

# Medium Heavy Vehicle–Diesel Engine

## Student/intern information:

Name \_\_\_\_\_ Date \_\_\_\_\_ Class \_\_\_\_\_

## Vehicle used for this activity:

Year \_\_\_\_\_ Make \_\_\_\_\_ Model \_\_\_\_\_

Odometer \_\_\_\_\_ VIN \_\_\_\_\_

Learning Objective / Task (Cylinder Head and Valve Train)	2007 NATEF Reference Number	2007 NATEF Priority Level
<ul style="list-style-type: none"> <li>Inspect cylinder head for cracks/damage; check mating surfaces for warpage; check condition of passages; inspect core/expansion and gallery plugs; determine needed action.</li> </ul>	B1-3	P-1
<ul style="list-style-type: none"> <li>Disassemble head and inspect valves, guides, seats, springs, retainers, rotators, locks, and seals; determine needed action.</li> </ul>	B1-4	P-3
<ul style="list-style-type: none"> <li>Measure valve head height relative to deck and valve face-to-seat contact; determine needed action.</li> </ul>	B1-5	P-3
<ul style="list-style-type: none"> <li>Inspect injector sleeves and seals; measure injector tip or nozzle protrusion; determine needed action.</li> </ul>	B1-6	P-3
<ul style="list-style-type: none"> <li>Inspect valve train components; determine needed action.</li> </ul>	B1-7	P-1

Time off \_\_\_\_\_

Time on \_\_\_\_\_

Total time \_\_\_\_\_

### Recommended Resource Materials

- CDX Automotive program
- CDX eTextbook
- Technical service bulletins, shop manuals, and any other information applicable to the specific vehicle or components you are working on
- Class notes

### Materials Required

- Vehicle with possible engine concern
- Vehicle manufacturer's workshop manual
- Manufacturer-specific tools depending on the concern
- Vehicle lifting equipment if applicable

### For every task in Diesel Engines, the following safety task must be strictly enforced:

Comply with personal and environmental safety practices associated with clothing; eye protection; hand protection; proper lifting practices; hand tools; power equipment; proper ventilation; and the handling, storage, and disposal of fuels/chemicals/materials in accordance with federal, state, and local regulations.

### Some Safety Issues to Consider

- Diagnosis of this fault may require test driving the vehicle on the school grounds or on a hoist, both of which carry severe risks. Attempt this task only with full permission from your supervisor/instructor and follow all the guidelines exactly.
- Caution: If you are working in an area where there could be "brake dust" present (may contain asbestos, which has been determined to cause cancer when inhaled or ingested), ensure you wear and use all OSHA-approved asbestos protective/removal equipment.
- Lifting equipment such as vehicle jacks and stands, vehicle hoists, and engine hoists are important tools that increase productivity and make the job easier. However, they can also cause severe injury or death if

used improperly. Make sure you follow the manufacturer's operation procedures. Also make sure you have your supervisor/instructor's permission to use any particular type of lifting equipment.

- 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 federal, state, and local regulations.
- Always wear the correct protective eyewear and clothing and use the appropriate safety equipment, as well as fender covers, seat protectors, and floor mat protectors.
- Make sure you understand and observe all legislative and personal safety procedures when carrying out practical assignments. If you are unsure of what these are, ask your supervisor/instructor.

### Performance Standard

**0–No exposure:** No information or practice provided during the program; complete training required

**1–Exposure only:** General information provided with no practice time; close supervision needed; additional training required

**2–Limited practice:** Has practiced job during training program; additional training required to develop skill

**3–Moderately skilled:** Has performed job independently during training program; limited additional training may be required

**4–Skilled:** Can perform job independently with no additional training

**TASK** Inspect cylinder head for cracks/damage; check mating surfaces for warpage; check condition of passages; inspect core/expansion and gallery plugs; determine needed action.

