Demonstrate Selecting, Using and Maintaining Various Special Tools Correctly

Skill Number CO-OP15GN104

Full Name: Dimas Surya Hadi W. **No ID:** _____

Validation Date: 29-12-2025 **School:** SMKN 1 Singosari

PERFORMANCE TASK:

Given some special tools, the student is requested to perform the following tasks:

- Selecting, using, maintaining various Special Tools in the installation of Engine or other system components.
- Perform close the job by ensuring all systems or conditions is in the standard condition.

Safety and Contamination Control must be applied to this process. All literatures will be available.

Prerequisite	Yes	No	N/A	Hints
The student must complete the knowledge assessment. Minimum passing grade 80%.	✓			

Tasks	Completed			Observation / Hints
	Yes	No	N/A	
Preparation				
Prepare related literature	✓			
Prepare required equipment	✓			
Prepare related tools	✓			
Prepare Safety & Contamination Control equipment	✓			

Tasks	Completed			Observation / Hints
	Yes	No	N/A	
Perform etiquette/manner when starting the job				
Meet the customer / assessor	✓			
Perform etiquette/manner when opening the interaction.	✓			
Explain the purpose of Student's activity.	✓			
Ask permission to perform the job.	✓			

Tasks	Completed			Observation / Hints
	Yes	No	N/A	
Selecting, Using and Maintaining Various Special Tools				
1. Inspect the Special Tool before using	✓			
2. Calibrate the special tool before using	✓			
3. Remove and install or disassemble and assemble conducted according to correct procedures	✓			
4. Tasks completed without damage to equipment and tools	✓			
5. Equipment and tooling is cleaned and returned to its correct location	✓			
6. Work area left clean and tidy	✓			
Documentation:				
Take picture if needed	✓			

Tasks	Completed			Observation / Hints
	Yes	No	N/A	
Perform close the job by ensuring all systems or conditions is in the standard condition				
Ensure all systems or conditions are in standard condition.	✓			

Tasks	Completed			Observation / Hints
	Yes	No	N/A	
Reporting				
All relevant documentation completed correctly and approved by customer (if required).	✓			

Tasks	Complete		Observation / Hints
	Yes	No	
Safety			
Using APD related to the job	✓		
Follows relevant workplace safety guidelines (tag out, safety equipment)	✓		
State and follow safety precautions	✓		
Serviceman completes job without accident due to incorrect procedure using hand tools.	✓		
Tasks completed without damage equipment and tools	✓		

Tasks	Complete		Observation / Hints
	Yes	No	
Contamination Control			
Environmental Practices &Housekeeping	✓		

Tasks	Completed			Observation / Hints
	Yes	No	N/A	
Perform etiquette/manner after completing the job				
Perform etiquette/manner when closing the communication.	✓			

General Comments

RESULT: COMPETENT ☑ NOT YET COMPETENT ☐ (please check (√))

	Name	Date	Signature
Student:	Dimas Surya H-W	29-12-2025	
Assessor:		29/12/25	
Supervisor:			
Data Recorded:			

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Full Name: Dimas Surya H.W No ID: _____

Validation Date: 29 - 12 - 2025 School: SMKN 1 Singosari

PERFORMANCE TASK:

Given some special tools, the student is requested to perform the following tasks:

- Selecting, using, maintaining various Special Tools in the installation of Engine or other system components.
- Perform close the job by ensuring all systems or conditions is in the standard condition.

Safety and Contamination Control must be applied to this process. All literatures will be available.

Prerequisite	Yes	No	N/A	Hints
The student must complete the knowledge assessment. Minimum passing grade 80%.	✓			Score special tools Course or subject.

Tasks	Completed			Observation / Hints
	Yes	No	N/A	
Preparation				
Prepare related literature	✓			
Prepare required equipment	✓			
Prepare related tools	✓			
Prepare Safety & Contamination Control equipment	✓			

TRAKINDOCO-OP CO-OP15GN104 - Assessor Marking Guide

Tasks	Completed			Observation / Hints
	Yes	No	N/A	
Perform etiquette/manner when starting the job				
Meet the customer / assessor	✓			
Perform etiquette/manner when opening the interaction.	✓			• Perform smile & greetings. • Introduce Student's identity
Explain the purpose of Student's activity.	✓			
Ask permission to perform the job.	✓			

Tasks	Completed			Observation / Hints
	Yes	No	N/A	
Selecting, Using and Maintaining Various Special Tools				
1. Inspect the Special Tool before using	✓			Visual inspection of the Special Tool for wear, cracks, damage
2. Calibrate the special tool before using	✓			• Torque wrench
3. Remove and install or disassemble and assemble conducted according to correct procedures	PTT 330C.			Equipment and tooling are identified and checked for safe and effective operation and must refer to Service manual or SIS
4. Tasks completed without damage to equipment and tools	✓			Component and tooling are cleaned and stored on the right place
5. Equipment and tooling is cleaned and returned to its correct location	✓			Cleaned and stored equipment tools on the right place.
6. Work area left clean and tidy	✓			Area cleaned from spills and wastes.
Documentation:				
Take picture if needed				

Tasks	Completed			Observation / Hints
	Yes	No	N/A	
Perform close the job by ensuring all systems or conditions is in the standard condition				
Ensure all systems or conditions are in standard condition.	✓			• Find the improper condition. • Communicate the finding to the customer/assessor.

Tasks	Completed			Observation / Hints
	Yes	No	N/A	
Reporting				
All relevant documentation completed correctly and approved by customer (if required).	✓			• Completing the Task List • Completing Measurement Form/Related Check Sheet, if required • Create Service Report (SIMS), if required • Create SPR, if required • Documenting the failed or damaged parts, if required • Provide Technical Analysis Report/Failure Analysis Report, if required.

Tasks	Complete		Observation / Hints
	Yes	No	
Safety			
Using APD related to the job	✓		
Follows relevant workplace safety guidelines (tag out, safety equipment)	✓		• Comply with safety regulation that applied on the workplace
State and follow safety precautions	✓		• Create Job Safety Analysis • Student must follow safety procedure refer to service manual or SIS related to job
Serviceman completes job without accident due to incorrect procedure using hand tools.	✓		• Correct working position. • Correct hand tool related to the job
Tasks completed without damage equipment and tools	✓		

Tasks	Complete		Observation / Hints
	Yes	No	
Contamination Control			
Environmental Practices &Housekeeping	✓		1. Waste is minimized, waste material, including sludge; solids and other wastes are sorted and stored in bins for recycling or disposal 2. Packaging of goods received is sorted and reused or disposed of by recycling 3. Materials that can be reused are cleaned and stored 4. Waste and scrap are removed following workplace procedures 5. All fluids are disposed of in accordance with enterprise policies and procedures

Tasks	Completed			Observation / Hints
	Yes	No	N/A	
Perform etiquette/manner after completing the job				
Perform etiquette/manner when closing the communication.	✓			• Perform smile & greetings. • Ask permission to leave or end the interaction.

General Comments

pelajari kalibrasi torque wrench lebih lanjut.

