

Product: Doosan Solar 030 Plus / 035 Crawled Excavator Service Repair Workshop Manual

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Solar 030 Plus / 035

Shop Manual

023-00046E

Serial Number 101 and Up

Serial Number 20001 and Up

Yanmar reserves the right to improve our products in a continuing process to provide the best possible product to the market place. These improvements can be implemented at any time with no obligation to change materials on previously sold products. It is recommended that consumers periodically contact their distributors for recent documentation on purchased equipment.

This documentation may include attachments and optional equipment that is not available in your machine's package. Please call your distributor for additional items that you may require.

Illustrations used throughout this manual are used only as a representation of the actual piece of equipment, and may vary from the actual item.

023-00046E Shop Manual

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INTRODUCTION

A Message to Daewoo Excavator Operators

- This manual has been prepared to inform you about the operation and maintenance of your new excavator. You are urged to read this manual carefully and to follow the instructions, safety rules and relevant laws and regulations before operating the excavator.
- For Solar 030 PLUS and 035 engines, please see the Operator's and Maintenance Manual for Isuzu Diesel Engines (SOLAR 035 : 3LD1, SOLAR 030 PLUS : 3LD1)
- Do not operate, inspect or service the excavator until you are thoroughly familiar with its' design and controls. This manual must be left in the cab so that it is always available to others.
- If you have any questions concerning the excavator, please supply the MODEL NO and SERIAL (PI)NO. These numbers are stamped on a name plate, which is attached to the front part of the main frame.

The information, specifications and illustrations included in this manual are based on the information available at the time it was published. Daewoo reserves the right to make improvements and changes in specifications or design without prior notice and without incurring obligation. Please check with your authorized Daewoo dealer for information on possible updates or revisions.

- The safety symbols and other safety information contained in this manual and on the excavator can not cover every possible dangerous situation that may result from operation, inspection and maintenance of this excavator. In addition, operation, inspection or maintenance of the machine, in a manner not specified in this manual, could be dangerous and is the sole responsibility of the operator or technician.

August. 2001

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1. SAFETY

1.1. SAFETY INFORMATION

1) Safety Information Location

Basic safety information and rules are compiled in this section (Section 1) of the manual. Throughout the rest of the manual, safety information is identified by three levels of hazard: DANGER, WARNING, and CAUTION. These hazard levels are explained below, under "1.2 SAFETY MESSAGES". Safety information is also included on safety labels on the machine. Read and understand all safety precautions both in the manual and on the machine.

2) Heavy Equipment Operation

Make sure that operators are qualified and that they hold a heavy equipment operator's license, if required.

1.2. SAFETY MESSAGES

1) Safety Hazard Levels

The following information defines each hazard level.

⚠ DANGER : This message indicates an extreme hazard that can result in serious personal injury or death to you or other persons if the machine is handled improperly or proper precautions are not taken.



⚠ WARNING : This message indicates a hazard that can result in serious personal injury or death to you or other persons, or cause minor injury or material damage if the machine is handled improperly or proper precautions are not taken.

⚠ CAUTION : This message identifies a hazard that is not likely to cause personal injury but may cause property loss or result in machine damage if the machine is handled improperly or proper precautions are not taken.

IMPORTANT : This message is used when the machine may be damaged or its service life may be shortened if the machine is handled improperly.

1. SAFETY

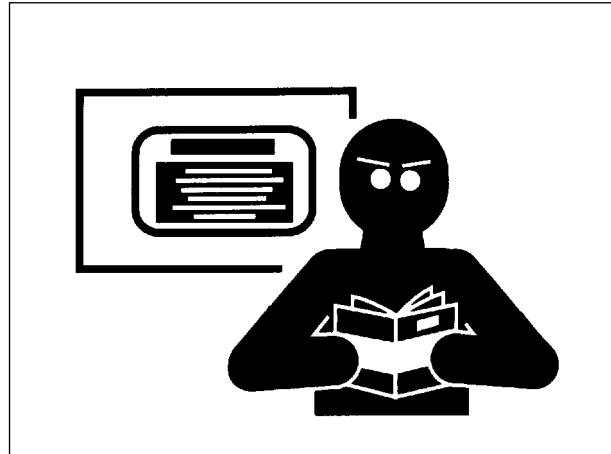
1.3. SAFE OPERATION

editor's note: all numbers shift down one from here to end of section.

1) General precautions

Carefully read and understand the safety symbols and messages placed in this manual and on the machine.

- Keep safety labels clean at all times.
- If safety labels are damaged or lost, order new ones from your Daewoo dealer.
- Make sure all operators are qualified , as required by law.
- Keep correct operating techniques in mind at all times.
- Operate the machine in a normal manner at all times.
- Do not modify your machine without permission from the manufacturer: Unauthorized modifications can cause injury, machine malfunctions or reduction in machine service life.
- This Safety Section explains basic safety rules. Use extreme caution whenever operating, inspecting or servicing this machine, whether a specific potential hazard is mentioned or not.



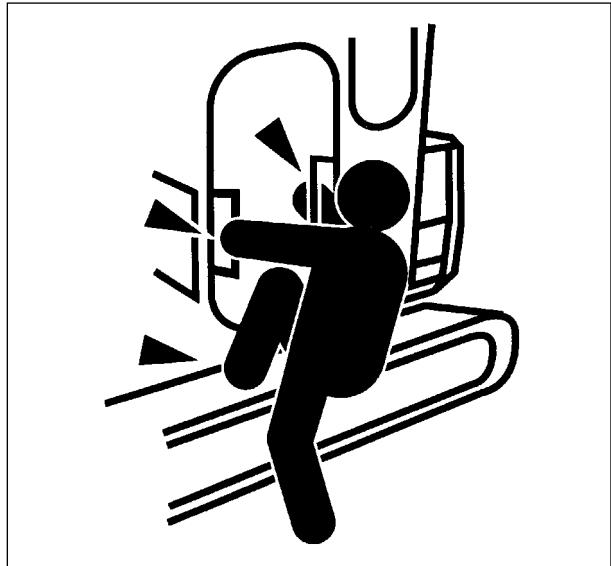
2) Per-operation inspection

- Check for damage and problems that require maintenance before operation. Always repair defective equipment before operation. Failure to inspect and repair the machine may result in failure of major components or systems such as the hydraulic system.



3) Use handrail and steps whenever you get on or off the machine.

- Guard against falling when getting on or off the machine.
- Always face the machine squarely when getting on or off the machine.
- Always use the handrail and steps and keep three points of contact at all times.
- Be careful not to get caught on a control by mistake.
- Never jump on or off the machine, even when it is stationary. Never get on or off the machine when it is in operation.
- Always wipe up any oil, water or other slippery or foreign material from platform, steps, and handrail immediately.



4) Adjust seat

If the driver's seat is not adjusted correctly, the operator may become easily fatigued and injury and/or damage could result.

- Be sure to adjust the driver's seat at the beginning of each work period.
- Adjust driver's seat so that the operator can easily reach the pedals while his back is firmly against the lumbar support of the seat.

**5) Use seat belts(optional equipment)**

Fasten seat belts securely to reduce injuries from tip -over, etc, during operation. If a machine starts to tip over, do not jump, stay in seat with seat belt fastened.

- Check seat belt buckles, belts and accessories for damage and repair before using .
- Replace seat belts every 3 years, regardless of their condition.

**6) Stay in seat while starting, operating and stopping machine.**

- Start engine only when seated in normal operating position in operator's seat.
- Do not short the starting circuit to start the engine: it is dangerous and may cause injury and/or damage to the machine.

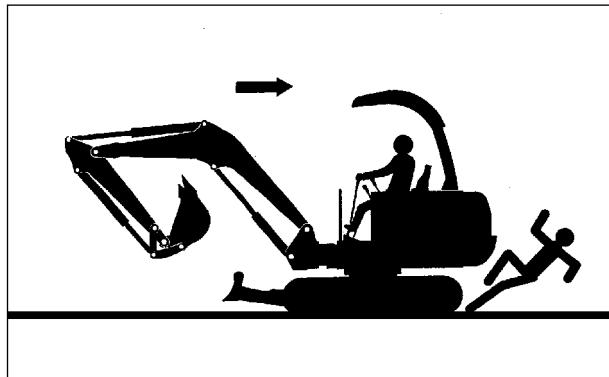


1. SAFETY

7) Watch for safety and traffic signals when travelling.

