1. CALIFORNIA PROPOSITION 65

⚠ WARNING

CALIFORNIA PROPOSITION 65

Breathing diesel engine exhaust exposes you to chemicals known to the State of California to cause cancer and birth defects or other reproductive harm.

- Always start and operate the engine in a well-ventilated area.
- If in an enclosed area, vent the exhaust to the outside.
- Do not modify or tamper with the exhaust system.
- Do not idle the engine except as necessary.

For more information go to www.P65warnings.ca.gov/diesel.

2. SAFETY INSTRUCTIONS

Safety Message

Intended Use

Machines should be operated by the procedure the described in the Operator manual.
The products described in the Operator manual are designed and manufactured mainly for the following purposes:

- Loading work
- Leveling work

Do not operate the machine for any purpose other than those stated above or in areas where there are potential risks. Make sure that you comply strictly with the safety regulations at all times. Please contact HD Hyundai Construction Equipment Co., Ltd. or your dealer for more information.

It is strictly prohibited to operate or use the machine in any of the following cases:

- Operation by an unskilled worker
- Lifting a worker up
- Transporting inflammable or dangerous materials
- Driving down or extracting piles with the bucket
- Towing damaged vehicles

Safety guidelines

Most safety accidents related to the operation, maintenance/ inspection, and repair of the machine result from a failure to comply with the safety instructions or to take adequate preventive measures. Safety accidents can be prevented by eliminating potentially hazardous situations. The operator should attend all mandatory training courses on the operation of the machine, and fully understand how to use the tools.

Improper operation, refueling, inspection or repair of this machine may cause serious injury or death.
Do not attempt to operate, refuel, inspect or repair this machine before reading and understanding the product information on such tasks.
This manual describes preventive measures and warnings about the product.
Failure to comply with the warnings about potential risks may result in serious injury or death.

General Safety Information

Unauthorized modification

Any attempt to modify the machine, including the use of unauthorized accessories or spare parts, may have adverse effects on the conditions of the machine and its ability to function as it was designed. Do not attempt to modify the machine in any way without the written consent of the company in advance. The company bears the right to disclaim all quality assurance of a product that is modified without its advance approval.

Never modify the operator's cabin by welding, grinding, drilling holes, or adding attachments unless instructed by HD Hyundai Construction Equipment in writing. Changes to the cabin can cause loss of operator protection from roll-over and falling objects. Can result in death or serious injury.

If the user performs unauthorized modification of the product, the user shall fully be responsible for any damages to the machine resulting from the effects of such modification.

1. The attachment, the accessory, or the spare part has been made or distributed by HD Hyundai Construction Equipment and has been installed according to approved methods described in a publication available from HD Hyundai Construction Equipment.
2. Any modification should be approved by the company in writing.

ROPS/FOPS

The cabin is designed to guarantee sufficient space to minimize impacts according to ISO 3471 of Rollover Protective Structures (ROPS). If any additional devices are installed that exceed the Max. certified weight indicated on the ROPS nameplate, the ROPS certification may be nullified. The protective structure of the cabin should be replaced immediately if it is permanently deformed or damaged.

Machines operated in areas where there is a risk of objects falling onto the cabin are fitted with a Falling Object Protective Structure (FOPS) according to ISO 3449.

Fire and Explosion

Preventing fires

The following actions should be taken to minimize the risk of fire:

- Do a visual inspection before operating the machine to check for any risk of fire.
- Do not operate the machine if there is a risk of fire.
- Be sure to identify the primary exit and alternative exit of the machine, and fully understand how to use the exits in the event of a fire.
- Do not perform any welding or drilling work on the engine cover.
- Keep the engine compartment free from the build-up of flammable materials such as dead leaves, small branches, paper, and other types of trash.
- Keep the covers of the major parts of the machine closed. Make sure that the covers operate normally in order to be able to use firefighting equipment in the event of a fire.

- Be careful when handling fuel. Fuel is a highly flammable.
- Always stop the engine when refueling the machine.
- Refuel outdoors.
- Remove any build-up of flammable materials from the machine.
- Do not operate the machine near a flame.

- All fuels and most lubricant and coolant mixtures are flammable materials, so special care should be exercised when handling such materials to prevent fire and explosion.
- Keep all fuels and lubricant in adequate containers.
- Never smoke in the area where refueling is taking place or in the space for handling battery electrolytes and other flammable materials.
- Oil leaked to a hot surface or electronic component may cause a fire.
- Do not operate the machine if there is an oil leak. Repair the source of the oil leak, and wipe clean any leaked oil before operating the machine.
- Always clean all electrical lines, connectors, and clamps, and check whether they are securely connected on a regular basis.
- If any electrical wire or connector is loose or damaged, repair it immediately.

- Do not weld, cut or use a cutting torch through any tubes or lines in which flammable flows. Check all tubes and lines for signs of abrasion or deterioration and replace if damaged.
- Dust or particles generated when repairing the non-metallic hood or fender are flammable or explosive. Repair such parts in a well ventilated area well away from flames or sparks, and be sure to wear suitable PPE (Personal Protective Equipment).

Prevention of explosion

The following actions should be taken to minimize the risk of explosion:

- Preheating function is provided to certain machines that are used in extremely cold environments.
- Never use starting aid fluid in a low-temperature environment as it can environment as it can harm the engine the engine performance and may cause an explosion.

- Do not attempt to recharge a frozen battery. Forcibly recharging a frozen battery may result in an explosion.
- Great care should be exercised when handling the batteries. Never let a tool make contact with the positive pole and the frame of the machine simultaneously. Sparks maybe generated, resulting in an explosion.
- The voltage of the battery to be recharged should be identical to the voltage of the recharger. Incorrect voltage may cause overheating and explosion.
- Do not use or charge the battery if the level of electrolytes in the battery is lower than the minimum level. Regularly check the electrolyte level, and refill the distilled water to the maximum level.

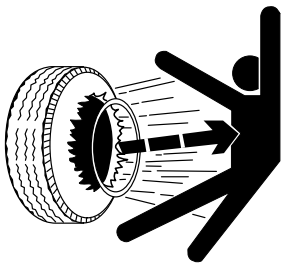
- Do not try to start the engine using an unsuitable booster cable as it may result in an explosion and serious injury.
- Only use the booster cable to start the engine in a ventilated open space, as starting the engine with a booster cable may generate inflammable gas.
- When hydraulic equipment and piping are overheated, flammable gas or airborne particles may explode. Make sure to protect and insulate such parts to prevent over heating.