RESULT: COMPETENT ☑ NOT YET COMPETENT ☐ (please check (√))

	Name	Date	Signature
Student:	Dimas Surya H.W	29-12-2025	
Assessor:	Sefiawan TP	29-12-2025	
Supervisor:			
Data Recorded:			

14/02/1996 Every 250 Hours (SEBU6998)

SMCS -

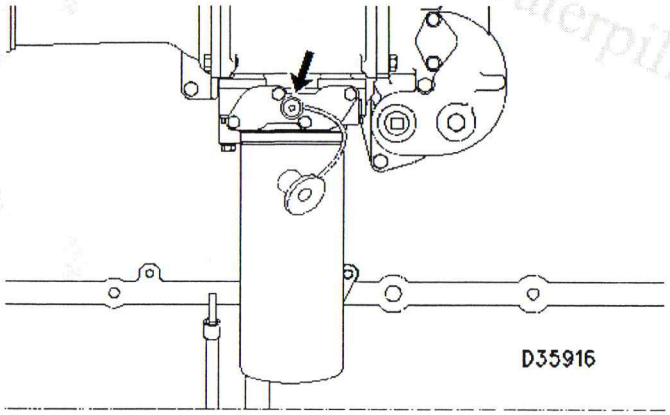
You must read and understand the warnings and instructions contained in the Safety section of this manual before performing any operation or maintenance procedures.

Scheduled Oil Sampling (S·O·S) Analysis

To compliment a good preventive maintenance program, Caterpillar recommends using S·O·S analysis at regular scheduled intervals to monitor the condition of the engine oil and maintenance requirements of your engine.

Obtain Sample

Each oil sample should be taken when the oil is warm and well mixed to ensure that the sample is representative of the oil in the crankcase. There are two methods recommended to obtain S·O·S samples from the engine crankcase.



Typical oil sampling valve

* Use the sampling valve (if equipped).

* Use a sampling gun inserted into the sump.

NOTE: Refer to How to Take a Good Oil Sample, PEHP6001 for a step-by-step explanation if using this method of sampling crankcase oil.

Caterpillar recommends using one of the above methods. If either of these methods are not possible, then use a drain stream method when changing oil.

NOTE: When using the drain stream to obtain the oil sample, do not sample from the beginning or end of drain stream. The oil at the beginning or end of the drain stream is not mixed well

enough to be representative of the oil in the crankcase.

Consult with your Caterpillar dealer for complete information and assistance in establishing an S·O·S program for your engine.

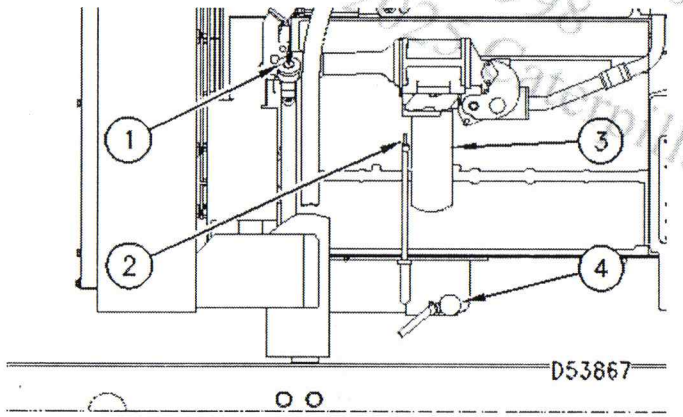
Engine Crankcase

Replace Oil and Filter(s)

Do not drain oil when the engine is cold. As oil cools, suspended waste particles settle on the bottom of the crankcase or oil pan. The waste particles are not removed with the draining cold oil. Drain the crankcase with the engine stopped and the oil warm. This allows for the draining of the waste particles that are suspended in the oil.

Failure to follow this recommended procedure would result in these waste particles being recirculated through your engine lubrication system with the new oil.

Drain Oil



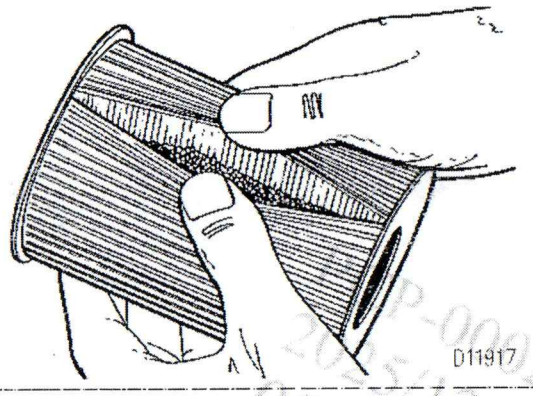
Oil filler cap (1), oil level gauge (dipstick) (2), oil filter (3), and oil drain valve (4).

1. After the engine has been run at normal operating water temperature, STOP the engine. If equipped with a drain valve, turn the valve knob counterclockwise (CCW) to drain the oil. If not equipped with a drain valve, remove the crankcase oil drain plug(s) and allow the oil to drain.

2. If equipped with a drain line valve, turn the valve knob clockwise (CW) to shut the drain. Install the oil drain plug(s). Tighten the plug(s) to 70 ± 14 N·m (50 ± 10 lb ft).

Replace Filter

1. Use a 2P-8250 Filter Wrench to remove the oil filter (2) and optional bypass oil filter, if equipped.



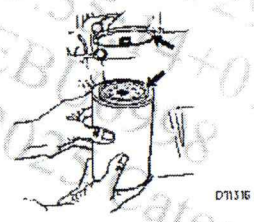
Element with debris.

2. Use a 4C-5084 Oil Filter Cutter to cut the oil filter open. Spread the pleats apart and inspect the element for metal debris. An excessive amount of debris in the oil filter element may be indicative of early wear or a pending failure.

Use a magnet to differentiate between the ferrous and non-ferrous metals found in your oil filter element. Ferrous metals may indicate wear on the steel and cast iron parts of your engine.

Non-ferrous metals may indicate wear on the aluminum, brass or bronze parts of your engine, such as main and rod bearings, turbocharger bearings and cylinder heads.

Due to normal wear and friction, it is not uncommon to find small amounts of debris in the oil filter element. Consult your Caterpillar dealer to arrange for further analysis if an excessive amount of debris is found in your oil filter element.



Typical filter mounting base and filter gasket.

3. Wipe the sealing surface of the filter mounting base. Make sure all of the old gasket is removed.

NOTE: Change oil filter(s) at every oil change. Make sure to use the correct Caterpillar oil filter(s) for your engine arrangement.

NOTICE

Caterpillar oil filters are built to Caterpillar specifications. Use of an oil filter not recommended by Caterpillar could result in severe engine damage to your engine bearings, crankshaft, etc., as a result of the larger debris particles from unfiltered oil entering your engine lubricating system. Only use oil filters recommended by Caterpillar.

4. Apply a small amount of clean engine oil to the new filter gasket.

NOTICE

Do NOT fill the oil filters with oil before installing them. This oil would not be filtered and could be contaminated. Contaminated oil will cause accelerated wear to engine components.

