

TEST PROJECT HEAVY VEHICLE MAINTENANCE

WSC2015_TPD4_A_Diesel_Engine_Systems_actual

Submitted by: Bobby Haraba

Name: WSC2015 Experts

Member country/region: All registered Members





COMPETITOR INSTRUCTIONS

MODULE A – DIESEL ENGINE SYSTEMS

EQUIPMENT: CUMMINS ISL DIESEL ENGINE

TIME ALLOWED

Familiarization time	15 minutes
Module duration	3 hours
Total breaks	15 minutes

COMPETITOR NAME	COUNTRY CODE	MODULE	TRANSLATED LANGUAGE
		A	EN

MARKING SUMMARY

SECTION	POSSIBLE MARK	WORLDSKILLS STANDARDS SPECIFICATION
A1	2.4	<p>The individual shall be able to:</p> <ul style="list-style-type: none">• Consistently and diligently follow the best procedures to protect health and safety in the working environment.• Use appropriate personal protective equipment. At all times individuals must wear safety footwear and eye protection with side shields. As needed, individuals must wear ear protection, respiratory protection, and either barrier gloves or fitted mechanic's gloves.• Select and handle appropriate substances, materials, and equipment safely and in compliance with manufacturers' instructions.• Dispose of substances and materials safely and sustainably.• Predict and eliminate all risks related to required activities.• Prepare and maintain an orderly workspace with regard to health and safety, and restore the workspace for the next technician.
A2	1.8	<p>The individual shall be able to:</p> <ul style="list-style-type: none">• Organize and implement appropriate decisions regarding maintenance or repair.• Use the methods best suited to complete each task.



SECTION		POSSIBLE MARK	WORLDSKILLS STANDARDS SPECIFICATION
A3	Use and interpretation of technical information	1.8	<p>The individual shall be able to:</p> <ul style="list-style-type: none"> Choose the appropriate sources of technical information applicable to the task. Read, interpret, and extract technical information from the chosen sources. Apply technical information to the task. Understand and accurately use the technical language associated with the task.
A4	Precision measurement	1.8	<p>The individual shall be able to:</p> <ul style="list-style-type: none"> Demonstrate an understanding of the types of diagnostic and precision measurement tools in both imperial and metric units. Demonstrate an understanding of the purposes, proper handling, and use of the types of diagnostic and precision measurement tools. Choose, use, and interpret the results of diagnostic and precision measurement tools to produce accurate measurements to determine component reusability and to find faults in components and systems.
A5	Fault finding	1.8	<p>The individual shall be able to:</p> <ul style="list-style-type: none"> Recognize and diagnose faults in heavy vehicle components or systems. Choose, use, and interpret the results of appropriate diagnostic methods and equipment. Apply the results of diagnostic testing and any relevant calculations to correctly identify and isolate faults related to the task.
A6	Appropriate use of tools	1.8	<p>The individual shall be able to:</p> <ul style="list-style-type: none"> Choose and properly use, maintain, and store appropriate tools for the task.
A7	Maintenance or repair of components or systems	1.8	<p>The individual shall be able to:</p> <ul style="list-style-type: none"> Choose the appropriate procedures to meet manufacturers' specifications for maintenance or repair of diesel engine systems; hydraulic systems; pneumatic systems; electrical and electronic systems; drive train systems; heating, ventilation, and air conditioning (HVAC) systems. Predict and alleviate the effects of the chosen procedures on other components or systems.
A8	Communication of maintenance or repair process	1.8	<p>The individual shall be able to:</p> <ul style="list-style-type: none"> Briefly and accurately record technical information about each task. Can be point form.
Total possible marks		15.00	



COMPETITOR NAME	COUNTRY CODE	MODULE	TRANSLATED LANGUAGE
		A	EN

INSTRUCTIONS

You must complete diagnosis and repair in the order shown below.

ENGLISH	TRANSLATION
<p>There are two separate tasks to complete. The engine will not run at any time during the competition. Work must be carried out and completed in the order shown below. All measurements and fault locations must be shown to the Expert using meters, torque wrenches, and wiring diagrams.</p>	
<p>1. Perform the Overhead Set procedure Valve adjustment, including the Engine Compression Brake. Briefly and very specifically document any faults found, and what the repair procedure is.</p>	
<p>2. Record engine fault code number(s) using Cummins Insite (electronic service diagnostic program). Diagnose the cause for the fault code, but do not repair the engine fault(s).</p>	

TEST PROJECT HEAVY VEHICLE MAINTENANCE

WSC2015_TPD4_B_Hydraulic_Systems_actual

Submitted by: Bobby Haraba

Name: WSC2015 Experts

Member country/region: All registered Members





COMPETITOR INSTRUCTIONS

MODULE B – HYDRAULIC SYSTEMS

EQUIPMENT: CASE 721 WHEEL LOADER

TIME ALLOWED

Familiarization time	15 minutes
Module duration	3 hours
Total breaks	15 minutes

COMPETITOR NAME	COUNTRY CODE	MODULE	TRANSLATED LANGUAGE
		B	EN

MARKING SUMMARY

SECTION	POSSIBLE MARK	WORLDSKILLS STANDARDS SPECIFICATION
B1	2.4	<p>The individual shall be able to:</p> <ul style="list-style-type: none">• Consistently and diligently follow the best procedures to protect health and safety in the working environment.• Use appropriate personal protective equipment. At all times individuals must wear safety footwear and eye protection with side shields. As needed, individuals must wear ear protection, respiratory protection, and either barrier gloves or fitted mechanic's gloves.• Select and handle appropriate substances, materials, and equipment safely and in compliance with manufacturers' instructions.• Dispose of substances and materials safely and sustainably.• Predict and eliminate all risks related to required activities.• Prepare and maintain an orderly workspace with regard to health and safety, and restore the workspace for the next technician.
B2	1.8	<p>The individual shall be able to:</p> <ul style="list-style-type: none">• Organize and implement appropriate decisions regarding maintenance or repair.• Use the methods best suited to complete each task.



