

**OCCUPATIONAL RISK PREVENCIÓN MANUAL
EARTHMOVING MACHINERY**



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OBJETIVE

The purpose of this manual is to provide a compendium of the risks and safety measures that can affect earthmoving machinery in general.

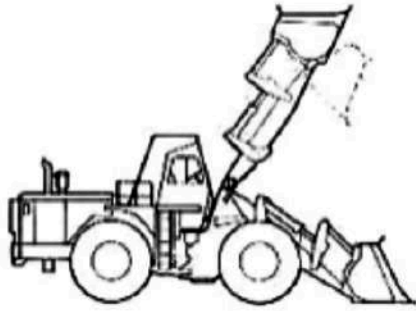
GENERAL CHARACTERISTICS

The risks and preventive measures of the machines are studied and analyzed according to the work phases as well as the different operations that can be carried out on them once the work is finished.

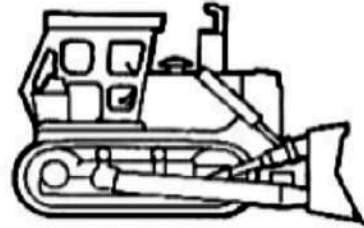
This manual can be applied to wheel and track loaders, bulldozers, compactors, motor graders and motor graders, backhoe loaders both wheeled and tracked, and compactors.



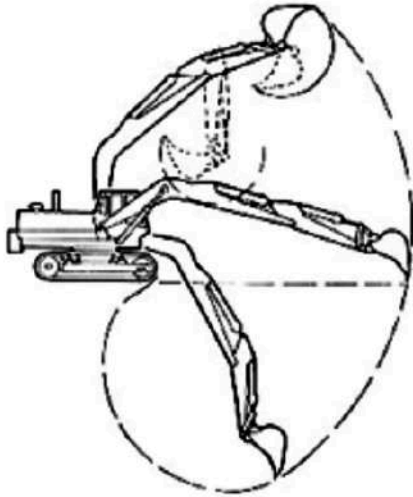
MOTOR GRADER



WHEEL LOADER



BULLDOZER



BACKHOE



TRACKED LOADER



COMPACTOR



MOTOTRAILLE

DEVELOPMENT OF WORK PHASES

Before starting any work

It is necessary to know the rules and recommendations that the work contractor advises. Likewise, the special recommendations made by the person in charge of the work must be followed.

The driver must wear personal protective clothing:

- ▶ Protective helmet for the head: Usually the driver's head is protected with a cabin, but the use of a protective helmet is essential when leaving it to circulate around the work site. The safety helmet will be approved.
- ▶ Non-slip safety boots: Safety footwear is important due to the conditions in which work is usually done on the construction site (with mud, water, oil, grease, etc.).
- ▶ Hearing protection: When the noise level exceeds the established safety margin and in any case, when it is higher than 80 dB, the use of headphones or earplugs will be mandatory. They will be approved.
- ▶ Work clothes: Loose work clothes that can be caught by moving elements should not be worn. Eventually, when weather conditions make it advisable and the command post lacks a cabin, the driver must wear clothing that protects him from the rain.
- ▶ Gloves: The driver must have suitable gloves for possible conservation emergencies during work.
- ▶ Eye protection: Likewise, and when there is no cabin, the driver must use safety glasses in order to protect yourself from the projection of particles in excavation operations.
- ▶ All personal protective clothing will be approved whenever required by current regulations.
- ▶ The traffic regulations in the work area, the signals and beacons used such as: banners, fences, manual signals, light and sound.
- ▶ When working on public roads, the machine must be suitably signposted in accordance with the provisions of the Highway Code.

RISKS and RISK FACTORS

GETTING FAMILIAR WITH THE OPERATION OF THE MACHINE

DANGEROUS CIRCUMSTANCES:

You maneuver the machine recklessly

PREVENTIVE MEASURES:

- ▶ Know the possibilities and limits of the machine and particularly the space necessary to maneuver.
- ▶ When the maneuvering space is very small or limited by obstacles, it is necessary to mark the area of evolution of the same.
- ▶ Monitor the position, function, and direction of operation of each of the controls, the signaling devices and the safety devices.
- ▶ Adjust the seat to the comfort, height and weight of the driver.

