



Technical Description

Rail Vehicle Technology

Skill 61



WorldSkills International, by a resolution of the Competitions Committee and in accordance with the Constitution, the Standing Orders, and the Competition Rules, has adopted the following minimum requirements for this skill for the WorldSkills Competition.

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1 Introduction

1.1 Name and description of the skill competition

1.1.1 The name of the skill competition is

Rail Vehicle Technology

1.1.2 Description of the associated work role(s) or occupation(s)

Rail transit for both goods and people is a vast, globally significant sector. As need and demand for sustainable forms of transit grow, the potential for rail to replace less energy-efficient transportation is increasing. The transition will drive significant innovation as a result. Rail transit is efficient, environmentally friendly, and enhances the travel experience and quality of life. Renowned for its safety, convenience, punctuality, and speed, rail is the world's most green transportation system.

Maintenance is a critical aspect of rail transit operations and the focus of rail vehicle technology occupation. Modern rail vehicles utilize integrated technologies, requiring maintenance technicians to have diverse skills and expertise.

The role of a rail vehicle technician comprises vehicle inspection, installation and commissioning, operation data analysis, health status assessment, and fault handling. To ensure the safe operation of all vehicle systems, rail vehicle technicians must be capable of handling emergency faults and addressing unexpected incidents within the specified time, and they should also be able to take preventive measures to maintain the continuity of services.

Rail vehicle maintenance requires technicians to have proficient individual operation skills and good teamwork abilities in order to jointly complete mechanical and electrical tasks of the vehicle. They need to perform maintenance and commissioning of vehicle systems such as the high-voltage current collection and traction system, air supply and brake system, door system, bogie system, passenger information system, lighting system, auxiliary power supply system, heating, ventilation and air conditioning system (HAVC), and train control and management system (TCMS), aiming to ensure the safety, efficiency and economic benefits of vehicle operation.

Excellent rail vehicle technicians should have comprehensive knowledge, understanding, and expertise relevant to rail vehicles. They must grasp the structure, working principles, and industry standards of vehicle components and control systems. As their work progresses, staying current with the development of emerging rail vehicle technologies is crucial. They should contribute their specialized expertise to enhanced team performance. These requirements drive them to continuously upgrade their skills to cope with more complex tasks.

With further professional development, a capable and dedicated rail vehicle technician can achieve promotions in the global rail transit industry, which highlights the significance of the industry and innovation within it.

1.1.3 Number of Competitors per team

Rail Vehicle Technology is a single Competitor skill competition.

1.1.4 Age limit of Competitors

The Competitors must not be older than 22 years in the year of the Competition.

1.2 The relevance and significance of this document

This document contains information about the standards required to compete in this skill competition, and the assessment principles, methods, and procedures that govern the competition.

Every Expert and Competitor must know and understand this Technical Description.

In the event of any conflict within the different languages of the Technical Descriptions, the English version takes precedence.

1.3 Associated documents

Since this Technical Description contains only skill-specific information it must be used in association with the following:

- WSI – Code of Ethics and Conduct
- WSI – Competition Rules
- WSI – WorldSkills Occupational Standards framework
- WSI – WorldSkills Assessment Strategy
- WSI online resources as indicated in this document
- WorldSkills Health, Safety, and Environment Policy and Regulations
- WorldSkills Standards and Assessment Guide (skill-specific)

2 The WorldSkills Occupational Standards (WSOS)

2.1 General notes on the WSOS

The WSOS specifies the knowledge, understanding, skills, and capabilities that underpin international best practice in technical and vocational performance. These are both specific to an occupational role and also transversal. Together they should reflect a shared global understanding of what the associated work role(s) or occupation(s) represent for industry and business (www.worldskills.org/WSOS).

The skill competition is intended to reflect international best practice as described by the WSOS, to the extent that it can. The Standard is therefore a guide to the required training and preparation for the skill competition.

In the skill competition the assessment of knowledge and understanding will take place through the assessment of performance. There will only be separate tests of knowledge and understanding where there is an overwhelming reason for these.

The Standard is divided into distinct sections with headings and reference numbers added.

Each section is assigned a percentage of the total marks to indicate its relative importance within the Standards. This is often referred to as the “weighting”. The sum of all the percentage marks is 100. The weightings determine the distribution of marks within the Marking Scheme.

Through the Test Project, the Marking Scheme will assess only those skills and capabilities that are set out in the WorldSkills Occupational Standards. They will reflect the Standards as comprehensively as possible within the constraints of the skill competition.

The Marking Scheme will follow the allocation of marks within the Standards to the extent practically possible. A variation of up to five percent is allowed, if this does not distort the weightings assigned by the Standards.

2.2 WorldSkills Occupational Standards

Section		Relative importance (%)
1	Work organization and management	5
	The individual needs to know and understand: <ul style="list-style-type: none"> • Rail vehicle manuals • Health and safety legislation, obligations and documentation • Approved manuals, and data from manufacturers and government • Situations where personal protective equipment (PPE) must be used • Safety protection measures for the on-site working environment • The purposes, uses, care, and safe storage of materials • Sustainability measures relating to the use of environmentally friendly materials, minimization of waste, and recycling of materials 	

