil drain in a proper container. (leave plug out and let oil drip)
- Remove oil filter
• Check transmission oil level and top up as needed (See operator’s manual for proper procedure)
• Check transmission breather
• Check different breather
• Examine the exhaust system and report on general conditions of the pipe, fittings, brackets, etc.
• Check and lubricate all chassis points requiring grease
  ➢ Tie rod ends
  ➢ All grease fittings
• Check cab hood and body for overall condition
  ➢ Steps
  ➢ Draw bar and wing
  ➢ Tires (condition and air pressure)
  ➢ Batteries (check connections and electrolyte level)
  ➢ Radiator (Check coolant level)
  ➢ Check for leaks (Overall unit)

THE OPERATOR IS RESPONSIBLE FOR THE SAFE OPERATION AND CARE OF THE TRACTOR.

Loading Equipment’s
Most rollers are not designed for travelling long distances. Since the roller is not a great traveler, it has to be transported on a trailer. When transporting a roller via trailers, it is very important to properly secure the equipment before proceeding.

Tie-Downs
Tie downs are rated by “working load limit” (WLL) on the tie down. The strength of a tie down is called its breaking strength or rated capacity. WLL is normally at least one-third of its breaking strength. The strength of a tie down is based on the weakest link. Markings on tie downs may be cast or stamped into the metal or printed onto attached tags. When using tie downs, use them in relation to the direction you are restraining against (forward, sideways and rear movement). Think about what you want the tie down to do and decide how to position them. For more details regarding load securement and information on WLL for chains and chain hooks see the load securement course trailer towing level 2. Appendix B contains a table for information on WLL for chains and chain hooks

THE LOAD ON A TIEDOWN MUST NEVER EXCEED ITS WORKING LOAD LIMIT (WLL)
Figure 7: Stamped and casted markings on tie downs

When loading and unloading rollers:

- Ensure trailer is hooked-up to truck before any loading / unloading operation
- Make sure trailer-bed and ramps are clear of any debris
- Plan ahead to minimize the need for backing. Always check to the rear before backing and use an observer when available. Make sure back-up alarms are working properly
- Never load a trailer beyond its recommended capacity
- Be aware of height and width of load
- Apply the parking brake and place all attachments to the deck
- Make sure roller is properly loaded and secured using only approved chain and load binders. Safety chains are to be used on any attachment in tow. Ensure that the chains are of the proper strength for the load and are properly secured to both the vehicle and attachment to be towed
- Use extreme care when loading rollers on trailers during periods of inclement weather, the wet deck of the trailer can cause a roller to slip during loading and unloading operations

Transporting Heavy Equipment

1. Articulated loaders require additional restraint to secure against swiveling in the hinge area if the articulation bar is not locked
2. Heavy equipment or machinery must have four anchor point and four chains for transport (more if needed)
3. WLL of all tie downs must be equal or greater than 50% of the loader to prevent sideways and rearward movement
4. Inspect the attachment points on heavy equipment and tie downs for wear and damage before you load
Safety Precautions
- Know your machine
- Don’t operate a machine with missing or damaged guards
- Prepare the work area
- Protect yourself (PPE)
- Watch out for others during start-up
- Ongoing monitoring of traffic and surroundings
- Under no circumstances should children/Co-workers be anywhere near the work area
- No riders!

Tipping Hazard
Due to the height of the unit, it is very important to keep the unit on level operating surfaces. Rollers tend to be very unstable, for this reason it is not advisable to drive down into the ditch on an angle. The roller is designed to move forward and backwards at identical speeds therefore the operator packs in a forward and backward motion. Be familiar with the operator’s platform as provided in Appendix A.

Due to design of drive lane, always operate roller in a gear that allows you to run engine at full RPM. This will significantly increase hydraulic pump and motor life.

Relatable SOP’s
Visit the MHI website (MHIsafety.ca) and review the following SOP’s
- Entering Exiting Units
- Trailers
- Packer
Appendix A
Operator’s Platform
## Appendix B

### WLL for Chain

<table>
<thead>
<tr>
<th>Chain Size in Millimeters (inches)</th>
<th>Unmarked Chain</th>
<th>Grade 70 transport</th>
<th>Grade 100 alloy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chain Marking</td>
<td>I</td>
<td>7, 70, 700</td>
<td>10, 100, 1000</td>
</tr>
<tr>
<td>7 mm 1/4 in</td>
<td>L</td>
<td>1,430 kgs 3,150 lbs</td>
<td>1,950 kgs 4300 lbs</td>
</tr>
<tr>
<td>8 mm 5/16 in</td>
<td>L</td>
<td>2,130 kgs 4,700 lbs</td>
<td>2,600 kgs 5,700 lbs</td>
</tr>
<tr>
<td>10 mm 3/8 in</td>
<td>E</td>
<td>2,990 kgs 6,600 lbs</td>
<td>4,000 kgs 8,800 lbs</td>
</tr>
<tr>
<td>11 mm 7/16 in</td>
<td>G</td>
<td>3,970 kgs 8,750 lbs</td>
<td>n/a</td>
</tr>
<tr>
<td>13 mm 1/2 in</td>
<td>A</td>
<td>5,130 kgs 11,300 lbs</td>
<td>6,800 kgs 15,000 lbs</td>
</tr>
<tr>
<td>16 mm 5/8 in</td>
<td>L</td>
<td>7,170 kgs 15,800 lbs</td>
<td>10,300 kgs 22,600 lbs</td>
</tr>
</tbody>
</table>
### WLL for Chain Hooks

<table>
<thead>
<tr>
<th>Clevis Grab Hook Size</th>
<th>Unmarked Grab Hooks</th>
<th>Grab Hooks Gr. 70 Steel</th>
</tr>
</thead>
<tbody>
<tr>
<td>7 mm 1/4 in</td>
<td>Do NOT use</td>
<td>1,431 kgs 3,150 lbs</td>
</tr>
<tr>
<td>8 mm 5/16 in</td>
<td>Do NOT use</td>
<td>2,136 kgs 4,700 lbs</td>
</tr>
<tr>
<td>10 mm 3/8 in</td>
<td>Do NOT use</td>
<td>3,000 kgs 6,600 lbs</td>
</tr>
<tr>
<td>11 mm 7/16 in</td>
<td>Do NOT use</td>
<td>4,000 kgs 8,800 lbs</td>
</tr>
<tr>
<td>13 mm 1/2 in</td>
<td>Do NOT use</td>
<td>5,136 kgs 11,300 lbs</td>
</tr>
</tbody>
</table>