worldskills

Technical Description

Optoelectronic Technology

Skill 60

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:

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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

Optoelectronic Technology

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

Optoelectronics is a branch of Photonics (the physical science of light). Optoelectronics combines the physics of light with electricity. Optoelectronic technology covers the design, manufacture and manipulation of hardware that converts electrical signals into photon signals and vice versa. Any device that does this can be referred to as optoelectronic.

Optoelectronics is a broad and fast developing field, defined by its:

- **Products:** for example, lighting, display, for communication and information, sensors, photovoltaic systems, and lasers
- **Applications:** such as research, automation, medical treatment, engineering, construction, security, advanced manufacture, detection, and measurement.
- **Occupations:** roles spanning design and integration, installation and commissioning, maintenance and optimization, quality assurance, technical support, and related functions across varied levels of complexity and responsibility.

This WSOS focuses on the occupational requirements of an optoelectronic (engineering) technician or associate professional. These personnel must work with accuracy and precision, meet detailed specifications and international quality standards, and have a wide range of technical capabilities. With growing emphasis on energy efficiency, intelligent systems, and digital integration, optoelectronic technicians must proactively maintain up-to-date skills and knowledge that meet current industry standards and expectations.

Optoelectronic technicians work directly and indirectly with and for customers, so must communicate with them, and serve them well. They must explain complex optoelectronics straightforwardly and help clients to use systems and products correctly. The nature of their work requires respect for confidentiality, together with integrity, honesty, and a strong sense of professional ethics.

In their scope of work, optoelectronic technicians may be involved in one, two, or all three stages of production, maintenance, and development, depending on the sector, size, and position of the employing organization, in the market or a supply chain.

- **Design, development, and manufacture:** contributing in leading or supporting roles to create new devices or systems; working across optical, electrical/electronic, magnetic, and mechanical domains; using relevant software tools (e.g. lighting design software such as DIALux evo, industry-identical simulation platforms for LED programming and playback, Arduino-based smart lighting applications, and simplified configuration tools for opto sensors/cameras).
- **Installation, commissioning, and maintenance:** installing, configuring, testing, and servicing optoelectronic systems whose performance and quality can be affected by factors such as humidity, vibration, electromagnetic fields, and grounding; carrying out ongoing maintenance, repair, documentation, and continuous improvement.
- **Quality control, testing, optimization, and reporting:** conducting measurements and analysis; troubleshooting and fault-finding; optimizing performance, energy use, and thermal management;

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producing reports and training materials. As environmental considerations grow and technologies evolve, this dimension of the role continues to increase in importance.

Employment opportunities for optoelectronic technicians are extensive - as freelancers or entrepreneurs, and within product agencies, engineering companies, manufacturers, integrators, and service providers. This is a rapidly expanding field in which outstanding technicians can develop broad or deep expertise and progress quickly as demand for optoelectronics grows globally.

1.1.3 Number of Competitors per team

Optoelectronic Technology is a single Competitor skill competition.

1.1.4 Age limit of Competitors

The Competitors must not be older than 25 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)

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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**	**10**
	The individual needs to know and understand: • Health and safety legislation, obligations, and documentation • The principles of working safely with electricity, electronics, and lasers • The situations when personal protective equipment (PPE) must be used • The purposes, uses, care, maintenance, and storage of all tools and equipment together with their safety implications • The purposes, uses, care, and storage of materials • The importance of keeping a clean and tidy work area	

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Section		Relative importance (%)
	• Sustainability measures applying to the use of 'green' materials and recycling • The ways in which working practices can minimize wastage and help to manage costs whilst maintaining quality • The principles of workflow and measurement • The significance of planning, accuracy, checking, and attention to detail in all working practices • The impact of new technology	
	The individual shall be able to: • Apply and follow Health, Safety, and Environmental standards, rules, and regulations • Diligently follow electrical safety procedures • Identify and use the appropriate personal protective equipment (PPE) including safety footwear, ear, and eye protection • Select, use, clean, maintain, and store all tools and equipment safely • Select, use, and store all materials safely • Identify and take particular care of expensive or vulnerable fixtures/ fittings • Plan the work area to maximize efficiency and maintain the discipline of regular tidying • Measure accurately • Manage time effectively • Work efficiently and check progress and outcomes regularly • Establish and consistently maintain high quality standards and working processes	
2	**Communication and interpersonal skills**	**5**
	The individual needs to know and understand: • The significance of establishing and maintaining customer confidence and trust • The importance of maintaining and keeping one's knowledge base up-to-date • The roles and requirements of related trades • The value of building and maintaining productive working relationships • Principles and techniques of effective teamwork • The importance of swiftly resolving misunderstandings and conflicting demands	
	The individual shall be able to: • Interpret customer requirements and manage customer expectations • Provide advice and guidance on products/solutions, such as technological advancements	

