



Engine Rebuild Checklist

14 steps across 5 phases — teardown, inspection, machining, assembly, and break-in.

By Michael Collins · Las Cruces, NM · CrankForge · 1 page, print-ready

1 Teardown

Document before you touch anything

Photograph everything — top, bottom, sides, all clearances

Minimum 100 photos before a single bolt is removed. Include orientation markers, component positions, and any wear patterns visible on the exterior.

Label every cap, lifter, and rocker with position notation

Number rod caps and main caps with a paint pen before disassembly. Mark rocker arms and lifters by cylinder. "I will remember" becomes "I cannot find" at reassembly.

MICHAEL'S TIP

I number every rod cap before I pull it — paint pen on the crank journal, matching number on the cap. The machinist will thank you and you will not spend 20 minutes on reassembly sorting mismatched caps.

2 Inspection

Before you spend a dollar on machine work

Compression test — dry and wet, all cylinders

Record psi for each cylinder. Wet test adds oil to the cylinder — if compression jumps, you have ring issues. Results within 10% across all cylinders.

Leak-down test — all cylinders

This is the one check that tells you whether you have a good block. Listen at the oil filler, exhaust, and coolant cap. Below 10% is healthy. Above 15% means significant wear.

Deck flatness — straight-edge and feeler gauge

4 points per cylinder at deck surface. Warp over 0.003" requires surfacing. Document this before any machine work — it is your baseline.

Rod big end and main bearing clearance — Plastigauge

Measure every rod and main bearing with Plastigauge before unbolting caps. This is your wear baseline — it tells you how far out of spec the block is and sets machine work expectations.

MICHAEL'S TIP

Most people skip the leak-down test. It is the one inspection that tells you whether you are rebuilding a solid block or chasing a cracked casting. Run it before you commit to anything.

Deck surfacing — verify flatness after

After surfacing, recheck with a straight-edge before the block leaves your shop. Every shop makes mistakes — catch it now, not at assembly.

 Bore honing — cross-hatch angle and surface finish

60-degree cross-hatch, 20-30 Ra surface finish for street engines. Get documentation from the shop — finish specs vary, and you need to know what you paid for.

 Crank grinding — journal finish and bearing clearance

Minimum 20 Ra journal finish required. Verify with Plastigauge before the crank leaves the shop. A cheap grind on rough journals eats new bearings in 500 miles.

 Valve job — confirm intake vs exhaust specs before dropping off heads

2-angle for stock rebuilds, 3-angle for performance builds. Know what you are getting before the heads go on the counter — it is the most common miscommunication with machine shops.

MICHAEL'S TIP

Never let a shop skip the crank finish spec. The journal surface quality is non-negotiable. 20 Ra minimum — this is what determines whether your new bearings last 100,000 miles or 500 miles.

 Main cap torque sequence — 3-stage, manufacturer spec

Initial snug, intermediate pass, final torque — in the correct order. Do not skip stages and do not go by memory. Use a beam or click-type torque wrench, not an impact.

 Rod cap torque — evaluate stock fasteners, upgrade if questionable

Inspect rod bolts at assembly. If stock fasteners show any signs of stretch, wear, or questionable condition, upgrade to ARP rod bolts now — it is cheaper than a second teardown.

 Head bolt torque — spiral from center out in 3 rounds

Round 1: 30% of target torque in a spiral pattern from center to outside. Round 2: 65%. Round 3: 100%. Never start from the corners — this creates uneven clamp load and gasket failure.

 Oil system prime — before first spark

Disable fuel and spark. Crank the engine with the starter for 15-20 seconds with the oil pressure gauge watching. This gets oil to all bearings before combustion — never skip it.

 Break-in oil — zinc-loaded conventional, no synthetic for first 500 miles

Use a diesel-rated break-in oil (high ZDDP content) for the first 500 miles. Switch to your preferred oil after the first oil change. Synthetic on fresh machine work early is a mistake.

 First 500 miles — varied rpm, no sustained high load

Vary rpm between 1,500-3,500. Avoid sustained high load, extended idle, and full-throttle runs. Heat cycles matter — let the engine reach operating temp, cool it down, repeat.

 First-start monitoring — oil pressure, temps, leaks, sounds

Watch oil pressure and coolant temp for the first 10 minutes. Listen for abnormal knock, tick, or rasp. Check for external leaks at all seals and gaskets. Document anything unusual.

MICHAEL'S TIP

Most break-in failures happen in the first 60 seconds — not enough oil pressure at startup because the prime step was skipped. Prime the oil system before you turn the key. It is a 2-minute step that prevents a \$2,000 mistake.

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