

WALLENSTEIN

BY EMB MFG INC.



**SKID STEER
MOUNTED BACKHOE
SKID DIGGER
MODEL QC500/QC620
OPERATOR'S MANUAL**

WALLENSTEIN SKID STEER MOUNTED BACKHOE

WARRANTY

This product is warranted to be free of defects in materials and workmanship under normal use and service, for a period of one year from the date of purchase, when operated and maintained in accordance with the Operating and Maintenance Instructions supplied with this unit. This warranty does not cover misuse or negligence.

Under no circumstances will the manufacturer be liable for any consequential damage or expense of any kind, including loss of profits. The manufacturer is under no circumstances liable for tractor damage of any kind. The manufacturer is not liable for the maintenance of the product.

This warranty is extended only to the original purchaser. Warranty is void if repairs are attempted by anyone other than an Authorized Service Centre.

If a difficulty develops with the product, you should contact your nearest Authorized Repair Centre, or distributor. Only these locations are authorized to make repairs to the product or affect the replacement of defective parts, which will be done at no charge within a reasonable time after the receipt of the product. Unit or parts should be returned at the customer's expense to the nearest repair location or Authorized Service Centre. Damage in-transit is not covered by warranty. Include original purchase receipt with any claim (keeping a copy for your files).

The distributor's liability under warranty is limited to repair of the product and/or replacement of parts and is given to the purchaser in lieu of all other remedies including incidental and consequential charges. There are no warranties, expressed or implied other than those specified herein. For the nearest Authorized Service Centre call the manufacturer.

EMB Manufacturing Inc.
4144 Boomer Line
St. Clements, ON
N0B 2M0 Canada
Phone: 519-699-9283
Fax: 519-699-4146

WARRANTY VOID IF NOT REGISTERED

WALLENSTEIN SKID STEER MOUNTED BACKHOE

WARRANTY REGISTRATION FORM & INSPECTION REPORT

WARRANTY REGISTRATION (please print)

This form must be filled out by the dealer and signed by both the dealer and the customer at the time of delivery.

Customer's Name _____	Dealer Name _____
Address _____	Address _____
City, State/Province, Code _____	City, State/Province, Code _____
Phone Number (____) _____	Phone Number (____) _____
Contact Name _____	
Model _____	
Serial Number _____	
Delivery Date _____	

DEALER INSPECTION REPORT

Fasteners Tight
 Hydraulic Fittings Tight - No Leaks
 Hydraulic Lines Free and in Good Condition
 Bucket Moves Freely
 Lubricate Machine

SAFETY

All Decals Installed
 Reflectors Clean
 Guards and Shields Installed
 Review Operating and Safety Instructions

I have thoroughly instructed the buyer on the above described equipment which review included the Operator's Manual content, equipment care, adjustments, safe operation and applicable warranty policy.

Date _____ Dealer's Rep. Signature _____

The above equipment and Operator's Manual have been received by me and I have been thoroughly instructed as to care, adjustments, safe operation and applicable warranty policy.

Date _____ Owner's Signature _____

WHITE	YELLOW	PINK
EMB MFG., INC	DEALER	CUSTOMER

SERIAL NUMBER LOCATION

Always give your dealer the serial number of your Wallenstein Skid Steer Mounted Backhoe when ordering parts or requesting service or other information.

The machine is equipped with a serial plate where indicated. Please mark the number in the space provided for easy reference.



QC500/QC620

SERIAL NUMBER LOCATION

Model Number _____

Serial Number _____

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1 INTRODUCTION

Congratulations on your choice of an Wallenstein Skid Steer Mounted Backhoe to compliment your operation. This equipment has been designed and manufactured to meet the needs of a discerning digging, excavating or trenching industry.

Safe, efficient and trouble free operation of your Wallenstein Backhoe requires that you and anyone else who will be operating or maintaining the machine, read and understand the Safety, Operation, Maintenance and Trouble Shooting information contained within the Operator's Manual.



This manual covers the Model QC500/QC620 manufactured by Wallenstein. Use the Table of Contents or Index as a guide to locate required information.

Keep this manual handy for frequent reference and to pass on to new operators or owners. Call your Wallenstein dealer or the Distributer if you need assistance, information or additional copies of the manuals.

OPERATOR ORIENTATION - The directions left, right, front and rear, as mentioned throughout this manual, are determined when sitting in the operator's seat and facing toward the boom.

2 SAFETY

SAFETY ALERT SYMBOL

This Safety Alert symbol means
ATTENTION! BECOME ALERT!
YOUR SAFETY IS INVOLVED!



The Safety Alert symbol identifies important safety messages on the Wallenstein Skid Steer Mounted Backhoe and in the manual. When you see this symbol, be alert to the possibility of personal injury or death. Follow the instructions in the safety message.

Why is SAFETY important to you?

3 Big Reasons

Accidents Disable and Kill
Accidents Cost
Accidents Can Be Avoided

SIGNAL WORDS:

Note the use of the signal words **DANGER**, **WARNING** and **CAUTION** with the safety messages. The appropriate signal word for each message has been selected using the following guide-lines:

DANGER - Indicates an imminently hazardous situation that, if not avoided, will result in death or serious injury. This signal word is to be limited to the most extreme situations typically for machine components which, for functional purposes, cannot be guarded.

WARNING - Indicates a potentially hazardous situation that, if not avoided, could result in death or serious injury, and includes hazards that are exposed when guards are removed. It may also be used to alert against unsafe practices.

CAUTION - Indicates a potentially hazardous situation that, if not avoided, may result in minor or moderate injury. It may also be used to alert against unsafe practices.

If you have any questions not answered in this manual or require additional copies or the manual is damaged, please contact your dealer or Wallenstein, 4144 Boomer Line, St. Clements, ON, N0B 2M0. Phone (519) 669-9283 or Fax (519) 699-4146.

SAFETY

YOU are responsible for the SAFE operation and maintenance of your Wallenstein Skid Steer Mounted Backhoe. **YOU** must ensure that you and anyone else who is going to use, maintain or work around the Backhoe be familiar with the using and maintenance procedures and related **SAFETY** information contained in this manual. This manual will take you step-by-step through your working day and alerts you to all good safety practices that should be used while using the Backhoe.

Remember, **YOU** are the key to safety. Good safety practices not only protect you but also the people around you. Make these practices a working part of your safety program. Be certain that **EVERYONE** using this equipment is familiar with the recommended using and maintenance procedures and follows all the safety precautions. Most accidents can be prevented. Do not risk injury or death by ignoring good safety practices.

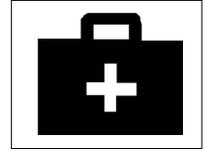
- Skid Steer Mounted Backhoe owners must give operating instructions to operators or employees before allowing them to operate the machine, and at least annually thereafter.
- The most important safety device on this equipment is a SAFE operator. It is the operator's responsibility to read and understand ALL Safety and Operating instructions in the manual and to follow these. Most accidents can be avoided.
- A person who has not read and understood all using and safety instructions is not qualified to use the machine. An untrained operator exposes himself and bystanders to possible serious injury or death.
- Do not modify the equipment in any way. Unauthorized modification may impair the function and/or safety and could affect the life of the equipment.
- Think SAFETY! Work SAFELY!

2.1 GENERAL SAFETY

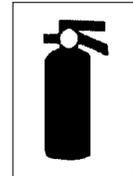
1. Read and understand the Operator's Manual and all safety signs before operating, maintaining, adjusting or servicing the Backhoe.



2. Have a first-aid kit available for use should the need arise and know how to use it.



3. Have a fire extinguisher available for use should the need arise and know how to use it.



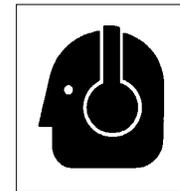
4. Do not allow riders.