Check for hazards in the work area before starting and moving.

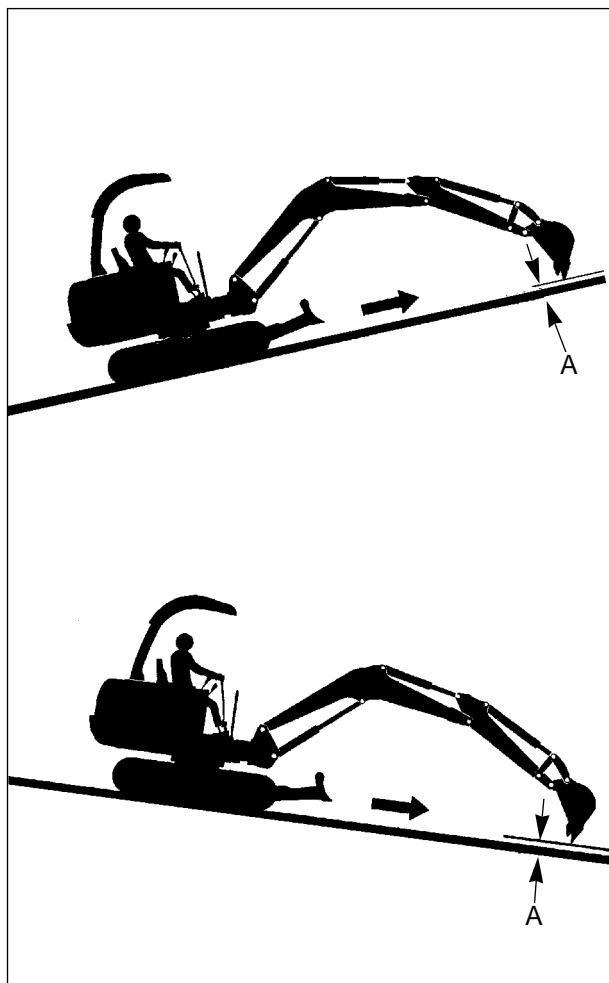
- Use horn or other signal to warn others when you start and move the machine.
- Use a signal man whenever the operator's vision is obstructed in any way. Make sure the signal man is in sight of the operator at all times.
- Agree on signals before operation.
- Keep bystanders and obstacles out of work area.
- Keep work areas well lighted at night.



8) Travel Precautions

Always check for hazards when traveling the machine. Avoid traveling on slopes

- Always keep a firm grip on control levers and keep the travel route in mind at all times.
- Raise bucket when encountering small obstacles.
- Keep bucket 20-30 cm (8-12") off ground when driving on slopes.
- Do not operate on grades in excess of those specified by the manufacturer.
- If machine slips, lower bucket to ground and stop immediately.
- When traveling on level ground, bring front attachment in and raise bucket 40-50 cm (15-20") with teeth facing up.



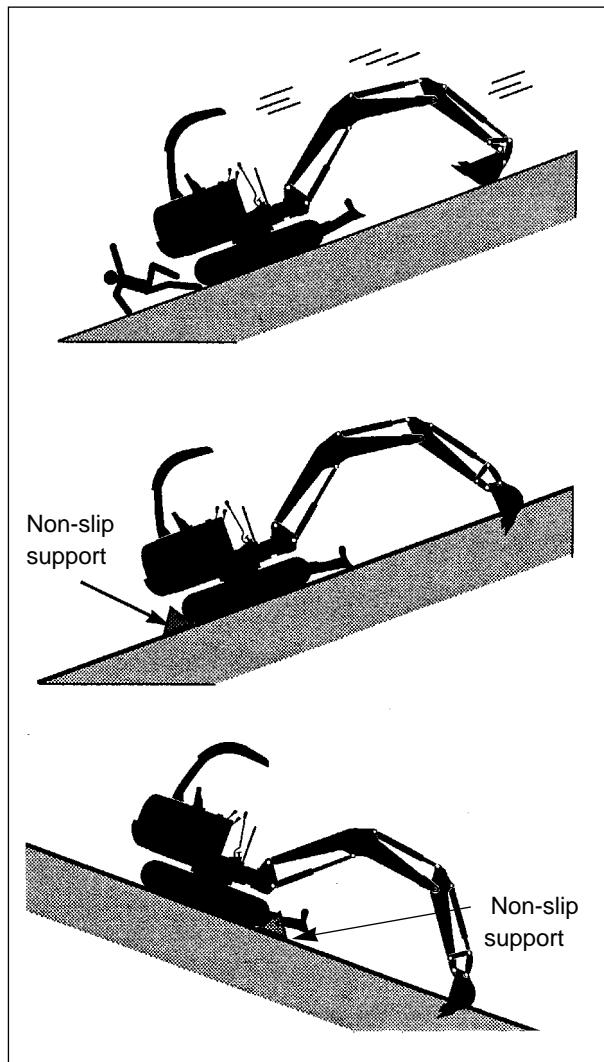
9) How to prevent machine from moving unintentionally and how to park machine.

Jumping onto or attempting to hold on to a moving machine, with or without an operator on board, can result in serious injury.

To prevent the machine from moving unintentionally, follow the procedures below:

- (1) Park on level ground and lower all attachments such as the bucket, blade, etc.
- (2) Place throttle control at lowest setting.
- (3) Turn ignition switch to OFF and remove key.
- (4) If machine must be left on an incline, line it up in the direction of the incline, chock both tracks and drive the point of the bucket into the ground.

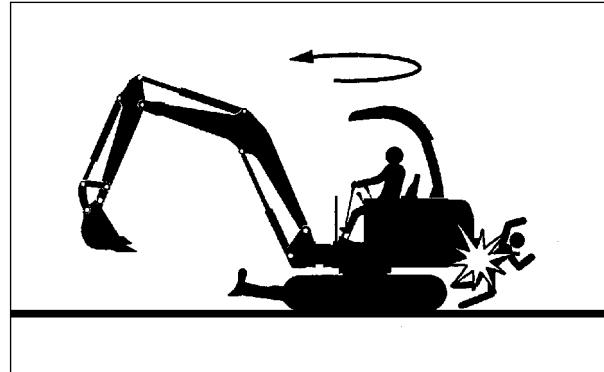
- Park machine so that there is enough clearance from other machines.



10) Precautions for turning and traveling in reverse.

Turning and backing up are potentially dangerous because of restricted visibility. Use a signal man when turning or backing up.

- Watch for people nearby.
- Use horn or other signal to warn people nearby.
- Keep windows, mirrors and head lights clean and in good repair at all times.
- Slow down when visibility is poor due to dust, heavy rain, fog, or other conditions.

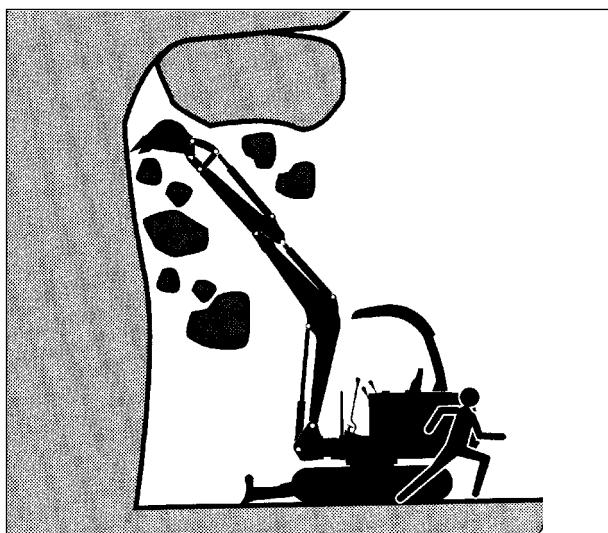
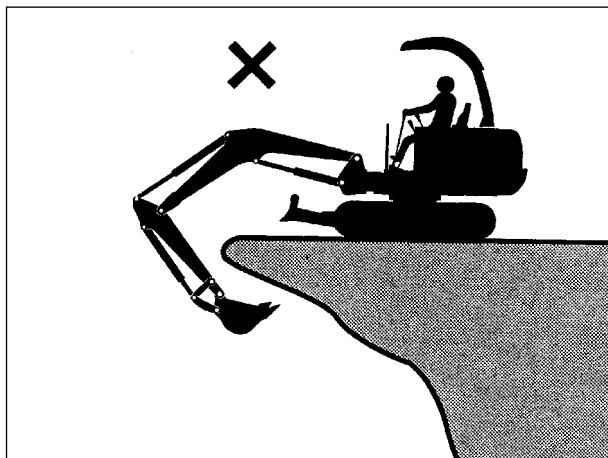


1. SAFETY

11) To prevent accidents.