KNOW THE WORK AREA

DANGEROUS CIRCUMSTANCES:

Not properly examining the place of work.

PREVENTIVE MEASURES:

- ▶ Know the circulation plan of the work and every day find out about the work carried out that may constitute a risk: open ditches, laying cables, etc.
- ▶ Know the height of the machine while driving and working, as well as areas of limited or narrow height.
- ▶ With the rubber wheel undercarriage, drive cautiously or at slow speed in areas of dust, mud or frozen ground.
- ▶ Carry out good maintenance of circulation areas.

START JOB WITH JOB

Before starting the engine, a series of checks must be carried out in accordance with the machine manufacturer's manual; Any anomaly that is observed will be noted in a record of observations and will be reported to the mechanical maintenance workshop.

DANGEROUS CIRCUMSTANCES:

- ▶ Lack of machine controls
- ▶ Defective visibility
- ▶ Lack of order

PREVENTIVE MEASURES:

- ▶ Look around the machine to observe possible oil leaks, parts or pipes in bad condition, etc.
- ▶ Check the headlights, position lights, turn signals and stop lights.
- ▶ Check the condition of the tires in terms of pressure and cuts in them.
- ▶ All security devices must be in place.
- ▶ Check the oil and water levels.
- ▶ Clean the windshield wipers, mirrors and rear-view mirrors before starting the machine, remove anything that may obstruct visibility.
- ▶ Do not leave rags in the engine compartment.
- ▶ The driving position must be clean, remove oil, grease, mud from the ground, cab access areas and handholds.
- ▶ In winter do the same when there is snow or ice.
- ▶ Do not leave various objects such as tools, rags, etc. on the floor of the driver's cab. Use the tool box for this.

WHEN STARTING THE MACHINE

DANGEROUS CIRCUMSTANCES:

- ▶ Before getting on the machine
- ▶ Get into the cabin holding the steering wheel or a control lever
- ▶ When starting the engine
- ▶ With the engine running, defects in the operation of the machine

PREVENTIVE MEASURES:

- ▶ Check that no person is in the vicinity of the machine, and if there is someone, make them move away from its surroundings.
- ▶ Dry hands, remove mud from shoes.
- ▶ Use the handles and stirrups to climb: if they are damaged, will repair.
- ▶ Check the seat adjustment.
- ▶ Follow the instructions in the driver's manual and in particular:
 - Put all controls in neutral.
 - Sit down before starting the engine
 - Remain seated while driving
 - Verify that the indications of the controls are normal
 - Do not start indoors

In a clear and safe place, check the correct operation: of the main and stop brakes, turn the steering wheel in both directions at low speed or maneuver with the levers, place the different gears.

WORK SAFELY

DANGEROUS CIRCUMSTANCES:

- ▶ Recklessness in driving the machine
- ▶ Driving recklessly
- ▶ Working without safety
- ▶ Terrain with slope
- ▶ Demolition work
- ▶ Electrical risks
- ▶ If you work in a dangerous place

PREVENTIVE MEASURES:

- ▶ Do not load passengers.
- ▶ Do not let anyone park around the machine.
- ▶ Do not use the shovel as a scaffold or support to lift people.
- ▶ Do not place the bucket above the cab of the truck.
- ▶ Before making any movement with the machine, look around, observing that there are no workers in the vicinity.
- ▶ Before moving the backhoe on the road, the stabilizers, the boom and the rotating area must be blocked with the mechanisms provided for this purpose.
- ▶ Repeat the signs.
- ▶ Circulate at a certain distance from the ditches, slopes and any alteration of the terrain that may make it possible for the machine to overturn.
- ▶ Slopes and slopes should be clean before work begins.
- ▶ Never go up or down while moving, even at low speed.
- ▶ Place the truck parallel to the machine.
- ▶ Load trucks with caution. When not in practice, try two posts and a horizontal bar.
- ▶ Work whenever possible with the rear wind, this way the dust will not impede visibility.
- ▶ If the truck driver has left the cab, check that he is not within the working radius of the machine.