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Section		Relative importance (%)
	• Create training materials according to the construction of each system, and implement training • Create training content and related materials for optoelectronic applications • Visualize and translate customer wishes, making recommendations which meet/improve their design and budgetary requirements • Question customers closely/deeply to fully understand requirements • Provide clear instructions • Introduce related trades to support customer requirements • Produce written reports for customers and organizations • Produce cost and time estimates for customers • Recognize and adapt to the changing needs of related trades • Work effectively as a member of teams	
3	**Design and manufacturing of optoelectronic applications**	**20**
	The individual needs to know and understand: • Principles of optics, electrical and mechanical theory • The various optoelectronic specialisms within specific industries • Commonly used and International industry standard symbols • The photovoltaic effect • The application environment of optoelectronics • Design schemes of optoelectronic applications • The characteristics and operating principles of various optoelectronic applications (such as photovoltaic products, LED luminaires, optoelectronic transmission equipment, optoelectronic display equipment, sensors, industrial opto sensors/cameras for inspection, and laser systems) • The characteristics of appropriate control equipment, photovoltaic power generation equipment, sensors, laser systems, optoelectronic application terminals, controls, or control platforms, for integrated applications • The possibilities to test parameters of optical and electronic components or optoelectronic products • How to select optical and electronic components • The drive and heat dissipation and configuration of optoelectronic applications. • The manufacturing specification for optoelectronic products • How to utilize optoelectronic-related software (e.g. lighting design software such as DIALux, industry-identical simulation platforms for LED programming/playback, Arduino-based smart lighting control apps, and simplified configuration tools for opto sensors/cameras) to assist their work	
	The individual shall be able to: • Analyse the important parameters and functional requirements of the application environment • Design optoelectronic application schemes	

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Section		Relative importance (%)
	• Manufacture simple applications according to the schemes. • Inspect the manufacturing and quality of optoelectronic applications • Complete the production and quality inspection of optical and electronic components with high efficiency and high quality • Test and select correct specifications for various optoelectronic applications (such as photovoltaic products, LED luminaires, optoelectronic transmission equipment, optoelectronic display equipment, sensors, and laser systems) • Select appropriate control equipment, photovoltaic power generation equipment, sensors, laser systems, optoelectronic application terminals, controls, or control platforms, for integrated applications to achieve energy-saving and efficient goals • Analyse the application environment of optoelectronic application products • Select and optimize manufacturing schemes for optoelectronic application terminals • Select and optimize energy-saving and light efficiency design schemes • Select application models of optical and electronic components • Test the function and performance parameters of optical and electronic components or optoelectronic products • Configure the drive and heat dissipation modules of optoelectronic application products • Test the function and performance of optoelectronic application products • Apply industry-aligned software tools to simulate, programme, and validate lighting and sensor-based applications	
4	**Installation and implementation of optoelectronic applications**	**35**
	The individual needs to know and understand: • Basic principles of optics, electronics, and mechanics • Basic principles and techniques for optoelectronic applications • Working principles of lighting devices and image displays. • The application environment for optoelectronic applications • Engineering drawings, wiring diagrams, schematics, technical manuals, and engineering instructions • The composition of optoelectronic applications • The requirements of optoelectronic applications • How to analyze requirements of optoelectronic applications • How to select optoelectronic application schemes • How to select appropriate electronic common tools and optoelectronic specific instruments or tools to complete their work • The principles of smart lighting and intelligent optoelectronic systems using Arduino-based control platforms • Basic principles of installing and configuring opto sensors/cameras for automation and quality inspection tasks	