SECTION		POSSIBLE MARK	WORLDSKILLS STANDARDS SPECIFICATION
B3	Use and interpretation of technical information	1.8	<p>The individual shall be able to:</p> <ul style="list-style-type: none"> • Choose the appropriate sources of technical information applicable to the task. • Read, interpret, and extract technical information from the chosen sources. • Apply technical information to the task. • Understand and accurately use the technical language associated with the task.
B4	Precision measurement	1.8	<p>The individual shall be able to:</p> <ul style="list-style-type: none"> • Demonstrate an understanding of the types of diagnostic and precision measurement tools in both imperial and metric units. • Demonstrate an understanding of the purposes, proper handling, and use of the types of diagnostic and precision measurement tools. • Choose, use, and interpret the results of diagnostic and precision measurement tools to produce accurate measurements to determine component reusability and to find faults in components and systems.
B5	Fault finding	1.8	<p>The individual shall be able to:</p> <ul style="list-style-type: none"> • Recognize and diagnose faults in heavy vehicle components or systems. • Choose, use, and interpret the results of appropriate diagnostic methods and equipment. • Apply the results of diagnostic testing and any relevant calculations to correctly identify and isolate faults related to the task.
B6	Appropriate use of tools	1.8	<p>The individual shall be able to:</p> <ul style="list-style-type: none"> • Choose and properly use, maintain, and store appropriate tools for the task.
B7	Maintenance or repair of components or systems	1.8	<p>The individual shall be able to:</p> <ul style="list-style-type: none"> • Choose the appropriate procedures to meet manufacturers' specifications for maintenance or repair of diesel engine systems; hydraulic systems; pneumatic systems; electrical and electronic systems; drive train systems; heating, ventilation, and air conditioning (HVAC) systems. • Predict and alleviate the effects of the chosen procedures on other components or systems.
B8	Communication of maintenance or repair process	1.8	<p>The individual shall be able to:</p> <ul style="list-style-type: none"> • Briefly and accurately record technical information about each task. Can be point form.



SECTION	POSSIBLE MARK	WORLDSKILLS STANDARDS SPECIFICATION
Total possible marks	15.00	

COMPETITOR NAME	COUNTRY CODE	MODULE	TRANSLATED LANGUAGE
		B	EN

INSTRUCTIONS

ENGLISH	TRANSLATION
<ul style="list-style-type: none">Test, adjust, diagnose, and repair hydraulic components and systems. <p>The engine can be run at any time during the competition.</p> <p>All measurements and fault locations must be shown to the Expert using meters, gauges, and wiring diagrams.</p>	
<p>Customer information.</p> <p>The client of a wheel loader Brand CASE 721E model complains that the hydraulic system of the lifting circuit is not working.</p> <ol style="list-style-type: none">1- Diagnose and repair;2- Record your measurements;	

TEST PROJECT HEAVY VEHICLE MAINTENANCE

WSC2015_TPD4_C_Electrical_and_Electronic_Systems_actual

Submitted by: Bobby Haraba

Name: WSC2015 Experts

Member country/region: All registered Members





COMPETITOR INSTRUCTIONS

MODULE C – ELECTRICAL AND ELECTRONIC SYSTEMS

EQUIPMENT: CATERPILLAR 312D EXCAVATOR

TIME ALLOWED

Familiarization time	15 minutes
Module duration	3 hours
Total breaks	15 minutes

COMPETITOR NAME	COUNTRY CODE	MODULE	TRANSLATED LANGUAGE
		C	EN

MARKING SUMMARY

SECTION	POSSIBLE MARK	WORLDSKILLS STANDARDS SPECIFICATION
C1 Safety	2.4	The individual shall be able to: <ul style="list-style-type: none">• Consistently and diligently follow the best procedures to protect health and safety in the working environment.• Use appropriate personal protective equipment. At all times individuals must wear safety footwear and eye protection with side shields. As needed, individuals must wear ear protection, respiratory protection, and either barrier gloves or fitted mechanic's gloves.• Select and handle appropriate substances, materials, and equipment safely and in compliance with manufacturers' instructions.• Dispose of substances and materials safely and sustainably.• Predict and eliminate all risks related to required activities.• Prepare and maintain an orderly workspace with regard to health and safety, and restore the workspace for the next technician.
C2 Logical order of repair	1.8	The individual shall be able to: <ul style="list-style-type: none">• Organize and implement appropriate decisions regarding maintenance or repair.• Use the methods best suited to complete each task.



SECTION		POSSIBLE MARK	WORLDSKILLS STANDARDS SPECIFICATION
C3	Use and interpretation of technical information	1.8	<p>The individual shall be able to:</p> <ul style="list-style-type: none"> • Choose the appropriate sources of technical information applicable to the task. • Read, interpret, and extract technical information from the chosen sources. • Apply technical information to the task. • Understand and accurately use the technical language associated with the task.
C4	Precision measurement	1.8	<p>The individual shall be able to:</p> <ul style="list-style-type: none"> • Demonstrate an understanding of the types of diagnostic and precision measurement tools in both imperial and metric units. • Demonstrate an understanding of the purposes, proper handling, and use of the types of diagnostic and precision measurement tools. • Choose, use, and interpret the results of diagnostic and precision measurement tools to produce accurate measurements to determine component reusability and to find faults in components and systems.
C5	Fault finding	1.8	<p>The individual shall be able to:</p> <ul style="list-style-type: none"> • Recognize and diagnose faults in heavy vehicle components or systems. • Choose, use, and interpret the results of appropriate diagnostic methods and equipment. • Apply the results of diagnostic testing and any relevant calculations to correctly identify and isolate faults related to the task.
C6	Appropriate use of tools	1.8	<p>The individual shall be able to:</p> <ul style="list-style-type: none"> • Choose and properly use, maintain, and store appropriate tools for the task.
C7	Maintenance or repair of components or systems	1.8	<p>The individual shall be able to:</p> <ul style="list-style-type: none"> • Choose the appropriate procedures to meet manufacturers' specifications for maintenance or repair of diesel engine systems; hydraulic systems; pneumatic systems; electrical and electronic systems; drive train systems; heating, ventilation, and air conditioning (HVAC) systems. • Predict and alleviate the effects of the chosen procedures on other components or systems.
C8	Communication of maintenance or repair process	1.8	<p>The individual shall be able to:</p> <ul style="list-style-type: none"> • Briefly and accurately record technical information about each task. Can be point form.



