

Technical Manual

Troubleshooting

ZW

220

250

Wheel Loader

Service Manual consists of the following separate Part No.
Technical Manual (Operational Principle) : Vol. No.TO4GB-E
Technical Manual (Troubleshooting) : Vol. No.TT4GB-E
Workshop Manual : Vol. No.W4GB-E

INTRODUCTION

TO THE READER

- This manual is written for an experienced technician to provide technical information needed to maintain and repair this machine.
- Be sure to thoroughly read this manual for correct product information and service procedures.
- If you have any questions or comments, at if you found any errors regarding the contents of this manual, please contact using "Service Manual Revision Request Form" at the end of this manual.
(Note: Do not tear off the form. Copy it for usage.)
Publications Marketing & Product Support
Hitachi Construction Machinery Co. Ltd.
TEL: 81-29-832-7084
FAX: 81-29-831-1162

ADDITIONAL REFERENCES

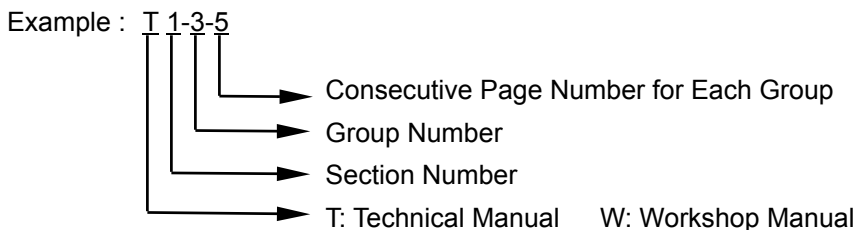
- Please refer to the materials listed below in addition to this manual.
 - The Operator's Manual
 - The Parts Catalog
 - The Engine Manual
 - Parts Catalog of the Engine
 - Hitachi Training Material

MANUAL COMPOSITION

- This manual consists of three portions: the Technical Manual (Operational Principle), the Technical Manual (Troubleshooting) and the Workshop Manual.
- Information included in the Technical Manual (Operational Principle):
technical information needed for redelivery and delivery, operation and activation of all devices and systems.
- Information included in the Technical Manual (Troubleshooting):
technical information needed for operational performance tests, and troubleshooting procedures.
- Information included in the Workshop Manual:
technical information needed for maintenance and repair of the machine, tools and devices needed for maintenance and repair, maintenance standards, and removal/installation and assemble/disassemble procedures.

PAGE NUMBER


- Each page has a number, located on the center lower part of the page, and each number contains the following information:



INTRODUCTION


SAFETY ALERT SYMBOL AND HEADLINE NOTATIONS

In this manual, the following safety alert symbol and signal words are used to alert the reader to the potential for personal injury or machine damage.


 This is the safety alert symbol. When you see this symbol, be alert to the potential for personal injury. Never fail to follow the safety instructions prescribed along with the safety alert symbol.

The safety alert symbol is also used to draw attention to component/part weights.

To avoid injury and damage, be sure to use appropriate lifting techniques and equipment when lifting heavy parts.

-  **CAUTION:**
Indicated potentially hazardous situation which could, if not avoided, result in personal injury or death.

- **IMPORTANT:**
Indicates a situation which, if not conformed to the instructions, could result in damage to the machine.

-  **NOTE:**
Indicates supplementary technical information or know-how.

UNITS USED

- SI Units (International System of Units) are used in this manual.
MKSA system units and English units are also indicated in parentheses just behind SI units.

Example : 24.5 MPa (250 kgf/cm², 3560 psi)

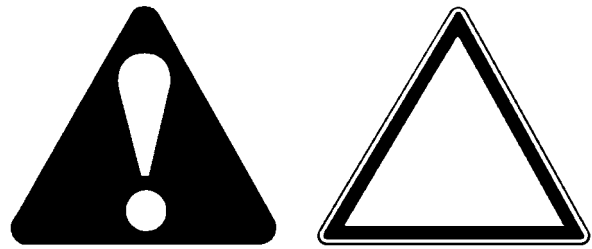
A table for conversion from SI units to other system units is shown below for reference purposes.

Quantity	To Convert From	Into	Multiply By	Quantity	To Convert From	Into	Multiply By
Length	mm	in	0.03937	Pressure	MPa	kgf/cm ²	10.197
	mm	ft	0.003281		MPa	psi	145.0
Volume	L	US gal	0.2642	Power	kW	PS	1.360
	L	US qt	1.057		kW	HP	1.341
	m ³	yd ³	1.308	Temperature	°C	°F	°C×1.8+32
Weight	kg	lb	2.205	Velocity	km/h	mph	0.6214
Force	N	kgf	0.10197		min ⁻¹	rpm	1.0
	N	lbf	0.2248	Flow rate	L/min	US gpm	0.2642
Torque	N·m	kgf·m	1.0197		mL/rev	cc/rev	1.0
	N·m	lbf·ft	0.7375				

SAFETY

RECOGNIZE SAFETY INFORMATION


- These are the **SAFETY ALERT SYMBOLS**.
 - When you see these symbols on your machine or in operator's manual, be alert to the potential for personal injury.
 - Follow recommended precautions and safe operating practices.



