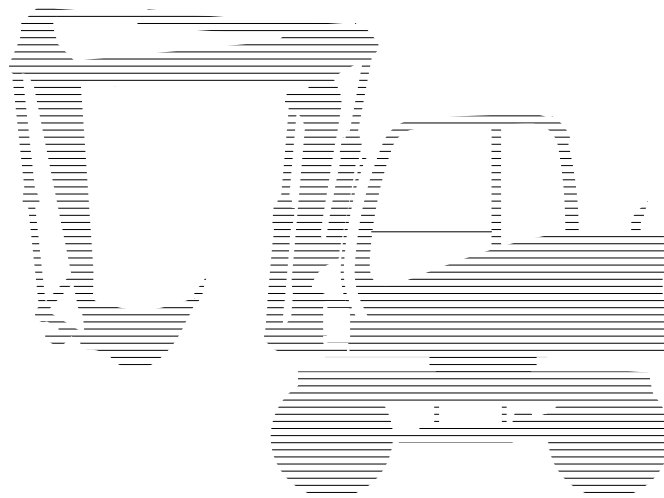


EXCAVATOR

WX95

WX125

SERVICE MANUAL



F24062

IMPORTANT:

Data contained in this manual was current at the time of publication. As the Manufacturer improves constantly his products, some information may result as not updated. If variances are observed, contact your Dealer and After-Sales Service.

CNH FRANCE S.A. - PRINT 9-91370 EN
December 2004

TO READER

- This manual has been printed for a skilful engineer to supply necessary technical information to carry out service operations on this machine.
- Read carefully this manual to collect correct information relevant to repair procedures.
- For any question or remark, or in case of any error relevant the contents of this manual, please contact :

CNH FRANCE
Rue des Meuniers
60330 LE PLESSIS BELLEVILLE
FRANCE

FURTHER REFERENCE

- Beyond this service manual, also refer to documents hereunder listed:
 - Operator's manual
 - Parts Catalogue

COMPOSITION OF COMPLETE HANDBOOK FOR INSTRUCTIONS AND REPAIRS

- The complete service manual consists of one volume:
 - WX95 - WX125**
Service Manual "Excavator"
- The Service Manual for "Excavator" contains the necessary technical information to carry out service and repair on machine , necessary tools to carry out those operations and information on service standard, on procedures for connection, disconnection, disassembly and assembly of parts.
- The complete Service Manual relevant to the excavator models **WX95, WX125** consists of following volume, which can be identified through relevant print out no. as stated hereunder:

VOLUME	MACHINE TYPE	PRINT NUMBER
- Service Manual - "Excavator"	WX95-WX125	9-91370

AVOID ACCIDENTS

The majority of accidents and injuries which occur in plants, in farms and at home or on roads, are caused by the non-observance of some simple and fundamental rules of precaution and safety. For this reason in the MAJORITY OF CASES THEY CAN BE AVOIDED: it is sufficient to foresee possible causes and to act according with the necessary precaution and care.

With any type of machine, as much as good planned or built, it is impossible to absolutely avoid risks of accidents without involving negatively some essential features for a reasonable access and an efficient operation.

Read carefully the indication and cautions of this manual contained in the SECTION "SAFETY PRECAUTIONS".

A careful and cautious operator is the best warranty against accidents.

The careful observation of a single and elementary safety precautions would be enough to avoid many serious accidents. This precaution is:

Never attempt any cleaning, lubrication or maintenance operation when machine is moving.



WARNING

Before carrying out any maintenance operation, adjustment and or repair on machines equipped with attachments, controlled hydraulically or mechanically, make sure that the attachment is lowered and safely set on the ground. If in order to get access to a machine part it is necessary to hold the attachment lifted, this should duly be supported by means that are not use to control the machine.

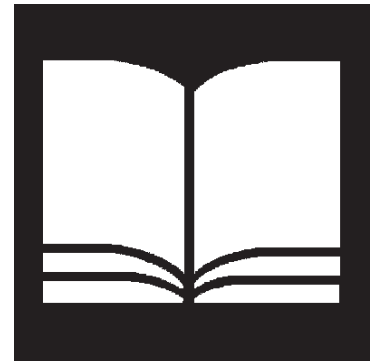
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WX95

WX125



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INTRODUCTION

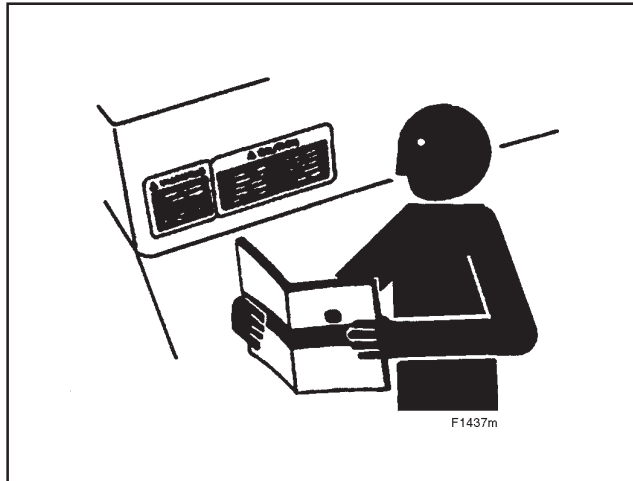
FOREWORD

This service manual has been prepared in order to increase repair quality, providing to the technicians the elements for a good knowledge of the product and showing the proper procedures to carry out the maintenance operations. We recommend to thoroughly read the content and follow it when necessary.

It is a concise guide. It covers construction features, operation principle, troubleshooting, disassembly and assembly of components and repair action.

Using this manual in systematic and rational way it is possible to reduce the repairing errors and delay that could cause machine stop with a detriment of cost management.

The information quoted in this service manual are supplied also to be used for training aids. Therefore it is advisable to be used in the training of new personnel that will be employed in the machine maintenance.



All the information, illustrations and specifications contained in this service manual are based on the latest product information available at the time of publication.

The Dealer reserves the right to make changes at any time without notice to this service manual for technical or trading reasons.

MANUAL HANDLING

CHANGES AND SUPPLEMENTS

This service manual is carried out in loose-leaf and therefore can be easily kept up-to-date.

The personnel in charge is responsible for updating the manual and will insert the changes or supplements that the Dealer will issue to its service organisation.

SYMBOLS AND INDICATIONS

In this service manual, symbols and indications are used to draw the attention on important points for safety and quality.

SAFETY

This safety symbol is used for important safety messages. When you see this symbol, be alert for the protection of your safety. Strictly follow the recommended precautions.



INDICATIONS

Reading this service manual you can find indications as **IMPORTANT** and **NOTE** that have the following meaning:

- **IMPORTANT**
Indicates a situation which, if not avoided, could cause damages to the machine.
- **NOTE**
Indicates an additional explanation for further technical information.

FEATURES OF THE MANUAL

MANUAL COMPOSITION

This service manual consists of 10 sections, of which we indicate hereunder denomination and content concisely. For the service manual best use, it is essential to understand how it is organised. Therefore, in order to speed up the searching of the wished subjects, it is advisable to carefully read this chapter.



SECTION 1 - MAIN OPERATING RULES

Begin to read first this Section to know the manual composition. This will help you for subject searching.



SECTION 2 - SAFETY PRECAUTIONS

This section gives indication on how to avoid dangerous situation during the machine use and maintenance. Besides, in this section are listed the safety decals applied on the machine and their relevant indications.



SECTION 3 - FEATURES AND DATA

This Section indicates the features and data of the machine.



SECTION 4 - SUPERSTRUCTURE

This section contains the information relevant to the operation principle of the systems, of the assemblies and of their components located on the machine upper frame. Besides, the assembly/disassembly procedures of the main devices are outlined.



SECTION 5 - UNDERCARRIAGE

This section contains the information relevant to the operation principle of the systems, of the assemblies and of their components located on the machine lower frame. Besides, the assembly/disassembly procedures of main devices are outlined (axles, transmission, travels motor, etc.).



SECTION 6 - FRONT ATTACHMENT

This section describes the front attachment and its components and the maintenance rules with relevant disassembly/assembly operations.



SECTION 7 - HYDRAULIC SYSTEM

This Section describes the operation of the machine from hydraulic point of view.



SECTION 8 - ELECTRICAL SYSTEM

This Section describes the electric system of the machine, the main electrical components and the connection with the electrical users.



SECTION 9 - TROUBLESHOOTING

In this Section information is provided for troubleshooting to the hydraulic and electric systems and the necessary instruction to use the support equipment (test harnesses and test devices).



SECTION 10 - PERFORMANCE TEST

Performance data and the procedures to detect data are provided in this section.

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BRIEF INFORMATION FOR MANUAL CONSULTATION

The manual is divided into section, each of them quotes a specific portion of the machine or specific related subject.

Some section (those related to main mechanical assembly) are divided into:

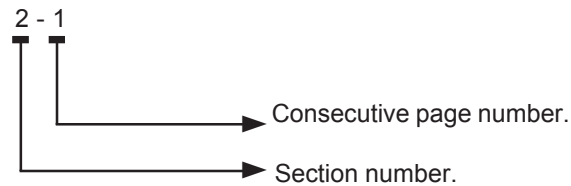
- Operation principle
- Disassembly and assembly

In the operation principle, the assemblies and their components are described with technical data.

The disassembly and assembly sections describe the procedures to perform overhaul or repair operations with special tools and technical data.

Page numbers have the following meaning:

- **for example:**



NOTES:

WX95

WX125



SECTION 2

SAFETY PRECAUTIONS

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SAFETY PRECAUTIONS

SAFETY PRECAUTIONS

GENERAL NOTES

Read the Operation and Maintenance Instruction Manual carefully before starting, operating, maintaining, fuelling or servicing the machine.

Carefully read the explanation to each and all safety signs in the special section of this Manual before starting, operating, maintaining, fuelling or servicing the machine.

Machine-mounted safety plates are colour coded yellow with black borders when they refer to points where special **ATTENTION** must be paid and failure to observe them may cause a serious **DANGER** to the integrity of machine operators.

They are white with red borders and black lettering when they refer to a **FORBIDDEN** practice.

It is fundamental that all machine operators know very well the meaning of each safety plate as this considerably decreases operating hazards and accidents.

Do not allow unauthorised personnel to operate or service this machine.

Do not wear rings, wrist watches, jewellery, loose or hanging garments, such as ties, torn clothing, scarves, unbuttoned or unzipped jackets that can get caught in moving parts. Wear certified safety clothes such as: hard hat, no-slip footwear, heavy gloves, ear protection, safety glasses, reflector vests, respirators every time the job requires it.

Ask your employer about safety regulations in force and protective equipment.

Always keep the operator's compartment, step plates, grab-rails and handles clean and clear of foreign objects, oil, grease, mud or snow to minimise the danger of slipping or stumbling. Remove mud or grease from your shoes before operating the machine.

Do not jump on or off the machine. Always keep both hands and one foot, or both feet and one hand in contact with steps and/or grab rails.

Do not use controls or hoses as hand holds. Hoses and controls are movable parts and do not provide solid support. Besides, controls may be inadvertently moved and cause unexpected movement of the machine or its attachments.

Never operate the machine or its attachments from any position other than sitting in the driver's seat. Keep head, body, limbs, hands and feet inside the operator's compartment at all times to reduce exposure to external hazards.

Be careful of possible slippery conditions of the steps and hand rails as well as of the ground around the machine. Wear protective boots or shoes with the soles made of highly no-slip rubber.

Do not leave the machine until it has come to a complete stop.

Always check height, width and weight limitations which may be encountered in the working site and ensure the machine does not exceed them.

Assess exact paths of gas ducts, water mains, telephone lines, sewers, overhead and underground electric lines and all other possible obstacles.

Such paths should be opportunely defined by competent Authorities. If necessary, require that the service is interrupted or said installations are moved prior to starting the work.

You must know the working capacity of the machine.

Define the rear superstructure swing area and provide for opportune barriers to prevent access into it.

