3.11 OIL PAN

The oil pan used on the Series 60 engine is made of plastic (epoxy vinyl ester) or aluminum. For engines built after April 1999, a one-piece bolt assembly is used with the improved plastic front sump and rear sump oil pans and a new isolator seal. The isolator seal is reusable. See Figure 3-38. Old and new components should not be mixed.

NOTE:
To expedite oil pan seal installation, use a soapy water solution to assist in installing the seal into the groove of the pan. When installing a new pan on an engine prior to serial number 6R490000 (built March 1, 1999), shift the pan toward the front of the engine before tightening the bolts. This will help eliminate the potential for any interference between the flywheel housing and the oil pan.

Figure 3-38 Typical Oil Pan Assembly

1. Drain Plug 6. Bolt
2. Nut 7. Plug
3. Isolator Seal 8. Insert
5. Isolator and Washer 10. Bolt ASM, Replaces 4, 5, 6

All information subject to change without notice.

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The plastic oil pan has side plugs that are threaded into a special stainless steel insert which is restrained by a nut inside the pan. Sealing is provided by a fluoroelastomer seal ring that fits into a groove machined on the flange of the insert. See Figure 3-39.

Figure 3-39    Side Plug Detail

Rubber isolator-washer assemblies and sleeves are used for attaching the oil pan. The metal sleeve spacer is inserted through the isolator and limits the travel of the oil pan bolts to prevent over-tightening and damaging the oil pan and isolator.

Effective August 1995, isolators made of an improved vibration-absorbing material were released to reduce noise emissions. In addition, isolator bolt sleeve length was increased by 0.8 mm (0.032 in.) to accommodate the slightly longer isolators.

When installing a pipe plug, coat the threads with Loctite® PT 7271 sealant (or equivalent), hold the insert to keep it from turning, and torque the plug to 45-56 N·m (33-41 lb·ft).
3.11.1 Repair or Replacement of Oil Pan

To determine if repair is possible or replacement is necessary, perform the following procedure. See Figure.

![Flow Chart for Repair or Replacement of Oil Pan](image-url)
3.11.2 Removal of Oil Pan

Precleaning is not necessary.

**NOTICE:**
Do not support the engine on the oil pan. Damage to the oil pan or engine could result.

**NOTE:**
On almost all engine applications it is possible to remove the oil pan without removing the engine.

If the engine is to be removed from the vehicle, the oil pan should be left in place until the engine is removed.

The procedure for removing the oil pan will vary with each installation. However, the following procedures will generally apply.

**NOTICE:**
When removing a side plug, hold the flats of the insert with a 2-1/8 in. open end or large adjustable wrench to keep it from turning. If the insert is loosened, it may be necessary to remove the oil pan and tighten the nut to prevent a possible oil leak. If required, torque the nut to 186-199 N·m (137-147 lb·ft).

Remove the oil pan as follows:

1. Remove the drain plug and drain the engine oil.
2. Remove the ten oil pan bolts, washers, isolators and sleeves or ten bolt assemblies. Remove the counter bolts on each side last.
3. Remove the oil pan, taking care not to damage the oil pump inlet pipe and screen.
4. Remove the oil pan isolator seal and inspect for damage.
3.11.3 Cleaning of Oil Pan

Clean the oil pan prior to inspection as follows:

1. Clean the oil pan and attaching hardware with clean fuel oil.

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<th>CAUTION:</th>
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<tr>
<td>To avoid injury from flying debris when using compressed air, wear adequate eye protection (face shield or safety goggles) and do not exceed 40 psi (276 kPa) air pressure.</td>
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2. Dry with compressed air.

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<th>NOTICE:</th>
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<tr>
<td>Do not use solvents to clean isolators. Damage to the isolator will result.</td>
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3. Clean the surfaces of the cylinder block, gear case and flywheel housing where they mate with the oil pan.

3.11.3.1 Inspection of Oil Pan

Inspect the oil pan, inserts, bolt isolators and isolator seal as follows:

1. Check for dryness, cracks or tears.
   - [a] If isolator is damaged, replace with new part.
   - [b] If isolator is not damaged, reuse the part.

2. Check oil pan inserts and nut assemblies for tightness.
   - [a] If inserts and nut assemblies are loose, torque to 183-197 N·m (135-145 lb·ft).

3. Check oil pan for major dents, cracks and other damage.
   - [a] If oil pan is damaged, replace with new part.
   - [b] If oil pan is not damaged, reuse the part.

4. Check isolator seal for dryness, cracks or tears.
   - [a] If seal is damaged replace with new part.
   - [b] If seal is not damaged clean off excess RTV and reuse part.
3.11.4  Installation of Oil Pan

Install the oil pan as follows:

1. Insert the raised lip portion of the isolator seal into the groove in the oil pan.
2. Press down on the isolator seal and insert it completely around the oil pan. Be careful not to stretch or bunch the seal. For best results, install the seal at each corner, then at points half way between the corners. Continue in this manner, halving the distance and seating the seal.
3. Insert a metal sleeve spacer into each isolator and washer.
4. Install the ten oil pan bolts into isolator assemblies or install ten bolt assemblies.
5. Ensure the joint surfaces of the gear case and the cylinder block, the gear case cover and gear case, and the flywheel housing and the cylinder block are cleaned and there is no damage to prevent sealing.
6. Apply a 3 mm (1/8 in.) bead of RTV across joints shown. See Figure 3-41.

Figure 3-41  RTV Application

7. Install the oil pan assembly in position on the cylinder block.