B1-3

1. Determine the type of crack detection process(es) that your workshop utilizes.
  - a. Magnetic particle inspection: Yes: \_\_\_\_\_ No: \_\_\_\_\_
  - b. Penetrating dyes: Yes: \_\_\_\_\_ No: \_\_\_\_\_
  - c. Pressure testing: Yes: \_\_\_\_\_ No: \_\_\_\_\_
  - d. Vacuum testing: Yes: \_\_\_\_\_ No: \_\_\_\_\_
  - e. Ultrasonic testing: Yes: \_\_\_\_\_ No: \_\_\_\_\_
  - f. None of the above: Yes: \_\_\_\_\_
    - i. If none of the above, name the method your workshop uses: \_\_\_\_\_
  - g. Outsource testing and repairs: Yes: \_\_\_\_\_ No: \_\_\_\_\_
2. Reference the manufacturer's workshop; list the procedure and all safety precautions that must be observed when carrying out an inspection of a cylinder head for cracks/damage.
  - a. List the steps involved in inspecting a cylinder head for cracks/damage:  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_
  - b. Determine what safety precautions must be observed when inspecting a cylinder head for cracks/damage:  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Time off \_\_\_\_\_

Time on \_\_\_\_\_

Total time \_\_\_\_\_

3. Discuss these procedures and safety precautions with your instructor. Determine what method of testing will be carried out:

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4. If directed by your instructor, commence crack testing the cylinder head. Follow the procedures listed above and reference the manufacturer's workshop.

a. Meets the manufacturer's specifications: Yes: \_\_\_\_\_ No: \_\_\_\_\_

b. If no, list the areas of cracking and your recommendations for any rectifications:

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5. Reference the workshop manual; list the procedure for checking for warpage of the cylinder head mating surfaces:

a. List the steps involved in checking the cylinder head for warpage:

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b. Determine what safety precautions must be observed when checking the cylinder head for warpage:

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6. Following the procedures listed above, and while referencing the manufacturer's workshop, check for any warpage of the cylinder head mating surfaces.

a. Meets the manufacturer's specifications: Yes: \_\_\_\_\_ No: \_\_\_\_\_

b. If no, list your recommendations for any rectifications:

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7. Referring to the workshop manual, check the condition of passages and inspect the core/expansion and gallery plugs.

a. Meets the manufacturer's specifications: Yes: \_\_\_\_\_ No: \_\_\_\_\_

b. If no, list the areas of concerns and your recommendations for any rectifications:

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8. Discuss the findings with your instructor.

Performance Rating

2007 NATEF Reference Number: B1-3

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Supervisor/instructor signature \_\_\_\_\_ Date \_\_\_\_\_

**▶ TASK** Disassemble head and inspect valves, guides, seats, springs, retainers, rotators, locks, and seals; determine needed action.

B1-4

Time off \_\_\_\_\_

Time on \_\_\_\_\_

Total time \_\_\_\_\_

1. While referencing the appropriate workshop manual, dismantle the cylinder head using the recommended special tools. When removing the components, store all the nuts and bolts in order in storage trays.

a. As you dismantle each valve assembly, keep them in order so that they can be evaluated as a unit. Lay out the components so as to identify their original position.

b. Remove and inspect the retainers.

i. Meets the manufacturer's specifications: Yes: \_\_\_\_\_ No: \_\_\_\_\_

c. Remove and inspect the rotators.

i. Meets the manufacturer's specifications: Yes: \_\_\_\_\_ No: \_\_\_\_\_

d. Remove and inspect the springs for twists, distortions, and nicks.

i. Meets the manufacturer's specifications: Yes: \_\_\_\_\_ No: \_\_\_\_\_

e. Remove and inspect the seals.

i. Meets the manufacturer's specifications: Yes: \_\_\_\_\_ No: \_\_\_\_\_

f. Remove and inspect the valves.

i. Meets the manufacturer's specifications: Yes: \_\_\_\_\_ No: \_\_\_\_\_

g. Inspect the valve seats.

i. Meets the manufacturer's specifications: Yes: \_\_\_\_\_ No: \_\_\_\_\_

ii. If no to any of the above, list the areas of concerns and your recommendations for any rectifications:

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

2. Discuss the findings with your instructor.

Performance Rating

2007 NATEF Reference Number: B1-4

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Supervisor/instructor signature \_\_\_\_\_ Date \_\_\_\_\_

**TASK**

Measure valve head height relative to deck and valve face-to-seat contact; determine needed action.

