

**CROWN**

# MAINTENANCE MANUAL



## WAVE 50 SERIES

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**CROWN**



# ***SAFETY INSTRUCTIONS***

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Notice:

### General maintenance

**Warning!**



**Risk of accident!**

**To prevent serious risk of injury to yourself and others observe the following safety instructions.**

These vehicles may become hazardous if adequate maintenance is neglected. Therefore, adequate maintenance facilities, trained personnel and procedures should be provided.

Maintenance and inspection shall be performed in conformance with the following practices:

- A scheduled planned maintenance, lubrication and inspection system should be followed.
- Only qualified and authorized personnel shall be permitted to maintain, repair, adjust and inspect vehicle.
- Before leaving the vehicle:
  - Stop the vehicle.
  - Fully lower the platform.
  - Place directional controls in neutral.
  - Turn off power (Battery disconnect).
  - Remove key.
  - Block the wheels if vehicle is on an incline.
- Before working on the vehicle
  - Raise drive wheels free of floor or disconnect power sources.

- Use chocks or other positive positioning devices.
- Block load engaging means, inter masts or chassis before working under them.
- Operation to check performance of vehicle or attachments shall be conducted in an authorized safe clearance area.
- Before starting to operate the vehicle:
  - Be in operating position.
  - Place directional control in neutral.
  - Before operating the vehicle, check the functions of lift systems, directional control, speed control, steering, warning devices and brakes.

**Warning!**



**Fire hazard!**

**Fire or flame can cause severe personal injury or property damage.**

**Do not use an open flame to check level or for leakage of electrolyte and fluids or oil.  
Do not use open pans of fuel or flammable cleaning fluids for cleaning parts.**

- Avoid fire hazards and have fire protection equipment present.
- Keep shop well ventilated, clean and dry.
- Brakes, steering mechanisms, control mechanisms, guards and safety devices shall be inspected regularly and maintained in a safe operating condition.

# SAFETY INSTRUCTIONS

## General maintenance



- Capacity, operation and maintenance instruction plates or decals shall be maintained in legible condition.
- All parts of lift mechanisms shall be inspected to maintain them in safe operating condition.
- All hydraulic systems shall be regularly inspected and maintained in conformance with good practice. Cylinders, valves and other similar parts shall be checked to assure that "drift" has not developed to the extent that it would create a hazard.
- Batteries, motors, controllers, limit switches, protective devices, electrical conductors and connections shall be maintained in conformance with good practice. Special attention shall be paid to the condition of electrical insulation.
- Vehicles shall be kept in a clean condition to minimize fire hazards and facilitate detection of loose or defective parts.
- Modifications and additions which affect capacity and safe vehicle operation shall not be performed by the customer or user without manufacturers prior written approval. Capacity, operation and maintenance plates or decals shall be changed accordingly.
- Care shall be taken to assure that all replacement parts are interchangeable with the original parts and of equal quality to that provided in the original equipment.
- Be sure that any equipment added to the truck (terminal, fan, clipboard, etc.) is positioned so that it does not block your vision or interfere with safe and efficient operation of the truck.

### Equipment Cleaning

#### WAVE® Vehicle Procedures

- Prefer dry pressured air for cleaning built up dirt and dust from electric material handling equipment.
- For localized degreasing use of an appropriate solvent such as "TOUGH ON GREASE" (Crown P/N 063009-005) is recommended.

If these methods are not effective and power washing is the only alternative, extreme care must be exercised.

#### **Caution!**



#### **Risk of damage!**

**Power washing or cleaning solvents can damage electrical components including connectors, terminal boards and wiring.**

**Mineral and chemical residue left on or in components (i.e. circuit boards, contactors, encoders, switches, potentiometers, etc.) after washing is a proponent of oxidation and corrosion. All electronic components including motors must be protected or even removed to eliminate the risk of damage.**

Functional integrity of contaminated components may be questionable. Nuisance fault logging, intermittent operation or immediate failure could be the resultant of power washing.

