worldskills

Technical Description

Heavy Vehicle Technology

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.

The Technical Description consists of the following:

1 Introduction

1.1 Name and description of the skill competition

1.1.1 The name of the skill competition is

Heavy Vehicle Technology

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

The Heavy Vehicle Technician maintains, diagnoses, and repairs large machines and industrial equipment including towed and self-propelled used in mining, forestry, agriculture, landscaping, and material handling industries. The technician must be able to maintain, diagnose, and repair internal combustion engines and components on stationary, mobile, tracked rubber-tired equipment, ground-engaging equipment, and earth-moving equipment.

Maintenance, diagnosis, and repair can involve individual components or entire systems, requiring the technician to have skill with engines, hydraulics, drive trains, electronics, braking systems, and much more. The technician must use specific tools to diagnose function, make adjustments, repair, or replace defective components or systems, test repairs for proper performance, interpret instructions in technical manuals, write service reports, and ensure that the work meets manufacturers' specifications and the requirements of legislation. The technician is frequently the interlocutor between the employer, the customer, and the manufacturer. This experience can allow the technician to advance to senior roles such as trainer, supervisor, or manager.

Although technicians often specialize in certain machines or equipment, either by choice or as a result of employment, the diversity of heavy equipment and, along with rapid changes in technology, require broad knowledge and adaptability. technicians must also be able to work alone or as part of a team, at a variety of hours, and in an employer's shop, a customer's building, or outdoors in urban or rural locations, regardless of weather. Machines often require quick intervention to enable uninterrupted activity to resume.

The work is most rewarding for those who enjoy working with their hands and are logical, curious, and interested in problem solving. The technicians also needs good vision, hearing, sense of feel and sense of smell to diagnose problems. The occupation requires strength and stamina. Proper safety standards must be maintained at all times to avoid risk of injury involved in working on heavy vehicles and with power tools.

1.1.3 Number of Competitors per team

Heavy 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 safety management**	**10**
	The individual needs to know and understand: • Best procedures to protect health and safety in the working environment • The current occupational health and safety rules and regulations which exist in heavy vehicle technology industry • The use of personal protective equipment used by a technicians. • The range and use of substances, materials, and equipment used in workplace • The safe and sustainable use and disposal of substances and materials • The causes and prevention of all risks related to required tasks	

Section		Relative importance (%)
	• The importance of an orderly workspace to personal health and safety, and the importance of restoring the workspace for the next mechanic	
	The individual shall be able to: • Consistently and diligently follow the best procedures to protect health and safety in the working environment • Use appropriate personal protective equipment (PPE) ◦ Safety footwear and eye protection with side shields, ear protection, respiratory protection, and either barrier gloves or fitted mechanic's gloves, bump caps as needed • 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 mechanic	
2	**Logical order of diagnosis and repair**	**13**
	The individual needs to know and understand: • The operation of the various systems and components found on heavy vehicle machines • How to organize and implement appropriate decisions regarding diagnoses, maintenance, or repair • The various diagnosis systems, tools available (Mechanical, Electronical, Electronic (computer) used to carry out the logical order of diagnosis and repair • The basis for creating diagnosis flow/procedure charts • The methods of repair best suited to complete each task	
	The individual shall be able to: • Organize and implement appropriate decisions regarding the diagnosis, maintenance and repair of the various systems and components • ask questions if there is any doubt about the task which has to be completed • carry out the various diagnosis processes to assist in the fault finding of systems or components in a safe and proper manner • Follow diagnosis flow/procedure charts • Use the methods and procedures best suited to complete each task	
3	**Use and interpretation of technical information**	**13**

Section		Relative importance (%)
	The individual needs to know and understand: • The purpose and use of the range of technical information in paper and electronic formats • How to read, interpret, and extract technical information from all formats • How to apply technical information to a task • How to accurately use the technical language associated with the task	
	The individual shall be able to: • 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 • Interpret and accurately use the technical language associated with the task	
4	**Diagnostics and precision measurement**	**13**
	The individual needs to know and understand: • The types of diagnostic and precision measurement tools in metric units • The purposes, proper handling, and use of the types of diagnostic and precision measurement tools • How to 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	
	The individual shall be able to: • Select and use correct types of diagnostic and precision measurement tools in metric units • Select and use diagnostic and precision tools according to their characteristics and the requirements of the task • 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	
5	**Fault-finding**	**13**
	The individual needs to know and understand: • The range of faults and their symptoms in heavy vehicle components or systems	

