

## 2008 NATEF AUTOMOBILE STANDARDS CORRELATIONS

### **ENGINE REPAIR**

**For every task in Engine Repair the following safety requirement must be strictly enforced:** Comply with personal and environmental safety practices associated with clothing; eye protection; hand tools; power equipment; proper ventilation; and the handling, storage, and disposal of chemicals/materials in accordance with local, state, and federal safety and environmental regulations.

| <b>A. General Engine Diagnosis; Removal and Reinstallation (R &amp; R)</b>  | <b>Student Edition</b> | <b>Technical Applications</b>                |
|---|------------------------|--|
| 1. Complete work order to include customer information, vehicle identifying information, customer concern, related service history, cause and correction. (P-1)                 | HB-48                  | Job Sheet ER-1                               |
| 2. Identify and interpret engine concern; determine necessary action. (P-1)   | ER-155 through ER-159  | Job Sheet ER-14                              |
| 3. Research applicable vehicle and service information, such as internal engine operation, vehicle service history, service precautions, and technical service bulletins. (P-1) | HB-48, ER-155          | Job Sheet HB-4                               |
| 4. Locate and interpret vehicle and major component identification numbers. (P-1)   | HB-48                  | Job Sheets HB-1, HB-2                        |
| 5. Inspect engine assembly for fuel, oil, coolant, and other leaks; determine necessary action. (P-1)   | ER-162 through ER-163  | Job Sheet ER-18                              |
| 6. Diagnose engine noises and vibrations; determine necessary action. (P-2)   | ER-166 through ER-169  | Diagnostic Sheet ER-4<br><br>Job Sheet ER-20 |
| 7. Diagnose the cause of excessive oil consumption, coolant consumption, unusual engine exhaust color and odor; determine necessary action. (P-2)                               | ER-156 through ER-161  | Diagnostic Sheet ER-3<br><br>Job Sheet ER-13 |
| 8. Perform engine vacuum tests; determine necessary action. (P-1)   | ER-159 through ER-161  | Job Sheet ER-16                              |
| 9. Perform cylinder power balance tests; determine necessary action. (P-2)  | ER-161                 | Job Sheet ER-17                              |
| 10. Perform cylinder cranking and running compression tests; determine necessary action. (P-1)  | ER-156 through ER-157  | Job Sheet ER-14                              |
| 11. Perform cylinder leakage tests; determine necessary action. (P-1)   | ER-158 through ER-159  | Job Sheet ER-15                              |

| A. General Engine Diagnosis; Removal and Reinstallation (R & R) <i>(continued)</i>  | Student Edition                              | Technical Applications                |
|---|--|---------------------------------------|
| 12. Remove and reinstall engine in an OBD II or newer vehicle; reconnect all attaching components and restore the vehicle to running condition. (P-2)                       | ER-173 through ER-176, ER-264 through ER-267 | Job Sheets ER-21, ER-22, ER-56, ER-57 |
| 13. Install engine covers using gaskets, seals, and sealers as required. (P-1)  | ER-149                                       | Job Sheet ER-55                       |
| 14. Perform common fastener and thread repair, to include: remove broken bolt, restore internal and external threads, and repair internal threads with thread insert. (P-1) | HB-86 through HB-87                          | Job Sheets HB-6, HB-7                 |
| 15. Inspect, remove, and replace engine mounts. (P-2)   | ER-176, MD-636                               | Job Sheet MD-6                        |
| B. Cylinder Head and Valve Train Diagnosis and Repair   | Student Edition                              | Technical Applications                |
| 1. Remove cylinder head; inspect gasket condition; install cylinder head and gasket; tighten according to manufacturer's specifications and procedures. (P-1)               | ER-258 through ER-263                        | Job Sheet ER-53                       |
| 2. Clean and visually inspect a cylinder head for cracks; check gasket surface areas for warpage and surface finish; check passage condition. (P-1)                         | ER-178, ER-199 through ER-205                | Job Sheet ER-25                       |
| 3. Inspect valve springs for squareness and free height comparison; determine necessary action. (P-3)   | ER-201 through ER-202                        | Job Sheet ER-26                       |
| 4. Replace valve stem seals on assembled engine; inspect valve spring retainers, locks/keepers, and valve lock/keeper grooves; determine necessary action. (P-3)            | ER-227 through ER-231                        | Job Sheets ER-43, ER-44, ER-45        |
| 5. Inspect valve guides for wear; check valve stem-to-guide clearance; determine necessary action. (P-3)  | ER-201, ER-222                               | Job Sheet ER-27                       |
| 6. Inspect valves and valve seats; determine necessary action. (P-3)  | ER-223 through ER-226                        | Job Sheets ER-41, ER-42               |
| 7. Check valve spring assembled height and valve stem height; determine necessary action. (P-3)   | ER-225 through ER-226, ER-230 through ER-231 |                                       |

