

Product: EXCAVATOR
Model: 225 EXCAVATOR 20S
Configuration: 225 EXCAVATOR 20S00001-UP (MACHINE)

Operation and Maintenance Manual 225 EXCAVATOR

Media Number -SEBU5789-00

Publication Date -01/06/1992

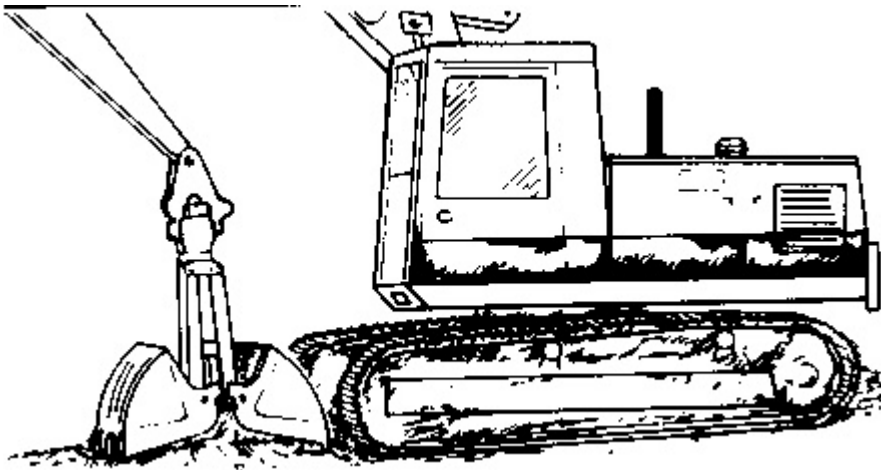
Date Updated -11/10/2001

Safety

SMCS - 7606

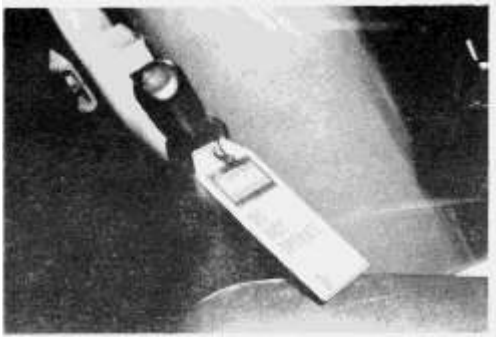
WARNING

Lower all equipment, engage the hydraulic and antitravel lock and stop the engine before performing maintenance on the machine, unless otherwise specified.



Lower the clamshell in the open position.

Read the warning and service information provided on the machine. Follow servicing instructions carefully.



Do not start or operate the machine while it is being serviced. Attach a warning tag to the controls.

There are certain hazards which must be recognized as potential causes of personal injury. Be aware of these hazards and follow the recommendations which are listed below.

Avoid Crushing or Cutting

Never attempt adjustments while the machine is moving or the engine is running.

Any implement can fall if a control is moved or a line breaks.

Support equipment when working beneath it. Do not depend on hydraulic cylinders to hold it up.

The fan blades will throw or cut any object or tool that falls or is pushed into them.

Know the weight limits of cable, chains, and slings before using them.

Wear gloves when handling cable. Do not use kinked or frayed cable; it is weakened.

Chips can fly from the object or hammer, when hammering on metal drifts, punches, or chisels. Wear protective glasses.

Burns

The radiator and all lines to heaters or the engine contain hot water or steam. Check the coolant level only when the engine is stopped and the radiator cap is cool enough to touch with your hand.

Remove the radiator cap slowly to avoid burns. Allow the cooling system components to cool before draining the coolant.

Lubricants will be hot enough to cause serious burns after machine compartments are up to normal operating temperature. Allow the compartments to cool before draining.

At operating temperature the hydraulic system is pressurized by hot air in the top of the tank. Remove the hydraulic tank cap slowly to relieve tank pressure. Allow the tank to cool before draining.

Fire or Explosion

Diesel fuel and all lubricants are flammable. Do not weld or torch cut, on pipes or tubes that contain oil. Clean them thoroughly with nonflammable solvent before welding or cutting.

Do not smoke when refueling.

Fuel leaked or spilled onto hot surfaces or electrical components can cause a fire.

Disconnect battery (turn disconnect switch OFF) when changing fuel filters or fuel/water separators. Drain fuel from fuel/water separator into a container before removing water separator retaining clamp.

To avoid fires, clean up oil spills and trash buildup. Steam clean the machine.

The vapor (hydrogen gas) from a charging battery is explosive. Do not smoke when checking batteries or working around batteries.

Tighten loose fluid fittings or connections.

Loose or damaged tubes, lines and hoses which leak can cause fires.

Tighten loose hose clamps or fasteners. Replace missing ones.

Check for misalignment of tubes, hoses, or items containing fluid. Reroute lines if necessary to prevent interference.

Look for loose, frayed, damaged, or disconnected wires.

Replace or tighten loose or missing mufflers or exhaust system parts.