5. Wear appropriate protective gear. This list includes but is not limited to:

- A hard hat
- Protective shoes with slip resistant soles
- Protective glasses, goggles or face shield
- Heavy gloves
- Wet weather gear
- Hearing Protection
- Respirator or filter mask



6. Install and secure all guards before starting.



7. Wear suitable ear protection for prolonged exposure to excessive noise.

8. Lower boom and bucket, place all controls in neutral, stop engine, remove ignition key and wait for all moving parts to stop before servicing, adjusting, repairing or maintaining.

9. Clear the area of people, especially small children, before using the unit.

10. Review safety related items annually.

2.2 EQUIPMENT SAFETY GUIDELINES

1. Safety of the operator and bystanders is one of the main concerns in designing and developing equipment. However, every year many accidents occur which could have been avoided by a few seconds of thought and a more careful approach to handling equipment. You, the operator, can avoid many accidents by observing the following precautions in this section. To avoid personal injury or death, study the following precautions and insist those working with you, or for you, follow them.
2. In order to provide a better view, certain photographs or illustrations in this manual may show an assembly with a safety shield removed. However, equipment should never be used in this condition. Keep all shields in place. If shield removal becomes necessary for repairs, replace the shield prior to use.
3. Replace any safety sign or instruction sign that is not readable or is missing. Location of such safety signs is indicated in this manual.
4. Never use alcoholic beverages or drugs which can hinder alertness or coordination while using this equipment. Consult your doctor about using this machine while taking prescription medications.
5. **Under no circumstances should young children be allowed to work with this equipment. Do not allow persons to use or assemble this unit until they have read this manual and have developed a thorough understanding of the safety precautions and of how it works.** Review the safety instructions with all users annually.
6. This equipment is dangerous to children and persons unfamiliar with its operation. The operator should be a responsible, properly trained and physically able person familiar with machinery and trained in this equipment's operations. If the elderly are assisting with work, their physical limitations need to be recognized and accommodated.
7. Never exceed the limits of a piece of machinery. If its ability to do a job, or to do so safely, is in question - **DON'T TRY IT.**
8. Do not modify the equipment in any way. Unauthorized modification may result in serious injury or death and may impair the function and life of the equipment.
9. Use a Skid Steer that is equipped with a Roll Over Protective Structure (ROPS) and a seat belt.
10. In addition to the design and configuration of this implement, including Safety Signs and Safety Equipment, hazard control and accident prevention are dependent upon the awareness, concern, prudence, and proper training of personnel involved in the operation, transport, maintenance, and storage of the machine. Refer also to Safety Messages and operation instruction in each of the appropriate sections of the engine and machine manuals. Pay close attention to the Safety Signs affixed to the skid steer and the machine.

2.3 SAFETY TRAINING

1. Safety is a primary concern in the design and manufacture of our products. Unfortunately, our efforts to provide safe equipment can be wiped out by a single careless act of an operator or bystander.
2. In addition to the design and configuration of equipment, hazard control and accident prevention are dependent upon the awareness, concern, prudence and proper training of personnel involved in the operation, transport, maintenance and storage of this equipment.
3. It has been said, "The best safety feature is an informed, careful operator." We ask you to be that kind of an operator. It is the operator's responsibility to read and understand ALL Safety and Using Instructions in the manual and to follow these. Accidents can be avoided.An illustration showing a pair of hands holding an open book, symbolizing reading and learning.
4. Working with unfamiliar equipment can lead to careless injuries. Read this manual before assembly or using, to acquaint yourself with the machine. If this machine is used by any person other than yourself, or is loaned or rented, it is the machine owner's responsibility to make certain that the operator, prior to using:
 - a. Reads and understands the operator's manuals.
 - b. Is instructed in safe and proper use.
5. Know your controls and how to stop power unit engine and machine quickly in an emergency. Read this manual and the one provided with your skid steer.
6. Train all new personnel and review instructions frequently with existing workers. Be certain only a properly trained and physically able person will use the machinery. A person who has not read and understood all using and safety instructions is not qualified to use the machine. An untrained operator exposes himself and bystanders to possible serious injury or death. If the elderly are assisting with the work, their physical limitations need to be recognized and accommodated.

2.4 SAFETY SIGNS

1. Keep safety signs clean and legible at all times.
2. Replace safety signs that are missing or have become illegible.
3. Replaced parts that displayed a safety sign should also display the current sign.
4. Safety signs displayed in Section 3 each have a part number in the lower right hand corner. Use this part number when ordering replacement parts.
5. Safety signs are available from your authorized Distributor or Dealer Parts Department or the factory.

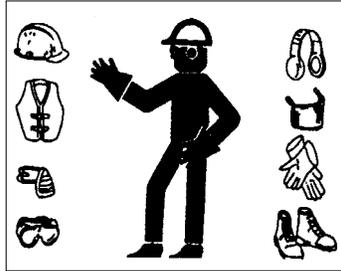
How to Install Safety Signs:

- Be sure that the installation area is clean and dry.
- Be sure temperature is above 50°F (10°C).
- Determine exact position before you remove the backing paper.
- Remove the smallest portion of the split backing paper.
- Align the sign over the specified area and carefully press the small portion with the exposed sticky backing in place.
- Slowly peel back the remaining paper and carefully smooth the remaining portion of the sign in place.
- Small air pockets can be pierced with a pin and smoothed out using the piece of sign backing paper.

2.5 PREPARATION

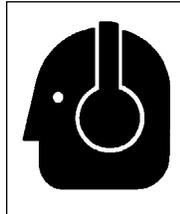
1. Never use the engine and machine until you have read and completely understand this manual, the Skid steer Operator's Manual and each of the Safety Messages found on the safety signs on the skid steer and machine.

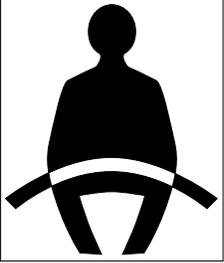
2. Personal protection equipment including hard hat, safety glasses, safety shoes, and gloves are recommended during assembly, installation, operation, adjustment, maintaining, repairing, removal, cleaning, or moving the unit. Do not allow long hair, loose fitting clothing or jewelry to be around equipment.



3. **PROLONGED EXPOSURE TO LOUD NOISE MAY CAUSE PERMANENT HEARING LOSS!**

Power equipment with or without equipment attached can often be noisy enough to cause permanent, partial hearing loss. We recommend that you wear hearing protection on a full-time basis if the noise in the Operator's position exceeds 80db. Noise over 85db on a long-term basis can cause severe hearing loss. Noise over 90db adjacent to the Operator over a long-term basis may cause permanent, total hearing loss. **NOTE:** Hearing loss from loud noise (from tractors, chain saws, radios, and other such sources close to the ear) is cumulative over a lifetime without hope of natural recovery.



4. Operate the machine only with a skid steer equipped with an approved Roll-Over-Protective Structure (ROPS). Always wear your seat belt when operating the skid steer. Serious injury or even death could result from falling off the skid steer - - particularly during a turnover when the operator could be pinned under the ROPS or the skid steer.
- 
5. Review maps of underground utilities before starting to dig. Remove all sticks, stones, roots, and wires from working area before starting. Take care not to contact overhead and underground obstructions during operation.
 6. Keep boom and bucket away from overhead and underground power lines. Electrocutation can occur without direct contact with an overhead power line.
 7. Operate only in daylight or good artificial light.
 8. Be sure machine is properly mounted, adjusted and in good operating condition.
 9. Ensure that all safety shielding and safety signs are properly installed and in good condition.

