Test Project

Module C – Maintenance of Vehicle Bogie

Rail Vehicle Technology

Submitted by:

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WSC2026_TP61_en

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Introduction to Test Project

A bogie is the part of a rail vehicle that is in fdirect contact with the rails and carries the entire weight of the train. It provides the power for train traction and brake, ensures the safe, stable, and comfortable running of the train, and is one of the core components of the rail vehicle. Bogie maintenance, which should meet strict requirements, is an essential assignment for vehicle technicians.

The workstation has a bogie with a complete mechanical structure. Vehicle technicians are required to conduct maintenance of the bogie, covering inspection, measurement, adjustment, maintenance, parts replacement, etc.

Description of project and tasks

The time allocated to the Maintenance of Vehicle Bogie Test Project is 180 minutes.

The Competitor should complete all tasks within the time allocated to the Module.

First, make preparations according to requirements.

Second, complete the three (3) tasks listed below:

- C1 Bogie parts appearance inspection, measurement and maintenance
- C2 Bogie parts replacement
- C3 Bogie air pipe test and maintenance

Note: Strictly adhere to the operation safety rules and carry out the tasks in order of C1, C2 and C3.

Lastly, after all tasks listed in this Test Project are completed, Competitors should clean the site and submit the relevant materials and Record Sheets to the Experts.

Preparations

Before starting the operation tasks, the Competitor needs to analyze all tasks and count and check equipment, tools and materials in the workstation according to the standards and requirements set out in the WSC2026_WM61_C Maintenance of Vehicle Bogie Work Manual. In the case of any problem, the Competitor need to solve it immediately.

1. Read carefully this Test Project to understand the operation tasks;
2. Count and check all equipment, tools and materials in the workstation and fill the problems uncovered in the Maintenance of vehicle bogie pre-operation inspection Record Sheet (fill all problems at once). If any equipment, tools or material is found missing or unqualified, submit the Record Sheet to the Experts to apply for replacement or supplementation;
3. Submit the Record Sheet (with name and country of the Competitor filled at the corresponding blanks) to the Experts.

Note: The WSC2026_TP61_C_R01 Bogie Fault Example Description Table clarifies the types of defects, and any defects not described in the Table are considered normal.

C1 Bogie parts appearance inspection, measurement and maintenance

Task C1 requires Competitors to conduct appearance inspection, measurement and maintenance to bogie parts according to the standards and requirements set out in the WSC2026_WM61_C Maintenance of Vehicle Bogie Work Manual. Main work items include:

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1. Condcut appearance inspection and maintenance to bogie parts and fill the operation results in the C1-1 Bogie parts appearance inspection and maintenance Record Sheet.
2. Handle the fauls such as abnormal fastener, stains, and foreign objects uncovered in the inspection process (Note: When handling a fault related to anti-loose marks, re-application of torque is not required).
3. Measure the bogie parts (wheel, distance between backs of wheel flanges and axle box spring height) and fill the measurement result in the C1-2 Bogie parts measurement Record Sheet.
4. After completing all items involved in task C1, the Competitor needs to report the operation status to the Experts and submit the Record Sheets (C1-1 and C1-2). Only with the Experts' approval can the Competitor proceed to the next task.

Note: The WSC2026_TP61_C_R01 Bogie Fault Example Description Table clarifies the types of defects, and any defects not described in the Table are considered normal.

C2 Bogie parts replacement

Task C2 requires Competitors to replace the relevant bogie parts according to the standards and requirements set out in the WSC2026_WM61_C Maintenance of Vehicle Bogie Work Manual. Main work items include:

1. Install or replace the mechanical parts (vertical damper, brake shoes, speed sensor, earthing carbon brush), with specific parts shown in the Record Sheet.
2. Install or replace the bogie motor wires, with specific parts shown in the Record Sheet.
3. Fill the operation results in the C2 Bogie parts replacement Record Sheet.
4. After completing all items involved in task C2, the Competitor needs to report the operation status to the Experts and submit the Record Sheet (C2). Only with the Experts' approval can the Competitor proceed to the next task.