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Section		Relative importance (%)
	The individual shall be able to: • Read and interpret engineering drawings, wiring diagrams, schematics, technical manuals, and engineering instructions • Analyze customer requirements for optoelectronic system applications • Select appropriate optical and electronic components' efficiency design schemes according to applications' needs • Analyze their functions and key characteristic parameter requirements • Select appropriate optical and electronic components according to the characteristics of the optoelectronic applications • Test relevant parameters according to the characteristics of each optoelectronic application • Test the characteristics of various sensors, laser systems and other control devices • Select suitable optoelectronic applications scheme according to demand analysis • Select and configure the correct drive and heat dissipation modules according to the optoelectronic applications terminal structure and power parameters, and deal with their processing technology • Provide system structure drawings, construction drawings, and related materials • Put equipment, components, devices, upgrades, or refurbished equipment into use • Use a variety of optoelectronic display devices, and optoelectronic transmission equipment, such as LED panels, screens, sensors and photovoltaic power generation equipment • Select flexibly energy-saving control methods • Select and test the characteristics of optoelectronic application equipment • Select, test, and use the optoelectronic application system control platform • Test the characteristics of various sensors and other control devices • Install and perform basic configuration of opto sensors/cameras, including connection, alignment, and computer-based setup • Install and debug the optoelectronic application system • Programme or configure Arduino-based smart lighting control systems • Start the operation of the application and maintain its normal operation • Basic programming or configuring of image display devices. • Complete system installation and debugging according to construction drawings, and provide corresponding test reports • Use electronic common tools and optoelectronic specific instruments or tools, such as electric soldering irons, digital multi-meters, and chroma meters • Design visually appealing light shows, colour changing patterns and schemes in different environments and application scenarios	

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Section		Relative importance (%)
5	**Maintenance of optoelectronic applications**	**15**
	The individual needs to know and understand: • Construction drawings and technical data of optoelectronic applications • The relevant industry standards of maintenance • The use of optoelectronic industrial materials and tools for general maintenance, installation, and maintenance tasks • Construction drawings for optoelectronic applications • Fault detection methods for optoelectronic application systems • Common faults in optoelectronic application systems • Optoelectronic application systems maintenance and functional testing	
	The individual shall be able to: • Read and interpret the drawings and documents for optoelectronic application systems • Analyze the working principles of the optoelectronic applications, the transmission process of the signals, and the characteristic parameters of each link • Analyze the causes of each fault, decide on a fault detection scheme, and make detections according to the fault phenomena • Diagnose and replace faulty equipment and lines in optoelectronic applications • Replace optoelectronic parts, components and cables • Use standard optoelectronic testing tools, instruments, and maintenance tools • Maintain each module of optoelectronic application systems • Modify control platform parameters • Debug and optimize optoelectronic application systems • Test optoelectronic applications after maintenance operations • Apply diagnostic methods to identify errors in sensor/camera configurations and smart lighting control systems	
6	**Optimization of optoelectronic applications**	**15**
	The individual needs to know and understand: • How to achieve maximum energy saving under the applicable demand parameters • Optoelectronic products/devices that are not sustainable or environment-friendly. • The benefits of optimizing optoelectronic application schemes • The principle of optimizing driving and heat dissipation of optoelectronic products • Light specifications or parameters that are harmful to people's health • How to optimize the design of optoelectronic products/devices	

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Section		Relative importance (%)
	• The principle of light efficiency design for optical and electronic components of optoelectronic products • Energy consumption management of optoelectronic application systems • Control principles of optoelectronic application systems • How to use relevant software to assist the optimization operation	
	The individual shall be able to: • Make appropriate optimizations based on existing traditional/legacy optoelectronic systems • Make proper adjustment or optimization on existing optoelectronic applications that are harmful to people's health (e.g. human eyes) • Select and implement each optimization scheme of optoelectronic systems • Achieve energy saving within various requirements and parameters • Optimize the heat dissipation performance of optoelectronic products • Design the structures of optoelectronic products • Optimize the driving circuits of optoelectronic products • Improve the user experience of optoelectronic products • Design light efficiency schemes relating to optical and electronic components • Improve the conversion efficiency of photovoltaic systems • Reduce the energy consumption of optoelectronic application systems • Design energy saving strategies for optoelectronic application systems • Upgrade existing traditional lighting systems to intelligent lighting systems • Optimize energy use and control strategies for intelligent lighting and sensor-based applications • Use related software to simulate different application scenes and optimize optical and electronic components' configuration • Optimize the application or system according to the optimized design drawings, and make them work normally and efficiently	
	Total	**100**

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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.