001-E01A-0001

SA-688

UNDERSTAND SIGNAL WORDS

- On machine safety signs, signal words designating the degree or level of hazard - **DANGER**, **WARNING**, or **CAUTION** - are used with the safety alert symbol.
 - **DANGER** indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.
 - **WARNING** indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.
 - **CAUTION** indicates a potentially hazardous situation
 - which, if not avoided, may result in minor or moderate injury.
 - **DANGER or WARNING safety signs** are located near specific hazards. General precautions are listed on **CAUTION safety signs**.
 - Some safety signs don't use any of the designated signal words above after the safety alert symbol are occasionally used on this machine.
- To avoid confusing machine protection with personal safety messages, a signal word **IMPORTANT** indicates a situation which, if not avoided, could result in damage to the machine.
-  **NOTE** indicates an additional explanation for an element of information.



SA-1223

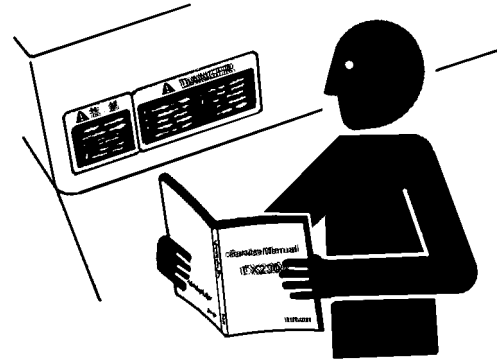
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SAFETY

FOLLOW SAFETY INSTRUCTIONS

- Carefully read and follow all safety signs on the machine and all safety messages in operator's manual.
- Safety signs should be installed, maintained and replaced when necessary.
 - If a safety sign or operator's manual is damaged or missing, order a replacement from your authorized dealer in the same way you order other replacement parts (be sure to state machine model and serial number when ordering).
- Learn how to operate the machine and its controls correctly and safely.
- Allow only trained, qualified, authorized personnel to operate the machine.
- Keep your machine in proper working condition.
 - Unauthorized modifications of the machine may impair its function and/or safety and affect machine life.
 - Do not modify any machine parts without authorization. Failure to do so may deteriorate the part safety, function, and/or service life. In addition, personal accident, machine trouble, and/or damage to material caused by unauthorized modifications will void Hitachi Warranty Policy.
 - Do not use attachments and/or optional parts or equipment not authorized by Hitachi. Failure to do so may deteriorate the safety, function, and/or service life of the machine. In addition, personal accident, machine trouble, and/or damage to material caused by using unauthorized attachments and/or optional parts or equipment will void Hitachi Warranty Policy.
- The safety messages in this SAFETY chapter are intended to illustrate basic safety procedures of machines. However it is impossible for these safety messages to cover every hazardous situation you may encounter. If you have any questions, you should first consult your supervisor and/or your authorized dealer before operating or performing maintenance work on the machine.

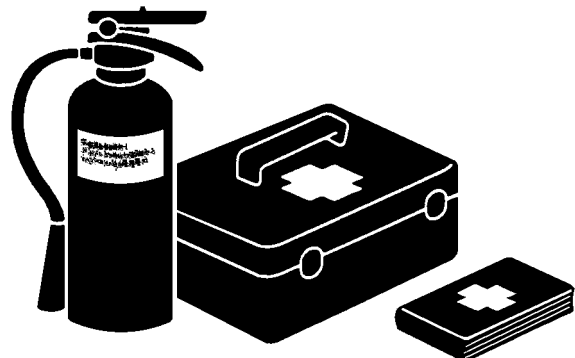
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SA-003

PREPARE FOR EMERGENCIES

- Be prepared if a fire starts or if an accident occurs.
 - Keep a first aid kit and fire extinguisher on hand.
 - Thoroughly read and understand the label attached on the fire extinguisher to use it properly.
 - To ensure that a fire-extinguisher can be always used when necessary, check and service the fire-extinguisher at the recommended intervals as specified in the fire-extinguisher manual.
 - Establish emergency procedure guidelines to cope with fires and accidents.
 - Keep emergency numbers for doctors, ambulance service, hospital, and fire department posted near your telephone.



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SA-437

SAFETY

WEAR PROTECTIVE CLOTHING

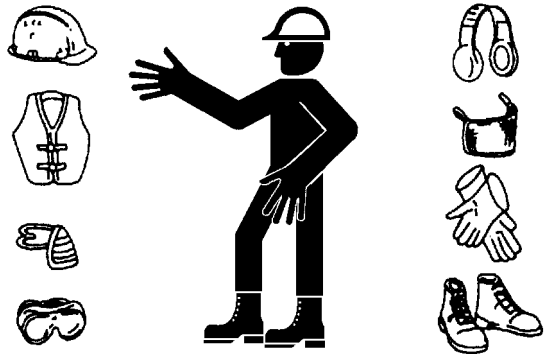
- Wear close fitting clothing and safety equipment appropriate to the job.