- ▶ When the ground is sloping, stop the machine and work with the equipment facing the slope.
- ▶ Whenever possible, place the equipment on a level surface, prepared and located far enough from areas with risk of collapse.
- ▶ Do not go down sideways.
- ▶ To move on sloping ground, point the arm towards the bottom, almost touching the ground.
- ▶ For extraction, work facing the slope.
- ▶ When stopping, direct the equipment towards the top of the slope and support it on the ground.
- ▶ A slope goes down with the same speed as it goes up.
- ▶ Never go down a slope with the engine stopped or in neutral, go down in gear.
- ▶ Do not knock down construction elements with the bucket where the height above the ground is greater than the length of the horizontal projection of the arm in action.
- ▶ Cover the holes in the ground before riding. If this is not possible to mark the area.
- ▶ When making ramps, do not use wooden or iron beams that may leave holes.
- ▶ Equip the cabin with a structure that protects the driver against falling materials.
- ▶ Do not work in the vicinity of a live overhead power line without ensuring that the minimum safety distances have been taken.
- ▶ When driving on a road next to a power line, the sinuosities, potholes and other irregularities of the same must be taken into account when calculating the minimum distances.
- ▶ For lines of less than 66,000 V. the distance will be at least 3 m. For more than 66,000 V. (See NTP 72.83). Likewise, to avoid arcing when working near overhead lines, respect the above distances.
- ▶ When working in a ditch, in a quarry, next to slopes where there is a danger of quality of materials or of the machine tipping over, the backhoe is equipped with an anti-tip cabin and against falling objects.
- ▶ If you enter a dark gallery, turn on the headlights and position lights.

AT THE END OF THE WORK DAY

DANGEROUS CIRCUMSTANCES:

- ▶ Fuel filling
- ▶ Park the machine

PREVENTIVE MEASURES:

- ▶ When the tank is full, do not smoke and have the engine stopped.
- ▶ Stand downwind so as not to get splashed with fuel.
- ▶ Close the tank cap tightly.
- ▶ It is preferable for the machine on flat ground, chock the wheels and support the equipment on the ground.
- ▶ The ground where the machine is parked will be firm and solid; in winter, do not park the machine in mud or puddles of water, as it can freeze.
- ▶ To stop the machine, consult the manufacturer's manual.
- ▶ Put all controls in neutral.
- ▶ Set the parking brake and disconnect the battery.
- ▶ Remove the ignition key and keep it for the driver, also close the cab door.
- ▶ Get out of the cab using the handles and steps designed for this. Always looking at the machine.

AUXILIARY WORK ON THE MACHINE

Work team changes

- ▶ Choose a flat and well-cleared location.
- ▶ Disassembled parts will be evacuated from the workplace.
- ▶ Scrupulously follow the manufacturer's instructions.
- ▶ Before disconnecting the hydraulic circuits, lower their pressure.
- ▶ To handle the parts, use gloves.
- ▶ If the driver needs an assistant, he explains in detail what to do and will observe him at all times.

Faults in the work area

- ▶ Lower the equipment to the ground, stop the engine and apply the brake, whenever possible.
- ▶ Post the appropriate signs indicating the failure of the machine.
- ▶ If the engine stops, stop the machine immediately, as you run the risk of being left without brakes or steering.
- ▶ For any fault, re-read the manufacturer's manual. Never get towed to start the engine.
- ▶ Never use the shovel to lift the machine.
- ▶ To change a tire, place a firm base to raise the machine.

Machine transport

- ▶ Park the trailer in a flat area.
- ▶ Check that the trailer length is adequate to transport the machine.
- ▶ Check that the access ramps can support the weight of the machine.
- ▶ Lower the bucket as soon as the machine is on the trailer.
- ▶ If the bucket does not fit the length of the trailer, it will be removed.
- ▶ Remove the ignition key.
- ▶ Hold the wheels firmly to the ground platform.