A line, hose or seal failure can cause a fire. Shields which protect hot exhaust components from oil or fuel spray must be installed correctly.

Make sure all clamps, guards and heat shields are installed correctly to prevent vibration, rubbing against other parts, or excessive heat buildup during operation.

Store rags that have oil or flammable material on them in a container. Keep the container away from open fires, welding, or flame cutting areas.

To prevent jobsite fuel storage tanks from being struck by equipment being fueled, protect them with an embankment or steel post.

Handle Fluids Safely

Cooling system conditioners contain alkali. Do not drink them or get them in your eyes.

Battery electrolyte is an acid and will harm skin and eyes.

Keep all lubricants stored in properly marked containers away from children.

Never put maintenance fluids in glass bottles or glasses that are within the reach of children.

Safety Equipment

Wear a hard hat, protective shoes, and protective glasses when doing lubrication and maintenance work.

Limit air pressure to 205 kPa (30 psi) when cleaning with air.

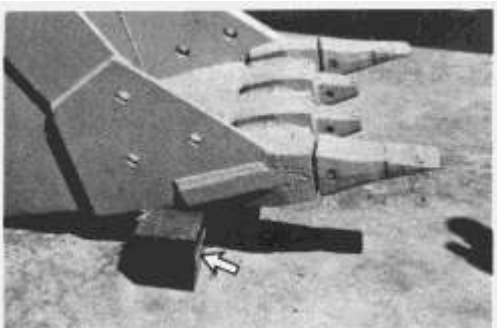
Never point an air nozzle at anyone.

Attach a "DO NOT OPERATE" or similar WARNING tag on the vehicle starter switch or controls when working on a machine.

Operate the engine only in a well ventilated area. In a closed area, vent exhaust fumes to the outside.



Use caution when removing caps, drain plugs, fittings, or pressure taps.



Block the bucket when changing teeth.



Use the steps, grab irons and walkways when mounting or moving around on the machine. Face the machine.

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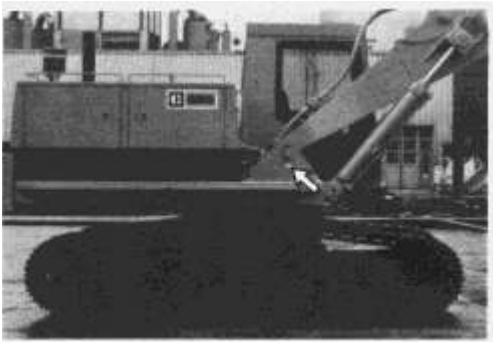
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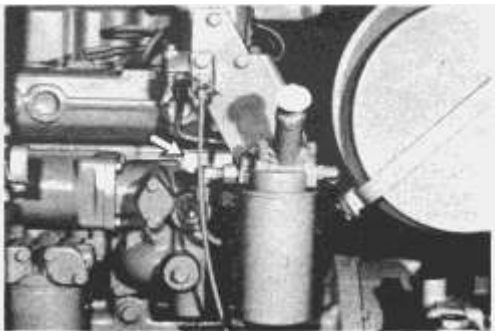
Serial Number Locations

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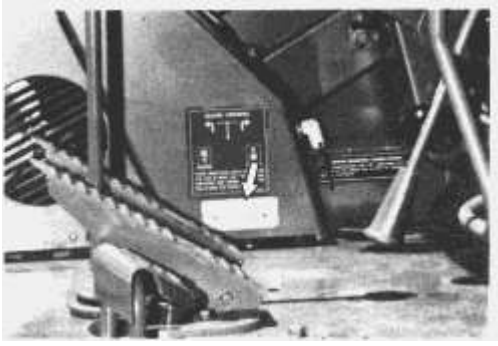
For quick reference, record your machine's serial numbers in the spaces provided below the photographs.



Frame Serial No. _____



Engine Serial No. _____



Engine and Frame Serial No.



Swing Bearing Serial No. _____

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Maintenance Recommendations

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Cooling System

NOTICE

Never add coolant to an overheated engine. Allow the engine to cool first.

Measure the specific gravity of antifreeze solution frequently in cold weather to ensure adequate protection. Pure undiluted antifreeze will freeze at -23°C (-10°F).

When permanent-type antifreeze and water solutions are used in the cooling system, drain and replace the solution "Every 2000 Service Hours or Yearly." When additions of conditioner are made as recommended, the drain and refill period can be extended to "Every 4000 Service Hours or Two Years."

The cooling system should contain a 3% to 6% concentration of conditioner at all times, regardless of the concentration of antifreeze.

Use clean water that is low in scale-forming minerals - not softened water.

Do not use Caterpillar Cooling System Conditioner with Dowtherm 209 Full-Fill coolant. Follow the recommendations provided with the Dowtherm 209 Full-Fill coolant.

If the machine is shipped to or stored in an area with freezing temperatures, the cooling system must either be protected to the lowest expected outside temperatures or drained completely.

The engine cooling system is protected to -29°C (-20°F) with permanent-type antifreeze when shipped from the factory.