SECTION	POSSIBLE MARK	WORLDSKILLS STANDARDS SPECIFICATION
Total possible marks	15.00	

COMPETITOR NAME	COUNTRY CODE	MODULE	TRANSLATED LANGUAGE
		C	EN

INSTRUCTIONS

ENGLISH	TRANSLATION
<p>There are nine separate tasks to complete. The engine will not run at any time during the competition. Work must be carried out and completed in the order shown below. All measurements and fault locations must be shown to the Expert using meters and wiring diagrams.</p>	
<p>Introduction: On this excavator different measurements and tests have been carried out. Now it should be put in order so it can be delivered. The fuel tank has already been filled up. Safety is important so therefore work in safe manner and obey all the applicable skill specific rules.</p>	
<p>Part 1. Sit in the cabin and switch the ignition on. What happens? Find the electrical fault and fix it. You can use the schematic. Do not loosen the nut on the battery cover for safety reasons. On the schematic circle the part which caused this failure.</p>	
<p>Part 2. Sit in the cabin and find the battery voltage on the operator monitor. Note it on the provided sheet. Is this measurement OK or not? Explain why?</p>	



ENGLISH	TRANSLATION
<p>Part 3. Find the fault which causes this voltage reading and fix it. On the schematic, circle the defective part.</p>	
<p>Part 4. Sit in the cabin, switch the ignition on. Is there anything else not OK? If necessary, take the proper action.</p>	
<p>Part 5. Check all electrical circuits as far it is possible with the engine standing. Identify the elements that are not working and note it on the provided sheet. Find the Problems and fix it. On the schematic mark the electrical line from the battery to the identified elements.</p>	
<p>Part 6. Sit in the cabin and find on the operator monitor the temperature from the hydraulic oil. Is this value OK? Find the fault and fix it. On the schematic, mark the electrical line between the faulty part and the gauge in the operator monitor.</p>	
<p>Part 7. The expert will give you a relay. Test it according to the relay test procedure. Note down the reading with the proper unit of measure. Is the relay OK?</p>	
<p>Part 8. Check the terminating resistor number 65. Note down the measurement with the proper unit of measure. Is it OK?</p>	
<p>Part 9. Measure the voltage of pin E of the CAN data link at the "Electronic Technician Console (ET Conn) and note it down on the sheet. Is the voltage OK?</p>	

TEST PROJECT HEAVY VEHICLE MAINTENANCE

MODULE D – DRIVE TRAIN SYSTEMS

WSC2015_TPD4_D_Drive_Train_Systems_actual

Submitted by: Bobby Haraba

Name: WSC2015 Experts

Member country/region: All registered Members





COMPETITOR INSTRUCTIONS

MODULE D – DRIVE TRAIN SYSTEMS

EQUIPMENT: MERITOR DRIVE AXLE

TIME ALLOWED

Familiarization time	15 minutes
Module duration	3 hours
Total breaks	15 minutes

COMPETITOR NAME	COUNTRY CODE	MODULE	TRANSLATED LANGUAGE
		D	EN

MARKING SUMMARY

SECTION	POSSIBLE MARK	WORLDSKILLS STANDARDS SPECIFICATION	
D1	Safety	2.4	The individual shall be able to: <ul style="list-style-type: none">• Consistently and diligently follow the best procedures to protect health and safety in the working environment.• Use appropriate personal protective equipment. At all times individuals must wear safety footwear and eye protection with side shields. As needed, individuals must wear ear protection, respiratory protection, and either barrier gloves or fitted mechanic's gloves.• Select and handle appropriate substances, materials, and equipment safely and in compliance with manufacturers' instructions.• Dispose of substances and materials safely and sustainably.• Predict and eliminate all risks related to required activities.• Prepare and maintain an orderly workspace with regard to health and safety, and restore the workspace for the next technician.
D2	Logical order of repair	1.8	The individual shall be able to: <ul style="list-style-type: none">• Organize and implement appropriate decisions regarding maintenance or repair.• Use the methods best suited to complete each task.



SECTION		POSSIBLE MARK	WORLDSKILLS STANDARDS SPECIFICATION
D3	Use and interpretation of technical information	1.8	<p>The individual shall be able to:</p> <ul style="list-style-type: none"> • Choose the appropriate sources of technical information applicable to the task. • Read, interpret, and extract technical information from the chosen sources. • Apply technical information to the task. • Understand and accurately use the technical language associated with the task.
D4	Precision measurement	1.8	<p>The individual shall be able to:</p> <ul style="list-style-type: none"> • Demonstrate an understanding of the types of diagnostic and precision measurement tools in both imperial and metric units. • Demonstrate an understanding of the purposes, proper handling, and use of the types of diagnostic and precision measurement tools. • Choose, use, and interpret the results of diagnostic and precision measurement tools to produce accurate measurements to determine component reusability and to find faults in components and systems.
D5	Fault finding	1.8	<p>The individual shall be able to:</p> <ul style="list-style-type: none"> • Recognize and diagnose faults in heavy vehicle components or systems. • Choose, use, and interpret the results of appropriate diagnostic methods and equipment. • Apply the results of diagnostic testing and any relevant calculations to correctly identify and isolate faults related to the task.
D6	Appropriate use of tools	1.8	<p>The individual shall be able to:</p> <ul style="list-style-type: none"> • Choose and properly use, maintain, and store appropriate tools for the task.
D7	Maintenance or repair of components or systems	1.8	<p>The individual shall be able to:</p> <ul style="list-style-type: none"> • Choose the appropriate procedures to meet manufacturers' specifications for maintenance or repair of diesel engine systems; hydraulic systems; pneumatic systems; electrical and electronic systems; drive train systems; heating, ventilation, and air conditioning (HVAC) systems. • Predict and alleviate the effects of the chosen procedures on other components or systems.