2.6 OPERATING SAFETY

1. Please remember it is important that you read and heed the safety signs on the Backhoe. Clean or replace all safety signs if they cannot be clearly read and understood. They are there for your safety, as well as the safety of others. The safe use of this machine is strictly up to you, the operator.
2. All things with moving parts are potentially hazardous. There is no substitute for a cautious, safe-minded operator who recognizes potential hazards and follows reasonable safety practices. The manufacturer has designed this Backhoe to be used with all its safety equipment properly attached, to minimize the chance of accidents. Study this manual to make sure you have all safety equipment attached.
3. If a safety shield or guard is removed for any reason, it must be replaced before the machine is again operated.
4. Always lock face plate to front of loader when attaching to prevent movement during operation.
5. Review maps of underground utilities before starting to dig. Remove all sticks, stones, roots, and wires from working area before starting. Take care not to contact overhead and underground obstructions during operation.
6. Never operate controls from the ground. Operate only from the operator's seat to prevent unexpected boom movement that can lead to crushing between frame members.
7. Do not dig under machine. A cave-in could result and the machine could fall into the excavation.
8. Keep boom and bucket away from overhead and underground power lines. Electrocutation can occur without direct contact with an overhead power line.
9. Do not exceed machine lift capacity. Overloading can cause structural damage and lead to unsafe operating conditions.
10. Position Backhoe so that loads extend directly in front of machine when lifting or placing heavy objects.
11. Never carry, lift or move people on boom or bucket.
12. Always use two people to handle heavy, unwieldy components during assembly, installation, removal or moving.
13. Never place any part of your body where it would be in danger if movement should occur during assembly, installation, operation, maintaining, repairing, removal or moving.
14. Do not walk or work under a raised machine or attachment unless it is securely blocked or held in position. Do not depend on the skid steer hydraulic system to hold the machine or attachment in place.
15. Never use alcoholic beverages or drugs which can hinder alertness or coordination while operating this equipment. Consult your doctor about operating this machine while taking prescription medications.
16. Do not allow riders on this machine at any time. There is no safe place for any riders.
17. Before you operate the machine, check over all hydraulic lines, hoses, connections and components. Replace any worn or damaged parts immediately. Tighten all leaking fittings.
18. Keep hands, feet, hair, jewelry, and clothing away from all moving and/or rotating parts.
19. Review safety instructions annually.

2.7 TRANSPORT SAFETY

1. Comply with state and local laws governing safety and transporting of machinery on public roads.
2. The use of flashing amber lights is acceptable in most localities. However some localities prohibit their use. Local laws should be checked for all highway lighting and marking requirements.
3. At all times, when driving the tractor and equipment on the road or highway under 20 mph (32 kph) use flashing amber warning lights and a slow moving vehicle (SMV) identification emblem. Do not exceed 20 mph (32 kph). Reduce speed on rough roads and surfaces.
4. Plan your route to avoid heavy traffic.
5. Do not drink and drive.
6. Be a safe and courteous driver. Always yield to oncoming traffic in all situations, including narrow bridges, intersections, etc. Watch for traffic when operating near or crossing roadways.
7. Turn into curves or go up or down hills only at a low speed and a gradual steering angle. Slow down on rough or uneven ground.
8. Never allow riders on either skid steer or machine.

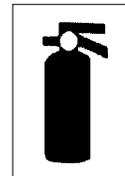
2.8 MAINTENANCE SAFETY

1. Good maintenance is your responsibility. Poor maintenance is an invitation to trouble.
2. Follow good shop practices.

- Keep service area clean and dry.
- Be sure electrical outlets and tools are properly grounded.
- Use adequate light for the job at hand.



3. Make sure there is plenty of ventilation. Never operate the tractor in a closed building. The exhaust fumes may cause asphyxiation.
4. Before working on this machine, lower the boom / bucket to the ground, place all controls in neutral, shut off the engine, set the park brake and remove the ignition key.
5. Never work under equipment unless it is blocked securely.
6. Use personal protection devices such as eye, hand and hearing protectors, when performing any service or maintenance work.
7. Where replacement parts are necessary for periodic maintenance and servicing, genuine factory replacement parts must be used to restore your equipment to original specifications. The manufacturer will not be responsible for injuries or damages caused by use of unapproved parts and/or accessories.

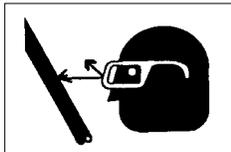


8. A fire extinguisher and first aid kit should be kept readily accessible while performing maintenance on this equipment.
9. Periodically tighten all bolts, nuts and screws and check that all fasteners are properly torqued.
10. When completing a maintenance or service function, make sure all safety shields and devices are installed before placing unit in service.

2.9 HYDRAULIC SAFETY

1. Make sure that all the components in the hydraulic system are kept in good condition and are clean.
2. Before applying pressure to the system, make sure all components are tight, and that lines, hoses and couplings are not damaged.
3. Do not attempt any makeshift repairs to the hydraulic lines, fittings or hoses by using tapes, clamps or cements. The hydraulic system operates under extremely high pressure. Such repairs will fail suddenly and create a hazardous and unsafe condition.

4. Wear proper hand and eye protection when searching for a high pressure hydraulic leak. Use a piece of wood or cardboard as a backstop instead of hands to isolate and identify a leak.



5. If injured by a concentrated high-pressure stream of hydraulic fluid, seek medical attention immediately. Serious infection or toxic reaction can develop from hydraulic fluid piercing the skin surface.
6. Relieve pressure on hydraulic system before maintaining or working on system.

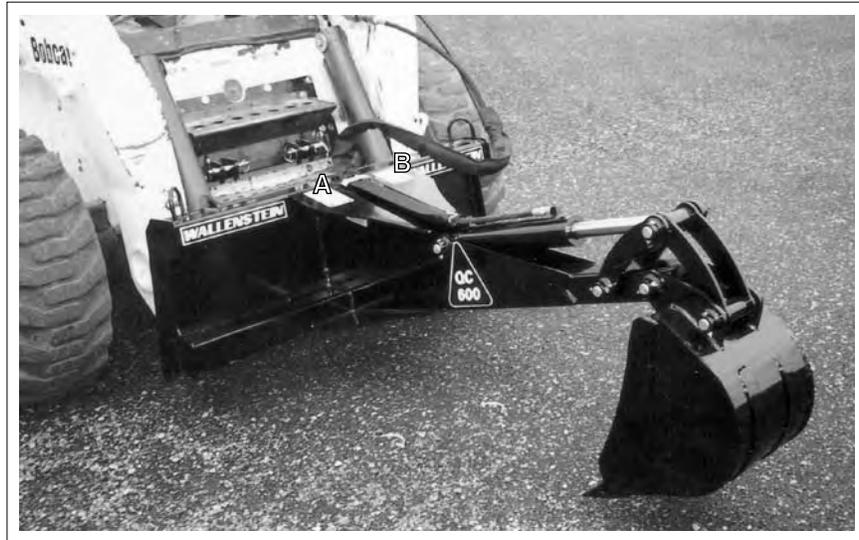
2.10 STORAGE SAFETY

1. Store the unit in an area away from human activity.
2. Do not allow children to play on or around the stored machine.
3. Store the unit in a dry, level area. Support the frame with planks if required.

3 SAFETY SIGN LOCATIONS

The types of safety signs and locations on the equipment are shown in the illustrations that follow. Good safety requires that you familiarize yourself with the various safety signs, the type of warning and the area, or particular function related to that area, that requires your SAFETY AWARENESS.

- Think SAFETY! Work SAFELY!



A



CAUTION



- Read and understand Operator's Manual before using.
- Lower boom, place all controls in neutral, stop engine, remove ignition key and wait for all moving parts to stop before servicing, adjusting, repairing or maintaining.
- Mount backhoe securely to tractor frame with the top link replaced with the anchor support end and the tractor side frame plates if required.
- Extend stabilizers to level frame and support weight during operation.
- Stay away from underground and overhead utilities. Review utility location before starting.
- Do not dig under stabilizers to prevent cave in.
- Do not operate backhoe while standing on the ground.
- Stand back at least 20 ft. (6m) when engine is running. Keep others away.
- Do not move or carry people on boom or bucket.
- Do not overload lift capacity.
- Install boom lock pins before transporting.
- Review safety instructions annually. #Z94036

B



DANGER







MOVING BOOM HAZARD
KEEP AWAY

To prevent serious injury or death from moving boom:

- Lower boom, place all controls in neutral, stop tractor engine, set park brake, remove ignition key and wait for all moving parts to stop before servicing, adjusting, repairing or unplugging.
- Stand back at least 20 ft. (6m) when engine is running.
- Keep others away.

