

# 3 Maintenance

## 3.1 Periodic Maintenance Schedule

Periodic maintenance is essential for top performance and long generator set life. Use the table below as a guide for normal periodic maintenance. In hot and dusty environments, some maintenance procedures should be performed more frequently, as indicated by the footnotes in the table. Keeping a log of maintenance performed and hours run will help you keep generator set maintenance regular and provide a basis for supporting warranty claims.

Maintenance, replacement or repair of emission control devices and systems may be performed by any engine repair establishment or individual. However, warranty work must be completed by an authorized Cummins dealer.

**TABLE 1. PERIODIC MAINTENANCE SCHEDULE**

MAINTENANCE PROCEDURE	MAINTENANCE FREQUENCY						Section
	Every Day or Every 8 Hours	After First 20 Hours	Every Month	Every 50 Hours	Every 150 Hours	Every 500 Hours	
General Inspections	X						<u>Section 3.2</u>
Check Engine Oil Level	X						<u>Section 3.3</u>
Clean and Check Batter							<u>3.5</u>
Clean Spark Arrestor				X			<u>Section 3.8</u>
Change Engine Oil & Oil Filter		X <sup>1</sup>			X <sup>2, 3, 4</sup>		<u>Section 3.4</u>
Replace Air Filter Element					X <sup>2</sup>		<u>Section 3.6</u>
Replace Spark Plugs						X <sup>5</sup>	<u>Section 3.7</u>
Clean Engine Cooling Fins						X <sup>2</sup>	-
Replace Fuel Filter						X <sup>5, 6, 7</sup>	-
Adjust Valve Lash						X <sup>6</sup>	-
1 - As a part of engine break-in, change the engine oil after the first 20 hours of operation. 2 - Perform more often when operating in dusty environments. 3 - Perform more often when operating in hot weather. 4 - Perform at least once a year. 5 - Perform sooner if engine performance deteriorates. 6 - Must be performed by a trained and experienced mechanic (authorized Cummins dealer). 7 - Replace every 500 hours or once every 3 years.							

## 3.2 Conducting General Inspections

Inspect the generator set before the first start of the day and after every eight hours of operation.

### 3.2.1 Oil Level

Check engine oil level ([Section 3.3](#)).

### 3.2.2 Exhaust System

**⚠ WARNING**

***Exhaust Gas Is Deadly***

***Do not operate the generator set if entering or being drawn into the vehicle.***

***t leak or any danger of exhaust gases***

**⚠ WARNING**

***Do not park the vehicle in high grass or brush. Contact with the exhaust system can cause a fire.***

- Look and listen for exhaust system leaks while the generator set is running. Shut down the generator set if a leak is found; have it repaired before operating the generator set again.
- Look for openings or holes between the generator set compartment and vehicle cab or living space if the generator set engine sounds louder than usual. Have all such openings or holes closed off or sealed to prevent exhaust gases from entering the vehicle.
- Replace dented, bent or severely rusted sections of the tailpipe. Make sure the tailpipe extends at least 1 inch (25.4 mm) beyond the perimeter of the vehicle.
- Park the vehicle so that generator set exhaust gases disperse away from the vehicle. Barriers such as walls, snow banks, high grass and brush, and other vehicles can cause exhaust gases to accumulate in and around the vehicle.
- Do not operate power ventilators or exhaust fans if the vehicle is standing with the generator set running. The ventilator or fan can draw exhaust gases into the vehicle.
- Check all CO monitors to assure proper operation.

### 3.2.3 Fuel System

**⚠ WARNING**

***Gasoline and LPG are highly flammable and explosive, and can cause severe personal injury or death. Shut down the generator set and repair leaks immediately.***

- Check for leaks at the hose, tube and pipe fittings in the fuel supply and return systems while the generator set is running and while it is stopped. **Do not use a flame to check for LPG leaks.**
- Check the flexible fuel hose sections for cuts, cracks, and abrasions.
- Make sure the fuel line is not rubbing against other parts.
- Replace worn or damaged fuel line parts before leaks occur.
- If you smell gas, close the LPG container shutoff valve and have the generator set serviced before using it again.