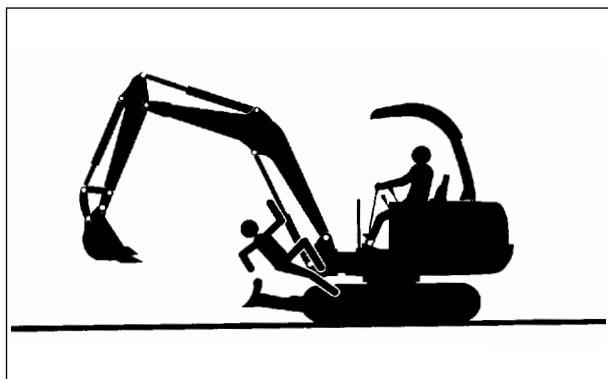
The operator and supervisors or owners in charge of the equipment or worksite are responsible for avoiding hazardous working conditions.

- To prevent tip-over and to avoid surfaces with poor support, check terrain in advance and keep records of conditions.
- When operating on slopes, use a signal man
- Keep people clear when working, swinging or travelling.
- Be sure that overhead guards are in place whenever there is a danger of falling objects.
- Tamp down soft ground before operation.
- Use special care on ground that is frozen or thawing: it is slippery.



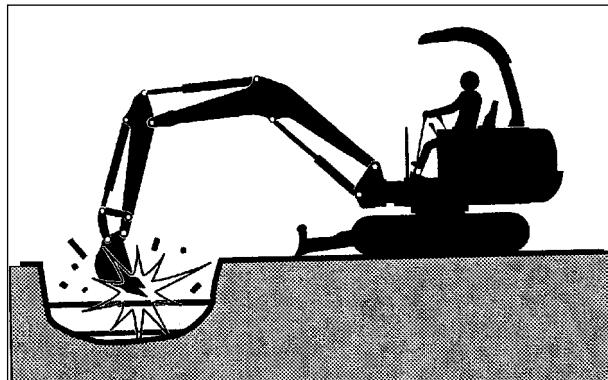
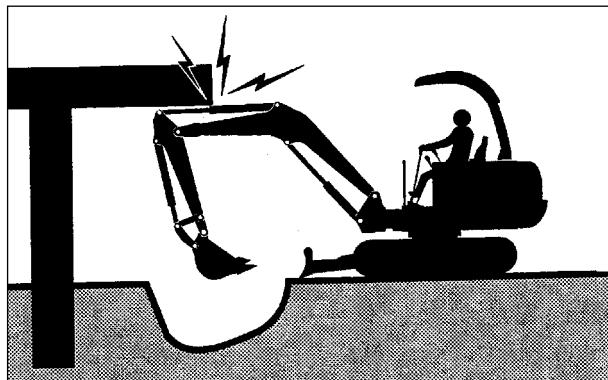
12) Never carry people in or on the machine.

- Never transport other persons in or on the machine.
- Riders restrict visibility, reduce concentration and may cause and/or be subject to injury.



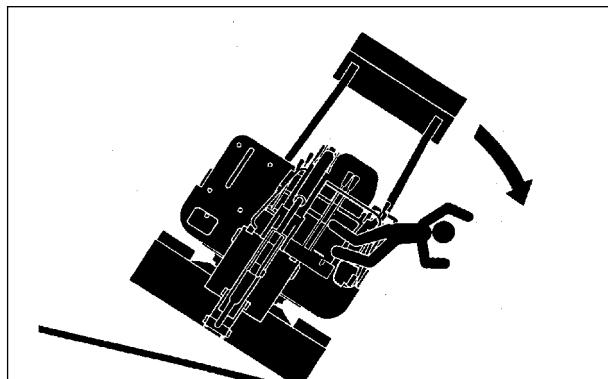
13) Be careful of underground utilities

Identify locations of underground cables, gas lines, water piping, etc. before beginning operation.

**14) Be aware of buildings, fences and other structures while operating.****15) Tip-over**

Use care to avoid tip-over when operating on a slope or when handling a heavy load.

- Lower bucket and pull it back in toward machine when operating on an incline.
- Line up tracks in the direction of the incline to reduce the chance of tip-over or serious injury.
- Slow down, when swinging the bucket, to reduce danger of tip-over.



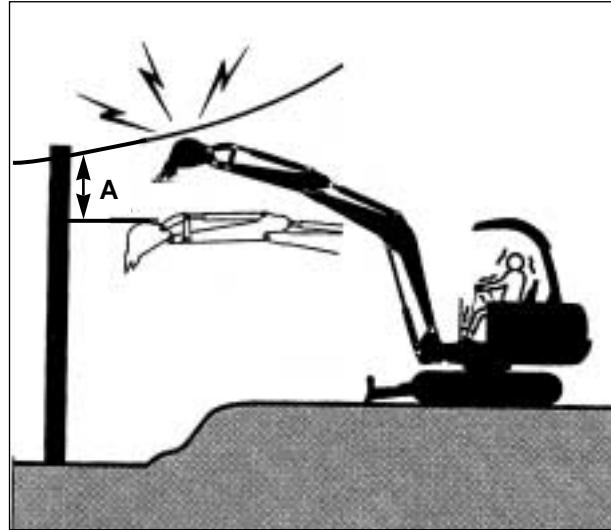
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16) Be careful of power cables.

You can be struck by electricity even without touching a high voltage power cable. Never bring your machine closer than the minimum clearances shown in the table below.

Cable Voltage (Kv)	Minimum Clearance m
6.6	3(10)
33.0	4(13)
66.0	5(17)
154.0	8(27)
275.0	10(33)

- Check with local power companies about the voltage of power cables in your area.
- Carry out the following precautions:
 - (1) Erect a fence to keep the machine and all personnel a safe distance away from the power cable.
 - (2) Install insulating material around power cable.
 - (3) Wear rubber or leather boots.



17) Never use machine for lifting.

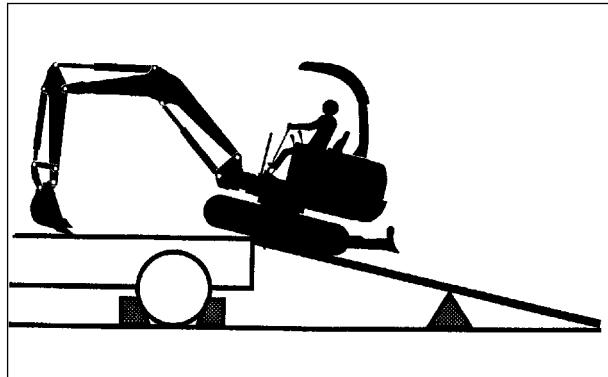
- The excavator is designed for excavating and loading only.
- The excavator is not equipped for lifting and does not have safety devices for lifting.



18) Safe Loading, Unloading and Transport

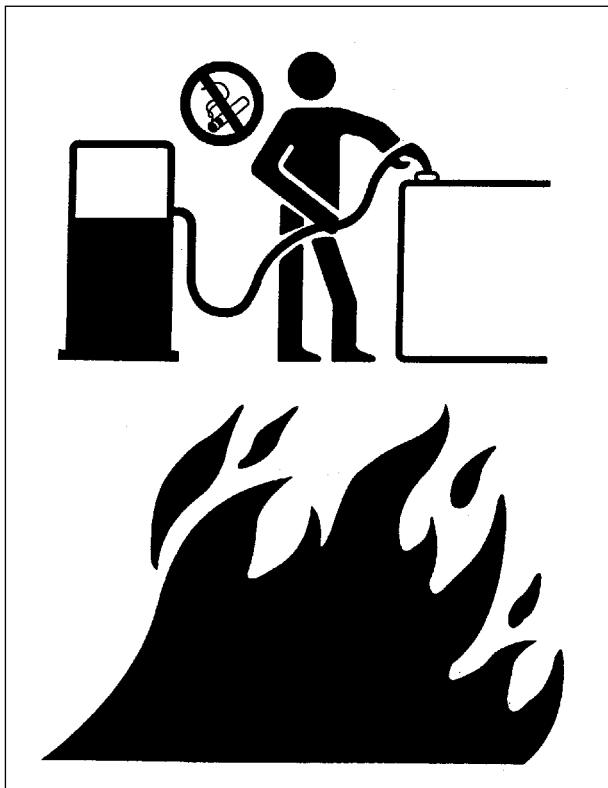
Follow all local laws that apply to your machine. Use proper equipment and use care when loading, unloading and transporting the machine.