#Z94037

REMEMBER - If safety signs have been damaged, removed, become illegible or parts replaced without safety signs, new signs must be applied. New safety signs are available from your authorized dealer.

4 OPERATION



OPERATING SAFETY

1. Please remember it is important that you read and heed the safety signs on the Backhoe.
2. Always lock face plate to front of loader when attaching to prevent movement during operation.
3. Review maps of underground utilities before starting to dig. Remove all sticks, stones, roots, and wires from working area before starting. Take care not to contact overhead and underground obstructions during operation. Remember; electrocution can occur without direct contact with power lines.
5. Never operate controls from the ground. Operate only from the operator's seat to prevent unexpected boom movement that can lead to crushing between frame members.
6. Do not dig under machine. A cave-in could result and the machine could fall into the excavation.
7. Do not exceed machine lift capacity. Overloading can cause structural damage and lead to unsafe operating conditions.
8. Position Backhoe so that loads extend directly in front of machine when lifting or placing heavy objects.
9. Never carry, lift or move people on boom or bucket.
10. Always use two people to handle heavy, unwieldy components during assembly, installation, removal or moving.
11. Never place any part of your body where it would be in danger if movement should occur during assembly, installation, operation, maintaining, repairing, removal or moving.
12. Do not walk or work under a raised machine or attachment unless it is securely blocked or held in position. Do not depend on the skid steer hydraulic system to hold the machine or attachment in place.
13. Do not allow riders on this machine at any time. There is no safe place for any riders.
14. Before you operate the machine, check over all hydraulic lines, hoses, connections and components. Replace any worn or damaged parts immediately. Tighten all leaking fittings.
15. Do not allow anyone who is not familiar with the safety rules and operating instructions use this machine. Review safety instructions annually.

4.1 TO THE NEW OPERATOR OR OWNER

The Wallenstein Skid Digger Backhoe is a medium duty machine that attaches to the loader on a skidsteer and can be used for all light to medium duty digging, trenching and excavating. Be familiar with the machine before starting.

It is the responsibility of the owner or operator to read this manual and to train all other operators before they start working with the machine. Follow all safety instructions exactly. Safety is everyone's business. By following recommended procedures, a safe working environment is provided for the operator, bystanders and the area around the work site. Untrained operators are not qualified to use the machine.

Follow all safety instructions exactly. Safety is everyone's business. By following recommended procedures, a safe working environment is provided for the operator, bystanders and the area around the work site. Untrained operators are not qualified to operate the machine.

Many features incorporated into this machine are the result of suggestions made by customers like you. Read this manual carefully to learn how to use the Backhoe safely and how to set it to provide maximum field efficiency. By following the using instructions in conjunction with a good maintenance program, your Backhoe will provide many years of trouble-free service.

4.2 MACHINE COMPONENTS

The Wallenstein Skid Steer Mounted Backhoe attaches to the loader face plate of a skid steer.

Power to operate the hydraulics is provided by the skid steer hydraulics. The machine controls are part of the skid steer.

The boom frame mounts rigidly to the loader face plate and boom movement/motion is controlled by switches on the hand control in the cab.

Each skid steer must be equipped with the optional hydraulic outlets on the front of the frame.

- A Main Frame
- B Boom
- C Bucket
- D Hydraulic Pump Outlet
- E Face Plate Mounting Bracket

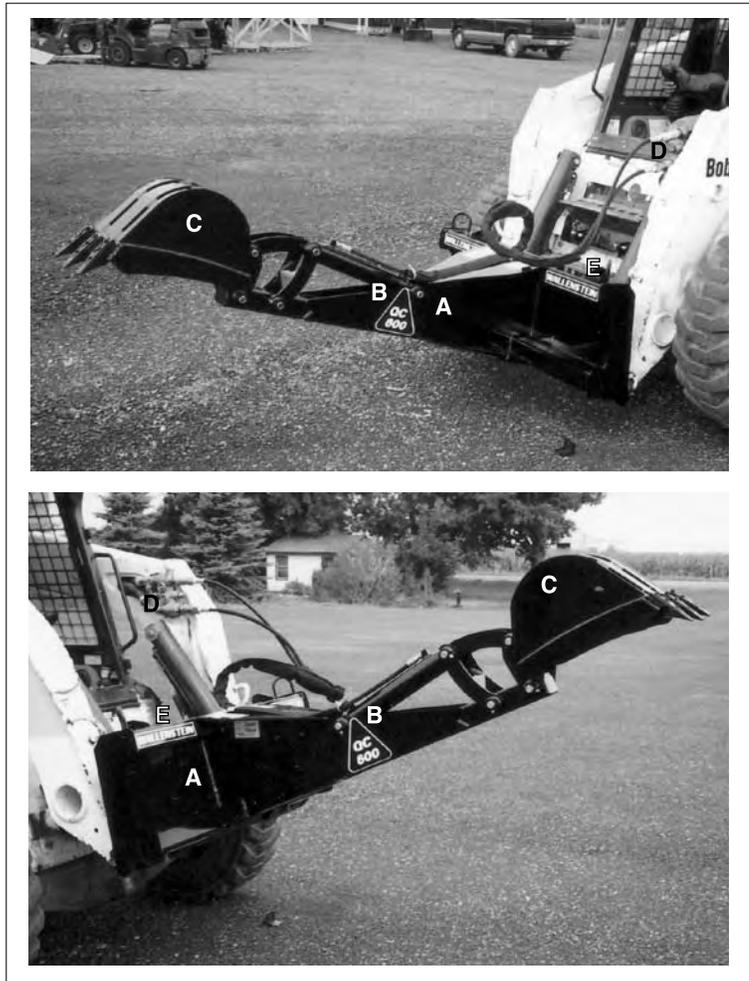


Fig. 1 MACHINE COMPONENTS

4.3 MACHINE BREAK-IN

Although there are no operational restrictions on the Backhoe when used for the first time, it is recommended that the following mechanical items be checked:

A. After operating for 1/2 hour:

1. Check all nuts, bolts and other fasteners. Tighten to their specified torque.
2. Check that the bucket is in good condition and pinned securely to the boom.
3. Check the condition of all hydraulic lines, hoses and fittings. Replace any that are damaged. Re-route those that are rubbing, pinched or crimped. Tighten any fitting that is leaking.
4. Check the condition of the teeth on the bucket. Replace any that are bent, chipped, broken or missing.
5. Check the oil level in the hydraulic reservoir in the skid steer. Add as required.
6. Check the boom, dipper and bucket.

4.4 PRE-OPERATION CHECKLIST

Efficient and safe operation of the Backhoe requires that each operator reads and understands the operating procedures and all related safety precautions outlined in this section. A pre-operation checklist is provided for the operator. It is important for both the personal safety and maintaining good mechanical condition that this checklist is followed.

Before operating the machine and each time thereafter, the following areas should be checked off:

1. Lubricate the machine per the schedule outline in Section 5 Service and Maintenance.
2. Use only a skid steer of adequate power and weight to operate the machine.
3. Check that the machine is properly attached to the skid steer. Be sure the lock pins on the loader face plate are fully engaged to secure the backhoe to the loader.
4. Check the oil in the reservoir of the skid steer. Add as required.
5. Check the condition of all hydraulic lines, hoses and fittings. Replace any that are damaged. Re-route those that are rubbing, pinched or crimped. Tighten any fitting that is leaking.
6. Check the condition of the teeth on the bucket. Replace any that are bent, chipped, broken or missing.
7. Check all parts for entangled material. Remove entangled material.
8. Install and secure all guards, doors and covers before starting.
9. Review the "controls" section in the skid steer operator's manual to be familiar with the control settings and functions before operating machine.