Corrective Actions Before and After a Fire

In the event of a fire in the machine, the top priority should be the safety of the operator and workers in the work area. In the event of a fire at a level that does not endanger the operator or workers, the following actions should be taken:

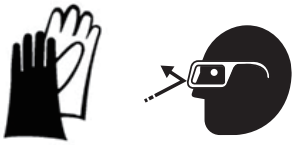
- Move the machine well away from any inflammable materials (e.g., fuel, engine oil, clothes, and bits of wood) and adjacent buildings.
- If the engine is running, it may cause a persistent fire. Immediatly stop the engine.
- In the event of an electric short, disconnect the batteries to eliminate the main ignition source.
  In the event of an electricity leak resulting from damage to the power wiring caused by fire, disconnect the batteries to eliminate the secondary ignition source.

If a fire becomes too large to control, assess the following risks :



- If the machine is equipped with wheels, there is a risk of tire combustion and explosion. If exploded, high-temperature fragments may scatter.
- The tank, accumulator, hose and fitting may burst into flames, splashing fuel and scattering particles throughout the surrounding area.

If you have to handle a machine that has been damaged by fire or one that is exposed to excessively high heat after extinguishing a fire, take the following precautions:



- Wear thick protective gloves and protective goggles.
- Never touch any materials left after combustion with your bare hands.
- Avoid contact with melted polymer materials (e.g., plastics).

Information on fire extinguisher

Fire extinguishers (if equipped) should be kept in a fully operable condition, and be inspected by a qualified person on a regular basis. Workers should complete a training course on the use of fire extinguishers in advance.

Use fire extinguishers in accordance with the following procedures, if required:

① Pull the safety pin of the fire extinguisher first.
② Extend the nozzle, and stand toward the fire.
③ Aim the nozzle at the flames, and firmly press the top and bottom handles.
④ Stand in a downwind position, and evenly spray the foam over the flames.

If the weight of the fire extinguisher exceeds 4.5 kg, mount the extinguisher in a location near the bottom of the cabin. Do not mount the fire extinguisher at a level higher than one third of the height of the cabin.

Do not weld or drill ROPS to mount a fire extinguisher. Contact your dealer or distributor for more information about the correct mounting of fire extinguishers.

Health and Safety

Personal protective equipment

The wearing of personal protective gear is mandatory for protecting the human body from hazardous chemicals and hazardous environments.

The wearing of personal protective gear is a means of preventing injury, and should not interfere with the performance of jobs. It is designed to protect the human body from hazardous environments and hazardous materials, and should be kept in an easily accessible place.

List of personal protection gear

Name	Symbol	Remarks
Safety helmet		Protects the head from falling objects, and reduces risks when falling down.
Dust mask		Air-purifying dust mask should not be worn in workplaces with an oxygen concentration of less than 18%.
Gas mask		Prevents the inhalation of mist, airborne particles, or protects against the spray of hazardous chemicals.
Welding helmet		Blocks airborne dust and slag, and shields the face from bright light during welding.
Protective clothing		Blocks dust, mist and hazardous chemicals, and protects against burns.
Protective gloves		Electric insulation gloves: Should be worn when working in areas with a high risk of electric shock. Chemical protective gloves: Should be worn when working in areas where there is a risk of contact with hazardous chemicals including materials leaked from batteries.
Protective goggles		Protects the eyes from dust, particles and airborne materials in work areas.
Earplugs and earmuffs		Wear earplug and earmuffs separately or in combination depending on the level and duration of noise.
Safety shoes		Protects the feet from falling objects, impacts, and sharp objects.

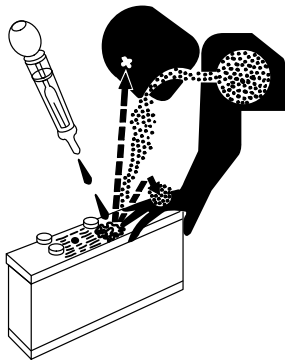
Health and safety instructions in hazardous environments

Comply with the following instructions during operation and maintenance of the machine.

When handling oil

Failure to wear personal protection equipment may result in burns caused by contact with a high-temperature liquid. Make sure you wear protective goggles, protective gloves and protective clothing when handling oils such as hydraulic oil and engine oil.
If the eyes come into contact with oil, wash them with a sufficient amount of water for 15 minutes or longer. If the skin comes into contact with oil, take off contaminated clothes and shoes, and wash the skin with soap and water for 15 minutes or longer.

When handling the battery



If battery electrolyte leaks while handling the battery, the sulfuric acid contained in the electrolyte may cause burns.
The lead components in battery electrolyte are toxic, so be sure to wear protective gloves and protective clothing.
Do not forget to wash your hands after handling the battery.
If a part of your body not protected by personal protective equipment comes into direct contact with battery electrolyte, immediately wash the affected part with flowing water for 20 minutes or more, and then see a doctor without delay.
If you accidentally swallow battery electrolyte, drink lots of water and do not forcibly induce vomiting, and then see a doctor without delay.

When hanlding refrigerant

Make sure you wear protective goggles, protective gloves and other personal protective equipment when handling refrigerant to prevent direct contact of the skin with the refrigerant. Wear protective gloves made of materials that are resistant to chemicals (such as neoprene and butyl rubber).
Never smoke when handing refrigerant.
If refrigerant comes into direct contact with the skin, wash the skin with warm water immediately.

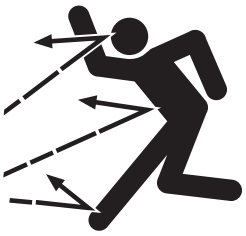
When handling coolants

After operation of the machine the coolant is of high temperature and high pressure, and is retained inside the engine radiator and the heater line. Direct contact of the skin with the coolant may result in serious burns. Open the cap of the radiator only after the engine has sufficiently cooled and the pressure has reduced to a safe level.

Coolant contains toxic and combustible ethylene glycol, and should be handled in a cool, well-ventilated place only when wearing protective goggles, protective gloves, protective clothing, and a gas mask.
Avoid inhaling airborne particles or spray from coolant. If the substances make contact with skin or eyes that are not protected by personal protection gear, immediately wash the skin and eye with flowing water for 20 minutes or longer.

When working in a place subject to airborne particles and falling objects,

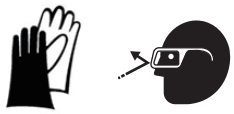
Make sure you wear a safety helmet, protective goggles and safety shoes to prevent injury from such particles and objects. Earplugs or earmuffs may be necessary when working in a noisy place.



When working in places with a high level of noise

When the operator is exposed to the noise exceeding 90 dB (A) for 8 hours or longer, wear earplugs or earmuffs.