Section		Relative importance (%)
	<ul style="list-style-type: none"> • Principles of workflow, time management, measurement, and cost analysis • The importance of researching, planning, accuracy, checking, and attention to detail in all working practices • The importance of teamwork, strengths and limitations of team members, and how to organize teams to optimize the available resources • The importance of completing tasks in accordance with the technical standards of International Union of Railways (UIC) 	
	<p>The individual shall be able to:</p> <ul style="list-style-type: none"> • Consistently and diligently follow health and safety standards, rules and regulations • Identify and use appropriate personal protective equipment • Organize site protection measures and ensure the safety of the work environment for staff and customers • Apply professional skills to each assignment • Select, use, clean, maintain, and store all tools, equipment and materials safely • Plan work areas to maximize efficiency and sustainability • Use the latest versions of approved manuals and data, and stay current with guidelines and procedures • Establish and consistently maintain high quality operation standards when under pressure • Ensure safe, successful completion of tasks within team environments to meet deadlines • Efficiently manage resources and team efforts to achieve objectives 	
2	Communication and interpersonal skills	5
	<p>The individual needs to know and understand:</p> <ul style="list-style-type: none"> • The importance of accurate written communication • The significance of establishing and maintaining customer confidence • The roles and responsibilities of related colleagues • The value of building and maintaining productive working relationships • The importance of developing and maintaining an industry-accepted attitude • Interpersonal techniques for effective teamwork • The importance of swiftly resolving misunderstandings and conflicting demands • Human factors as they relate to work environments and standards 	

Section		Relative importance (%)
	<p>The individual shall be able to:</p> <ul style="list-style-type: none"> • Interpret customer requirements and manage customer expectations positively • Undertake investigative discussions to improve solutions and work efficiency • Regularly inform/update planned maintenance procedures • Coordinate schedules to optimize efficiency • Reflect positively and respond constructively to feedback on own performance, and the performance of other team members • Recognize and respond to the needs of support organizations, such as logistical suppliers and engineering authorities 	
3	Problem-solving, innovation, planning	10
	<p>The individual needs to know and understand:</p> <ul style="list-style-type: none"> • The common types of problem which can occur within work processes • The distinctions between sector or national standards, and international best practice • Diagnostic approaches to problem solving • The importance of following manufacturers' most recent manuals and documents for problem-solving • Trends and developments in the industry including new materials, methods, and technologies • The importance of making safe, timely and cost-effective work plans in a team environment 	
	<p>The individual shall be able to:</p> <ul style="list-style-type: none"> • Check work regularly to identify potential issues and take preventive measures • Challenge incorrect instructions to maintain standards • Use manufacturers' latest maintenance manuals and documents and show resilience in solving complex problems • Contribute ideas and suggestions to improve outcomes and overall customer satisfaction • Show willingness to try new methods and embrace change • Check one's own and others' work to ensure it meets best sustainability practice, given the environment and available resources 	
4	Vehicle mechanical part repair, maintenance, and commissioning	35
	<p>The individual needs to know and understand:</p> <ul style="list-style-type: none"> • Standards of International Union of Railways (UIC) and International Electrotechnical Commission (IEC) • Manufacturers' maintenance manuals 	

Section		Relative importance (%)
	<ul style="list-style-type: none"> • Mechanical basics and knowledge about materials, vehicles' composition, structure, and motion principles • Standards for checking, installation, commissioning, maintenance, and tests, of vehicle components • Technology for repairing/manufacturing vehicle components • Vehicle intelligent maintenance technology • How and when to use tools and instruments • How and when to inspect and update related material inventories • Hazardous elements during work, and corresponding safety protection measures 	
	<p>The individual shall be able to:</p> <ul style="list-style-type: none"> • Make and maintain personal and site safety protection based on the working conditions • Read and use vehicle and parts structure diagrams, operation manuals, and maintenance manuals, as supplied by manufacturers • Identify vehicle repair tools and materials, and use them to best effect • Select and use correct and efficient inspection and maintenance measures according to maintenance manuals • Identify vehicle parts defects and faults and fix them by using correct tools and methods • Resolve unexpected abnormal conditions of vehicle mechanical components promptly and efficiently • Test main vehicle parts' mechanical motion, and adjust their motion and status parameters for optimal performance • Use manufacturing technology to repair vehicle components • Use intelligent technology for vehicle maintenance • Make and maintain accurate work reports • Dispose of waste safely and sustainably 	
5	Vehicle electrical systems care, maintenance, and testing	35
	<p>The individual needs to know and understand:</p> <ul style="list-style-type: none"> • Standards of International Union of Railways (UIC) and International Electrotechnical Commission (IEC) • Manufacturers' vehicle maintenance manuals • Vehicle electrical system function test manuals • Electrical basics and knowledge about materials • Composition and principles of vehicle electrical system • The structure of vehicle's electrical equipment • Vehicle electrical design, manufacturing, installation and wiring standards • Vehicle electrical legends, icons and symbols • Use of instruments and tools • Vehicle intelligent detection technology 	

Section		Relative importance (%)
	<ul style="list-style-type: none"> • Hazardous elements during electrical work, and corresponding safety protection measures 	
	<p>The individual shall be able to:</p> <ul style="list-style-type: none"> • Take personal and site safety protection measures based on working conditions • Read and use electrical systems' schematic diagrams, assembly diagrams, wiring diagrams, layout diagrams, maintenance manuals, and so on, which are supplied by manufacturers • Identify and optimize the use of vehicle electrical and electronic components • Select and use vehicle electrical instruments (such as Ground Test Bench, and commissioning software.) and tools • Select and use correct and effective inspection measures and maintenance methods • Complete tasks in accordance with electrical design, manufacturing, installation and wiring standards • Test the functions of the vehicle electrical systems and identify their working status • Assess problems of vehicle electrical systems based on the actual operating environment and take corresponding measures • Use intelligent technology for vehicle electrical testing • Develop electric circuit optimization and testing manuals • Save and reuse materials • Make and maintain accurate work reports 	
6	Vehicle integrated commissioning, fault diagnosis and repair	10
	<p>The individual needs to know and understand:</p> <ul style="list-style-type: none"> • Standards of International Union of Railways (UIC) and International Electrotechnical Commission (IEC) standards, IEC 61375 standards, train network control system, and its data • Manufacturers' vehicle testing manuals • Vehicle fault code list • Vehicle network topology and subsystem node functions • Vehicle subsystems' composition, working principles, and control principles, mainly relating to: <ul style="list-style-type: none"> ◦ High voltage current collection and traction system ◦ Air supply and brake system ◦ Auxiliary power supply system ◦ Bogie system ◦ Door system ◦ Heating, ventilation, and air conditioning (HVAC) system ◦ Train control and management system (TCMS) ◦ Fire alarm system ◦ Passenger information system ◦ Lighting system 	