### 3.2.4 Battery Connections

Check the battery terminals for clean, tight connections. Loose or corroded connections have high electrical resistance which makes starting harder. See Maintaining the Battery and Battery Connections (Section 3.5).

### 3.2.5 Mechanical

**⚠ WARNING**

***Always wear safety glasses when using compressed air, a pressure washer or a steam cleaner to avoid severe eye injury.***

- Look for mechanical damage. Start the generator set. Look, listen and feel for noises and vibrations.
- Check the generator set mounting bolts to make sure they are secure.
- Check to see that the generator set air inlet and outlet openings are not clogged with debris or blocked.
- Clean accumulated dust and dirt from the generator set. Do not clean the generator set while it is running or still hot. Protect the alternator, air cleaner, control panel, and electrical connections from water, soap and cleaning solvents.

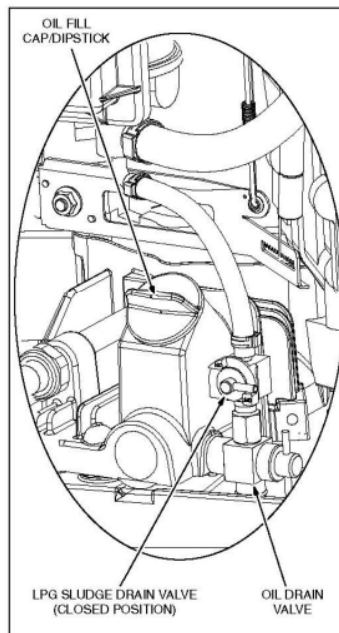
## 3.3 Checking Engine Oil Level

Park the vehicle on level ground and shut off the generator set before checking the engine oil level.

**⚠ WARNING**

***Crankcase pressure can blow hot engine oil out the fill opening causing severe burns. Always stop the generator set before removing the oil fill cap.***

1. Unscrew the oil fill cap and wipe oil off the dipstick as shown in the figure below.



**FIGURE 2. OIL FILL/DIPSTICK AND DRAIN VALVE**

2. Screw the cap back on, remove it and check the oil level on the dipstick.
3. Add or drain oil as necessary. See Engine Oil Recommendations ([Section 12.4](#)). Keep the oil level between the FULL and ADD marks. The oil fills slowly because it takes time for the air in the crankcase to escape. Recheck the level in a few minutes to make sure.

**⚠ CAUTION**

*Too much oil can cause high oil consumption. Too little oil can cause severe engine damage. Keep the oil level between the Full and Add marks.*