5. Install the new filter(s) until the gasket contacts the base. Tighten the filter 3/4 of a turn more by hand. Do not over tighten.

Fill Crankcase

6. Remove the oil filler cap. Refer to Lubricant Specifications for the proper oil to use for this engine. Fill the crankcase with the proper amount of oil (refer to the Refill Capacities chart).

NOTICE

If equipped with an auxiliary oil filter or system, extra oil must be added when filling the crankcase. Follow the OEM or filter manufacturer's recommendations. If the extra oil is not added, the engine may starve for oil.

To prevent crankshaft or bearing damage, crank engine to fill all filters BEFORE starting. Do Not crank engine for more than 30 seconds.

7. Start and run the engine at LOW IDLE for two minutes to ensure the lube system (including auxiliary filters, etc.) has oil and the oil filter(s) are filled. Inspect for oil leaks.

8. Stop the engine and allow the oil to drain back to the sump for a minimum of ten minutes.

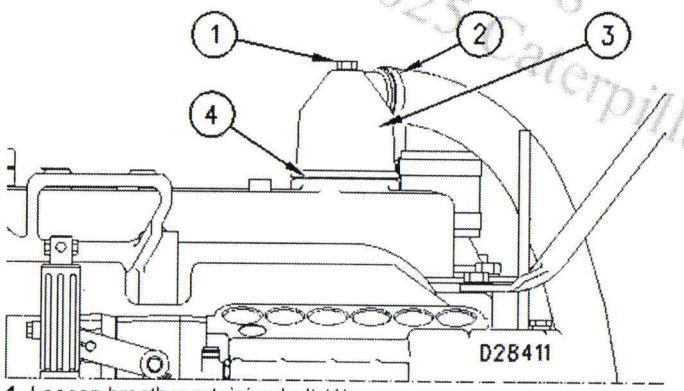
9. Remove the dipstick to check the oil level. Maintain the oil level between the ADD and FULL marks on the ENGINE STOPPED side of the dipstick.

Crankcase Breather

NOTICE

If the crankcase breather is not maintained on a regular basis, it will become plugged. A plugged crankcase breather would result in excessive crankcase pressure that may cause crankshaft seal leakage.

Clean



1. Loosen breather retaining bolt (1).

2. Loosen hose clamp(s) (2) and remove breather assembly (3) and seal (4).

3. Wash the breather in clean, nonflammable solvent. Allow the breather assembly to dry.

4. Install a new seal.

5. Assemble the breather. Install the breather in reverse order of removal.

6. Tighten the hose clamp(s). Refer to the Torque Specifications section of this manual.

Cooling System

NOTICE

Make sure you read and understand the information in the Safety and Cooling System Specifications sections of this manual before you proceed with cooling system maintenance.

Check the cooling system only after the engine is stopped and cool. Remove the filler cap slowly to relieve pressure. To prevent engine damage, never add cooling system products to an overheated engine. Allow the engine to cool first.

Test for SCA Or Obtain Level I Analysis (Conventional Coolant/Antifreeze Only)

The use of Caterpillar SCA will prevent internal damage to the engine, such as liner or block pitting. If the concentration level is too low, pitting of the cylinder wall may occur, which can lead to costly engine damage.

If the concentration level is too high, sludge and mud-like deposits may form in the cooling system. This adversely affects engine performance and can also lead to costly repairs of the engine and cooling system.

NOTICE

The over concentration of a supplemental coolant additive will result in deposits on the higher temperature surfaces of the cooling system and create a barrier that reduces the engine's heat transfer characteristics.

Reduced heat transfer could cause cracking of the cylinder head and other high temperature components. Excessive concentrations of additive could also accelerate water pump seal wear.

Use the 4C-9301 Test Kit or use the 8T-5296 Test Kit to check for SCA concentration. Add SCA if the concentration is too low. If the SCA concentration is excessive, drain half the coolant, and replace with the proper water/antifreeze mixture.

NOTE: You may test your coolant SCA concentration **OR** have the SCA concentration tested as part of a S·O·S Coolant Analysis (Level I).

Obtain Level I Analysis

S·O·S Coolant Analysis is the best way to monitor the condition of your coolant and your cooling system.

Level I: Basic Coolant Maintenance Check

Checks for correct chemical balance for proper heat and corrosion control. Tests for:

* glycol
* SCA concentrations
* pH
* conductivity

Caterpillar's S·O·S Coolant Analysis reports results and makes recommendations, usually within 24 hours. Consult with your Caterpillar dealer for more information.

Add Liquid SCA

NOTICE

Only add SCA if required by SCA test results.

NOTICE

Excessive and continuous over concentration of SCA (greater than the recommended 6 percent initial fill), together with antifreeze concentrations greater than 60 percent, can result in deposits on the higher temperature surfaces of the cooling system, accelerated water pump seal wear, and radiator tube blockage, forming a barrier that reduces the engine's heat transfer characteristics. Reduced heat transfer could cause cracking of the cylinder head and other high temperature components.

To prevent over inhibiting the engine's cooling system, never use both SCA liquid AND the SCA element (if equipped) at the same time.

1. Loosen the radiator filler cap slowly to relieve pressure. Remove the cap.

2. It may be necessary to drain enough coolant from the radiator to allow for the addition of the SCA.

3. Add 0.25 liter (1/2 pt) of Caterpillar SCA for every 20 liter (5 US gal) of cooling system capacity.

Refer to the Refill Capacities chart in this publication for the cooling system capacity for your engine.

4. Inspect the radiator filler cap gaskets. Replace the cap if the gaskets are damaged.

5. Install the filler cap.

Replace SCA Element (If Equipped)

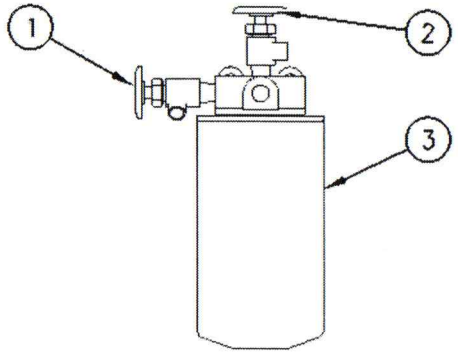
NOTICE

Only replace SCA element if required by SCA test results.

NOTICE

DO NOT use SCA and coolant additive elements together. Doing so would result in an over concentration of additive. Use one

method or the other exclusively.



1. Close the coolant additive element inlet valve (1) and outlet valve (2). Remove and discard the coolant additive element (3).

2. Clean the element mounting base. Make sure all of the old gasket is removed.

3. Install a new Caterpillar coolant additive element.

4. Coat the gasket of the new element with a thin film of coolant.

5. Install the element. Spin the element until the seal contacts the base, then tighten 3/4 turn more by hand. Do not over tighten.