Section		Relative importance (%)
	<ul style="list-style-type: none"> • Vehicle network fault information • Vehicle electrical legends, icons, and symbols • Use of instruments and tools • Vehicle intelligent detection technology • Hazardous factors in electrical operations and corresponding safety protection measures 	
	<p>The individual shall be able to:</p> <ul style="list-style-type: none"> • Read and use schematic diagrams, assembly diagrams, wiring diagrams, layout diagrams, maintenance manuals, etc. of electrical subsystems supplied by manufacturers • Identify vehicle electrical components • Carry out vehicle integrated commissioning and testing according to manuals to identify vehicle status • Identify vehicle network status, download and analyze operation data, and locate fault ranges • Troubleshoot and locate fault points, repair faults and verify that the vehicle has returned to normal status through tests, measurement, and other means • Use intelligent technology for vehicle integrated commissioning and product lifecycle management • Accurately record faults and repair results 	
	Total	100

3 The Assessment Strategy and Specification

3.1 General guidance

Assessment is governed by the WorldSkills Assessment Strategy. The Strategy establishes the principles and techniques to which WorldSkills assessment and marking must conform.

Expert assessment practice lies at the heart of the WorldSkills Competition. For this reason, it is the subject of continuing professional development and scrutiny. The growth of expertise in assessment will inform the future use and direction of the main assessment instruments used by the WorldSkills Competition: the Marking Scheme, Test Project, and Competition Information System (CIS).

Assessment at the WorldSkills Competition falls into two broad types: Measurement and Judgement. For both types of assessment, the use of explicit benchmarks against which to assess each Aspect is essential to guarantee quality.

The Marking Scheme must follow the weightings within the Standards. The Test Project is the assessment vehicle for the skill competition, and therefore also follows the Standards. The CIS enables the timely and accurate recording of marks; its capacity for scrutiny, support, and feedback is continuously expanding.

The Marking Scheme, in outline, will lead the process of Test Project design. After this, the Marking Scheme and Test Project will be designed, developed, and verified through an iterative process, to ensure that both together optimize their relationship with the Standards and the Assessment Strategy. They will be agreed by the Experts and submitted to WSI for approval together, to demonstrate their quality and conformity with the Standards.

Prior to submission for approval to WSI, the Marking Scheme and Test Project will liaise with the WSI Skill Advisors for quality assurance and to benefit from the capabilities of the CIS.

4 Assessment Design and Practice

4.1 General guidance

This section describes the role and place of the Marking Scheme, how the Experts will assess Competitors' work as demonstrated through the Test Project, and the procedures and requirements for marking.

The Marking Scheme is the pivotal instrument of the WorldSkills Competition, in that it ties assessment to the standard that represents each skill competition, which itself represents a global occupation. It is designed to allocate marks for each assessed aspect of performance in accordance with the weightings in the Standards.

By reflecting the weightings in the Standards, the Marking Scheme establishes the parameters for the design of the Test Project. Depending on the nature of the skill competition and its assessment needs, it may initially be appropriate to develop the Marking Scheme in more detail as a guide for Test Project design. Alternatively, initial Test Project design can be based on the outline Marking Scheme. From this point onwards the Marking Scheme and Test Project should be developed together.

Section 2.1 above indicates the extent to which the Marking Scheme and Test Project may diverge from the weightings given in the Standards, if there is no practicable alternative.

For integrity and fairness, the Marking Scheme and Test Project are increasingly designed and developed by one or more Independent Test Project Designer(s) with relevant expertise. In these instances, the Marking Scheme and Test Project are unseen by Experts until immediately before the start of the skill competition, or competition module. Where the detailed and final Marking Scheme and Test Project are designed by Experts, they must be approved by the whole Expert group prior to submission for independent validation and quality assurance. Please see the Competition Rules for further details.

Experts and Independent Test Project Designers are required to submit their Marking Schemes and Test Projects for review, verification, and validation well in advance of completion. They are also expected to work with their Skill Advisor, reviewers, and verifiers, throughout the design and development process, for quality assurance and in order to take full advantage of the CIS's features.

In all cases a draft Marking Scheme must be entered into the CIS at least eight weeks prior to the Competition. Skill Advisors actively facilitate this process.

4.2 Assessment Criteria

The main headings of the Marking Scheme are the Assessment Criteria. These headings are derived before, or in conjunction with, the Test Project. In some skill competitions the Assessment Criteria may be similar to the section headings in the Standards; in others they may be different. There will normally be between five and nine Assessment Criteria. Whether or not the headings match, the Marking Scheme as a whole must reflect the weightings in the Standards.