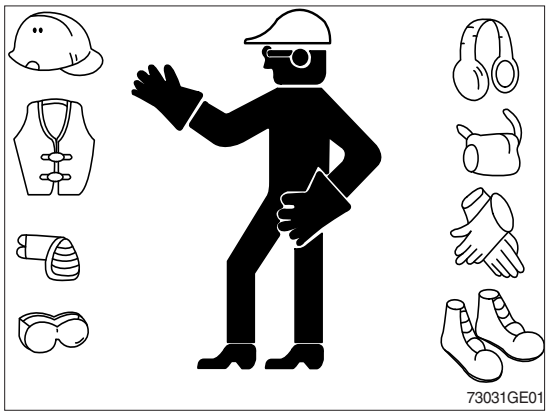
Personal protection gear for various situations

Situation	Symbol
Oil handling	
Battery handling	
Refrigerant handling	
Coolant handling	
Repair by welding	
Working in areas subject to airborne particles and falling objects	
Working in places with a high level of noise	
Handling machines damaged by fire or exposed to excessively high temperature	

WEAR PROTECTIVE CLOTHING

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

- Do not wear loose clothing and accessories. Secure long hair. These items can snag on controls or on other parts of equipment.
- Do not wear oily clothes. They are highly flammable.
- Wear a hard hat, safety shoes, safety goggles, mask, leather gloves, earplugs and other protective equipment, as required.
- While working on machine, never use inadequate tools. They could break or slip, or they may not adequately perform intended.



Noise and Vibration

Information on vibration

This section describes the vibration data of the machine, and methods of calculating the vibration level.

The vibration level of the machine varies according to any of the following conditions:

- Driving habits of the operator (i.e. aggressive/mild temperament when driving)
- Quality of seat and suspension
- Type of machine, attachments, and conditions of machine
- Conditions of work site, working environment, ground surface conditions, and weather

Vibration also varies according to the duration of operation. Accordingly, it is not possible to precisely calculate the vibration level of the machine; however, it is possible to predict the level.

Physical Agents Directive 2002/44/ECdefines the exposure action value as 0.5m/s^2, and the exposure limit value as 1.15 m/s^2. If the predicted value is near the exposure action value or exposure limit value, the predicted value should be assumed to exceed the two latter values, and necessary action should be taken.

As regards the actions to take according to vibrations, refer to the following table :

Daily vibration exposure (A(8))	Vibration exposure range	Actions to be taken
A(8) $\leq$ 0.5 m/s^2	Exposure action value or lower	When approaching the exposure activity value, reasonable measures should be taken to minimize exposure to vibration. The relevant information and opportunities for training on vibration reduction should be provided to the operator.
0.5 m/s^2 < A(8) $\leq$ 1.15 m/s^2	Exceeding the exposure action value, but not exceeding the exposure limit value	It is required to execute certain measures for reducing exposure to and risks of vibration to the minimum. The health of an operator who has been exposed to excessive vibration should be examined.
1.15 m/s^2<A(8)	Exceeding the exposure limit value:	Immediate action is required to reduce the vibration exposure level to below the exposure limit value.

The vibration level can be predicted based on the information in the following table which is used to calculate the daily level of vibration exposure.

Predict the vibration level in the three vibration directions of axes X, Y, and Z. The mean vibration level should be used under normal operation conditions. Scenario factors from mean vibration level based on operation by skilled operator and on smooth terrain are excluded. Scenario factors are included to obtain the mean vibration level based on aggressive operation and severe terrain to assess the expected vibration level.

※ **All vibration values are indicated in m/s^2.**

Instructions on mitigating vibration

Machines should be correctly adjusted and maintained to ensure smooth operation. The terrain conditions should be observed. The following instructions will help reduce the whole body vibration level:

① Use machines and attachments of the correct types and sizes.

② Maintain the machines pursuant to the manufacturer's recommendations.
- Brake and steering systems
- Controls, hydraulic system and linkage
- Tire pressure

③ Maintain and provide good terrain conditions.
- Remove any large rocks or obstacles.
- Fill gutters or holes.
- Keep the vibration level minimal by adjusting the speed and driving path

④ Use a driver's seat that satisfies ISO 7096.
- Adjust the driver's seat and suspension for the weight and the size of the operator.
- Inspect the suspension and adjusting devices of the driver's seat.

⑤ Perform the following maneuvers without using excessive force :
- Steering
- Braking
- Accelerating
- Gear shifting

⑥ Move the attachments smoothly.

⑦ Adjust the speed and path of machine to keep the vibration level minimal.
- Operate the machine so as to avoid obstacles and rough terrain.
- Decelerate the machine when driving on rough terrain.

⑧ Keep the level of vibration minimal when working for a long time or driving for a long distance.
- Use a machine mounted with suspension system.
- Use the machine's drive control system (optional).
- If the machine is not fitted with a drive control system, reduce the speed.
- Transport the machine when moving between worksites; do not drive the machine to get to another worksite.

⑨ The operator's convenience may be reduced by various risk factors. Comply with the following conditions to effectively ensure the operator's comfort and convenience.

- Adjust the driver's seat adjustment device to allow a convenient posture.
  Adjust the angles of the mirrors to minimize awkward, compromised posture
- Avoid working for an excessively long time, and take regular breaks.
- Do not jump on or from the cabin.
- Minimize repeated handling of loads and lifting of loads.
- The vibration information and calculation procedures are based on <ISO/TR 25398>, which has been defined according to the emission of vibrations measured under the actual working conditions of the machines.

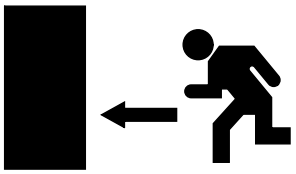
Information on noise

Noise level (EN 474-1:2018 and 2000/14/EC) are as follows :

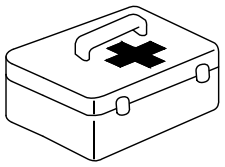
- Sound pressure level (LpA) : See pages 0-3.
- Sound power level (LwA) : See pages 0-3.

Emergency situations

In the event of an emergency situation, use the emergency hammer installed inside the cabin to break the windshield of the cabin, and carefully escape from the cabin. The emergency hammer should always be kept inside the cabin for emergencies, and should not be removed or used for other purposes. If the emergency hammer is lost, replace it immediately.



Keep a first-aid kit inside the cabin or in another place at the worksite for safety accidents.



Keep contact information (e.g., phone number) to request help with an emergency situation or injury.

Safety Information on the Machines and Operation

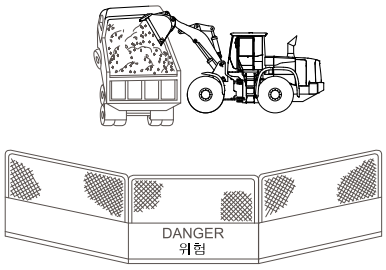
Before Operating the Machine

Visual inspection shall be performed for identifying potential hazards and obstruction of visibility around the machine.