Section		Relative importance (%)
	• How to apply the results of diagnostic testing and any relevant calculations to identify and isolate faults • The importance of regular maintenance to minimize faults in components or systems	
	The individual shall be able to: • Recognize and diagnose faults in heavy vehicle components or systems • Choose, interpret, and use 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	
6	**Appropriate use of tools and equipment**	**13**
	The individual needs to know and understand: • The purposes and proper handling of the wide range of tools and equipment used to diagnosis, maintain, or repair any components or system relating to heavy vehicle service • How to use the wide range of tools in proper and safe manner when working on the different vehicle systems and components • That when not in use these tools should be properly maintained, recalibrated, and stored in a safe manner	
	The individual shall be able to: • Select the correct piece of equipment or tools to complete the task • Properly use and calibrate the piece of equipment or tools to complete the task • Maintain and store the piece of equipment or tools when the task is complete	
7	**Maintenance or repair of components or systems**	**13**
	The individual needs to know and understand: • The range of procedures and manufacturers' specifications for maintenance or repair of diesel engine systems, hydraulic systems; pneumatic systems, electrical and electronic systems, drive train systems, and pre-delivery inspections • How to choose the appropriate procedures to maintain or repair these systems • The effects of the chosen procedures on other components or systems	

Section		Relative importance (%)
	The individual shall be able to: • Choose the appropriate procedures to meet manufacturers' specifications for maintenance or repair of: ◦ Diesel engine systems ◦ Hydraulic and Pneumatics systems ◦ Steering, Brakes and Undercarriage ◦ Electrical and Electronic systems ◦ Drive train systems ◦ Pre-delivery • Predict and alleviate the effects of the chosen procedures on other components or systems	
8	**Communication of maintenance or repair process**	**12**
	The individual needs to know and understand: • The technical language associated with the occupation, as used in written documents, both paper and electronic based circuit diagrams, and associated documents related to the task • How to record clearly and accurately, supporting technical information in a written report about each task • The technical information written in the task document	
	The individual shall be able to: • Clearly and accurately record supporting technical information about each task in a written report • Comprehend the information and follow the instructions in the task document • Include compliant practice, investigation, diagnostics, and completed repair	
	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 The Marking Scheme

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
STANDARDS SPECIFICATION SECTION		A	B	C	D	E	F	G	H			
	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.

- The Chief Expert will divide the Experts into Marking Teams and assign one team to each Competitior workstation for the duration of the competition. The Marking Teams will include a mixture of languages, cultures, and WorldSkills experience.
- The Skill Competition Manager and Chief Expert may nominate Experts with Special Responsibilities.
- Experts will fairly and objectively assess each Competitor identically, in accordance with the Marking Scheme and the spirit of the WorldSkills event.
- Assessment will take place while a Competitor is completing the modules at a workstation.
- The marks are entered into the CIS for each module on the same day as the marking was completed.
- Under the following circumstances, all Competitors will receive full marks for the task at hand:
  - If one or more Competitors cannot complete a task because of the shortcomings of the infrastructure, including lack of proper equipment or equipment failure.

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 six (6) standalone modules.

The six modules are:

1. Diesel Engines Systems
2. Hydraulic Systems
3. Electrical and Electronic Systems
4. Drive Train Systems
5. Steering, Braking, and Undercarriage Systems
6. Pre-Delivery Inspections

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.

- The Heavy Vehicle Technology Test Project will comply with WorldSkills requirements and numbering standards;
- The Test Project will include six (6) separate modules involving multiple tasks, to be objectively assessed according to the WorldSkills Occupational Standards applicable to each task, so that each WorldSkills Occupational Standards is tested at least once throughout the Test Project;
- The Test Project is accompanied by a Marking Scheme for each module;
- The total working time for the Test Project is 18 hours;

At each workstation, the Competitor will receive brief but clear descriptions of:

- The module;
- Instructions for completing the module;
- A Hazard Assessment specific to the workstation, including the counteractive measures that must be taken prior to starting, to be able to work safely.
- The tasks will involve the maintenance, diagnosis, or repair of components or systems relating to diesel engines, hydraulics, electrical and electronics, drive trains, pre-delivery inspections, steering, brake, and undercarriage systems, and precision measuring;
- Each of the eight sections of the WorldSkills Occupational Standards are tested at least once throughout the Test Project as indicated in section 2.2

    1. Work organization and safety management
    2. Logical order of diagnosis and repair
    3. Use and interpretation of technical information
    4. Diagnostics and precision measurement
    5. Fault finding
    6. Appropriate use of tools and equipment
    7. Maintenance or repair of components or systems
    8. Communication of maintenance or repair process

- All Competitors are given the same amount of time to complete each module.
- The modules at each workstation are completed on the assigned day so that progressive marking can take place.