Never exceed machine lifting capacity.

Remain within the limits shown in the loading capacity chart located on the machine.

START UP

Never start up or set in motion a failed machine. Before getting on, walk around the machine to inspect it. Before operating the machine, make sure that any possible dangerous condition has been properly removed.

Before starting machine, check that steering and attachment controls are in the neutral position and the safety lever is in the LOCK position.

Immediately report any malfunction of parts or systems to the maintenance managers for proper action.

Prior to starting the engine, check, adjust and lock the driver's seat for maximum riding comfort and control accessibility.

Prior to operating the machine and/or its attachments, check that bystanders are outside the machine operating range. Sound horn.

Obey all hand signals, safety indications and signs.

Due to the presence of flammable fluids, never check fuel level, refuel, charge the batteries or use the starting fluid in the presence of smoking materials, open flames or sparks.

Ensure that nobody is within the excavator operating area before starting the machine, swinging the upper structure or moving in any direction.

Adjust all rear-view mirrors for maximum visibility of the area behind the machine.

Ensure that engine speed is appropriate to the job to be carried out.

If any hydraulic control or system exhibits erratic performance or responds abnormally, have the machine checked for air in the system.

Air in these circuits may cause incorrect movements with consequent accident hazard.

Refer to the Operation and Maintenance Instruction Manual about corrective action to be taken.



SAFETY PRECAUTIONS

OPERATION

Do not run the engine of this machine in closed buildings without proper ventilation capable to remove harmful exhaust gases which concentrate in the air.

Keep the driver's seat free from foreign objects, especially if these are not secured. Never use the machine to transport objects, unless proper securing points are provided.

Do not carry riders on the machine.

Study and familiarise with escape routes alternative to normal exit routes.

For your personal safety, do not climb on or off the machine while it is in motion.

Make sure that bystanders are clear of the machine operating range before starting the engine and operating the attachment. Sound horn.

Obey all hand signals, safety indications and signs.

When backing, always look to where the machine is to be moved.

Be alert of the position of bystanders. Should someone enter the work area, stop the machine.

Maintain a safe distance from other machines or obstacles to ensure required visibility conditions.

Always give way to loaded machines.

Maintain a clear vision of the surroundings of the travel or work area at all times.

Keep cab windows clean and repaired.

When pulling loads or towing through a cable or chain, do not start suddenly at full throttle. Take-up slack carefully. Avoid kinking or twisting chains or cables.

Carefully inspect cables or chains for flaws or problems before proceeding.

Do not pull through a kinked chain or cable as the high anomalous stresses existing in this condition may induce failures in the kinked portion. Always wear heavy gloves when handling chains or cables.

Chains and cables should be securely anchored using suitable hooks. Anchor points should be strong enough to withstand the expected load.

Keep anyone clear of anchor points and cables or chains. **Do not pull or tow unless the operator's compartments of the machines involved are properly protected against possible backlash in case of cable or chain failure or detachment.**

Be alert of soft ground conditions close to newly constructed walls. The fill material and machine weight may cause the wall to collapse under the machine.

In darkness, check area of operation carefully before moving in with the machine. Use all lights provided. Do not move into low visibility areas.

If the engine tends to slow down and stall for whatever reason under load or at idle, immediately report this problem to the maintenance managers for proper action. Do not operate the machine until this condition is corrected.

Regularly check all exhaust system components, as exhaust fumes are toxic for the operator.

Operators must know the performance of the machine they are driving.

When working on slopes or near sudden level drops in the terrain, pay attention not to lose adherence and avoid loose soft ground since overturn or loss of machine control could result.

If noise level is high and exceeds 90 dB(A) over 8 hours at the operator's ear, wear approved ear protection in compliance with local regulations.

Do not operate the machine if you are extremely tired or feel ill.

Be especially careful towards the end of the working shift.

Where removable counterweights are provided, do not operate the machine if they have been removed.

When operating the machine, keep in mind height limits of overhead doors, arches, overhead cables and lines as well as width limits of corridors, roads and narrow passages. Also, get to know load limits of the ground and paving type of the ramps you are to work on.

Beware of fog, smoke or dust that obscure visibility.

Check constantly the work areas to find out the dangerous points. Some examples of dangerous work areas are: inclines, overhangs, trees, demolition rubble, fires, ravines, steep slopes, rough terrain, ditches, crowns, ridge trenches, diggings in traffic areas, crowded parking lots, crowded service areas, fenced zones. In such conditions, proceed with extreme care.

Whenever possible, avoid crossing over obstacles such as very rough terrain, rocks, logs, steps, ditches, railroad tracks. When obstructions must be crossed, do so with extreme care and at a square angle, if possible.

Slow down. Ease up to the break-over point, pass the balance point slowly and ease down the other side also using the attachment, if necessary.

To overcome deep trenches or sinking ground, place the machine perpendicular to the obstacle, drastically reduce ground speed and start crossing using also the attachment if necessary, only after assessing that ground conditions allow the traverse safely and without risks.

The gradient you may attempt to overcome is limited by factors such as ground conditions, load being handled, machine type and speed, and visibility.

There is no substitute for good judgement and experience when working on slopes. Avoid operating the attachment too close to an overhang or high wall, either above or below the machine. Beware of caving edges, falling objects and landslides.

Remember that such hazards are likely to be concealed by bushes, undergrowth and such.

Avoid faggots, bushes, logs and rocks. Never drive over them, nor over any other surface irregularities that discontinue adherence or traction with the ground, especially near slopes or drop-offs.

Be alert to avoid changes in adherence conditions



SAFETY PRECAUTIONS

that could cause loss of control. **Work with extreme care** on ice or frozen ground and on stepped slopes or near drop-offs.

The word "bulldozing" generally refers to work in virgin rough terrain, characterised by the presence of all the perils and risks listed above. We emphasise the danger represented in these conditions by large tree limbs and large roots, which may act as a leverage under the machine when up-rooted and cause their overturn. Position the machine according to the loading and unloading areas in order to slew leftwards to load and to obtain best visibility.

Never use the bucket or attachment to lift persons or carry riders on the machine.

Never use the machine as a work platform or scaffolding. The machine must not be improperly used for works not consistent with its features (such as pushing railway cars, trucks or other machines).

Always pay attention to people within the machine operating range.

Never move or stop the bucket, other loads or the attachment above ground personnel or truck cabs.

Before loading a truck make sure that the driver finds a safe place. Load trucks from side or rear. Use only the type of bucket recommended considering machine type, materials to be handled, material piling up and loading characteristics, ground type and other typical conditions of the work to be performed. When travelling with a loaded bucket, keep it as rolled-back as possible.

Ground speed should be adequate to the load and ground conditions. The load must always be properly arranged in the bucket. Move with extreme care when transporting oversize loads.

Do not lift and move the bucket overhead where persons are standing. When working on slopes avoid travelling with bucket downhill because this could reduce the machine stability. Load the bucket from uphill side. Loads to be raised using the machine should be exclusively hooked to the hitch specially provided.

The excavator is no lifting and transportation means, therefore it should not be used to position loads accurately. Should it be exceptionally used to lift and lay building components, special caution must be taken as follows:

- The machine should necessarily be equipped with the special option supplied by Dealer. Besides, follow carefully safety rules for the excavator used as lifting means.
- Secure the loads to be raised using cables or chains fastened with appropriate hooking mechanisms.
- Nobody should be allowed to remain under the raised load or within the excavator operating range for any reason whatever.

Never exceed specified loading capacity. Incorrect fastening of slings or chains may cause boom/arm failure or failure of the lifting means with consequent bodily injuries and even death.

Always ensure that slings and chains used for lifting are adequate to the load and in good condition.

All loading capacities are referred to the machine on a level surface and should be disregarded when working on a slope.

Avoid travelling across slopes. Proceed from uphill downhill and vice-versa.

If machine starts slipping sideways when on a slope, lower the bucket and thrust bucket teeth into the ground.

Working on slopes is dangerous. Grade the working area if possible. Reduce work cycle time if it is not possible to grade the working area.

Do not move full bucket or a load from uphill downhill as this would reduce machine stability.

Do not work with the bucket turned uphill as counterweights protruding downhill would reduce machine stability on the slope and increase risk of overturning.

We recommend to work on slopes with the bucket downhill, after checking machine stability with the bucket empty and attachment retracted, by slowly swinging the upper structure by 360°.

Position the carriage at a right angle relative to slopes, hanging walls, etc. to exit the working area easily. Be aware when the upperstructure is turned by 180°, steering and travel controls are reversed.

Properly judge ground conditions with particular attention to consistency of the area you are going to work on. Keep the machine sufficiently far from the digging border.

Never dig under the machine.

Should it be necessary to dig under the machine, always ensure that digging walls are opportunely propped up against landslide to prevent the machine from falling into the trench.

Do not slew the upper structure, raise the load or brake abruptly if not required. This may cause accidents.

Prior to beginning the work near gas distribution mains or other public utilities:

- Contact the Company Owner of the gas mains or its nearest branch before starting the work. Look up the number in the telephone directory.
- Define together which precautions should be taken to guarantee work safety.
- Decrease work speed. Reaction time could be too slow and distance evaluation wrong.
- When working near gas mains or other public utilities installations, appoint a person in charge of signalling duties. This person will have the responsibility of observing the machine, any part of it and/or the load approaching the electric line from a better standpoint with respect to the Operator's position. This signal-man shall directly communicate with the Operator and the Operator must pay special attention to any signals supplied.
- The gas distributing Company, if previously advised and involved in the work, as well as machine Operator, Owner and/or any natural person or legal entity



SAFETY PRECAUTIONS

having rent or leased the machine or being responsible at the time by contract or by law, are liable for the adoption of the necessary precautions.

Working near electric lines can be very dangerous, therefore some special precautions must be observed. Within this Manual, "work near electric lines" means when the attachment or load raised by the excavator (in any position) may reach the minimum safety distance established by local or international Safety Regulations.

To work without risks, keep maximum possible distance from electric lines and never trespass minimum safety distance.

Ensure that local or national safety regulations concerning work near electric lines are observed.

Prior to beginning the work near electric lines:

- Contact the Company Owner of the electric lines or its nearest branch before starting the work. Look up the in the telephone directory.
- Define together with the Company representative which precautions should be taken to guarantee work safety.
- All electric lines should be considered as operative live lines even though it might be well known that the line in question is out of work and visibly connected to the ground.
- The Electric Power Company, if previously advised and involved in the work, as well as machine Operator, Owner and/or any natural person or legal entity having rent or leased the machine or being responsible at the time by contract or by law, are liable for the adoption of the necessary precautions.
- Decrease work speed. Reaction time could be too slow and distance evaluation wrong.
- Warn all ground personnel to keep clear of the machine and/or load at all times. If the load has to be guided down for laying, consult the Electric Power Company to know which precautions should be taken.
- Appoint a person in charge to signal instructions. This person will have the responsibility of observing the machine, any part of it and/or the load approaching the electric line from a better standpoint with respect to the Operator's position. This signalman shall directly communicate with the Operator and the Operator must pay special attention to any signals supplied.

When working in or near pits, in ditches or very high walls, check that the walls are sufficiently propped up to avoid cave-in hazards.

Pay the utmost attention when working near overhang walls or where landslides may take place. Make sure that the support surface is strong enough to prevent landslides.

When digging, there is the risk of cave-ins and landslides.

Always check ground conditions and conditions of the material to be removed. Support everywhere it is required to prevent possible cave-ins or landslides when:

- When digging near recently formed trenches filled with filling materials.
- When digging in bad ground conditions.
- When digging trenches subject to vibration from railroads, working machines or highway traffic.

STOP

When the machine is to be stopped for whatever reason, always check that all controls are in the neutral position and that the safety lever is on the lock position to guarantee risk-free start-up.

Never leave the machine unattended with the engine running.