You may need:

- A hard hat
- Safety shoes
- Safety glasses, goggles, or face shield
- Heavy gloves
- Hearing protection
- Reflective clothing
- Wet weather gear
- Respirator or filter mask.

Be sure to wear the correct equipment and clothing for the job. Do not take any chances.

- Avoid wearing loose clothing, jewelry, or other items that can catch on control levers or other parts of the machine.
- Operating equipment safely requires the full attention of the operator. Do not wear radio or music headphones while operating the machine.



SA-438

005-E01A-0438

PROTECT AGAINST NOISE

- Prolonged exposure to loud noise can cause impairment or loss of hearing.
 - Wear a suitable hearing protective device such as earmuffs or earplugs to protect against objectionable or uncomfortably loud noises.



006-E01A-0434

SA-434

INSPECT MACHINE

- Inspect your machine carefully each day or shift by walking around it before you start it to avoid personal injury.
 - In the walk-around inspection be sure to cover all points described in the “PRE-START INSPECTION” chapter in the operator’s manual.



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SA-435

SAFETY

GENERAL PRECAUTIONS FOR CAB

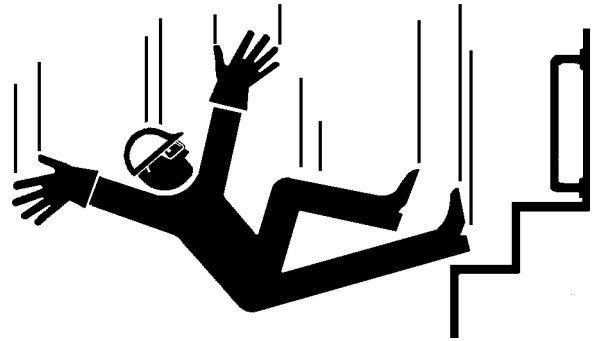
- Before entering the cab, thoroughly remove all dirt and/or oil from the soles of your work boots. If any controls such as a pedal is operated while with dirt and/or oil on the soles of the operator's work boots the operator's foot may slip off the pedal, possibly resulting in a personal accident.
- Do not leave parts and/or tools lying around the operator's seat. Store them in their specified locations.
- Avoid storing transparent bottles in the cab. Do not attach any transparent type window decorations on the windowpanes as they may focus sunlight, possibly starting a fire.
- Refrain from listening to the radio, or using music headphones or mobile telephones in the cab while operating the machine.
- Keep all flammable objects and/or explosives away from the machine.
- After using the ashtray, always cover it to extinguish the match and/or tobacco.
- Do not leave cigarette lighters in the cab. When the temperature in the cab increases, the lighter may explode.

524-E01A-0000

SAFETY

USE HANDHOLDS AND STEPS

- Falling is one of the major causes of personal injury.
 - When you get on and off the machine, always face the machine and maintain a three-point contact with the steps and handrails.
 - Do not use any controls as hand-holds.
 - Never jump on or off the machine. Never mount or dismount a moving machine.
 - Be careful of slippery conditions on platforms, steps, and handrails when leaving the machine.



008-E01A-0439

SA-439

ADJUST THE OPERATOR'S SEAT

- A poorly adjusted seat for either the operator or for the work at hand may quickly fatigue the operator leading to misoperations.
 - The seat should be adjusted whenever changing the operator for the machine.
 - The operator should be able to fully depress the pedals and to correctly operate the control levers with his back against the seat back.
 - If not, move the seat forward or backward, and check again.
 - Adjust the rear view mirror position so that the best rear visibility is obtained from the operator's seat. If the mirror is broken, immediately replace it with a new one.



SA-462

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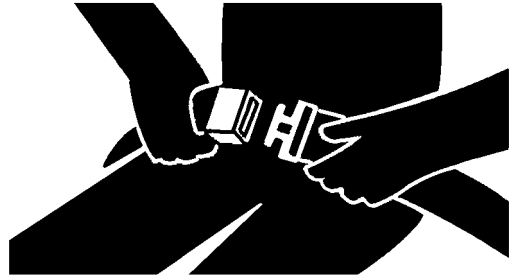
ENSURE SAFETY BEFORE RISING FROM OR LEAVING OPERATOR'S SEAT

- Before rising from the operator's seat to open/close either side window or to adjust the seat position, be sure to first lower the front attachment to the ground and then move the pilot control shut-off lever to the LOCK position. Failure to do so may allow the machine to unexpectedly move when a body part unintentionally comes in contact with a control lever, possibly resulting in serious personal injury or death.
 - Before leaving the machine, be sure to first lower the front attachment to the ground and then move the pilot control shut-off lever to the LOCK position. Turn the key switch OFF to stop the engine.
 - Before leaving the machine, close all windows, doors, and access covers and lock them up.