C3 Bogie air pipe test and maintenance

Task C3 requires Competitors to conduct pressure maintaining test and maintenance according to the standards and requirements set out in the WSC2026_WM61_Mainatenance of Vehicle Bogie Work Manual. Main work items include:

1. Find the air pipe parts with leaks through air tightness test and repair or replace the parts.
2. Conduct pressure maintaining test to the pneumatic pipeline and ensure that it meets the air tightness requirements.
3. Fill in the operation results in the C3 Bogie air pipe test and maintenance Record Sheet.
4. After completing all items involved in task C3, the Competitor need to report the operation status to the Experts and submit the Record Sheet (C3). Only with the Experts' approval can the Competitor proceed to the next task.

Post-operation site cleaning

After all tasks are completed, Competitors should clean the site and return the tools.

1. Arrange the equipment neatly and clean the site;
2. Return the tools and the remaining materials, and check that they have all been returned.

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Instructions to the Competitor

Instructions

1. Competitors should not bring any device irrelevant to the Competition to the workstation.
2. Tools, electrical components and materials for the Skill are all provided at the workstation for Competitors' free access.
3. During the Competition, for matters irrelevant to the Competition contents, such as use of the washroom, or reporting faults of equipment, facilities, tooling or tools, Competitors can seek help from the Experts.
4. Competitors may refer to the reference documents for the Skill provided.

Operation safety rules

1. Put on proper personal protective equipment according to operation requirements;
2. Take site safety protection measures and confirm that no safety hazards exist;
3. Do not operate in a violent or an unsafe manner, including but not limited to forcibly pulling, dragging, smashing, throwing, and other violent behaviors, as well as behaviors that may cause personnel injuries or damage to equipment;
4. When using a torque spanner, do confirm the correctness of the torque; set the torque to 0 when returning the spanner;
5. All the tools or materials used during operations should be placed in the tool trolley or on the rubber tool mat only.

Note: If a Competitor fails to comply with the operation safety rules and is considered to be have operated in a dangerous manner or have caused a safety hazard in the workplace, or equipment damage or personal injuries, marks will be deducted. In serious cases, the Competitor may be disqualified from the Competition.

Record Sheets

The Record Sheets to be filled out during completion of this Test Project are:

1. Vehicle bogie maintenance pre-operation inspection Record Sheet
2. C1-1 Bogie parts appearance inspection and maintenance operation Record Sheet
3. C1-2 Bogie parts measurement operation Record Sheet
4. C2 Bogie parts replacement operation Record Sheet
5. C3 Bogie air pipe test and maintenance Record Sheet

Note: Record Sheets will be provided separately.

References

1. WSC2026_WM61_C Maintenance of Vehicle Bogie Work Manual
2. WSC2026_TP61_C_R01_Bogie Fault Example Description Table

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Vehicle bogie maintenance pre-operation inspection Record Sheet

Country/Region:_____ Competitor:_____

Instructions:

1. Record abnormal equipment/tools/materials only, and mark the corresponding options with "☒". After inspection of all equipment/tools/materials, sign at the bottom of the Record Sheet;
2. If an item needs to be replaced or claimed, submit this Record Sheet to an Expert (or designated person). For replacement of an items, the original one needs to be provided as well. The Expert have the right to reject requests for items that are not abnormal;
3. The Review Result column will be filled in by the Expert (or designated person) who should sign at the bottom of the Record Sheet after requests have been reviewed and handled.

No.	Equipment/Tool/Material Name	Problem Description	Request	Review Result
1			Replacement☐ Claim for new item☐	Approved☐ Rejected☐
2			Replacement☐ Claim for new item☐	Approved☐ Rejected☐
3			Replacement☐ Claim for new item☐	Approved☐ Rejected☐
4			Replacement☐ Claim for new item☐	Approved☐ Rejected☐
5			Replacement☐ Claim for new item☐	Approved☐ Rejected☐
6			Replacement☐ Claim for new item☐	Approved☐ Rejected☐

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7			Replacement☐ Claim for new item☐	Approved☐ Rejected☐
8			Replacement☐ Claim for new item☐	Approved☐ Rejected☐

- Expert (or designated person):

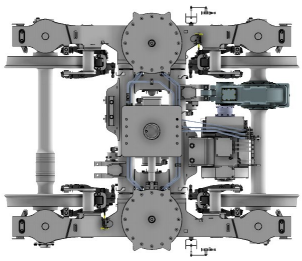
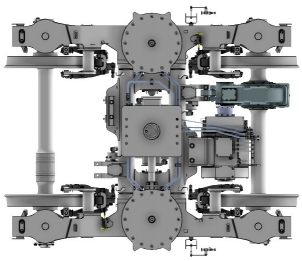
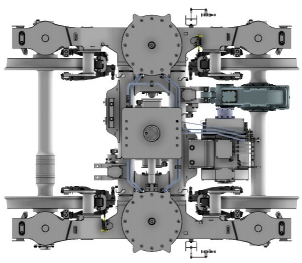
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C1-1 Bogie parts appearance inspection and maintenance Record Sheet