4.5 EQUIPMENT MATCHING

To insure the safe and reliable operation of the Backhoe, it is necessary to use a tractor with the correct specifications. Use the following list as a guide in selecting a tractor to use on the machine.

1. Horsepower:

Although horsepower is not required to operate the backhoe, it does establish the total weight for machine stability. Do not exceed the backhoe power specifications.

2. Tractor Weight:

By following the recommendations for the tractor power, the tractor will have sufficient weight to provide stability for the unit when digging or transporting.

3. Hydraulic System:

The skid steer hydraulic system must be capable of 5 gpm (19 lpm) a 2000 psi (13,800 kPa). The backhoe requires 2 circuits: one for the dipper and one for the bucket.

Table 1: Model vs. Skid Steer HP

Model	Recommended Tractor Horsepower
QC620	50 - 65

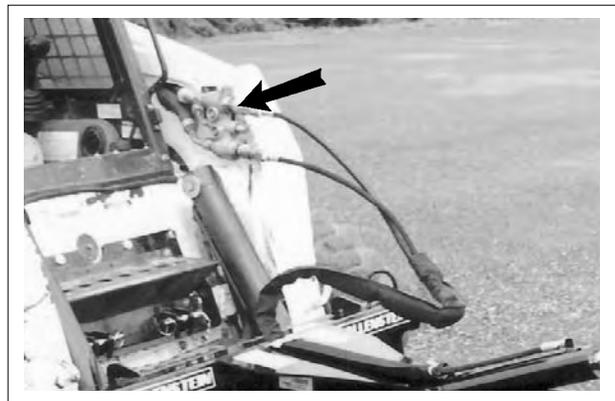


Fig. 2 HYDRAULIC OUTLETS (typical)

4.6 CONTROLS

Always review the "controls" section of the Skid Steer operator's manual to be familiar with the location, settings and function of the controls. Be familiar with the controls before starting.

4.7 ATTACHING / UNHOOKING SKID STEER

The machine is shipped from the factory in a basic, universal configuration that allows it to be mounted to any model skid steer. However, the skid steer must be equipped with a remote hydraulic outlet on the front of the cab frame.

The Backhoe should always be located on a level, dry area that is free of debris and other foreign objects. When attaching the Backhoe to the tractor, follow this procedure:

1. Make sure that all bystanders, especially small children are clear of the work area.
2. Make sure there is enough room and clearance to safely drive up to the backhoe.
3. Drive up to the backhoe while aligning the mounting components.



Fig. 3 MACHINE



Face Plate



Mating

Fig. 4 ALIGNING

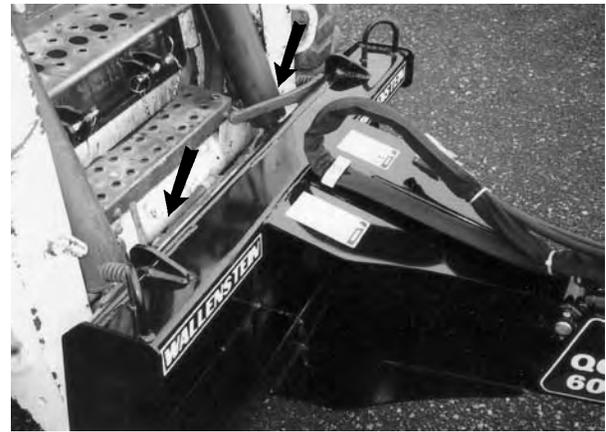
4. **Secure the mounting:**

- a. Drive into the mounting frame.
- b. Seat the top of the face plate into the frame of the backhoe.
- c. Raise the loader and tilt the face plate until it is fully mated.



Mated

5. Engage the lock pins to secure the backhoe to the loader.



Latched

Fig. 5 MOUNTING

6. **Connect the hydraulics:**

NOTE

Clip the plastic ties securing the hoses for shipping if this is the first time the backhoe is mounted.

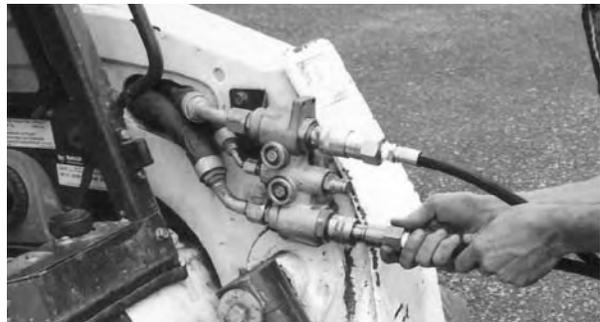
- a. Use a clean rag or paper towel to clean the dirt from the couplers on the hose ends of the skid steer.
- b. Connect the hoses to the skid steer couplers. Be sure the couplers are securely seated.
- c. Route and secure the hoses along the frame with clips, tape or plastic ties to prevent binding and pinching. Be sure to provide slack for tilting.



Hoses



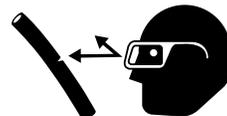
Coupler



Connected

Fig. 6 HYDRAULICS

WARNING



HIGH PRESSURE FLUID HAZARD
To prevent serious injury or death from high-pressure fluid:

- Relieve pressure on system before repairing or adjusting.
- Wear proper hand and eye protection when searching for leaks. Use wood or cardboard instead of hands.
- Keep all components in good repair.

7. Raise the boom and bucket.



Fig. 7 MOUNTED

8. Reverse the above procedure when unhooking.
9. Place planks or boards under the bucket and frame for extra support if required.

4.8 FIELD OPERATION



OPERATING SAFETY

1. Please remember it is important that you read and heed the safety signs on the Backhoe.
2. Always lock face plate to front of loader when attaching to prevent movement during operation.
3. Review maps of underground utilities before starting to dig. Remove all sticks, stones, roots, and wires from working area before starting. Take care not to contact overhead and underground obstructions during operation. Remember; electrocution can occur without direct contact with power lines.
5. Never operate controls from the ground. Operate only from the operator's seat to prevent unexpected boom movement that can lead to crushing between frame members.
6. Do not dig under machine. A cave-in could result and the machine could fall into the excavation.
7. Do not exceed machine lift capacity. Overloading can cause structural damage and lead to unsafe operating conditions.
8. Position Backhoe so that loads extend directly in front of machine when lifting or placing heavy objects.
9. Never carry, lift or move people on boom or bucket.
10. Always use two people to handle heavy, unwieldy components during assembly, installation, removal or moving.
11. Never place any part of your body where it would be in danger if movement should occur during assembly, installation, operation, maintaining, repairing, removal or moving.
12. Do not walk or work under a raised machine or attachment unless it is securely blocked or held in position. Do not depend on the skid steer hydraulic system to hold the machine or attachment in place.
13. Do not allow riders on this machine at any time. There is no safe place for any riders.
14. Before you operate the machine, check over all hydraulic lines, hoses, connections and components. Replace any worn or damaged parts immediately. Tighten all leaking fittings.
15. Do not allow anyone who is not familiar with the safety rules and operating instructions use this machine. Review safety instructions annually.

Follow this procedure when using the Backhoe:

1. Prepare the Skid Steer and Backhoe (refer to section 4.7)
2. Attach Backhoe to the skid steer (refer to Section 4.8).
3. Review and follow the pre-operation checklists (refer to Section 4.4).
4. Review the location and function of all controls (refer to Section 4.5)
5. Review the work site and plan the project before starting.
6. Transport the Backhoe to the worksite (refer to Section 4.10).

7. **Training:**

Each operator must be trained in the proper operating procedures prior to being allowed to operate the machine.

