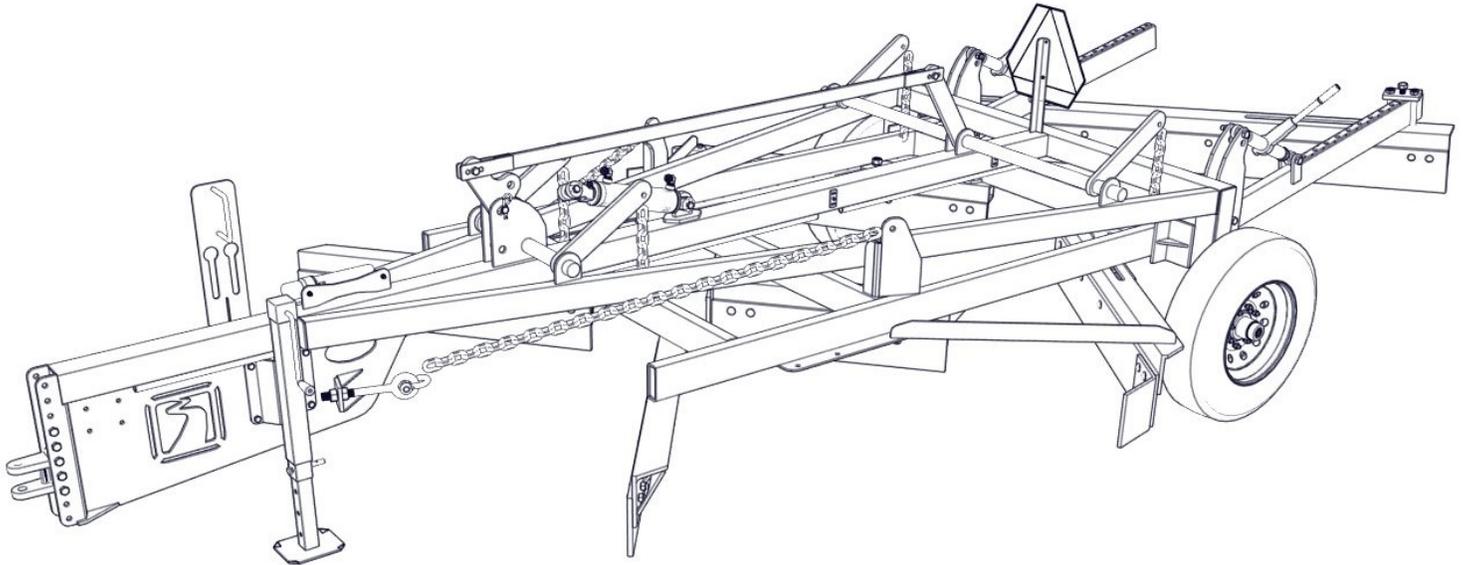




312 PERFECT ROAD MAINTAINER MANUAL
Serial numbers 923 & UP
REV 12/20/21



When ordering parts, please refer to the Model and Serial Numbers of your Road Maintainer. They are on the back cover of this manual Manual No. BON-000916.



Manufactured, sold, and serviced by:

Bonnell Industries
1385 Franklin Grove Road
Dixon, IL 61021
800-851-9664

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CAPICITIES & SPECIFICATIONS

Weight.....	3100 LBS
Overall Length.....	20'-6"
Overall Width.....	8'-0 – 10'-0
Overall Height.....	5'-0
Tires.....	8T23580R16, Load Range E



SAFETY FIRST

Please read this manual before attempting to install or operate this equipment.



The symbol at left means ALERT. Any time you see this symbol, you are being warned that your safety is in danger! Please be careful!

GUIDELINES TO FOLLOW:

1. Turn off all power including truck engine when servicing or installing equipment.
2. Follow all recommended operation procedures.
3. Follow a regular maintenance schedule so that your equipment is kept in good operating condition at all times. Improper maintenance can lead to failure during operation, which makes for unsafe conditions.
4. Recognize and avoid hazardous situations during the installation, operation, maintenance, and servicing of equipment.
5. Please pay attention to, and respect, safety decals. They are there to protect you from injury.

AVOID ACCIDENTS

Most accidents, whether they occur in industry, on the farm, at home, or on the highway, are caused by failure of some individual to follow simple and fundamental safety rules or regulations. For this reason, most accidents can be prevented by recognizing the real cause and doing something about it before the accident occurs.

Regardless of the care used in the design and construction of any type of equipment, there are many conditions that cannot be completely safeguarded against without interfering with reasonable accessibility and efficient operation.

A careful operator is the best insurance against an accident. The complete observance of one simple rule would prevent many thousand serious injuries each year. That rule is:

***NEVER ATTEMPT TO CLEAN, OIL, OR ADJUST
A MACHINE WHILE IT IS IN MOTION.***

NATIONAL SAFETY COUNCIL

PLEASE, ALWAYS THINK SAFETY FIRST!

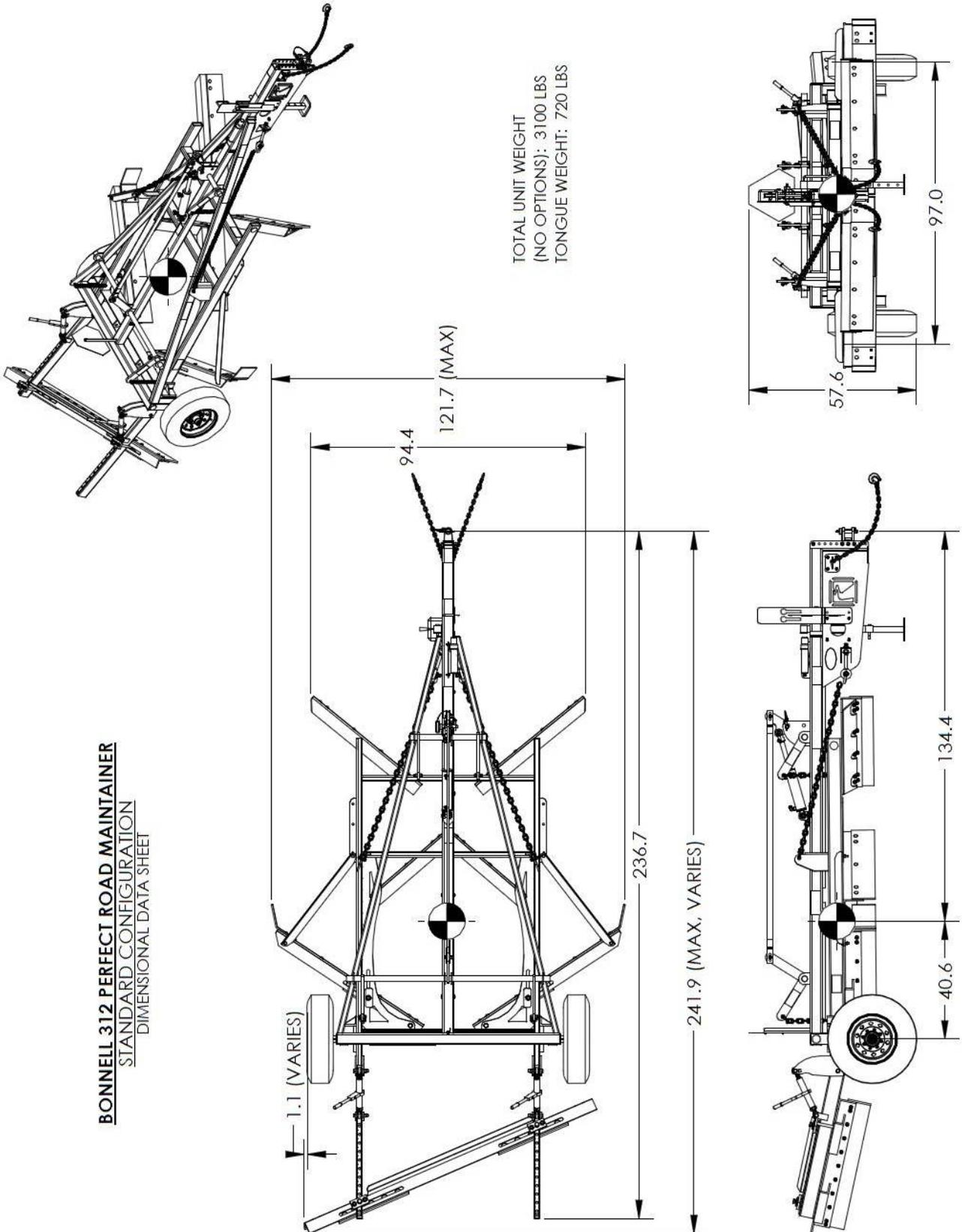
The purpose of this manual is to inform the person using the unit with the necessary information to properly install, operate, and maintain this unit. These instructions cannot replace the fundamental knowledge that a person must possess in order to safely and adequately operate this unit. The person must be qualified and possess the clear thinking necessary to install and operate this equipment. Since the life of any machine depends largely upon the care it is given, we suggest that this manual be read thoroughly and referred to regularly by anyone working on or around this unit. If for any reason you do not understand the instructions, please call your authorized service center or our office at (815) 284-3819. It has been our experience that by following these installation and maintenance instructions, and by observing the operation of this equipment, you will have sufficient understanding of how to troubleshoot and correct all normal problems that you may encounter during the life of the equipment.

THE NEED FOR SAFETY CANNOT BE STRESSED ENOUGH. WE URGE YOU TO MAKE SAFETY YOUR TOP PRIORITY WHEN OPERATING THIS UNIT OR ANY OTHER EQUIPMENT.

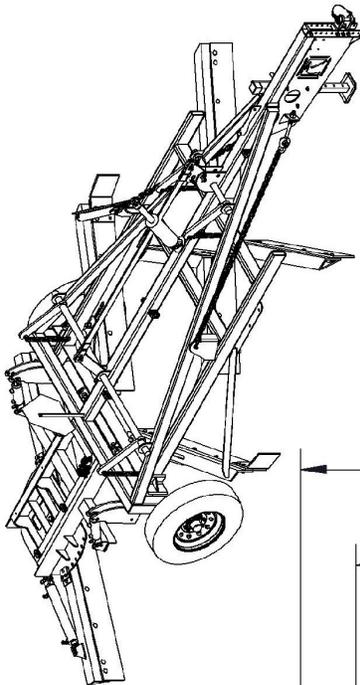
**ACCIDENTS HURT!
ACCIDENTS COST!
ACCIDENTS CAN BE AVOIDED!**

1. DIMENSIONAL DATA

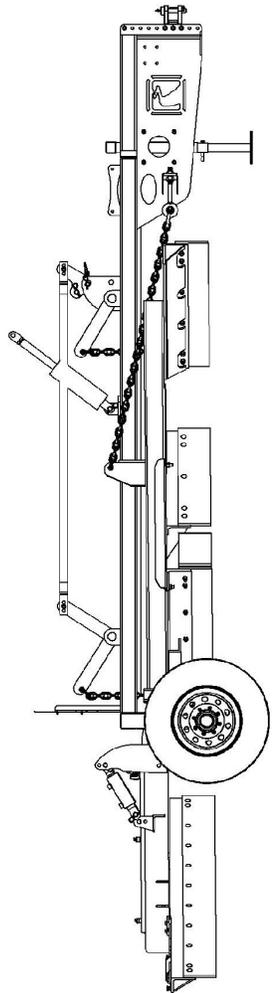
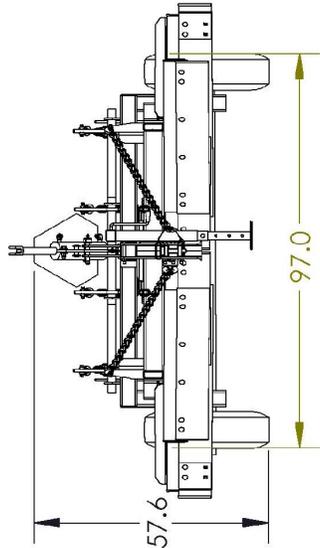
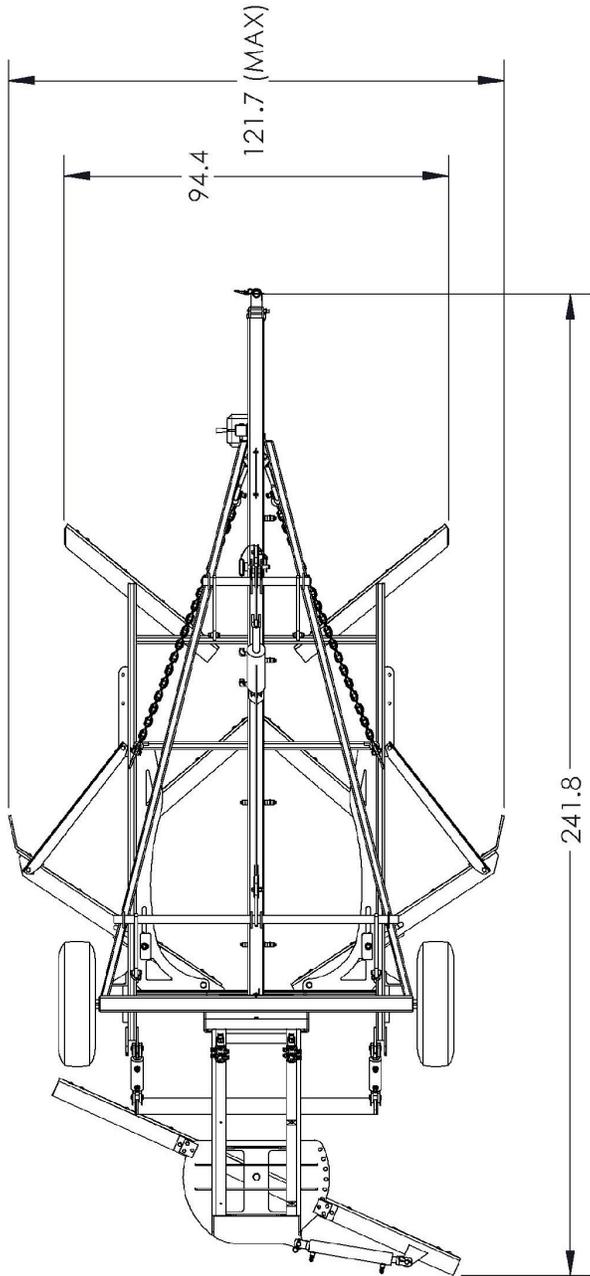
1.1. 312 DIMENSIONS



1.2. 312 HRLS DIMENSIONS



BONNELL 312 HRLS PERFECT ROAD MAINTAINER
HYDRAULIC RAISE, LOWER, & SWING CONFIGURATION
DIMENSIONAL DATA SHEET



2. GENERAL SAFETY INFORMATION

2.1. SAFETY ALERT SYMBOLS AND SIGNAL WORDS

The safety information in this manual is denoted by the safety alert symbol: 
The level of risk is indicated by the following signal words.

 Danger
DANGER – Immediate hazards which WILL result in severe personal injury or death if the warning is ignored.
 WARNING
WARNING – Hazards or unsafe practices which COULD result in severe personal injury or death if the warning is ignored.
Caution
CAUTION – Practices that could result in damage to the Perfect Road Maintainer or other property.

2.2. MAJOR HAZARDS

Loss of control of the Perfect Road Maintainer or Perfect Road Maintainer/tow vehicle combination can result in death or serious injury. The most common causes for loss of control of the Perfect Road Maintainer are:

- Improper sizing the Perfect Road Maintainer for the tow vehicle, or vice versa.
- Excessive Speed: Driving too fast for the conditions.
- Failure to adjust driving behavior when towing a Perfect Road Maintainer.
- Improper or mis-coupling of the Perfect Road Maintainer to the hitch.
- Improper braking and steering under sway conditions.
- Not maintaining proper tire pressure.
- Not keeping lug nuts tight.

IMPROPER SIZING OF THE PERFECT ROAD MAINTAINER TO THE TOW VEHICLE.

Perfect Road Maintainers that weigh too much for the towing vehicle can cause stability problems, which can lead to death or serious injury. Furthermore, the additional strain put on the engine and drive-train may lead to serious tow vehicle maintenance problems. For these reasons the maximum towing capacity of your towing vehicle should not be exceeded. The towing capacity of your tow vehicle, in terms of maximum Gross Perfect Road Maintainer Weight (GTW) and maximum Gross Combined Weight Rating (GCWR) can be found in the tow vehicles Owner's Manual.

Danger

Use of a hitch with a load rating less than the load rating of the Perfect Road Maintainer can result in loss of control and may lead to death or serious injury.

Use of a tow vehicle with a towing capacity less than the load rating of the Perfect Road Maintainer can result in loss of control, and may lead to death or serious injury.

Be sure your hitch and tow vehicle are rated for the Gross Vehicle Weight Rating (GVWR) of your Perfect Road Maintainer.

DRIVING TOO FAST

With ideal road conditions, the maximum recommended speed for safely towing a Perfect Road Maintainer is 45 mph. If you drive too fast, the Perfect Road Maintainer is more likely to sway, thus increasing the possibility for loss of control. Also, your tires may overheat, thus increasing the possibility of a blowout.

WARNING

Driving too fast for conditions can result in loss of control and cause death or serious injury.

ADJUSTING DRIVING BEHAVIOR TO MATCH CONDITIONS

When towing a Perfect Road Maintainer, you will have decreased acceleration, increased stopping distance, and increased turning radius (which means you must make wider turns to keep from hitting curbs, vehicles, and anything else that is on the inside corner). Furthermore, the Perfect Road Maintainer will change the handling characteristics of your towing vehicle, making it more sensitive to steering inputs and more likely to be pushed around in windy conditions or when being passed by large vehicles. In addition, you will need a longer distance to pass, due to slower acceleration and increased length. With these caveats in mind:

Be alert for slippery conditions. You are more likely to be affected by slippery road surfaces when driving a tow vehicle with a Perfect Road Maintainer, than driving a tow vehicle without a Perfect Road Maintainer.

Anticipate the Perfect Road Maintainer “swaying.” Swaying can be caused by excessive steering, wind gusts, roadway edges, or by the Perfect Road Maintainer reaction to the pressure wave created by passing trucks and busses.

When encountering Perfect Road Maintainer sway take your foot off the gas, and steer as little as possible in order to stay on the road. Use small “trim-like” steering adjustments. Do not attempt to steer out of the sway; you’ll only make it worse. Also do not apply the tow vehicle brakes to correct Perfect Road Maintainer swaying. Check rearview mirrors frequently to observe the Perfect Road Maintainer and traffic. Use lower gear when driving down steep or long grades. Use the engine and transmission as a brake. Do not ride the brakes, as they can overheat and become ineffective.

PERFECT ROAD MAINTAINER NOT PROPERLY COUPLED TO THE HITCH

It is critical that the Perfect Road Maintainer be securely coupled to the tow vehicle and that the safety chains are correctly attached. Uncoupling may result in death or serious injury to you and to others.

 **WARNING**

Proper selection and condition of the coupler and hitch are essential to safely towing your Perfect Road Maintainer. A loss of coupling may result in death or serious injury.

Be sure the hitch load rating is equal to or greater than the load rating of the coupler.

Be sure the hitch size matches the coupler size

Observe the hitch for wear, corrosion and cracks before coupling.

Replace worn, corroded or cracked hitch components before coupling the Perfect Road Maintainer to the tow vehicle.

Be sure the hitch components are tight before coupling the Perfect Road Maintainer to the tow vehicle.

 **WARNING**

An improperly coupled Perfect Road Maintainer can result in death or serious injury.

Do not move the Perfect Road Maintainer until:

The coupler is secured and locked to hitch;

The safety chains are secured to the tow vehicle; and

The Perfect Road Maintainer jack is fully retracted.

Do not tow the Perfect Road Maintainer on the road until:

Tires and wheels are checked;

The Perfect Road Maintainer lights are connected and checked.