4. Screw the oil fill cap back on securely.

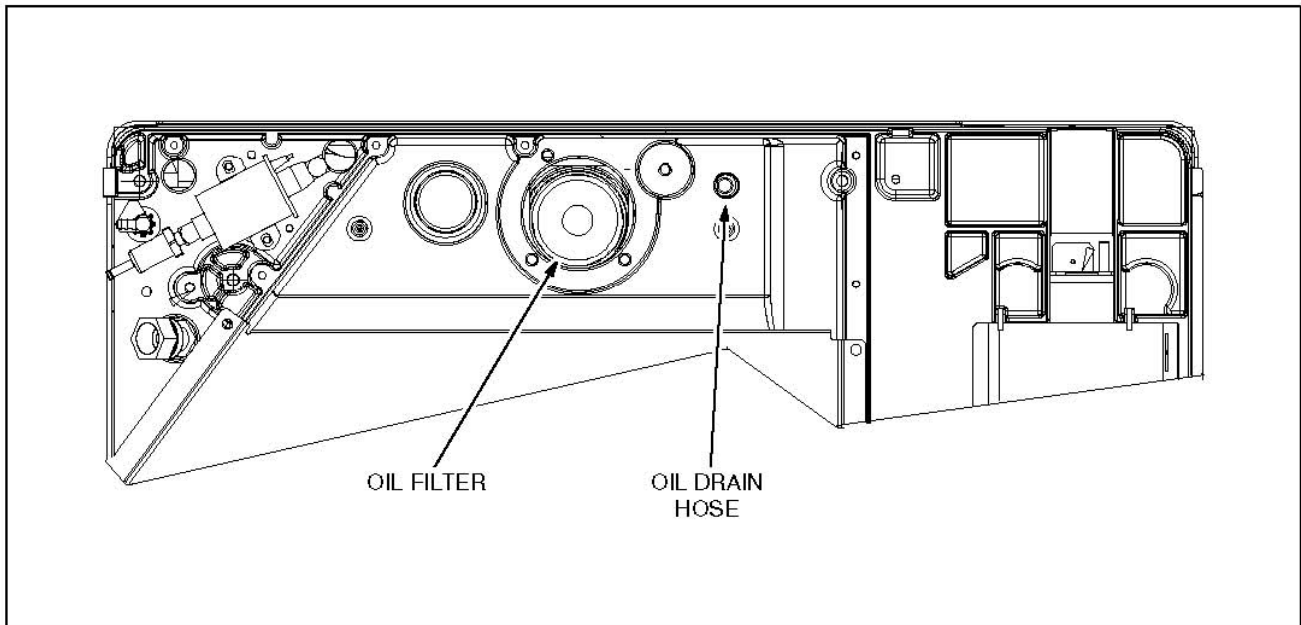
## 3.4 Changing Engine Oil and Oil Filter

**⚠ WARNING**

*State and federal agencies have determined that contact with used engine oil can cause cancer or reproductive toxicity. Avoid skin contact and breathing of vapors. Use rubber gloves and wash exposed skin.*

Refer to [Table 1](#) for scheduled engine oil change. Change oil more often in hot or dusty environments.

1. Place a pan underneath the oil drain hose and filter, as shown in the figure below.



**FIGURE 3. OIL FILTER AND DRAIN HOUSE (VIEW FROM BELOW THE GENERATOR SET FRONT EDGE)**

2. Run and then stop the engine when it is warm.

**⚠ WARNING**

***Crankcase pressure can blow hot engine oil out the fill opening causing severe burns. Always stop the generator set before removing the oil fill cap.***

3. Remove the oil fill cap.
4. Open the oil drain valve (**Figure 2**).
5. Let all oil drain from the engine.
6. Close the drain valve.
7. *H* **LPG generator sets only:**
  - a. Drain the LPG system of accumulated sludge by opening the sludge drain valve (**Figure 2**). Oil-like sludge can migrate from the LPG supply system during operation, and if allowed to accumulate, can cause hard starting and rough running. The sludge drains out through the engine oil drain hose.
  - b. Make sure to re-close the valve to keep out dust and to keep the engine running smoothly.
8. Spin off the old oil filter.
9. Thoroughly wipe off the filter mounting surface.
10. Remove the old gasket if it does not come off with the filter.
11. Apply a film of oil to the filter gasket and spin the new filter on by hand until the gasket just touches the mounting pad.
12. Turn it no more than 1/2 to 3/4 turn.
13. Refill with 2 quarts (1.8 L) of oil. See Engine Oil Recommendations (**Section 12.4**). Check and add or drain oil as necessary.

**⚠ CAUTION**

*Too much oil can cause high oil consumption. Too little oil can cause severe engine damage. Keep the oil level between the Full and Add marks.*

*Oil fills very slowly. Take your time and check level often while filling. It takes time for the air in the crankcase to escape and allow oil to enter.*

14. Dispose of the used oil and oil filter in accordance with local environmental regulations.

## 3.5 Maintaining the Battery and Battery Connections

**⚠ WARNING**

*Arcing at the battery terminals or light switch or other equipment or flames and sparks can ignite battery gas causing severe personal injury:*

- *Ventilate the battery area before working on or near battery.*
- *Wear safety glasses.*
- *Do not smoke.*
- *Switch the trouble light ON/OFF away from battery.*
- *Do not disconnect battery cables while generator set is running or vehicle battery charging system is on.*
- *Always disconnect the negative (-) cable first and reconnect it last.*

*Refer to [Table 1](#) for scheduled battery maintenance, and follow the battery manufacturer's instructions. **Hold** the battery charging system serviced if DC system voltage is consistently low or high. Always:*

1. Keep the battery terminals clean and dry, and the terminals tight.
2. Remove the battery cables with a battery terminal puller.
3. Make sure which terminal is positive (+) and which is negative (-) before making battery connections, always removing the negative (-) cable first and reconnecting it last to reduce arcing.