Assessment Criteria are created by the person or people developing the Marking Scheme, who are free to define the Criteria that they consider most suited to the assessment and marking of the Test Project. Each Assessment Criterion is defined by a letter (A-I). **The Assessment Criteria, the allocation of marks, and the assessment methods, should not be set out within this Technical Description. This is because the Criteria, allocation of marks, and assessment**

methods all depend on the nature of the Marking Scheme and Test Project, which is decided after this Technical Description is published.

The Mark Summary Form generated by the CIS will comprise a list of the Assessment Criteria and Sub Criteria.

The marks allocated to each Criterion will be calculated by the CIS. These will be the cumulative sum of marks given to each Aspect within that Assessment Criterion.

4.3 Sub Criteria

Each Assessment Criterion is divided into one or more Sub Criteria. Each Sub Criterion becomes the heading for a WorldSkills marking form. Each marking form (Sub Criterion) contains Aspects to be assessed and marked by Measurement or Judgement, or both Measurement and Judgement.

Each marking form (Sub Criterion) specifies both the day on which it will be marked, and the identity of the marking team.

4.4 Aspects

Each Aspect defines, in detail, a single item to be assessed and marked, together with the marks, and detailed descriptors or instructions as a guide to marking. Each Aspect is assessed either by Measurement or by Judgement.

The marking form lists, in detail, every Aspect to be marked together with the mark allocated to it. The sum of the marks allocated to each Aspect must fall within the range of marks specified for that section of the Standards. This will be displayed in the Mark Allocation Table of the CIS, in the following format, when the Marking Scheme is reviewed from C-8 weeks. (Section 4.1 refers.)

	CRITERIA								TOTAL MARKS PER SECTION	WSSS MARKS PER SECTION	VARIANCE	
	A	B	C	D	E	F	G	H				
STANDARDS SPECIFICATION SECTION	1	5.00								5.00	5.00	0.00
	2		2.00					7.50		9.50	10.00	0.50
	3								11.00	11.00	10.00	1.00
	4			5.00						5.00	5.00	0.00
	5				10.00	10.00	10.00			30.00	30.00	0.00
	6		8.00	5.00				2.50	9.00	24.50	25.00	0.50
	7			10.00				5.00		15.00	15.00	0.00
TOTAL MARKS	5.00	10.00	20.00	10.00	10.00	10.00	15.00	20.00	100.00	100.00	2.00	

4.5 Assessment and marking

There is to be one marking team for each Sub Criterion, whether it is assessed and marked by Judgement, Measurement, or both. The same marking team must assess and mark all Competitors. Where this is impracticable (for example where an action must be done by every Competitor simultaneously, and must be observed doing so), a second tier of assessment and marking will be put in place, with the approval of the Competitions Committee Management Team. The marking teams must be organized to ensure that there is no compatriot marking in any circumstances. (Section 4.6 refers.)

4.6 Assessment and marking using Judgement

Judgement uses a scale of 0-3. To apply the scale with rigour and consistency, Judgement must be conducted using:

- benchmarks (criteria) for detailed guidance for each Aspect (in words, images, artefacts, or separate guidance notes). This is documented in the Standards and Assessment Guide.
- the 0-3 scale to indicate:
 - 0: performance below industry standard
 - 1: performance meets industry standard
 - 2: performance meets and, in specific respects, exceeds industry standard
 - 3: performance wholly exceeds industry standard and is judged as excellent

Three Experts will judge each Aspect, normally simultaneously, and record their scores. A fourth Expert coordinates and supervises the scoring, and checks their validity. They also act as a judge when required to prevent compatriot marking.

4.7 Assessment and marking using Measurement

Normally three Experts will be used to assess each Aspect, with a fourth Expert supervising. In some circumstances the team may organize itself as two pairs, for dual marking. Unless otherwise stated, only the maximum mark or zero will be awarded. Where they are used, the benchmarks for awarding partial marks will be clearly defined within the Aspect. To avoid errors in calculation or transmission, the CIS provides a large number of automated calculation options, the use of which is mandated.

4.8 The use of Measurement and Judgement

Decisions regarding the choice of criteria and assessment methods will be made during the design of the competition through the Marking Scheme and Test Project.

4.9 Skill assessment strategy and procedures

WorldSkills is committed to continuous improvement including reviewing past limitations and building on good practice. The following skill assessment strategy and procedures for this skill competition take this into account and explain how the marking process will be managed.

During the competition design process, the standard and assessment method chosen is determined by Marking Scheme and Test Project.

Assessment contains but is not limited to:

- The condition of personal protection and workplace protection
- Compliance of operations with work safety standards
- Correct use of tools and instruments
- Accuracy of measurement data
- Precision of parameters adjustment
- Mechanical manufacturing and installation status
- Electrical manufacturing and installation status
- Efficiency in electrical troubleshooting
- Results of vehicle integrated commissioning and testing
- Assessment of material conservation and sustainability

Procedures

Subject to further discussion, there may be marking by Measurement and Judgement.

The Chief Expert will divide the Experts into teams for purpose of marking and setting up marking schedules. Consideration is given to WorldSkills experience, language, and culture.

Each module/task/section is completed on the assigned day so that progressive marking can take place.

Marking is to be entered after each section has been completed, and a programme has been developed for computer calculation after time and task data has been entered.

The Experts marking criteria and Competitor marking forms, for each of the modules are given to the Experts at the Competition.

5 The Test Project

5.1 General notes

Sections 3 and 4 govern the development of the Test Project. These notes are supplementary.

Whether it is a single entity, or a series of stand-alone or connected modules, the Test Project will enable the assessment of the applied knowledge, skills, and behaviours set out in each section of the WSOS.