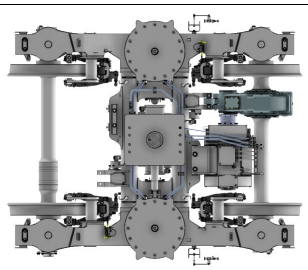
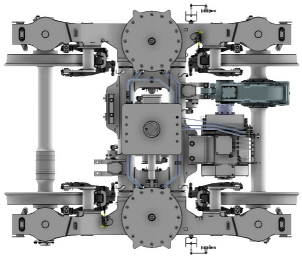
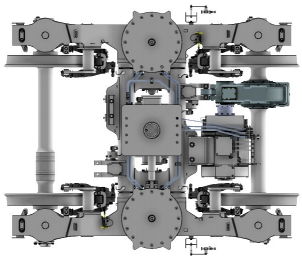
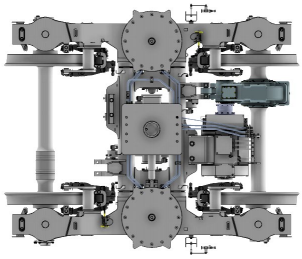
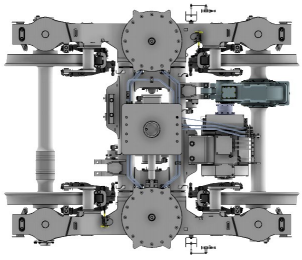
Country/Region:_____ Competitor:_____

Instructions:

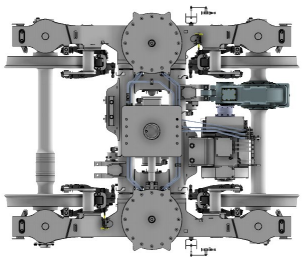
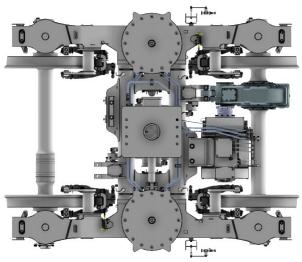
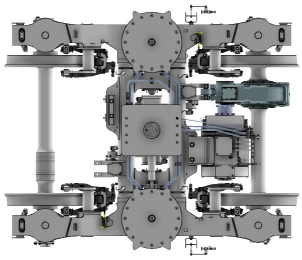
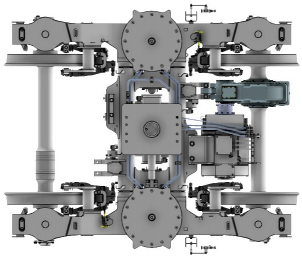
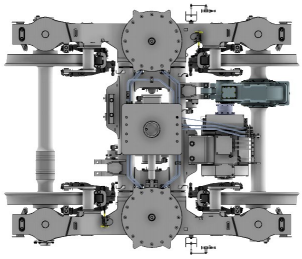
1. For the record of a single faulty part, fill in one row of the table, where the Competitor should circle the faulty position in the Fault Position Illustration column. If a part has multiple faults, additional annotations can be added as needed. (Note: The fault point should be at the center of the circle, and the diameter of the circle shall not exceed 10 mm.)
2. In the Fault Description column, describe fault type only, such as loose fastener, stains, and foreign objects;
3. Fill in the Maintenance Status according to actual operation status and mark the corresponding option with "☒".