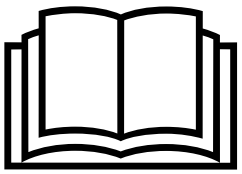
Carefully examine the following conditions and take the necessary actions, if required, to prevent risk factors before operating the machine:

Checking the worksite

- Check the weather condition at the worksite (e.g., fog, rain, etc.). Fog or heavy rain may narrow the operator's field of vision, or render the machine inoperable. In particular, the operator should bring the bucket down to the ground in the event of thunder and lightning, and evacuate to a safe place.
- Check the worksite for obstacles, and avoid collisions with such obstacles during operation. Check the surroundings of the machine for any obstacles that may hinder operation.
- Check the worksite for buried waterlines, telecommunication cables, power cables and oil pipelines in advance, and avoid damaging them.
- If the terrain of the worksite is too rough for normal operation of the machines, flatten the terrain before operating the machines. Make sure that the ground of the worksite is not soft as it may cause hazards during operation.
- If the worksite is a marshy place (e.g., shallow river, large or small lake, swamp, etc), check the conditions and the depth of marshy areas, and the flow rate before driving or operating the machines. Do not operate the machines underwater.
- Do not operate the machines on cliffs or at the end of a road on soft ground as the machine may overturn.
- When operating the machine in areas with pedestrian or vehicle traffic, or in a zone in the vicinity of such an area, appoint workers exclusively responsible for controlling the traffic, or install fences or blocking wall to separate the worksite from the traffic area. Workers responsible for vehicle control in the traffic area or exposed to public vehiclar traffic shall be worn with warning vests or clothing made of reflective or high-visibility materials. Prevent unauthorized workers or machines from accessing the worksite.



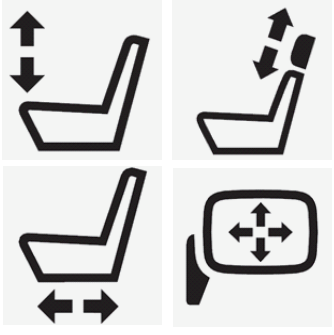
Operator conditions to be checked before operating the machine



- The machine shall be operated by authorized and skilled operators only.
- The operator should wear clothes and personal protection gear that are appropriate for the work environment.
- The operator should only be permitted to operate the machine under normal conditions after checking the state of the operator. Operator under the influence of alcohol or drugs, or an extremely exhausted operator should not operate the machine.
- The operator should read and fully understand the operator's manual before operating the machine.
- The operator should fully understand the details and procedures of the work to be performed.
- If a risk of a safety accident is suspected, consult sufficiently with the responsible worker, and only perform the work after taking the necessary preventive measures.

Machine conditions to be checked before operating the machine

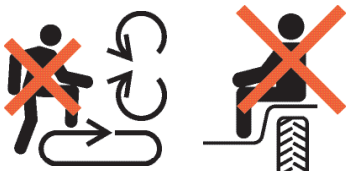
- When defects make continued operation hazardous to operator and workers around the worksite, the defective items of the machine shall not be operated and placed in a designed area posted for that purpose, or a tag or other effectice method of marking the defective items shall be used to prohibit further use untile the defects are corrected.
- If damaged windows obscure visibility necessary for safe operation, or crated hazard to the equipment operator, the windows shall be replaced or corrected.
- Check the machine for abnormal noise, vibration or heat, and for the leakage of engine oil, hydraulic oil, fuel or refrigerant.
- Remove any substances (e.g., inflammable materials such as wooden chips, dead leaves, and pieces of paper) from the engine and the battery. The buildup of such substances may cause a fire.
- Do not operate a machine that needs repairing without taking actions for repair.
  Operate the machine only after making sure that the regular inspection and service recommended in the operator's manual have been executed.



- Adjust the operator’s seat to suit the physical condition of the operator. Check the seatbelt for damage, and replace it if damaged. Do not store unnecessary objects or tools in the cabin.
- Keep clean all parts related to the visibility, such as the windshield and rearview mirror. In particular, adjust the rearview mirror to ensure that the operator’s field of vision is clear.
- Check the acoustic alarms (e.g., the horn and warning signal when driving backward or moving) for normal operation.

During Operation of the Machine

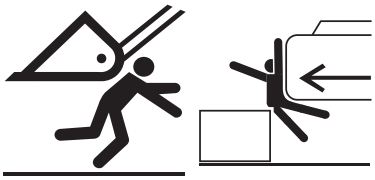
Getting on and off

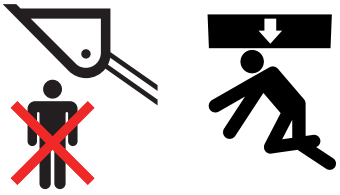


- Do not jump on or off the machine.
  Do not try to get on or off the machine while it is moving.
- Get on or off the machine using the handrail and step (or stepladder, if any). Always keep the handrail and step clean and free from mud or oil.
- Wear anti-slip shoes.
- Comply with the principle of three-point contact* by contacting the machine with either both hands and one foot or vice versa when getting on or off the machine.
- Do not sit on a seat not suited or intended for sitting.

※ **Three-point contact means making contact with the machine with both hands and one foot, or with one hand and both feet.**

During operation

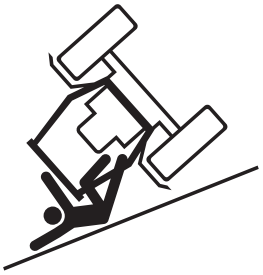




- The operator should start the engine only after sitting on the operator's seat. Make sure that all levers are shifted to the neutral position before starting the engine.
- If there are any obstacles at the worksite, pay attention to prevent collision of the machine with such obstacles, particularly when turning and moving backward. Make sure that there are no obstacles when turning and moving backward.
- When lifting a load, the capacity of the machine and the size and weight of the object to be lifted must be considered. Do not lift a heavy object with slings by suspending the slings on the tooth of the bucket.
- Do not allow any worker to stand under the bucket.

Operation on a slope

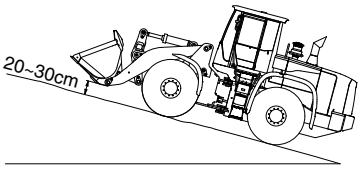
Comply with the following conditions when operating the machine on a slope:

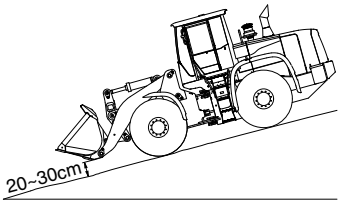


- Do not work on slopes of 10˚ or more.
- The maximum climbing angle of the machine on a slope is 30˚. Do not operate the machine at an angle exceeding this value.
- If operation of the machine on a slope is unavoidable, perform the work after flattening the ground.