Power washing will also remove and/or destroy lubricants in or on the surface of shafts, unsealed bearings, hinges, exposed gears, bushings, chains, linkages, etc.

- These items must also be protected before cleaning or properly lubricated after cleaning.

Consideration must also be given to metal surfaces. The cleaning process can strip away paint and protective coatings applied to components (i.e. hydraulic lines, terminal strips, linkages) for freezer/corrosion environment.

- Paint and/or protective coating must be reapplied to these areas to reduce the chance of oxidation and corrosion.
- Remove solvent residue and dry the component thoroughly before installing removed components, lubricating or returning the equipment to service.

# SAFETY INSTRUCTIONS

## Control of Hazardous Energy



### Control of Hazardous Energy

#### Lockout/Tagout

#### WAVE® Work Assist Vehicle


In the interest of safety and to ensure compliance with the OSHA Regulations, (Standards - 29 CFR), The control of hazardous energy (lockout/tagout) - 1910.147, Crown has developed guidelines for proper energy control when performing service and maintenance on the WAVE.

- Review the appropriate sections in this service manual for additional procedures to be followed, before performing any service or maintenance on the WAVE.


In addition, Crown recommends that all mechanics wear appropriate protective items, such as safety glasses, work gloves, and steel toed shoes, whenever performing service or maintenance work on Crown equipment.

#### Battery


##### Safety rules

<b><u>Warning!</u></b>	<b>Risk of injury!</b>
	<b>Electrolyte contained in batteries can cause severe personal injury or property damage if coming in contact with eyes, skin, clothing or floor</b> <b>Avoid any contact of electrolyte with eyes or skin</b> <b>Wear protective clothing, such as, rubber apron, gloves, boots and full face shield when performing any maintenance on batteries</b>

- If electrolyte comes in contact with eyes, flush immediately and thoroughly with clean water. Obtain medical attention immediately.
- Should electrolyte be spilled on skin, rinse promptly with clean water and wash with soap.
- A baking soda solution (one pound to one gallon of water) will neutralize acid spilled on clothing, floor or any other surface. Apply solution until bubbling stops and rinse with clean water.
- Keep vent plugs firmly in place at all times except when adding water or taking hydrometer readings.

<b><u>Danger!</u></b>	<b>Risk of explosion!</b>
	<b>Gas formed during charging is highly explosive and can cause serious personal injury. There also may be a danger of release of harmful substances.</b> <b>Never smoke or bring flame near the battery.</b>

This gas remains in the battery cells long after charging has stopped.

<b><u>Warning!</u></b>	<b>Risk of arcing!</b>
	<b>Do not lay metallic or conductive objects on battery. Otherwise arcing will result and cause property damage.</b>

- Do not allow dirt, cleaning solution or other foreign material to enter cells. Impurities in electrolyte has a neutralizing effect reducing available charge.
- If battery repair is planned, follow the battery manufacturer's instructions concerning repair practices and procedures.

### Charging

#### **Warning!**



**Risk of property damage!**

**NEVER** operate truck with an undersized battery, otherwise the truck can be seriously damaged.  
**Make certain battery used meets weight, size and voltage requirements of truck (refer to serial plate).**

- Make certain the charger being used matches the voltage and amperage of the truck battery. This voltage is listed on the truck serial plate.

#### **Caution!**



**Risk of injury!**

**Unauthorised component removal or improper maintenance can result in significant danger to the user.**  
**Only qualified and experienced personnel should perform maintenance and repair on batteries.**

#### **Danger!**



**Risk of accident!**

**Current flowing between battery and charger can cause shock hazard and result in serious injury to you, the battery and charger.**  
**NEVER connect or disconnect batteries to a charger while the charger is "ON".**  
**Make sure the charger is "OFF" before disconnecting or connecting batteries.**

- Make certain battery used meets weight, size and voltage requirements of truck (refer to serial plate). **NEVER** operate truck with an undersized battery.