## 3.6 Replacing the Air Filter Element

Refer to [Table 1](#) for scheduled air filter element replacement. In dusty environments the filter element should be inspected and changed more frequently. To change the filter element ([Figure 4](#)):

1. Unlatch the three spring clips and rotate the cover out and away from the hooks on top. Remove the air filter element.
2. Wipe the filter element sealing surfaces clean and reassemble the air filter with a new filter element.

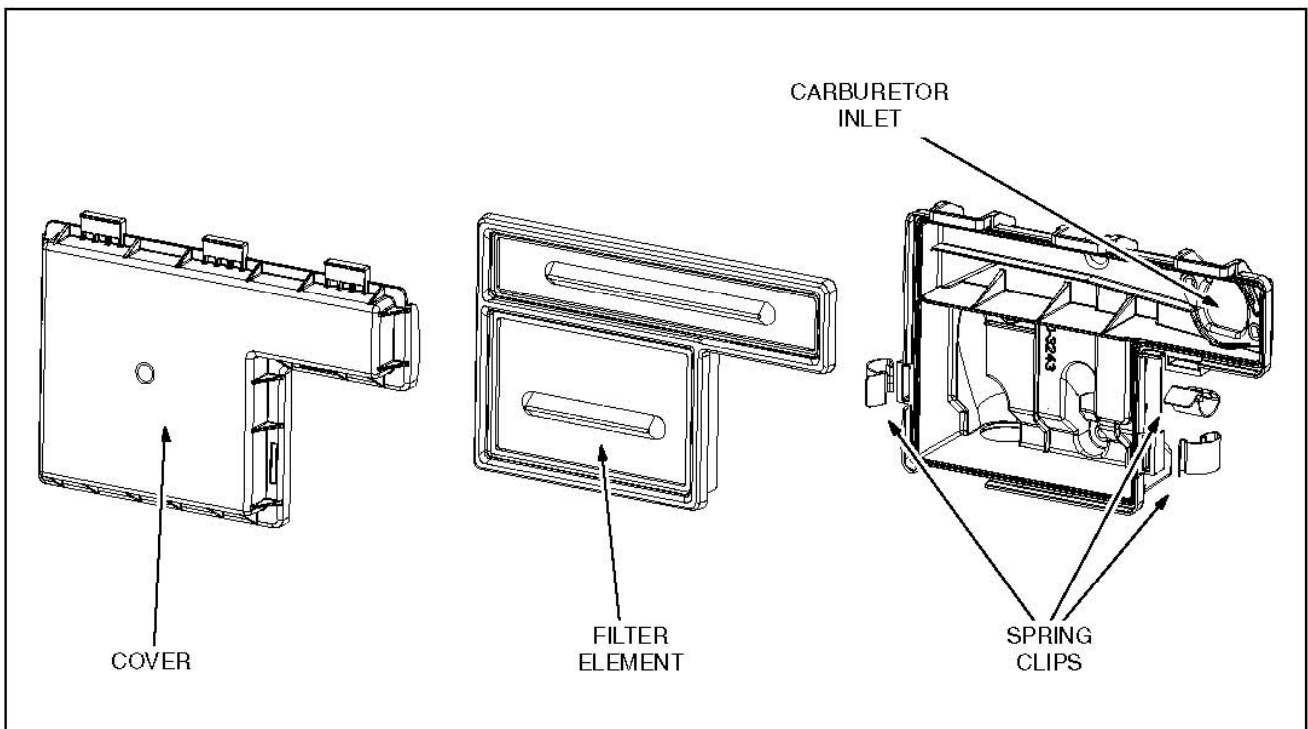