6. Open the inlet valve (1) and the outlet valve (2).

7. Remove the radiator filler cap.

8. Start the engine and check for leaks. Allow the coolant level to stabilize.

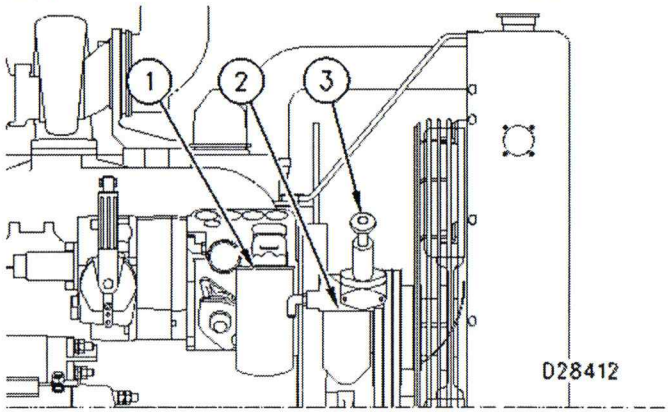
9. Add premixed coolant water, if necessary, to bring the coolant to within 13 mm (1/2 inch) below the bottom of the fill pipe or to the proper level on the sight glass, if equipped.

10. Replace the radiator filler cap.

Refer to Know Your Cooling System, SEBD0518, Coolant and Your Engine, SEBD0970 or your Caterpillar dealer for more detailed information.

Fuel System

Clean/Replace Fuel Filters



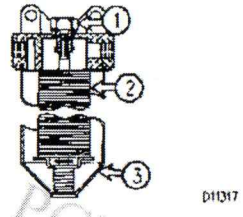
Typical final fuel filter (1), primary fuel filter (2), and priming pump (3).

* Stop the engine.

* Turn the ECS switch OFF or disconnect the battery (or starting motor) when performing maintenance on fuel filters.

* Shut off the fuel tank supply valve to the engine.

Clean Primary Fuel Filter



Typical primary fuel filter section view: bolt (1), element (2), and case (3).

1. Loosen bolt (1) and remove case (3).

2. Remove element (2) and wash it in clean, nonflammable solvent.

3. Install element (2) and case (3). Tighten bolt (1) to a torque of 24 ± 4 N·m (18 ± 3 lb ft).

Replace Final Fuel Filter

1. Remove and discard the final fuel filter.

2. Clean the gasket sealing surface of the filter base. Make sure all of the old gasket is removed.

3. Apply clean diesel fuel to the new filter gasket.

NOTICE

Do NOT fill the fuel filters with fuel before installing them. This fuel would not be filtered and could be contaminated. Contaminated fuel will cause accelerated wear to fuel system parts.

4. Install new filter. Spin filter until gasket contacts the filter base. Tighten the filter 3/4 turn more by hand. Do not over tighten.

5. Prime the fuel system.

Priming the Fuel System

Prime the fuel system to fill dry fuel filters and purge trapped air. The fuel system requires priming after:

* being run dry.

* storage.

* fuel filter cleaning/replacement.

NOTE: If the engine does not have a fuel priming pump, go to step 4.

1. Unlock and operate the priming pump until a resistance is felt. A considerable number of strokes may be required.

2. Push in and hand-tighten the plunger.

3. Crank the engine. If the engine starts, but runs rough, continue running the engine at low idle until the engine runs smoothly.

NOTICE

Do not crank the engine for more than 30 seconds. If the engine does not start, allow the starter motor to cool for two minutes before cranking again.

NOTE: If the engine will not start, or once started, continues to misfire or smoke, further priming is necessary. Repeat steps one through three. If operating problems persist after repeating steps one through three, further priming is necessary.

4. Open the vent valve (if equipped) on the fuel injection pump housing.

NOTICE

DO NOT remove the plug in the fuel filter base (for the fuel pressure sending unit [if equipped]) to purge air from the fuel system. Periodic removal of the plug will result in increased wear of the threads in the fuel filter base and lead to fuel leakage.

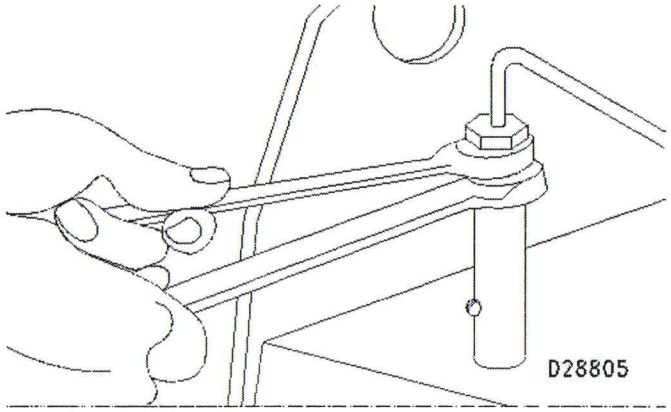
5. Operate the priming pump until the flow of fuel from the vent valve is continuous and free of air bubbles. If the engine does not have a fuel priming pump, crank the engine until the fuel flows free of air bubbles. Do not crank the engine for more than 30 seconds. Allow the starter to cool for two minutes before cranking again.

6. Close the vent valve. Push in and hand-tighten the plunger.

7. Crank the engine. If the engine starts, but runs rough, continue running the engine at low idle until the engine runs smoothly.

NOTE: If the engine will not start, or once started, continues to misfire or smoke, further priming is necessary.

8. Loosen the fuel line nuts, one at a time, at the fuel injection nozzle.



NOTICE

A fuel injection nozzle will be damaged if the top of the nozzle turns in the body. The engine will be damaged if a defective fuel injection nozzle is used because the fuel spray pattern that comes out of the nozzle will be incorrect. Fuel injection nozzles can be permanently damaged by twisting if only one wrench is used to loosen or tighten the fuel line nuts. Do NOT let the tops of the fuel nozzles turn when the fuel lines are loosened. Use one wrench to hold the nozzle and another to loosen the fuel line nut.

Operate the priming pump plunger until the flow of fuel from the fuel line is continuous and free of air bubbles. Push the plunger in and tighten by hand. If the engine does not have a fuel priming pump, crank the engine.

Tighten each fuel line nut before the next fuel line nut is loosened. Tighten the fuel line nuts to 40 ± 7 N·m (30 ± 5 lb ft). Continue the procedure until all of the fuel lines have been cleared of air. Make sure the fuel line nuts are tightened and the priming pump is locked before starting the engine.

Fuel Tank

Drain Water and Sediment

Fuel quality is critical to engine component performance and durability. Any water in the fuel can cause a failure. Condensation occurs as fuel is heated when passing through the fuel system and cools when returned to the fuel tank. This causes water to accumulate in fuel storage tanks.

Water can be eliminated by draining the fuel tank regularly and by obtaining fuel from reliable sources.

Fuel tanks should contain some provision for draining water and sediment from the bottom of the tanks.

Open the drain valve on the fuel tank and drain the water and sediment. Close the valve.

Drain water and sediment from the fuel storage tank weekly, at the oil change, and before the tank is refilled. This will help prevent water or sediment from being pumped from the storage tank into the engine fuel tank.

If a bulk storage tank has been refilled or moved recently, allow adequate time for the sediment to settle before filling the engine fuel tank. Internal baffles in the bulk storage tank will also help trap sediment. Filtering fuel as it is pumped from the storage tank helps ensure the quality. Water separators should be used whenever possible.