PROPER USE OF SAFETY CHAINS

If your Perfect Road Maintainer comes loose from the hitch for any reason, we have provided safety chains so that control of the Perfect Road Maintainer can still be maintained.

 **WARNING**

Improper rigging of the safety chains can result in loss of control of the Perfect Road Maintainer and tow vehicle, leading to death or serious injury, if the Perfect Road Maintainer uncouples from the tow vehicle.

Fasten chains to frame of tow vehicle. Do not fasten chains to any part of the hitch unless the hitch has holes or loops specifically for that purpose.

Cross chains underneath hitch and coupler with enough slack to permit turning and to hold tongue up, if the Perfect Road Maintainer comes loose.

WORN TIRES, LOOSE WHEELS, AND LUG NUTS

As with any vehicle, the Perfect Road Maintainer tires and wheels are important safety items. Therefore, it is essential to inspect the Perfect Road Maintainer tires before each tow.

If a tire has a bald spot, bulge, cut, cracks, or is showing any cords, replace the tire before towing. If a tire has uneven tread wear, take the Perfect Road Maintainer to a dealer service center for diagnosis. Uneven tread wear can be caused by tire imbalance, axle misalignment or incorrect inflation.

Tires with too little tread will not provide adequate frictional forces on wet roadways and can result in loss of control, leading to death or serious injury.

Improper tire pressure causes increased tire wear and may reduce Perfect Road Maintainer stability, which can result in a tire blowout or possible loss of control. Therefore, before each tow you must also check the tire pressure. Allow 3 hours cool-down after driving as much as 1 mile at 40 mph before checking tire pressure.

 **WARNING**

Improper tire pressure can result in a blowout and loss of control, which can lead to death or serious injury.

Be sure tires are inflated to pressure indicated on sidewall before towing Perfect Road Maintainer.

The tightness of the lug nuts is very important in keeping the wheels properly seated to the hub. Before each tow, check to make sure they are tight.

 **WARNING**

Metal creep between the wheel rim and lug nuts will cause rim to loosen and could result in a wheel coming off, leading to death or serious injury.

Tighten lug nuts before each tow.

The proper tightness (torque) for lug nuts is listed in Section 6.2.1.4 in the “Inspection, Service, and Maintenance” chapter of this manual. Use a torque wrench to tighten the lug nuts, use the crisscross star pattern on page 32. If you do not have a torque wrench, use a lug wrench (from your tow vehicle) and tighten the nuts as much as you can. At the first opportunity, have a service garage or Perfect Road Maintainer dealer tighten the lug nuts to the proper torque.

 **WARNING**

Lug nuts are prone to loosen after initial installation, which can lead to death or serious injury.

Check lug nuts for tightness on a new Perfect Road Maintainer or when wheel(s) have been remounted after the first 5, 10 and 25 miles of operation.

 **WARNING**

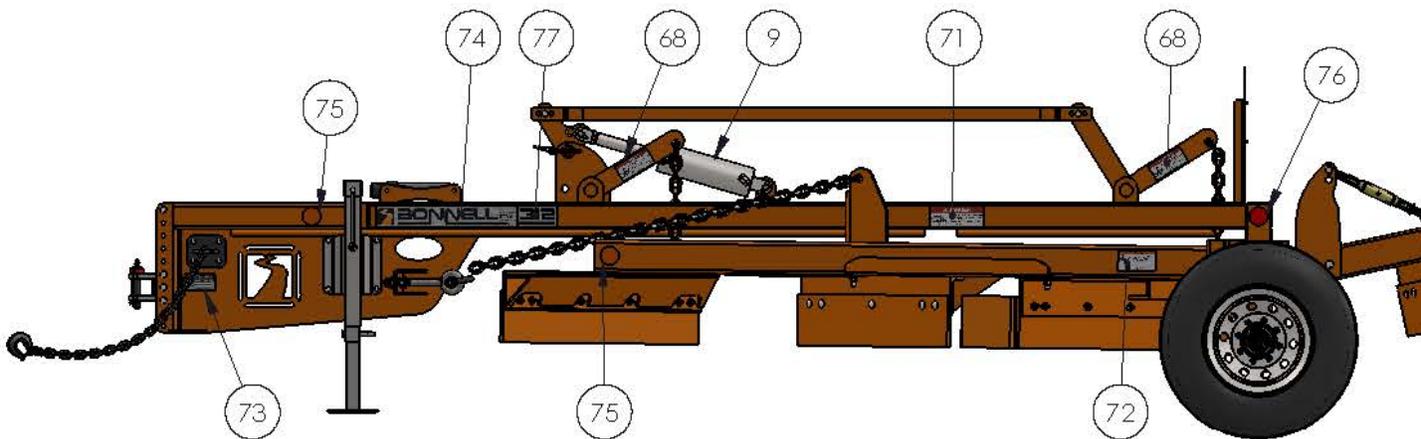
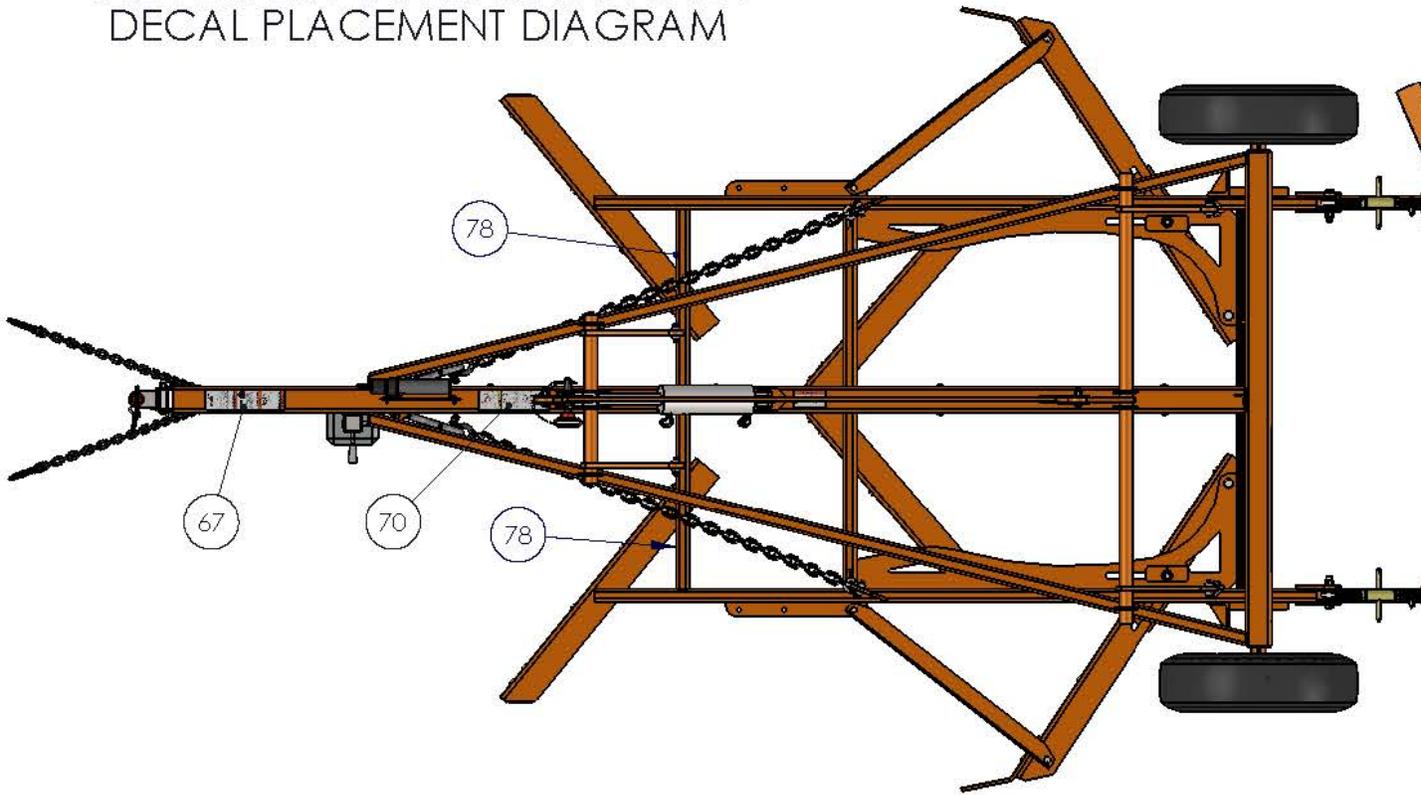
Improper lug nut torque can cause a wheel separating from the Perfect Road Maintainer, leading to death or serious injury. Be sure lug nuts are tight before each tow.

HAZARDS FROM MODIFYING YOUR PERFECT ROAD MAINTAINER

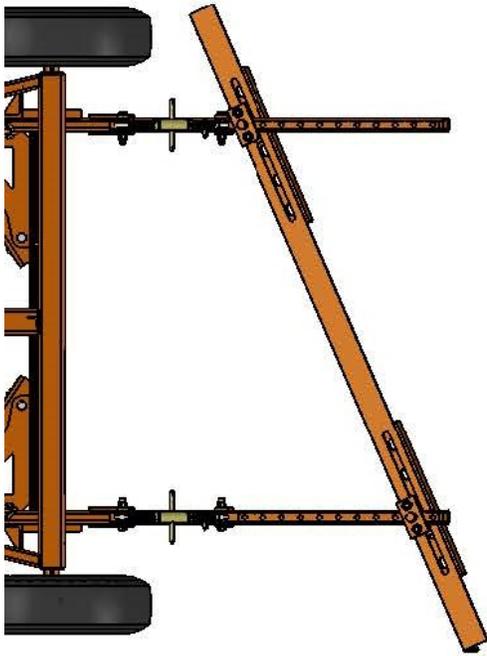
Essential safety items can be damaged by altering your Perfect Road Maintainer. Before making any alteration to your Perfect Road Maintainer, contact your dealer or Bonnell Industries, Inc. at 800-851-9664 and describe the alteration you are contemplating. Alteration of the Perfect Road Maintainer structure or modification of mechanical, electrical, or other systems on your Perfect Road Maintainer must be performed only by qualified technicians who are familiar with the system installed on your Perfect Road Maintainer.

SAFETY WARNING LABELS ON YOUR PERFECT ROAD MAINTAINER

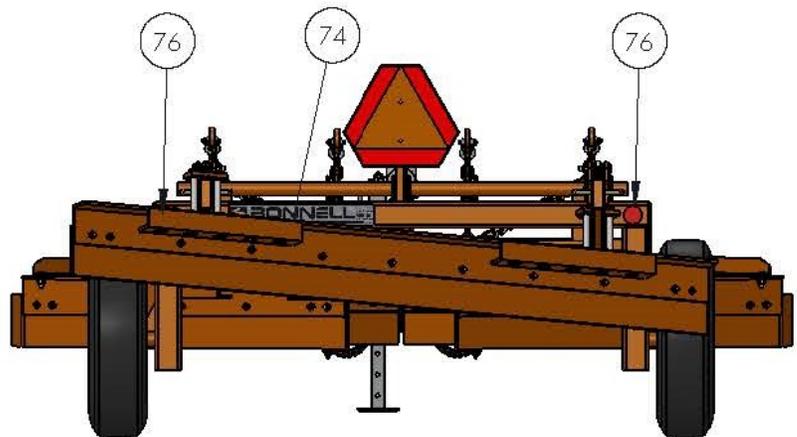
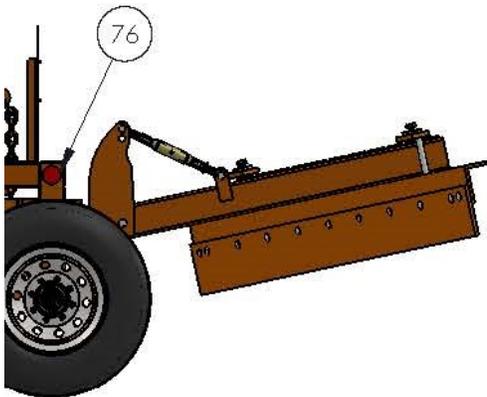
**312 PERFECT ROAD MAINTAINER
DECAL PLACEMENT DIAGRAM**



312 PERFECT ROAD MAINTAINER DECAL PLACEMENT DIAGRAM



78	2	BON-006453	DECAL, 312 WARNING LIMITED HEIGHT CLEARANCEB3
77	2	BON-006418	DECAL, HRLS
76	2	BON-006417	DECAL, 312
75	4	PM-B490R	REFLECTOR, ROUND, RED
74	4	PM-B490A	REFLECTOR, ROUND, AMBER
73	3	BON-003301L	DECAL, LOGO, LARGE
72	1	BON-004002	NAMEPLATE/SERIAL/MODEL PLATE SELF ADHESIVE
71	2	BON-006445	DECAL, 312 WARNING REAR BLADE PINCH POINT
70	2	BON-006444	DECAL, 312 DANGER ENTANGLEMENT HAZARD
69	1	BON-006443	DECAL, 312 DANGER CRUSHING HAZARD TRANSPORT SAFETY PIN
67	4	BON-006441	DECAL, 312 DANGER LIFTING ARMS CRUSHING HAZARD
66	1	BON-006440	DECAL, 312 WARNING WHEELS, SAFETY CHAINS, JACK
9	1	BON-006442	DECAL, WARNING HIGH PRESSURE FLUID FOR ALL HYDRAULIC CYLINDERS
ITEM	QTY	PART NUMBER	DESCRIPTION



Below are illustrations of the safety decals applied to your machine. Familiarize yourself with their locations & importance. To protect you and others against death or serious injury, all of the labels shown below must be on the Perfect Road Maintainer and must be legible. If any of these labels are missing or cannot be read, call Bonnell Industries, Inc. at 800-851-9664 for replacement labels.

⚠ DANGER

CRUSHING HAZARD
Serious injury or death will occur



- Transport Safety Pin must be in place when drag is not in operation.



- Place safety latch pin in storage position when in operation.
- Drag section must be lowered to the ground while performing service work.



CAUTION

- Read and understand Operator's Manual before operating unit. A manual is supplied with Maintainer in the front storage canister. Replacement manuals are available from Bonnell Industries.



BON-006443

⚠ WARNING



HIGH PRESSURE OIL HAZARD
Serious injury or death can occur

- Check for leaks with cardboard; never use hands.
- Before loosening fittings: lower load, release pressure, and be sure oil is cool.
- Consult physician immediately if skin penetration occurs.

BON-006442

⚠ WARNING

LOSS OF CONTROL HAZARD
Serious injury or death can occur

Tire, wheel, or lug nut failure can cause loss of control. Before each operation, check the following:

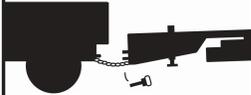
- Tire pressure and tread.
- Tires and wheels for damage.
- Lug nuts for tightness.



⚠ WARNING

LOSS OF CONTROL HAZARD
Serious injury or death can occur

- Always use safety chains. Chains hold Maintainer if connection fails.
- Cross chains underneath coupler.
- Allow slack for turning.
- Attach chain hooks securely to tow vehicle frame.



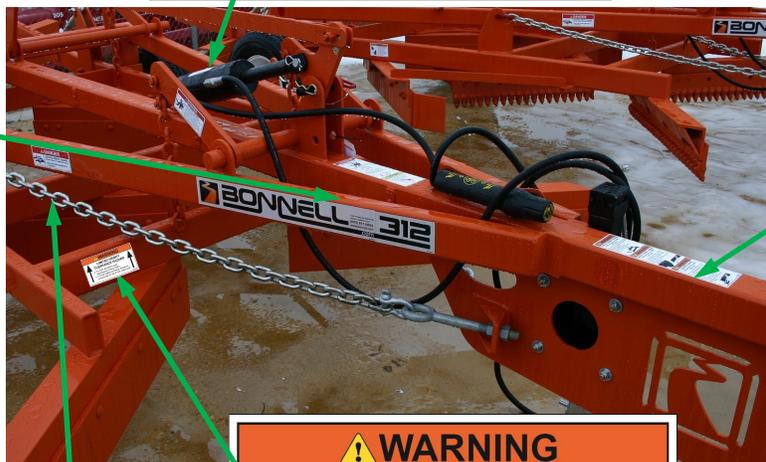
⚠ WARNING

CRUSHING HAZARD
Serious injury or death can occur

- Always use the parking jack. When uncoupling the Maintainer, follow these steps:
 - Park Maintainer in a flat, dry safe place.
 - Chock wheels of the Maintainer.
 - Lower drop foot and reinstall safety pin.
 - Adjust jack height until hitch is lifted off tow vehicle coupler.
 - Disconnect safety chains and coupler.



BON-006440



⚠ WARNING

LIMITED HEIGHT CLEARANCE HAZARD

- DO NOT attempt to make adjustments to lifting chains.
- DO NOT install accessory equipment or hardware on top of main drag frame.

BON-006441

⚠ DANGER



ENTANGLEMENT HAZARD
Serious injury or death will occur

- Keep clear while equipment is in operation.

BON-006444

⚠ DANGER

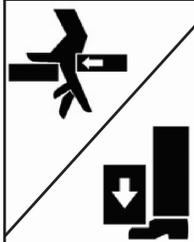
CRUSHING HAZARD
Serious injury or death will occur



- Transport Safety Pin must be in place when drag is not in operation.
- Drag section must be lowered to the ground while performing service work.
- Hydraulic hoses must be disconnected before performing service work.

BON-006441

⚠ WARNING



PINCH POINT HAZARD
Serious injury or death can occur

- Keep hands, feet and clothing away from moving parts.
- Drag section must be lowered to ground and blocked securely before adjusting or replacing blades.
- Turn power off before servicing.
- Refer to manual for rear blade adjustment procedures.

BON-006445



2.3. PERFECT ROAD MAINTAINER TOWING GUIDE

Driving a vehicle with a Perfect Road Maintainer in tow is vastly different from driving the same vehicle without a Perfect Road Maintainer in tow. Acceleration, maneuverability and braking are all diminished with a Perfect Road Maintainer in tow. It takes longer to get up to speed; you need more room to turn and pass, and more distance to stop when towing a Perfect Road Maintainer. You will need to spend time adjusting to the different feel and maneuverability of the tow vehicle with a loaded Perfect Road Maintainer. Because of the significant differences in all aspects of maneuverability when towing a Perfect Road Maintainer, the hazards and risks of injury are also much greater than when driving without a Perfect Road Maintainer. You are responsible for keeping your vehicle and Perfect Road Maintainer in control, and for all the damage that is caused if you lose control of your vehicle and Perfect Road Maintainer.

Before you start towing the Perfect Road Maintainer, you must follow all of the instructions for inspection, testing, and coupling. Also, before you start towing, adjust the mirrors so you can see the Perfect Road Maintainer as well as the area to the rear of it.

Drive slowly at first, 5 mph or so, and turn the wheel to get the feel of how the tow vehicle and Perfect Road Maintainer combination responds. Next, make some right and left hand turns. Watch in your side mirrors to see how the Perfect Road Maintainer follows the tow vehicle. Turning with a Perfect Road Maintainer attached requires more room.