- Make sure ground is level and solid.
- Use a loading ramp.
- Never push down on pedal to shift gears while loading or unloading.
- Never turn on the loading ramp. To adjust direction of travel, go back to the ground or to the platform/bed of the hauling vehicle.
- Use extreme caution when crossing the point where the loading ramp is attached to the hauling vehicle: it may cause a shift in the machine's center of gravity.
- Fasten machine securely to chassis of hauling vehicle using wire cable.

**19) Handle fuel and oil carefully (Do not allow any source of sparks, heat or flame near the machine)**

Fuel, oil and antifreeze are highly flammable and dangerous. Handle carefully.

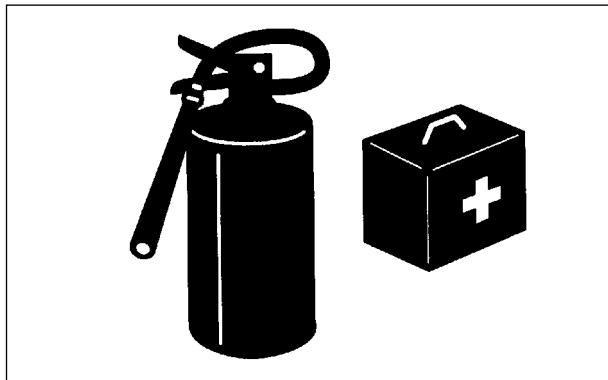
- (1) Keep sparks, heat and flame away from machine when refueling. Never smoke while refueling.
- (2) Stop engine when refueling.
- (3) Refuel in an open area.
 - Store flammable liquids and material in a well ventilated area.
 - Keep machine clean and free of grease and other foreign material.
 - Do not store shop cloths that have flammable substances on them: they can catch fire easily and "spontaneously".



1. SAFETY

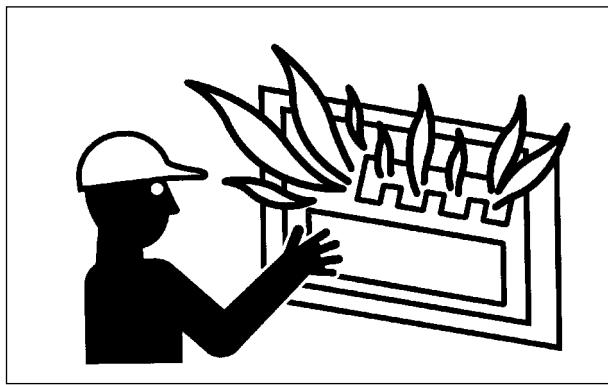
20) Keep first-aid kits and fire extinguishers available

- Make sure that you know how to operate the fire extinguisher and are familiar with the contents of the first aid kit.
- Know the location of emergency services such as hospitals, ambulance and fire stations.



21) Keep the inside and outside of the machine clean.

- After operation, allow engine to idle and cool down to prevent the engine compartment from overheating and possibly causing a fire.
- To reduce fire hazard, keep the engine compartment, radiator, batteries, hydraulic lines, fuel tank and operator's seat clean and free of any foreign material.



22) Wear proper clothing

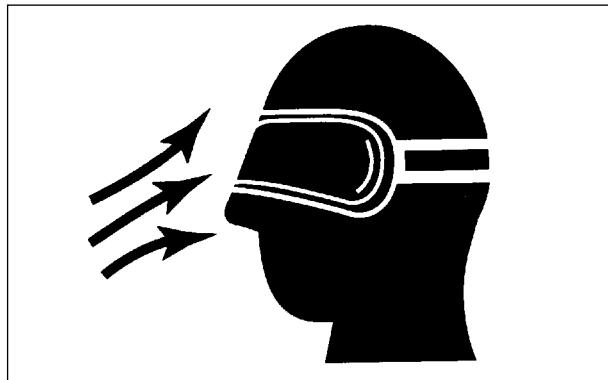
Wear proper safety protection and clothing such as hard hats.

- Never wear loose clothes or accessories such as watches and jewelry, since they can get caught on control levers or other parts of the machine.
- Concentrate on operation: do not listen to the radio or use headphones, which could distract you from safe operation.



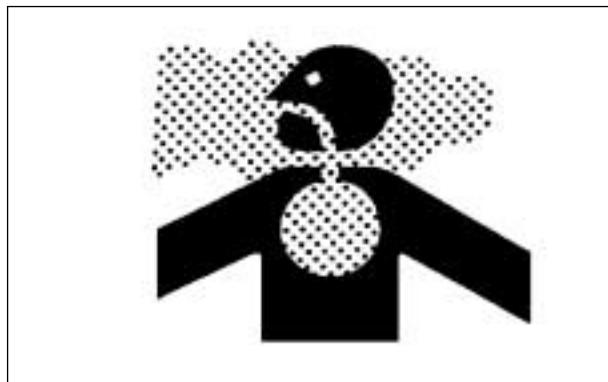
23) Protect yourself from flying or falling objects.

Wear safety glasses when operating in dusty or sandy conditions or when rock fragments could be thrown up by operation. Also wear protection when carrying out maintenance such as removing or installing the bucket pin, etc.

**24) Be careful of exhaust gases when operating in enclosed spaces.**

Engine exhaust gases are deadly. Use the following precautions:

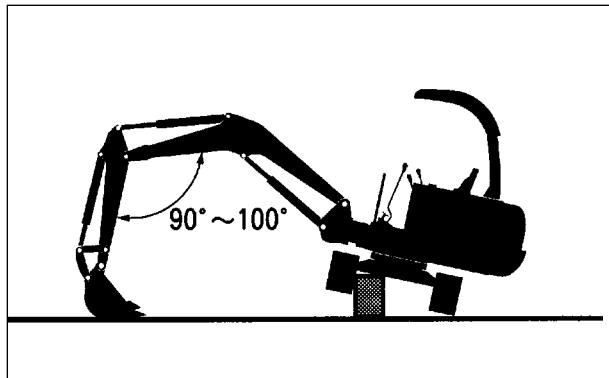
- (1) Open doors and windows to ventilate the work area.
- (2) Use an extension on the exhaust pipe so that exhaust gas is piped outdoors.



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25) Safe Inspection and Safe Maintenance

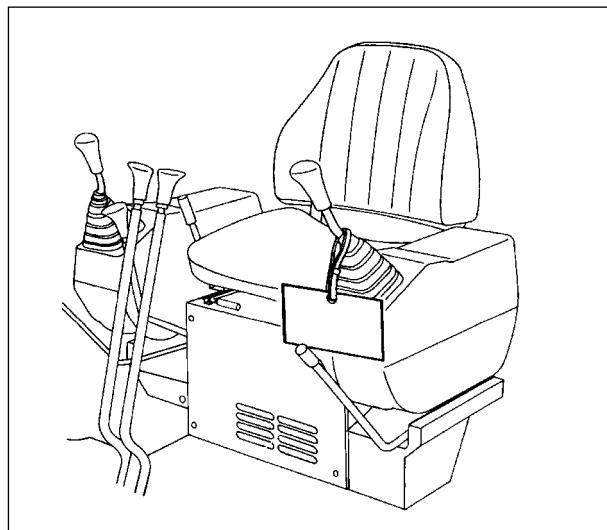
- Before inspecting or serving the machine, check with fellow workers and plan all procedures.
- Park the machine safely (see Number 9).
- Keep surroundings clean.
- Place service warning tags on cab doors , on the operator's seat, and in other places where they are easy to see.
- Wait for engine and hydraulic oil to cool down to a safe temperature before doing maintenance.
- When it is necessary to check or service the machine with the engine running, always have a second person present to work the controls, shut down the engine, etc.
- Never inspect or service the machine when it is in motion.
- Avoid inspecting or carrying out service under a machine that is jacked up.
- When inspecting or performing service under a machine that is jacked up, keep boom at a 90°-100°angle to the arm and chock tracks securely.
- Care for and service the machine so that it functions correctly at all times.
- Repair or replace worn or damaged parts immediately.
- Remove grease, oil, loose paint and any foreign material from the machine immediately.
- Disconnect negative battery terminal when making adjustments or welding.