NOTE: Fill the engine's fuel tank at the end of each day of operation to drive out moist air and to prevent condensation. Do not fill the tank to the top. Fuel expands as it gets warm and may overflow.

Radiator, Aftercooler

Clean/Inspect Radiator

Check the radiator fins for debris. High pressure water is an excellent way to clean the debris out of the radiator fins. If necessary, use a light bulb behind the radiator fins to see if they are completely clean.

Refer to Know Your Cooling System, SEBD0518, for more detailed information on cleaning your radiator fins.

Clean/Inspect Aftercooler

NOTICE

A hose failure or significant system leak will cause a large drop in boost pressure and power. The engine can be operated at this power level long enough to reach a safe stop or repair area. Sustained operation under this condition should be avoided.

Inspect the front of the air-to-air aftercooler. Examine core fins for external damage, insects, dirt, debris, salt, corrosion, etc. Use a firm stainless steel brush and soapy water to remove dirt,

debris, salt, etc. Depending on your findings and operating environment, the maintenance interval for cleaning the air-to-air aftercooler may be more frequent.

A slight reduction in power or response, or a small increase in exhaust temperature, may indicate a small air leak in the charge air cooler core or piping. Inspect all air ducting and gasket connections at each oil change. Constant torque hose clamps should be secure. Tighten these clamps until the spring is at least partially compressed.

Inspect all welds for cracks. Check the mounting brackets to ensure they are secure and in good condition.

NOTE: Whenever air-to-air aftercooler parts are repaired and/or replaced, a leak test is highly recommended. Refer to the service manual or consult your Caterpillar dealer for the correct procedure to use when performing a leak test.

Belts

Check/Adjust

Check the condition and adjustment of alternator belts and fan drive belts.

Inspect all drive belts for wear and replace if they show any signs of wear.

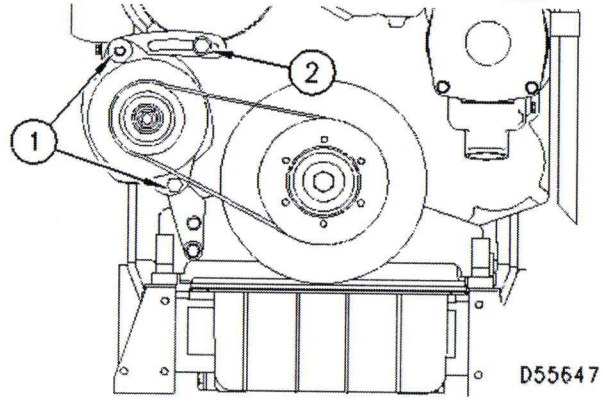
If one belt in a set requires replacement, always install a new matched set of belts. Never replace just the worn belt. If only the worn belt is replaced, the new belt will carry all the load, as it will not be stretched as much as the older belts. All the belts will fail in rapid succession.

If belts are too loose, they vibrate enough to cause unnecessary wear on the belts and pulleys. If belts are too tight, unnecessary stresses are placed upon the pulley bearings and belts which might shorten the life of both.

1. Inspect the condition and adjustment of alternator belts and fan drive belts.

2. To check the belt tension, apply 110 N (25 lbs) of force midway between the pulleys. Correctly adjusted belts will deflect 13 to 19 mm (1/2 to 3/4 inch).

Adjust Alternator Belts



3. To adjust the alternator drive belts, slightly loosen mounting nuts (1) and adjusting bracket nut (2).

4. Move the pulley to adjust the belt tension.

5. Tighten adjusting nut (2). Tighten mounting nuts (1).

6. If new belts are installed, check belt adjustment again after 30 minutes of engine operation. Replace belts in matched sets only.

Adjust Fan Drive Belts

1. To adjust the fan drive belts, loosen mounting bolts and adjust with adjusting bolt.

2. Move the fan drive up or down as required to obtain the correct adjustment. Tighten mounting bolt and adjusting bolt.

3. If new belts are installed, check belt adjustment again after 30 minutes of engine operation.

Hoses

Inspect

Hose replacement prior to failure is a cost effective preventive maintenance practice. Replacing a hose before it fails saves you money and reduces the chances for unscheduled downtime. By replacing a hose that is cracked, soft, or leaking, you will avoid major repairs that could result in a severe engine overheating problem.

* Inspect all hoses for leaks due to cracking and softness. Inspect for loose clamps.
* Replace hoses that are cracked or soft and tighten loose clamps.

Replace

1. Loosen the radiator filler cap slowly to relieve any pressure and remove the cap. Drain the coolant from the cooling system to a level below the hose being replaced.

2. Remove the hose clamps, disconnect the old hose. Install the new hose.

3. Install the hose clamps. See the Torque Specifications section of this publication for the appropriate torque.

4. Refill the cooling system with the recommended coolant/antifreeze mixture. Refer to the Cooling System Specifications in this Manual.

NOTE: Fill the cooling system with the coolant solution at 19 L (5 US gal) or less per minute to avoid air locks. See the Refill Capacities chart in this publication for the capacity of your cooling system.

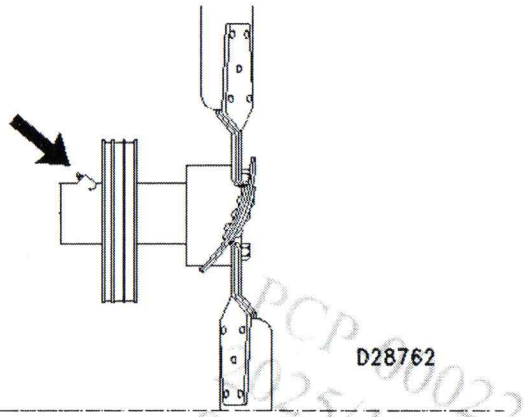
5. Start and run the engine with the filler cap removed. Allow the coolant to warm, the thermostat to open and the coolant level to stabilize. Inspect for leaks and proper operating temperature. Check for coolant leaks at the oil cooler connections.

6. Check the coolant level. Add coolant mixture if necessary to bring the coolant to within 13 mm (1/2 inch) below the bottom of the fill tube, or the correct level on the sight glass (if equipped).

7. Check the condition of the filler cap gasket before installing the cap. If the gasket is damaged, discard the old filler cap and install a new filler cap.

Fan Drive Bearing

Lubricate



Lubricate one fitting.

Use 2S-3230 Bearing Lubricant Special Purpose Grease or equivalent to service ball and roller bearings which operate at high speeds and temperatures. NLGI No.2 Grade is acceptable for temperatures from -34 to 163°C (-20 to 325°F).

Inspect the fan drive pulley assembly. If the shaft is loose, an inspection of the internal components should be made. If the assembly should require disassembly, refer to the Special

Instruction, SMHS7001 or the Service Manual for the procedure.