Maintenance

Maintenance in the work area

- ▶ Place the machine on level ground. Block the wheels or chains.
- ▶ Place the spoon on the ground. If the bucket must be kept raised it will immobilize it properly.
- ▶ Disconnect the battery to prevent a sudden start of the machine.
- ▶ Do not stay between the wheels or on the chains, under the bucket or the arm.
- ▶ Never place a metal piece on top of the battery terminals.
- ▶ Use a charge meter to check the battery.
- ▶ Never use a lighter or matches to see inside the engine.
- ▶ Learn to use fire extinguishers.
- ▶ Keep the machine in good clean condition.

Workshop maintenance

- ▶ Before starting repairs, it is advisable to clean the area to be repaired.
- ▶ Never clean the parts with gasoline. Work in a ventilated room.
- ▶ NO SMOKING.
- ▶ Before starting the repairs, remove the ignition key, lock the machine and put up signs indicating that the mechanisms are not tampered with.
- ▶ If several mechanics work on the same machine, their jobs must be coordinated and known to each other.
- ▶ Allow engine to cool before removing radiator cap.
- ▶ Lower the pressure in the hydraulic circuit before removing the drain plug, likewise when draining the oil make sure that it is not burning.
- ▶ If the arm and bucket have to be raised, they will be immobilized before starting work.
- ▶ Carry out the evacuation of the gases from the exhaust pipe directly outside the premises.
- ▶ When the tension on the motor belts is fixed, the motor will be stopped.
- ▶ Before starting the engine, check that no tools have been left on it.
- ▶ Wear safety gloves and shoes.

Tire maintenance

- ▶ To change a wheel, fit the stabilizers.
- ▶ Never use the boom or bucket to lift the machine.
- ▶ Always use an inflation box when the wheel is not on the machine.
- ▶ When a tire is being inflated, do not stay in front of it but to the side.
- ▶ Do not cut or weld on a rim with the tire inflated.

Machine examination

- ▶ Before starting any work, the machine must be examined in all its parts.
- ▶ The exams must be renewed as many times as they are necessary and fundamentally when there has been a failure in the material, in the machine, in the facilities or the safety devices, having caused or not an accident.
- ▶ All these examinations will be carried out by the person in charge or competent personnel designated by the same. The name and position of this person will be recorded in a security record book, which will be kept by the person in charge.

Tips for the driver

- ▶ Do not drink alcoholic beverages before and during work.
- ▶ Do not take non-prescription medications, especially tranquilizers.
- ▶ Do not make races or jokes to other drivers.
- ▶ Be only attentive to work.
- ▶ Do not transport anyone on the bucket.
- ▶ When someone has to guide the driver, he will never lose sight of him.
- ▶ Never let this assistant touch the controls.
- ▶ Turn on headlights at the end of the day to see and be seen.

PERSONAL PROTECTION ITEMS

Head protective helmet

Usually the driver's position is protected with a cabin, but the use of a protective helmet is essential when leaving it to circulate on the work site.

The safety helmet will be approved.

Non-slip safety boots

Safety footwear is important due to the conditions in which work is usually done on the construction site (with mud, water, oil, grease, etc.).

Ear protection

When the noise level exceeds the established safety margin and in any case, when it is higher than 80 dB, the use of approved headphones or earplugs will be mandatory.

Workwear

Loose work clothes that can be caught by moving elements should not be worn.

Eventually, when weather conditions make it advisable and the command post lacks a cabin, the driver must have clothing to protect him from the rain.

Gloves

The driver must have suitable gloves for possible conservation emergencies during work.

Sight protection

Likewise, and when there is no cabin, the driver must use safety glasses in order to protect himself from the projection of particles in excavation operations.

If the glasses are of a universal type, they will be approved.

Anti-vibration abdominal belt

In order to be protected from the effects of vibrations.

This belt can fulfill the double mission of preventing the driver from being thrown out of the tractor.

Respiratory protection

In work with dusty soils, masks should be used

Legislation affected

General Ordinance on Occupational Safety and Hygiene (Articles 31, 65, 92, 124, 141, 143, 145, 147, 148, 149 and 151).

Construction, Glass and Ceramics Labor Ordinance (Articles 277, 278, 279, 281, 285, 289, 290 and 291).

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