2.4. SAFE PERFECT ROAD MAINTAINER TOWING GUIDELINES

- Before towing, check coupling, safety chain, tires, wheels and lights.
- Check the lug nuts or bolts for tightness.
- Check coupler tightness after operating 1 hour.
- Use your mirrors to verify that you have room to change lanes or pull into traffic.
- Use your turn signals well in advance.
- Allow plenty of stopping space for your Perfect Road Maintainer and tow vehicle.
- Do not drive so fast that the Perfect Road Maintainer begins to sway due to speed. Generally, never drive faster than 45 m.p.h.
- Shift your automatic transmission into a lower gear for city driving.
- Use lower gears for climbing and descending grades.
- Do not ride the brakes while descending grades, they may get so hot that they stop working. Then you will potentially have a runaway tow vehicle and Perfect Road Maintainer.
- To conserve fuel, don't use full throttle to climb a hill. Instead, build speed on the approach.
- Slow down for bumps in the road. Take your foot off the brake when crossing the bump.
- Do not brake while in a curve unless absolutely necessary. Instead, slow down before you enter the curve.
- Do not apply the tow vehicle brakes to correct extreme Perfect Road Maintainer swaying. Instead, lightly apply the Perfect Road Maintainer brakes with the hand controller.
- Make regular stops, about once each hour. Confirm that:
 - The coupler is secure to the hitch and is locked,
 - There is appropriate slack in the safety chains,
 - The tires are not visibly low on pressure

2.5. GENERAL SAFETY RELATED TO OPERATION OF THE MAINTAINER

- Review safety items with all relevant personal at regular intervals.
- Ensure all operators are familiar with this manual before operating.
- Ensure your operation is in compliance with all applicable codes and regulations.
- Before operating machine, do a safety inspection.
- Inspect work area before operating machine. Inspect for heavy debris, such as bricks, rocks, or glass bottles.
- Ensure all pedestrians and operators are clear of the work area.
- Prior to towing, inspect pintle, safety chains, & tires.
- Secure drag section Transport Safety Pin for transport.
- No riders are allowed on the machine. **Maximum speed during operation not to exceed 15 MPH.**

3. TIRE SAFETY INFORMATION

3.1. TIRE SAFETY - EVERYTHING RIDES ON IT

The National Traffic Safety Administration (NHTSA) has published a brochure (DOT HS 809 361) that discusses all aspects of Tire Safety, as required by CFR 575.6. This brochure is reproduced in part below. It can be obtained and downloaded from NHTSA, free of charge, from the following web site:

http://www.nhtsa.dot.gov/cars/rules/TireSafety/ridesonit/tires_index.html

Studies of tire safety show that maintaining proper tire pressure, observing tire and vehicle load limits (not carrying more weight in your vehicle than your tires or vehicle can safely handle), avoiding road hazards, and inspecting tires for cuts, slashes, and other irregularities are the most important things you can do to avoid tire failure, such as tread separation or blowout and flat tires. These actions, along with other care and maintenance activities, can also:

- Improve vehicle handling
- Help protect you and others from avoidable breakdowns and accidents
- Improve fuel economy
- Increase the life of your tires.

SAFETY FIRST—BASIC TIRE MAINTENANCE

Properly maintained tires improve the steering, stopping, traction, and load-carrying capability of your vehicle. Underinflated tires and overloaded vehicles are a major cause of tire failure. Therefore, as mentioned above, to avoid flat tires and other types of tire failure, you should maintain proper tire pressure, observe tire and vehicle load limits, avoid road hazards, and regularly inspect your tires.

CHECKING TIRE PRESSURE

It is important to check your vehicle's tire pressure at least once a month for the following reasons:

- Most tires may naturally lose air over time.
- Tires can lose air suddenly if you drive over a pothole or other object or if you strike the curb when parking.
- With radial tires, it is usually not possible to determine under inflation by visual inspection.

For convenience, purchase a tire pressure gauge to keep in your vehicle. Gauges can be purchased at tire dealerships, auto supply stores, and other retail outlets.

The recommended tire inflation pressure that vehicle manufacturers provide reflects the proper psi when a tire is cold. The term cold does not relate to the outside temperature. Rather, a cold tire is one that has not been driven on for at least three hours. When you drive, your tires get warmer, causing the air pressure within them to increase. Therefore, to get an accurate tire pressure reading, you must measure tire pressure when the tires are cold or compensate for the extra pressure in warm tires.

STEPS FOR MAINTAINING PROPER TIRE PRESSURE

- Step 1: Locate the recommended tire pressure on the vehicle's tire information placard, certification label, or in the owner's manual.
- Step 2: Record the tire pressure of all tires.

- Step 3: If the tire pressure is too high in any of the tires, slowly release air by gently pressing on the tire valve stem with the edge of your tire gauge until you get to the correct pressure.
- Step 4: If the tire pressure is too low, note the difference between the measured tire pressure and the correct tire pressure. These "missing" pounds of pressure are what you will need to add.
- Step 5: At a service station, add the missing pounds of air pressure to each tire that is underinflated.
- Step 6: Check all the tires to make sure they have the same air pressure (except in cases in which the front and rear tires are supposed to have different amounts of pressure).

If you have been driving your vehicle and think that a tire is underinflated, fill it to the recommended cold inflation pressure indicated on your vehicle's tire information placard or certification label. While your tire may still be slightly underinflated due to the extra pounds of pressure in the warm tire, it is safer to drive with air pressure that is slightly lower than the vehicle manufacturer's recommended cold inflation pressure than to drive with a significantly underinflated tire. Since this is a temporary fix, don't forget to recheck and adjust the tire's pressure when you can obtain a cold reading.

TIRE SIZE

To maintain tire safety, purchase new tires that are the same size as the vehicle's original tires or another size recommended by the manufacturer. Look at the tire information placard, the owner's manual, or the sidewall of the tire you are replacing to find this information. If you have any doubt about the correct size to choose, consult with the tire dealer.

TIRE TREAD

The tire tread provides the gripping action and traction that prevent your vehicle from slipping or sliding, especially when the road is wet or icy. In general, tires are not safe and should be replaced when the tread is worn down to 1/16 of an inch. Tires have built-in tread wear indicators that let you know when it is time to replace your tires. These indicators are raised sections spaced intermittently in the bottom of the tread grooves. When they appear "even" with the outside of the tread, it is time to replace your tires. Another method for checking tread depth is to place a penny in the tread with Lincoln's head upside down and facing you. If you can see the top of Lincoln's head, you are ready for new tires.

TIRE BALANCE AND WHEEL ALIGNMENT

To avoid vibration or shaking of the vehicle when a tire rotates, the tire must be properly balanced. This balance is achieved by positioning weights on the wheel to counterbalance heavy spots on the wheel-and-tire assembly. A wheel alignment adjusts the angles of the wheels so that they are positioned correctly relative to the vehicle's frame. This adjustment maximizes the life of your tires. These adjustments require special equipment and should be performed by a qualified technician.

TIRE REPAIR

The proper repair of a punctured tire requires a plug for the hole and a patch for the area inside the tire that surrounds the puncture hole. Punctures through the tread can be repaired if they are not too large, but punctures to the sidewall should not be repaired. Tires must be removed from the rim to be properly inspected before being plugged and patched.

TIRE SAFETY TIPS

Preventing Tire Damage

- Slow down if you have to go over a pothole or other object in the road.
- Do not run over curbs or other foreign objects in the roadway, and try not to strike the curb when parking.

4. COUPLING TO THE TOW VEHICLE

Follow all of the safety precautions and instructions in this manual to ensure safety of persons and satisfactory life of the Perfect Road Maintainer.

4.1. USE AN ADEQUATE TOW VEHICLE AND HITCH

If the vehicle or hitch is not properly selected and matched to the Gross Vehicle Weight Rating (GVWR) of your Perfect Road Maintainer, you can cause an accident that could lead to death or serious injury. If you already have a tow vehicle, know your vehicle tow rating, and Gross Combination Weight Rating (GCWR) and make certain the Perfect Road Maintainer's rated capacity is less than or equal to the tow vehicle's rated towing capacity. If you already have (or plan to buy) a Perfect Road Maintainer, make certain that the tow rating of the tow vehicle is equal to or greater than the GVWR of the Perfect Road Maintainer, and that the GCWR will be within limits.

Danger

Use of a hitch with a load rating less than the load rating of the Perfect Road Maintainer can result in loss of control and may lead to death or serious injury.

Use of a tow vehicle with a towing capacity less than the load rating of the Perfect Road Maintainer can result in loss of control, and may lead to death or serious injury.

Be sure your hitch and tow vehicle are rated for the Gross Vehicle Weight Rating (GVWR) of your Perfect Road Maintainer.

4.2. COUPLING AND UNCOUPLING THE PERFECT ROAD MAINTAINER

A secure coupling (or fastening) of the Perfect Road Maintainer to the tow vehicle is essential. A loss of coupling may result in death or serious injury. Therefore, you must understand and follow all of the instructions for coupling.

The following parts are involved in making a secure coupling between the Perfect Road Maintainer and tow vehicle:

Coupling: That part of the Perfect Road Maintainer connecting mechanism by which the connection is actually made to the Perfect Road Maintainer hitch. This does not include any structural member, or extension of the Perfect Road Maintainer frame.

Hitch: That part of the connecting mechanism including the ball support platform and ball and those components that extend and are attached to the towing vehicle, including bumpers intended to serve as hitches.)

Safety chains: Chains permanently attached to the Perfect Road Maintainer such that if the coupler connection comes loose, the safety chains or cables can keep the Perfect Road Maintainer attached to the tow vehicle. With properly rigged safety chains, it is possible to keep the tongue of the Perfect Road Maintainer from digging into the road pavement, even if the coupler-to-hitch connection comes apart.

Perfect Road Maintainer lighting connector: A device that connects electrical power from the tow vehicle to the Perfect Road Maintainer. Electricity is used to turn on brake lights, running lights, and turn signals as required.

Jack: A device on the Perfect Road Maintainer that is used to raise and lower the Perfect Road Maintainer tongue. On larger Perfect Road Maintainers the jack is sometimes called the "landing gear."

RIG THE SAFETY CHAINS

The 312 Perfect Road Maintainer is equipped with a safety tow chains. These chains help prevent loss of control should the main hitch connection fail. Familiarize all operators with the use of safety tow chains, and the hazards of not using it properly: Visually inspect the safety chains and hooks for wear or damage. Replace worn or damaged safety chains and hooks before towing.

Rig the safety chains so that they:

- Criss-cross underneath the coupler so if the Perfect Road Maintainer uncouples, the safety chains can hold the tongue up above the road.
- Loop around a frame member of the tow vehicle or to holes provided in the hitch system (but, do **not** attach them to an interchangeable part of the hitch assembly)
- Attach hooks up from underneath the hole (do not just drop into hole); and
- Provide enough slack to permit tight turns, but not be close to the road surface to drag.



Uncoupling the Ball Hitch Perfect Road Maintainer with Tongue Jack

Follow these steps to uncouple your ball hitch Perfect Road Maintainer from the tow vehicle:

- Block the Perfect Road Maintainer tires to prevent the Perfect Road Maintainer from rolling, before jacking the Perfect Road Maintainer up.
- Disconnect the safety chains from the tow vehicle.
- Unlock the coupler and open it.
- Before extending jack, make certain the ground surface below the jack pad will support the tongue load.
- Rotate the jack handle (or crank) clockwise. This will slowly extend the jack and transfer the weight of the Perfect Road Maintainer tongue to the jack.

5. GENERAL OPERATING INSTRUCTIONS

5.1. PRE-TOW CHECKLIST

Before towing, double-check all of these items: See section 6.1, “Inspection, Service & Maintenance Summary Charts,” for more information.

Tires, wheels and lug nuts (see the Major Hazards section starting on page 8 of this manual)

- Tire Pressure. Inflate tire on Perfect Road Maintainer and tow vehicle to the pressure stated on the VIN / Certification label.
- Coupler secured and locked (see the “Coupling and Uncoupling the Perfect Road Maintainer” section starting on page 18 of this manual)
- Safety chains properly rigged to tow vehicle, not to hitch or ball (see the “Coupling to the Tow Vehicle” chapter starting at Page 18 of this manual)
- Test of lights: Tail, Stop, and Turn Lights
- Check all bolts for tightness. Torque as required if loose.
- Check for missing or broken cotter pins.
- Grease all fittings as required.
- Verify all hydraulic fittings are tight and not leaking.
- Check all hydraulic lines for damage or kinks.
- Check cylinder and lift arm operation.

5.2. MAKE REGULAR STOPS

After one hour of towing, stop and check the following items:

- Towing coupler is secured.
- Safety chains are fastened and not dragging.
- Check all bolts for tightness. Torque as required if loose.
- Check for missing or broken cotter pins.
- Verify all hydraulic fittings are tight and not leaking.
- Check plow cutting edge wear.

Caution

CAUTION – failure to check and replace worn cutting edges will result in damage to the Road Maintainer!

5.3. SETUP AND ADJUSTMENT

SPECIAL NOTE: this section of the manual is intended as a supplement to your specific municipal or business guidelines in equipment operation, and is not intended to be a “complete secondary road maintenance guide”. Training is the key to safe and proper operation of this equipment. Ensure your operation is in compliance with all applicable codes and regulations.

With towing unit and maintainer on level surface, adjust hitch on the maintainer so that the front end of the main running gear frame will be 1”–2” higher than main running gear frame rear cross tube.

Connect maintainer to the towing unit. Re-check the 1”–2” measurement stated above, and connect hydraulic hoses.

Operate hydraulics to raise maintainer blades as high as possible.

Test unit on one of your roadways. Make adjustments to the finishing blade as required. Best operating speeds are 8–12 mph, and vary with road and material conditions. Unit is designed for working section with blades to float, but when approaching an intersection, the operator should slowly raise the working section so as not to leave a pile of loose materials at the end.

Allow 4-5 hours of use to become familiar with the unit.

Refer to page 22 for additional fine tuning of the lifting system.

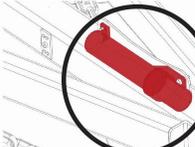


5.4. TRANSPORT SAFETY PIN

The 312 Perfect Road Maintainer is equipped with a Transport Safety Pin. This pin must be in place when drag is not in operation. Familiarize all operators with the use of the Transport Safety Pin, and the hazards of not using it properly:

- Transport Safety Pin must be in place when drag is not in operation.
- Place Transport Safety Pin in storage position when in operation.
- Drag section must be lowered to the ground while performing service work.

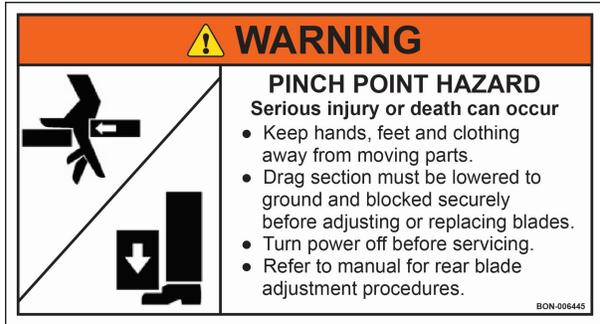


<p>! DANGER</p> <p>CRUSHING HAZARD Serious injury or death will occur</p> 
<ul style="list-style-type: none">• Transport Safety Pin must be in place when drag is not in operation. 
<ul style="list-style-type: none">• Place safety latch pin in storage position when in operation.• Drag section must be lowered to the ground while performing service work. 
<p>CAUTION</p> <ul style="list-style-type: none">• Read and understand Operator's Manual before operating unit. A manual is supplied with Maintainer in the front storage canister. Replacement manuals are available from Bonnell Industries. 

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5.5. LIFTING ADJUSTMENT

The drag section of the Perfect Road Maintainer is adjustable in the way it lifts. From the factory, the unit is set to lift level. If this needs to be adjusted so that either the front or rear lifts first, refer to the following procedure. **DO NOT MAKE ADJUSTMENTS TO LIFTING CHAINS, OR SEVERE DAMAGE WILL OCCUR TO THE MAINTAINER.**



Above shows the adjustment bolts on the lifting tie strap. From the factory, the bolts are in the center holes.

- To raise the front first: move the bolts to the **outer holes** on the tie strap. One or both bolts may be moved to make this adjustment.
- To raise the rear first: move the bolts to the **inner holes** on the tie strap. One or both bolts may be moved to make this adjustment.

To raise the front first: move the bolts to the **outer holes** on the tie strap.



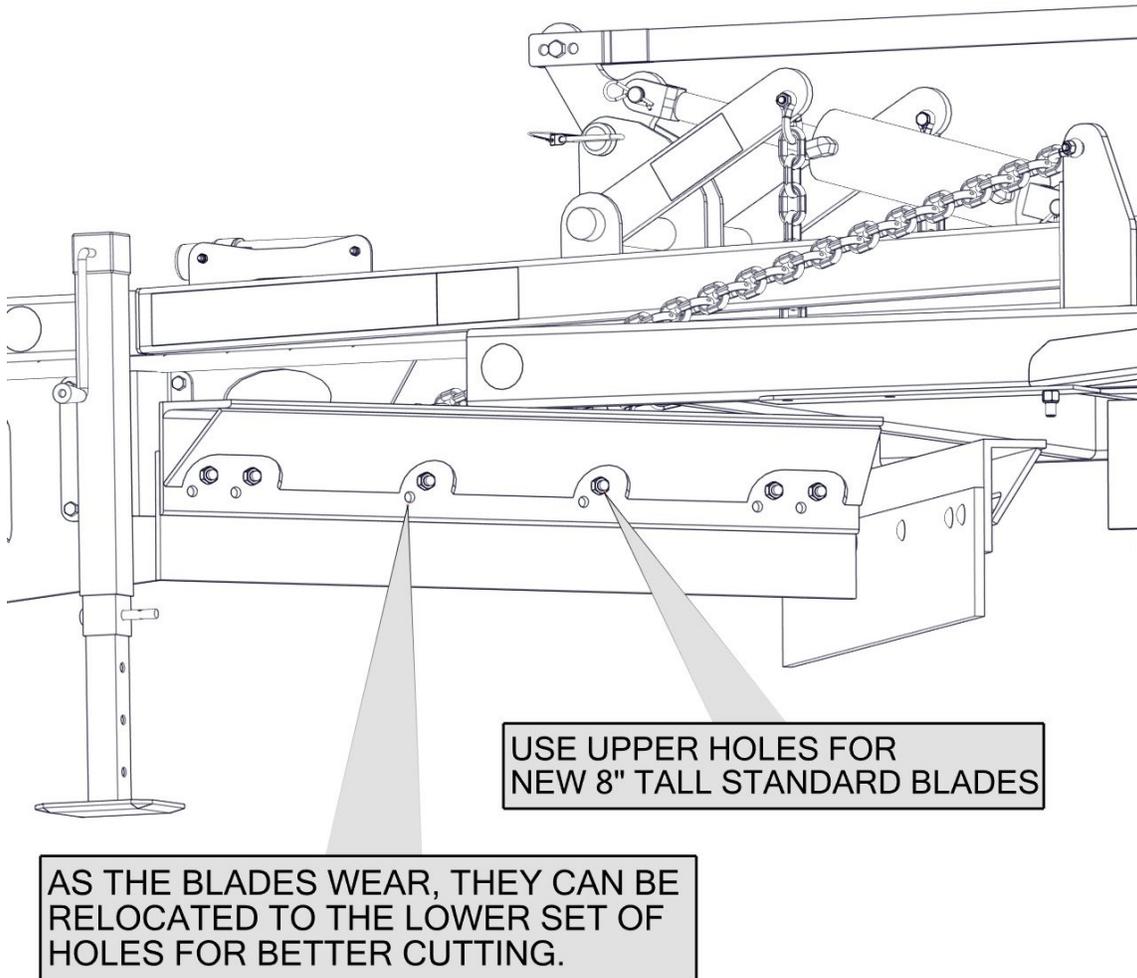
To raise the rear first: move the bolts to the **inner holes** on the tie strap.

5.6. FRONT MIXING BLADE INSTALLATION (STANDARD BLADES)

The front two sets of blade mounting angles (4 footers and 3 footers) are equipped with two sets of mounting holes.

- The upper holes are standard factory position for standard 5/8" x 8" straight blades.
- The lower holes are factory position for optional scarifier bit blades.

When replacing standard straight blades with new ones, the upper rows of holes are to be used. As the blades wear down, they can then be relocated to the lower set of holes.