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
Ten (10) months prior to the Competition	The ITPD is identified and a Confidentiality Agreement between WSI and the ITPD is organized.
One (1) month prior to the Competition	The Test Project documents are sent to the WorldSkills International Skills Competitions Administration Manager.
At the Competition at the beginning of each module	The Test Project/modules are presented to Competitors and Experts.

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 not circulated prior to the Competition. The Test Project/modules are presented to Experts and to Competitors at the beginning of each module.

5.8 Test Project change

Due to the Test Project being developed by an Independent Test Project Designer (ITPD), there is no change required to be made to the Test Project/modules at the Competition. Exceptions are amendments to technical errors in the Test Project documents and according to infrastructure limitations.

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
Photos and videos	• The Skill Assistant is assigned a device provided by the Skill Competition Manager to take photos of every Competitor at each module throughout the Competition. All photos are made available to all Experts and Competitors to download and save at the end of C4.

7 Skill-specific safety requirements

7.1 Personal Protective Equipment

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

Task	Safety glasses with side protection	Face shield	dust mask	Mechanics gloves
General PPE for safe areas Safety glasses with side protection, steel-toed boots and work clothes are required by everyone in the competition area. No unescorted visitors are allowed in the worksite due to the potential operation of our large mobile vehicles and their implements. Competitors must not wear jewellery (rings, bracelets, watches, necklaces, pins), ties, lanyards, ID badges, or anything attached to them or dangling from them that might get caught in a piece of moving equipment. Long hair must be tied up or tied back and tucked away down the back of the shirt so none is dangling, for protection from moving equipment.				

Task	Safety glasses with side protection	Face shield	dust mask	Mechanics gloves
1. Diesel Engine Systems Latex gloves for possibly handling internal diesel engine components and fluids such as petroleum-based fuels and lubricants, glycol-based coolants, and urea-based diesel exhaust fluid. Form-fitted mechanics gloves for possibly handling heavy, sharp, or hot components. Safety glasses with side protection, steel-toed boots, work clothes. Hearing protection in the event the engine is operational.	√			√
2. Hydraulic Systems Latex gloves for possibly handling internal hydraulic components and petroleum-based hydraulic fluid. Form-fitted mechanics gloves for possibly handling heavy, sharp, or hot components. Safety glasses with side protection, steel-toed boots, work clothes. Hearing protection in the event the vehicle is operational.	√			√
3. Electrical and Electronic Systems Latex gloves for possibly handling fluids such as petroleum-based lubricants, glycol-based coolants, urea-based diesel exhaust fluid, and battery electrolyte. Form-fitted mechanics gloves for possibly handling heavy, sharp, or hot components. Face shield for possible High Rate Discharge Test of vehicle batteries. Safety glasses with side protection, steel-toed boots, work clothes. Hearing protection in the event the vehicle is operational.	√	√		√

Task	Safety glasses with side protection	Face shield	dust mask	Mechanics gloves
4. Drive Train Systems Latex gloves for possibly handling fluids such as petroleum-based lubricants, and tooth-contact paint and solvent. Form-fitted mechanics gloves for possibly handling heavy, sharp, or hot components. Safety glasses with side protection, steel-toed boots, work clothes. Hearing protection in the event the vehicle is operational.	√			√
5. Steering, Braking, and Undercarriage Systems Latex gloves for possibly handling internal hydraulic components and petroleum-based hydraulic fluid. Form-fitted mechanics gloves for possibly handling heavy or sharp components. Safety glasses with side protection, steel-toed boots, work clothes. Hearing protection in the event the vehicle is operational.	√			√
6. Pre-delivery Inspection Latex gloves for possibly handling fluids such as petroleum-based lubricants, glycol-based coolants, urea-based diesel exhaust fluid, and battery electrolyte. Form-fitted mechanics gloves for possibly handling heavy or sharp components. Safety glasses with side protection, steel-toed boots, work clothes.	√			√