SECTION		POSSIBLE MARK	WORLDSKILLS STANDARDS SPECIFICATION
D8	Communication of maintenance or repair process	1.8	The individual shall be able to: <ul style="list-style-type: none">Briefly and accurately record technical information about each task. Can be point form.
Total possible marks		15.00	

COMPETITOR NAME	COUNTRY CODE	MODULE	TRANSLATED LANGUAGE
		D	EN

INSTRUCTIONS

ENGLISH	TRANSLATION
<p>There are four separate tasks to complete. Work must be carried out and completed in the order shown below.</p> <p>Where there are no manufacture procedures, the competitor must complete the task using his own procedures and knowledge.</p> <p>All measurements and fault locations must be shown to the Expert using torque wrenches, and diagrams.</p>	
<p>1. Prior to disassembling this carrier, inspect and briefly record the gear tooth contact pattern, the back lash, the total bearing preload, and the drive pinion preload.</p>	
<p>2. Measure and record the total thickness of pinion depth shim pack.</p> <p>Reinstall the pinion using the original pinion depth shim pack.</p>	
<p>3. Reassemble the drive ring gear to obtain the best gear tooth-contact pattern possible.</p> <p>Briefly and very specifically record your results.</p>	
<p>4. Is the pattern acceptable?</p> <p>If not, what is required to correct it?</p>	

TEST PROJECT HEAVY VEHICLE MAINTENANCE

WSC2015_TPD4_E_Heating_Ventilation_and_Air_Conditioning_Systems_actual

Submitted by: Bobby Haraba

Name: WSC2015 Experts

Member country/region: All registered Members





COMPETITOR INSTRUCTIONS

MODULE E – HEATING, VENTILATION, AND AIR CONDITIONING (HVAC) SYSTEMS

EQUIPMENT: CASE ??? SKID STEER LOADER

TIME ALLOWED

Familiarization time	15 minutes
Module duration	3 hours
Total breaks	15 minutes

COMPETITOR NAME	COUNTRY CODE	MODULE	TRANSLATED LANGUAGE
		E	EN

MARKING SUMMARY

SECTION	POSSIBLE MARK	WORLDSKILLS STANDARDS SPECIFICATION
E1	2.4	<p>The individual shall be able to:</p> <ul style="list-style-type: none">• Consistently and diligently follow the best procedures to protect health and safety in the working environment.• Use appropriate personal protective equipment. At all times individuals must wear safety footwear and eye protection with side shields. As needed, individuals must wear ear protection, respiratory protection, and either barrier gloves or fitted mechanic's gloves.• Select and handle appropriate substances, materials, and equipment safely and in compliance with manufacturers' instructions.• Dispose of substances and materials safely and sustainably.• Predict and eliminate all risks related to required activities.• Prepare and maintain an orderly workspace with regard to health and safety, and restore the workspace for the next technician.
E2	1.8	<p>The individual shall be able to:</p> <ul style="list-style-type: none">• Organize and implement appropriate decisions regarding maintenance or repair.• Use the methods best suited to complete each task.



SECTION		POSSIBLE MARK	WORLDSKILLS STANDARDS SPECIFICATION
E3	Use and interpretation of technical information	1.8	<p>The individual shall be able to:</p> <ul style="list-style-type: none"> • Choose the appropriate sources of technical information applicable to the task. • Read, interpret, and extract technical information from the chosen sources. • Apply technical information to the task. • Understand and accurately use the technical language associated with the task.
E4	Precision measurement	1.8	<p>The individual shall be able to:</p> <ul style="list-style-type: none"> • Demonstrate an understanding of the types of diagnostic and precision measurement tools in both imperial and metric units. • Demonstrate an understanding of the purposes, proper handling, and use of the types of diagnostic and precision measurement tools. • Choose, use, and interpret the results of diagnostic and precision measurement tools to produce accurate measurements to determine component reusability and to find faults in components and systems.
E5	Fault finding	1.8	<p>The individual shall be able to:</p> <ul style="list-style-type: none"> • Recognize and diagnose faults in heavy vehicle components or systems. • Choose, use, and interpret the results of appropriate diagnostic methods and equipment. • Apply the results of diagnostic testing and any relevant calculations to correctly identify and isolate faults related to the task.
E6	Appropriate use of tools	1.8	<p>The individual shall be able to:</p> <ul style="list-style-type: none"> • Choose and properly use, maintain, and store appropriate tools for the task.
E7	Maintenance or repair of components or systems	1.8	<p>The individual shall be able to:</p> <ul style="list-style-type: none"> • Choose the appropriate procedures to meet manufacturers' specifications for maintenance or repair of diesel engine systems; hydraulic systems; pneumatic systems; electrical and electronic systems; drive train systems; heating, ventilation, and air conditioning (HVAC) systems. • Predict and alleviate the effects of the chosen procedures on other components or systems.
E8	Communication of maintenance or repair process	1.8	<p>The individual shall be able to:</p> <ul style="list-style-type: none"> • Briefly and accurately record technical information about each task. Can be point form.



SECTION	POSSIBLE MARK	WORLDSKILLS STANDARDS SPECIFICATION
Total possible marks	15.00	

COMPETITOR NAME	COUNTRY CODE	MODULE	TRANSLATED LANGUAGE
		E	EN

INSTRUCTIONS

You must complete diagnosis and repair in the order shown below.