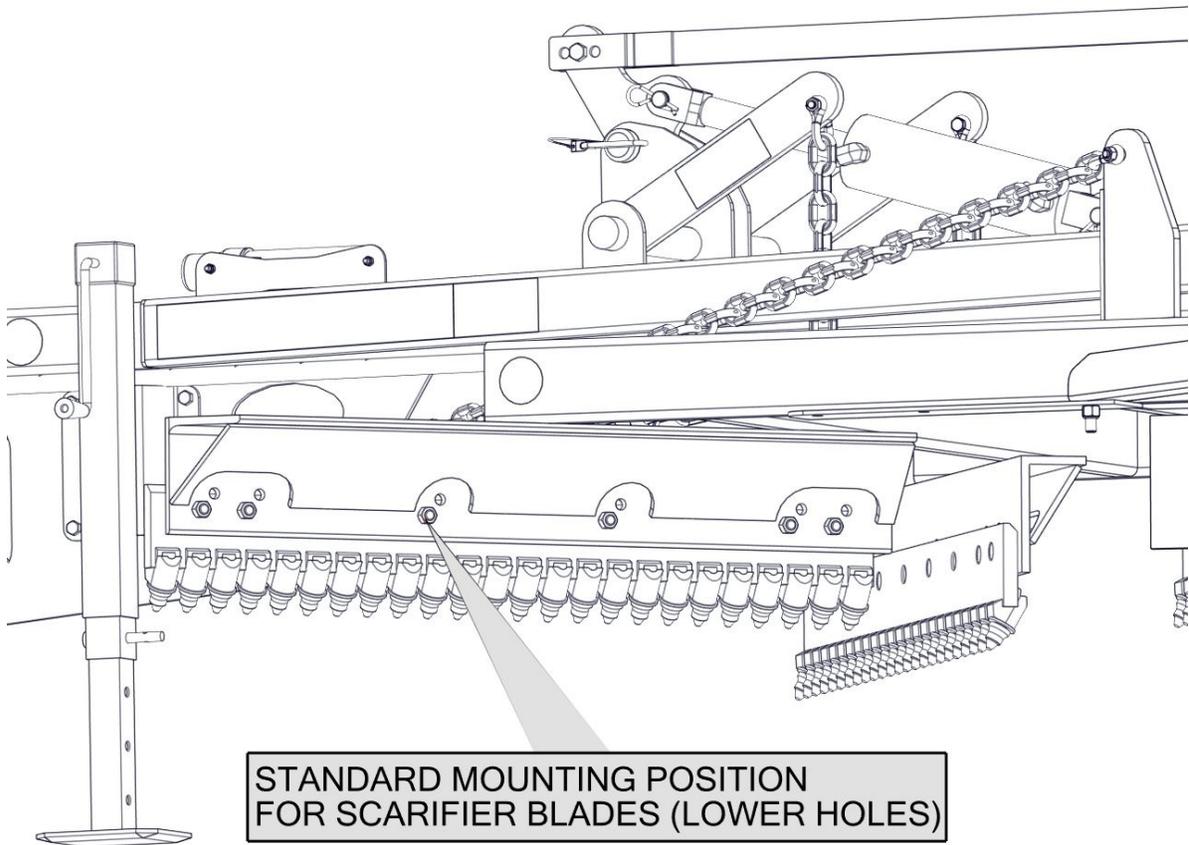


5.7. FRONT MIXING BLADE INSTALLATION (CARBIDES)

The front two sets of blade mounting angles (4 footers and 3 footers) are equipped with two sets of mounting holes.

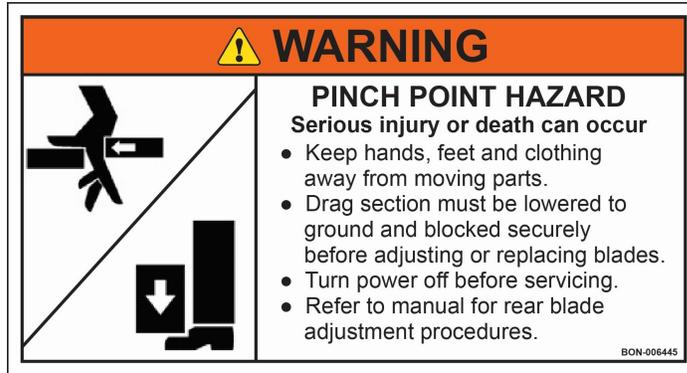
- The upper holes are standard factory position for standard 5/8" x 8" straight blades.
- The lower holes are factory position for optional scarifier bit blades.

When replacing or installing scarifier blades, the lower rows of holes are to be used. This will provide proper cutting depth for the scarifier teeth.

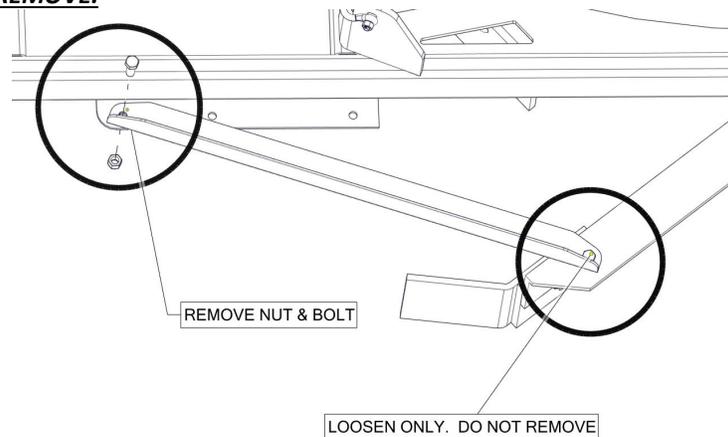


REAR MIXING BLADE ADJUSTMENT

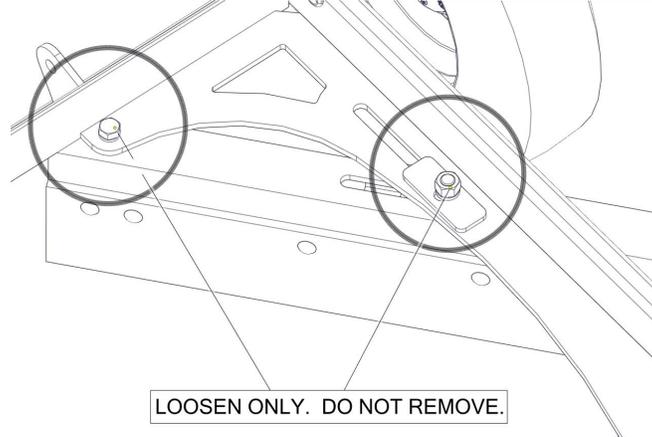
The rear 5' mixing blades can be adjusted in pitch, thereby increasing or decreasing the overall operating width. The maintainer is delivered with the blades at their narrowest position, roughly 8 feet wide. Additional positions are provided, allowing the blades to be set at 9 feet wide, or 10 feet wide.



- Loosen and remove front 5/8" bolt on adjusting angle bracket (below left).
- Loosen rear 5/8" bolt on adjusting angle bracket (below, right). **DO NOT COMPLETELY REMOVE.**



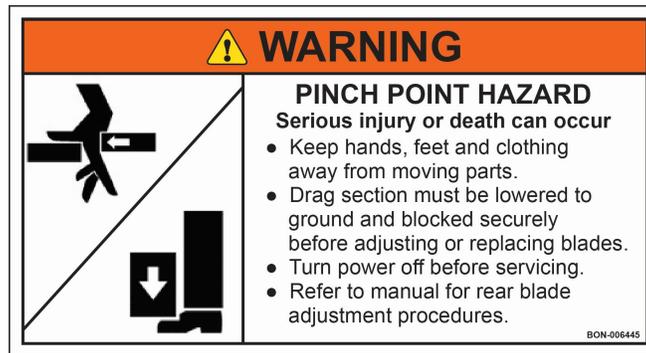
- Loosen 1" center bolt and nut (below, right). **DO NOT COMPLETELY REMOVE.**
- Loosen 7/8" inner bolt and nut (below, left). **DO NOT COMPLETELY REMOVE.**



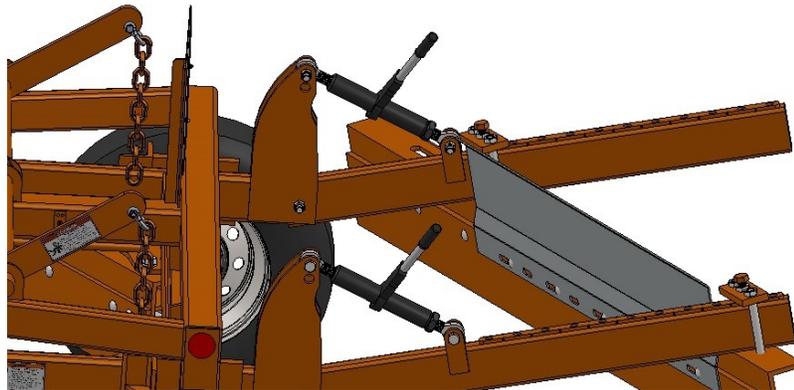
- Verify all persons and property are in the clear.
- Swing blade angle to desired position, and reinstall front 5/8" bolt.
- Tighten all four bolts.

5.8. FINISHING BLADE ADJUSTMENT

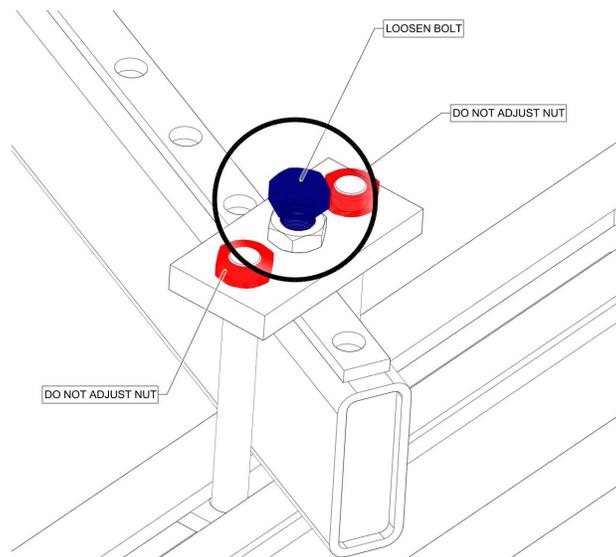
The rear Finishing Blade can be adjusted manually up and down to feather material out into a fresh, smooth road surface, while also building crown. Several adjustments are necessary:



For blade height adjustment, use the two top link turnbuckle assemblies to adjust the blade. These can be adjusted independently, and control road crown buildup and material discharge.



For blade pitch adjustment, loosen center bolts (BELOW IN BLUE) on blade. **DO NOT LOOSEN OUTER NUTS, SHOWN BELOW IN RED.** Slide blade forward or backward, and retighten bolt, ensuring that the adjustment bolt is retained in a hole on the retaining bars.



6. INSPECTION, SERVICE & MAINTENANCE

6.1. INSPECTION, SERVICE & MAINTENANCE SUMMARY CHARTS

Inspection and Service prior to each operation	
Item	Inspection / Service
Coupler, Clevis type	Check for cracks, pits, and flats. Inspect pin for damage.
Coupler, Hitch Ball	Check for cracks, pits, and flats. Replace w/ball & coupler having Perfect Road Maintainer GVW Rating. Grease. Check locking device & replace if necessary.
Coupler, Pintle Ring	Check for cracks, pits, and flats. Inspect pin for damage. Grease. Check locking device & replace if necessary.
Safety Chains & Hooks	Check for wear and damage.
Transport Safety Pin	Check for wear and damage.
Cutting Edges	Check for wear and damage, also loose bolts.
Fasteners	Check all bolts for tightness. Torque as required if loose. Check for missing or broken cotter pins.
Tires	Check tire pressure when cold. Inflate as needed.
Lubrication	Grease all fittings as required.
Hydraulics	Verify all hydraulic fittings are tight and not leaking. Check all hydraulic lines for damage or kinks. Check cylinder and lift arm operation.
Wheels - Lug Nuts (Bolts) & Hub	Check for tightness Tighten. For new and remounted wheels, check torque after first 10, 25 & 50 miles of driving and after any impact

Inspection & Service every 6 months	
Item	Inspection / Service
Tires	Rotate @ 5,000 miles
Tires	Inspect tread and sidewalls thoroughly. Replace tire when treads are worn, when sidewall has a bulge, or sidewall is worn

Inspection & Service annually	
Item	Inspection / Service
Jack, Drop-leg	Grease gears at top
Structure > Frame members > Welds	Inspect all frame members, bolts & rivets. Repair or replace damaged, worn or broken parts. Inspect all welds. Repair as needed
Wheels > UNSEALED Bearings (Hubs) > Rims	Disassemble / inspect / assemble and repack. Replace promptly if immersed in water Inspect for cracks & dents. Replace as needed.

6.2. INSPECTION AND SERVICE INSTRUCTIONS

WARNING

Never crawl under your Perfect Road Maintainer unless it is on firm and level ground and resting on properly placed and secured jack stands.

PERFECT ROAD MAINTAINER STRUCTURE

6.2.1.1. Fasteners and Frame Members

Inspect all of the fasteners and structural frame members for bending and other damage, cracks, or failure. Repair or replace any damaged fastener and repair the frame member. If you have any questions about the condition or method of repair of fasteners or frame members, get the recommendation of, or have the repair done by, your dealer.

6.2.1.2. Welds

All welds can crack or fail when subjected to heavy loads or movement of cargo that was not properly tied to prevent movement. To prevent severe damage to your Perfect Road Maintainer, inspect all of the welds for cracks or failure at least once a year.

WARNING

Improper weld repair will lead to early failure of the Perfect Road Maintainer structure and can cause serious injury or death.

Do not repair cracked or broken welds unless you have the skills and equipment to make a proper repair. If not, have the welds repaired by your dealer.

PERFECT ROAD MAINTAINER JACK

MANUAL:

If a grease fitting is present, you must use a grease gun to lubricate the jack mechanism. Grease the gears in the top of hand-cranked jacks once a year, by removing the top of the jack and pumping or hand packing grease into the gears.

LIGHTS AND SIGNALS

Before each tow, check the Perfect Road Maintainer taillights, stoplights, turn signals and any clearance lights for proper operation.

WARNING

Improper operating taillights, stoplights and turn signals can cause collisions.

Check all lights before each tow.

TIRES

Perfect Road Maintainer tires may be worn out even though they still have plenty of tread left. This is because Perfect Road Maintainer tires have to carry a lot of weight all the time, even when not in use. It is actually better for the tire to be rolling down the road than to be idle. During use, the tire releases

lubricants that are beneficial to tire life. Using the Perfect Road Maintainer tires often also helps prevent flat spots from developing.

The main cause of tire failure is improper inflation. Check the cold tire inflation pressures at least once a week for proper inflation levels. "Cold" means that the tires are at the same temperature as the surrounding air, such as when the vehicle has been parked overnight. Wheel and tire manufacturers recommend adjusting the air pressure to the Perfect Road Maintainer manufacturer's recommended cold inflation pressure, in pounds per square inch (PSI) stated on the vehicle's Federal Certification Label or Tire Placard when the Perfect Road Maintainer is loaded to its gross vehicle weight rating (GVWR). If the tires are inflated to less than the recommended inflation level or the GVWR of the Perfect Road Maintainer is exceeded, the load carrying capacity of the tire could be dramatically affected. If the tires are inflated more than the recommended inflation level, handling characteristics of the tow vehicle/Perfect Road Maintainer combination could be affected. Refer to the owner's manual or talk to your dealer or vehicle manufacturer if you have any questions regarding proper inflation practices.

Tires can lose air over a period of time. In fact, tires can lose 1 to 3 PSI per month. This is because molecules of air, under pressure, weave their way from the inside of the tire, through the rubber, to the outside. A drop in tire pressure could cause the tire to become overloaded, leading to excessive heat build-up. If a Perfect Road Maintainer tire is under-inflated, even for a short period of time, the tire could suffer internal damage.

High speed towing in hot conditions degrades Perfect Road Maintainer tires significantly. As heat builds up during driving, the tire's internal structure starts to breakdown, compromising the strength of the tire. It is recommended to drive at moderate speeds.

If you are storing your Perfect Road Maintainer for an extended period, make sure the tires are fully inflated to the maximum rated pressure and that you store them in a cool, dry place, such as a garage. Use tire covers to protect the Perfect Road Maintainer tires from the harsh effects of the sun.

 WARNING
Worn, damaged or under-inflated tires can cause loss of control, resulting in damage, serious injury and possibly death. Inspect tires before each tow.

WHEEL RIMS

If the Perfect Road Maintainer has been struck, or impacted, on or near the wheels, or if the Perfect Road Maintainer has struck a curb, inspect the rims for damage (i.e. being out of round); and replace any damaged wheel. Inspect the wheels for damage every year, even if no obvious impact has occurred.

WHEELS, BEARINGS AND LUG NUTS

A loose, worn or damaged wheel bearing is the most common cause of brakes that grab.

To check your bearings, jack Perfect Road Maintainer and check wheels for side-to-side looseness. If the wheels are loose, or spin with a wobble, the bearings must be serviced or replaced.

Most Perfect Road Maintainer axles are built with sealed bearings that are not serviceable. Sealed bearings must be replaced as complete units.

6.2.1.3. Unsealed Bearings (Hubs)

Your Perfect Road Maintainer has unsealed axle bearings, and they must be inspected and lubricated once a year to insure safe operation of your Perfect Road Maintainer.

If a Perfect Road Maintainer wheel bearing is immersed in water, it must be replaced.

If your Perfect Road Maintainer has not been used for an extended amount of time, have the bearings inspected and packed more frequently, at least every six months and prior to use.

Follow the steps below to disassemble and service the UNSEALED wheel bearings.

- After removing the grease cap, cotter pin, spindle nut and spindle washer (items 7-10 in “Exploded Wheel Bearing” figure), remove the hub and drum to inspect the bearings for wear and damage.
- Replace bearings that have flat spots on rollers, broken roller cages, rust or pitting. Always replace bearings and cups in sets. The inner and outer bearings are to be replaced at the same time.
- Replace seals that have nicks, tears or wear.
- Lubricate the bearings with a high quality EP-2 automotive wheel bearing grease.

Every time the wheel hub is removed and the bearings are reassembled, follow the steps below to check the wheel bearings for free running and adjust.

- Turn the hub slowly, by hand, while tightening the spindle nut, until you can no longer turn the hub by hand.
- Loosen the spindle nut just until you are able to turn it (the spindle nut) by hand. Do not turn the hub while the spindle nut is loose.
- Put a new cotter pin through the spindle nut and axle.
- Check the adjustments. Both the hub and the spindle nut should be able to move freely (the spindle nut motion will be limited by the cotter pin).

6.2.1.4. Lug Nuts (Bolts)



Being sure wheel mounting nuts (lug nuts) on Perfect Road Maintainer wheels are tight and properly torqued is an important responsibility that Perfect Road Maintainer owners and users need to be familiar with and practice. Inadequate and/or inappropriate wheel nut torque (tightness) is a major reason that lug nuts loosen in service. Loose lug nuts can rapidly lead to a wheel separation with potentially serious safety consequences.

Lug nuts are prone to loosen right after a wheel is mounted to a hub. When driving on a new or remounted wheel, check the lug nut tightness often during the first few hundred miles of the Perfect Road Maintainer's use, especially after the first 10, 25 and 50 miles of driving, before each tow, and at least twice per year thereafter.

⚠ WARNING

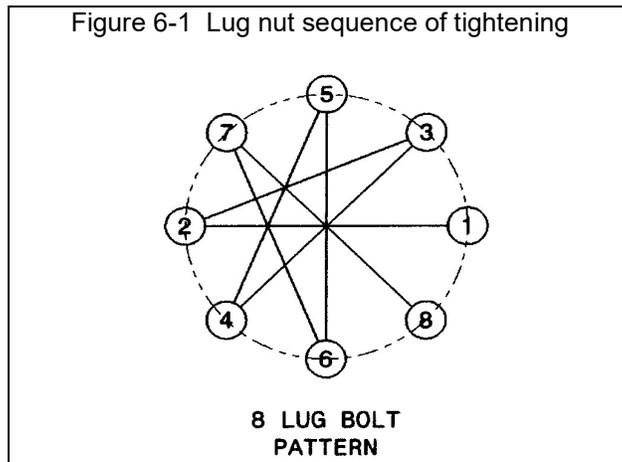
Lug nuts are prone to loosen after initial installation, which can lead to death or serious injury. Check lug nuts for tightness on a new Perfect Road Maintainer or when wheel(s) have been remounted after the first 5, 10 and 25 miles of operation.