Batteries

Clean/Check Electrolyte Level

BATTERY ELECTROLYTE CHART	
Battery	**Interval**
Conventional	125 Hour
Low Maintenance	250 Hours
Maintenance Free	None Required

1. Remove fill caps. Maintain electrolyte level to bottom on fill plug openings.

If the addition of water is necessary, use distilled water. If distilled water is not available use clean water that is low in minerals. Do not use artificially softened water.

At proper charging rate, batteries should not require more than 30 cc (1 oz) water per cell per week.

2. Keep batteries clean.

3. Loosen and remove cable clamps from all battery terminals.

4. Clean all battery terminals.

5. Clean all cable clamps.

6. Install and tighten cable clamps to battery terminals.

7. Coat cable clamps and terminals with 5N-5561 Silicone Lubricant, petroleum jelly or MPGM grease.

Check Battery Charger (if equipped)

* Check the battery charger for proper operation. If batteries are properly charged, ammeter reading should be very near zero. All batteries should be kept charged to a corrected specific gravity of 1.250 or above.

* The batteries should be kept warm, if possible. The battery temperature affects the cranking power. If the battery is too cold, it will not crank the engine, even if the engine is warm.

* When the engine is not run for long periods of time or is run for short periods, the batteries may not fully recharge. Ensure a full charge to help prevent the battery from freezing.

Battery or Battery Cable Replacement

NOTE: When replacing batteries or battery cables, use the following procedure.

1. Turn off the START switch or the ECS switch to the OFF/RESET position. Turn off (open) the ignition switch (if equipped) and remove the key and all electrical loads.

2. Disconnect the cable from ground (one cable connects to frame and one to battery negative). Be sure the cable cannot contact where it was just removed.

3. Disconnect the negative battery cable terminal at the battery(s) that goes to the control panel switch. Where four 12 volt batteries are involved, the negative side of two batteries must be disconnected.

4. Proceed with necessary system repairs. Reverse steps to reconnect all cables.

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SMCS -

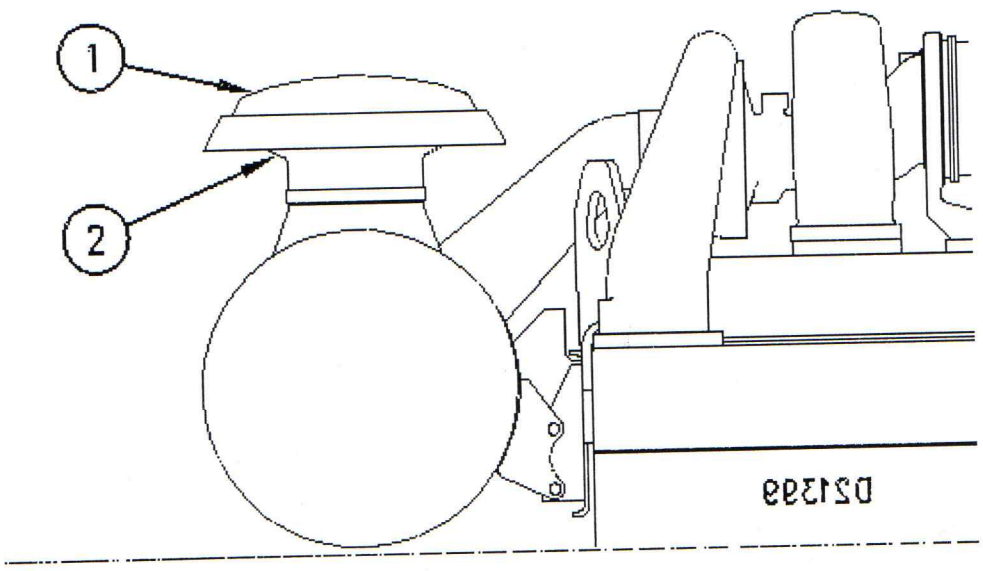
You must read and understand the warnings and instructions contained in the Safety section of this manual before performing any operation or maintenance procedures.

Air Cleaner

NOTICE

Never run the engine without an air cleaner installed. Never run the engine with a damaged air cleaner. Do not use filter elements with damaged pleats, gaskets or seals. Dirt entering the engine causes premature wear and damage to engine components. Air cleaners prevent airborne debris from entering the engine through the air inlet.

Clean Precleaner



Typical rain cap (1) and precleaner (2).

1. Remove the rain cap (1). Remove the precleaner (2).
2. Wipe precleaner with a clean, dry cloth.
3. Install the precleaner. Install and secure the rain cap.

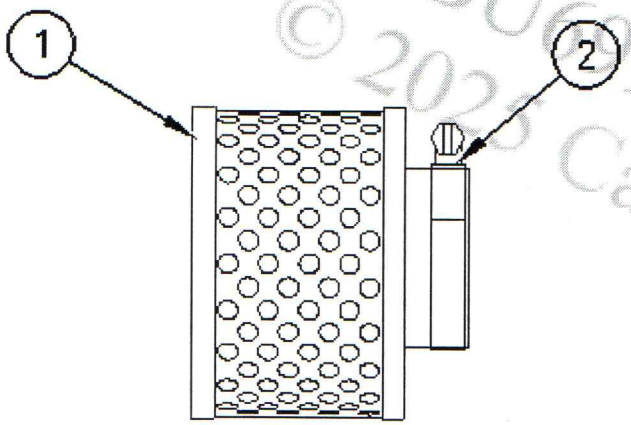
Light Duty Air Cleaner

Light duty air cleaners are not serviceable (washable). Light duty air cleaners are intended for a 50 service hours of maximum use, or one year, whichever occurs first. However, engines operating in a severe environment may require more frequent air cleaner replacement.

Dust conditions vary for different operating environments. Service the air cleaner at regular intervals as determined by the operating environment. Check the air cleaner service indicator (if equipped) daily.

Check the air cleaner for cleanliness and damage such as rips and tears. Replace the air cleaner element at the required service interval, or more often as determined by the operating environmental dust conditions.

Replace



D22683

1. Loosen the clamp (2) fastening the air cleaner element (1) to the air inlet, and remove the dirty element and clamp.

2. Install the clamp on a new element.

3. Install the new element to the air inlet and tighten the clamp. Refer to the Torque Specifications section of this manual.

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14/02/1996 **Maintenance Schedule (SEBU6998)**

SMCS -

NOTE: For all generator maintenance activities, refer to SEBU6918, the Generator and Control Panel Operation and Maintenance Manual.

Use fuel consumption, service hours, or calendar time, whichever occurs first, to determine maintenance intervals. Experience has shown that maintenance intervals are most accurately scheduled on the basis of fuel consumed rather than service hours.