The purpose of the Test Project is to provide full, balanced, and authentic opportunities for assessment and marking across the Standards, in conjunction with the Marking Scheme. The relationship between the Test Project, Marking Scheme, and Standards will be a key indicator of quality, as will be its relationship with actual work performance.

The Test Project will not cover areas outside the Standards or affect the balance of marks within the Standards other than in the circumstances indicated by Section 2. This Technical Description will note any issues that affect the Test Project's capacity to support the full range of assessment relative to the Standards. Section 2.1 refers.

The Test Project will enable knowledge and understanding to be assessed solely through their applications within practical work. The Test Project will not assess knowledge of WorldSkills rules and regulations.

Most Test Projects and Marking Schemes are now designed and developed independently of the Experts. They are designed and developed either by the Skill Competition Manager, or an Independent Test Project Designer, normally from C-12 months. They are subject to independent review, verification, and validation. (Section 4.1 refers.)

The information provided below will be subject to what is known at the time of completing this Technical Description, and the requirement for confidentiality.

Please refer to the current version of the Competition Rules for further details.

5.2 Format/structure of the Test Project

The Test Project is a series of four (4) standalone modules.

- Module A - Maintenance and control of pantograph
- Module B - Installation and commissioning of passenger compartment door
- Module C - Maintenance of vehicle bogie
- Module D - Fault finding and repair of vehicle

5.3 Test Project design requirements

Test Projects should reflect the purposes, structures, processes, and outcomes of the occupational role they are based on. They should aim to be a small-scale version of that role. Before focusing on practicalities, SMTs should show how the Test Project design will provide full, balanced, and authentic opportunities for assessment and marking across the Standards, as set out in Section 5.1.

All technical terms and descriptions used in the Test Project must conform to internationally recognized standards.

The design of Test Project should be based on relevant standards or technical requirements. These documents are provided to the Competitors during the competition, including:

- Manuals of vehicle component structures and principles
- Equipment and tools use manuals
- Vehicle maintenance manuals
- Technical drawings

General Requirements for the Design of Test Project:

1. It should reflect whether the Competitors' personal protection and equipment protection meet the safety requirements;
2. It should reflect whether the operation process of the Competitors complies with the operation safety standards;
3. It should reflect whether the operation process and products of the Competitors meet standards;
4. It should reflect the Competitors' ability to handle emergencies during operations;
5. It should reflect whether the Competitors have the awareness of environmental protection, conservation, and sustainable development;
6. It should reflect the Competitors' ability to meet the challenges of innovative technologies.

Module	Time
Module A: Maintenance and control of pantograph	6 hours
Module B: Installation and commissioning of passenger compartment door	6 hours
Module C: Maintenance of vehicle bogie	3 hours
Module D: Fault finding and repair of vehicle	3 hours
Total	18 hours

Module A – Maintenance and control of pantograph

This module should mainly include the inspection and maintenance of vehicle pantograph mechanical parts, installation and commissioning of electric circuits and pneumatic circuits, fault diagnosis and handling, etc. It should comprehensively examine the Competitors' safe operation, standard inspection, defect judgment, maintenance and repair, drawing reading, installation skills, function commissioning, intelligent maintenance and other operation skills.

The main tasks include:

1. Preparation
2. Pantograph mechanical parts maintenance
3. Pantograph pneumatic circuit maintenance
4. Pantograph motion parameters adjustment and setting
5. Pantograph electric circuit wiring and detection
6. Pantograph electrical function test
7. Site cleaning

Module B – Installation and commissioning of passenger compartment door

This module should mainly include the installation of the mechanical mechanisms of the passenger compartment door, status adjustment, systemic testing, fault diagnosis and handling, etc. It should

comprehensively examine the Competitors' safe operation, faulty component identification, drawing reading, mechanical parts installation, assembly, and adjustment, function commissioning, intelligent maintenance, and other operation skills.

The main tasks include:

1. Preparation
2. Passenger compartment door installation and mechanical parameters adjustment
3. Passenger compartment door electrical connection
4. Passenger compartment door overall appearance inspection
5. Passenger compartment door electrical function test
6. Site cleaning

Module C – Maintenance of vehicle bogie

The module should mainly include bogie inspection, measurement, adjustment, maintenance, and component replacement, pipe installation, etc. It should comprehensively examine the Competitors' safe operation, defect identification, component disassembly and installation, component maintenance, mechanical part measurement, parameter adjustment, pipe maintenance, and other operation skills.

The main tasks include:

1. Preparation
2. Bogie parts appearance inspection, measurement and maintenance
3. Bogie fault diagnosis and repair
4. Air pipeline test and repair
5. Site cleaning

Module D – Fault-finding and repair of vehicle

This module should mainly include vehicle status inspection, integrated commissioning, data analysis, fault diagnosis and handling, etc. It should comprehensively examine the Competitors' safe operation, vehicle inspection, integrated commissioning, fault handling and other operation skills in the environment of a real vehicle or a simulated vehicle.

The main tasks include:

1. Preparation
2. Vehicle mechanical parts inspection
3. Making and connection of wire harnesses
4. Vehicle electrical tests and fault handling
5. Site cleaning

5.4 Test Project coordination and development

The Test Project MUST be submitted using the templates provided by WorldSkills International (www.worldskills.org/expertcentre). Use the Word template for text documents and DWG template for drawings.

5.4.1 Test Project coordination (preparation for Competition)

Coordination of the Test Project/modules will be undertaken by the Skill Competition Manager.