Task	Latex gloves	sturdy shoes with closed toe and heel	safety shoes with protective cap
General PPE for safe areas Safety glasses with side protection, steel-toed boots and work clothes are required by everyone in the competition area. No unescorted visitors are allowed in the worksite due to the potential operation of our large mobile vehicles and their implements. Competitors must not wear jewellery (rings, bracelets, watches, necklaces, pins), ties, lanyards, ID badges, or anything attached to them or dangling from them that might get caught in a piece of moving equipment. Long hair must be tied up or tied back and tucked away down the back of the shirt so none is dangling, for protection from moving equipment.		√	
1. Diesel Engine Systems Latex gloves for possibly handling internal diesel engine components and fluids such as petroleum-based fuels and lubricants, glycol-based coolants, and urea-based diesel exhaust fluid. Form-fitted mechanics gloves for possibly handling heavy, sharp, or hot components. Safety glasses with side protection, steel-toed boots, work clothes. Hearing protection in the event the engine is operational.	√		√
2. Hydraulic Systems Latex gloves for possibly handling internal hydraulic components and petroleum-based hydraulic fluid. Form-fitted mechanics gloves for possibly handling heavy, sharp, or hot components. Safety glasses with side protection, steel-toed boots, work clothes. Hearing protection in the event the vehicle is operational.	√		√
3. Electrical and Electronic Systems	√		√

Task	Latex gloves	sturdy shoes with closed toe and heel	safety shoes with protective cap
Latex gloves for possibly handling fluids such as petroleum-based lubricants, glycol-based coolants, urea-based diesel exhaust fluid, and battery electrolyte. Form-fitted mechanics gloves for possibly handling heavy, sharp, or hot components. Face shield for possible High Rate Discharge Test of vehicle batteries. Safety glasses with side protection, steel-toed boots, work clothes. Hearing protection in the event the vehicle is operational.			
4. Drive Train Systems Latex gloves for possibly handling fluids such as petroleum-based lubricants, and tooth-contact paint and solvent. Form-fitted mechanics gloves for possibly handling heavy, sharp, or hot components. Safety glasses with side protection, steel-toed boots, work clothes. Hearing protection in the event the vehicle is operational.	√		√
5. Steering, Braking, and Undercarriage Systems Latex gloves for possibly handling internal hydraulic components and petroleum-based hydraulic fluid. Form-fitted mechanics gloves for possibly handling heavy or sharp components. Safety glasses with side protection, steel-toed boots, work clothes. Hearing protection in the event the vehicle is operational.	√		√
6. Pre-delivery Inspection Latex gloves for possibly handling fluids such as petroleum-based lubricants, glycol-based coolants, urea-based diesel exhaust fluid, and battery electrolyte.	√		√

Task	Latex gloves	sturdy shoes with closed toe and heel	safety shoes with protective cap
Form-fitted mechanics gloves for possibly handling heavy or sharp components. Safety glasses with side protection, steel-toed boots, work clothes.			

Task	tight fitting work clothes (long trousers/ coveralls)	hearing protection/ disposableear plugs	hairnet (for a lot or long hair)
General PPE for safe areas Safety glasses with side protection, steel-toed boots and work clothes are required by everyone in the competition area. No unescorted visitors are allowed in the worksite due to the potential operation of our large mobile vehicles and their implements. Competitors must not wear jewellery (rings, bracelets, watches, necklaces, pins), ties, lanyards, ID badges, or anything attached to them or dangling from them that might get caught in a piece of moving equipment. Long hair must be tied up or tied back and tucked away down the back of the shirt so none is dangling, for protection from moving equipment.			
1. Diesel Engine Systems Latex gloves for possibly handling internal diesel engine components and fluids such as petroleum-based fuels and lubricants, glycol-based coolants, and urea-based diesel exhaust fluid. Form-fitted mechanics gloves for possibly handling heavy, sharp, or hot components.	√	√	√

Task	tight fitting work clothes (long trousers/ coveralls)	hearing protection/ disposableear plugs	hairnet (for a lot or long hair)
Safety glasses with side protection, steel-toed boots, work clothes. Hearing protection in the event the engine is operational.			
2. Hydraulic Systems Latex gloves for possibly handling internal hydraulic components and petroleum-based hydraulic fluid. Form-fitted mechanics gloves for possibly handling heavy, sharp, or hot components. Safety glasses with side protection, steel-toed boots, work clothes. Hearing protection in the event the vehicle is operational.	√	√	√
3. Electrical and Electronic Systems Latex gloves for possibly handling fluids such as petroleum-based lubricants, glycol-based coolants, urea-based diesel exhaust fluid, and battery electrolyte. Form-fitted mechanics gloves for possibly handling heavy, sharp, or hot components. Face shield for possible High Rate Discharge Test of vehicle batteries. Safety glasses with side protection, steel-toed boots, work clothes. Hearing protection in the event the vehicle is operational.	√	√	
4. Drive Train Systems Latex gloves for possibly handling fluids such as petroleum-based lubricants, and tooth-contact paint and solvent. Form-fitted mechanics gloves for possibly handling heavy, sharp, or hot components.	√	√	√