Daily

Walk-Around Inspection -Inspect engine for leaks and loose connections

Engine Crankcase -Check oil level

Cooling System -Check coolant level

Air Cleaner -Check service indicator/Service air cleaner when needed

Air Starter Lubricator (If Equipped) -Check fluid level/Adjust oiler feed

Air Tank (If Equipped) -Drain water/Check pressure

Every 1,900 L (500 gal) of Fuel or 50 Hours

Air Cleaner -Clean Precleaner (If Equipped)/Replace Light Duty Air Cleaner (If Equipped)

First 8,500 L (2,200 gal) of Fuel or 250 Hours (First Oil Change)

Engine Valve Lash -Check/Adjust

Magnetic Pickup -Inspect/Adjust

Every 8,500 L (2,200 gal) of Fuel or 250 Hours

Scheduled Oil Sampling (S·O·S) -Obtain Sample and analysis

Engine Crankcase -Replace oil and filter(s)

Crankcase Breather -Clean

Cooling System (Conventional Coolant/Antifreeze Only)-Test for SCA concentration OR obtain Level I coolant analysis/Add SCA if necessary

Fuel System -Clean primary fuel filter (if equipped)/Replace final fuel filter

Fuel Tank -Drain water and sediment

Radiator, Aftercooler (If Equipped) -Clean/Inspect

Belts -Check/Adjust

Hoses -Inspect/Replace

Fan Drive Bearing -Lubricate

Batteries -Clean/Check (if required)

Every 34,000 L (9,000 gal) of Fuel or 1000 Hours

Engine Protection Devices -Inspect/Check

Fuel Control Linkage-Check/Lubricate

Every 67,000 L (18,000 gal) of Fuel or 2000 Hours

Engine Valve Lash, Valve Rotators -Check/Adjust

Fuel Ratio Control, Set Point, and Low Idle -Check/Adjust

Fuel Injection Nozzles -Test/Exchange

Turbocharger -Clean/Inspect/Check

Engine Mounts -Inspect

Crankshaft Vibration Damper -Inspect

Every 91,000 L (24,000 gal) of Fuel or 3000 Hours or Two Years

Temperature Regulator (Thermostat) - Replace

Cooling System (Long Life Coolant/Antifreeze Only)-Add Extender

Cooling System (Conventional Coolant/Antifreeze Only)-Drain/Clean/Replace Coolant

Water Pump -Inspect/Replace seal

Every 136,000 L (36,000 gal) of Fuel or 4000 Hours

Magnetic Pickup -Inspect/Adjust

Every 204,000 L (54,000 gal) of Fuel or 6000 Hours or Four Years

Cooling System (Long Life Coolant/Antifreeze Only)-Drain/Flush/Replace Coolant

SMCS - 1261, 1262

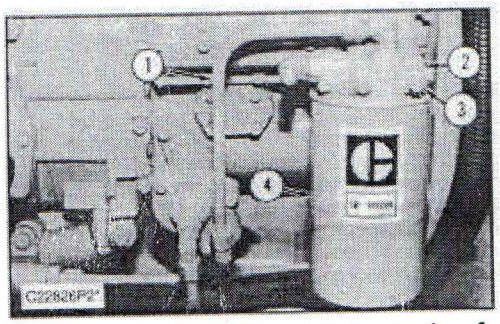
SENR10940015

Remove & Install Fuel Filter & Base

Tools Needed		A
2P8250	Strap Wrench	1

FLUID SPILLAGE CONTAINMENT

Care must be taken to ensure that fluids are contained during performance of inspection, maintenance, testing, adjusting and repair of the machine. Be prepared to collect the fluid with suitable containers before opening any compartment or disassembling any component containing fluids. Refer to "TOOLS AND SHOP PRODUCT GUIDE, NENG2500", for tools and supplies suitable to collect and contain fluids in Caterpillar machines. Dispose fluids according to local regulations and mandates.



1. Remove fuel filter (4) from the fuel filter base with Tool (A).

2. Disconnect fuel line (1) from the fuel filter base.

3. Remove bolts (3), fuel filter base (2) and the gasket from the fuel injection pump housing.

4. Put the gasket and fuel filter base (2) in position on the fuel injection pump housing, and install bolts (3) to hold them.

5. Connect fuel line (1) to the fuel filter base.

6. Use Tool (A) and install fuel filter (4).

Trakindo CAT

Nomor Formulir / *Form Number*	SHE.SHE.FRM.005.R04

ANALISIS LINGKUNGAN KESELAMATAN KERJA / *JOB SAFETY ENVIRONMENT ANALYSIS*

Pekerjaan / *Task*	PM 250 Engine 3306	Nomor JSEA / *JSEA Number*		Halaman / *Page*	1	Dari / *Of*	2

Tanggal Pembuatan JSEA / *Date of JSEA*	29/12/2025	Departemen / *Dept*	TAB	Tempat Kerja / *Work Location*	Work shop TAB

Disusun Oleh / *Compiled By*	Surya	TTD / *Sign*		Review Oleh / *Reviewed By*	SHE	TTD / *Sign*		Atasan / *Superior*		TTD / *Sign*	

Apakah Anda sudah terlatih untuk melakukan pekerjaan ini ? / *Are you properly trained to complete these task ?* ☐ Ya / *Yes* ☐ Tidak / *No*

Apa yang Anda perlukan untuk memastikan bahwa pekerjaan selesai tanpa adanya kecelakaan kerja ? / *What do you need to ensure this job is completed incident free ?*

Tools yang digunakan sudah sesuai dengan Manual

Siapa yang bertanggung jawab untuk menghentikan pekerjaan jika terjadi perubahan pekerjaan atau gangguan kondisi lingkungan kerja ? / *Who is responsible for Stop Work Authority if change job or workplace distraction could ?*

ABCD-1 (Technician Leader) / Mr. X (Customer)

Apakah Anda memerlukan peralatan LOTO ? / *Are you need LOTO Equipments ?* ☐ Ya / *Yes* ☐ Tidak / *No*

Apakah Anda mengetahui ERP/MERP dari pekerjaan yang sedang dilakukan? ☐ Ya / *Yes* ☐ Tidak / *No* ***Jika tidak, silahkan tambahkan dalam urutan langkah tugas diawal***

Kondisi Lingkungan / *Environmental Conditions*	Cuaca / *Weather*		Medan / *Terrain*	

Pengendalian Sumber Bahaya / *Hazardous Energy Control*					
	☑ Listrik / *Electrical*	☑ Gravitasi (Benda jatuh,tertimpa) / *Gravitation (Falling objects, struck down)*	☐ Pneumatik / *Pneumatic*		
	☐ Hidraulik / *Hydraulic*	☑ Mekanis / *Mechanical*	☐ Panas / *Thermal*		

APD yang diperlukan / *Required PPE*					
	☑ Helm / *Safety Helm*	☐ Pelindung Muka / *Face shield*	☑ Kacamata / *Safety Glass*		
	☑ Sarung Tangan / *Hand Gloves*	☐ Pelindung Pernafasan / *Respiratory Protection*	☐ Perlindungan Kejatuhan / *Fall Protection*		
	☑ Sepatu / *Safety Shoes*	☐ Pelindung Telinga / *Hearing Protection*	☐ Lain-Lain / *Other*		

Hal yang perlu dipertimbangan dalam mengidentifikasi bahaya / *These to consider in identify hazards* :