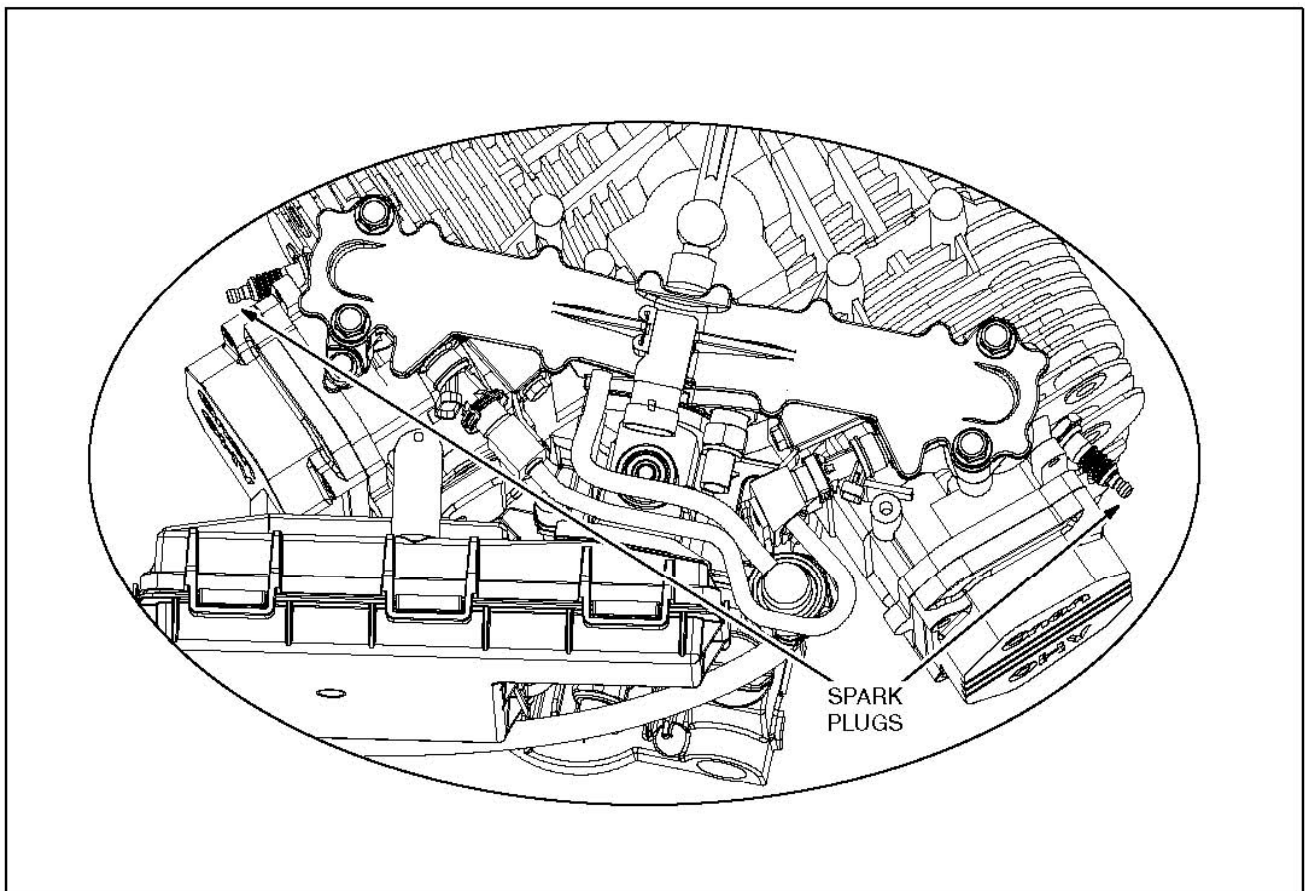


FIGURE 4. REPLACING THE AIR FILTER ELEMENT

### 3.7 Replacing Spark Plugs

Refer to the Periodic Maintenance section for scheduled spark plug replacement. The generator set has two spark plugs, as shown in the figure below. The spark plugs must be in good condition for proper engine starting and performance. A spark plug that fouls frequently or has heavy soot deposits indicates the need for engine service. See the Troubleshooting section.