B1-5

Time off \_\_\_\_\_

Time on \_\_\_\_\_

Total time \_\_\_\_\_

1. While referencing the appropriate workshop manual, measure valve head height relative to the deck and valve face-to-seat contact using the recommended special tools. Record your findings in the tables below.

Cylinder N°	Valve head height relative to deck					
	Valve 1	Valve 2	Valve 3	Valve 4	Valve 5	Valve 6
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						

Cylinder N°	Valve face-to-seat contact (Use coding below)					
	Valve 1	Valve 2	Valve 3	Valve 4	Valve 5	Valve 6
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						

**Valve face-to-seat contact coding: Unserviceable = US; Requires Servicing = RS; Serviceable = S; Requires Replacement = RR**

- a. List the areas of concern and your recommendations for any rectifications:

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

2. Discuss your findings with your instructor.

Performance Rating

2007 NATEF Reference Number: B1-5

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Supervisor/instructor signature \_\_\_\_\_ Date \_\_\_\_\_

**▶ TASK** Inspect injector sleeves and seals; measure injector tip or nozzle protrusion; determine needed action.

**B1-6**

1. While referencing the appropriate workshop manual, inspect injector sleeves and seals.

a. Meets the manufacturer's specifications: Yes: \_\_\_\_\_ No: \_\_\_\_\_

b. If no, list the areas of concern and your recommendations for any rectifications:

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

2. While referencing the appropriate workshop manual and using the recommended special tools, measure the injector tip or nozzle protrusion and record your findings in the table below.

Cylinder N°	Injector tip or nozzle protrusion
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	

a. List the areas of concern and your recommendations for any rectifications:

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Time off \_\_\_\_\_

Time on \_\_\_\_\_

Total time \_\_\_\_\_

- Discuss your findings with your instructor.

Performance Rating

2007 NATEF Reference Number: B1-6

0

1

2

3

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Supervisor/instructor signature \_\_\_\_\_ Date \_\_\_\_\_

**▶ TASK** Inspect valve train components; determine needed action

B1-7

- While referencing the appropriate workshop manual, inspect the injector sleeves and seals. Inspect and report on all the components that are applicable to your task in the table below.

Component	Serviceable	Repairable	Unserviceable
Camshaft/lobes			
Cam Followers			
Bucket tappets			
Adjusting shims			
Rockers			
Cam rollers			
Cam gear(s)			
Cam retaining caps			
Timing belt/chain			
Rocker shaft(s)			

Time off \_\_\_\_\_

Time on \_\_\_\_\_

Total time \_\_\_\_\_

- Valve inspection and assessment:

Cylinder N°	Valve spring height (inches or mm) and tension (ft/lbs or Nm)							
	Valve 1	Valve 2	Valve 3	Valve 4	Valve 5	Valve 6	Valve 7	Valve 8
	Height	Tension	Height	Tension	Height	Tension	Height	Tension
1								
2								
3								
4								
5								
6								
7								
8								
9								
10								

- Meets the manufacturer's specifications: Yes: \_\_\_\_\_ No: \_\_\_\_\_

b. If no, list the areas of concern and your recommendations for any rectifications:

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3. Discuss the findings with your instructor.

**Performance Rating**

**2007 NATEF Reference Number: B1-7**

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Supervisor/instructor signature \_\_\_\_\_ Date \_\_\_\_\_