Before leaving the driver's seat and after ensuring no one is near the machine, slowly lower the attachment until it rests safely onto the ground. Move possible additional tools in the safe retracted position. Check that all controls are in the neutral position. Move engine controls to the shut-down position. Switch off the key-start switch. Consult the Operation and Maintenance Instruction Manual.

Park the machine in a non-operating and no-traffic area. Park on firm level ground. If this is not possible, position the machine at a right angle to the slope, making sure there is no danger of uncontrolled sliding.

If parking in traffic lanes cannot be avoided, provide prescribed danger signals such as: flags, barriers, flares and other signals. Moreover arrange further danger signals on traffic lane so as to adequately warn the oncoming drivers.

Always switch off the key-start switch before cleaning, repairing or servicing, or parking the machine to prevent accidental unauthorised start-up.

Never lower the attachment or auxiliary tools other than from sitting in the operator's seat. Sound horn. Make sure that nobody is within the machine operating range. Lower the attachment slowly.

Securely block and lock the machine every time you leave it unattended. Return keys to the safe place previously agreed upon.

Perform all necessary operations for stopping as detailed in the Operation and Maintenance Instruction Manual.

Drive the machine far from pits, trenches, rocky hanging walls, areas with overhead electric lines, and slopes before stopping it at the end of the working day.

Align the upperstructure to the tracks in order to allow to easily get on and off the driver's compartment.

Move all controls to the position specified for machine stopping. Refer the Operation and Maintenance Instruction Manual.

Never park on an incline without accurately blocking the machine to prevent unexpected movement.

Always follow stopping instructions contained in the Operation and Maintenance Instruction Manual.



SAFETY PRECAUTIONS

MAINTENANCE

GENERAL NOTES

Carefully read the Operation and Maintenance Instruction Manual before starting, operating, maintaining, fuelling or servicing the machine in any manner.

Read all safety plates mounted on the machine and observe instructions they contain before starting, operating, repairing, fuelling or servicing the machine.

Do not allow unauthorised personnel to operate or service this machine.

Do not carry out any work on the attachment without prior authorisation.

Observe recommended maintenance and repair procedures.

Do not wear rings, wrist watches, jewellery, loose or hanging garments, such as ties, torn clothing, scarves, unbuttoned or unzipped jackets that can get caught in moving parts. Wear certified safety clothes such as: hard hat, no-slip footwear, heavy gloves, ear protection, safety glasses, reflector vests, respirators when required.

Ask your employer about safety regulations in force and protective equipment.

Do not use controls or hoses as hand holds. Hoses and controls are movable parts and do not provide solid support.

Besides, controls may be inadvertently moved and cause unexpected movement of the machine or its attachments. Do not jump on or off the machine. Always keep both hands and one foot, or both feet and one hand in contact with steps and/or grab rails.

Never service the machine with someone sitting in the driver's seat, unless this person is an authorised operator assisting in the maintenance being carried out.

Keep the operator's compartment, step plates, grab rails and handles clear of foreign objects, oil, grease, mud or snow to minimise the danger of slipping or stumbling. Remove mud or grease from your shoes before operating the machine.

Never attempt to operate the machine or its attachments from any position other than sitting in the operator's seat.

Keep the driver's seat free from foreign objects, especially if these are not secured.

Should it be necessary to move the attachment for maintenance purposes, do not raise or lower the attachment from any other position than sitting in the operator's seat. Before starting the machine or moving its attachment, sound the horn and require that nobody remains near the machine.

Raise the attachment slowly.

Always lock all moving components or parts of the machine that must be lifted for maintenance purposes using adequate external means as required by local and national regulations.

Do not allow anyone to pass or stay near or below a raised attachment. If you are not absolutely sure about your safety, do not stay or walk under a raised attachment.

Do not place head, body, limbs, hands, feet or fingers near articulated cutting edges deprived of the necessary guards, unless they are suitably and safely locked.

Never lubricate, repair or adjust the machine with the engine running, except when this is specifically required by the Operation and Maintenance Instruction Manual.

Do not wear loose clothing, jewellery near rotating parts.

When service or maintenance require access to areas that cannot be reached from the ground, use a ladder or step platform conforming to local or national regulations to reach the working area. If such means are not available, use machine grab rails and steps. Always perform all service or maintenance work with the greatest care and attention.

Shop and/or field service platforms or ladders should be manufactured and maintained in accordance with local or national safety regulations in force.

Disconnect batteries and label all controls to warn that service work is in progress, according to local and national safety regulation requirements.

Block the machine and all attachments to be raised according to local and national safety regulation requirements.

Do not check or fill fuel tanks or install batteries near burning or smoking materials and open flames due to the presence of flammable vapours.

The fuel filler pipe nozzle must be constantly kept in contact with the filler neck and this even before fuel starts flowing in. Keep this contact from the beginning to the end of the fuelling operation to avoid possible generation of sparks due to static electricity.

Use a truck or trailer to haul a failed machine. Should it be necessary to tow it, provide for suitable danger signals as required by the local norms and regulations and observe recommendations given in the Operation and Maintenance Instruction Manual. Load/unload the machine on firm level ground providing safe support to the wheels of the truck or trailer.

Use strong access ramps, with adequate height and angle. Keep the trailer flatbed free of mud, oil or slippery materials. Tie the machine securely to the trailer and block carriages and upperstructure.

When aligning the pin bores, never insert your finger or hands into the pin bore. Use a suitable tool.

Remove all sharp edges and burrs from re-worked parts.

Use only approved and grounded auxiliary power sources for heaters, battery chargers, pumps and similar equipment to reduce electrical shock hazard.

Lift and handle heavy components using hoisting devices of appropriate capacity. Ensure the parts are supported by appropriate straps and hooks.



SAFETY PRECAUTIONS

Use lifting eyes provided to this aim. Pay attention to bystanders near the lifting area.

Never pour gasoline or diesel fuel into an open container.

Never use gasoline, solvents or other flammable fluids to clean parts. Use only proprietary certified solvents, non-flammable and non-toxic.

When using compressed air to clean parts, wear safety glasses with side shields. Limit pressure to max. 2 bars, in accordance with local and national safety regulations in force.

Do not run the engine of this machine in closed buildings without proper forced ventilation capable to remove toxic exhaust gases concentrating in the air.

Do not smoke, nor allow open flames or sparks nearby while refuelling the unit or handling highly flammable materials.

Do not use open flames as light sources to look for leaks or inspect anywhere on the machine.

Make sure that all mechanical tools provided are in good condition at all times. Never use tools with mushroomed or damaged heads. Always wear eye protections with side shields.

Move with extreme care when working under, on or near the machine or its attachments.

In case of attachment tests during which the engine should be kept running, a qualified operator must sit in the driver's seat at all times while the mechanic is at work. **Keep hands and clothes far OFF moving parts.**

Stop the engine and move the safety lever to the lock position before starting adjusting or repairing an assembly.

Do not carry out any work on the attachment without prior authorisation. Observe recommended maintenance and repair procedures.

In case of field service, move the machine to level ground and block it. If work on an incline cannot be avoided, securely block the machine and its attachments. Move the machine to level ground as soon as possible.

Do not twist chains and cables. Never use a twisted chain or cable for lifting or pulling. Always wear safety gloves to handle chains or cables.

Be sure chains and cables are firmly fastened and that the anchor point is strong enough to withstand the expected load. Keep all bystanders clear of the anchor point, cables or chains. **Do not pull or tow unless the operator's compartments of the machines involved are fitted with proper guards against cable or chain backlash.**

Keep the maintenance area clean and dry at all times.

Clean immediately all water and oil spillage.

Do not pile up oily or greasy rags. They represent a major fire hazard. Always store them in closed metal containers.

Before starting the machine or its attachment, check, adjust and lock the operator's seat. Also ensure that nobody is within the machine or attachment operating

range before starting or operating the machine and/or its attachments. Sound horn.

Rust inhibitors are volatile and flammable. Prepare parts in well ventilated areas. Keep open flames away. **Do not smoke.** Store containers in a cool well ventilated place where they could not be reached by unauthorised people.

Do not carry loose objects in your pockets that might fall unnoticed into open compartments.

Wear appropriate safety clothing such as hard hat, safety shoes and gloves, safety glasses when splinters or other particles may be ejected.

Wear the appropriate welder's equipment such as dark safety glasses or mask, hard hat, protective clothing, safety gloves and footwear always while welding or arc-cutting. Wear dark safety glasses when you are near a welding in progress. **Do not look the welding arc without proper eye protection.**

Become acquainted with all your jacking equipment and their capacity. Ensure that the jacking point on the machine is appropriate for the load applied. Also, be sure the supports under the jack and between the jack and the machine are appropriate and stable. Any equipment supported by a jack represents a possible hazard. Always support the load onto appropriate blocking means as a safety measure before proceeding with service or maintenance work, in compliance with local or national safety regulations.

Metal cables produce steel splinters. Always wear certified protection clothes such as safety gloves and glasses while handling them.

Handle all parts with great care. Keep hands and fingers away from gaps, gears, and similar. Always use and wear certified safety clothes such as safety glasses, gloves and footwear.

The attachment is kept constantly in position by an oil column trapped into the high pressure circuit. Lower the attachment to the ground and relieve pressure from all circuits prior to carrying out any type of maintenance or repair work.

Do not service or repair the machine if it is parked downhill. Consult the Operation and Maintenance Instruction Manual for correct maintenance procedure.

Areas near articulated cutting edges where mechanical parts are in motion are where personal injuries are most likely to occur. Pay attention to prevent possible part movements by means of blocks or by keeping clear of such zones when motion may take place during maintenance or repair.

Move the hydraulic system lock safety lever to the lock position when stopping the machine for whatever reason.

Always install the safety stays for the hood and other hinged covers before performing any maintenance or repair work in the engine compartment.



SAFETY PRECAUTIONS

TRANSFERS AND TRANSPORTATION

Before moving or transporting the machine, block upperstructure swing to prevent accidental movement. Pay particular attention during transfer on inclines, both uphill and downhill. Keep the bucket in a position to provide a possible anchor point into the ground in case of slipping.

During transfers on inclines, both uphill and downhill, keep the upperstructure aligned with the carriages. Do not travel across the slope.

Never transfer the machine in the working site, in a crowded area, or near people without having at least one person charged with hand-signals who could guide the Operator.

Sound the horn to inform that you are about to move off.

It is necessary to know load limits of bridges and dimensional limits of tunnels. Such limits must never be exceeded. You should also know machine height, width, and weight. Have a signal-man help you when clearances are limited.

Check distance between boom/arm and dimensional limits during transfer or transportation.

Rough terrain may cause the machine to sway and roll to such an extent that boom/arm could get to contact electric lines or other obstacles. Cross obstacles at a right angle at low speed. Pay attention to machine shaking when the centre of gravity overcomes the obstacle.

Keep the bucket down at all times during transfers.

Drive with the lights on and use appropriate signals and flags.

Get to know and respect local and national regulations.

Consider boom/arm and upperstructure dimensions while turning. Use a ramp to load the machine on a trailer. If a ramp is not available, fabricate one using blocks. The ramp should be sufficiently strong to support machine weight. Always load and unload on level surface.

Tow the machine following the instructions contained in the Operation and Maintenance Instruction Manual.

MOTOR

Do not run the engine in closed buildings without proper ventilation capable to remove harmful exhaust fumes.

Do not place head, body, limbs, feet, hands or fingers near rotating fans or belts. Be especially careful near blower fans.

Loosen the radiator cap very slowly to relieve system pressure before removing it. Always top-up coolant level with the engine off or idling if hot.

See the Operation and Maintenance Instruction Manual.

Keep the exhaust manifold and tube free from combustible matters. Fit the machine with shields and guards when working in the presence of combustible matter free in the air.

Do not refuel with the engine running, especially if hot, as this increases fire hazard in case of fuel spillage.

Never attempt to check or adjust fan belt tensions when the engine is running.

Do not adjust the fuel injection pump when the machine is operating.

Do not lubricate the machine with the engine running. Do not run the engine with the air intakes open and not protected. If this cannot be avoided for service reasons, place protection meshes on all intakes before servicing the engine.