| <b>B. Cylinder Head and Valve Train Diagnosis and Repair<br/>(continued)</b>  | <b>Student Edition</b>                       | <b>Technical Applications</b> |
|---|--|-------------------------------|
| 8. Inspect pushrods, rocker arms, rocker arm pivots and shafts for wear, bending, cracks, looseness, and blocked oil passages (orifices); determine necessary action. (P-2)   | ER-203 through ER-205                        | Job Sheet ER-30               |
| 9. Inspect valve lifters; determine necessary action. (P-2)   | ER-204                                       | Job Sheet ER-31               |
| 10. Adjust valves (mechanical or hydraulic lifters). (P-1)  | ER-230 through ER-231                        | Job Sheet ER-46               |
| 11. Inspect and replace camshaft and drive belt/chain (includes checking drive gear wear and backlash, end play, sprocket and chain wear, overhead cam drive sprocket(s), drive belt(s), belt tension, tensioners, camshaft reluctor ring/tonewheel, and variable valve timing components). (P-1) | ER-203 through ER-204, ER-257, ER-259        | Job Sheets ER-28, ER-52       |
| 12. Inspect and/or measure camshaft for runout, journal wear and lobe wear. (P-2)   | ER-203 through ER-204                        | Job Sheet ER-29               |
| 13. Inspect camshaft bearing surface for wear, damage, out-of-round, and alignment; determine necessary action. (P-2)   | ER-207                                       | Job Sheet ER-33               |
| 14. Establish camshaft position sensor indexing. (P-1)  | ER-259                                       | Job Sheet ER-54               |
| <b>C. Engine Block Assembly Diagnosis and Repair</b>  | <b>Student Edition</b>                       | <b>Technical Applications</b> |
| 1. Disassemble engine block; clean and prepare components for inspection and reassembly. (P-2)  | ER-177 through ER-187                        | Job Sheet ER-51               |
| 2. Inspect engine block for visible cracks, passage condition, core and gallery plug condition, and surface warpage; determine necessary action. (P-2)  | ER-199 through ER-201, ER-206 through ER-215 | Job Sheet ER-32               |
| 3. Inspect and measure cylinder walls/sleeves for damage, wear, and ridges; determine necessary action. (P-2)   | ER-180 through ER-182, ER-236 through ER-240 | Job Sheets ER-23, ER-24       |
| 4. Deglaze and clean cylinder walls. (P-2)  | ER-236                                       | Job Sheet ER-47               |
| 5. Inspect and measure camshaft bearings for wear, damage, out-of-round, and alignment; determine necessary action. (P-3)   | ER-207                                       | Job Sheet ER-34               |