ENGLISH	TRANSLATION
<p>There are two separate tasks to complete. The engine can be run at any time during the competition. Work must be carried out and completed in the order shown below. All measurements and fault locations must be shown to the Expert using meters, gauges, charts, and diagrams. What you have to do:</p>	
<ul style="list-style-type: none"> • Check the heater on its function. • To this purpose, the service documents are stored on the computer. • Pay attention to the safety regulations during the work. 	
<ul style="list-style-type: none"> • Create drawing of the heating system coolant circuit. 	
<ul style="list-style-type: none"> • Measure the maximum vent temperature. • Measure the maximum vent temperature when heating control set on, without air-conditioning. • If you find a heating system error record it on paper. 	
<ul style="list-style-type: none"> • Check the function of air conditioning. • The service manual is on the computer. 	
<ul style="list-style-type: none"> • Create a rough drawing function of air conditioning refrigerant circuit. 	
<ul style="list-style-type: none"> • Measure the vent temperature with air conditioning turned on. 	



ENGLISH	TRANSLATION
<ul style="list-style-type: none">• Check the air conditioning system for leaks using the leak detector.	
<ul style="list-style-type: none">• Check how much refrigerant is present in the air conditioning system.	
<ul style="list-style-type: none">• Write down how much refrigerant must be filled in the air conditioning system?	
<ul style="list-style-type: none">• Check the function of the air conditioner according to the manual and refill.	
<ul style="list-style-type: none">• Check the pressure on the high pressure side and the low pressure side after repair.	
<ul style="list-style-type: none">• Disconnect wire connector to condenser fan and run A/C.• What increases the pressure on the high-pressure side now? Write your answer.• If you find an air conditioning error, record it on paper.• Create a chart showing the vent and pressure measurements results.	

TEST PROJECT HEAVY VEHICLE MAINTENANCE

WSC2015_TPD4_F_Steering_and_Brake_Systems_actual

Submitted by: Bobby Haraba

Name: WSC2015 Experts

Member country/region: All registered Members





COMPETITOR INSTRUCTIONS

MODULE F – STEERING AND BRAKE SYSTEMS

EQUIPMENT: MERCEDES AXOR TRUCK

TIME ALLOWED

Familiarization time	15 minutes
Module duration	3 hours
Total breaks	15 minutes

COMPETITOR NAME	COUNTRY CODE	MODULE	TRANSLATED LANGUAGE
		F	EN

MARKING SUMMARY

SECTION	POSSIBLE MARK	WORLDSKILLS STANDARDS SPECIFICATION	
F1	Safety	2.4	The individual shall be able to: <ul style="list-style-type: none">• Consistently and diligently follow the best procedures to protect health and safety in the working environment.• Use appropriate personal protective equipment. At all times individuals must wear safety footwear and eye protection with side shields. As needed, individuals must wear ear protection, respiratory protection, and either barrier gloves or fitted mechanic's gloves.• Select and handle appropriate substances, materials, and equipment safely and in compliance with manufacturers' instructions.• Dispose of substances and materials safely and sustainably.• Predict and eliminate all risks related to required activities.• Prepare and maintain an orderly workspace with regard to health and safety, and restore the workspace for the next technician.
F2	Logical order of repair	1.8	The individual shall be able to: <ul style="list-style-type: none">• Organize and implement appropriate decisions regarding maintenance or repair.• Use the methods best suited to complete each task.



SECTION		POSSIBLE MARK	WORLDSKILLS STANDARDS SPECIFICATION
F3	Use and interpretation of technical information	1.8	<p>The individual shall be able to:</p> <ul style="list-style-type: none"> • Choose the appropriate sources of technical information applicable to the task. • Read, interpret, and extract technical information from the chosen sources. • Apply technical information to the task. • Understand and accurately use the technical language associated with the task.
F4	Precision measurement	1.8	<p>The individual shall be able to:</p> <ul style="list-style-type: none"> • Demonstrate an understanding of the types of diagnostic and precision measurement tools in both imperial and metric units. • Demonstrate an understanding of the purposes, proper handling, and use of the types of diagnostic and precision measurement tools. • Choose, use, and interpret the results of diagnostic and precision measurement tools to produce accurate measurements to determine component reusability and to find faults in components and systems.
F5	Fault finding	1.8	<p>The individual shall be able to:</p> <ul style="list-style-type: none"> • Recognize and diagnose faults in heavy vehicle components or systems. • Choose, use, and interpret the results of appropriate diagnostic methods and equipment. • Apply the results of diagnostic testing and any relevant calculations to correctly identify and isolate faults related to the task.
F6	Appropriate use of tools	1.8	<p>The individual shall be able to:</p> <ul style="list-style-type: none"> • Choose and properly use, maintain, and store appropriate tools for the task.
F7	Maintenance or repair of components or systems	1.8	<p>The individual shall be able to:</p> <ul style="list-style-type: none"> • Choose the appropriate procedures to meet manufacturers' specifications for maintenance or repair of diesel engine systems; hydraulic systems; pneumatic systems; electrical and electronic systems; drive train systems; heating, ventilation, and air conditioning (HVAC) systems. • Predict and alleviate the effects of the chosen procedures on other components or systems.
F8	Communication of maintenance or repair process	1.8	<p>The individual shall be able to:</p> <ul style="list-style-type: none"> • Briefly and accurately record technical information about each task. Can be point form.



SECTION	POSSIBLE MARK	WORLDSKILLS STANDARDS SPECIFICATION
Total possible marks	15.00	

COMPETITOR NAME	COUNTRY CODE	MODULE	TRANSLATED LANGUAGE
		F	EN

INSTRUCTIONS

ENGLISH	TRANSLATION
<p>There are six separate tasks to complete. The vehicle will not run at any time during the competition. Work must be carried out and completed in the order shown below. All measurement, adjustments, and findings must be shown to the Expert. Where there are no manufacture procedures, the competitor must complete the task using his own procedures and knowledge. The competitor shall carry out the following tasks in a safe manner, following manufactures specifications and procedures.</p>	
1. Remove one front wheel in a safe manner as pointed out by your Expert.	
2. Remove the front wheel hub.	
3. Remove and replace the outside wheel bearing.	
4. Remove and replace the back seals of the wheel hub.	
5. Remove the pneumatic brake chamber to check and replace the diaphragm.	
6. At the end of the task all components which were disassembled have to be reassembled to manufacturer specifications.	