**FIGURE 5. SPARK PLUGS**

To prevent cross threading, always thread a spark plug in by hand until it seats and then torque to 13 Nm (10 lb-ft) if new, or to 24 Nm (18 lb-ft) if being reused.

### 3.8 Cleaning the Spark Arrestor

Refer to [Table 1](#) for scheduled cleaning of the spark arrestor muffler. Cleaning is required for maximum generator set performance. *Park the vehicle away from grass, brush or debris that could be ignited by sparks expelled during this procedure.*

**⚠ WARNING**

***A hot muffler can cause severe burns. Let the muffler cool down before removing or installing cleanout plugs or screens.***

***HGJAA and HGJAD models only:*** A muffler is mounted inside the generator set. The cleanout plug is in the drum, but accessible from below, though not readily visible.

1. Locate the square-headed cleanout plug by hand.
2. Solidly seat a 7/16 inch, *eight point*, 3/8 inch drive socket wrench with 3 inch extension on the plug.
3. Add a swivel section and 6 inch extension.
4. Turn with a ratchet to remove the plug.
5. Start and load the generator set to near full power.



6. Let the generator set run for about five minutes to expel the soot in the muffler.
7. Stop the generator set.
8. Allow the muffler to cool down.
9. Reinstall the plug.

**HGJAB and HGJAE models only**  
as shown in the figure below.

le-drum muffler, the cleanout plug is accessible from below

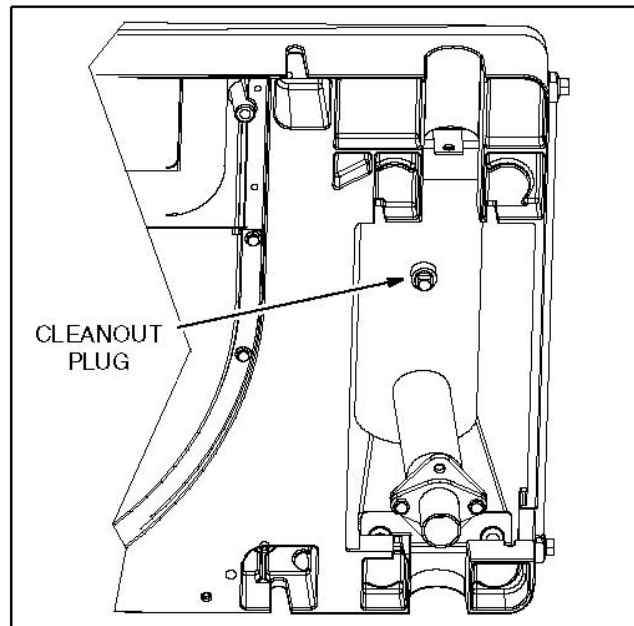


FIGURE 6. HJGAB AND HGJAE CLEANOUT PLUG (VIEW FROM BELOW)

### 3.9 Cleaning Cylinder Heads

#### NOTICE

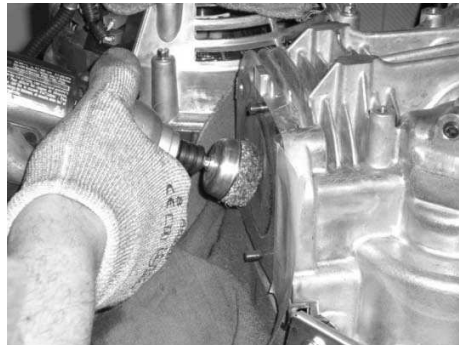
This process was previously an emissions requirement, but is no longer a required maintenance procedure for any gasoline generator set.