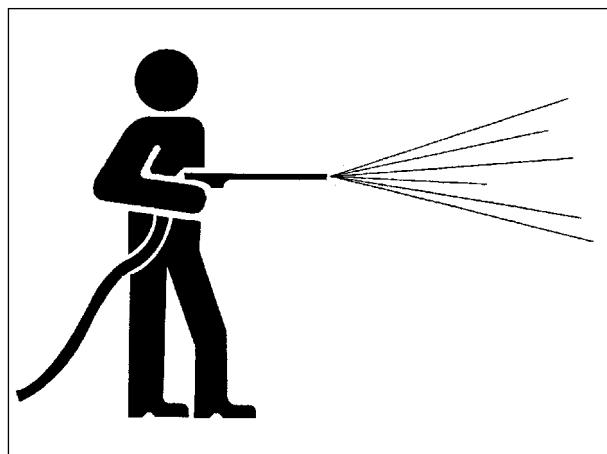
26) Inspection and Service Cautions

Use extreme care that machine does not move unintentionally.

- Place service warning tags on cab doors, on the operator's seat, and in other places where they are easy to see.
- Wait for all fluids (coolant, engine oil, gear oil and hydraulic oil) to cool down before checking or servicing the machine. Fluids are hot and/or under high pressure and will burn you or cause other serious injury.

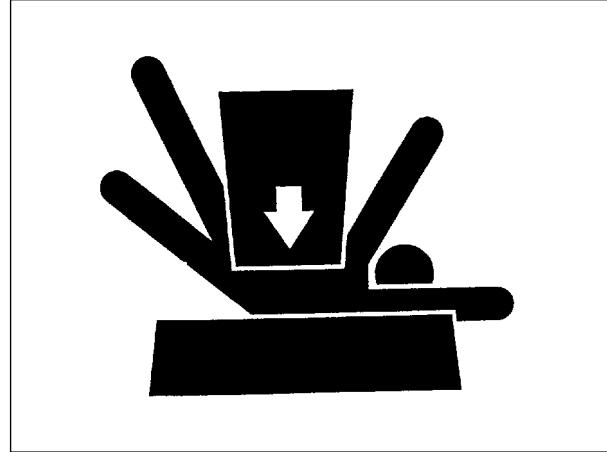
**27) Keep machine clean at all times**

- Keep machine free of oil and grease at all times.
- Water will damage the electrical system. Never use water or steam on the inside of the cab, in the engine compartment or in any location where it may reach sensors, connectors or other electrical components.

**28) Block up machine securely**

- Never inspect or service a machine that is unstable.

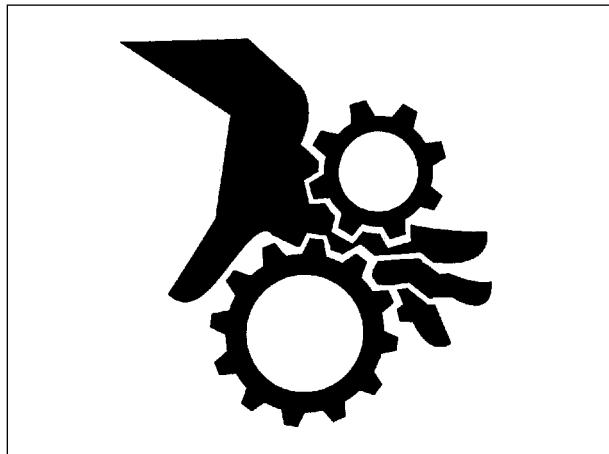
- (1) Lower all working attachments to the ground.
- (2) When it is necessary to work either with the machine or with working attachments raised, chock machine with wooden blocks (never concrete) or jack securely.



1. SAFETY

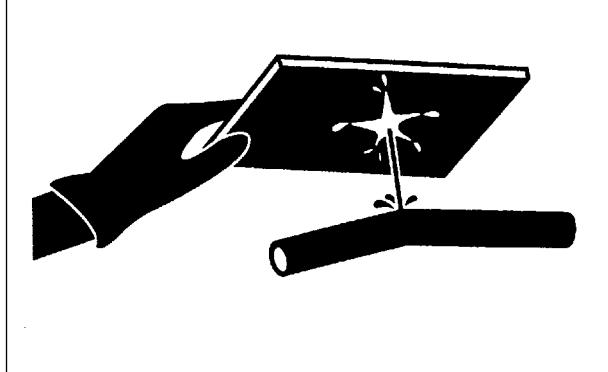
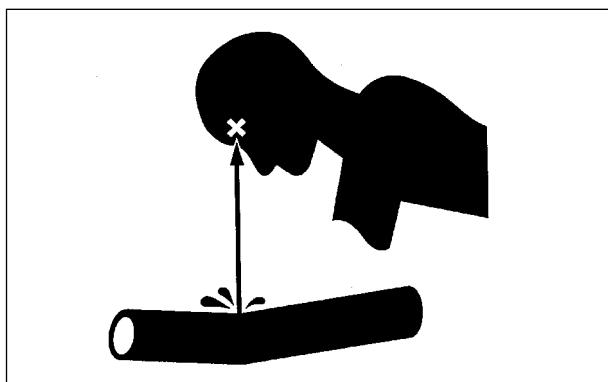
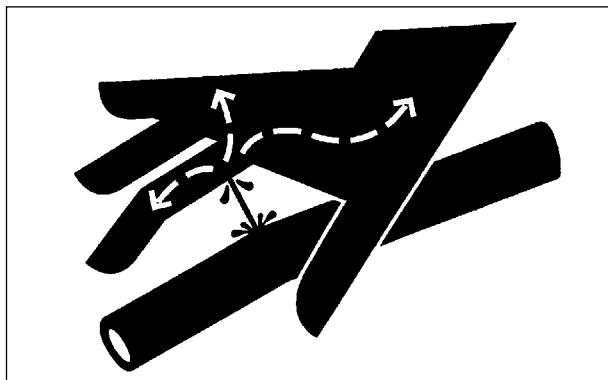
29) Never touch moving parts

Avoid becoming caught by moving parts.



30) Be careful with hydraulic oil under pressure

- (1) Whenever possible, release all hydraulic pressure before working on hydraulic components or lines. When pressure testing the hydraulic system, make sure all lines and connections are tight.
- (2) Check for leaks of pressurized oil using cardboard or wood. Carefully avoid having pressurized oil hit your skin.
- (3) If pressurized oil penetrates your skin, get help from a doctor immediately. It must be removed within a short time or it will cause serious injury.



31) Fire prevention**(1) Hoses and piping**

- Check hoses, lines and connections for leaks, which can cause a fire.
- Check for loose or missing plugs, and frayed or kinked hoses and piping.

(2) Electric cable and wiring

- Check daily for loose, kinked, hardened or frayed electric cables or lines. Electrical wiring with a short can cause a fire.

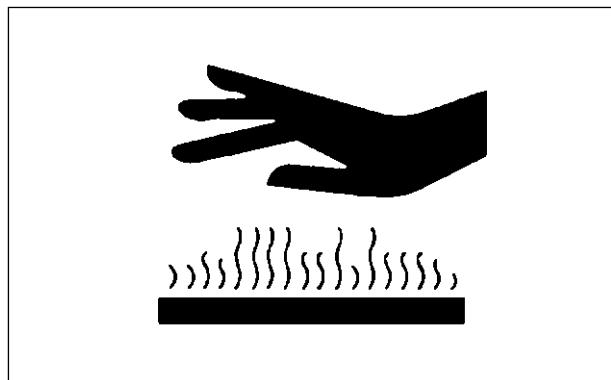
32) Prevention of battery explosion

Batteries emit hydrogen gas, which can explode. Take the following precautions when handling batteries:

- (1) Never bring sparks, lighted cigarettes, any source of intense heat or flame near the battery.
- (2) Never check battery by shorting positive terminal with a metal object. Use a voltmeter and a hydrometer.
- (3) Never recharge frozen batteries. An explosion may result. Heat frozen batteries slowly up to 16°C (60°F) before recharging.