SAFETY

FASTEN YOUR SEAT BELT

- If the machine should overturn, the operator may become injured and/or thrown from the cab. Additionally the operator may be crushed by the overturning machine, resulting in serious injury or death.
 - Prior to operating the machine, thoroughly examine webbing, buckle and attaching hardware. If any item is damaged or worn, replace the seat belt or component before operating the machine.
 - Be sure to remain seated with the seat belt securely fastened at all times when the machine is in operation to minimize the chance of injury from an accident.
 - We recommend that the seat belt be replaced every three years regardless of its apparent condition.

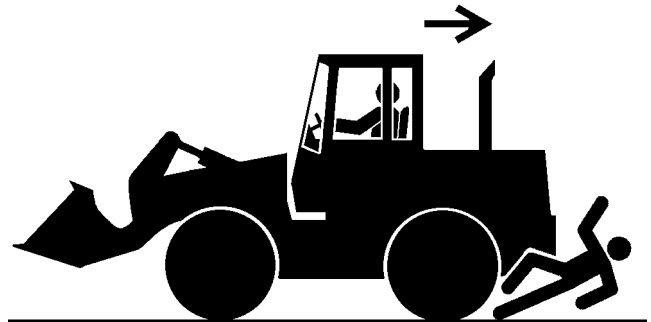


SA-237

010-E01A-0237

MOVE AND OPERATE MACHINE SAFELY

- Bystanders can be run over.
 - Take extra care not to run over bystanders. Confirm the location of bystanders before moving, or operating the machine.
 - Always keep the travel alarm and horn in working condition (if equipped). It warns people when the machine starts to move.
 - Use a signal person when moving, swinging, or operating the machine in congested areas. Coordinate hand signals before starting the machine.
 - Use appropriate illumination. Check that all lights are operable before operating the machine. If any faulty illumination is present, immediately repair it.



SA-398

011-E01A-0398

HANDLE STARTING AIDS SAFELY

Starting fluid:

- Starting fluid is highly flammable.
 - Keep all sparks and flame away when using it.
 - Keep starting fluid well away from batteries and cables.
 - Remove container from machine if engine does not need starting fluid.
 - To prevent accidental discharge when storing a pressurized container, keep the cap on the container, and store it in a cool, well-protected location.
 - Do not incinerate or puncture a starting fluid container.



SA-293

036-E01A-0293-3

SAFETY

OPERATE ONLY FROM OPERATOR'S SEAT

- Inappropriate engine starting procedures may cause the machine to runaway, possibly resulting in serious injury or death.
 - Start the engine only when seated in the operator's seat.
 - NEVER start the engine while standing on the track or on ground.
 - Do not start engine by shorting across starter terminals.
 - Before starting the engine, confirm that all control levers are in neutral.
 - Before starting the engine, confirm the safety around the machine and sound the horn to alert bystanders.

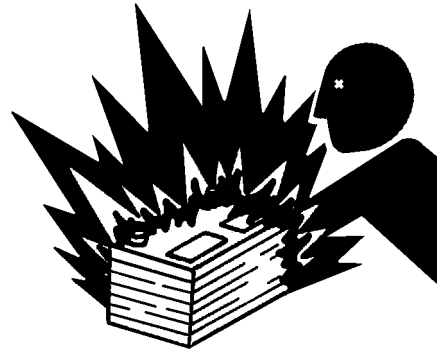


SA-431

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JUMP STARTING

- Battery gas can explode, resulting in serious injury.
 - If the engine must be jump started, be sure to follow the instructions shown in the "OPERATING THE ENGINE" chapter in the operator's manual.
 - The operator must be in the operator's seat so that the machine will be under control when the engine starts.
 - Jump starting is a two-person operation.
 - Never use a frozen battery.
 - Failure to follow correct jump starting procedures could result in a battery explosion or a runaway machine.



SA-032

S013-E01A-0032 SA-032

SAFETY

INVESTIGATE JOB SITE BEFOREHAND

- When working at the edge of an excavation or on a road shoulder, the machine could tip over, possibly resulting in serious injury or death.
 - Investigate the configuration and ground conditions of the job site beforehand to prevent the machine from falling and to prevent the ground, stockpiles, or banks from collapsing.
 - Make a work plan. Use machines appropriate to the work and job site.
 - Reinforce ground, edges, and road shoulders as necessary. Keep the machine well back from the edges of excavations and road shoulders.
 - When working on an incline or on a road shoulder, employ a signal person as required.
 - Confirm that your machine is equipped a FOPS cab before working in areas where the possibility of falling stones or debris exist.
 - When the footing is weak, reinforce the ground before starting work.
 - When working on frozen ground, be extremely alert. As ambient temperatures rise, footing becomes loose and slippery.
 - Beware the possibility of fire when operating the machine near flammable objects such as dry grass.