TEST PROJECT HEAVY VEHICLE MAINTENANCE

WSC2015_TPD4_G_Precision_Measurement_of_Components_actual

Submitted by: Bobby Haraba

Name: WSC2015 Experts

Member country/region: All registered Members





COMPETITOR INSTRUCTIONS

MODULE G – PRECISION MEASUREMENTS OF COMPONENTS

EQUIPMENT: CUMMINS ISL DIESEL ENGINE

TIME ALLOWED

Familiarization time	15 minutes
Module duration	3 hours
Total breaks	15 minutes

COMPETITOR NAME	COUNTRY CODE	MODULE	TRANSLATED LANGUAGE
		G	EN

MARKING SUMMARY

SECTION	POSSIBLE MARK	WORLDSKILLS STANDARDS SPECIFICATION
G1	1.6	<p>The individual shall be able to:</p> <ul style="list-style-type: none">• Consistently and diligently follow the best procedures to protect health and safety in the working environment.• Use appropriate personal protective equipment. At all times individuals must wear safety footwear and eye protection with side shields. As needed, individuals must wear ear protection, respiratory protection, and either barrier gloves or fitted mechanic's gloves.• Select and handle appropriate substances, materials, and equipment safely and in compliance with manufacturers' instructions.• Dispose of substances and materials safely and sustainably.• Predict and eliminate all risks related to required activities.• Prepare and maintain an orderly workspace with regard to health and safety, and restore the workspace for the next technician.
G2	1.2	<p>The individual shall be able to:</p> <ul style="list-style-type: none">• Organize and implement appropriate decisions regarding maintenance or repair.• Use the methods best suited to complete each task.



SECTION		POSSIBLE MARK	WORLDSKILLS STANDARDS SPECIFICATION
G3	Use and interpretation of technical information	1.2	<p>The individual shall be able to:</p> <ul style="list-style-type: none"> • Choose the appropriate sources of technical information applicable to the task. • Read, interpret, and extract technical information from the chosen sources. • Apply technical information to the task. • Understand and accurately use the technical language associated with the task.
G4	Precision measurement	1.2	<p>The individual shall be able to:</p> <ul style="list-style-type: none"> • Demonstrate an understanding of the types of diagnostic and precision measurement tools in both imperial and metric units. • Demonstrate an understanding of the purposes, proper handling, and use of the types of diagnostic and precision measurement tools. • Choose, use, and interpret the results of diagnostic and precision measurement tools to produce accurate measurements to determine component reusability and to find faults in components and systems.
G5	Fault finding	1.2	<p>The individual shall be able to:</p> <ul style="list-style-type: none"> • Recognize and diagnose faults in heavy vehicle components or systems. • Choose, use, and interpret the results of appropriate diagnostic methods and equipment. • Apply the results of diagnostic testing and any relevant calculations to correctly identify and isolate faults related to the task.
G6	Appropriate use of tools	1.2	<p>The individual shall be able to:</p> <ul style="list-style-type: none"> • Choose and properly use, maintain, and store appropriate tools for the task.
G7	Maintenance or repair of components or systems	1.2	<p>The individual shall be able to:</p> <ul style="list-style-type: none"> • Choose the appropriate procedures to meet manufacturers' specifications for maintenance or repair of diesel engine systems; hydraulic systems; pneumatic systems; electrical and electronic systems; drive train systems; heating, ventilation, and air conditioning (HVAC) systems. • Predict and alleviate the effects of the chosen procedures on other components or systems.
G8	Communication of maintenance or repair process	1.2	<p>The individual shall be able to:</p> <ul style="list-style-type: none"> • Briefly and accurately record technical information about each task. Can be point form.



SECTION	POSSIBLE MARK	WORLDSKILLS STANDARDS SPECIFICATION
Total possible marks	10.00	

COMPETITOR NAME	COUNTRY CODE	MODULE	TRANSLATED LANGUAGE
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INSTRUCTIONS

ENGLISH	TRANSLATION
<ul style="list-style-type: none">Perform metric precision measurements on a diesel engine.	<ul style="list-style-type: none">
Work must be carried out and completed in the order shown below. All measurements must be shown to the Expert using precision measurement tools and written in a clear manner on the sheet.	
1. Remove the cylinder head.	
2. Remove the rod cap (piston number 1 next to engine timing) and measure the clearance between the bushing crank arm and the crankpin using Plastigauge®.	
3. Remove piston number 1 to inspect and measure a bushing crank arm (thickness).	
4. Measure diameter of cylinder bore number 1 at the top of the cylinder.	
5. Measure wear of cylinder bore number 1.	
6. Remove all piston rings from piston 1 and measure the gap of the top piston ring. that you see and that you propose?	



ENGLISH	TRANSLATION
7. Position the rings on the piston and reinstall piston. See the specification page for more information.	
8. Torque connecting rod caps. See the specification page for more information. 9. Remove the valves of first cylinder and measure all four valves stem diameters.	
10. Reinstall the valves and measure the protrusion of the valve's head (marked with an X).	
11. Measure the flatness of cylinder head.	
12. Reinstall the head gasket, reinstall the cylinder head, and torque the cylinder head bolts. See the specification page for more information.	