When draining and refilling the cooling system, start the engine with the radiator cap off. Allow the engine to reach operating temperature. Check the coolant level.

Premix antifreeze solution to provide protection to the lowest expected outside temperature.

Filling the cooling system at over a 19 liter/min (5 gpm) rate can cause air pockets in the cooling system.

When measuring the coolant level, inspect the fill cap gasket. Replace the cap if the gasket is damaged.

Operate with a thermostat in the cooling system all year round. Cooling system problems can develop without a thermostat.

Fuel System

Fill the fuel tank at the end of each day of operation to drive out moisture laden air.

Measure the fuel level with the dipstick in the fill opening.

Drain water and sediment from the fuel tank at the start of each shift or after the tank has been filled and allowed to stand 5 to 10 minutes. Drain moisture and sediment as required by prevailing conditions.

Drain water and sediment from the main fuel storage tank weekly. Also, drain the tank before it is refilled. This will help prevent water and sediment from being pumped into the machine fuel tank.

Always bleed the fuel system after changing fuel filters.

Hydraulic System

NOTICE

Make-up hydraulic fluid must mix with the fluid in the tank. Use only petroleum products unless the machine is equipped for use with special products.

Water or air in the hydraulic system can cause pump failure.

If the hydraulic oil is cloudy, water or air is entering the system. Purge and refill the system. Tighten the suction hose clamps and flanges. Consult your Caterpillar dealer for the correct purging instructions.

If hydraulic system drift is experienced, while operating at high outside temperatures, SAE30 hydraulic oil should be used.

SAE30 is not recommended if start-up temperatures will be below 4°C (40°F).

SAE30 hydraulic oil in high temperatures will minimize drift, and increase pump life at temperatures up to 55°C (125°F).

A mixture of 55% SAE40 and 45% SAE10W oil is the equivalent of SAE30.

The equivalent of SAE30 oil in the hydraulic system can be obtained by draining SAE10W oil from the tank, and replacing it with SAE40 oil.

NOTE: Retract as many hydraulic cylinders as possible.

Drain 320 liters (84 gal.) of SAE10W oil from the tank and replace it with SAE40 oil.

See "Hydraulic System" at "2000 Service Hours or Yearly" for hydraulic tank drain and refill instructions.

Engine Air Intake System

Service the air cleaner when the indicator light goes on.

Inspect the air precleaner cup daily for accumulation of dust and debris.

Electrical System

NOTICE

When using an external electrical source to start the machine, turn the disconnect switch off and remove the key before attaching the cable to the emergency starting receptacle.

When using booster cables, be sure to connect in parallel; POSITIVE (+) to POSITIVE (+) and NEGATIVE (-) to NEGATIVE (-).

Scheduled Oil Sampling

Use scheduled oil sampling to monitor machine condition and maintenance requirements.

Each sample should be taken when the oil is hot and well mixed. This will ensure that the sample is representative of the oil in the compartment.

Consult your Caterpillar dealer for complete information and assistance in establishing a scheduled oil sampling program for your equipment.

Sampling Interval Chart	
Compartment	Interval
Engine Crankcase	At Oil Change
Pump Drive	Every 500 Service Hours
Hydraulic System	Every 500 Service Hours

General

Clean all plugs, fittings and caps before servicing.

Bolt Torques for Ground Engaging Tools

Bolt Size	Recommended Torque*	
	Inch	N·m
5/8	265 ± 35	195 ± 25
3/4	475 ± 70	350 ± 50
7/8	765 ± 115	565 ± 85
1	1220 ± 150	900 ± 110

*These values are applicable only to Caterpillar cutting edge bolts.

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Fuel, Coolant and Lubricant Specifications

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Fuel Specifications

Types of Fuel

Caterpillar diesel engines have the ability to burn a wide variety of fuels. These fuels are divided into two general groups, PREFERRED and PERMISSIBLE.

The PREFERRED fuels provide maximum engine service life and performance. They are distillate fuels. They are commonly called fuel oil, furnace oil, diesel fuel, gas oil, or kerosene.

The PERMISSIBLE fuels are crude oils or blended fuels. Use of these fuels can result in higher maintenance costs and reduced engine service life.

See Caterpillar Form Number SEHS7067 for a detailed summary of PREFERRED and PERMISSIBLE fuels and their specifications.

Cetane Requirement

The minimum cetane number recommended for the engine is 40.

Fuel Cloud Point

Fuel waxing can plug the fuel filters in cold weather. The fuel cloud point must be below the temperature of the surrounding air to prevent filter waxing and power loss.

A fuel heater attachment is available from your Caterpillar dealer. This can help keep heavier fuel above the cloud point temperature.

Fuel Sulfur Content

The percentage of sulfur in the fuel will affect the engine oil recommendations. If the fuel has over 0.5% sulfur content, the CD oil must have a TBN of 20 times the percentage of fuel sulfur. Your oil supplier should be able to furnish the correct oils.

Coolant Specifications (EC)

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