SA-447

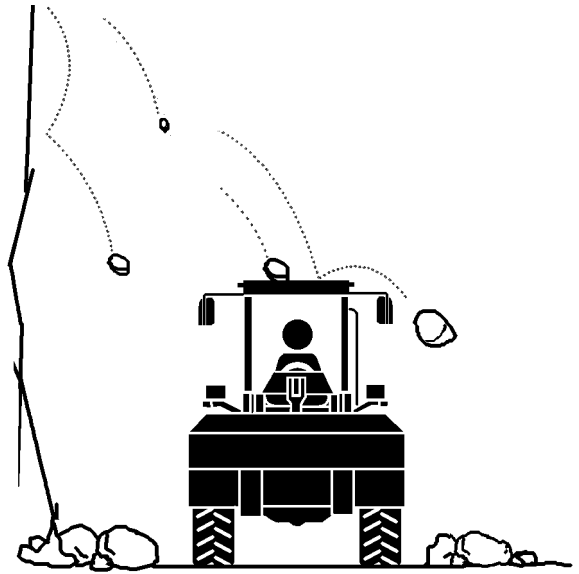
015-E01B-0447

SAFETY

EQUIPMENT OF HEAD GUARD, ROPS, FOPS

In case the machine is operated in areas where the possibility of falling stones or debris exist, equip a head guard, ROPS, or FOPS according to the potential hazardous conditions. (The standard cab for this machine corresponds to ROPS and FOPS.)

ROPS: Roll-Over Protective Structure
FOPS: Falling Object Protective Structure



SA-521

PROVIDE SIGNALS FOR JOBS INVOLVING MULTIPLE NUMBERS OF MACHINES

- For jobs involving multiple numbers of machines, provide signals commonly known by all personnel involved. Also, appoint a signal person to coordinate the job site. Make sure that all personnel obey the signal person's directions.



018-E01A-0481

SA-481

SAFETY

KEEP RIDERS OFF MACHINE

- Riders on machine are subject to injury such as being struck by foreign objects and being thrown off the machine.
 - Only the operator should be on the machine. Keep riders off.
 - Riders also obstruct the operator's view, resulting in the machine being operated in an unsafe manner.

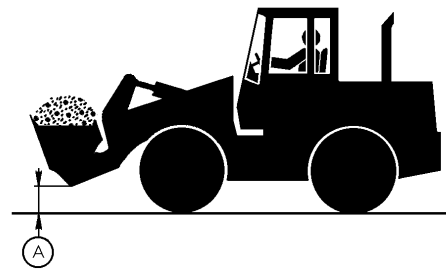


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SA-427

DRIVE SAFELY

- Beware of the possibility of slipping and/or turning over the machine when driving on a slope.
 - When driving on level ground, hold the bucket at mark (A) 400 to 500 mm above the ground as illustrated.
 - Avoid driving over any obstacles.
 - Drive the machine slowly when driving on rough terrain.
 - Avoid quick direction changes. Failure to do so may cause the machine to turn over.
 - If the engine stops while driving, the steering function becomes inoperative. Immediately stop the machine by applying the brake to prevent personal accident.

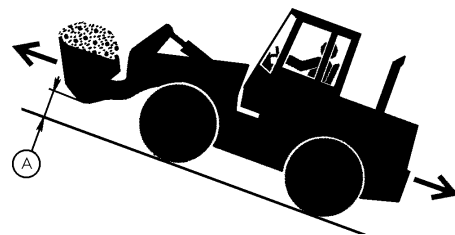


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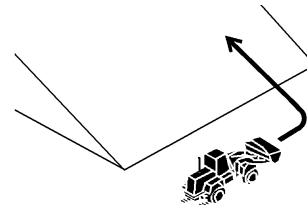
SA-448

DRIVE MACHINE SAFELY (WORK SITE)

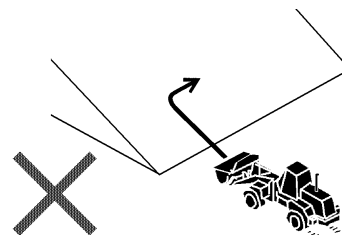
- Before driving the machine, always confirm that the steering wheel/F-N-R lever direction corresponds to the direction you wish to drive.
 - Be sure to detour around any obstructions.
- Driving on a slope may cause the machine to slip or overturn, possibly resulting in serious injury or death.
 - When driving up or down a slope, keep the bucket facing the direction of travel, approximately 200 to 300 mm (approximately 8 to 12 in) (A) above the ground.
 - If the machine starts to skid or becomes unstable, immediately lower the bucket to the ground and stop.
- Driving across the face of a slope or steering on a slope may cause the machine to skid or overturn. If the direction must be changed, move the machine to level ground, then, change the direction to ensure safe operation.