- a. Review control location, function and movement directions.
- b. Move the unit to a large open area to allow the operator to become familiar with control function and machine response.
- c. When a new operator is familiar and comfortable with the machine, they can proceed with the work. Do not allow untrained operators to use the machine. They can endanger themselves and others or damage property and the machine.



Fig. 8 TRAINING

8. **Job Site:**

It is the responsibility of the operator to be thoroughly familiar with the work site prior to starting. Prevent the chance or possibility of problems or accidents by not being in the situation to start with. Some items the operators should check include but are not limited to:

- a. Underground wires, cables, pipes or other obstructions if digging. Contact your local utility to identify exactly the location of the lines, pipes, etc. Turn off, disconnect, etc. as required to prevent a problem if contact is made.
- b. Overhead power lines, obstructions or overhangs. Power lines can lead to electrocution if the machine gets too close without contacting the line. Overhead obstructions can cause a loss of control or tipping from the contact. Overhangs can collapse or give way covering the machine or causing it to move as the footing gives way.

- c. Close or cramped work site. Be sure there is sufficient space and clearance for the machine to dig, swing and dump while working. If the working area is cramped, modify the work site to provide more area. Unplanned contact with adjacent buildings, equipment or terrain can cause the operator to lose control of the machine leading to injury or damage to buildings or equipment

d. **Working Lay-Out:**

Organize the work site to minimize the distance the support equipment has to travel between digging and dumping. The shorter the travel distance the faster the dig / dump cycle will be and the more that can be done.

e. **Prevailing Winds:**

Set-up the work site so the prevailing winds will blow dust, dirt, straw, chaff, debris, snow, etc. away from the air intakes for the engine and cooling system. As a result, there will be less need to clean these systems and more time can be spent working.

f. **Smooth the Surfaces:**

A rough surface will require slow speeds of support equipment while working. Smoothing the surface prior to starting to work will shorten the work cycle and result in higher productivity.

9. **Machine Placement:**

It is the responsibility of the operator to review the work site layout and how to best position the machine. Items to consider include but are not limited to:

a. **Working Inside a Building:**

Some jobs require that the backhoe be operated inside a building. The machine can be operated inside a building providing that the engine exhaust is piped outside and/or there is adequate ventilation. Gas and diesel engines produce carbon monoxide that can asphyxiate operators and bystanders if not supplied with fresh air. Do not take chances with carbon monoxide poisoning.

b. **Bystanders:**

Do not place the backhoe where there will be any bystanders, on-lookers or unauthorized personnel. Stop the machine whenever unauthorized personnel enter the working area. Unauthorized personnel can get in the way or get pinched / caught by components. Do not resume work until the unauthorized people have left.

c. **Slopes:**

Slopes have special placement requirements when locating the machine. The machine is designed to carry the operating loads when the frame is vertical.

Swing the boom up the slope when dumping the bucket to minimize the chance of tipping. Always keep the bucket close to the ground when swinging the boom to reduce tipping loads.



Fig. 9 WORKING

10. Lower the loader to move the backhoe closer to the ground.



Fig. 10 STARTING/STOPPING

11. Starting:

- a. Start the skid steer engine (refer to skid steer manual).
- b. Turn on hydraulic circuit to provide oil to the bucket cylinder.
- c. Increase engine speed to mid or 3/4 RPM range.
- d. Proceed with the work.

12. Stopping:

- a. Lower the dipper / bucket to the ground.
- b. Place all controls in neutral.
- c. Slow the engine to idle.
- d. Turn the hydraulic circuit OFF.
- j. Shut off engine.

13. Emergency Stopping:

In case of an emergency, lower the dipper / bucket to the ground and stop engine. Be sure to resolve and correct the emergency situation before resuming work. Do not take chances in an emergency.

14. Digging Action:

a. Digging With Boom:

- i. Use the loader face plate and bucket cylinder to set the bucket at the appropriate angle.

NOTE

Be sure the boom angle is set so that the heel of the bucket does not hit the bottom of the hole.

- ii. Tilt the face plate to pull the bucket through the soil until it is full.
- iii. Raise the loader and tilt the bucket.

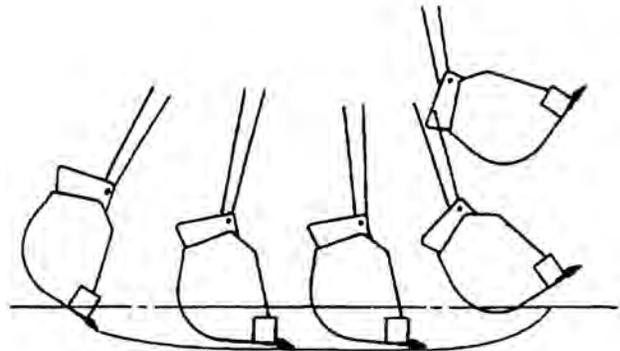


Fig. 11 DIGGING WITH BOOM

b. Digging With Bucket:

This is the procedure recommended when a vertical wall is desired at the end of a trench.

- i. Use the loader face plate to set the bucket angle for digging.
- ii. Use the loader face plate/boom to force the bucket into the ground.
- iii. Use the boom to force the bucket further into the ground and at the same time roll the bucket back (curl) until it is full.
- iv. Raise the boom and dump the bucket.
- v. Continue to dig in the same way by digging 3 to 6 inches (75 to 150 mm) deeper each time.

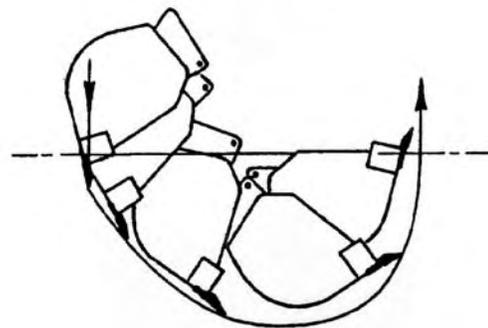


Fig. 12 DIGGING WITH BUCKET

15. Emptying Bucket:

- a. Raise the loader to lift the bucket above the ground.
- b. Turn skid steer until the bucket is over the dumping area.

NOTE

It may be necessary to back away from the hole when dumping the bucket to keep from falling into the hole or collapsing the sides of the hole.

- c. Empty the bucket.



Filled



Turned



Dumping

Fig. 13 EMPTYING BUCKET

- d. Turn the skid steer until the boom/bucket is back over the digging area.

16. Trenching:

- a. The backhoe works well for trenching. Use the boom or bucket method to dig.
- b. Extend the trench as far as you can. Be familiar with the reach and curl of the bucket.



Fig. 14 BUCKET REACH

17. Filling Holes:

- a. Use the boom or bucket technique to pick up material from a stockpile area.
- b. Swing the skid steer until the bucket is over the hole.
- c. Dump the bucket.
- d. Repeat the procedure until the hole is filled.



Picking Up



Emptying

Fig. 15 FILLING HOLES

18. Excavating:

Use either the arm or the bucket digging method to excavate the hole.

- a. Dump the bucket far enough away from the hole so the tailings do not fall back into the hole.
- b. Use a truck with low sides when dumping the bucket if loading a truck.



Fig. 16 DUMPING

19. Bucket Teeth:

The bucket teeth can be replaced. Check on their condition weekly. Replace if chipped, bent or damaged.



Fig. 17 TEETH

20. Loads:

The backhoe can be used to lift and place lines, pipes or other loads into trenches or excavations if it is equipped with a thumb.

- a. Do not exceed the lifting capacity of the backhoe. Review the capacity specs and do not overload.
- b. Always position the skid steer at right angles to the trench or excavation when moving loads.
- c. Do not carry or lift people on the backhoe.
- d. Do not swing loads over people when placing loads in trenches or excavations.



Fig. 18 LOADS

21. **Thumbs (Optional):**

Backhoes can be equipped with an optional thumb that is used as a back-stop when picking up something. Thumbs are available in a mechanical or hydraulic position version.

a. **Mechanical Thumb:**

A kit is available that can be mounted to the inside of the boom arm. Use the adjustment in the thumb and support arm to position the thumb as required. Be sure to install the retainers through the mounting pins.