⚠ WARNING

Metal creep between the wheel rim and lug nuts will cause rim to loosen and could result in a wheel coming off, leading to death or serious injury.
Tighten lug nuts before each tow.

Tighten the lug nuts to the proper torque for the axle size on your Perfect Road Maintainer to prevent wheels from coming loose. Use a torque wrench to tighten the fasteners. The only way to be certain you have checked the torque or torqued the lug nuts to the proper torque is with a torque wrench. Four-way wrenches, ratchets, and similar tools can be useful for short-term emergency repairs, but are not appropriate tools for adequately checking lug nut torque. You must use a torque wrench to adequately indicate the torque that you are applying to the lug nut. If you do not have a torque wrench, tighten the fasteners with a lug wrench as much as you can, then have a service garage or dealer tighten the lug nuts to the proper torque. Over-tightening will result in breaking the studs or permanently deforming the mounting stud holes in the wheels.

Figure 6-1 Lug nut sequence of tightening



Keep a record of the date and approximate mileage when you check the lug nut torque. Note any lug nut that has lost torque. Investigate the reason(s) if the lug nut torque is not maintained after more than one re-torque application, because this indicates there is something wrong with the lug nuts, nut studs, wheels and/or hubs and should be corrected.

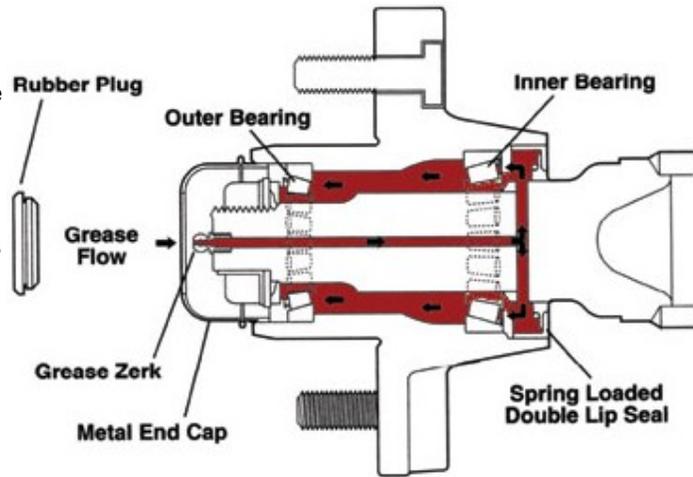
Contact your dealer or vehicle manufacturer immediately if you experience any persistent lug nut loosening or any other lug, wheel or axle problems.

In the event of a wheel separation incident, notify the vehicle manufacturer and dealer. Seek prompt professional assistance in assessing the Perfect Road Maintainer and its gear, and retain, but don't re-use involved lugs, wheels and studs. Don't repair or service the Perfect Road Maintainer yourself. Call a trained technician.

LUBRICATION

Several areas on the 312 Perfect Road Maintainer require lubrication:

Hubs – hubs are equipped with an EZ-Lube type grease system. Hub dust caps have a removable center rubber cover which provides access to the grease fitting. Applying grease to this fitting will lubricate the inner bearing, forcing grease through the hub and to the outer bearing. Wheel bearings are packed at the factory; however hubs should be greased regularly.



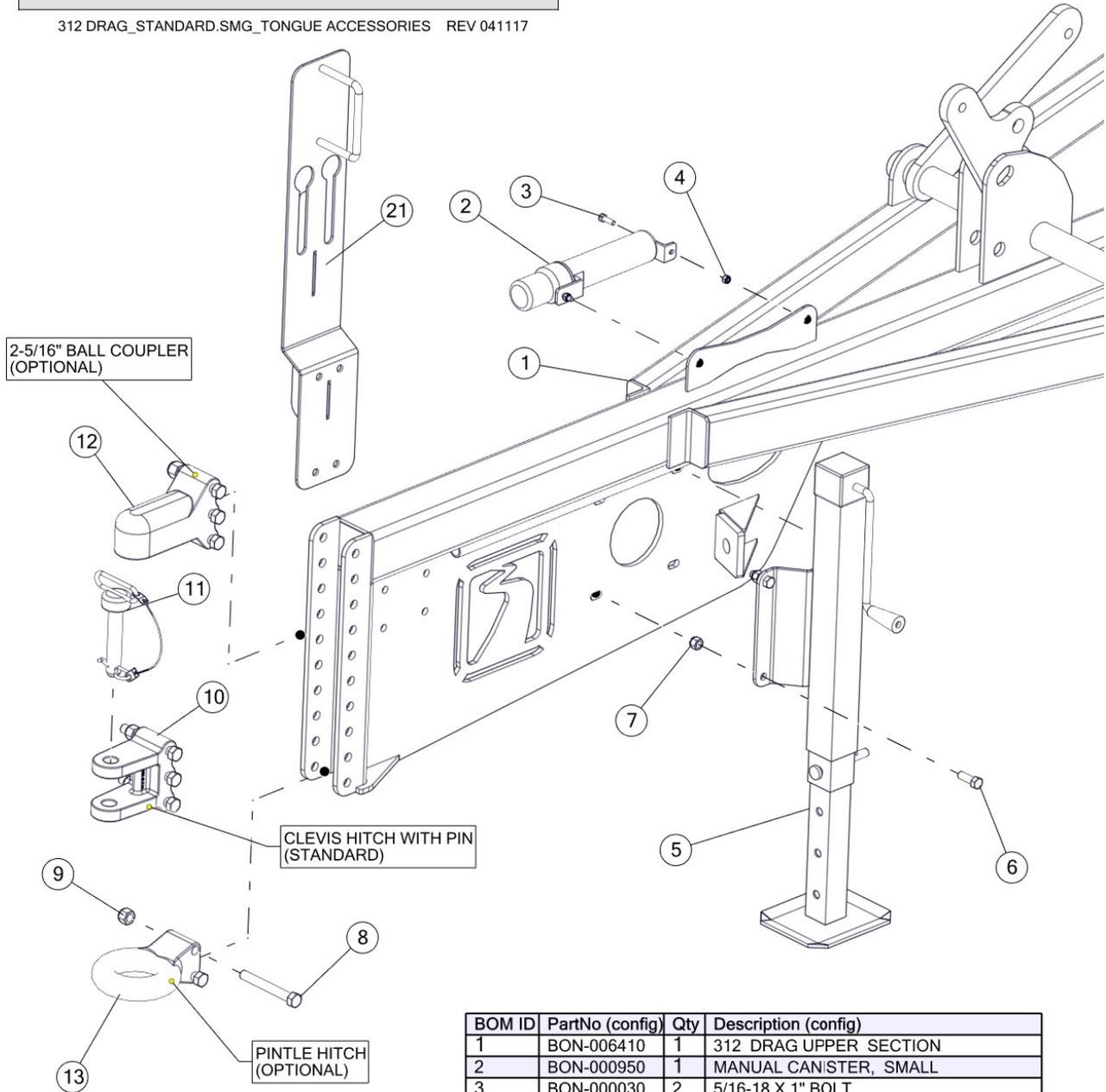
Rear Finishing Blade Adjustment Screws – The adjustment screws may require lubrication from time to time. This can be done by cranking the screws out fully, then applying a lubricant to the threads and then screwing back to the operating position. Oil, grease, or never seize can be used on the screws.

7. PART BREAKDOWNS

7.1. TONGUE ACCESSORIES

312 PERFECT ROAD MAINTAINER TONGUE ACCESSORIES

312 DRAG_STANDARD.SMG_TONGUE ACCESSORIES REV 041117

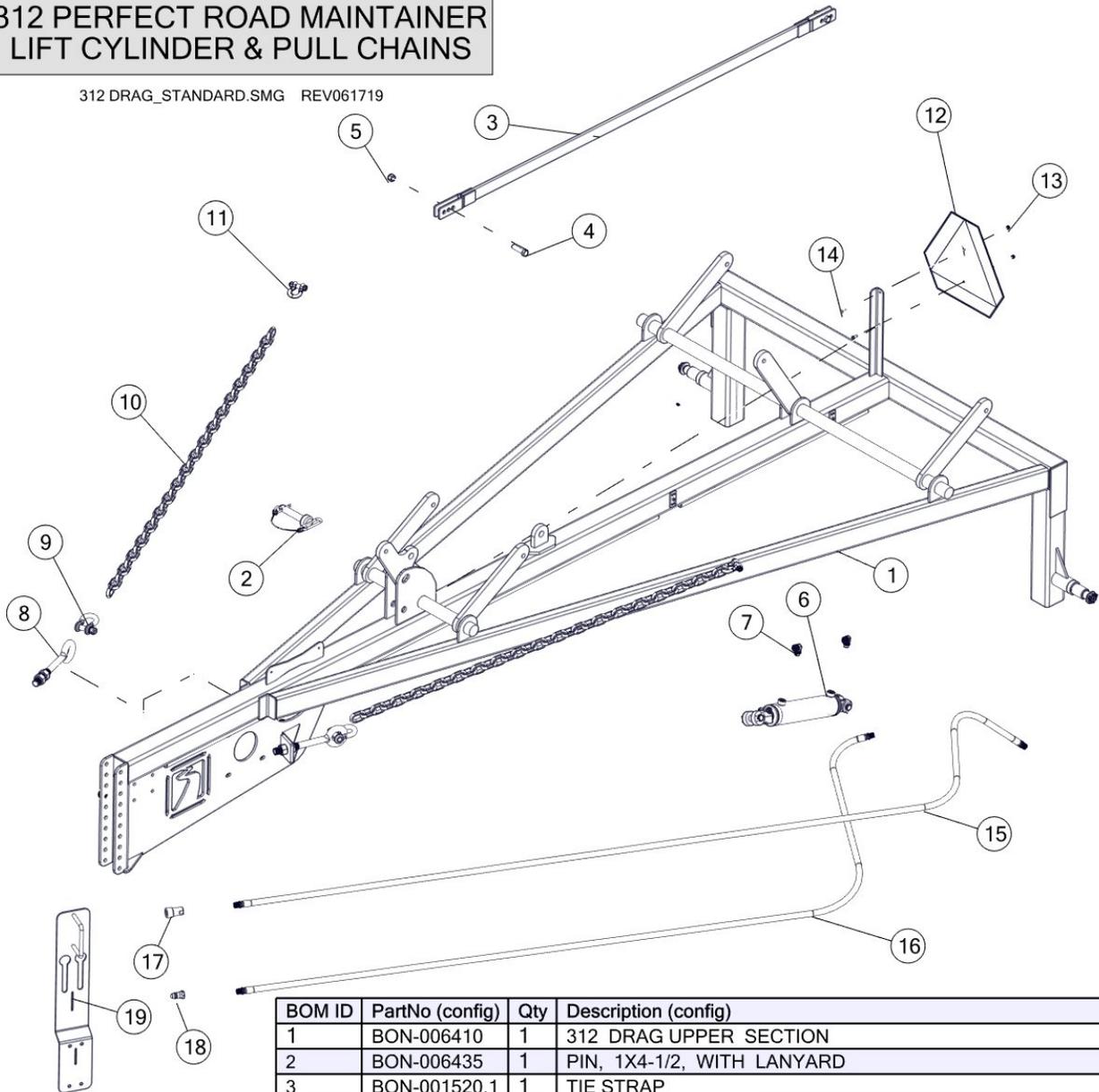


BOM ID	PartNo (config)	Qty	Description (config)
1	BON-006410	1	312 DRAG UPPER SECTION
2	BON-000950	1	MANUAL CANISTER, SMALL
3	BON-000030	2	5/16-18 X 1" BOLT
4	BON-000320	2	NYLON INSERT LOCKNUT, 5/16-18 UNC
5	BON-006416	1	312 DRAG JACK STAND
6	BON-000107	4	1/2-13 x 1-1/2" BOLT
7	BON-000321	4	NYLON INSERT LOCKNUT, 1/2-13 UNC
8	BON-000163	3	5/8-11 X 5" BOLT
9	BON-000322	3	NYLON INSERT LOCKNUT, 5/8-11 UNC
10	BON-006423	1	CLEVIS HITCH, 20K
11	BON-006435	1	PIN, 1X4-1/2, WITH LANYARD
12	BON-006430	1	2-5/16" BALL COUPLER
13	LV-1085	1	PINTLE EYE, 3" ID, 14,000 MAX CAPACITY
21	BON-006455	1	HOSE RETAINING BRACKET

7.2. LIFT CYLINDER & PULL CHAINS

312 PERFECT ROAD MAINTAINER LIFT CYLINDER & PULL CHAINS

312 DRAG_STANDARD.SMG REV061719

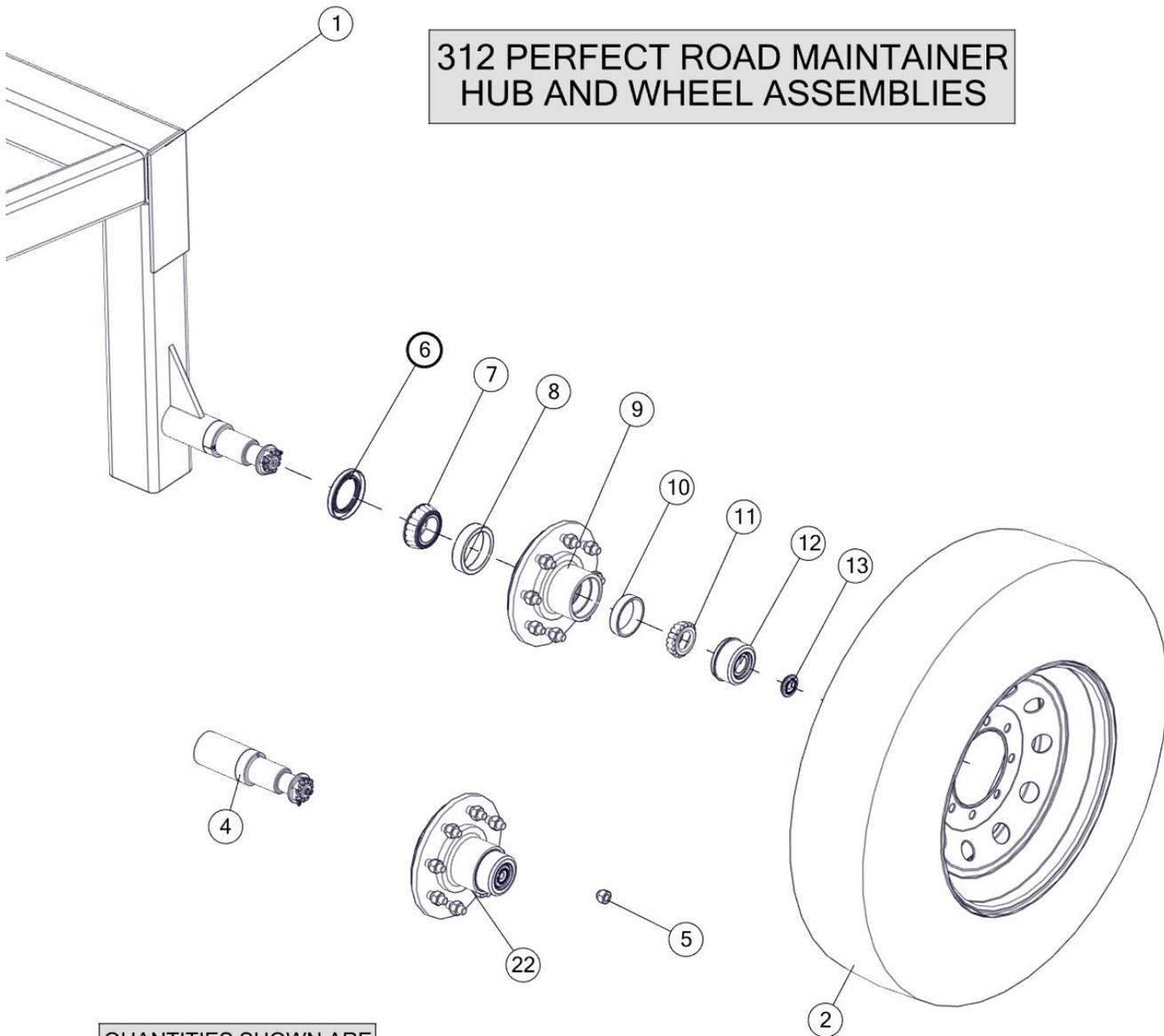


FRONT REPLACEMENT
LIFT ASSEMBLY:
BON-006464

REAR REPLACEMENT
LIFT ASSEMBLY:
BON-006465

BOM ID	PartNo (config)	Qty	Description (config)
1	BON-006410	1	312 DRAG UPPER SECTION
2	BON-006435	1	PIN, 1X4-1/2, WITH LANYARD
3	BON-001520.1	1	TIE STRAP
4	BON-000155	2	5/8-11 X 2-1/2" BOLT
5	BON-000322	2	NYLON INSERT LOCKNUT, 5/8-11 UNC
6	BON-006457	1	CYLINDER, HYD, 3.000" X 10.000", DA
7	60UB 08X08	2	MALE ORB X 90DEG FEMALE PIPE SW 3/4-16TPI TO 1/2 NPSM
8	BON-002752	2	1" EYEBOLT, INCLUDES 2 NUTS
9	BON-000661	2	SCREW PIN ANCHOR SHACKLE, 5/8"
10	BON-006431	2	312 PULL CHAIN, 1/2"
11	BON-006439	2	BOLT TYPE ANCHOR SHACKLE, 1/2"
12	SMV SIGN	1	SLOW MOVING VEHICLE SIGN
13	BON-000318.5	2	NYLON INSERT LOCKNUT, 1/4-20 UNC
14	BON-000003	2	1/4-20 x 3/4" BOLT
15	BON-001916	1	ROAD DRAG HOSE, LONG
16	BON-001915	1	ROAD DRAG HOSE, SHORT
17	PHD-4050-4P	1	1/2" FEMALE HYDRAULIC QUICK COUPLER
18	PHD-4010-4	1	1/2" MALE HYDRAULIC QUICK COUPLER
19	BON-006455	1	HOSE RETAINING BRACKET