No.	Faulty Part	Fault Position Illustration	Fault Description	Maintenance Status
1				Repaired☐ Not repaired☐
2				Repaired☐ Not repaired☐
3				Repaired☐ Not repaired☐

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4				Repaired☐ Not repaired☐
5				Repaired☐ Not repaired☐
6				Repaired☐ Not repaired☐
7				Repaired☐ Not repaired☐
8				Repaired☐ Not repaired☐

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9				Repaired☐ Not repaired☐
10				Repaired☐ Not repaired☐
11				Repaired☐ Not repaired☐
12				Repaired☐ Not repaired☐
13				Repaired☐ Not repaired☐

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Supplemental description (if necessary):

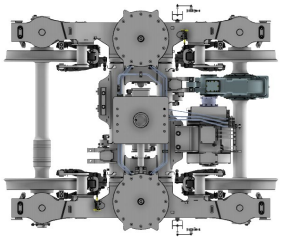
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C1-2 Bogie parts measurement Record Sheet

Country/Region:_____ Competitor:_____

Position example:

Position 1 **Position 3**



Position 2 **Position 4**

Instructions:

1. Fill in the accurate value according to the measurement result, retaining decimal places according to the accuracy of the measuring tool.
2. If the measurement result is normal, mark the Yes option with "☒", and skip the "Defect description" cell.
3. If the measurement result is abnormal, mark the No option with "☒", and fill the defect position and status in the "Defect description" cell.

No.	Measurement Item		Measurement Result			
1	Measurement of wheels	Wheel flange height	Standard value: _____mm			
			Position 1	**Position 2**	**Position 3**	**Position 4**
			Flange height at the 3 points ①_____mm ②_____mm ③_____mm	Flange height at the 3 points ①_____mm ②_____mm ③_____mm	Flange height at the 3 points ①_____mm ②_____mm ③_____mm	Flange height at the 3 points ①_____mm ②_____mm ③_____mm
			Average measurement value: _____ mm	Average measurement value: _____mm	Average measurement value: _____mm	Average measurement value: _____mm
			Normal or not: Yes □ No □	Normal or not: Yes □ No □	Normal or not: Yes □ No □	Normal or not: Yes □ No □

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<table>
<tr><td></td><td rowspan="3"></td><td></td><td colspan="4">Defect description:</td></tr>
<tr><td>2</td><td>Tread circumference wear</td><td colspan="4">Standard value: _____mm</td></tr>
<tr><td></td><td></td><td>Position 1</td><td>Position 2</td><td>Position 3</td><td>Position 4</td></tr>
<tr><td></td><td></td><td>Tread circumference wear at the 3 points
①_____mm
②_____mm
③_____mm</td><td>Tread circumference wear at the 3 points
①_____mm
②_____mm
③_____mm</td><td>Tread circumference wear at the 3 points
①_____mm
②_____mm
③_____mm</td><td>Tread circumference wear at the 3 points
①_____mm
②_____mm
③_____mm</td></tr>
<tr><td></td><td></td><td>Average measurement value:
_____mm</td><td>Average measurement value:
_____mm</td><td>Average measurement value:
_____mm</td><td>Average measurement value:
_____mm</td></tr>
<tr><td></td><td></td><td>Normal or not:
Yes □
No □</td><td>Normal or not:
Yes □
No □</td><td>Normal or not:
Yes □
No □</td><td>Normal or not:
Yes □
No □</td></tr>
<tr><td></td><td></td><td colspan="4">Defect description:</td></tr>
<tr><td>3</td><td></td><td>Flange thickness</td><td colspan="4">Standard value:_____mm</td></tr>
<tr><td></td><td></td><td></td><td>Position 1</td><td>Position 2</td><td>Position 3</td><td>Position 4</td></tr>
<tr><td></td><td></td><td></td><td>Flange thickness at the 3 points
①_____mm
②_____mm
③_____mm</td><td>Flange thickness at the 3 points
①_____mm
②_____mm
③_____mm</td><td>Flange thickness at the 3 points
①_____mm
②_____mm
③_____mm</td><td>Flange thickness at the 3 points
①_____mm
②_____mm
③_____mm</td></tr>
<tr><td></td><td></td><td></td><td>Average measurement value:
_____mm</td><td>Average measurement value:
_____mm</td><td>Average measurement value:
_____mm</td><td>Average measurement value:
_____mm</td></tr>
</table>