Fig. 19 THUMBS

22. Operating Hints:

- a. Review work site before positioning backhoe and starting work. Stay away from utility lines and obstructions.
- b. Back away from the hole and turn the skid steer when emptying bucket. Stay away from edge of hole.
- c. Do not allow untrained personnel to operate the machine.
- d. Do not operate machine when unauthorized people are in work area. Stop until they leave.
- e. Operate the machine only while sitting in the skid steer seat. Never operate controls while standing on the ground.
- f. Do not carry personnel on the boom or bucket.



Fig. 20 DUMPING BUCKET

- g. Do not exceed lift capacity of backhoe.
- h. Keep hydraulic components and fittings on tight and in good condition.



Fig. 21 LOADS

4.9 TRANSPORTING



TRANSPORT SAFETY

- Comply with state and local laws governing safety and transporting of machinery on public roads.
- The use of flashing amber lights is acceptable in most localities. However some localities prohibit their use. Local laws should be checked for all highway lighting and marking requirements.
- At all times, when driving the tractor and equipment on the road or highway under 20 mph (32 kph) use flashing amber warning lights and a slow moving vehicle (SMV) identification emblem. Do not exceed 20 mph (32 kph). Reduce speed on rough roads and surfaces.
- Plan your route to avoid heavy traffic.
- Do not drink and drive.
- Be a safe and courteous driver. Always yield to oncoming traffic in all situations, including narrow bridges, intersections, etc. Watch for traffic when operating near or crossing roadways.
- Turn into curves or go up or down hills only at a low speed and a gradual steering angle. Make certain that at least 20% of the tractor's weight is on the front wheels to maintain safe steering. Slow down on rough or uneven ground.
- Never allow riders on either tractor or machine.

Wallenstein Backhoes are designed to be easily and conveniently moved from work site to work site. When transporting, follow this procedure:

1. Be sure all bystanders are clear of the machine.
2. Be sure that the machine is hitched positively to the skid steer and retainer latches are engaged.
3. Fully extend the boom straight out from the skid steer.
4. Keep to the right and yield the right-of-way to allow faster traffic to pass. Drive on the road shoulder, if permitted by law.
5. Make sure the SMV (Slow Moving Vehicle) emblem and all lights and reflectors required by the local highway and transport authorities are in place, are clean and can be seen clearly by all overtaking and oncoming traffic.
6. It is not recommended that the machine be transported faster than 20 mph (32 kph).
7. Do not allow riders on the backhoe or skid steer.



Fig. 22 TRANSPORT CONFIGURATION

8. During periods of limited visibility, use pilot vehicles and use extra lights on the machine.
10. Always use hazard flashers on the tractor when transporting unless prohibited by law.

4.10 STORAGE



STORAGE SAFETY

- Store the unit in an area away from human activity.
- Do not permit children to play on or around the stored machine.
- Store the unit in a dry, level area. Support the frame with planks if required.

4.11.1 PLACING IN STORAGE

After the season's use, the machine should be thoroughly inspected and prepared for storage. Repair or replace any worn or damaged components to prevent any unnecessary down time at the start of the next season. To ensure a long, trouble-free life, this procedure should be followed when preparing the unit for storage:

1. Clear the area of bystanders, especially small children.
2. Thoroughly wash the machine using a pressure washer to remove all dirt, mud, debris and residue.
3. Inspect the bucket and boom for damage or entangled material. Repair or replace damaged parts. Remove all entangled material.
4. Lubricate all grease fittings. Make sure all grease cavities have been filled with grease to remove any water residue from washing.
5. Touch up all paint nicks and scratches to prevent rusting.
6. Move to storage area.
7. Select an area that is dry, level and free of debris.
8. Place blocks or planks under the frame and bucket if required.
9. Unhook from skid steer (See Section 4.8).
10. Apply a coat of heavy grease to exposed cylinder rams to prevent rusting.



Fig. 23 STORED

11. If the machine cannot be placed inside, cover with a waterproof tarpaulin and tie securely in place.
12. Store the machine in an area away from human activity.
13. Do not allow children to play on or around the stored machine.

4.11.2 REMOVING FROM STORAGE

When removing from storage and preparing to use, follow this procedure:

1. Clear the area of bystanders, especially small children and remove foreign objects from the machine and work area.
2. Attach the skid steer to the backhoe by following the procedure in Section 4.8.
3. Check
 - a. All hardware. Tighten as required.
 - b. All hydraulic lines, fittings and connections. Tighten as required.
4. Lubricate all grease fittings.
5. Remove grease from cylinder rams.
6. Replace any defective parts.
7. Go through the pre-operation checklist (section 4.4) before using.

5 SERVICE AND MAINTENANCE



MAINTENANCE SAFETY

- Good maintenance is your responsibility. Poor maintenance is an invitation to trouble.
- Follow good shop practices.
 - Keep service area clean and dry.
 - Be sure electrical outlets and tools are properly grounded.
 - Use adequate light for the job at hand.
- Make sure there is plenty of ventilation. Never operate the engine of the towing vehicle in a closed building. The exhaust fumes may cause asphyxiation.
- Before working on this machine, shut off the engine, set the brake, and turn fuel valve off.
- Never work under equipment unless it is blocked securely.
- Always use personal protection devices such as eye, hand and hearing protectors, when performing any service or maintenance work. Use heavy gloves when handling sharp components.
- Where replacement parts are necessary for periodic maintenance and servicing, genuine factory replacement parts must be used to restore your equipment to original specifications. The manufacturer will not be responsible for injuries or damages caused by use of unapproved parts and/or accessories.
- A fire extinguisher and first aid kit should be kept readily accessible while performing maintenance on this equipment.
- Periodically tighten all bolts, nuts and screws and check that all electrical and fuel connections are properly secured to ensure unit is in a safe condition.
- When completing a maintenance or service function, make sure all safety shields and devices are installed before placing unit in service.

5.1 SERVICE

5.1.1 FLUIDS AND LUBRICANTS

1. **Grease:**
Use an SAE multipurpose high temperature grease with extreme pressure (EP) performance. Also acceptable is an SAE multipurpose lithium base grease.
2. Your machine can operate at top efficiency only if clean lubricants are used. Use clean containers to handle all lubricants. Store them in an area protected from dust, moisture and other contaminants.

5.1.2 GREASING

Use the Maintenance Checklist provided to keep a record of all scheduled maintenance.

1. Use a hand-held grease gun for all greasing.
2. Wipe grease fitting with a clean cloth before greasing, to avoid injecting dirt and grit.
3. Replace and repair broken fittings immediately.
4. If fittings will not take grease, remove and clean thoroughly. Also clean lubricant passageway. Replace fittings if necessary.

5.1.3 SERVICING INTERVALS

The period recommended is based on normal operating conditions. Severe or unusual conditions may require more frequent lubrication or oil changes.

8 Hours or Daily

1. Grease the pivot pins.
 - a. Bucket pivots.
 - b. Boom pivots.

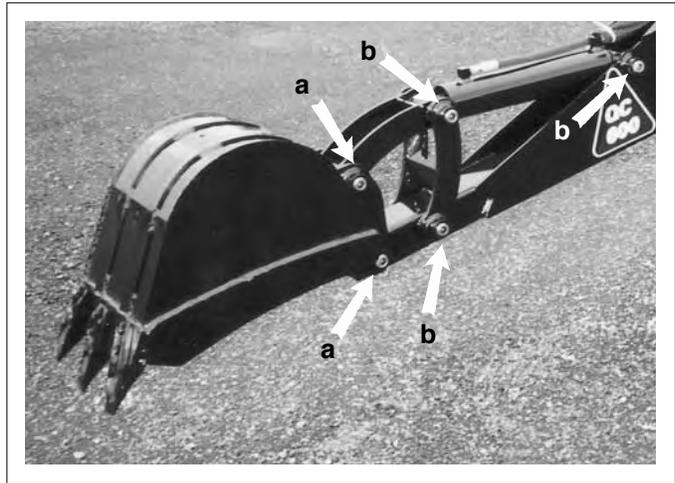


Fig. 24 PIVOT PINS

Annually

1. Wash and clean machine.



Fig. 25 QC620

5.1.4 SERVICE RECORD

See Lubrication and Maintenance sections for details of service. Copy this page to continue record.