1. **Bahaya Keselamatan** : Kondisi tidak aman yang dapat menyebabkan injury atau kematian seperti terjepit, terpeleset/terjatuh, tertimpa dll.
   Safety Hazard : unsafe conditions that can cause injury or even death, such as spill/falls, pinch point, struck by, etc.
2. **Bahaya Fisik** : Listrik, Api/ledakan, Kebisingan, Radiasi, Panas, Tekanan, Terjepit, Tersandung/Terjatuh, Tertimpa, Getaran.
   Physical Hazards : Electrical, Fire/Explosion, Noise, Radiations, Thermal, Pressure, Pinch Point, Slips/Falls, Struck by, Vibration.
3. **Bahaya Kimia** : Terhirup, terkena kulit, injeksi, tertelan, terserap.
   Chemical Hazards : Inhalation, skin contact, injection, ingestion, absorption.
4. **Bahaya Biologi** : Patogen yang ditularkan melalui darah, jamur, tanaman/serangga/hewan.
   Biological Hazards : bloodbone pathogens, mold, Plant/Insect/Animals
5. **Bahaya Ergonomi** : Gerakan berulang-ulang, beban yang berlebihan, Postur Janggal, Durasi kerja, Desain area kerja.
   Ergonomic Hazards : Repetitions, Forcefull extention, Awkward Posture, Duration , Work area desain.
6. **Bahaya Organisasi** : stres atau bahaya terkait dengan masalah tempat kerja yang menyebabkan efek jangka panjang atau pendek, beban kerja yang berat dan kekerasan ditempat kerja.
   Organizational hazards: stressors or hazards associated with workplace issues that cause long or short term effects heavy workloads, stressful interactions and workplaces violence.

No	Urutan Dasar Langkah Tugas / *Job Steps* (* Maksimum 15 Langkah / *Maximum 15 Steps*)	Bahaya Yang Terkait / *Potential Hazard(s)*	Tindakan Perbaikan / *Recommended Action*
A	ERP/MERP		
	1. Saat pekerjaan terjadi gempa	tertimpa reruntuhan	1.1 Segera evakuasi menuju master point baru ditetapkan/ tempat terbuka 1.2 Melaporkan kejadian kepada atasan
	2. Saat pekerjaan ada teknisi yang pingsan	Cidera kepala, tangan tergores	2.1 Lakukan protokol P3K 2.2 Segera evakuasi korban menuju fasilitas kesehatan terdekat 2.3 Melaporkan kejadian kepada atasan
B	Langkah Pekerjaan		
1	Prepare APD	Tersandung Meja	1.1 Pindahkan Benda yang menghalangi
			1.2 Fokus saat prepare
		Ergonomi saat memasang sepatu	1.3 Posisikan badan yang nyaman
2	Walk Around Inspection	Terpeleset Fluida	2.1 Bersihkan dengan majun
		kaki tersandung engine	2.2 Berhati hati saat melangkah
3	Prepare Tools	Terjepit Laci ToolBox	3.1 Hindari titik jepit
			3.2 Berhati hati saat bekerja
		Tersandung komponen	3.3 Pindahkan benda yang menghalangi
		Terjepit Roda tool box	3.4 hindari titik jepit Roda
			3.5 Dorong tool box saat memindah
4	Doing Pre Maintenance	Terjepit komponen	4.1 hindari titik jepit
			4.2 Hati hati saat bekerja
		Terpeleset Fluida berceceran	4.3 Bersihkan Fluida dengan majun
		Terbentur komponen engine	4.4 Jauhkan posisi badan dari benda tajam

Trakindo CAT

Nomor Formulir / *Form Number*	SHE.SHE.FRM.005.R03

ANALISIS LINGKUNGAN KESELAMATAN KERJA / JOB SAFETY ENVIRONMENT ANALYSIS

Pekerjaan / *Task*	PM 250 Engine 3306	Nomor JSEA / *JSEA Number*		Halaman / *Page*	2	Dari / *Of*	2

No	Urutan Dasar Langkah Tugas / *Job Steps*	Bahaya Yang Terkait / *Potential Hazard(s)*	Tindakan Perbaikan / *Recommended Action*
			4.5 Fokus saat bekerja
		Tersengat listrik	4.6 Pindah kabel ke area yang aman
5	House keeping	Debu masuk ke pernafasan	5.1 Pakai Masker
		Fluida berceceran	5.2 Bersihkan dengan majun

Bukti sosialisasi / *Evidence of socialization* :

No	Nama / *Name*	TTD / *Sign*
1	Fritski	
2	Ega	
3	Saka Alzena	
4		
5		

No	Nama / Name	TTD / Sign

No	Nama / Name	TTD / Sign

4/5

Trakindo CAT

PT Trakindo Utama

SERVICE PARTS REQUISITION

WORK ORDER NO.	A/C NO.	CUSTOMER	MODEL 9NR	SERIAL NO. 3306 B
SEGMENT NO.	WARRANTY ☐	UNIT DOWN ☑	SCHEDULED ☐	CATERPILLAR PARTS: YES / NO
CUSTOMER REPRESENTATIF NAME	CUSTOMER REPRESENTATION SIGNATURE		INITIAL SUPPLY PSO REF NO.	
DELIVER TO	DATE TIME OF DELIVERY	PREPARED BY	TOTAL PARTS ESTIMATE	
APPROVED BY: Dimas Surya Hadi W.	DATE TIME APPROVED			

ITEM	PART NUMBER	CHANGED TO	DESCRIPTION	QTY EST	QTY ACT	APPROVAL *	UNIT PRICE	EXTENDED PRICE	RECD
1	1R-0739		Oil filter	1	1				
2	3E-9844		Engine oil	1	1				
3	335-9830		Engine oil	2	2				
4	9N(-2341		Element primary Ael	1	1				
5									
6									
7									
8									
9									
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18									
19									
20									
21									
22									
23									
24									
25									
							TOTAL C/F		

* APPROVAL CODE:

C = CUSTOMER REQUEST
I = FOUND BY INSPECTOR
R = FOUND DURING REPAIR
O = APPROVED BY CUSTOMER
X = NOT APPROVED BY CUSTOMER

Trakindo CAT

PT Trakindo Utama

SERVICE PARTS REQUISITION

WORK ORDER NO.	A/C NO.	CUSTOMER	MODEL	SERIAL NO.
SEGMENT NO.	WARRANTY ☐	UNIT DOWN ☐	SCHEDULED ☐	CATERPILLAR PARTS: YES / NO
CUSTOMER REPRESENTATIF NAME	CUSTOMER REPRESENTATION SIGNATURE			INITIAL SUPPLY PSO REF NO.
DELIVER TO	DATE TIME OF DELIVERY	PREPARED BY		TOTAL PARTS ESTIMATE
APPROVED BY	DATE TIME APPROVED			

ITEM	PART NUMBER	CHANGED TO	DESCRIPTION	QTY EST	QTY ACT	APPROVAL *	UNIT PRICE	EXTENDED PRICE	RECD
1									
2									
3									
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22									
23									
24									
25									
							TOTAL C/F		

* APPROVAL CODE:

C - CUSTOMER REQUEST
I - FOUND BY INSPECTOR
R - FOUND DURING REPAIR

O - APPROVED BY CUSTOMER
X - NOT APPROVED BY CUSTOMER