**33) Burn Prevention****(1) Be careful not to get burned by hot coolant or steam.**

- Coolant in the engine, radiator and heater lines is very hot or is turned to steam during operation. It is also under high pressure. Stop the engine and allow the radiator to cool down before inspection or service.
- After radiator is cool, remove radiator cap slowly to release pressure slowly.



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(2) Do not allow hot engine, gear or hydraulic oil to contact your skin.

- Allow all systems to cool down before inspecting and servicing the machine.
- The hydraulic oil tank is under pressure. Stop engine, wait for hydraulic oil to cool, then partly loosen cap to release internal pressure.



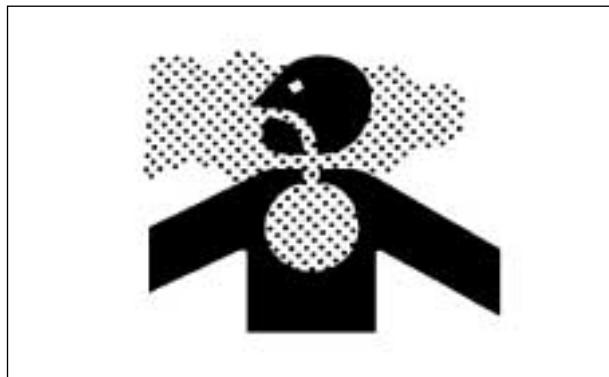
34) Remove coating before welding or heating

(1) Protect yourself from noxious smoke or dust

- Welding, soldering or heating with a welding torch directly on a coated surface can produce noxious gases. Perform these operations in an open or well-ventilated area.

(2) Remove coatings from surface before welding or heating.

- When removing coating with a grinder, wear a welder's helmet to prevent inhaling the dust.
- When using a welding flux, wipe the face of the weld with soapy or clear water.
- Do not store a welding flux near flame. Wait 15 minutes or more after removing coating before welding or heating.



35) Do not heat hydraulic system and piping.

(1) Heating hydraulic components, piping or nearby areas can produce flammable steam or gas. Take the following precautions:

1. Clean flammable liquids out of piping using a nonflammable solvent before welding.
2. Never weld, solder or use a welding torch on hydraulic components or nearby areas.
3. Piping with hydraulic oil under pressure or rubber hoses can burst if heated directly. Be sure to use fire-proof shields.

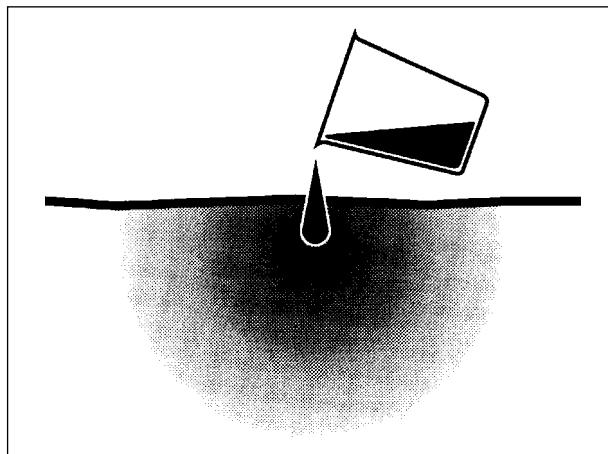


36) Store attachments safely

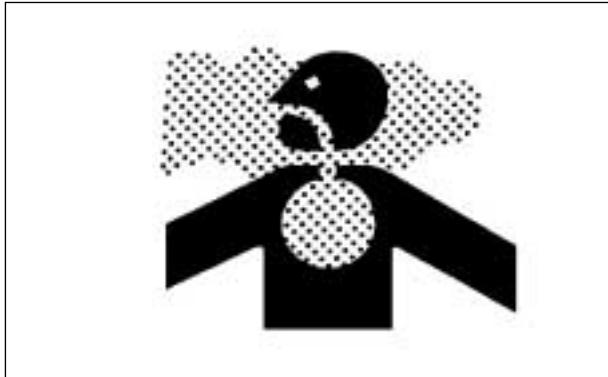
- Store attachments such as the bucket, blade and breaker in a secure manner.
- Do not allow access to storage area by children or unauthorized personnel.

**37) Disposal of liquid and material waste**

- Drain used liquids into approved containers.
- Dispose of waste liquid according to current regulations.
- Follow all regulations when disposing of oil, fuel, coolant, brake fluid, solvent, filters, batteries and other toxic material.

**38) Be careful of asbestos dust**

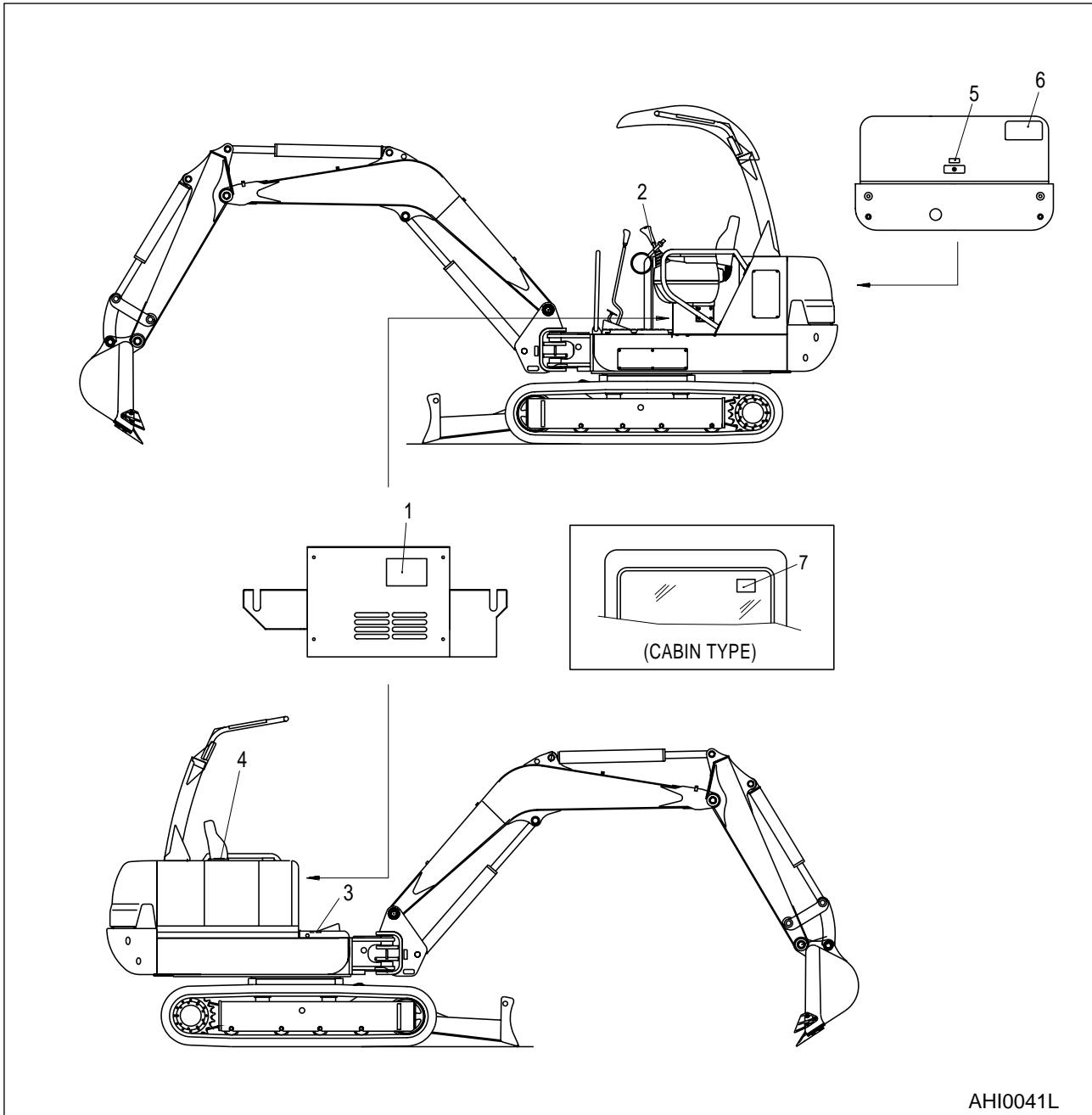
- There may be asbestos in brake pads, bands, linings, clutch plates and gaskets. Asbestos is injected into these parts as a resin or by methods which do not usually allow dust to be released
- When handling parts that may contain asbestos, take steps to avoid inhaling asbestos dust- it can cause serious lung damage or death.