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<table>
<tr><td></td><td></td><td></td><td>Normal or not:
Yes ☐
No ☐</td><td>Normal or not:
Yes ☐
No ☐</td><td>Normal or not:
Yes ☐
No ☐</td><td>Normal or not:
Yes ☐
No ☐</td></tr>
<tr><td></td><td></td><td></td><td colspan="4">Defect description:</td></tr>
<tr><td rowspan="3">4</td><td rowspan="3"></td><td rowspan="3">Flange vertical wear</td><td colspan="4">Standard value: _____mm</td></tr>
<tr><td>Position 1</td><td>Position 2</td><td>Position 3</td><td>Position 4</td></tr>
<tr><td>Flange vertical wear at the 3 points
① Normal or not:
Yes ☐ No ☐
② Normal or not:
Yes ☐ No ☐
③ Normal or not:
Yes ☐ No ☐</td><td>Flange vertical wear at the 3 points
① Normal or not:
Yes ☐ No ☐
② Normal or not:
Yes ☐ No ☐
③ Normal or not:
Yes ☐ No ☐</td><td>Flange vertical wear at the 3 points
① Normal or not:
Yes ☐ No ☐
② Normal or not:
Yes ☐ No ☐
③ Normal or not:
Yes ☐ No ☐</td><td>Flange vertical wear at the 3 points
① Normal or not:
Yes ☐ No ☐
② Normal or not:
Yes ☐ No ☐
③ Normal or not:
Yes ☐ No ☐</td></tr>
<tr><td></td><td></td><td></td><td colspan="4">Defect description:</td></tr>
<tr><td rowspan="4">5</td><td colspan="2" rowspan="4">Measurement of distance between backs of wheel flanges</td><td colspan="4">Standard value: _____mm</td></tr>
<tr><td colspan="2">Position 1- Position 2</td><td colspan="2">Position 3- Position 4</td></tr>
<tr><td colspan="2">Distance between backs of wheel flanges
①_____mm
②_____mm
③_____mm</td><td colspan="2">Distance between backs of wheel flanges
①_____mm
②_____mm
③_____mm</td></tr>
<tr><td colspan="2">Average measurement value:
_____mm</td><td colspan="2">Average measurement value:
_____mm</td></tr>
<tr><td></td><td></td><td colspan="2">Normal or not: Yes ☐ No ☐</td><td colspan="2">Normal or not: Yes ☐ No ☐</td></tr>
</table>

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<table>
<tr><td></td><td></td><td colspan="2">Defect description:</td></tr>
<tr><td rowspan="3">6</td><td rowspan="3">Measurement of the relative height difference between axle box springs</td><td>Axle box springs at Position 1 and Position 2
Measurement value 1:_____ mm
Measurement value 2:_____ mm</td><td>Axle box springs at Position 3 and Position 4
Measurement value 3:
mm
Measurement value 4:
mm</td></tr>
<tr><td colspan="2">Relative height difference between axle box springs at Position 1 and Position 2:
_____ mm
Relative height difference between axle box springs at Position 3 and Position 4:
_____ mm
Maximum relative height difference between axle boxe springs at Position 1, Position 2, Position 3, and Position 4:
_____ mm</td></tr>
<tr><td colspan="2">Normal or not: Yes ☐ No ☐</td></tr>
</table>

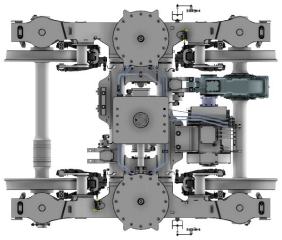
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C2 Bogie parts replacement Record Sheet

country/Region:_____ Competitor:_____

Position example:

Position 1 **Position 3**



Position 2 **Position 4**

Instructions:

1. Install or replace the parts at the positions indicated in the Record Sheet, apply the corresponding torque and draw anti-lose marks during the operation, and record the torque values in the Record Sheet.
2. Record the operation result by marking the corresponding option with "☒" in the Operation Result column.

No.	Operation Content	Operation Position	Torque Value	Operation Result
1	Primary Vertical Damper Replacement	Position 2	M12: _____N·m	Completed ☐ Not Completed ☐
2	Brake Shoes Replacement (Install a new one if the original part is missing)	Position 1, Position 2	\	Completed ☐ Not Completed ☐
3	Speed Sensor Replacement (Install a new one if the original part is missing)	Position 1	M20: _____N·m M8: _____N·m	Completed ☐ Not Completed ☐
4	Earthing Carbon Brush Replacement (Install a new one if the original part is missing)	Position 2 or Position 3	M6: _____ N·m M8: _____ N·m	Completed ☐ Not Completed ☐
5	Motor Wires Replacement (Install a new one if the original part is missing)	Motor between Position 3 and Position 4	M8: _____ N·m M10: _____N·m	Completed ☐ Not Completed ☐