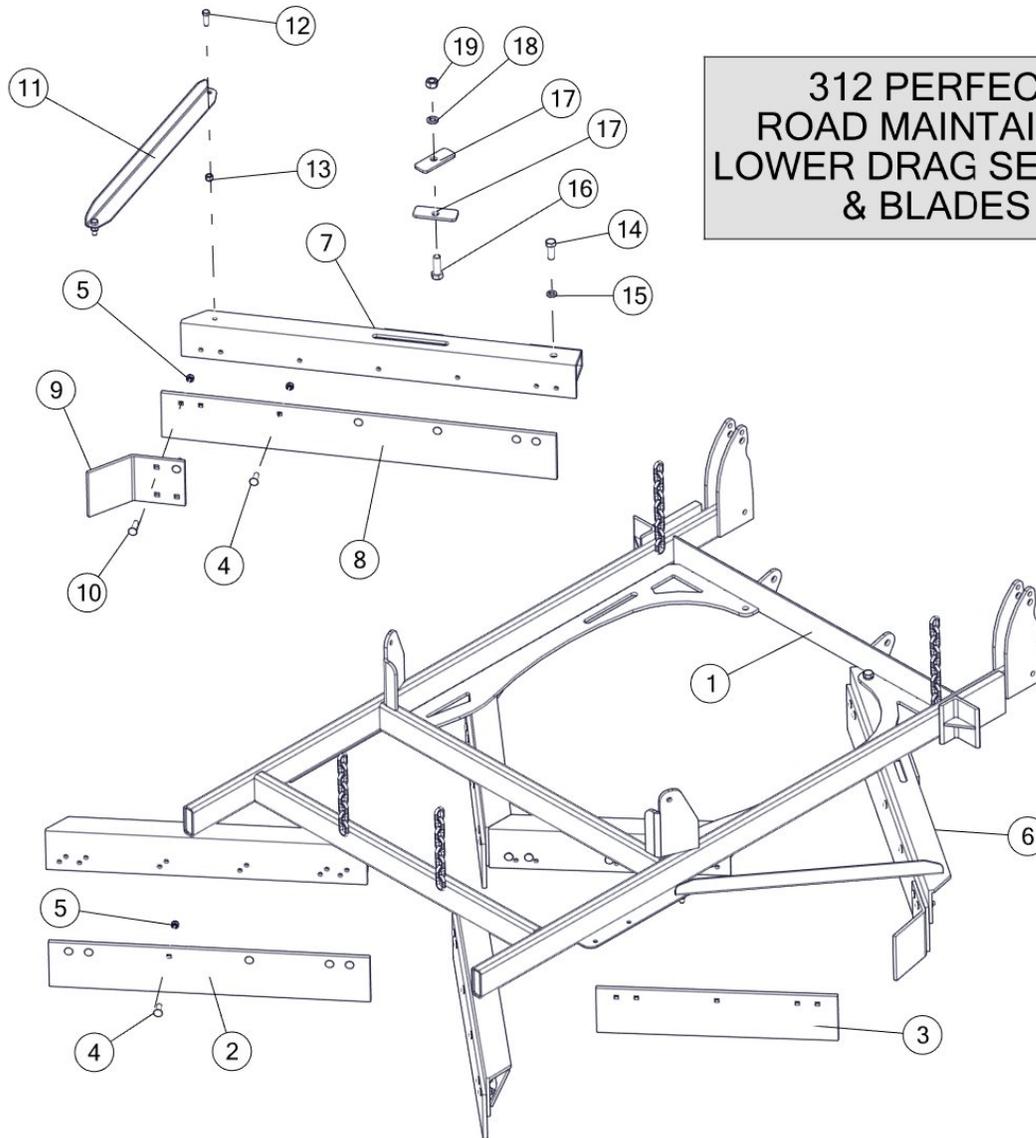
7.3. HUB & WHEEL ASSEMBLIES



QUANTITIES SHOWN ARE PER WHEEL ASSEMBLY

BOM ID	PartNo (config)	Qty	Description (config)
1	BON-006410	1	312 DRAG UPPER SECTION
2	LV-1071	1	TIRE & RIM ASSEMBLY 16" RIM, 8 ON 6-1/2.
4	BON-006427	1	312 DRAG SPINDLE, SAWED TO CORRECT LENGTH
5	BON-000297	1	1/2-20 TPI LUG NUT
6	C/R-22558	1	SEAL, 312 ROAD DRAG HUB
7	BRG-25580	2	BEARING, 1.750 BORE, FOR 312 ROAD DRAG HUB
8	RACE-25520	1	RACE, 3.265 OD, FOR 312 ROAD DRAG HUB
9	BON-006425	2	312 DRAG HUB WITH RACES & NUTS
10	RACE-14276	1	RACE, 2.716" OD, 312 DRAG HUB
11	BRG-14125A	2	BEARING, 1.25" BORE, FOR 312 HUB
12	BON-006426	2	DUST CAP, 312 ROAD DRAG HUB
13	BON-006452	2	312 HUB EZ LUBE RUBBER CAP
22	BON-006422	1	HUB, COMPLETE WITH BEARINGS, RACES, SEALS, DUST CAP AND GREASE FITTING.

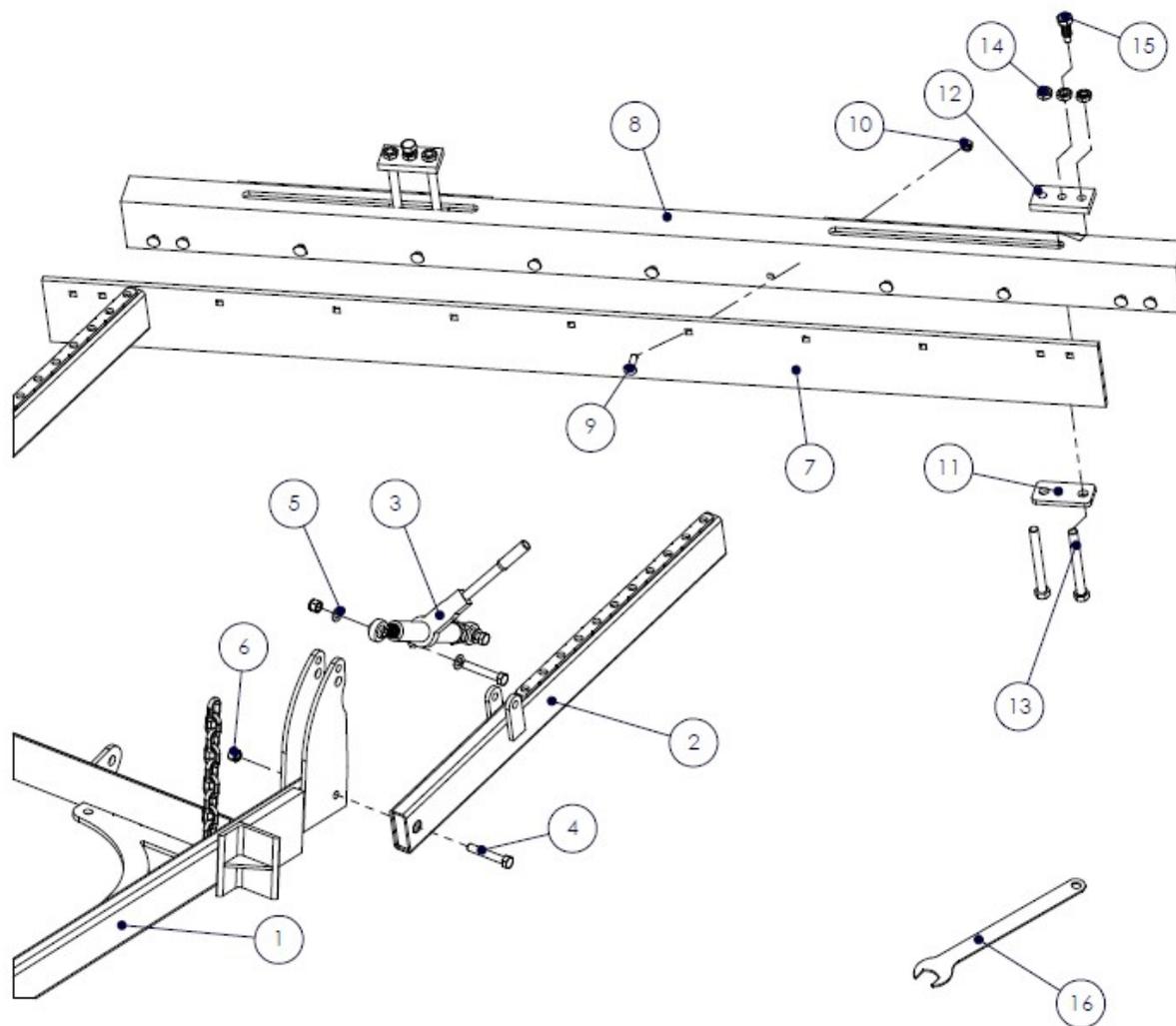
7.4. LOWER DRAG SECTION & BLADES



BOM ID	PartNo (config)	Qty	Description (config)
1	BON-006411	1	312 DRAG LOWER SECTION
2	BON-000724	2	FSE,5/8X8X4' CARBON AASHO TOP PUNCH 1-1/2 GA.
3	BON-000723	2	FSE,5/8X8X3' CARBON AASHO TOP PUNCH 1-1/2 GA.
4	BON-CB8250	32	5/8-11 X 2-1/2" CARRIAGE BOLT GR. 8
5	BON-000307F	36	HEX NUT, 5/8"-11TPI, HEX FLANGED NUT
6	BON-001511.2	1	REAR BLADE ANGLE, LEFT HAND
7	BON-001510.2	1	REAR BLADE ANGLE, RIGHT HAND
8	BON-000725	2	FSE,5/8X8X5' CARBON AASHO TOP PUNCH 1-1/2 GA.
9	BON-001512	2	BLADE END SHOE
10	BON-CB8250	4	5/8-11 X 2-1/2" CARRIAGE BOLT GR. 8
11	BON-001513	2	REAR BLADE ADJUSTING ANGLE BRACKET
12	BON-000153	4	5/8-11 X 2" BOLT
13	BON-000322	4	NYLON INSERT LOCKNUT, 5/8-11 UNC
14	BON-000211	2	7/8-9 X 2-1/2" BOLT
15	BON-000358	2	LOCK WASHER, 7/8
16	BON-000234	2	1-8 X 3" BOLT
17	BON-001663	4	PLATE WASHER FOR REAR BLADE ANGLE
18	BON-000359	2	LOCK WASHER, 1
19	BON-000310	2	HEX NUT, 1"-8TPI

7.5. STANDARD FINISHING BLADE ASSEMBLY

FILE NAME	312 FINISHING BLADE ASSEMBLY	REV.		DESCRIPTION	DATE	INITIALS
DWG NAME	FINISHING BLADE ASSEMBLY, 312	-		ORIGINAL	12/20/21	EDG



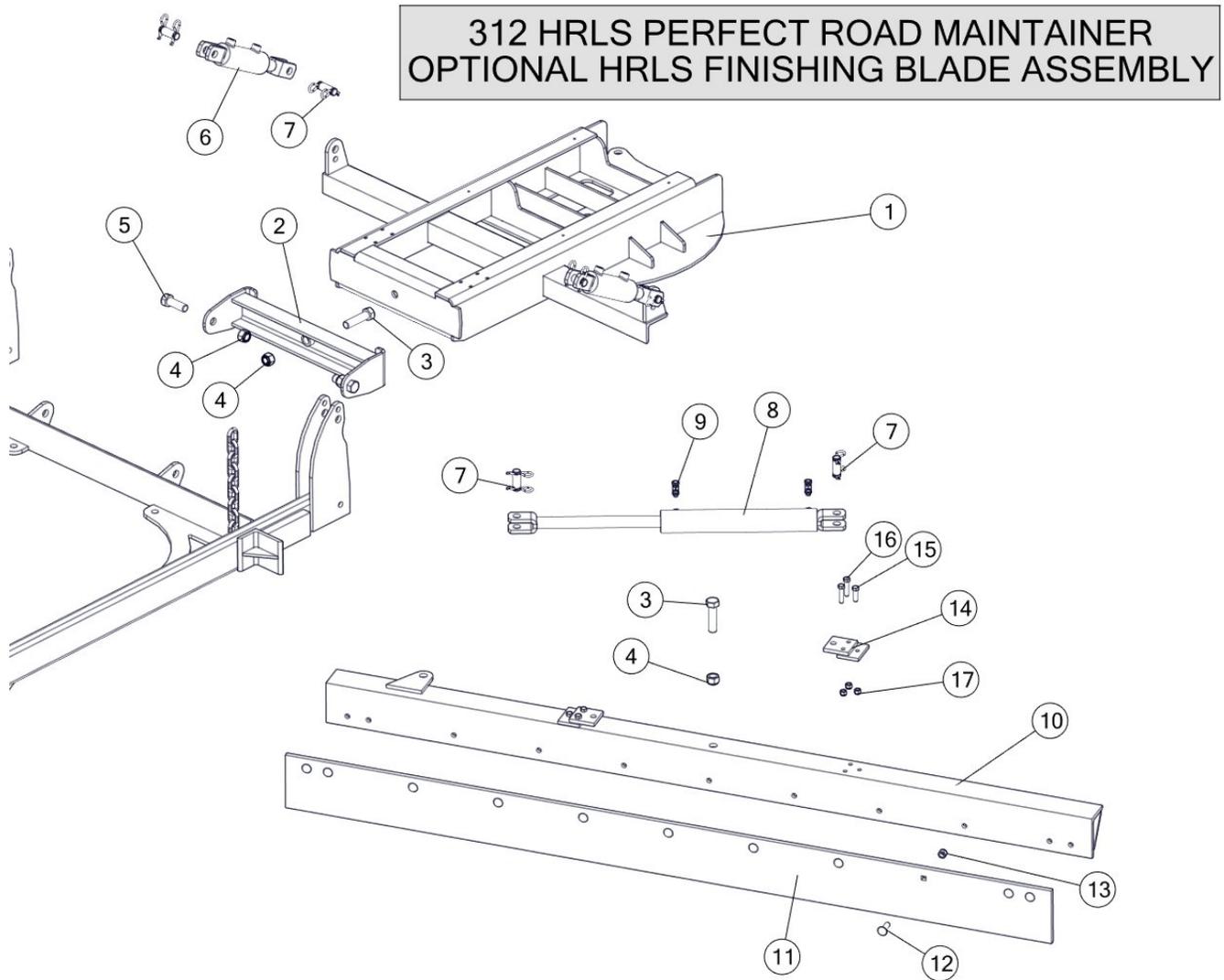
16	1	BON-006466	WRENCH, TOP LINK JAM NUT
15	2	BON-001988	LOCK DOWN SCREW
14	6	BON-000309.1	7/8-9 TPI HEX JAM NUT
13	4	BON-000225.8	7/8-9 X 8" BOLT
12	2	BON-001517	UPPER LOCK PLATE
11	2	BON-001518	LOWER LOCK PLATE
10	11	BON-000307F	HEX FLANGED NUT, 5/8-11 TPI
9	11	BON-CB8250	5/8-11 X 2-1/2" CARRIAGE BOLT GR. 8
8	1	BON-001516-2	REAR FINISHING BLADE
7	1	BON-000722	5/8X8X9 CUTTING EDGE
6	6	BON-000323	NYLON INSERT LOCKNUT, 3/4-10 UNC
5	8	BON-000343.1	HARDENED SAE FLAT WASHER
4	6	BON-000191	3/4-10 X 4-1/2" BOLT
3	2	BON-006454	TOP LINK
2	2	BON-006419	312 DRAG TAIL SECTION
1	1	BON-006411	312 DRAG LOWER SECTION
ITEM	QTY	PART NUMBER	DESCRIPTION

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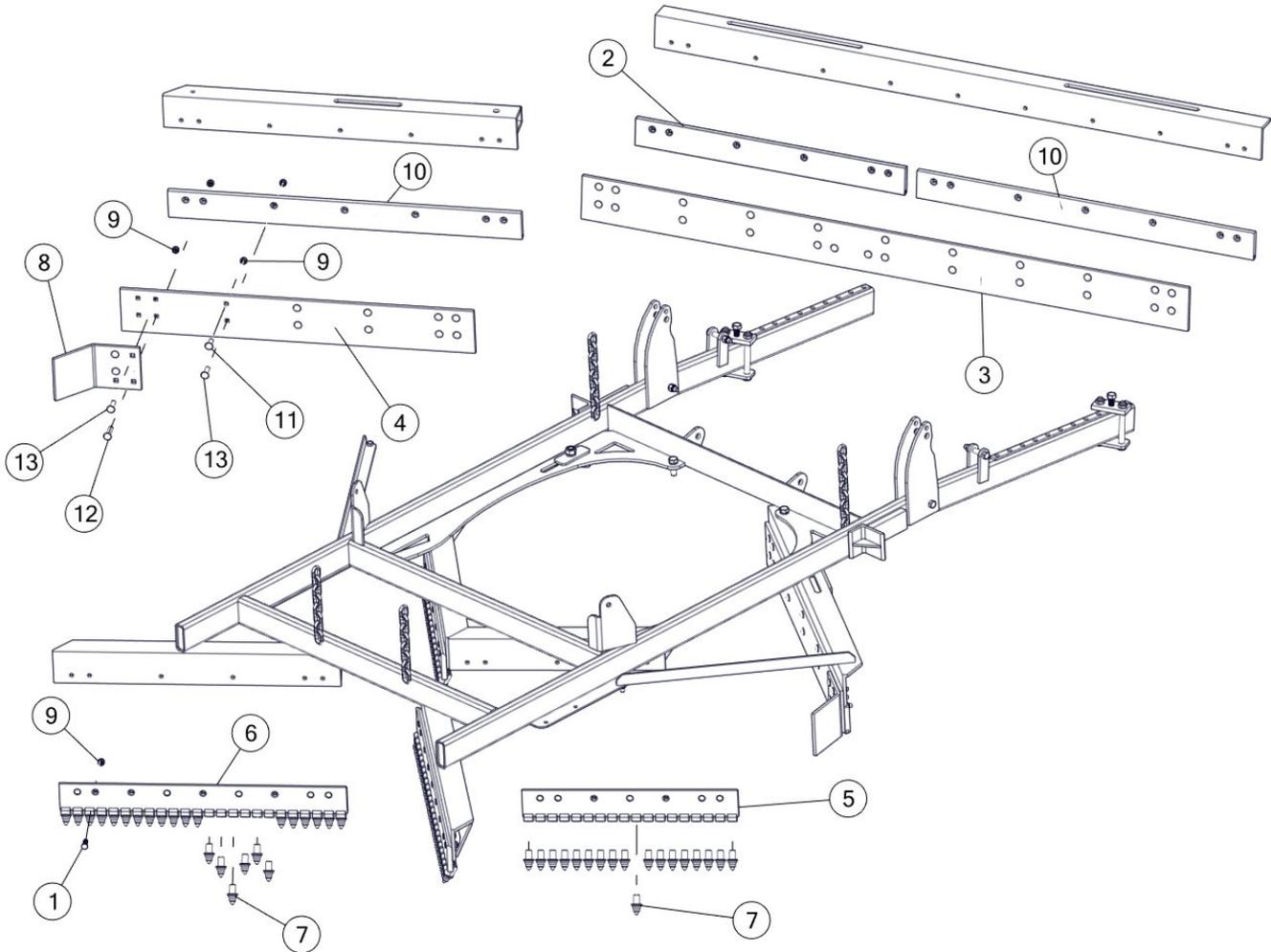
7.6. HRLS FINISHING BLADE ASSEMBLY



BOM ID	PartNo (config)	Qty	Description (config)
1	BON-006412	1	312 HRLS TAIL SECTION
2	BON-006415	1	312 HRLS SWIVEL BAR
3	BON-000238	2	1-8 X 4" BOLT
4	BON-000310.3	4	NYLON INSERT LOCKNUT, 1-8 UNC
5	BON-000234	2	1-8 X 3" BOLT
6	BON-006414	2	HYD CYLINDER, DA, 2X4, CLEVIS ENDS, 3000 PSI WELDED BARREL
7	PMC-190400005	6	CLEVIS PIN, 1" X 2-1/8" WORKING LENGTH
8	LV-1111W	1	CYLINDER, 2-1/2X16 WELDED
9	60UA 06X06	2	MALE PIPE X 90DEG FEMALE SWIVL 3/8 NPTF TO 3/8 NPSM
10	BON-006413	1	312 HRLS REAR BLADE ANGLE
11	BON-000722	1	5/8X8 X 9 CUTTING EDGE
12	BON-CB8250	11	5/8-11 X 2-1/2" CARRIAGE BOLT
13	BON-000307F	11	HEX FLANGED NUT, 5/8-11 UNC
14	BON-001890.1	2	BLADE ANGLE CLAMP
15	BON-000108	2	1/2-13 x 1-3/4" BOLT
16	BON-000110	4	1/2-13 x 2-1/4" BOLT
17	BON-000321	6	NYLON INSERT LOCKNUT, 1/2-13 UNC