**39) How to avoid inhaling asbestos dust.**

- Do not use compressed air to clean parts.
- Do not use a grinder.
- Wear breathing apparatus (respirator) that you are sure will prevent breathing in asbestos dust.
- Use a vacuum cleaner, if possible.
- Wet down parts with oil or water.
- Do not allow other personnel into the work area.

1. SAFETY

1.4. LOCATION OF SAFETY LABELS



AHI0041L

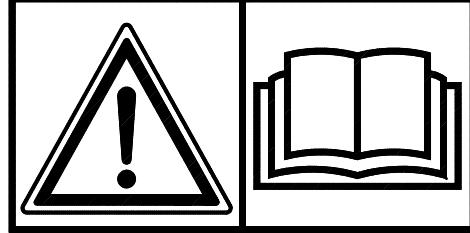
Always keep these labels clean. If they are lost or damaged, replace them with a new label. It is the responsibility of the equipment owner and crew to provide essential safety information in the immediate vicinity of hazards.

Safety labels may be available in languages other than English, or labels providing a warning for other hazards than those that follow may be available. Contact your Daewoo distributor to find out what labels are available.

1. WARNING FOR OPERATION, INSPECTION AND MAINTENANCE (2190 - 2627, 190 - 00092)

⚠ CAUTION!

- **Read manual and labels before operation and maintenance. Follow instructions and warnings in manual and on labels on the machine.**
- **Never get in under the machine while it is being jacked up with boom and arm.**
- **Sound the horn to alert the people nearby before operating, and make sure all persons are clear of area.**
- **Always make sure when leaving operator's seat to:**
 - Lower bucket or other working tools to the ground.
 - Turn key switch OFF. Remove key from switch.
 - If hydraulic components and units are ABNORMAL, consult nearest DEAWOO dealer or authorized service shop. Do not attempt to make an overhaul.

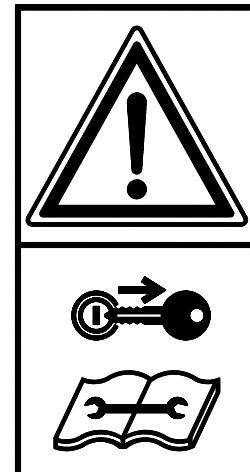


ACO1360L

2. WARNING TAG (2190-2549, 190 - 00098)

⚠ CAUTION!

Don't touch when performing inspection or maintenance.



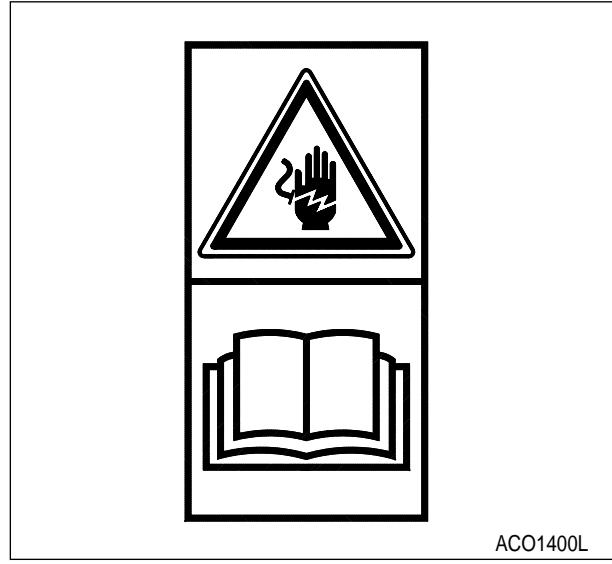
ACO1450L

1. SAFETY

3. WARNING FOR BATTERY MAINTENANCE (2190 - 2533, 190 - 00100)

⚠ WARNING!

- **Battery fumes can explode. Keep sparks and flames away from batteries.**
- **Always avoid storing metals like tools or inflammable materials around or on the batteries.**
explosion or fire can be caused by short circuiting batteries.
- **Sulfuric acid in battery is poisonous.**
It is strong enough to burn skin, eat holes in clothing, and cause blindness if splashed in eyes.
- **If you spill acid on yourself:**
 1. **Flush your skin with water.**
 2. **Apply baking soda or lime to help neutralize the acid.**
 3. **Flush your eyes with water for 10-15 minutes.**
Get medical attention immediately.



ACO1400L

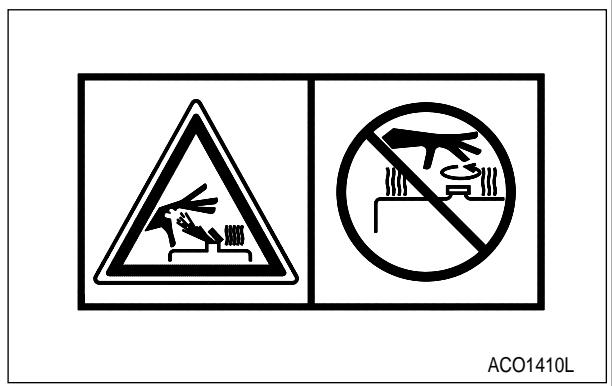
4. WARNING FOR HIGH TEMPERATURE HYDRAULIC OIL (2190 - 2529, 190 - 00097)

⚠ CAUTION!

HYDRAULIC OIL

To prevent hot oil from spouting out:

- **Turn engine “OFF”.**
- **Allow oil to cool.**
- **Slowly loosen cap to relieve pressure before removing.**

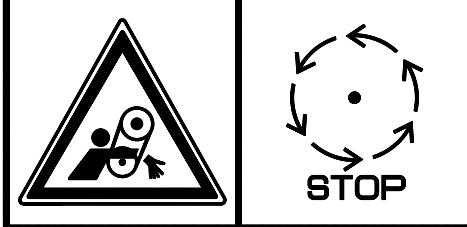


ACO1410L

5. WARNING WHEN OPENING ENGINE HOOD (2190-2640, 190 - 00095)

⚠ CAUTION!

Before opening bonnet, stop engine.

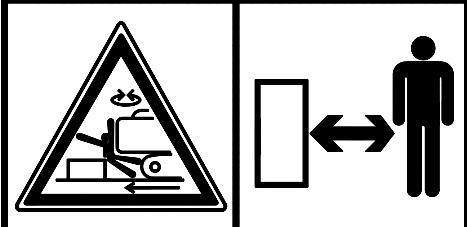


ACO1420L

6. KEEP OFF OF THE SWING AREA (2190 - 2590, 190 - 00163)

⚠ CAUTION!

KEEP OFF OF SWING AREA



ACO1430L

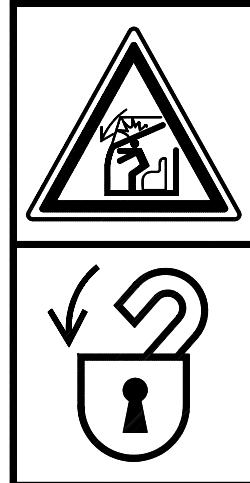
1. SAFETY

7. WARNING WHEN OPENING FRONT WINDOW (2190 - 2526, 190 - 00093) (IF EQUIPPED WITH CAB)

CAUTION!

When raising window, lock it in place with
lock pins on both sides.