- When operating the machine laterally on a slope, there is a high risk of machine overturning or slipping. Do not operate the machine in such conditions.

- Do not operate the machine on a slope covered with wet grass or a thick layer of dead leaves, as the machine may slip.
- Do not park or stop the machine on a slope.
  If parking or stopping the machine on a slope is unavoidable, bring the bucket down to the ground, and support the wheels with wheel chocks.





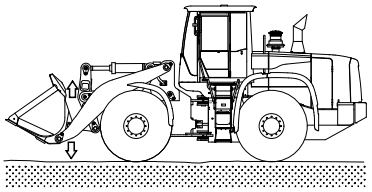
- When traveling up a slope, operate the machine at a slow speed with the attachment extended forward to keep the machine balanced, and with the bucket raised at least 20 ~30 cm from the ground.
- Never travel down a slope in neutral. Keep the bucket 20~30 cm above the ground and use the bucket as a brake in an emergency situation.
- If the engine suddenly stalls, immediately bring the bucket to the ground.
- If the fuel gauge reaches the red zone while operating the machine, immediately refill with fuel. (If the machine operates on a slope under these conditions, air may be introduced into the engine, causing it to stall suddenly.)

Cautions to Be Taken When Driving the Machine

- If you operate the machine with the parking brake on, it may cause serious damage to the parking brake disk.
- Select the appropriate gear for the driving speed.
- Do not change direction when driving the machine at max. speed as this may cause serious damage to the transmission.

- Only drive the machine for short distances on the road.
- Make sure you fully comply with the local road traffic regulations and legislation of your country when driving on the road.
- Please note that the machine is wider and travels at a lower driving speed than other vehicles on the roads.
- Pay attention to any vehicles behind your vehicle, and allow them to overtake your vehicle safely.

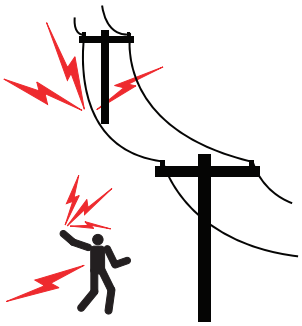
Driving position



- Check the following conditions before driving the machine on the public road :
  - Remove any dirt and sand from the machine.
  - Empty the bucket and move it to the driving position (40~ 50 cm above the ground) and fix it.
  - Close the windshield. Turn the working light off.
  - Wear the seat belt.
  - Use the lighting devices, such as the headlights, emergency warning light and rotating beacon, pursuant to the local road traffic legislation.
  - Pay attention to people in the vicinity of the machine.
  - Do not operate the machine on roads or bridges where the machine exceeds the weight limit.
  - Familiarize yourself fully with the width, length and height of the machine.
  - Check the tire pressure.
  - When traveling for a long distance, stop the machine after every 40 km or on an hourly basis, and take a break.
  - Check the level of fuel and coolant.
  - Never shift the gear to the neutral position when driving down a slope.
  - Changing direction when operating the machine on a slope is dangerous.
  - Do not drive on a slope of 30˚ or more.
  - Drive slowly when traveling the machine on rough terrain or moving over obstacles.
  - Install chains on the tires when operating the machine on slippery roads covered with snow or rainwater, and do not attempt to start, stop or turn the machine suddenly.
  - Be sure to avoid any obstacles when traveling the machine on paths.

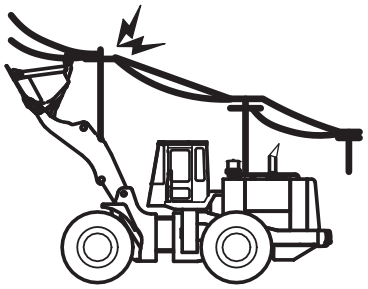
Operations to be avoided or prohibited

· Pay attention when operating the machine in an enclosed space as this may result in the risk of a buildup of hazardous gases.

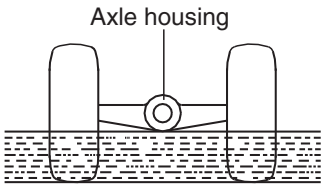


· If the machine is operated in the vicinity of a high-voltage line, there is a risk of death or serious injury.
· Make sure you are fully aware of the height and working radius of the machine, and maintain the minimum safety distance.

Voltage	Minimum safety distance
6.6 kV	3 m (10 ft)
33.0 kV	4 m (13 ft)
66.0 kV	5 m (16 ft)
154.0 kV	8 m (26 ft)
275.0 kV	10 m (33 ft)



· In the event of contact with a high-voltage line, keep sitting on the operator's seat until the electric current has been shut down.
· Warn any workers on the ground in the vicinity of the machine not to make contact with the machine.
· If leaving the machine is unavoidable, jump down to a place free from any contact with the machine.
· Do not operate the machine too close to the edge of cliffs, overhangs and deep ditches for preventing falling down or tipping over. Avoid operating on loose ground, especially the ground near ditch is likely to collapse. Pay special attention when it is raining as the heavy rainfall may soften the ground.
· Avoid operating the machine on soft ground, a slope or cliff as there is a risk that it may overturn. Pay special attention when it is raining as the rainfall may soften the ground.

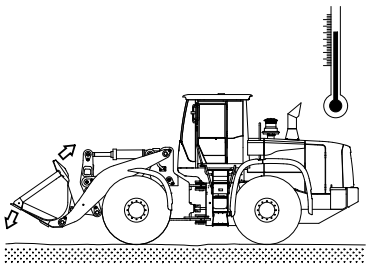


· When operating or driving the machine underwater, check the floor conditions, depth of water and flow rate, and make sure that the top roller and axle housing are not immersed in water.
· Do not operate the machine under adverse weather conditions caused by overcast skies, snow, and rainfall.
· Do not turn or travel the machine when the bucket is stuck in the ground.
· Do not excavate too deeply under the front of the machine for preventing from falling or tipping over.