SA-449



SA-450



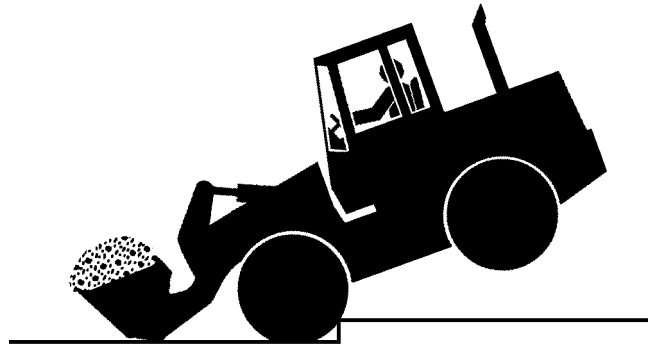
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SA-451

SAFETY

DRIVE SAFELY WITH BUCKET LOADED

- If the machine is incorrectly operated while driving with the bucket loaded, turning over of the machine may result. Be sure to follow all the instructions indicated below.
 - When driving the machine on a job site with the bucket loaded, hold the bucket as low as possible to keep the machine balanced and to have good visibility.
 - Do not exceed the rated load capacity. Always operate the machine within the rated load capacity.
 - Avoid fast starts, stops, and quick turns. Failure to do so may result in personal injury and/or death.
 - Avoid rapid drive direction changes which could possibly cause personal injury and/or death.

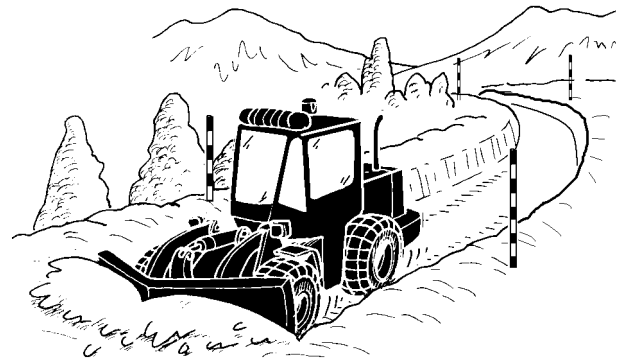


SA-400

051-E02A-0400

DRIVE ON SNOW SAFELY

- Beware of the possibility of slipping or turning over the machine when driving on frozen snow surfaces.
 - The machine may slip more easily than expected on frozen snow surfaces even if the inclination is small. Reduce speed when driving. Avoid fast starts, stops and quick turns.
 - Road shoulder and/or set-up utilities covered with snow are difficult to locate. Be sure where they are before removing snow.
 - Be sure to use tire chains when driving on snow.
 - Avoid applying the brake for quick stops on snow. If a quick stop is required, lower the bucket to the ground.

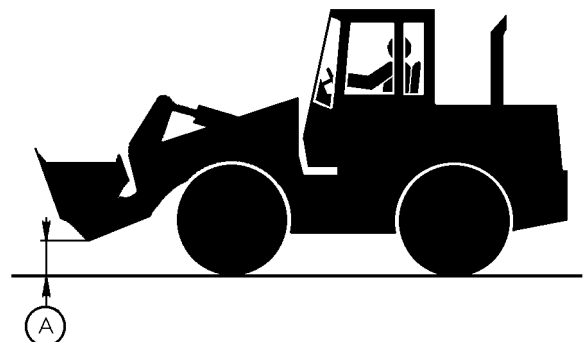


SA-452

052-E02A-0452

TRAVEL ON PUBLIC ROADS SAFELY

- This machine is not allowed to drive on public roads with the bucket loaded.
 - Be sure to empty the bucket.
 - Hold the bucket at mark (A) 400 to 500 mm above the road surface as illustrated.



053-E02A-0453

SA-453

SAFETY

AVOID INJURY FROM ROLLAWAY ACCIDENTS

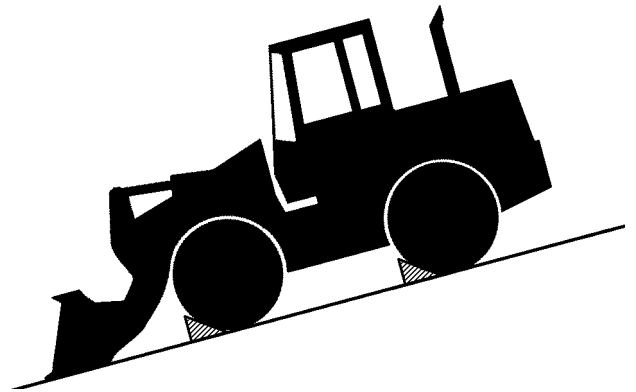
- Death or serious injury may result if you attempt to mount or stop a moving machine.