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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**

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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

SAMPLE OF TABLE FROM CIS

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.)

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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.

Each Aspect describes in detail one of the estimated indicators, as well as possible assessments or instructions for judgement marking.

The Marking Scheme lists in detail each Aspect for which a mark is made, along with the number of marks assigned to it.

The amount of marks awarded for each Aspect should fall within the range of marks defined for each section of the WSOS. It is displayed in the CIS score distribution table, in the following format.

The Skill Competition Manager allocates three to four Experts to each module as a Marking Team. The Skill Competition Manager and Chief Expert nominate a supervisor for each Marking Team. The supervisor is responsible for the recording of measurement results and overseeing the marking and does not mark, except an Expert of their group is needed to mark their compatriot Competitor.

Experts start marking after the end of each module. Each Marking Team can organize the Marking Schedule after consultation with the Chief Expert and Skill Competition Manager.

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Assessment is completed each Competition day. All assessment is done when the last Module's assessment is completed.

Only the Expert Marking team for a specific module assesses the Module. All other Experts may leave the Competition site if they are not involved in assessment.

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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 three (3) standalone modules.

- Module 1 - Design and manufacturing of an optoelectronic application terminal or system
- Module 2 - Installation and implementation of an optoelectronic application terminal or system
- Module 3 - Maintenance and optimization of optoelectronic application terminal or system

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 Test Project is to be designed to reflect current and upcoming technologies.

All technical terms and descriptions used in the Test Project must be in accordance with internationally recognized standards.

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The Test Project documents shall use the least amount of words possible. The Test Project documents shall be translated quickly into the chosen language of the Competitor. The documents need to include a small project brief, parts lists; electrical diagrams, and data table package.

Test Project documentation need to be brought to the competition on memory sticks in Microsoft Word. All lines are to be double spaced underneath to allow for translation into the chosen language of the Competitors. The Independent Test Project Designer is encouraged to use illustrations, diagrams, and videos to reduce the amount of text that requires translation.

The Independent Test Project Designer will use Microsoft office tools or software used in the competition to create documentation. Paper copies should also be presented.

Where possible, circuit diagrams, photographs, line drawings, etc. are used for all modules and project wording should be as brief as possible.

Test Project(s) are presented to Experts by the Independent Test Project Designer. An example is shown working in physical form with all required. Videos can support but not replace the demonstration of Test Project functionality.

Module 1 - Design and manufacturing of an optoelectronic application terminal or system

- Analyze a given application scenario to identify key functional requirements, environmental factors (e.g. heat, vibration, energy efficiency), and customer/user needs.
- Design an optical efficiency scheme that balances brightness, energy-saving, and thermal management, using appropriate lighting design and simulation tools.
- Select suitable optical and electronic components or products (e.g. LEDs, drivers, sensors, controllers, mechanical parts), justifying choices based on specifications, cost, and performance criteria.
- Configure the application using industry-aligned software tools, including lighting simulation platforms, programmable control systems, and configuration tools for opto sensors/cameras.
- Assemble and complete the terminal/system, integrating optical, electrical, and mechanical elements in accordance with drawings, wiring diagrams, and safety standards.
- Perform quality inspection of the completed application, including visual checks, measurement of optical/electrical parameters, and verification against design specifications.
- Manufacture a simple but functional application according to the design scheme, demonstrating practical workmanship, accuracy, and adherence to quality standards.
- Prepare concise technical documentation and reports summarizing the design rationale, component choices, configuration steps, and test/inspection results.

Module 2 - Installation and implementation of an optoelectronic application terminal or system

- Analyze the requirements for an optoelectronic application, considering customer specifications, safety standards, energy efficiency, and integration with existing systems.
- Select and optimize an application scheme to meet energy-saving and performance goals, ensuring compliance with environmental and safety standards.
- Test and confirm the specifications of optoelectronic equipment (e.g. luminaires, drivers, control modules) against the design requirements prior to installation.
- Test and select correct specifications of sensors and control equipment, including opto sensors/cameras, ensuring alignment, signal output, and functional accuracy.
- Install and commission the optoelectronic system, including wiring, grounding, and assembly, following engineering drawings and technical manuals.
- Perform basic configuration of system control platforms, such as microcontroller-based smart lighting systems or simplified configuration software for sensors/cameras.
- Debug and verify the complete application, ensuring proper operation under both normal and stress-test conditions, and document test results.