Skill name

Heavy Vehicle Maintenance

Criteria	Mark
A Diesel Engine Systems	15.00
B Hydraulic Systems	15.00
C Electrical and Electronic Systems	15.00
D Drive Train Systems	15.00
E Heating, Ventilation, and Air Conditioning (HVAC) Systems	15.00
F Steering and Brakes Systems	15.00
G Precision Measurement of Components	10.00

Sub Criteria ID	Sub Criteria Name or Description	Aspect Type O = Obj S = Sub J = Judg	Aspect - Description	Judg Score
A1	Overhead set and fault code diagnosis	<input type="radio"/> 1. Safety A <input type="radio"/> 1. Safety B <input type="radio"/> 2. Logical order of repair <input type="radio"/> 3. Use and interpretation of technical information <input type="radio"/> 4. Precision measurements <input type="radio"/> 5. Fault-finding <input type="radio"/> 6. Appropriate use of tools <input type="radio"/> 7. Maintenance or repair of components or systems <input type="radio"/> 8. Communication of maintenance or repair process		

Sub Criteria ID	Sub Criteria Name or Description	Aspect Type O = Obj S = Sub J = Judg	Aspect - Description	Judg Score
B1	Hydraulics	<input type="radio"/> 1. Safety A <input type="radio"/> 1. Safety B <input type="radio"/> 2. Logical order of repair <input type="radio"/> 3. Use and interpretation of technical information <input type="radio"/> 4. Precision measurements <input type="radio"/> 5. Fault-finding <input type="radio"/> 6. Appropriate use of tools <input type="radio"/> 7. Maintenance or repair of components or systems <input type="radio"/> 8. Communication of maintenance or repair process		
Sub Criteria ID	Sub Criteria Name or Description	Aspect Type O = Obj S = Sub J = Judg	Aspect - Description	Judg Score
C1	Electrical	<input type="radio"/> 1. Safety A <input type="radio"/> 1. Safety B <input type="radio"/> 2. Logical order of repair <input type="radio"/> 3. Use and interpretation of technical information <input type="radio"/> 4. Precision measurements <input type="radio"/> 5. Fault-finding <input type="radio"/> 6. Appropriate use of tools <input type="radio"/> 7. Maintenance or repair of components or systems <input type="radio"/> 8. Communication of maintenance or repair process		
Sub Criteria ID	Sub Criteria Name or Description	Aspect Type O = Obj S = Sub J = Judg	Aspect - Description	Judg Score

D1	Drive axle carrier	<input type="radio"/> 1. Safety A <input type="radio"/> 1. Safety B <input type="radio"/> 2. Logical order of repair <input type="radio"/> 3. Use and interpretation of technical information <input type="radio"/> 4. Precision measurements <input type="radio"/> 5. Fault-finding <input type="radio"/> 6. Appropriate use of tools <input type="radio"/> 7. Maintenance or repair of components or systems <input type="radio"/> 8. Communication of maintenance or repair process		
Sub Criteria ID	Sub Criteria Name or Description	Aspect Type O = Obj S = Sub J = Judg	Aspect - Description	Judg Score
E1	A/C	<input type="radio"/> 1. Safety A <input type="radio"/> 1. Safety B <input type="radio"/> 2. Logical order of repair <input type="radio"/> 3. Use and interpretation of technical information <input type="radio"/> 4. Precision measurements <input type="radio"/> 5. Fault-finding <input type="radio"/> 6. Appropriate use of tools <input type="radio"/> 7. Maintenance or repair of components or systems <input type="radio"/> 8. Communication of maintenance or repair process		
Sub Criteria ID	Sub Criteria Name or Description	Aspect Type O = Obj S = Sub J = Judg	Aspect - Description	Judg Score
F1	Steering and brake systems	<input type="radio"/> 1. Safety A <input type="radio"/> 1. Safety B <input type="radio"/> 2. Logical order of repair <input type="radio"/> 3. Use and interpretation of technical information		

Sub Criteria ID	Sub Criteria Name or Description	Aspect Type O = Obj S = Sub J = Judg	Aspect - Description	Judg Score
		<input type="radio"/> 4. Precision measurements <input type="radio"/> 5. Fault-finding <input type="radio"/> 6. Appropriate use of tools <input type="radio"/> 7. Maintenance or repair of components or systems <input type="radio"/> 8. Communication of maintenance or repair process		
G1	Metric measurements	<input type="radio"/> 1. Safety <input type="radio"/> 1. Safety <input type="radio"/> 1. Safety <input type="radio"/> 2. Logical order of repair <input type="radio"/> 3. Use and interpretation of technical information <input type="radio"/> 3. Use and interpretation of technical information <input type="radio"/> 3. Use and interpretation of technical information <input type="radio"/> 4. Precision measurements <input type="radio"/> 4. Precision measurements <input type="radio"/> 4. Precision measurements <input type="radio"/> 4. Precision measurements <input type="radio"/> 4. Precision measurements <input type="radio"/> 4. Precision measurements <input type="radio"/> 4. Precision measurements <input type="radio"/> 4. Precision measurements <input type="radio"/> 4. Precision measurements <input type="radio"/> 4. Precision measurements <input type="radio"/> 4. Precision measurements <input type="radio"/> 5. Fault-finding <input type="radio"/> 5. Fault-finding <input type="radio"/> 6. Appropriate use of tools <input type="radio"/> 6. Appropriate use of tools <input type="radio"/> 6. Appropriate use of tools <input type="radio"/> 6. Appropriate use of tools <input type="radio"/> 7. Maintenance or repair of components or systems <input type="radio"/> 8. Communication of maintenance or repair process		

Extra Aspect Description (Obj or Subj) OR Judgement Score Description (Judg only)	Requirement or Nominal Size (Obj Only)	WSSS Section	Max Mark
Disconnecting battery negative post first., Covering removal	value of each .4	1	1.20
Not removing their eye protection, Keeping the work area	value of each .4	1	1.20
Only adjusting the needed settings, performed all preparat	value of each .3	2	1.80
proper manual selected, fault code tree followed,proper us	value of each .6	3	1.80
valves set to proper dimensions, engine brake set to prop	value of each .3	4	1.80
identified loose locknuton valve adjustment, identified mis	value of each .45	5	1.80
thickness gauge usage, torque wrench usage back off wh	value of each .3	6	1.80
Proper serial number for manual selected, manufacturer's	value of each .3	7	1.80
The competitor will be able to briefly and accurately record	value for each .9	8	1.80