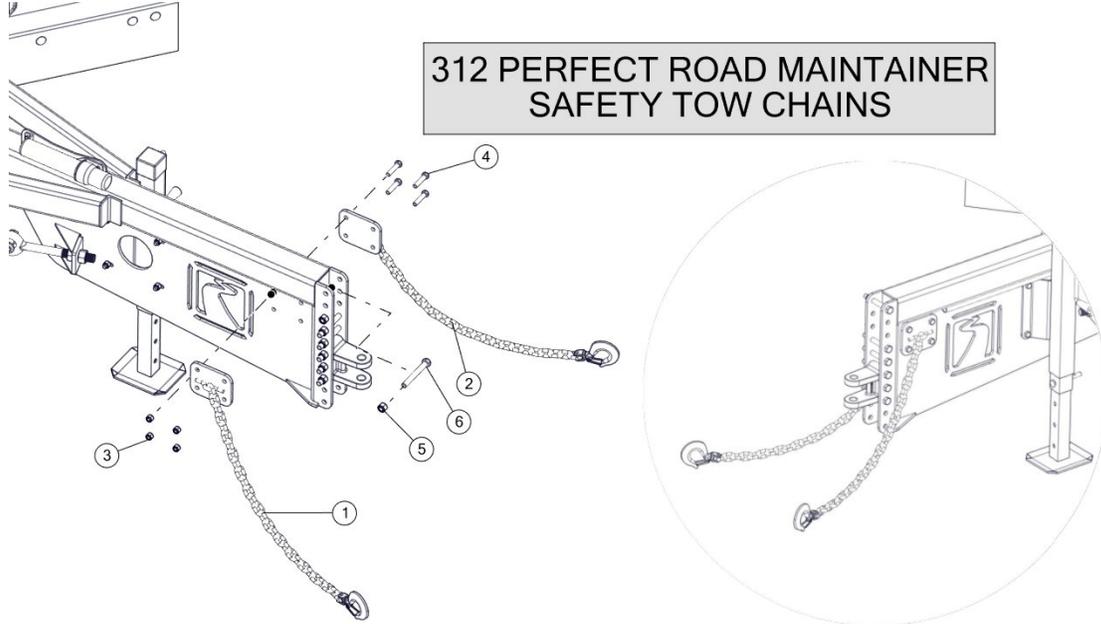
7.7. SCARIFIER & CARBIDE BLADES

312 PERFECT ROAD MAINTAINER OPTIONAL SCARIFIER & CARBIDE BLADES



BOM ID	PartNo (config)	Qty	Description (config)
1	BON-000659	22	5/8" X 2" PLOW BOLT
2	BON-000718	1	CARBIDE, 7/8X5X4'
3	BON-000722CA	1	CARBIDE BLADE ADAPTER FOR 312, 9' LONG
4	BON-000725CA	2	CARBIDE BLADE ADAPTER FOR 312, 5' LONG
5	BON-000760	1	SCARIFIER, 7/8X36, LESS BITS
6	BON-000761	2	SCARIFIER, 7/8X48 LESS BITS
7	BON-000762	84	SCARIFIER BIT NEW STYLE WITH WASHER
8	BON-001512	2	BLADE END SHOE
9	BON-000307F	74	HEX FLANGE NUT, 5/8"-11TPI
10	KEN-PB-760H	3	CARBIDE, 7/8X5X5'
11	BON-CB8250	21	5/8-11 X 2-1/2" CARRIAGE BOLT GR. 8
12	BON-CB8300	4	5/8-11 X 3" CARRIAGE BOLT GR. 8
13	BON-CB8250	27	5/8-11 X 2-1/2" CARRIAGE BOLT GR. 8

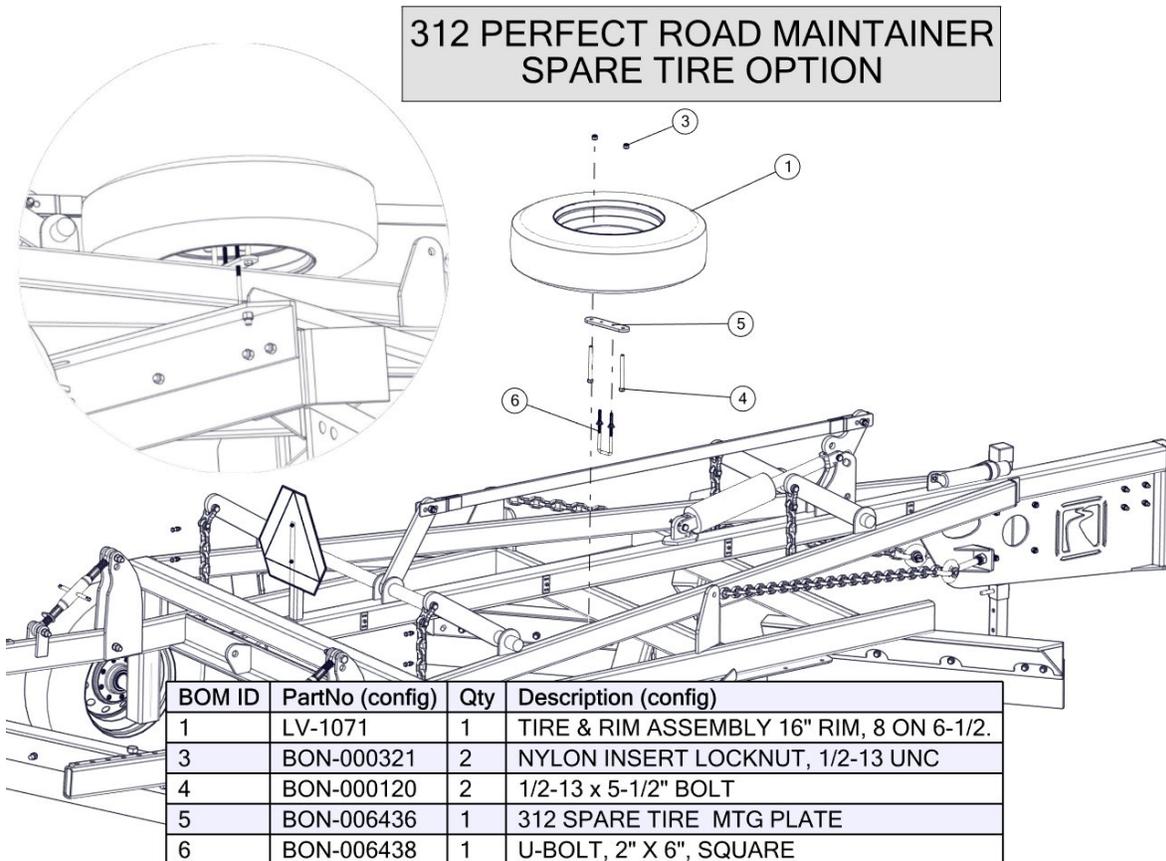
7.8. SAFETY TOW CHAINS



312 PERFECT ROAD MAINTAINER
SAFETY TOW CHAINS

BOM ID	PartNo (config)	Qty	Description (config)
1	BON-001507	1	312 DRAG SAFETY CHAIN WELDMENT
2	BON-001507	1	312 DRAG SAFETY CHAIN WELDMENT
3	BON-000321	4	NYLON INSERT LOCKNUT, 1/2-13 UNC
4	BON-000110	4	1/2-13 x 2-1/4" BOLT
6	BON-000163	1	5/8-11 X 5" BOLT
5	BON-000322	1	NYLON INSERT LOCKNUT, 5/8-11 UNC

7.9. OPTIONAL SPARE TIRE

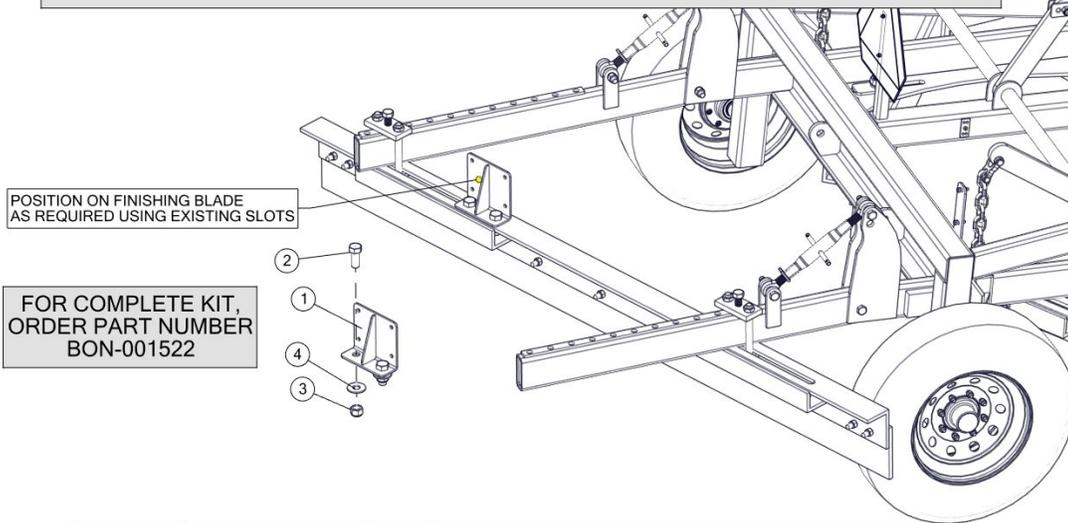


312 PERFECT ROAD MAINTAINER
SPARE TIRE OPTION

BOM ID	PartNo (config)	Qty	Description (config)
1	LV-1071	1	TIRE & RIM ASSEMBLY 16" RIM, 8 ON 6-1/2.
3	BON-000321	2	NYLON INSERT LOCKNUT, 1/2-13 UNC
4	BON-000120	2	1/2-13 x 5-1/2" BOLT
5	BON-006436	1	312 SPARE TIRE MTG PLATE
6	BON-006438	1	U-BOLT, 2" X 6", SQUARE

7.10. OPTIONAL FINISHING BLADE EXTENSION BRACKETS

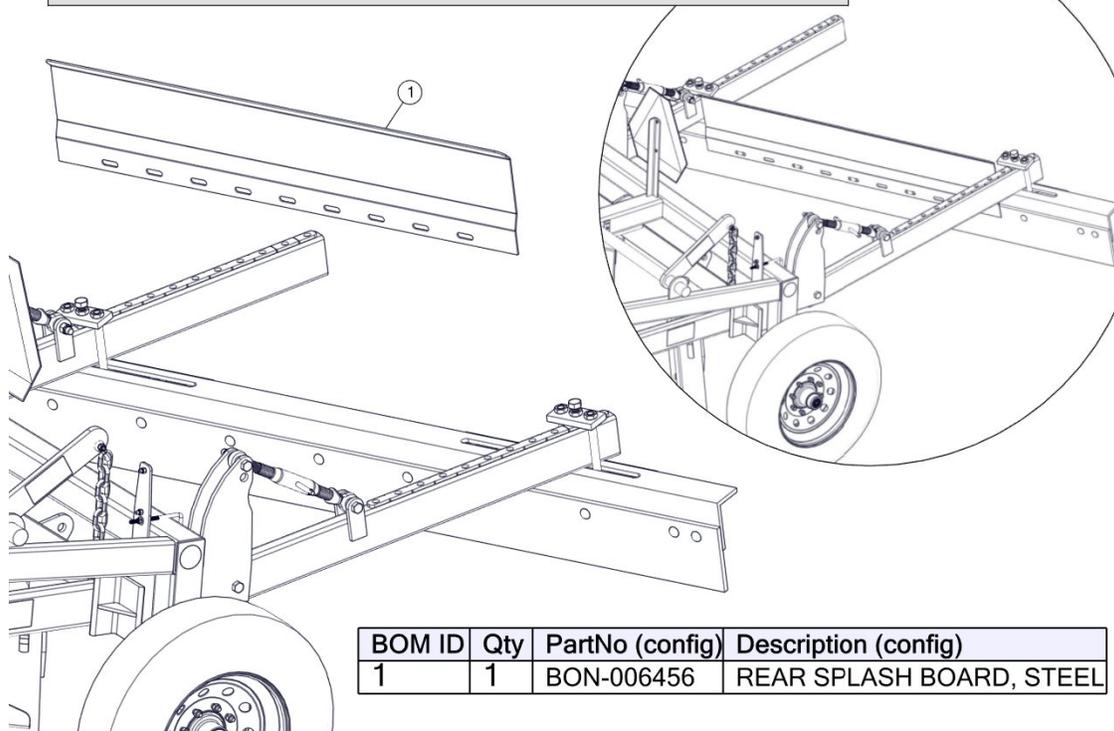
312 PERFECT ROAD MAINTAINER
 OPTIONAL FINISHING BLADE EXTENSION BRACKETS
 DESIGNED FOR USE WITH 2X8 OR 2X10 (NOT INCLUDED)



BOM ID	PartNo (config)	Qty	Description (config)
1	BON-001523	2	FINISHING BLADE HEIGHT EXT BRACKET
2	BON-000232	4	1-8 X 2-1/2" BOLT
3	BON-000310.3	4	NYLON INSERT LOCKNUT, 1-8 UNC
4	BON-000345	4	FLAT WASHER, 1

7.11. OPTIONAL FINISHING BLADE SPLASH BOARD

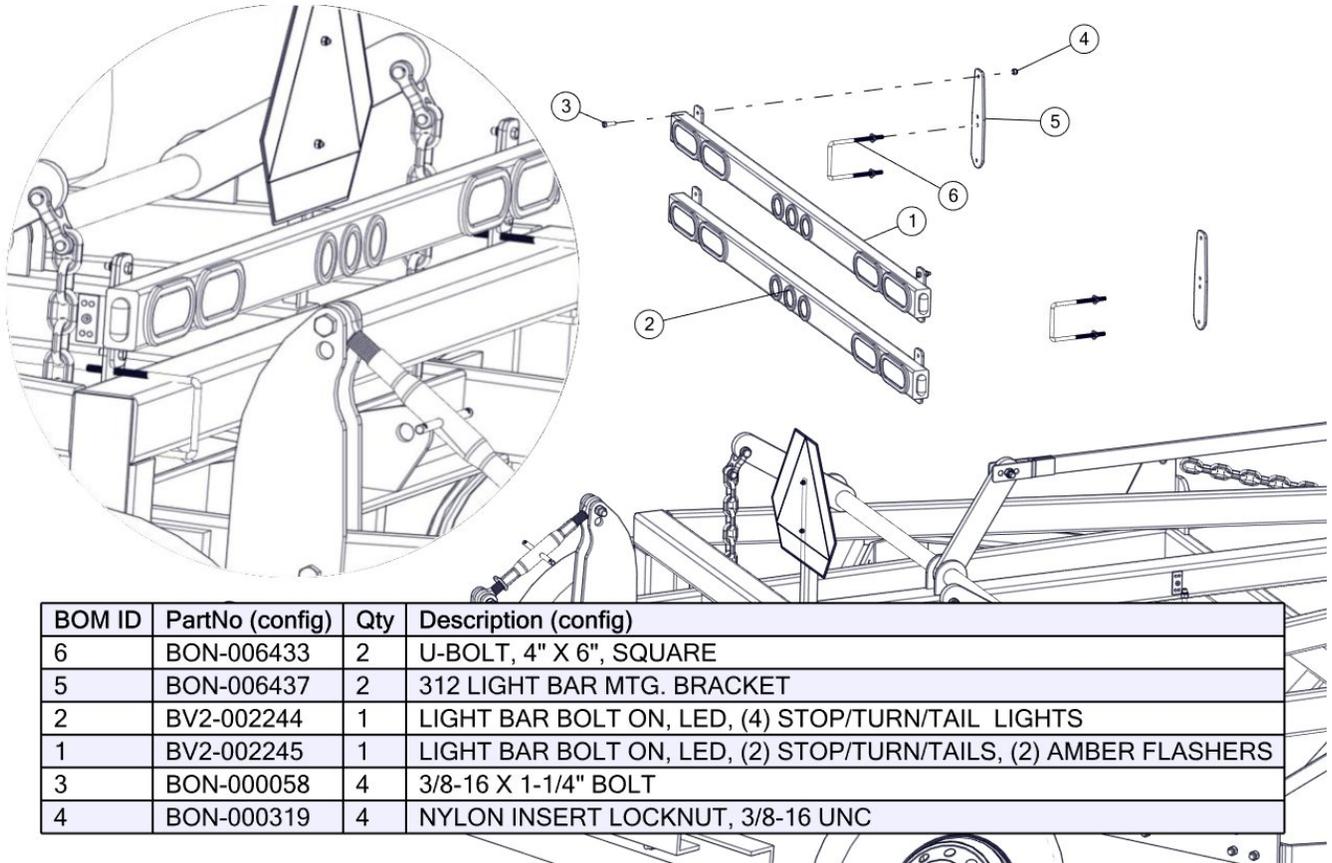
321 PERFECT ROAD MAINTAINER
 OPTIONAL FINISHING BLADE SPLASH BOARD



BOM ID	Qty	PartNo (config)	Description (config)
1	1	BON-006456	REAR SPLASH BOARD, STEEL

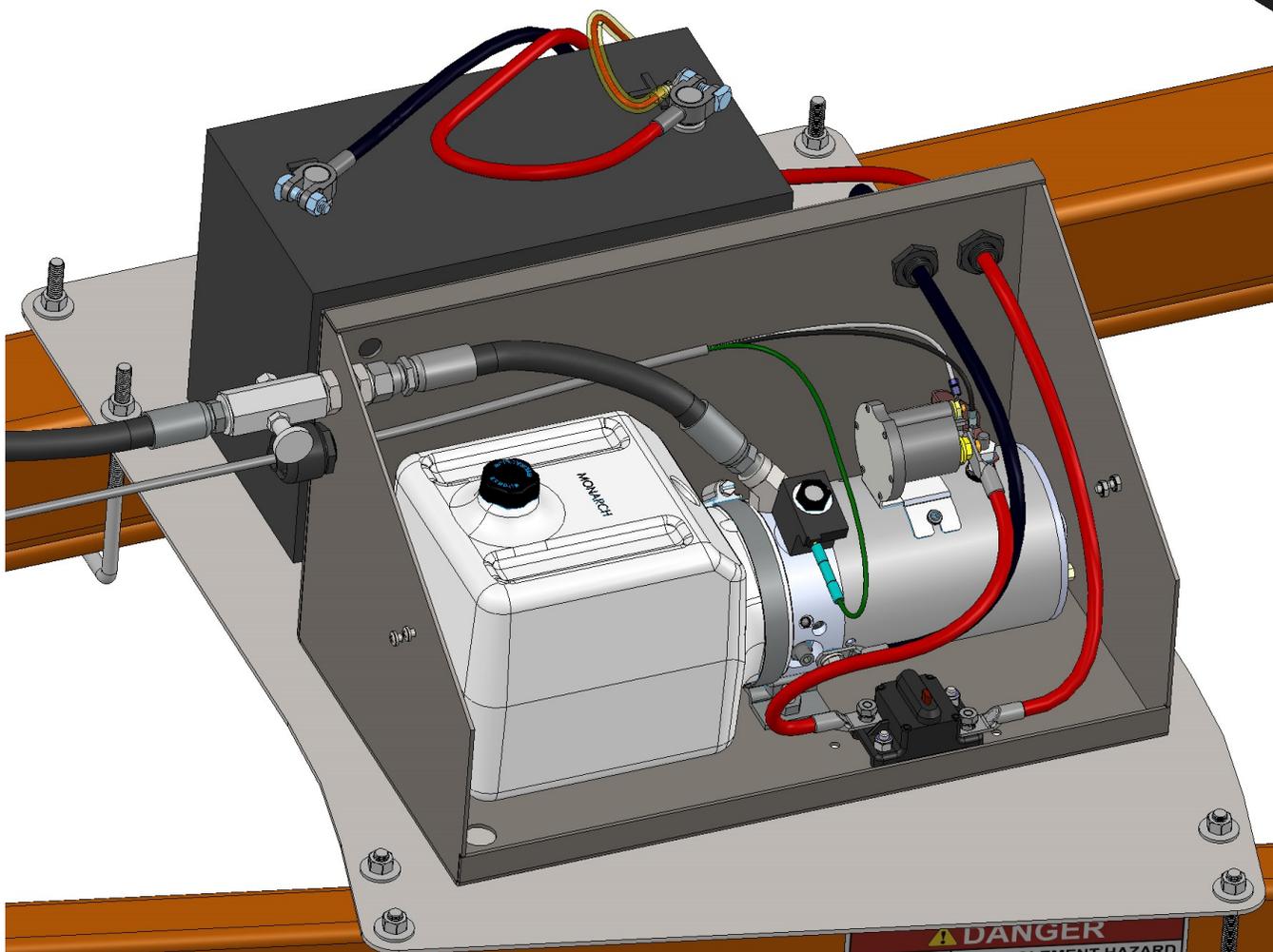
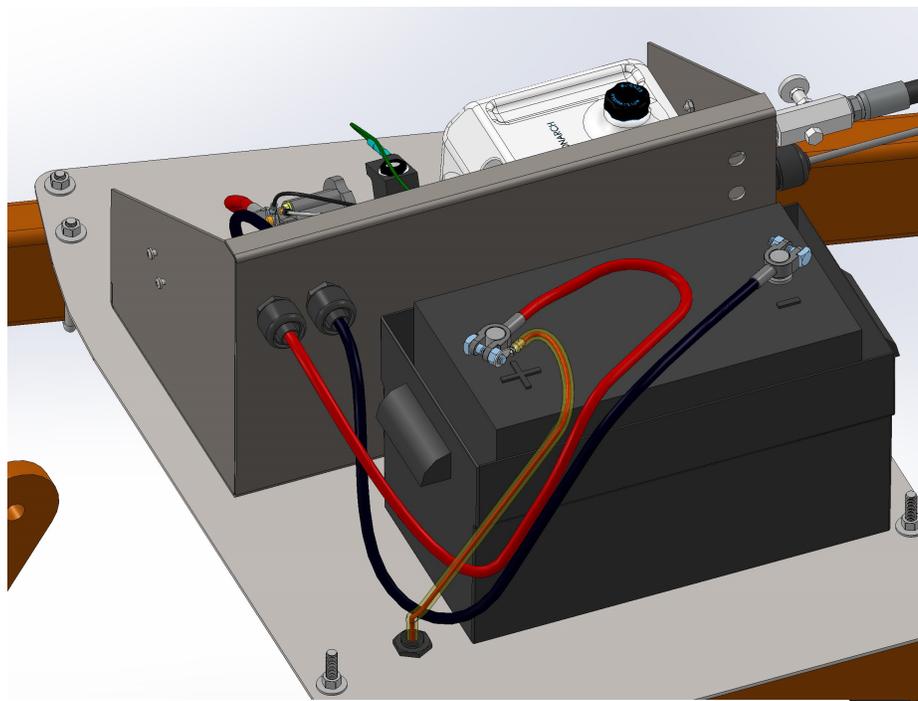
7.12. OPTIONAL LIGHT BAR