1. Inspect cylinder head and ensure all measurements are within tolerances listed in Dimensions and Clearances [Section 9.9](#).
2. Move first cylinder to be cleaned to TDC.
3. Cover push rod ports with masking tape to protect from debris while cleaning [Figure 7](#).
4. Clean piston top and top of engine block with rotating Scotch-Brite pad. For difficult deposits a rotating steel wire brush may be used. Avoid use of steel brush on gasket mating surfaces [Figure 8](#).
5. Wipe down all surfaces with degreaser.
6. Move cylinder to BDC and clean any deposits or cleaning debris from crown of piston bore with Scotch-Brite pad. Be careful not to damage piston-ring travel area, do not touch this area with abrasive material.
7. Repeat steps 1 through 5 for cleaning second cylinder.
8. Remove intake and exhaust valves.

9. Secure cylinder head in a bench vise, being careful not to over-tighten. A vise with soft jaws is preferred for this operation.
10. Clean combustion chamber and surface of head with rotating steel wire brush.
11. Wipe down all surfaces with degreaser clean ports and valve guides with compressed air.
12. Repeat steps 7 through 9 for second cylinder head.
13. Follow procedure for Reassembly and Installation of cylinder head and valves on [Section 9.7](#), including lapping the intake and exhaust valves.
14. Complete reinstallation of intake and exhaust manifolds, ensuring all fasteners are tightened to the proper torque specifications.



**FIGURE 7. PUSH ROD PORTS WITH MASKING TAPE**



**FIGURE 8. PISTON CLEANING**

# 4 Preparing for Service

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## 4.1 Troubleshooting

Refer to the Troubleshooting section before starting work on the generator set. Note that some problems have several possible causes.

## 4.2 Safety

There are hazards in servicing generator sets. Study *Safety Precautions* and become familiar with the hazards listed in Table 2. Note the following safeguards and ways of avoiding hazards:

- **Use personal protective equipment:** Use protective safety equipment, such as safety shoes and safety glasses.
- Do not wear rings or jewelry and do not wear loose or damp clothing that might get caught in equipment or conduct electricity.
- **Reduce the hazard:** A safe, orderly workshop area and well-maintained equipment reduce the hazard potential. Keep guards and shields in place on machinery and maintain equipment in good working condition. Store flammable liquids in approved containers; away from fire, flame, spark, pilot light, switches, arc-producing equipment and other ignition sources. Keep the workshop clean and well-lighted and provide adequate ventilation.
- **Develop safe work habits:** Accidents with tools and machines. Be familiar with the equipment and know how to use it safely. Use the correct tool for the job and check its condition before starting. Comply with the warnings in this manual and take special precautions when working around electrical equipment. Do not work alone if possible and take no risks.
- **Be prepared for an accident:** Keep fire extinguishers and safety equipment nearby. Agencies such as the Red Cross and public safety departments offer courses in first aid, CPR and fire control. Take advantage of this information to be ready to respond to an accident. Learn to be safety-conscious and make safety procedures part of the work routine.

**TABLE 2. HAZARDS AND THEIR SOURCES**

Hazard	Sources
Fire and Explosion	<ul style="list-style-type: none"> <li>• Leaking or spilled fuel</li> <li>• Hydrogen gas from battery</li> <li>• Oily rags improperly stored</li> <li>• Flammable liquids improperly stored</li> </ul>
Burns	<ul style="list-style-type: none"> <li>• Hot exhaust pipes</li> <li>• Hot engine and generator surfaces</li> <li>• Electrical shorts</li> </ul>
Poisonous Gas	<ul style="list-style-type: none"> <li>• Operating generator set where exhaust gases can accumulate</li> </ul>
Electrical Shock (AC)	<ul style="list-style-type: none"> <li>• Improper generator connections</li> <li>• Faulty wiring</li> <li>• Worn electrical components</li> <li>• Jewelry near electrical components</li> </ul>
Rotating Machinery	<ul style="list-style-type: none"> <li>• Fan guards not in place</li> </ul>