Cautions when operating in specific areas

Operating in extremely cold environments

- Do not attempt to start, stop or turn the machine suddenly as this may cause it to slip. There is potential for the machine to slip.
- Snow-covered or frozen ground may be slippery and dangerous.
- Idle operation of the machine may be required to elevate the engine temperature during startup.
- An impact resulting from a sudden movement of the boom or the attachments at an extremely low temperature may cause serious damage to the machine.
- The working cycle or loading weight might be reduced to lower than those under normal conditions.
- Check the following conditions before operating the machine :



  - Warm up the engine for 3~4 seconds when starting up the engine.
  - Always fully charge the battery. A discharged battery will freeze earlier than a fully charged battery.
  - Use engine oil and fuel that are appropriate for the temperature.
  - Keep the fuel tank full.
  - Remove any moisture from the fuel tank, and change the fuel filter regularly.
  - If the fuel filter is frozen, the flow of fuel may be blocked.
  - Pour the proper volume of antifreeze into the coolant.
  - Wait until the various parts of the machine reach the operating temperature after starting the engine.
  - Make sure that every controller and function of the machine operates normally.
  - Remove any dirt, snow and ice from the machine after completing the operation, and park the machine on a wooden pallet.

Operating in extremely hot environments

- Continuous operation of the machine for a long period of time may cause the machine to overheat. Pay special attention to prevent the overheating of respective parts such as the engine and the hydraulic system, and stop the machine and take a break if necessary.
  Check the following conditions frequently :

  - Check the level of the coolant in the radiator.
  - Check the radiator grill for clogging by foreign pollutant, and remove them, if any.
  - Check the level of the battery electrolyte.
  - If the battery will not be used for a long period of time, store it in a cool place.
  - Check the hydraulic system for oil leakage.
  - Check the lubrication oil on the respective parts, and top up the oil if necessary.
  - If the paint coating of any parts has been effaced or damaged, coat the parts with paints or treat them with an anti-rust additive.
  - Do not park the machine under direct light for a long period of time.
  - When parking or storing the machine outdoors, use the proper cover to protect the machine from sunlight and dust.

Operating in dusty or sandy environments

- Check the radiator grill for clogging by pollutant, and remove them, if any.
- Check the fuel system, and protect it from dust or sand when refueling.
- Inspect the air cleaner regularly, and replace it if necessary.
- If the gauge lamp on the dashboard lights up and the buzzer sounds at the same time, clean or replace the air cleaner independently of the usual inspection cycle.
- Frequently check consumables such as hydraulic oil and lubrication oil, and change them if necessary. Pay attention care to prevent the introduction of dust or sand when changing the consumables.
- Check the air-conditioner and the heater filters regularly, and clean or replace them if necessary.
- When parking or storing the machine outdoors, use the proper cover to protect the machine from dust and sand.

Operating in rainy or humid environments

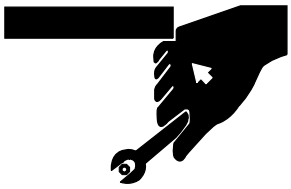
- Do not operate the machine in areas where there is heavy rainfall or thick fog.
- If operating the machine in such areas is unavoidable, perform operation after ensuring sufficient field of vision.
  - Use lighting devices such as the head lamp and working light.
  - Warn any workers within the radius of operation of the machine.
- Pay attention when operating the machine on smooth ground as there is a risk of it overturning.
- If the paint coating on any parts has been effaced or damaged, coat the parts with paints or treat them with an anti-rust additive.

Operating the machine in coastal areas

- Special care should be taken when operating the machine in coastal areas as exposed parts may be corroded easily.
- If the paint coating on any parts has been effaced or damaged, coat the parts with paints or treat them with an anti-rust additive.
- Perform inspection and maintenance of the parts promptly.

Cautions during maintenance

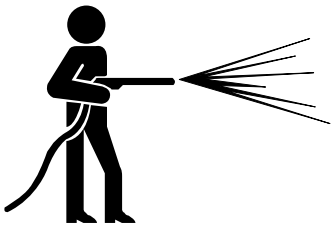
Tools



- Use the correct tools for each type of work.
- Using improper tools may damage the machine and its parts.
- Using deteriorated or damaged tools may result in bodily injury.

Inspection and servicing

- Prevent access to the machine by all unauthorized workers (other than those authorized during operation of the machine).
- In the event of an inspection park the machine in a flat area and attach it with an 'Under Inspection' sign.
- Clean the machine before inspection or maintenance.
  - When performing inspection or maintenance on a dirty machine, it may be difficult to diagnosis or detect the cause of a problem with the machine, if any.
  - Dust or dirt accumulated on the machine may cause a worker to slip or fall.
  - Wear protective goggles and protective clothes when cleaning the machine using a compressed water jet.
  - Do not spray water directly on sensors or electric connectors (sensors or electrical connection units, etc.). If water gets into the electrical system, it can cause operational problems.

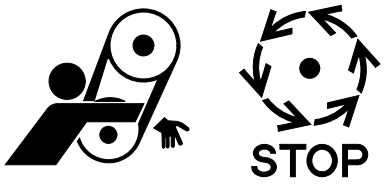


- Use proper lighting devices when operating the machine in a dark area.
- Use lighting devices that satisfy the explosion-proof requirements when handling inflammable materials such as fuel and hydraulic oil.
- Never attempt to use a direct flame such as a cigarette lighter in lieu of the lighting device.

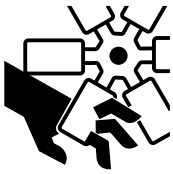
- Check the level of the cooling water after stopping and sufficiently cooling down the engine.
- Sufficiently relieve the inside pressure before opening the cooling water cap.
- The cooling system contains basic components. Pay attention to prevent the skin or eyes coming into contact with the basic components.

- Pay attention to protect the body from contact with hot fluid or parts.
- Replace the filters only after stopping off and sufficiently cooling down the engine.
- Slowly remove the hydraulic oil filter plug to relieve the inside pressure.
- Relieve the pressure from the hydraulic system before disconnecting the lines and fittings.

Collision or cutting



- Never open or remove the engine hood while the machine is in operation.
- Two workers should perform the job while the engine is running:
- One worker should be ready to operate the machine or to turn the engine off from the cabin.
- Keep areas in the vicinity of rotating or moving parts clean.
- Keep articles in the vicinity of the fan clean.
  - Wear safety gloves when handling the wire cables.
  - Wear protective goggles and protective clothes, if required.

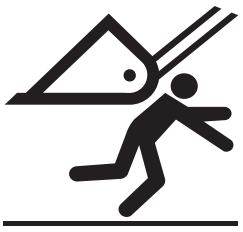


Preventing fire and explosion

- All fuels and most lubrication oils and coolant mixtures are inflammable materials, so special care should be exercised when handling such materials to prevent fire and explosion.
- Oil that leaks on to a hot surface or electronic components may cause a fire.
- Keep all fuels and lubrication oils in adequate containers.
- Do not smoke while refueling fuels, or at the refueling point.

- Do not smoke in a space where battery electrolyte and other inflammable materials are handled.
- Always keep all electrical lines, connectors, and clamps clean, and check whether they are securely connected on a regular basis.
- If any electrical wire or connector is loose or damaged, repair it immediately.
- Do not weld or cut with gas cutter pipes or tubes that contains flammable fluids.