312 PERFECT ROAD MAINTAINER OPTIONAL LIGHT BAR

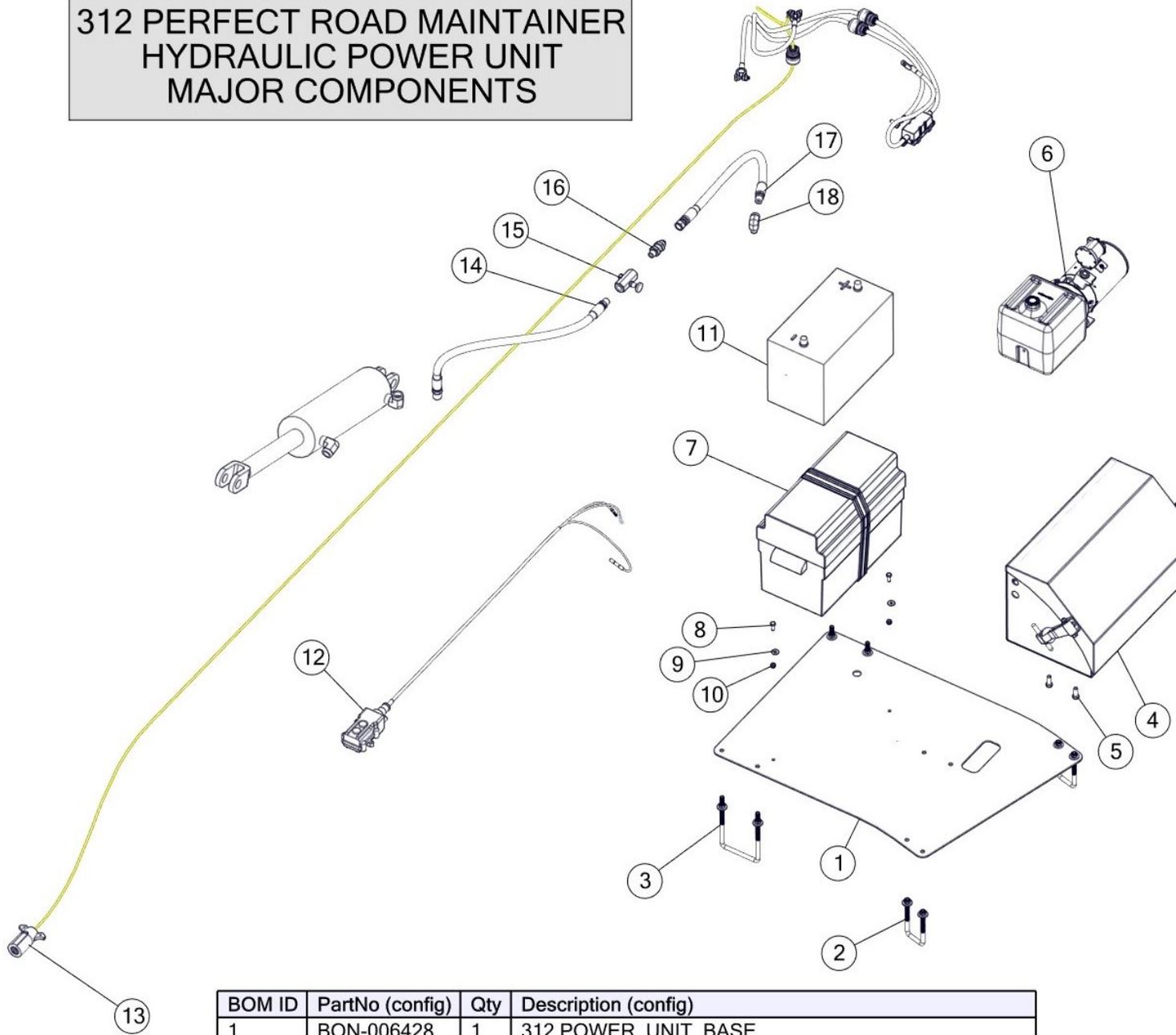


BOM ID	PartNo (config)	Qty	Description (config)
6	BON-006433	2	U-BOLT, 4" X 6", SQUARE
5	BON-006437	2	312 LIGHT BAR MTG. BRACKET
2	BV2-002244	1	LIGHT BAR BOLT ON, LED, (4) STOP/TURN/TAIL LIGHTS
1	BV2-002245	1	LIGHT BAR BOLT ON, LED, (2) STOP/TURN/TAILS, (2) AMBER FLASHERS
3	BON-000058	4	3/8-16 X 1-1/4" BOLT
4	BON-000319	4	NYLON INSERT LOCKNUT, 3/8-16 UNC

7.13. OPTIONAL HYDRAULIC POWER UNIT



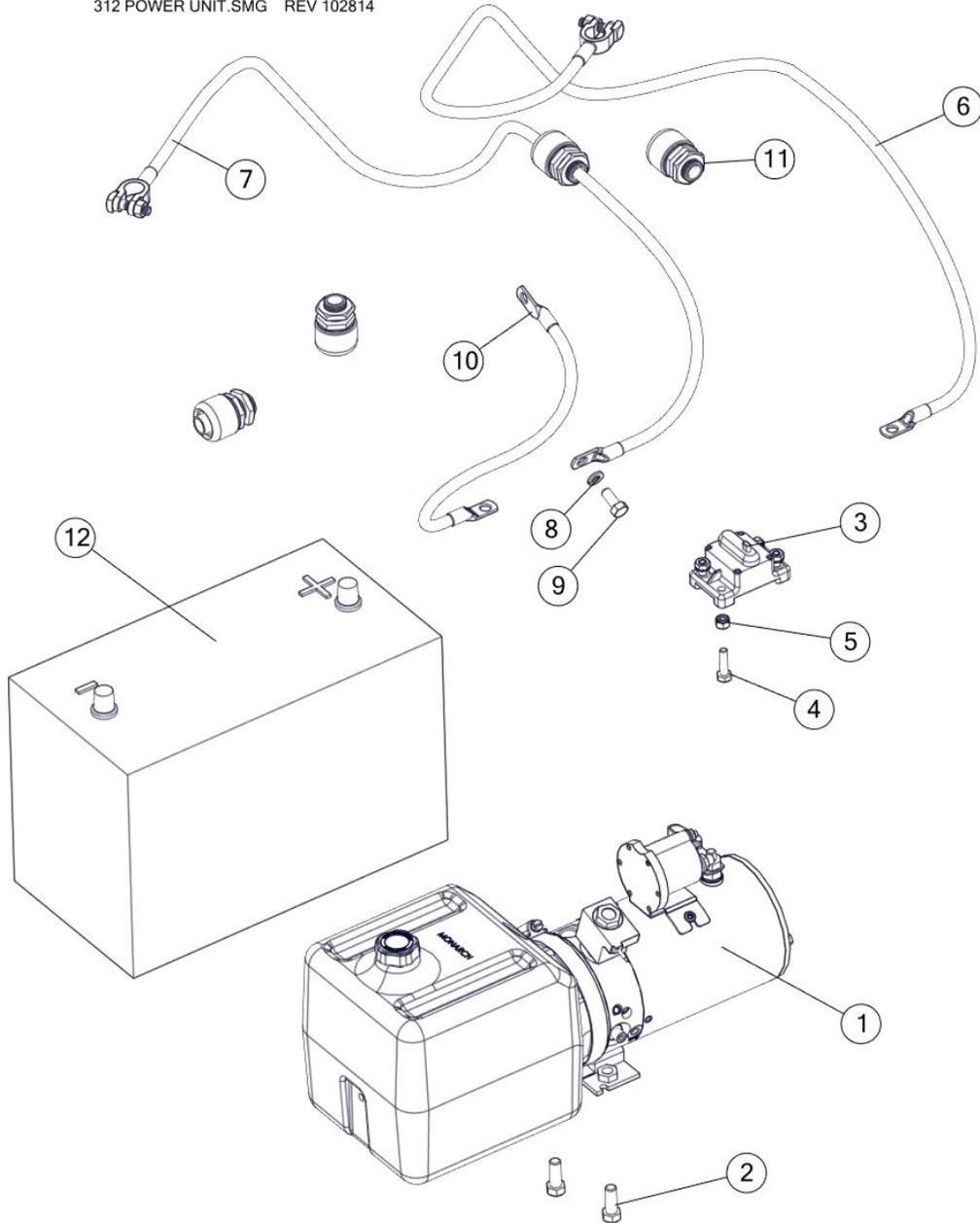
312 PERFECT ROAD MAINTAINER HYDRAULIC POWER UNIT MAJOR COMPONENTS



BOM ID	PartNo (config)	Qty	Description (config)
1	BON-006428	1	312 POWER UNIT BASE
2	BON-006432	2	U-BOLT, 2" X 4", SQUARE
3	BON-006433	2	U-BOLT, 4" X 6", SQUARE
4	LV-1433	1	SINGLE SECTION HYD. POWER UNIT ENCLOSURE
5	BON-000057	2	3/8-16 X 1" BOLT
6	BON-001504	1	HYD POWER UNIT, SINGLE FUNCTION
7	LV-1145	1	BATTERY BOX (INCLUDES TIE DOWN STRAP)
8	BON-000003	2	1/4-20 x 3/4" BOLT
9	BON-000336	2	FLAT WASHER, 1/4
10	BON-000318.5	2	NYLON INSERT LOCKNUT, 1/4-20 UNC
11	LV-1144	1	BATTERY (12VOLT)
12	MON-03240	1	PENANT CONTROL
13	BON-006449	1	312 CHARGE WIRE HARNESS WITH TRAILER PLUG
14	BON-006451	1	312 HYD HOSE, CYLINDER TO POWER UNIT
15	F 25 BK	1	FLOW CONTROL VALVE
16	2706-06-08LN	1	BULKHEAD; 3/8 MNPT X #08 37* MALE JIC
17	BON-006450	1	312 HYD HOSE, POWER UNIT TO BULKHEAD
18	25UG 06	1	MALE PIPE X 90DEG FEMALE PIPE 3/8" NPT

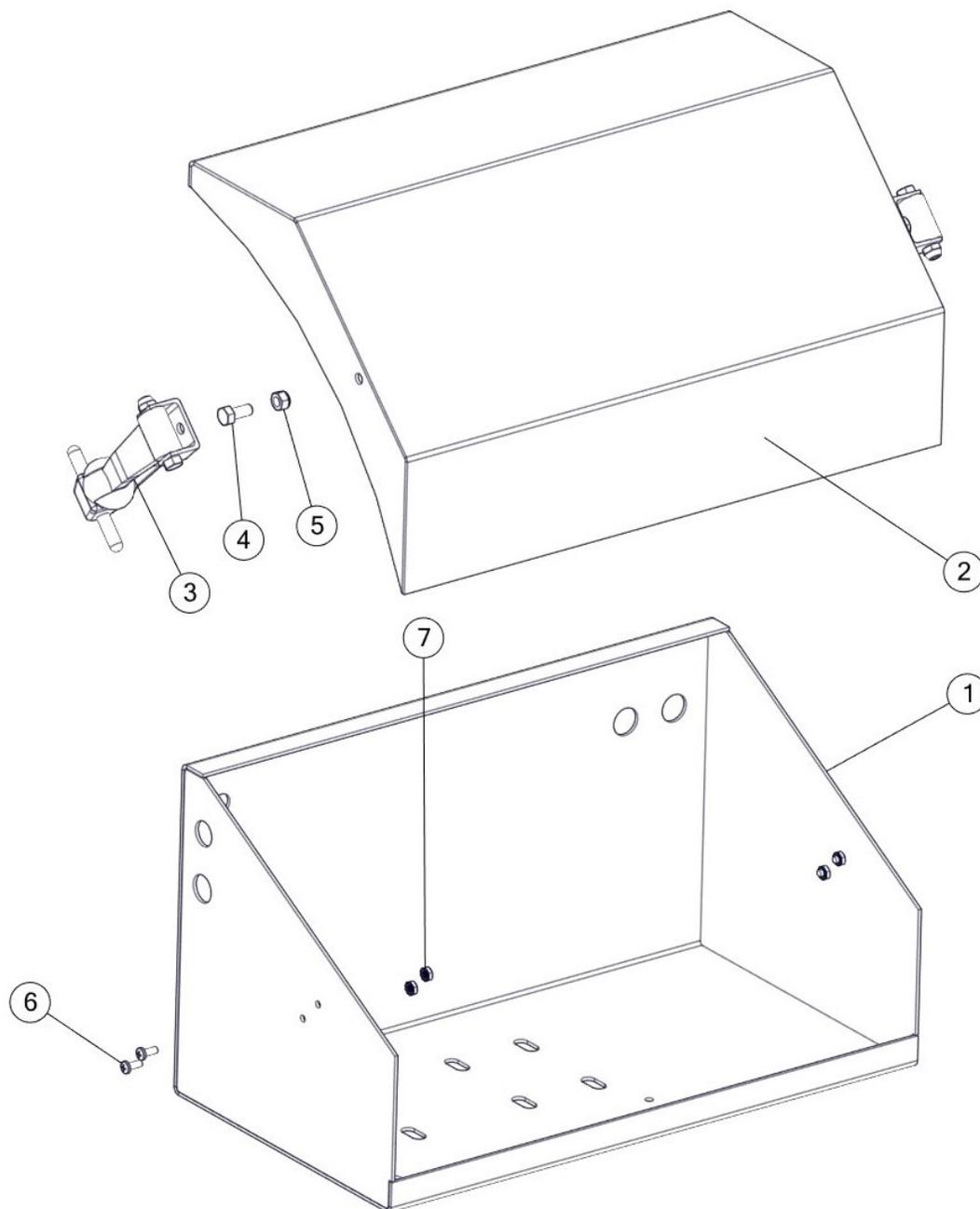
312 & 122 PERFECT ROAD MAINTAINER HYDRAULIC POWER UNIT ELECTRICAL SYSTEM

312 POWER UNIT.SMG REV 102814



BOM ID	PartNo (config)	Qty	Description (config)
1	BON-001504	1	HYD POWER UNIT, SINGLE FUNCTION
2	BON-000057	2	3/8-16 X 1" BOLT
3	BON-006592	1	CIRCUIT BREAKER, 150 AMP
4	BON-000005	2	1/4-20 x 1" BOLT
5	BON-000318.5	2	NYLON INSERT LOCKNUT, 1/4-20 UNC
6	BON-006448	1	312 CABLE, FUSE TO BATTERY
7	BON-006447	1	312 CABLE, GROUND
8	BON-000351	1	LOCK WASHER, 5/16
9	BON-000028	1	5/16-18 X 3/4" BOLT
10	BON-006446	1	312 CABLE, POWER UNIT TO FUSE
11	WAY-27262	4	THREADED LOOM FITTING, 1/2" NTP, 1/2" LOOM
12	LV-1144	1	BATTERY (12VOLT)

312 PERFECT ROAD MAINTAINER HYDRAULIC POWER UNIT ENCLOSURE



BOM ID	PartNo (config)	Qty	Description (config)
1	LV-1380	1	POWER UNIT ENCLOSURE BASE
2	LV-1381	1	POWER UNIT ENCLOSURE COVER
3	ORR-H-5800	2	LATCH
4	BON-000028	2	5/16-18 X 3/4" BOLT
5	BON-000320	2	NYLON INSERT LOCKNUT, 5/16-18 UNC
6	90675A011	4	10-24 X1/2" MACHINE SCREW
7	10-24 HEX NUT	4	10-24 HEX NUT WITH STAR WASHER

8. WARRANTY



WARRANTY

Issued: January 1, 1998

Bonnell Industries, Inc. warrants to the original purchaser that if any part of the product proves to be defective in workmanship or material within one year of the date of original installation and is returned to us freight prepaid within 30 days after such defect is discovered and notification thereof is provided Bonnell, we will either replace or repair the defective part (our option). This warranty does not apply to damage resulting from neglect, misuse, accident or improper installation or maintenance. Charges for field service, labor, or other expenses not previously authorized and approved in writing by Bonnell Industries, Inc. will not be accepted. This warranty is exclusive and in lieu of all other warranties whether expressed or implied. Bonnell Industries, Inc. neither assumes nor authorizes anyone to assume for it any other obligation or liability in connection with this warranty, and will not be liable for consequential damages. This warranty applies only to products made and/or supplied by Bonnell Industries, Inc. and does not apply to other products not made or supplied by us and to which our products may be attaches, such as trucks. We accept no responsibility for damages to such other products, even if our product is alleged to have contributed to the damage of the other product.

Hydraulic, electrical, or other components furnished by other manufacturers and used with our products are warranted by that manufacturer and not by Bonnell Industries, Inc. the manufacturer's own warranty will apply to these parts. Hydraulic or electrical components are not to be disassembled without the express written permission of Bonnell Industries, Inc.

All defective parts returned from an end user must include the unit model, serial number, date installed, and dealer from whom purchased.

Bonnell Industries, Inc. reserves the right to make changes or improvements to its products without incurring any liability or obligation and without being required to make corresponding changes or improvements to products manufactured or sold prior to those changes or improvements.

The Bonnell Industries, Inc. Warranty Policy is subject to change without notice.

Product Information

When ordering parts, please refer to the information below.

INSTALLATION DATE:

Certificate of Origin

This product was manufactured at Bonnell Industries, Inc.,
located at 1385 Franklin Grove Rd.,
in the city of Dixon, Illinois, U.S.A.

MADE IN THE USA 