ACTION CODE CL CLEAN G GREASE

<div style="text-align: right; padding-right: 10px;"> HOURS SERVICED BY </div>																	
	MAINTENANCE																
8 Hours or Daily																	
G Bucket Pivots																	
G Boom Pivots																	
Annually																	
CL Machine																	

5.2 MAINTENANCE

5.2.1 BUCKET TEETH

The bucket teeth are designed to be replaced. They should be checked weekly. They need to be replaced if bent, broken or worn out.

When replacing, follow this procedure:

1. Clear the area of bystanders, especially small children.
2. Lower dipper / bucket to the ground, place all controls in neutral, stop engine, set park brake, remove ignition key and wait for all moving parts to stop before dismounting.
3. Remove tooth / teeth that need replacing.
4. Install replacement tooth and weld in position.

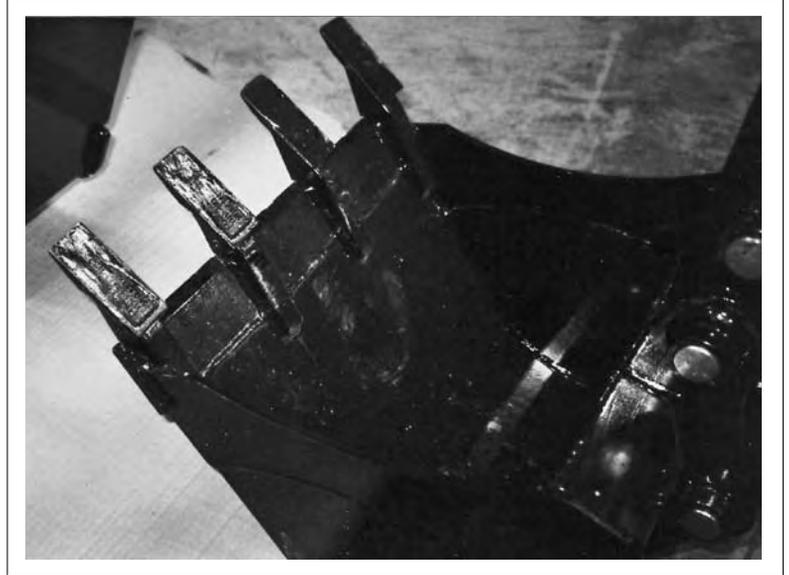


Fig. 26 TEETH

6 TROUBLE SHOOTING

The Wallenstein Backhoe is designed to fit on the front of a skid steer loader and is used to dig, excavate and trench. It is a simple and reliable system that requires minimal maintenance.

In the following section, we have listed many of the problems, causes and solutions to the problems that you may encounter.

If you encounter a problem that is difficult to solve, even after having read through this trouble shooting section, please call your local distributor or dealer. Before you call, please have this Operator's Manual from your unit and serial number ready.

PROBLEM	CAUSE	SOLUTION
Bucket moves slowly.	Pump worn out.	Replace pump.
	Low oil flow.	Increase engine RPM.
	Low oil level.	Check oil level. Add as required.
<hr/>		
Machine jerks when moving.	Sucking air.	Check fittings in hydraulic system. Tighten all fittings to stop air intake.
	Low oil level.	Check oil level. Add as required.
<hr/>		
Cylinder does not stay up.	Cylinder seals leaking.	Replace cylinder seals.

7 SPECIFICATIONS

7.1 MECHANICAL

Model	QC500	QC620
Weight (No Bucket)	150 lb (68 kg)	296 lb (134 kg)
Digging Depth	48" (1219 mm)	72" (1829 mm)
Max. System Pressure	3000 psi (20684 kPa)	3000 psi (20694 kPa)

Fig. 27 MECHANICAL SPECIFICATIONS

7.2 HYDRAULIC FITTING TORQUE

Tightening Flare Type Tube Fittings *

1. Check flare and flare seat for defects that might cause leakage.
2. Align tube with fitting before tightening.
3. Lubricate connection and hand tighten swivel nut until snug.
4. To prevent twisting the tube(s), use two wrenches. Place one wrench on the connector body and with the second tighten the swivel nut to the torque shown.

- The torque values shown are based on lubricated connections as in reassembly.

Tube Size OD (in.)	Nut Size Across Flats (in.)	Torque Value*		Recommended Turns To Tighten (After Finger Tightening)	
		(N.m)	(lb-ft)	(Flats)	(Turn)
3/16	7/16	8	6	1	1/6
1/4	9/16	12	9	1	1/6
5/16	5/8	16	12	1	1/6
3/8	11/16	24	18	1	1/6
1/2	7/8	46	34	1	1/6
5/8	1	62	46	1	1/6
3/4	1-1/4	102	75	3/4	1/8
7/8	1-3/8	122	90	3/4	1/8

SPECIFICATIONS SUBJECT TO CHANGE WITHOUT NOTICE

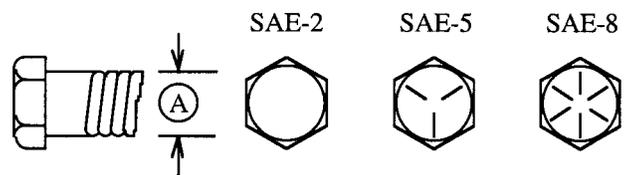
7.3 BOLT TORQUE

CHECKING BOLT TORQUE

The tables shown below give correct torque values for various bolts and capscrews. Tighten all bolts to the torques specified in chart unless otherwise noted. Check tightness of bolts periodically, using bolt torque chart as a guide. Replace hardware with the same strength bolt.

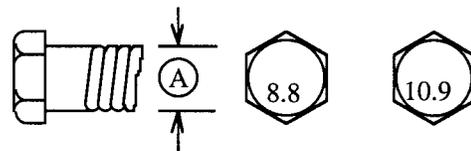
ENGLISH TORQUE SPECIFICATIONS

Bolt Diameter "A"	Bolt Torque*					
	SAE 2 (N.m) (lb-ft)		SAE 5 (N.m) (lb-ft)		SAE 8 (N.m) (lb-ft)	
1/4"	8	6	12	9	17	12
5/16"	13	10	25	19	36	27
3/8"	27	20	45	33	63	45
7/16"	41	30	72	53	100	75
1/2"	61	45	110	80	155	115
9/16"	95	60	155	115	220	165
5/8"	128	95	215	160	305	220
3/4"	225	165	390	290	540	400
7/8"	230	170	570	420	880	650
1"	345	225	850	630	1320	970



METRIC TORQUE SPECIFICATIONS

Bolt Diameter "A"	Bolt Torque*			
	8.8 (N.m) (lb-ft)		10.9 (N.m) (lb-ft)	
M3	.5	.4	1.8	1.3
M4	3	2.2	4.5	3.3
M5	6	4	9	7
M6	10	7	15	11
M8	25	18	35	26
M10	50	37	70	52
M12	90	66	125	92
M14	140	103	200	148
M16	225	166	310	229
M20	435	321	610	450
M24	750	553	1050	774
M30	1495	1103	2100	1550
M36	2600	1917	3675	2710



Torque figures indicated above are valid for non-greased or non-oiled threads and heads unless otherwise specified. Therefore, do not grease or oil bolts or capscrews unless otherwise specified in this manual. When using locking elements, increase torque values by 5%.

* Torque value for bolts and capscrews are identified by their head markings.

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