5.4.2 Who develops the Test Project/modules

The Test Project/modules are developed by an Independent Test Project Designer (ITPD) in collaboration with the Skill Competition Manager.

5.4.3 When is the Test Project developed

The Test Project/modules are developed according to the following timeline:

Time	Action
Fifteen (15) months prior to the Competition	The ITPD is identified and a Confidentiality Agreement between WSI and the ITPD is organized.
Two (2) months prior to the Competition	The Test Project documents are sent to the WorldSkills International Skills Competitions Administration Manager to be circulated on the WorldSkills website as a pre-competition file.
Three (3) months prior to the Competition	The pre-competition files will then be changed by a minimum of 30%.
At the Competition on C-2	The final Test Project/documents are presented to Experts and Competitors.

5.5 Test Project initial review and verification

The purpose of a Test Project is to create a challenge for Competitors which authentically represents working life for an outstanding practitioner in an identified occupation. By doing this, the Test Project will apply the Marking Scheme and fully represent the WSOS. In this way it is unique in its context, purpose, activities, and expectations.

To support Test Project design and development, a rigorous quality assurance and design process is in place (Competition Rules sections 10.6-10.7 refer.) Once approved by WorldSkills, the Independent Test Project Designer (ITPD) is expected to identify one or more independent expert(s), and trusted individuals initially to review the Independent Test Project Designer's ideas and plans, and subsequently to verify the Test Project, prior to validation.

A Skill Advisor will ensure and coordinate this arrangement, to guarantee the timeliness and thoroughness of both initial review, and verification, based on the risk analysis that underpins Section 10.7 of the Competition Rules.

5.6 Test Project validation

The Skill Competition Manager coordinates the validation of the Test Project/modules and will ensure that it can be completed within the material, equipment, knowledge, and time constraints of Competitors.

5.7 Test Project circulation

The Test Project/modules are circulated three (3) months prior to the Competition.

5.8 Test Project change

Due to the Test Project being circulated prior to the Competition, an Independent Test Project Designer must develop a 30% change as required by WorldSkills. This change is presented to Experts and Competitors on C-2.

5.9 Material or manufacturer specifications

Specific material and/or manufacturer specifications required to allow the Competitor to complete the Test Project will be supplied by the Competition Organizer and are available from www.worldskills.org/infrastructure located in the Expert Centre. However, note that in some cases details of specific materials and/or manufacturer specifications may remain secret and will not be released prior to the Competition. These items may include those for fault finding modules or modules not circulated.

6 Skill management and communication

6.1 Discussion Forum

Prior to the Competition, all discussion, communication, collaboration, and decision making regarding the skill competition must take place on the WorldSkills skill-specific Discussion Forum. (<http://forums.worldskills.org>). Skill related decisions and communication are only valid if they take place on the WorldSkills Discussion Forum. The Chief Expert (or an Expert Lead appointed by the Skill Management Team) will be the moderator for this Discussion Forum. Refer to the Competition Rules for the timeline of communication and competition development requirements.

6.2 Competitor information

All information for registered Competitors is available from the Competitor Centre (www.worldskills.org/competitorcentre).

This information includes:

- Competition Rules
- Technical Descriptions
- Mark Summary Form (where applicable)
- Test Projects (where applicable)
- Infrastructure List
- WorldSkills Health, Safety, and Environment Policy and Regulations
- Other Competition-related information

6.3 Test Projects and Marking Schemes

Circulated Test Projects will be available from www.worldskills.org/testprojects and the Competitor Centre (www.worldskills.org/competitorcentre).

6.4 Day-to-day management

The day-to-day management of the skill competition during the Competition is defined in the Skill Management Plan that is created by the Skill Management Team. The Skill Management Team comprises the Skill Competition Manager, Chief Expert, and the Expert Leads. The Skill Management Plan is progressively developed in the six (6) months prior to the Competition and finalized at the Competition. The Skill Management Plan can be viewed in the Expert Centre (www.worldskills.org/expertcentre).

6.5 General best practice procedures

General best practice procedures clearly delineate the difference between what is a best practice procedure and skill-specific rules (section 9). General best practice procedures are those where Experts and Competitors CANNOT be held accountable as a breach to the Competition Rules or skill-specific rules which would have a penalty applied as part of the Issue and Dispute Resolution procedure including the Code of Ethics and Conduct Penalty System. In some cases, general best practice procedures for Competitors may be reflected in the Marking Scheme.

Topic/task	Best practice procedure
Allocation of workstations/ modules	<ul style="list-style-type: none"> • All Competitors are timetabled in the module with their compatriot Expert during the first round of competition (where possible)
Experts/Interpreters	<ul style="list-style-type: none"> • It is forbidden that any Experts or Interpreters pass on any information about the Test Projects to any Competitor or anyone associated with a Competitor. • Experts must always apply themselves in a professional manner.

7 Skill-specific safety requirements

7.1 Personal Protective Equipment

Refer to WorldSkills Safety Policy and Regulations for Host country or region regulations.

Task	Safety shoes with protective cap	Sturdy shoes with closed toe and no heel	General protective gloves	Ear plugs	Safety Gloves	Safety glasses
General PPE for safe areas		√				
For all workstations	√		As required for the module	As required for the module	As required for the module	As required for the module

8 Materials and equipment

8.1 Infrastructure List

The Infrastructure List details all equipment, materials, and facilities provided by the Competition Organizer.

The Infrastructure List is available at www.worldskills.org/infrastructure.

The Infrastructure List specifies the items and quantities requested by the Skill Management Team for the next Competition. The Competition Organizer will progressively update the Infrastructure List specifying the actual quantity, type, brand, and model of the items. Note that in some cases details of specific materials and/or manufacturer specifications may remain secret and will not be released prior to the Competition. These items may include those for fault finding modules or modules not circulated.