Task	tight fitting work clothes (long trousers/ coveralls)	hearing protection/ disposableear plugs	hairnet (for a lot or long hair)
Safety glasses with side protection, steel-toed boots, work clothes. Hearing protection in the event the vehicle is operational.			
5. Steering, Braking, and Undercarriage Systems Latex gloves for possibly handling internal hydraulic components and petroleum-based hydraulic fluid. Form-fitted mechanics gloves for possibly handling heavy or sharp components. Safety glasses with side protection, steel-toed boots, work clothes. Hearing protection in the event the vehicle is operational.	√	√	√
6. Pre-delivery Inspection Latex gloves for possibly handling fluids such as petroleum-based lubricants, glycol-based coolants, urea-based diesel exhaust fluid, and battery electrolyte. Form-fitted mechanics gloves for possibly handling heavy or sharp components. Safety glasses with side protection, steel-toed boots, work clothes.	√	√	

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 PPE.

8.5 Materials and equipment prohibited in the skill area

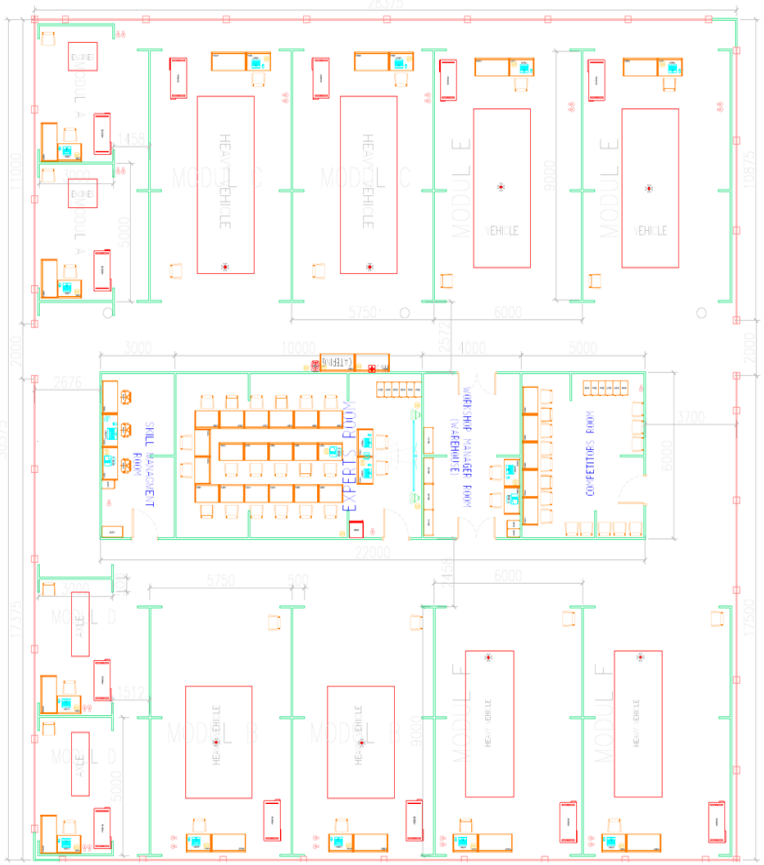
Competitors and Experts are prohibited to bring any materials or equipment not listed in section 8.3 and section 8.4.

The following items are not allowed in the workshop: mobile phones, any electronic communication transmitters and receivers, audial and visual recording equipment, and any personal tools.

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 rule
Use of technology – Data storage devices such as USB flash drives.	• Chief Expert, Experts, Competitors, and Interpreters are not allowed to bring data storage devices into the workshop.
Use of technology – personal laptops, tablets, and mobile phones.	• Chief Expert, Experts, Competitors, and Interpreters are not allowed to bring personal laptops, tablets, mobile phones, or smart watches into the workshop. If these items are brought into the workshop, then they must be locked in the personal locker until the end of each day. • Personal mobile phones must be locked in the personal locker for the duration of the competition. These can be taken out at lunchtime and at the conclusion of each day.
Use of technology – personal photo and video taking devices.	• Competitors, Experts, and Interpreters are only allowed to use personal photo and video taking devices in the workshop after the conclusion of the competition on C4.
Templates, aids, and other similar things.	• Competitors are not permitted to bring or use templates or aids.
Drawings, recording information.	• Chief Expert, Experts, Competitors, and Interpreters are not permitted to bring drawings or prepared information into the workshop. If these items are brought into the workshop, then they must be locked in the personal locker until the end of each day.
Competitor movement	• 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.