Cautions on decoupling the attachments



- Do not allow unauthorized workers to access the machine.
- Place the operating machine in a safe position.
- Install safety fences around the operating machine.

Repair by welding

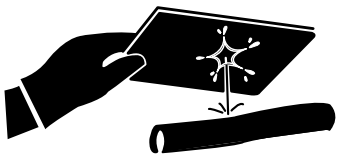
- Perform repairs by welding in an area where adequate facilities for welding are available.
- Welding work may be subject to risks of gas leak, flame and electric shock.
  Welding should be performed only by a qualified welder.
- Take the following precautions when welding:
  - Separate and remove the battery to prevent battery explosion.
  - Perform direct heating in a place free from the risk of explosion.
  - Cover parts such as rubber hoses subject to damage by welding with flame-resistant materials.
  - Wear a welding helmet, protective clothes, protective gloves, and safety shoes.
  - Perform welding work in a well-ventilated place.
  - Remove all inflammable materials from areas in the vicinity of welding work.
  - Provide fire extinguishers.

Precautions to take when working on the machine

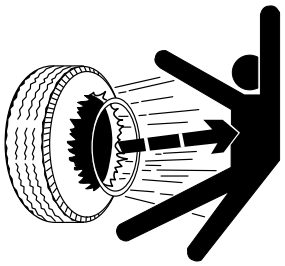
- There is a risk of falling when working on the machine.
- Keep the area around the workers' feet clean and tidy.
- Do not spill oil or grease.
- Do not leave tools lying on the floor.
- Be careful on the floor when moving.
- Never jump from the machine.
- When getting off the machine, use the step or handrail and get off the machine while keeping to the principle of three-point contact.
- Wear protective clothes if necessary.
- Do not perform maintenance work in an area where no anti-slipping pads have been installed.
- Replace anti-slipping pads and step treads with new ones if they have deteriorated or no longer function.

Cautions when working with the high-pressure line or hose

- Make sure that the internal pressure is released before replacing or checking the high-pressure line or hose.
- If the internal pressure is not released, serious injury may result.
- Be careful in the following conditions:
  - Provide fire extinguishers.
  - Leaked oil may penetrate the skin or cause serious injury.
  - Never check for oil leaks with your bare hands.
  - Check an oil leak using a wooden plate or cardboard.
  - Never bend or hit the high-pressure line hard.
  - Do not install a bent or damaged line or hose.
  - Make sure that all of the clamps and protective devices are properly installed.
- Check the pipes and hoses regularly and replace any damaged parts if necessary.



Cautions on inspecting the tire

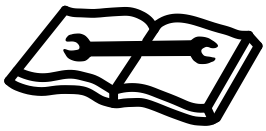


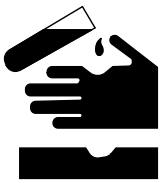
- Always keep the tires inflated to the proper pressure.
- Overheating or rupture of the tires may result in serious injury.
- Repairing or changing the tires requires exclusive facilities and expertise. Please contact a professional tire repair shop if repairs are necessary.

Cautions on inspecting the counterweight

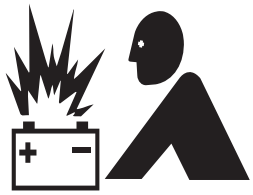
- Never stand beneath the counterweight when installing or removing it.
- Make sure that the status and conditions of the lifting device are normal.

Battery





- The battery contains flammable materials.
- Never smoke in the vicinity of the battery.
- The battery electrolyte is strong acid. Pay attention to prevent the skin and eyes from coming into contact with the electrolyte.
- If the battery electrolyte accidentally comes into contact with the body or clothes, immediately wash off the electrolyte with water.
- If the battery electrolyte is frozen, do not use other devices to start the engine up.
- Always wear protective goggles and protective gloves when working on the battery.
- Always keep the switch in the 'OFF' position when working on the battery.
- Securely fasten the battery cap.
- Always disconnect the battery from the machine before charging the battery.
- Disconnect the cathode (-) first when removing the battery.
- Connect the anode (+) first when connecting the battery.
- Follow the safety procedures when jump starting or charging the battery. Improper connection of the cable may result in an explosion and serious injury.
- Use a voltmeter when inspecting the charging system.
- Regularly inspect the battery cable, and replace it if damaged.
- A battery cable with exposed wires may cause a short if it comes into contact with the grounding surface.
- A short circuit of the battery cable may cause heat from the battery current and result in a fire.
- If the wires of the ground cable are exposed between the battery and the master switch, the exposed wires make contact with the grounding surface and the current may bypass to the master switch. This may destabilize the machine operation.
  Repair or replace the part before operating the machine.



Battery disconnection switch

- Do not turn off the battery disconnect switch while engine is running. There is a risk of damaging electrical system.
- The battery disconnect switch can be found under the left-hand door of the machine.
- Make sure to turn off the battery disconnect switch when welding or servicing electrical systems, and before clocking out.

Switchboard

- The relay and fuse can be found on the switchboard at the rear of the cab.
- Do not use the fuse that has a higher amperage than indicated on the decal. There is a risk of damaging electric circuits or catching fire.

Parking and Storage

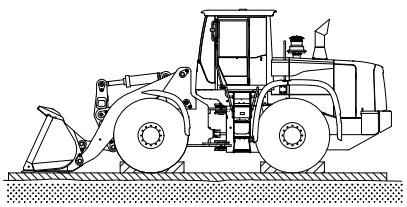
Cautions on parking

- Park the machine on the flat ground as possible.
- If parking the machine on a slope is unavoidable, use wheel chocks to prevent the machine from moving.
- Bring the bucket right down to the ground.
- Make sure that all of the switches are turned to the 'OFF' position.
- Make sure that all of the controllers are turned to the neutral position.
- Activate the parking brake.
- Stop the engine, and withdraw the ignition key.
- Close and lock the windshield, door and cover completely.
- Install fences around the machine when parking it on a public road, and put up a warning sign.