To avoid rollaways:

- Select level ground when possible to park machine.
- Do not park the machine on a grade.
- Lower the bucket to the ground.
- Place the F-N-R lever in neutral, and put the park brake switch in the ON (parking brake) position.
- Run the engine at slow idle speed without load for 5 minutes to cool down the engine.
- Stop the engine and remove the key from the key switch.
- Pull the lock lever to LOCK position.
- Block both tires and lower the bucket to the ground.
- Position the machine to prevent rolling.
- Park a reasonable distance from other machines.



SA-457



SA-458

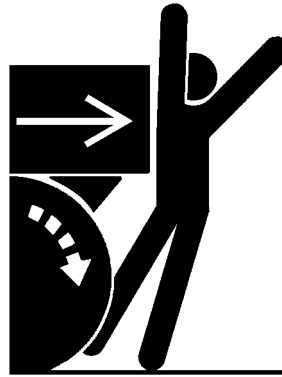
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SAFETY

AVOID ACCIDENTS FROM BACKING UP AND TURNING

- Make sure no one is working under or close to the machine before backing up or turning the machine to avoid personal injury and/or death by being run over or entangled in the machine.
 - Keep all personnel away from the machine by sounding the horn and/or using hand signals. Use extra care to be sure no one is in from the articulation area before turning the machine.
 - Keep windows, mirrors, and lights in good condition.
 - Reduce travel speed when dust, heavy rain, fog, etc., reduce the visibility.
 - In case good visibility is not obtained, use a signal person to guide you.

021-E02A-0517



SA-383



SA-312

SAFETY

AVOID POSITIONING BUCKET OVER ANYONE

- Never allow the bucket to pass over co-workers and/or the dump truck operator's cab. Falling soil from the bucket or contact with bucket may cause serious personal accidents and/or damage to the machine.
 - Avoid carrying the bucket over the co-workers to ensure safe operation.



023-E02A-0518

SA-518

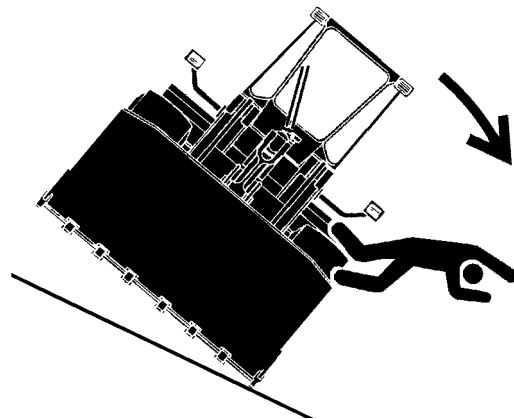
AVOID TIPPING

DO NOT ATTEMPT TO JUMP CLEAR OF TIPPING MACHINE. MACHINE WILL TIP OVER FASTER THAN YOU CAN JUMP FREE, POSSIBLY RESULTING IN SERIOUS PERSONAL INJURY OR DEATH. IF TIPPING OVER OF THE MACHINE IS PREDICTED, SECURELY HOLD THE STEERING WHEEL TO PREVENT YOUR BODY FROM BEING THROWN OUT OF THE MACHINE.

MACHINE WILL TIP OVER FASTER THAN YOU CAN JUMP FREE

FASTEN YOUR SEAT BELT

- The danger of tipping is always present when operating on a grade, possibly resulting in serious injury or death.
 - To avoid tipping:
- Be extra careful before operating on a grade.
 - Prepare machine operating area flat.
 - Keep the bucket low to the ground and close to the machine.
 - Reduce operating speeds to avoid tipping or slipping.
 - Avoid changing direction when traveling on grades.
 - NEVER attempt to travel across a grade steeper than 5 degrees if crossing the grade is unavoidable.
 - Reduce swing speed as necessary when swinging loads.
- Be careful when working on frozen ground.
 - Temperature increases will cause the ground to become soft and make ground travel unstable.



SA-463

SAFETY

NEVER UNDERCUT A HIGH BANK

- The edges could collapse or a land slide could occur causing serious injury or death.

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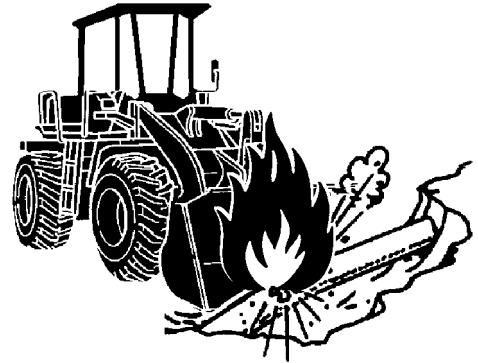


SA-519

DIG WITH CAUTION

Before digging, check the location of cables, gas lines, and water lines.