Topic/task	Skill-specific rule
	• When Competitors enter the workshop, they must go straight to the Competitors room unless otherwise instructed to by the Chief Expert.

10 Visitor and media engagement

10.1 Engagement methods

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

Skills Competitions take place in large, public venues, to raise awareness of the value of skilled trades and technologies and to deliver hands-on opportunities for the public, particularly students, to explore these careers.

Youth are able to observe other young people in a high-calibre competition performing real-life tasks with skill, knowledge, and professionalism.

Visitors may have the opportunity to also try a hands-on, interactive activity in the Try-a-Skill area, assisted by ambassadors keen to share their insights into the trade.

The competition area is visually appealing, showcasing massive machines, photos and videos of equipment at work, and information about employment opportunities, and animated by industry professionals ready to answer questions. The public easily recognizes that the Heavy Vehicle and Agricultural Equipment Mechanic trade is well-established in all countries and in many sectors, offering a high degree of employability and many career options.

The competition is equally important for the connections and partnerships it creates between the public, technical training providers, students, employers, and manufacturers. The Try-a-Skill and ambassador stations bring together instructors, prospective students, and employers.

Information about the equipment and the manufacturers' achievements is posted in the area. Manufacturers lend the competition the most recent equipment, which keeps Experts and Competitors up to date, and increases ambassadors' enthusiasm for the appeal of the trade. The networks created generate excitement about the trade as participants share stories in their wider communities, contributing to the positive profile of the trade.

11 Sustainability

11.1 Sustainable practices

This skill competition will focus on the sustainable practices below:

In accordance with the WorldSkills Sustainability Policy, the Heavy Vehicle Technology Competition adheres to the sustainability principles: Reduce, reuse or repurpose, regenerate, recycle. The event therefore makes every attempt to preserve the local environment, conserve WorldSkills assets, and increase social capital.

Reduce

Heavy Vehicle Mechanics conserves WorldSkills staff hours and expense by making every effort to be helpful by obtaining donations of heavy vehicles, materials, tools, and extra items needed for the competition, displays, and the Try-a-Skill activities.

As well, we ask our sponsors to pay the cost of shipping materials and equipment to and from the venue, saving thousands of dollars in shipping fees.

We make every effort to use as few tools as possible, so sponsors don't have to sell them at a discount as used.

We use laminated schematics, which we donate to industry or technical schools to be used again.

Furthermore, every effort is made to reduce the impact on the host community. Equipment used in the competition incorporates the latest in exhaust emission pollution controls, and the venue is equipped with fume extractors. Fluids and waste materials are handled in compliance with environmental standards.

Reuse or Repurpose

Visitors to our Try-a-Skill may make and take away a durable and useful item marked with information about the trade, generally made of a collection of repurposed materials.

Our Hands-On examples typically reuse training equipment and other repurposed items.

Our Competition Tasks can also reuse discarded failed parts.

Recycle

We recycle as much as possible, if any materials remain after we have reduced, reused, or repurposed.

Regenerate

Failed items repaired during the competition can be placed back into circulation.

Social Sustainability

The Heavy Vehicle Technology Experts and trade ambassadors are, of course, all volunteers, scattered across the world. Sustainability of a group of this nature requires cohesion, which comes from a respectful, team-building leadership atmosphere that fosters positive personal relationships between people of diverse backgrounds. We are all proud to represent WorldSkills and our trade.

12 References for industry consultation

12.1 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/)

12.2 References

This WSOS appears to relate partly to mobile heavy equipment mechanics, except engines: ttps://www.onetonline.org/link/summary/49-3042

It appears to fall between supervisory and attendant roles here: http://data.europa.eu/esco/occupation/264b00c9-84d0-4dc9-b590-aed2cea2b904.

These links also enable adjacent occupations to be explored.

ILO 7231

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 Lyon 2024.

Organization	Contact name
Cummins Meritor	John Hinesley, Director
Toromont Cat	Dave Goswell, Product Support Manager for Nova Scotia
Volvo Construction Equipment	Stacey Gatch, Head of Uptime Program Development

13 Appendix

13.1 Appendix information

Not applicable.