Criterion
A

Total
Mark 15.00

Extra Aspect Description (Obj or Subj) OR Judgement Score Description (Judg only)	Requirement or Nominal Size (Obj Only)	WSSS Section	Max Mark
Used personal protective equipment (PPE), according to t Prepared and maintained the area of work in order in relat Diagnosis of Hydraulic System Repair of hydraulic system Preventive review of the hydraulic system End on time		1 1 2 3 4 5 6 7 8	1.20 1.20 1.80 1.80 1.80 1.80 1.80 1.80 1.80
Extra Aspect Description (Obj or Subj) OR Judgement Score Description (Judg only)	Requirement or Nominal Size (Obj Only)	WSSS Section	Max Mark
Wearing gloves. Not removing their eye protection. Keepin Not removing their eye protection. Keeping the work area Check the cigarette lighter if it is working, note it. Find in th Using the manual to determine appropriate relay value Check the outlet 12 V A, note it. Check the outlet 12 V B, n After this two items are ok check the cabel to the lamp. Br Using Ohmmeter. Using Voltmeter Batteries have been circled on the scematic..Electrical line Electrical line has been high lighted on schematic		1 1 2 3 4 5 6 7 8	1.20 1.20 1.80 1.80 1.80 1.80 1.80 1.80 1.80
Extra Aspect Description (Obj or Subj) OR Judgement Score Description (Judg only)	Requirement or Nominal Size (Obj Only)	WSSS Section	Max Mark

Criterion B Total Mark 15.00

Criterion C Total Mark 15.00

Criterion D Total Mark 15.00

		1	1.20
Not removing their eye protection , keeping the work area	0.24 each	1	1.20
Inspect gears, bearings, and races, Applying a light coat of	0.18 each	2	1.80
Following procedures in order, Found nut torque of 2000-2	0.2 each	3	1.80
Measure drive gear runout, initial backlash in 2 areas (take	0.3 each	4	1.80
Backface runout, Pinion preload, Pattern, Backlash, pinion	0.3 each	5	1.80
Mount dial indicator 90° to crown for backface runout, Sta	0.2 each	6	1.80
Measure backface runout before disassembly, Measure b	0.15 each	7	1.80
Recorded: Axle model, Initial total preload, back face runo	0.15 each	8	1.80

Extra Aspect Description (Obj or Subj) OR Judgement Score Description (Judg only)	Requirement or Nominal Size (Obj Only)	WSSS Section	Max Mark
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Criterion E Total Mark 15.00

used shoes, goggles, gloves; tidy tools, tidy with remove	.24 each	1	1.20
Locking cab, locking hood, empty the AC Line before remo	.24 each	1	1.20
using the correct tools and using the Internet for the PSI b	0.6 each	2	1.80
measure the engine temp., measure the high pressure an	0.2 each	3	1.80
Preventive review of the hydraulic system	0.6 each	4	1.80
find the fault 1, find the fault 2, find the fault 3	0.6 each	5	1.80
use the special Tools for the coverings; using the correktly	0.6 each	6	1.80
Calculate the filling quantity, Error description of the failed	0.6 each	7	1.80
Making a measurement diagram with correkt results of th	0.6 each	8	1.80

Extra Aspect Description (Obj or Subj) OR Judgement Score Description (Judg only)	Requirement or Nominal Size (Obj Only)	WSSS Section	Max Mark
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Criterion F Total Mark 15.00

Not removing their eye protection, Keeping the work area	.2 each	1	1.20
Has wheel been stored safety, Has the lift jack used in the	.2 each	1	1.20
Has the competitor asked to release air pressure, Has the	0.6 each	2	1.80
Has the competitor removed air connection safely, remove	0.2 each	3	1.80

Reassembling of air service cylinder	0.6 each	4	1.80
Removal wheel hub	0.6 each	5	1.80
Removal of front taper roller bearing	0.6 each	6	1.80
Removal of back centre seal	0.6 each	7	1.80
Removal of back outer seal	0.6 each	8	1.80

Extra Aspect Description (Obj or Subj) OR Judgement Score Description (Judg only)	Requirement or Nominal Size (Obj Only)	WSSS Section	Max Mark
Keeping the floor free of tools and parts, Using the glasses	0.40 each	1	1.20
Cleaning up when done		1	0.10
Using gloves to work		1	0.30
Applying full torque to bolts for plastic gauge, Identify screws	0.4 for each	2	1.20
Applying the procedure for reinstall rod caps		3	0.30
Applying the procedure for reinstall rings		3	0.50
Applying the procedure for reinstall cylinder head		3	0.40
Measure a bushing crank arm 2.56 mm \pm 0.02		4	0.10
Hole diameter of 114.00 mm \pm 0.05		4	0.05
Measure wear of hole 12mm<x< 35mm		4	0.20
Ring measure in top of her position in cylinder		4	0.15
Gap of piston ring top 0.4 mm \pm 0.05, Gap of piston ring m	0.05 each	4	0.15
Valves: measure at the different points		4	0.20
4 valves stem diameter 8mm \pm 0.05		4	0.05
Protrusion of the valves 0.84 < x < 1.32 mm		4	0.10
Precision measure plan \pm 0.05		4	0.20
No oil to lift the parts		5	0.70
Not tighten the screws of cylinder head in the order		5	0.50
Not over tightening the outside micrometer, Use the micro	0.2 each	6	0.60
Know read measure of plastigauge		6	0.30
Backing off the torque wrench when done		6	0.10
Using the dial bore gauge at 90° to the cylinder		6	0.20
Reinstall a new rings kit, The ring at 120 degree the gap	0.6 each	7	1.20
Legibly recording the measurements, Note all measured v	0.6 each	8	1.20

Criterion G Total Mark 10.00

Competition	Total Mark	100.00
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