ELECTRIC SYSTEM

Pay attention to connect connecting cables to correct poles (+ to +) and (- to -) at both ends. Do not short-circuit the terminals. Thoroughly follow instructions given in Operation and Maintenance Instruction Manual.

Always move the key-start switch in the lock position before servicing or repairing the machine.

Batteries contain SULFURIC ACID. Protect the eyes when working near the batteries against possible sprays of the acid solution. Should acid contact skin, eyes, or clothes, RINSE IMMEDIATELY IN WATER FOR AT LEAST 15 MINUTES. Seek for immediate medical assistance.

Battery released gas is highly flammable. Leave the battery compartment cover open during recharging to improve ventilation. Never check battery charge by placing metal objects across the posts. Keep sparks or open flames away from batteries. Do not smoke near the battery to prevent explosion hazard. Before any maintenance or repair, make sure that there are no fuel or electrolyte leaks from the batteries. If any, correct prior to proceeding with further work.

Do not recharge batteries in confined spaces. Ensure proper ventilation is provided to avoid accidental explosions due to build-up of explosive gas released during charging.

Disconnect batteries before working on the electrical system or carrying out any other type of work.



SAFETY PRECAUTIONS

HYDRAULIC SYSTEM

Pressure fluid escaping from a very small hole can be almost invisible and still have sufficient force to penetrate the skin. Always check any suspected pressure leaks using a piece of cardboard or wood. Do not use hands. If injured by escaping fluid, obtain medical attention immediately. If proper medication is not carried out immediately serious infection or reaction may develop.

Stop the engine and ensure pressure is relieved from all systems before removing side panels, housings, guards and covers. See the Operation and Maintenance Instruction Manual.

Always use gauges of adequate capacity for pressure testing. Refer to the Operation and Maintenance Instruction Manual or Repair Manual.

ATTACHMENTS

Always keep head, body, limbs, feet, hands, and fingers away from the bucket and attachments, when in the raised position.

Prior to any maintenance or repair work, install all supports necessary to this aim according to local and national safety regulations.

In case the attachment is to be operated for maintenance or repair purposes, do so exclusively while sitting in the driver's seat. Sound the horn before starting the machine or moving the attachment. Require that nobody remain near the machine. Raise the attachment slowly.

Do not use the machine to transport loose objects, unless proper securing devices are provided.

TYRES AND WHEELS

Always check that inflating pressure of tyres corresponds to the prescribed value suggested by Manufacturer and check periodically its integrity.

If the inflating pressure of tyres has to be changed, carry out this operation keeping at a safety distance.

The tyres inflating pressure has always to be checked with no load and in cold conditions. Never use reconditioned discs wheel as eventual weldings, heat treatments or brazings not executed correctly can weaken the wheels and be therefore cause of successive damages or faults.

Do not perform torch cutting or welding operations on rims with tyres installed. The spare tyre should be inflated only as far as needed to hold the ring parts together: remember that when not installed on the disc, a tyre inflated to maximum pressure can explode.

When working on tyres, lock previously all wheels front and back ones. After lifting machine with hydraulic jack, prevent its falling down inserting supports according to the safety regulations in force.

Deflate the tyres before removing them.

Before extracting possible foreign bodies jammed in the tread, it is necessary to deflate tyres.

Do not inflate tyres with flammable gas: they may cause explosions and serious personal injuries.

At the end of work shifts check for loose screws and/or rims mounting brackets, if necessary carry out their tightening according to the instruction given in this issue.



SAFETY PRECAUTIONS

RECOGNISE SAFETY INFORMATION

This is your **SAFETY ALERT SYMBOL**.

When you see this symbol on your machine or in this Manual, be alert of the potential for personal injury. Follow recommended precautions and safe operating practices.



F3264

UNDERSTAND SIGNAL WORDS

In this Manual you will find the following words: **DANGER**, **WARNING**, **CAUTION**.

Referring to different hazard risks. These words are always accompanied by the safety alert symbol.

DANGER indicates an imminent hazardous situation which, if not avoided, will result in death or serious injury.

WARNING indicates a potential hazardous situation which, if not avoided, could result in death or serious injury.

CAUTION indicates a potential hazardous situation which, if not avoided, may result in minor or moderate injury.

IMPORTANT indicates a situation which, if not avoided, may cause damage to the machine.

NOTE indicates an additional explanation for information purposes.



DANGER



WARNING



CAUTION

**IMPORTANT
NOTICE**

ENVIRONMENTAL PROTECTION

This Manual also contains this symbol accompanying instructions for correct behaviour as regards environmental protection.



F5041



SAFETY PRECAUTIONS

FOLLOW SAFETY INSTRUCTION

Carefully read and follow all safety signs on the machine and all safety messages in this manual.

Safety signs should be installed maintained and replaced when necessary.

If a safety sign or this manual is damaged or missing, order a replacement from your dealer in the same way you order other replacement parts (be sure to state machine model and serial number when ordering).

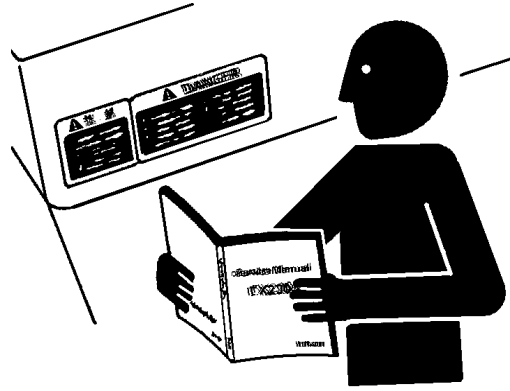
Learn how to operate the machine and its controls correctly and safely.

Allow only trained, qualified, authorized personnel to operate the machine.

Keep your machine in proper working condition.

Unauthorized modifications to the machine may impair the function and/or safety and affect machine life.

The safety messages in this SAFETY PRECAUTIONS chapter are intended to illustrate basic safety procedures of hydraulic excavators. 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 before operating and servicing the machine.



F1437

PREPARE FOR EMERGENCIES

Be prepared if a fire starts or an accident occurs.

Keep the first-aid kit and fire extinguisher on hand. Thoroughly read and understand the label attached to the fire extinguisher to use it properly. Establish emergency priority procedures to cope with fires and accidents.

Keep emergency numbers for doctors, ambulance service, hospitals and fire department posted near the telephone.



SAFETY PRECAUTIONS

WEAR PROTECTIVE CLOTHING

Wear tight clothing and safety equipment suitable for the job to carry out.

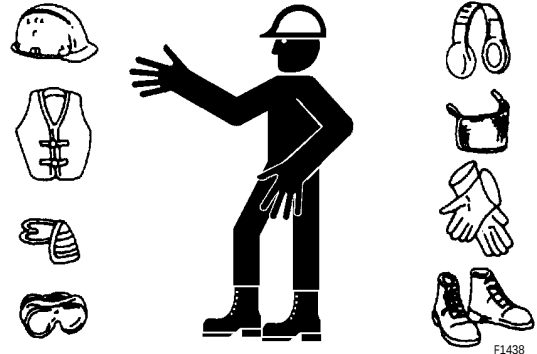
It is necessary to dispose of:

- hard hat,
- Safety shoes;
- Safety glasses, goggles, or face shield;
- Heavy gloves;
- Hearing protection;
- Reflective clothing;
- Water-proof clothing;
- Respirator or filter mask;

Make sure to wear clothing and safety equipment suitable for the job to carry out.

- Do not leave anything to the case.
- Avoid wearing loose clothing, jewelry, or other items that can catch on control levers or other parts of the machine.

To operate the machine in full safety, the operator should be completely careful. Do not wear radio or music headphones while operating machine. Wear close fitting clothing and safety equipment appropriate for the job.



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 constant or uncomfortably loud noise.



INSPECT THE MACHINE

Inspect the machine carefully every day or work-shift by an attentive visual inspection of machine outside prior to starting it to prevent damages and personal injuries.

In the walk-around inspection, be sure to cover all points detailed in the Chapter **MAINTENANCE**, paragraph **EXTERNAL VISUAL INSPECTION**.





SAFETY PRECAUTIONS

USE HANDHOLDS AND STEPS

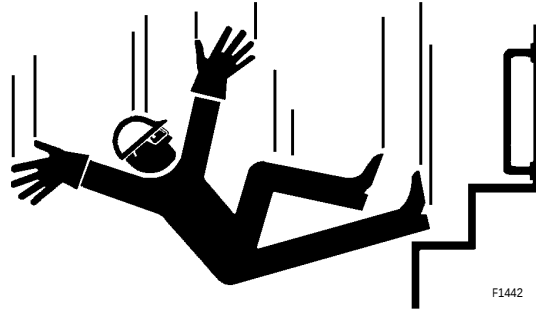
Falling is one of the major causes of personal injury. When you get on and off the machine, always maintain a three-point contact with the steps and handrails and face the machine.

Do not use any controls as hand-holds.

Never jump on or off the machine.

Never mount or dismount a moving machine.

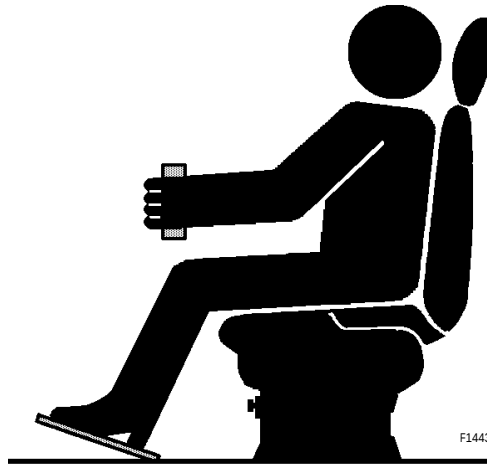
Be careful of slippery conditions on platforms, steps, and handrails when leaving the machine.



ADJUST THE SEAT

A seat poorly adjusted for operator or work requirements may quickly fatigue the operator leading to improper operations.

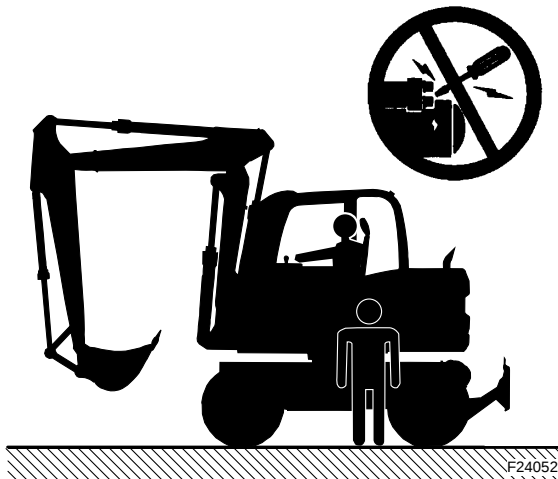
- The seat should be adjusted whenever machine operator changes.
- The operator should be able to fully press the pedals and correctly move the control levers with his back resting against the seat back.
- If not, move the seat fore and aft, and check again.



OPERATE ONLY FROM THE DRIVER'S SEAT

To start the motor with an unsuitable procedure may cause sudden movement of the machine with possibility to cause serious injuries or mortal incidents.

- Start the engine only from the driver's seat.
- Do not start the engine by shorting across starter motor terminals.
- Before starting the engine, ensure that all control levers are in the neutral position.



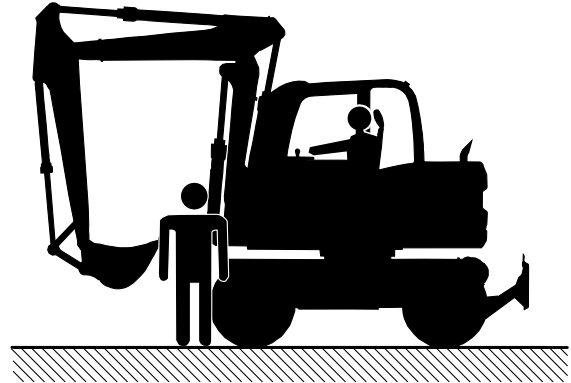


SAFETY PRECAUTIONS

DONT CARRY RIDERS ON THE MACHINE

Riders on the machine are subject to injuries such as being struck by foreign objects and being thrown off the machine.