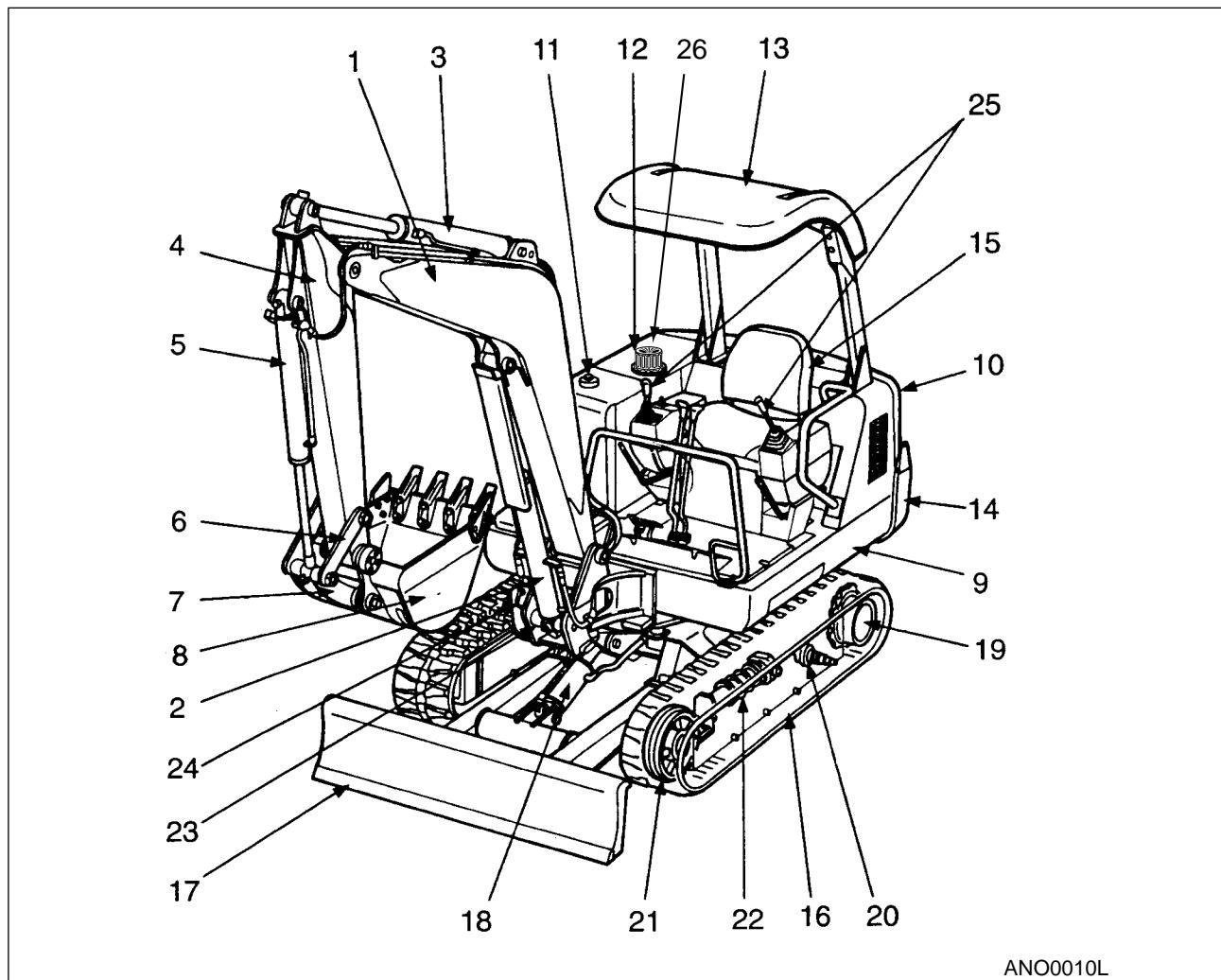
Falling window can cause injury.



ACO1360L

2. GENERAL INFORMATION

2.1 EXCAVATOR MAJOR COMPONENTS

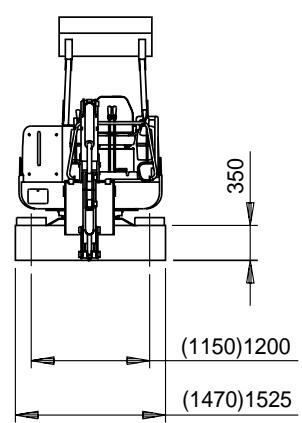
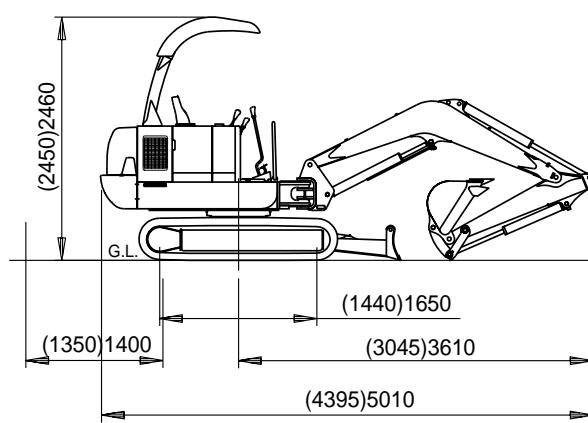
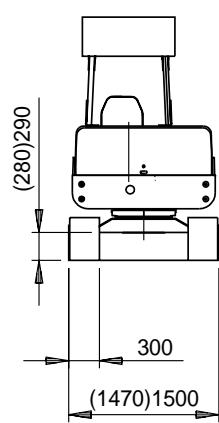
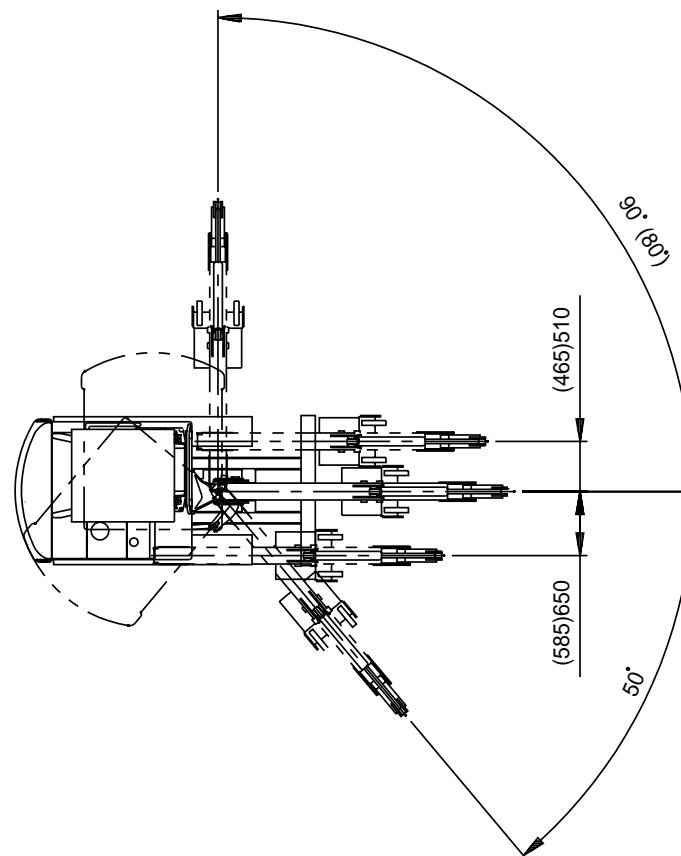


1. Boom	10. Engine hood	19. Travel motor
2. Boom cylinder	11. Fuel tank	20. Lower roller
3. Arm cylinder	12. Hydraulic oil tank	21. Idler
4. Arm	13. Canopy	22. Track spring
5. Bucket cylinder	14. Counterweight	23. Swing bracket
6. Bucket linkage	15. Seat	24. Swing cylinder
7. (Dump) linkage	16. Rubber crawler	25. Attachment control levers
8. Bucket	17. Blade	26. Air breather
9. Swing frame	18. Blade cylinder	

2. GENERAL INFORMATION

2.2 EXCAVATOR EXTERNAL VIEWS AND OPERATING SPACE

- SOLAR 035/SOLAR 030 Plus Excavators (with canopy)



* Dimensions in () indicate the specifications for SOLAR 030 Plus.

- SOLAR 035/SOLAR 030 Plus Excavators (with cabin)