At each Competition, the Skill Management Team must review and update the Infrastructure List in preparation for the next Competition. The Skill Competition Manager must advise the Director of Skills Competitions of any increases in space and/or equipment.

At each Competition, the Technical Observer must audit the Infrastructure List that was used at that Competition for the upcoming WorldSkills Competition.

The Infrastructure List does not include items that Competitors and/or Experts are required to bring and items that Competitors are not allowed to bring – they are specified below.

8.2 Competitors toolbox

Competitors are not allowed to send a toolbox to the Competition. All tools are provided by the Competition Organizer.

8.3 Materials, equipment, and tools supplied by Competitors

It is not applicable for Competitors to bring materials, equipment, and tools to the Competition.

However, Competitors are required to supply their own Personal Protective Equipment as specified in section 7 skill-specific safety requirements.

8.4 Materials, equipment, and tools supplied by Experts

Experts are required to supply their own Personal Protective Equipment as specified in section 7 skill-specific safety requirements.

Experts are responsible that Interpreters bring their own PPE.

8.5 Materials and equipment prohibited in the skill area

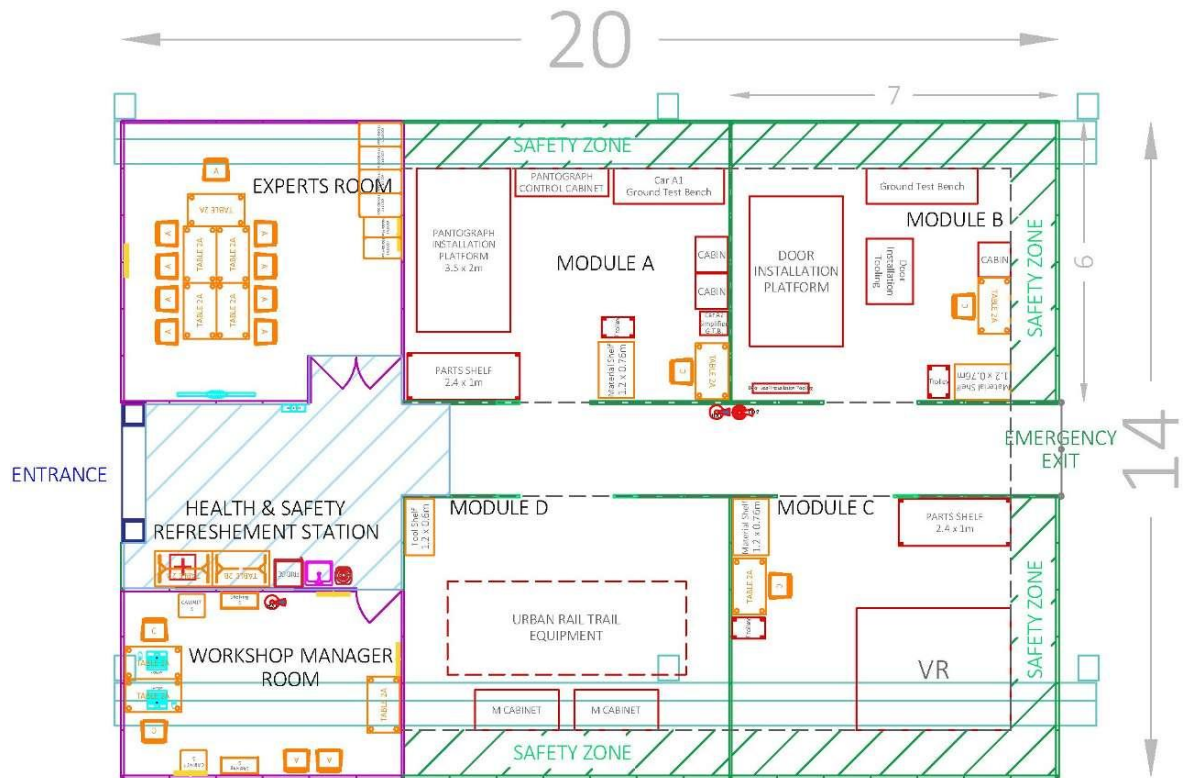
Competitors and Experts are prohibited to bring any materials or equipment not listed in section 8.3 and section 8.4.

Competitors and Experts are prohibited to bring any materials or equipment not listed in section 8.3 and section 8.4.

8.6 Proposed workshop and workstation layouts

Workshop layouts from previous competitions are available at www.worldskills.org/sitelayout.

Example workshop layout



9 Skill-specific rules

9.1 General notes

Skill-specific rules cannot contradict or take priority over the Competition Rules. They do provide specific details and clarity in areas that may vary from skill competition to skill competition. This includes but is not limited to personal IT equipment, data storage devices, Internet access, procedures and workflow, and documentation management and distribution. Breaches of these rules will be solved according to the Issue and Dispute Resolution procedure including the Code of Ethics and Conduct Penalty System.