| <b>C. Engine Block Assembly Diagnosis and Repair</b><br><i>(continued)</i>  | <b>Student Edition</b>                               | <b>Technical Applications</b> |
|---|--|-------------------------------|
| 6. Inspect crankshaft for straightness, journal damage, keyway damage, thrust flange and sealing surface condition, and visual surface cracks; check oil passage condition; measure end play and journal wear; check crankshaft position sensor reluctor ring (where applicable); determine necessary action. (P-1) | ER-208 through ER-210                                | Job Sheet ER-35               |
| 7. Inspect main and connecting rod bearings for damage, and wear; determine necessary action. (P-2)   | ER-211 through ER-213, ER-247                        | Job Sheet ER-38               |
| 8. Identify piston and bearing wear patterns that indicate connecting rod alignment and main bearing bore problems; inspect rod alignment and bearing bore condition. (P-3)   | ER-210 through ER-213                                | Job Sheet ER-37               |
| 9. Inspect and measure piston skirts and ring lands; determine necessary action. (P-2)  | ER-210 through ER-211, ER-245 through ER-246         | Job Sheet ER-48               |
| 10. Remove and replace piston pin. (P-3)  | ER-210 through ER-211                                | Job Sheet ER-48               |
| 11. Determine piston-to-bore clearance. (P-2)   | ER-245   | Job Sheet ER-48               |
| 12. Inspect, measure, and install piston rings. (P-2)   | ER-210 through ER-211, ER-246, ER-255 through ER-256 | Job Sheet ER-49               |
| 13. Inspect auxiliary shaft(s) (balance, intermediate, idler, counterbalance or silencer); inspect shaft(s) and support bearings for damage and wear; determine necessary action; reinstall and time. (P-2)   | ER-214 through ER-215, ER-257, ER-259                | Job Sheet ER-40               |
| 14. Removes, inspect or replace crankshaft vibration damper (harmonic balancer). (P-2)  | ER-260 through ER-261                                | Job Sheet ER-36               |
| 15. Assemble engine block. (P-1)  | ER-251 through ER-267                                | Job Sheets ER-50, ER-51       |

| <b>D. Lubrication and Cooling Systems Diagnosis and Repair</b>  | <b>Student Edition</b> | <b>Technical Applications</b>           |
|---|------------------------|---|
| 1. Perform oil pressure tests; determine necessary action. (P-1)  | ER-163 through ER-165  | Job Sheet ER-19                         |
| 2. Inspect oil pump gears or rotors, housing, pressure relief devices, and pump drive; perform necessary action. (P-2)  | ER-213 through ER-214  | Job Sheet ER-39                         |
| 3. Perform cooling system pressure tests; check coolant condition; inspect and test radiator, pressure cap, coolant recovery tank, and hoses; determine necessary action. (P-1) | ER-136 through ER-140  | Job Sheet ER-5                          |
| 4. Inspect, replace, and adjust drive belts, tensioners, and pulleys; check pulley and belt alignment. (P-1)  | ER-133                 | Diagnostic Sheet ER-1<br>Job Sheet ER-3 |
| 5. Inspect and replace engine cooling and heater system hoses. (P-1)  | ER-132 through ER-133  | Job Sheet ER-2                          |
| 6. Inspect, test, and replace thermostat and gasket/seal. (P-1)   | ER-134                 | Job Sheet ER-4                          |
| 7. Test coolant; drain and recover coolant; flush and refill cooling system with recommended coolant; bleed air as required. (P-1)  | ER-138 through ER-141  | Job Sheet ER-8                          |
| 8. Inspect, remove, and replace water pump. (P-2)   | ER-137                 | Diagnostic Sheet ER-2<br>Job Sheet ER-6 |
| 9. Remove and replace radiator. (P-2)   | ER-141                 | Job Sheet ER-9                          |
| 10. Inspect, and test fans(s) (electrical or mechanical), fan clutch, fan shroud, and air dams. (P-1)   | ER-137 through ER-138  | Job Sheet ER-7                          |
| 11. Inspect auxiliary coolers; determine necessary action. (P-3)  | ER-144                 | Job Sheet ER-10                         |
| 12. Inspect, test, and replace oil temperature and pressure switches and sensors. (P-2)   | ER-144                 | Job Sheet ER-11                         |

| <b>D. Lubrication and Cooling Systems Diagnosis and Repair</b><br><i>(continued)</i> | <b>Student Edition</b>         | <b>Technical Applications</b> |
|--|--------------------------------|-------------------------------|
| 13. Perform oil and filter change. (P-1)   | ER-149 through ER-150          | Job Sheet ER-12               |
| 14. Identify causes of engine overheating. (P-1)                                     | ER-131, ER-132, ER-134, ER-136 |                               |