- Only machine operator is allowed on the machine. Riders are not allowed.
- Riders also obstruct the operator's visibility, resulting in the machine being operated **UNSAFELY**.

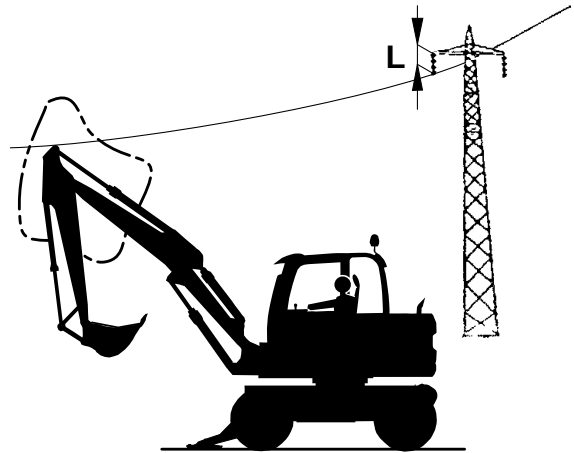


F24154

AVOID ELECTRIC LINES

Serious injury or death can result if the machine or front attachments are not kept a safe distance from electric lines.

- When working near electric lines, **NEVER MOVE** any part of the machine or loads at a distance lower than 3 meters plus twice the length (L) of line insulators.
- Perform all checks and behave in compliance with any applicable local regulation.
- Wet ground will expand the area that could cause any person on it to be affected by electric shock.
- Keep all people and/or assistants away from the working area.



F24656



SAFETY PRECAUTIONS

AVOID INJURY FROM REVERSE GEAR AND SLEW ACCIDENTS

If someone stands near the machine when this is carrying out slew or reverse-gear movement, the same can hit or run over this person causing heavy injuries or even death.

To avoid reverse gear and slew accidents:

Always look around before **REVERSE GEAR OR MACHINE SLEW. BE SURE THAT NOBODY IS WITHIN WORKSITE.**

Keep travel alarm in working condition (if equipped).

ALWAYS BE ALERT FOR BYSTANDERS MOVING IN THE WORK AREA. USE HORN OR OTHER SIGNALS TO WARN BYSTANDERS BEFORE STARTING MACHINE..

TAKE ADVANTAGE OF A PERSON THAT WATCHES THE REVERSE GEAR IF VISIBILITY IS PREVENTED. ALWAYS KEEP VISUAL CONTACT WITH BYSTANDERS.

Use manual signals, according to local rules, if working condition require a flagman.

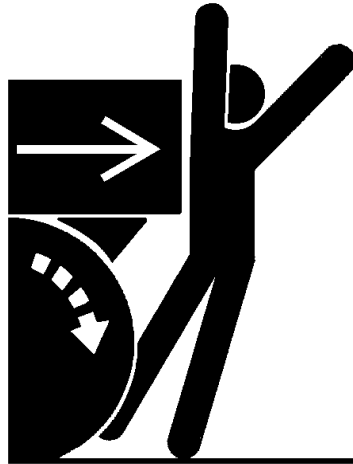
No motions shall be made unless signals are clearly understood by both signalman and operator.

Learn the meaning of all flags, signs, and markings used on the job and confirm who has the responsibility for signaling.

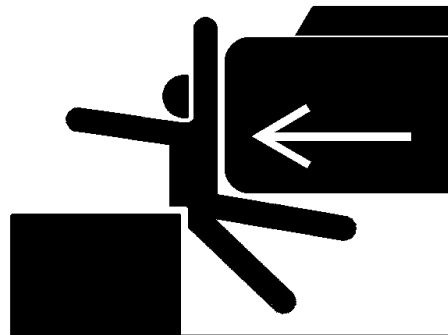
Keep windows, mirrors, and lights clean and in good condition.

Dust, heavy rain, fog, etc., can reduce visibility. As visibility decreases, reduce speed and use proper lighting.

Read and understand all instruction for the operation given in this manual.



F1447



F3625



SAFETY PRECAUTIONS

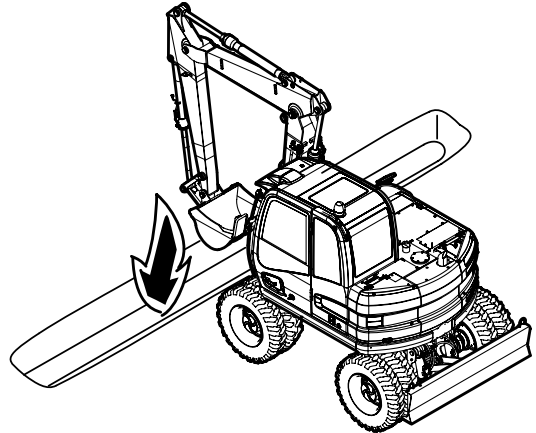
DIG WITH CAUTION

Accidental severing of underground cables or gas lines may cause an explosion and/or fire, possibly resulting in serious injury or death.

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

Keep the minimum distance required by law from cables, gas lines, or water lines. If a fiber optic cable should be accidentally severed, do not look into the end, to avoid eyes injury.

To solve possible doubts, contact local authorities and/or the Power companies (Electric Power, Gas, Telephone, Water, Telecommunications, etc.). Ask for information about underground utility lines.



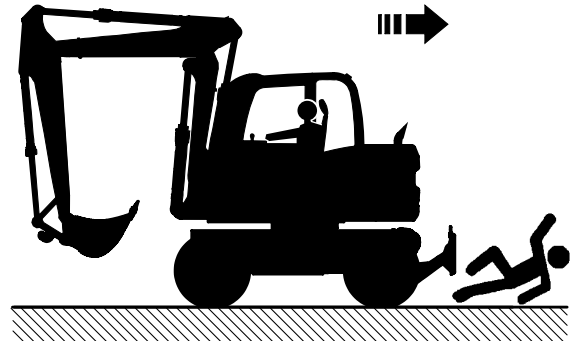
F24954

MOVE AND OPERATE MACHINE SAFELY

Bystanders are in danger of being run over. Confirm the location of bystanders before moving, slewing, or operating the machine.

Always keep the travel alarm in good working condition. (if equipped). It warns people when the machine starts to move.

Use a signal person when moving, slewing, or operating the machine in congested areas. Coordinate hand signals before starting the machine.



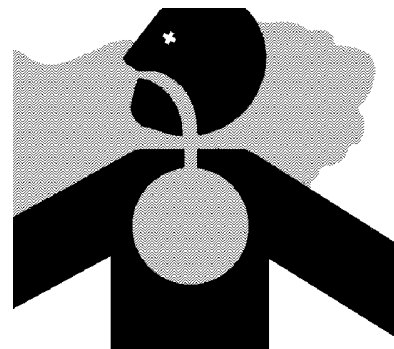
F24657

BEWARE OF EXHAUST FUMES

Engine exhaust fumes can cause sickness or death.

If you must operate in closed buildings, be sure there is adequate ventilation.

Use an extension to eliminate exhaust gases or open doors and windows to ensure a sufficient air exchange.



F1446



SAFETY PRECAUTIONS

RULES FOR ROAD TRANSFER

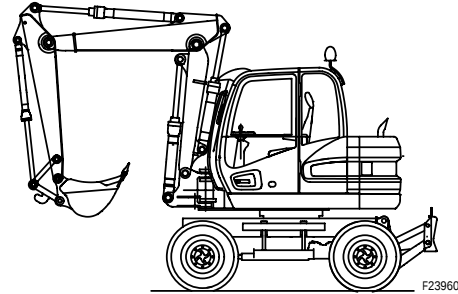
The machine is equipped with safety locks to be used for road transfer.

When transfer is necessary:

- Position the upper structure toward the front swinging axle and insert the anti-rotation lock.
- Locate cylinders as shown in homologation configuration.
- Lock cylinders (cocks, reference marks).
- Lift stabilizers and blade (if equipped).
- Disengage control levers for attachments by shifting lever of safety equipment in lock position.

On the road follow the rules regulating traffic.

During road transfers always disconnect front axle lock.



INVESTIGATE JOB SITE BEFORE HAND

Clear all persons from area of operation and machine movement.

Make sure worksite footing has sufficient strength to firmly support the machine.

When working close to an excavation, operate the machine with the chassis frame positioned perpendicular to the cliff face, so that the machine can more easily evacuate if the cliff face collapses. Confirm that your machine is equipped with a **F.O.P.S.** (Falling Object Protective Structure) cab before working in areas where there is the possibility of falling stones or landslides.

When digging deeply, avoid hitting bottom of boom or bucket cylinder hoses against the ground.

Use the bucket only for digging.

To avoid accidents, do not use it as a jack hammer or wrecking ball.





SAFETY PRECAUTIONS

TRAVELLING ON SLOPES

Never go down on slopes with gearbox in neutral. You might lose control and cause serious injuries or death.

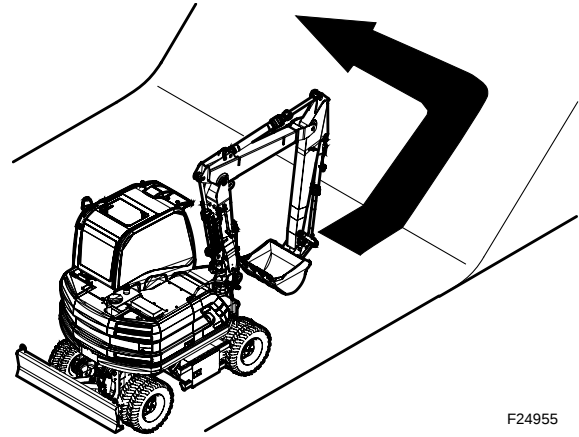
When going down on slopes, use a low gear. In this way the engine is used as brake and holds the machine without overloading brakes.

When working on a slope and the fuel warning light lights up refuel immediately.

Because of the machine inclination, the engine can suck air and stop immediately putting in great danger the incolumity of the operator and of the downhill bystanders.

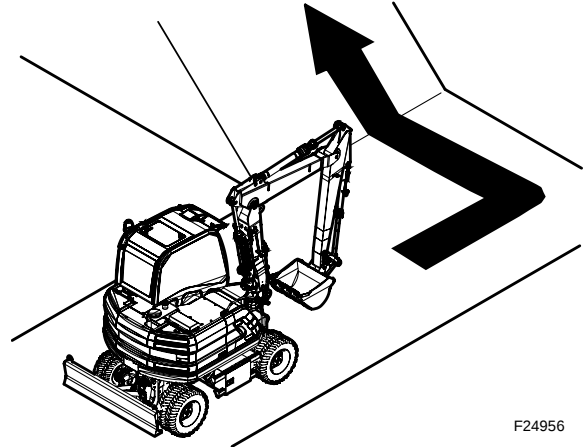
If the engine stops suddenly, apply brakes and lower immediately the bucket to the ground.

WRONG



F24955

CORRECT



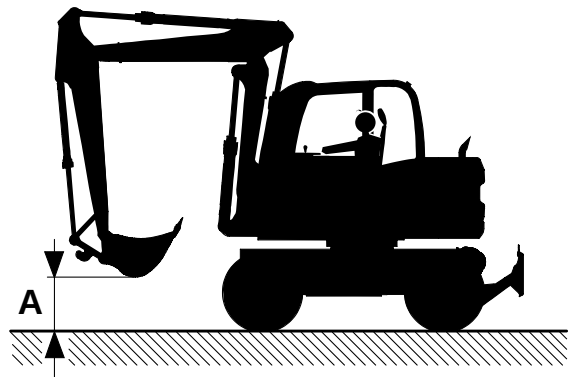
F24956

DRIVE MACHINE SAFELY

Before starting the machine, read carefully the “use and instructions manual” to get familiar with pedals and levers.