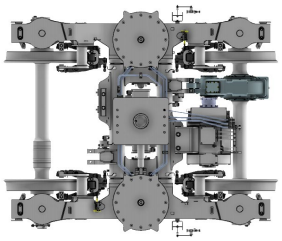
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C3 Bogie air pipe test and maintenance Record Sheet

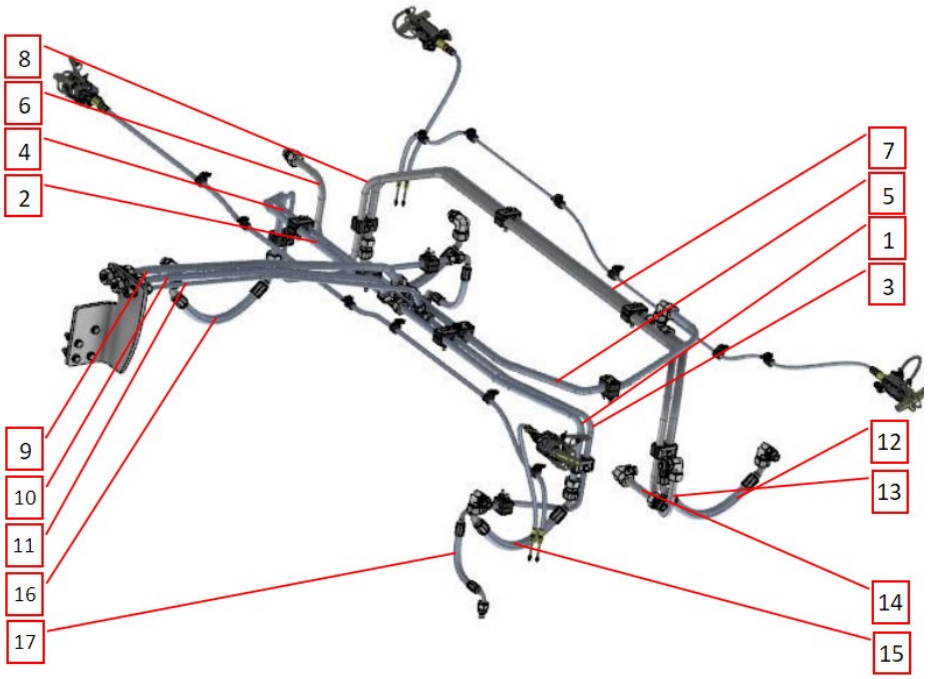
Country/Region:_____ Competitors:_____

Position number:

Position 1 **Position 3**



Position 2 **Position 4**



Instructions:

1. Fill in the accurate value; mark the corresponding option with "☒" in the Operation Result column.
2. If the test result is normal, skip the leak point recording.
3. If the test result is abnormal, find the leak point and fill in the leak position (locate a leak point by pipe number, for example: No.4 pipe joint is loose).

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No.	Operation Content	Operation Data	Operation Result
1	It is known that pipeline No. ___ is defective. Please replace it.	The defective pipeline number will be filled in by the judge. If it has not been filled in, please consult the judge.	Replaced or not: Yes ☐ No ☐
2	Conduct pressure maintaining test for the service brake pipeline between Position 1 and Position 2. If any loose connections are found, they must be tightened. (Record only the final test data; cross out incorrect data.)	Leak point (pipe with leaks) position recording:	Repaired or not: Yes ☐ No ☐
		Pressure maintenance status: _____minutes, decreased from 500kPa to _____kPa	Is standard met: Yes ☐ No ☐
3	Conduct pressure maintaining test for the service brake pipeline between Position 3 and Position 4. If any loose connections are found, they must be tightened. (Record only the final test data; cross out incorrect data.)	Leak point (pipe with leaks) position recording:	Repaired or not: Yes ☐ No ☐
		Pressure maintenance status: _____minutes, decreased from 500kPa to _____kPa	Is standard met: Yes ☐ No ☐
4	Conduct pressure maintaining test for the parking brake pipeline between Position 1 and Position 3. If any loose connections are found, they must be tightened. (Record only the final test data; cross out incorrect data.)	Leak point (pipe with leaks) position recording:	Repaired or not: Yes ☐ No ☐
		Pressure maintenance status: _____minutes, decreased from 500kPa to _____kPa	Is standard met: Yes ☐ No ☐

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