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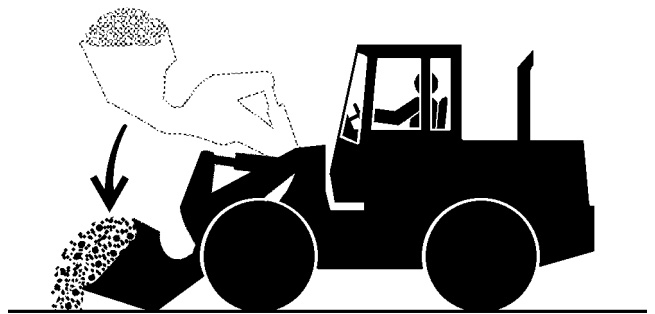


SA-396

PERFORM TRUCK LOADING SAFELY

- Do not operate the machine involuntarily. Unexpected machine movement may cause personal injury and/or death.
 - Do not lower the bucket with the loader control lever in the FLOAT position. The bucket may free fall, possibly causing personal injury and/or death.
 - Always select a level surface for truck loading.

028-E01A-397



SA-397

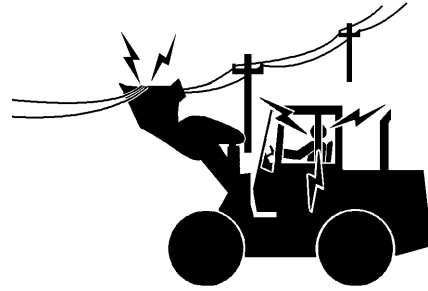
SAFETY

AVOID POWER LINES

Serious injury or death can result from contact with electric lines.

Never move any part of the machine or load closer to any electric line than 3 m (10 ft) plus twice the line insulator length.

29-E01A-0455



SA-455

PRECAUTIONS FOR OPERATION

- If the front attachment or any part of the machine comes in contact with an overhead obstacle, both the machine and the overhead obstacle may become damaged, and personal injury may result.
 - Take care to avoid coming in contact with overhead obstacles with the bucket or arm during operation.

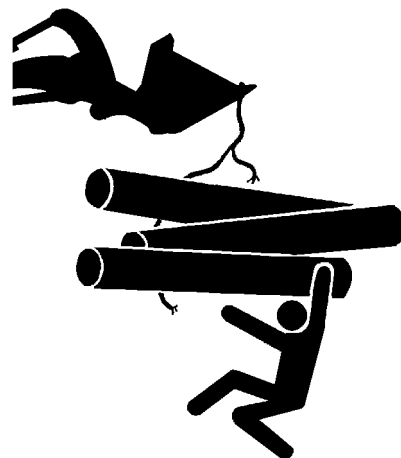
PRECAUTIONS FOR LIGHTENING

- The machine is vulnerable to lightning strikes.
 - In the event of an electrical storm, immediately stop operation, and lower the bucket to the ground. Evacuate to a safe place far away from the machine.
 - After the electrical storm has passed, check all of the machine safety devices for any failure. If any failed safety devices are found, operate the machine only after repairing them.

OBJECT HANDLING

- If a lifted load should fall, any person nearby may be struck by the falling load or may be crushed underneath it, resulting in serious injury or death.
 - When using the machine for craning operations, be sure to comply with all local regulations.
 - Do not use damaged chains or frayed cables, cables, slings, or ropes.
 - Before craning, position the upperstructure with the position of the bucket support located on the chassis at the front.
 - Move the load slowly and carefully. Never move it suddenly.
 - Keep all persons well away from the load.
 - Never move a load over a person's head.
 - Do not allow anyone to approach the load until it is safely and securely situated on supporting blocks or on the ground.
 - Never attach a sling or chain to the bucket teeth. They may come off, causing the load to fall.

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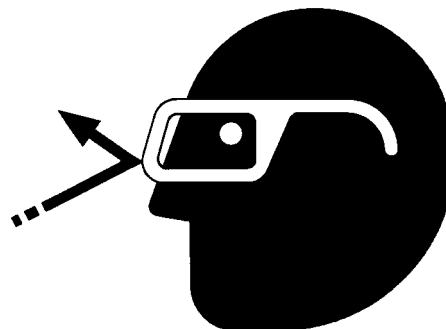


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SAFETY

PROTECT AGAINST FLYING DEBRIS

- If flying debris hit eyes or any other part of the body, serious injury may result.
 - Guard against injury from flying pieces of metal or debris; wear goggles or safety glasses.
 - Keep bystanders away from the working area before striking any object.



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PARK MACHINE SAFELY

To avoid accidents:

- Park machine on a firm, level surface.
- Lower bucket to the ground.
- Place the F-N-R lever in neutral, and put the park brake switch in the ON (parking brake) position.
- Run engine at slow idle speed without load for 5 minutes.
- Turn key switch to OFF to stop engine.
- Remove the key from the key switch.
- Lower the lock lever to the LOCK position.
- Close windows, roof vent, and cab door.
- Lock all access doors and compartments.



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