Before moving the machine, confirm which way to move travel pedals/levers for the corresponding direction you wish to go.

When traveling up or down a grade, keep the bucket in the direction of travel, approximately 30 to 40 cm (A) above the ground. If the machine begins to slip or becomes unstable, lower the bucket immediately.



F24659



SAFETY PRECAUTIONS

AVOID TIPPING

When operating on a slope, keep bucket low to ground and close to machine.

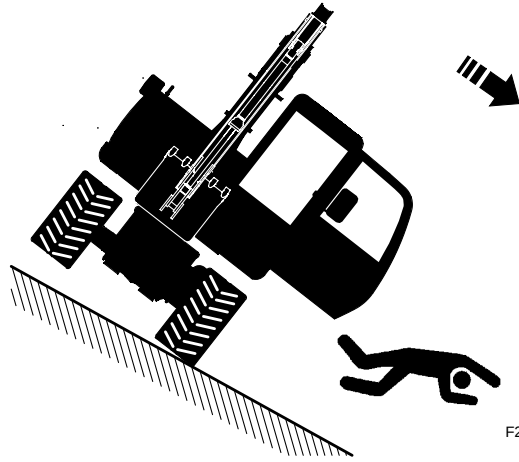
Point chassis frame uphill to avoid tipping.

To avoid tipping:

- Be extra careful before operating on a grade.
- Prepare machine operating area flat by grading.
- Keep the bucket low to the ground and close to the machine.
- Reduce machine operating speed to avoid tipping or slipping.
- Avoid changing direction when travelling on grades.
- Never attempt to travel across a grade steeper than 15 degrees.
- 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.



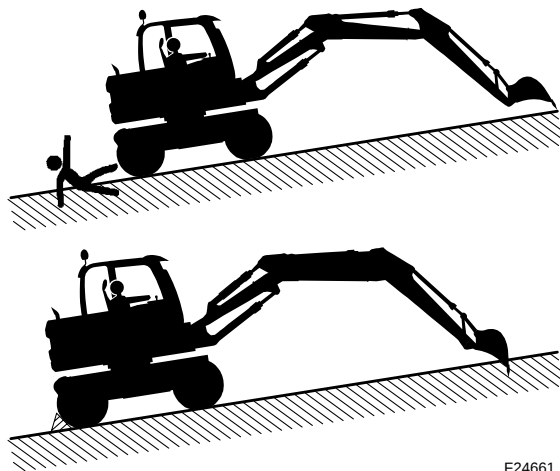
F24849

AVOID INJURY FROM UNEXPECTED MACHINE MOVEMENT

Death or serious injury may result if you attempt to get on or off a moving machine.

To avoid roll-aways:

- Select level ground when possible to park machine.
- Do not park the machine on a grade.
- Lower the bucket and/or other work tools to the ground. Thrust the bucket teeth into the ground if you must park on a grade.
- Disconnect Auto/idle switch.
- Run the engine at slow idle speed without load for 5 minutes to cool down the engine.
- Stop the engine and take off ignition key.
- Pull the safety lever to (**LOCK**) position.
- Block both tracks.
- Position the machine to prevent overturning.
- Park a reasonable distance from other machines.



F24661



SAFETY PRECAUTIONS

PROTECTION OF DRIVING CAB

In case of operation of the excavator under conditions where land slides with falling rocks or any conditions where there is a potential falling of objects of different nature that could endanger the operator, it is necessary to install a **F.O.P.S.** (Falling Object Protective Structure) to protect the cab.

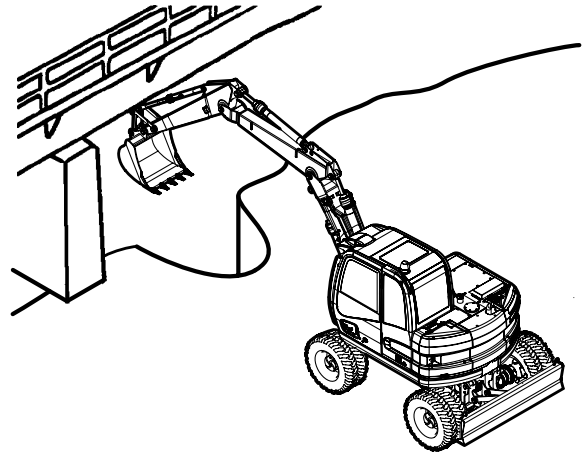


F24660

OPERATE WITH CAUTION

If the front attachment or any other part of the machine hits against an overhead obstacle, such as a bridge, both the machine and the overhead obstacle will be damaged, and personal injury may result as well.

Take care to avoid hitting overhead obstacles with the boom or arm.

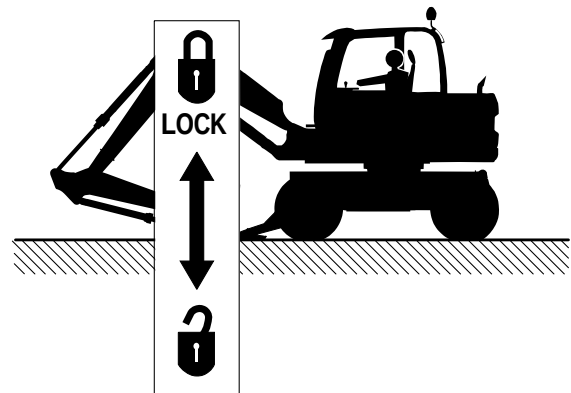


F24957

PARK MACHINE SAFELY

Before working on the machine:

- Park machine on a level surface.
- Lower bucket to the ground.
- Move turret swing lever to lock position.
- Run engine at slow idle speed without load for 5 minutes.
- Turn key switch to **O** to stop engine. Remove key from switch.
- Pull the safety lever to **(LOCK)** position.
- Allow engine to cool.
- Close windows, roof window, and cab door.
- Lock all access doors and compartments.



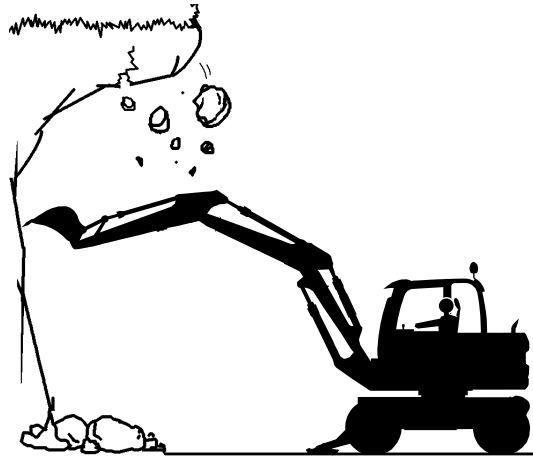
F24662



SAFETY PRECAUTIONS

NEVER UNDERCUT A HIGH BANK

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



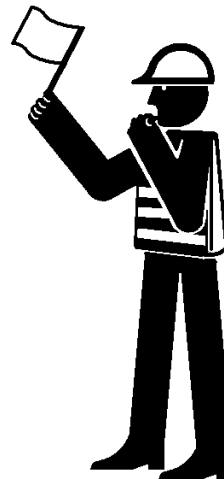
F24663

PROVIDE SIGNALS FOR JOBS INVOLVING A NUMBER OF MACHINES

For jobs involving several machines, provide signals commonly known by all personnel involved.

Also, appoint a signal person to co-ordinate the job site.

Make sure that all personnel obey the signal person's directions.



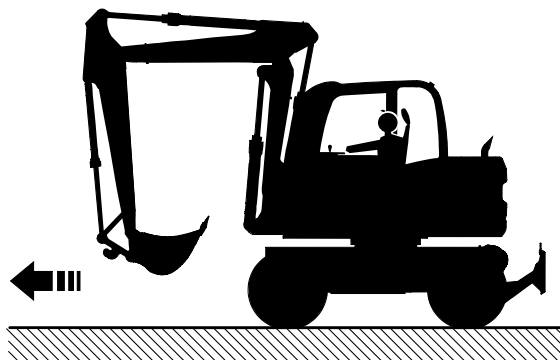
F3614

CONFIRM DIRECTION WHERE THE MACHINE IS TO BE DRIVEN

Instinctive travel pedal operation may result in serious injury and even death.

Before driving the machine, be aware of the undercarriage position relative to the operator's seat.

If swinging/steering axle is located behind towards the counterweight, the machine will move reverse when control pedal is moved forwards.



F24664



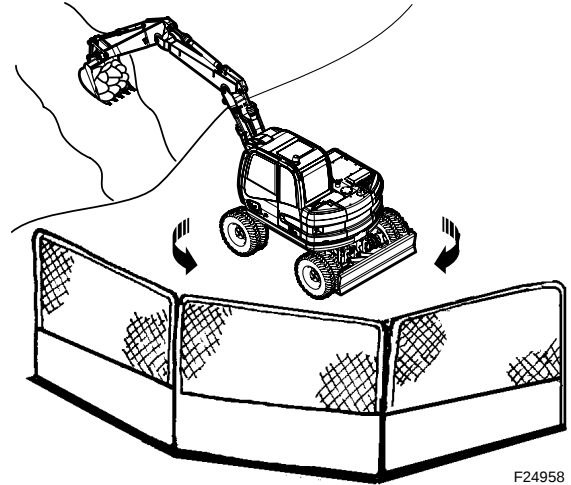
SAFETY PRECAUTIONS

KEEP PERSONNEL CLEAR FROM WORKING AREA

A person may be hit severely by the swinging front attachment or counterweight and/or may be crushed against an other object, resulting in serious injury or death.

Keep all persons clear from the area of operation and machine movement.

Before operating the machine, set up barriers to the sides and rear area of the bucket swing radius to prevent anyone from entering the work area.



F24958

NEVER MOVE THE BUCKET OVER ANY ONE

Never lift, move, or swing bucket above anyone or a truck cab.

Serious injury or machine damage may result due to bucket load spill or due to collision with the bucket.



F24665

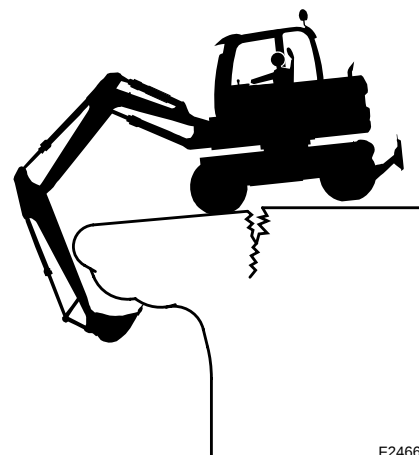
AVOID UNDERDIGGING

Never undercut or the footing might collapse.

Before starting to work, make sure of the excavator control direction.

If the footing starts to collapse and if sufficient retreat is not possible, do not panic.

Often, the machine can be secured by lowering the front attachment.



F24666



SAFETY PRECAUTIONS

SAFETY TRANSPORT

The danger of tipping is present when loading/unloading the machine onto/from a truck or trailer bed.

- Be sure to observe local regulations when transporting the machine on public roads.
- Provide an appropriate truck or trailer for transporting the machine.

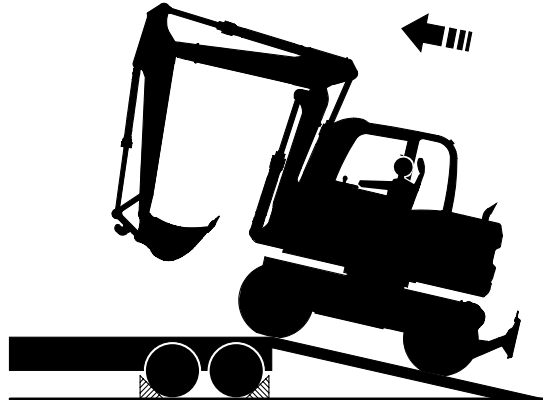
Take the following precautions when loading/unloading the machine:

- Select firm level ground.
- Be sure to use a loading dock or ramp.
- Be sure to have a signal person when loading/unloading the machine.
- Always turn the auto-idle switch off when loading or unloading the machine, to avoid unexpected speed increase due to unintentional operation of a control lever.
- Always select the slow speed mode with the travel speed selector.