9.2 Skill-specific rules

Topic/task	Skill-specific rules
Use of technology – personal laptops, tablets, and mobile phones	<ul style="list-style-type: none"> • The Chief Expert, Experts, Competitors, and Interpreters are allowed to bring personal laptops, tablets, or mobile phones into the workshop however when not in use they must remain in the locker. Laptops and tablets must remain in the locker until the end of C4 however mobile phones can be taken at lunch time and the end of each day. The Skill Competition Manager is exempt from this rule. • Competitors cannot bring phones into the work area. They must remain in the Competitor's locker during the competition time. Competitors can use their phones during lunch time away from the competition area. Competitors can take their phones at the end of each day. • Interpreters are not allowed phones in the workshop area unless authorized by the Skill Competition Manager. If brought in they can be locked in the personal locker and removed at lunch time and the end of each day. • Any digital translation can be done using the supplied computer in the Expert room.
Use of technology – personal photo and video taking devices	<ul style="list-style-type: none"> • No photos/videos can be taken prior to C1. After C1 Experts can take photos of their compatriot Competitor but no workstation until their compatriot Competitor is competing in that module or has completed that module. • Competitors cannot take photos of workstations from outside the competition area during the competition. • Experts are allowed to use a dedicated camera and memory device as required for the marking process. These must be approved by the Chief Expert.

Topic/task	Skill-specific rules
Use of technology – USB, memory sticks	<ul style="list-style-type: none"> • The Skill Competition Manager, Chief Expert, Competitors, Experts, and Interpreters are not allowed to bring memory sticks into the workshop as they are supplied by the Competition Organizer. They must be returned to the Chief Expert at the end of each day. • If these items are brought into the workshop, they must be locked away in the personal locker and not removed until the end of competition on C4.
Templates, aids, etc.	<ul style="list-style-type: none"> • Competitors are not allowed to bring or use any templates, notes, aids at the workstation during competition time. • All notes taken during competition time must be given with the Test Project information, report sheet (where applicable) to the Expert in charge of that module at the workstation of that module.
Drawings, recording information	<ul style="list-style-type: none"> • Competitors are not allowed to bring any prepared drawings or documented information to the Competition.
Competitor movement	<ul style="list-style-type: none"> • Competitors during the competition must not stay around the outside of the competition workshop. • Competitors must not enter the competition workshop unless instructed to by Chief Expert. They must wait outside the entry until instructed otherwise. • When Competitors enter the workshop, they must go straight to the Competitors room unless otherwise instructed to by the Chief Expert.

10 Expert knowledge and experience

10.1 Requirements

Experts appointed for this skill competition must have the following knowledge and experience for the appropriate occupation or work role as documented in **section 1.1.2**.

This section is currently under development for WSC2026.

11 Visitor and media engagement

11.1 Engagement methods

Following is a list of possible ways to maximize visitor and media engagement:

- Equipped with rail transit train simulation driving experience system to attract public participation for driving and experience;
- Equipped with VR, AR, MR virtual maintenance system enables public and young visitor to participate the skill;
- Invite media to engage for ensuring the coverage and persistence;
- Strengthen the display of the competition process by 5G live network broadcast, get the competition scene on the Internet;
- Equipped with screens to play the worker's actual working site, the devices and tools used during work;
- Test Project descriptions are simplified for visitors and make them clear, visible and understandable by visitors;
- Provide Competitors profile, including their age, career, working experience, education background, etc;
- Daily reporting of competition status – results are displayed in the Competition area. This is of the progressive marking for all sections of the competition and will display the current total aggregate results per country/region;
- Invite international rail transit organizations and companies to discuss with WorldSkills Experts and exchange ideas for improving future competitions;
- Invite non-members of WorldSkills having rail transit systems to visit and experience the skill competition and promotion in order to attract more non-members of WorldSkills to participate in future, may also sponsor developing countries and regions to visit the competition.

12 Sustainability

12.1 Sustainable practices

This skill competition will focus on the sustainable practices below:

- The main device is provided by sponsor or partner, necessary site and device management cost would be provided. Once the competition finishes, the Test Project device could be re-installed in colleges or company training institutes for students and employee skill training purpose;
- During designing of Test Projects and liaising with the current Workshop Manager, the uses of “green” materials are to be considered. Materials that meet the following requirements are to be used as far as possible:
 - Halogen free;
 - Recyclable;
 - Free from toxic substances.
- Materials that can be reused, are to be offered to local schools to be used in education for training purpose. Materials that cannot be reused are to be sorted as per Host Country regulations or, if meeting higher requirements, WorldSkills regulations;
- Make sure the devices in the Infrastructure List will all be used;
- The industry partner designing the Test Project must carefully consider sustainability as a key issue.

13 References for industry consultation

13.1 General notes

WorldSkills is committed to ensuring that the WorldSkills Occupational Standards fully reflect the dynamism of internationally recognized best practice in industry and business. To do this WorldSkills approaches a number of organizations across the world that can offer feedback on the draft Description of the Associated Role and WorldSkills Occupational Standards on a two-yearly cycle.

In parallel to this, WSI consults three international occupational classifications and databases:

- ISCO-08: (<http://www.ilo.org/public/english/bureau/stat/isco/isco08/>)
- ESCO: (<https://ec.europa.eu/esco/portal/home>)
- O*NET OnLine (www.onetonline.org/)

13.2 References

This WSOS is for a junior version of a rolling stock engineering technician: <http://data.europa.eu/esco/occupation/0f2c04f1-9001-4a77-884f-1ea16949f6f6>

and is closer to a rolling stock assembler: <http://data.europa.eu/esco/occupation/839d738b-8b54-4408-868a-6d8af102d2de>.

These links enable adjacent occupations to be explored.

ILO 8211 is the closest equivalent.

The following table indicates which organizations were approached and provided valuable feedback for the Description of the Associated Role and WorldSkills Occupational Standards in place for WorldSkills Shanghai 2026.

Organization	Contact name
Irish Rail	Conor Doolan, Apprentice development executive

14 Appendix

14.1 Appendix information

Not applicable.