Cautions on storage for a long period of time

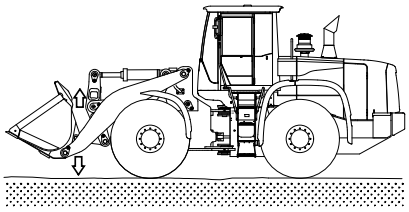
- Park the machine in accordance with the cautions for parking.
- When storing the machine for a month or longer, pay attention the following conditions to prevent deterioration of the machine performance :

  - Thoroughly clean the machine before storing.
  - Inject sufficient lubrication oil and grease into the injection ports.
  - If the lubrication oil is deficient, top it up. If the oil is contaminated, change it.
  - The lubrication oil may deteriorate during storage. Pay special attention to reusing the oil.
  - The density of the oil may drop during storage.
  - Apply an anti-rust additive to the exposed area of the piston rod of the cylinder in areas where it is likely to rust quickly.
  - Keep the master switch mounted in the power box (or the toolbox on the left of the rear frame of the machine) turned 'OFF'.
  - Top up the antifreeze in the radiator.
  - Keep the machine in a dry indoor environment.
    If storing the machine outdoors is unavoidable, store it on a wooden pallet.
  - Keep the exposed area of the piston load of the cylinder covered.
  - Bring the attachments right down to the ground, and keep the wheels and the track immobile by placing wheel chocks.



Regular lubrication (during storage)

- Breaking the lubrication film on parts may cause abnormal abrasion during the next operation.
- Start up the engine once a month, perform all of the functions, and apply lubrication oil to every part.
- Check the level of the engine oil and coolant when starting the engine up, and top them up if necessary.
- Thoroughly wipe off any rust-proofing oil from the cylinder and piston rod.
- Sufficiently warm up the engine after starting the engine and repeat the operation of the attachments several times to wear in the parts sufficiently.
- Fully charge and store the battery.
- Store the battery separately for a long period of time under extremely cold weather conditions.
- Check the tire pressure.
- The machine shall not be lubricated manually while it is in motion where application of the lubricant may expose persons to injury.



Visibility

Before you start the machine, perform a walk-around inspection in order to ensure that there are no hazards around the machine.

While the machine is in operation, constantly survey the area around the machine in order to identify potential hazards as hazards become visible around the machine.

Your machine may be equipped with visual aids. Some examples of visual aids are Closed Circuit Television(CCTV), AAVM(Advanced Around View Monitoring) and mirrors. Before operating the machine, ensure that the visual aids are in proper working condition and that the visual aids are clean.

If may not be possible to provide direct visibility on large machines to all areas around the machine, appropriate job site organization is required in order to minimize hazards that are caused by restricted visibility. Job site organization is a collection of rules and procedures that coordinates machines and people that work together in the same area.

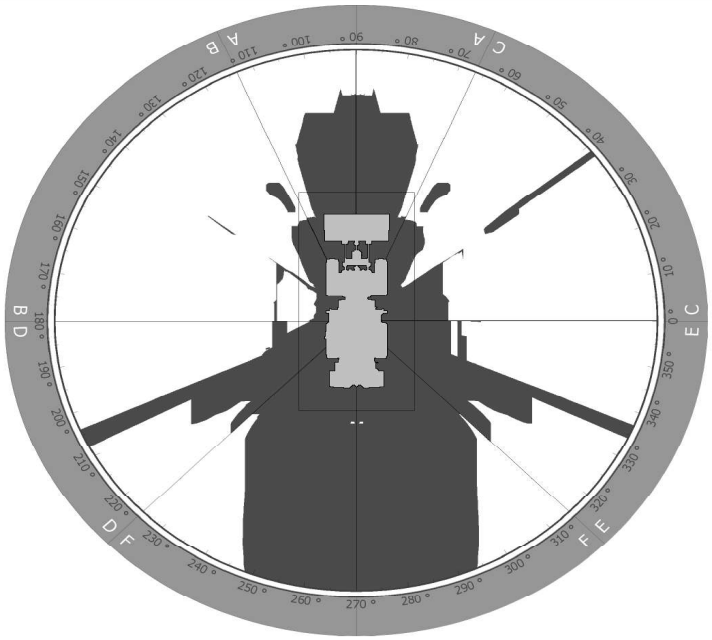
Examples of job site organization include the following:

- Safety instructions
- Controlled patterns of machine movement and vehicle movement
- Workers that direct traffic to move when it is safe
- Restricted areas
- Operator training
- Warning symbols or warning signs on machines or on vehicles
- A system of communication
- Communication between workers and operators prior to approaching the machine

Modifications of the machine configuration by the user could result in a restriction of the machine visibility. In this case, a new risk assessment shall be performed according to ISO 5006:2017.

Restricted Visibility

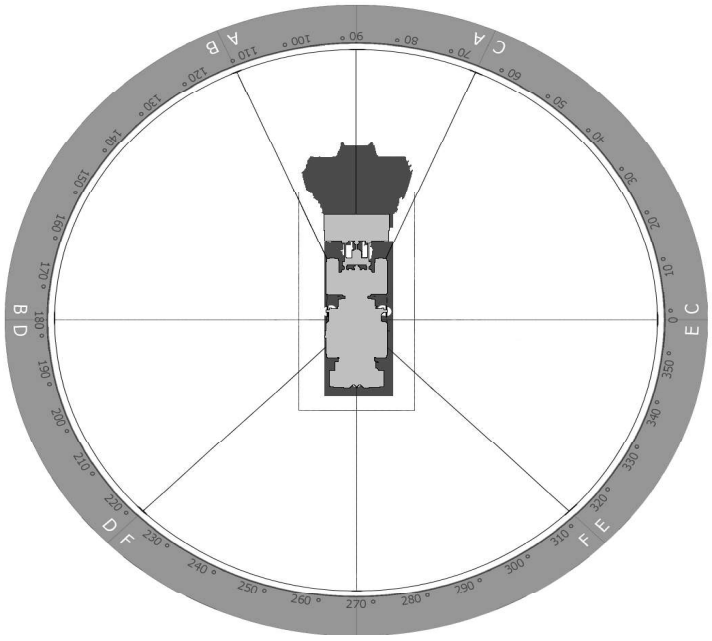
The size and the configuration of this machine may result in areas that can not be seen when the operator is seated. The following illustration of visual map provides an approximate visual indication of areas of significant restricted visibility. This illustration indicates restricted visibility areas at ground level inside a radius of 12.00m (40 ft) from the operator on a machine only with the use of right side mirror and left side mirror installed. (without the use of optional visual aids.) This illustration provide areas of restricted visibility for distances outside a radius of 12.00m (40 ft).
This machine may be equipped with optional visual aids (CCTV or AAVM) that may provide visibility to some of the restricted visibility areas. For areas that are not covered by the optional visual aids, the job site organization must be utilized to minimize hazards of this restricted visibility.



< Top view of the machine at ground level visibility without use of optional visual aids >

※ The shaded areas indicate the approximate location of areas with significant restricted visibility. (Radius = 12 m / 34 ft)

There is restricted visibility to the area directly behind the machine with no optional visual aids. Failure to make sure the area is clear could result in serious injury or death. Make sure that the area is clear with the other person on the ground before you start the reverse movement.



< Top view of the machine at ground level visibility with use of optional visual aids >

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