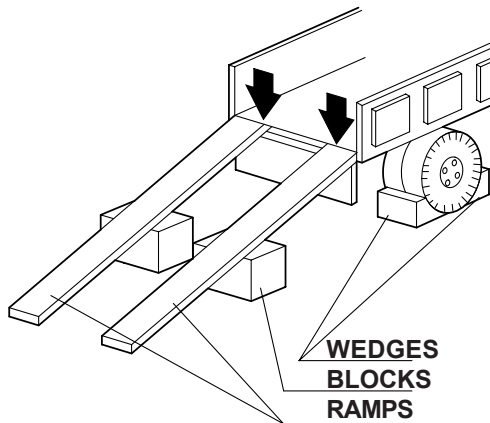
In the high speed mode, travel speed may automatically increase.

- Avoid steering while driving up or down the ramps as it is extremely dangerous.
- If steering is unavoidable, first move back to the ground or flatbed, modify travelling direction, and begin to drive again.
- Operate the safety lever but do not operate any other control except travel control when driving up or down the ramp.
- The top end of the ramp where it meets the trailer flatbed is a sudden bump. Take care when traveling over it.
- Prevent possible injuries caused by the from machine tipping over, while the superstructure is slewing.
- Keep the arm tucked under and rotate the superstructure slowly for better machine stability.
- Securely fasten machine frame using chains or cables.

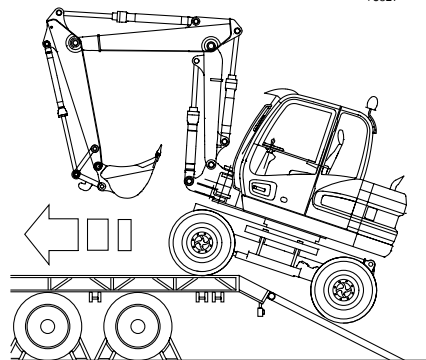
Refer to "Transport" chapter in this manual for details.



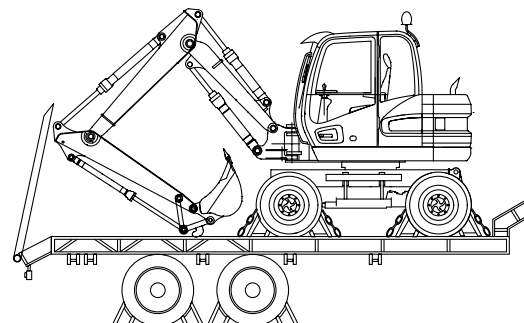
F24667



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SAFETY PRECAUTIONS

PRACTICE SAFE MAINTENANCE

Understand service procedures before doing work.

Keep work area clean and dry.

Never lubricate or service the machine while it is moving.

Keep hands, feet and clothing from moving parts.

Before servicing the machine, park the machine on a level surface.

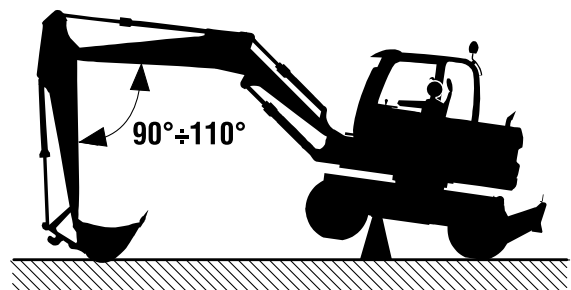
If maintenance procedure must be performed with engine running, do not leave machine unattended.

If the machine must be raised, keep a 90 to 110° between boom and arm. Securely support any machine elements that must be raised for service work. Never work under a machine raised by the boom.

Inspect certain parts periodically and repair or replace as necessary.

Keep all parts in good condition and properly installed. Fix any damage immediately. Replace worn or broken parts.

Remove any building of grease, oil, or debris. Disconnect the ground cable (-) from the batteries before servicing electrical systems or welding on the machine.





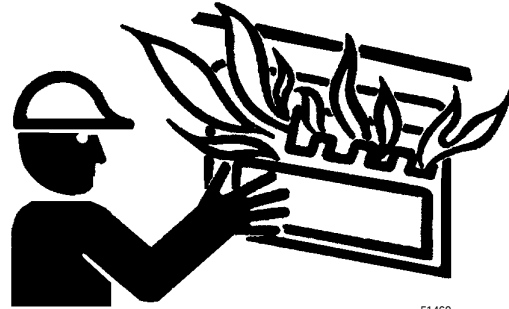
SAFETY PRECAUTIONS

KEEP MACHINE CLEAN

Keep engine bay, radiator, batteries, hydraulic lines, fuel tank, and operator's seat clean. Temperature in the engine bay may go up immediately after engine is stopped.

BE ALERT FOR FIRES IN THAT OCCASION.

Open access doors to cool the engine faster, and clean engine bay.



F1460

WARN OTHERS OF SERVICE WORK

Unexpected machine movement can cause serious injury.

Before performing any work on the machine, apply the "Maintenance in progress" tag (also see chapter **SAFETY PLATES**). This tag can be applied to the left-hand control lever, safety lever or cab door.

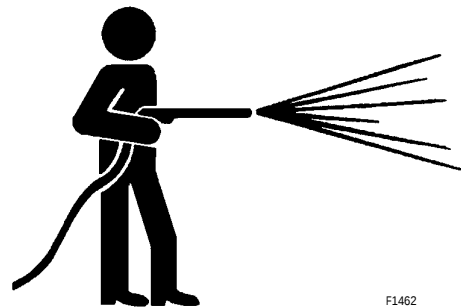


F2431

WASH THE MACHINE REGULARLY

Remove any grease, oil or debris build-up to avoid possible injury or machine damage.

Do not spray water or steam inside the cab.



F1462

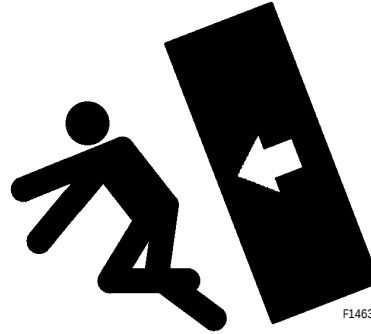


SAFETY PRECAUTIONS

STORE ATTACHMENTS SAFELY

Stored attachments such as buckets, hydraulic breakers, and blades can fall and cause serious injury or death.

Securely store attachments and implements to prevent them from falling. Keep playing children and bystanders away from storage area.



SUPPORT MACHINE PROPERLY

Never attempt to work on the machine without securing the machine first.

Always lower the attachment or tool to the ground before working on the machine.

If you must work on a lifted machine or attachment, securely support the machine or attachment.

Do not support the machine on cinder blocks, hollow tires, or props that may crumble under continuous load. Do not work under a machine that is supported solely by a jack.



PREVENT PARTS FROM FLYING OFF

Tyres are charged with pressure.

Tyre and/or rim parts burst may result in serious injury or death.

Only skilled staff can replace tyres.

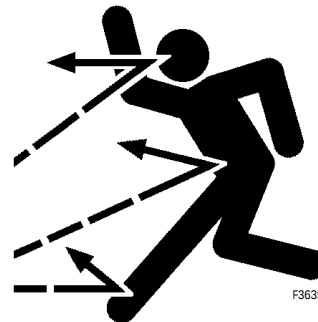
Always keep the correct tyre pressure.

Never exceed the recommended pressure when inflating tyres.

Slow down or stop and let tyres get cool.

When adjusting tyre pressure, keep at a certain distance and protect yourself. Use an extension equipped with a quick connection for the valve handling.

Always stay behind the tyre when adjusting pressure.





SAFETY PRECAUTIONS

STARTING THE ENGINE WITH BOOSTER BATTERIES

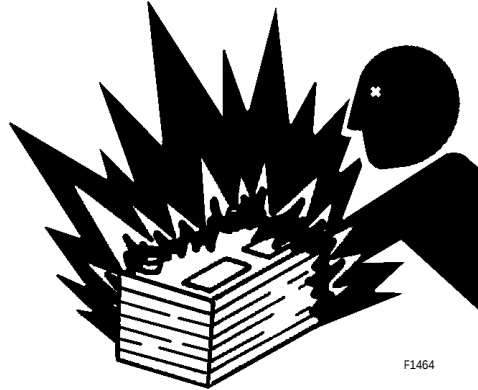
Battery gas may explode causing serious damages and injuries.

If the engine is to be started using booster batteries, ensure to comply with all procedures detailed in chapter **OPERATING INSTRUCTIONS**.

The operator should be sitting in the driver's seat to keep the machine under control when the engine starts. Starting the engine with booster batteries is a two man operation.

Do not recharge batteries that have been stored in the cold for a long time as they might explode. Heat them at 15°C.

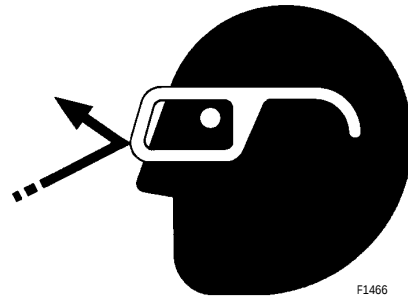
Mistakes in following procedures detailed for starting the engine with booster batteries may cause the batteries to explode or machine to move unexpectedly.



PROTECT YOURSELF AGAINST FLYING CHIPS

Guard against injury from flying pieces of metal or chips; wear goggles or safety glasses.

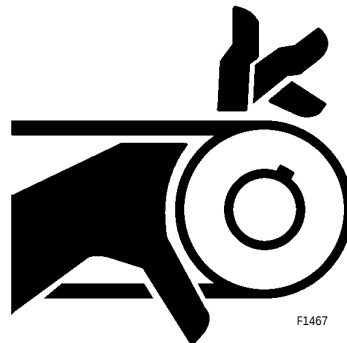
Keep bystanders away from the working area before striking any object, to avoid personal injury.



STAY CLEAR OF MOVING PARTS

Entanglements in moving parts can cause serious injury.

To prevent accidents, care should be taken to ensure that hands, feet, clothing, jewelry and hair do not become entangled when working around rotating parts.





SAFETY PRECAUTIONS

PREVENT BURNS

After operation, the engine coolant is hot and is under pressure. Hot water or steam are contained in the engine, radiator and heater lines.

Skin contact with escaping hot water or steam can cause severe burns.

Stop engine and let the same cool together with radiator.

Slowly loosen the cap to release pressure after the system has cooled, then remove it.

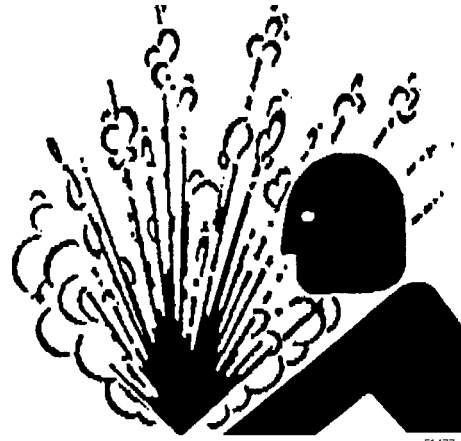
Engine oil, gear oil and hydraulic oil also become hot during operation.

The engine, hoses, lines and other parts become hot as well.

Wait for the oil and components to cool before starting any maintenance or inspection work.

The hydraulic oil tank is pressurized.

Again, be sure to release all pressure before removing the cap.