#### **Caution!**



**Risk of injury!**

**Unauthorised component removal or improper maintenance can result in significant danger to the user.**  
**Only qualified and experienced personnel should perform maintenance and repair on batteries.**

#### **Warning!**



**Risk of explosion!**

**Gas formed during charging is highly explosive and can cause serious personal injury. There also may be a danger of release of harmful substances.**  
**Never smoke or bring flame near the battery.**

Never use a match or lighter. Battery fumes are explosive.

- Consult the charger manufacturer's manual covering your charger for hints on operation and maintenance.

# SAFETY INSTRUCTIONS

## Control of Hazardous Energy



### Battery removal

#### **Caution!**

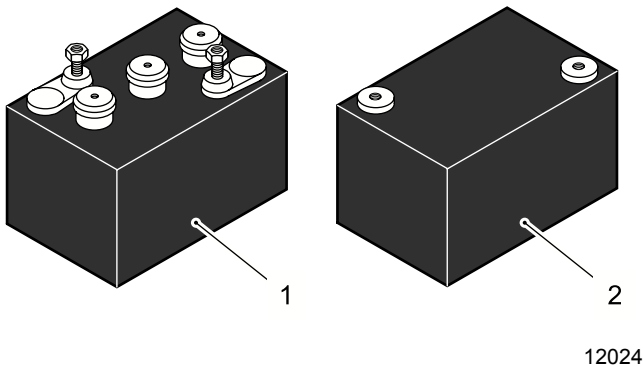


#### **Risk of short-circuit!**

Do not allow any metallic object to come in contact with the top of the battery cells. This may cause a short circuit when removing, transporting a battery. Use an insulator (such as plywood, plastic caps) to cover the top of battery posts before and during removal.

When removing a battery, move truck to area intended for battery care. Floor must be level.

Turn keyswitch or toggle switch to "off" position and remove key. Disconnect battery and lockout or tagout truck as described in Battery - Lockout/Tagout in this section. Lower load engaging means completely.



- 1 Wet cell battery
- 2 Maintenance free battery

### Battery installation

#### **Warning!**



#### **Risk of injury!**

A non-stable or rolling truck may cause injury to you or others. When installing a battery, move truck to area intended for battery care. Floor must be level. Turn keyswitch or toggle switch to "off" position and remove key.

#### **Caution!**



#### **Risk of short-circuit!**

Do not allow any metallic object to come in contact with the top of the battery cells. This may cause a short circuit when removing, transporting a battery. Use an insulator (such as plywood, plastic caps) to cover the top of battery posts before and during removal.

#### **Warning!**

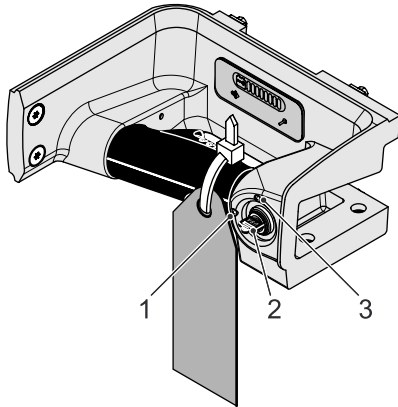


#### **Risk of property damage!**

NEVER operate truck with an undersized battery, otherwise the truck can be seriously damaged. Make certain battery used meets weight, size and voltage requirements of truck (refer to serial plate).

- Lockout or tagout truck as described in Battery - Lockout/Tagout in this section.

### Battery Lockout/Tagout



MS-2450-002

- 1 Key switch, OFF
- 2 Key
- 3 Key switch, ON

- Always turn key (2) switch to "off" (1), remove key (2) and apply tag to steering pod with cable tie warning others truck is being serviced.

When maintenance is performed and **the batteries are left in the truck:**

- disconnect batteries,
- remove the main power fuses and
- install a commercially available lockout device on battery connector.

When maintenance is performed and **the batteries are removed from the truck:**

- remove the main power fuses,
- install a lockout device on the trucks battery connector if possible,
- or if possible install a tag with a cable tie on the trucks battery connector so it cannot be removed easily warning that the truck is not available for operation.



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