REMOVE PAINT BEFORE WELDING OR HEATING

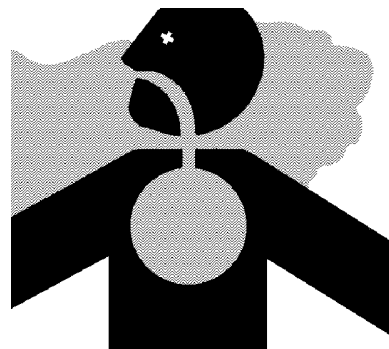
Avoid potentially toxic fumes and dust.

Hazardous fumes can be generated when paint is heated by welding, soldering, or using a torch.

Do all such work outside or in a well-ventilated area. Dispose of paint and solvent properly.

If you sand or grind paint, avoid breathing the dust. Wear an approved respirator.

If you use solvent or paint stripper, remove stripper with soap and water before welding. Remove solvent or paint stripper containers and other flammable material from area. Allow fumes to disperse at least 15 minutes before welding or heating.





SAFETY PRECAUTIONS

AVOID HEATING NEAR PRESSURIZED LINES

Flammable spray can be generated by applying heat near pressurized fluid lines, resulting in severe burns to yourself and bystanders. Do not heat by welding, soldering, or using a torch near pressurized fluid lined or other flammable materials.

Pressurized lines can be accidentally cut when heat goes beyond the immediate flame area. Install temporary fire resistant guards to protect hoses or other materials when engaging in welding, soldering, etc.



AVOID TO HEAT LINES CONTAINING FLAMMABLE FLUIDS

Do not weld or flame cut pipes or tubes that contain flammable fluids.

Clean them thoroughly with nonflammable solvent before welding or flame cutting them.



BEWARE OF FLUIDS UNDER PRESSURE

Escaping fluid under pressure can penetrate the skin causing serious injury.

Avoid this hazard by relieving pressure before disconnecting hydraulic or other lines.

Relieve the pressure by moving the control levers several times.

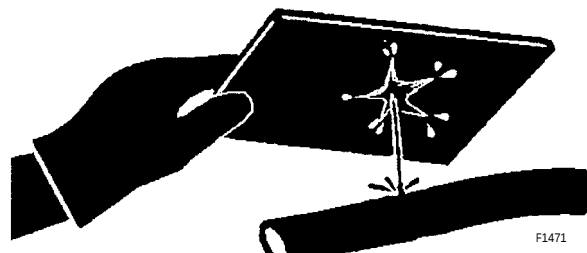
Tighten all connections before applying pressure.

Wear a shield or protection glasses to protect your eyes.

Search for leaks with a piece of cardboard; take care to protect hands and body from high-pressure fluids.

If an accident occurs, see a doctor familiar with this type of injury immediately.

Any fluid injected into the skin must be surgically removed within a few hours or gangrene may result.





SAFETY PRECAUTIONS

PREVENT FIRES

1. Check for oil leaks:

Fuel, hydraulic oil and lubricant leaks can lead to fires that may result in serious injury.

Check for missing or loose clamps, kinked hoses, lines or hoses that rub against each other, damaged oil-cooler, and loose oil-cooler flange bolts, for oil leaks.

Search for leaks with a piece of cardboard. Pressurized fluid leaks can penetrate skin and cause serious injuries.

Do not use your bare hand to check for oil leaks.

Tighten, repair or replace any missing, loose or damaged clamps, lines, hoses, oil-cooler and oil cooler flange bolts.

Do not bend or strike high-pressure lines. Never install bent or damaged lines, pipes or hoses.



F3638

2. Check for short circuits:

Short circuits can cause fires that may result in serious injury.

Clean and tighten all electrical connections.

Check before each shift or after eight (8) hours of operation for loose, kinked, hardened or frayed electrical cables and wires.

Check before each shift or after eight (8) hours of operation for missing or damaged terminal caps.

DO NOT OPERATE MACHINE if cable or wires are loose, kinked, etc.

Tighten, repair or replace any loose or damaged electrical cables, wires, and terminal caps before operating the machine.

3. Clean flammables:

Spilled fuel and oils, and accumulated coal dust and other flammables may cause fires and serious personal injury.

Prevent fires by keeping machine clean every day.



SAFETY PRECAUTIONS

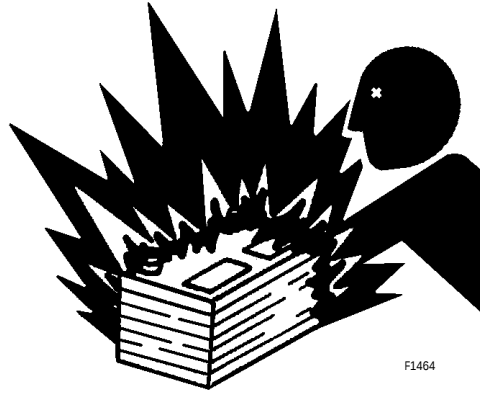
4. Check key-start switch:

If a fire breaks out, failure to stop the engine will escalate the fire, hampering fire fighting.

Always check key-start switch function before operating the machine every day:

- start the engine and run it at slow idle;
- turn the start switch key to **OFF**, to confirm the engine stops.

If any abnormalities are found, be sure to repair them before operating the machine.



F1464

5. Check heat shields:

Damaged or missing heat shields may lead to fires. Damaged or missing heat shields must be repaired or replaced before operating the machine.

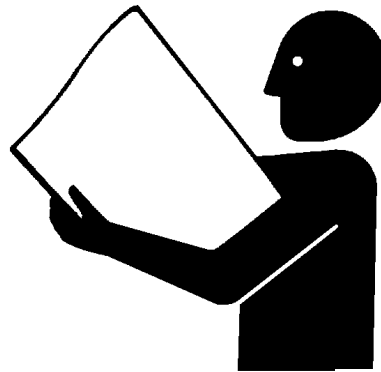
HANDLE CHEMICAL PRODUCTS SAFETY

Direct exposure to hazardous chemicals can cause serious injury. Potentially hazardous chemicals used with your machine include such items as lubricants, coolants, paints, and adhesives.

A Material Safety Data Sheet (MSDS) provides specific details on chemical products: physical and health hazards, safety procedures, and emergency response techniques.

Check the MSDS before you start any job using a hazardous chemical. That way you will know exactly what the risks are and how to do the job safely.

Contact your Dealer for MSDS list of chemical products used on machine.



F1465



SAFETY PRECAUTIONS

DISPOSE OF WASTE PROPERLY

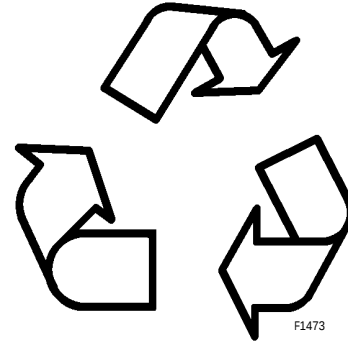
Improperly disposing of waste can threaten the environment and ecology. Potentially harmful waste on excavators includes such items as oil, fuel, coolant, brake fluid, filters, and batteries.

Use leakproof containers when draining fluids. Do not use food or beverage containers that may mislead someone into drinking from them.

Do not pour waste onto the ground, down a drain, or into any water source.

Air conditioning refrigerants escaping into the air can damage the Earth's atmosphere. Government regulations may require a certified air conditioning service center to recover and recycle used air conditioning refrigerants.

Obtain information on the proper way to recycle or dispose of waste from your local environmental or recycling center, or from your authorized dealer.



PREVENT ACID BURNS

Sulfuric acid in battery electrolyte is poisonous. It is strong enough to burn skin, eat holes in clothing, and cause blindness if splashed into eyes.

Avoid the hazard by:

Filling batteries in a well-ventilated area.

Wearing eye protection and rubber gloves.

Avoiding breathing fumes when electrolyte is added.

Avoiding spilling or dripping electrolyte.

Use proper jump start procedure.

If you spill acid on yourself:

Flush your skin with water.

Apply baking soda or lime to help neutralize the acid.

Flush your eyes with water for 10-15 minutes.

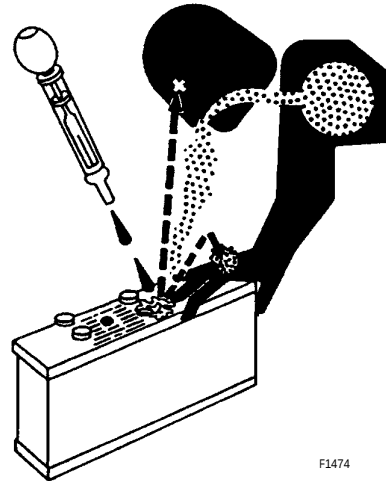
Get medical attention immediately.

If acid is swallowed:

Drink large amounts of water or milk.

Then drink milk of magnesia, beaten eggs, or vegetable oil.

Get medical attention immediately.





SAFETY PRECAUTIONS

HANDLE FLUID UNDER SAFETY CONDITIONS - AVOID FIRE SPREAD

Handle fuel with great care : it is highly flammable.
Do not refuel the machine while smoking or near open flame or sparks.
Always stop engine before refuelling machine.
Fill fuel tank outdoors.

Store flammable fluids away from fire hazards.
Do not incinerate or puncture pressurized containers.

Make sure machine is clean of trash, grease, and debris.

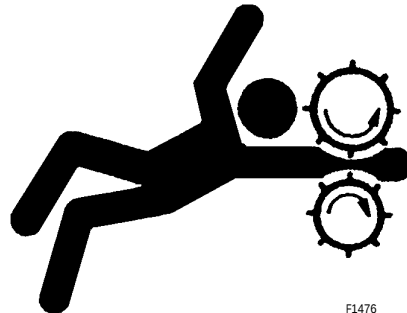
Do not store oily rags; they can ignite and burn spontaneously.



SERVICE MACHINE SAFELY

Tie long hair behind your head.
Do not wear a necktie, scarf, loose clothing, or necklace when you work near machine tools or moving parts. If these items were to get caught, severe injury could result.

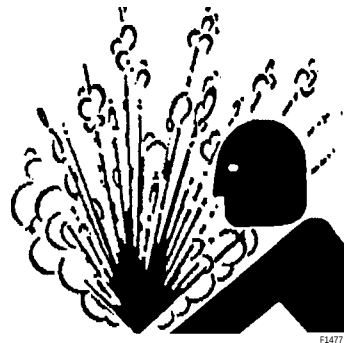
Remove rings and other jewelry to prevent electrical shorts and entanglement in moving parts.



SERVICE COOLING SYSTEM SAFELY

Explosive release of fluids from pressurized cooling system can cause serious burns.

Shut off engine.
Only remove filler cap when cool enough to touch with bare hands.

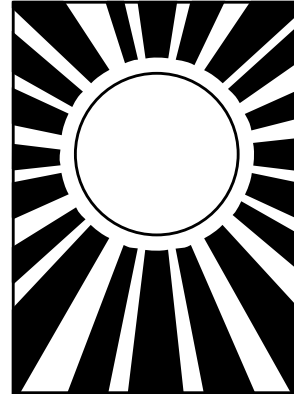




SAFETY PRECAUTIONS

WORK IN A CLEAN AREA

Before starting a job, clean the work area.
Remove objects that may be a safety hazard to the mechanic or bystanders.



F5835

SAFELY ILLUMINATE WORK AREA

Illuminate your work area adequately and safely.
Use a portable safety light for working inside or under the machine.
Make sure the bulb is enclosed by a wire cage.
The hot filament of an accidentally broken bulb can ignite spilled fuel or oil.



F1480

USE PROPER TOOLS

Use tools appropriate to the work. Makeshift tools and procedures can create safety hazards.

Use power tools only to loosen threaded tools and fasteners.

For loosening and tightening hardware, use the correct size tools. Do not use U.S. measurement tools on metric fasteners. Avoid bodily injury caused by slipping wrenches.

Use genuine spare parts only.



F1479



SAFETY PRECAUTIONS

EVACUATING IN CASE OF FIRE

If a fire breaks out, evacuate the machine in the following way:

If time is available, stop the engine by turning the start switch key to O.

Use a fire extinguisher if there is time.
Exit the machine.



F3638

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