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- Develop and present training materials or user guides that explain operation, safety, and maintenance procedures for the installed application.

Module 3 - Maintenance and optimization of optoelectronic application terminal or system

- Measure key performance parameters (optical output, power consumption, temperature, communication signals) using appropriate instruments.
- Apply systematic troubleshooting methods to detect and diagnose faults, analysing root causes across optical, electrical, and software subsystems.
- Repair or replace faulty equipment, components, or wiring, ensuring compliance with safety and performance standards.
- Reconfigure control platform parameters (e.g. lighting control settings, sensor alignment/ calibration) to restore full system functionality.
- Test the application after maintenance to confirm that performance meets or exceeds specifications.
- Implement optimization strategies to improve energy efficiency, thermal performance, or user experience, including upgrades from traditional to intelligent lighting systems.
- Document all maintenance and optimization work, including fault diagnosis, corrective actions, test results, and recommended improvements, in a professional report format.

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.
No later than two (2) months prior to the Competition	The Test Project documents are sent to the WorldSkills International Skills Competitions Administration Manager
One (1) month prior to the Competition	The Test Project is circulated on the WorldSkills website.
At the Competition on C1	The Test Project/modules are presented to Experts and Competitors.

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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 one (1) month prior to the Competition via the WorldSkills website.

5.8 Test Project change

Due to the Test Project being circulated prior to the Competition, the Skill Competition Manager must change at least 30% to the pre-circulated TP as required by WorldSkills. This change is presented to Experts and Competitors at the Competition on C1.

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.

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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.

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Topic/task	Best practice procedure
Allocation of workstations/ modules	• All Competitors are timetabled in the same module where their compatriot Expert is part of the marking team during the first round of competition (where possible).
Competition workflow and preparation	• Competitors should visually inspect wiring, grounding, and component orientation before applying power, to reduce risk of failure. • Competitors are encouraged to test sub-assemblies (e.g. LED circuits, sensor connections) before final system integration. This avoids last-minute troubleshooting. • Where programming/configuration tasks are involved, Competitors should save iterative versions of their code or settings, allowing them to roll back to a stable version if problems occur.
Infrastructure	• Competitors and Experts must wear ESD straps when handing components. • Work surfaces should be kept free of unnecessary tools or packaging to reduce risk of damage or misplacement.
Equipment failure	• In the occurrence of equipment failure Competitors must notify Experts immediately by raising their hand. • If equipment supplied by the Competition Organizer fail and the Technician of the sponsor or supplying company specifies proves it is not a “user error”, Experts will take note of the time that the Competitor is not able to make use of their equipment, any time lost is provided to the Competitor at the end of the standard module time. • If there is a clear evidence that Competitors have caused damage to equipment themselves, they will not be given a substitute and will not be given any additional time.
Use of software and digital tools	• Competitors should save work frequently using the Competition Organizer’s designated storage devices. • When using competition-provided software (e.g. for lighting design, sensor configuration, or control systems), Competitors are encouraged to verify correct installation and functionality before starting tasks. • Screenshots, exported logs, or similar records should be generated where required for verification or reporting tasks.
Documentation and reporting	• Competitors are encouraged to present reports with headings (requirements, setup steps, results, improvements). This makes translation and marking easier. • When software configuration is part of the task, Competitors should generate logs or screenshots as supporting evidence of correct setup. • Measurements and reports should always use SI units and internationally recognized symbols.
Health and safety	• Safety glasses, gloves, and other PPE must be worn whenever indicated by the task (e.g. soldering, machining, cutting).

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Topic/task	Best practice procedure
	• Cables and wiring should be routed neatly to avoid trip hazards and damage. • Competitors should maintain a clean and tidy workspace throughout each module, disposing of waste in the designated areas.
Breaks	• No extra time is given to Competitors who stop work during competition time to go to the bathroom or for those who break for a food and/or drink. When time is completed all Competitors must stop all work in their workstation immediately. • Competitors are encouraged to manage personal needs and hydration during scheduled breaks outside module time.
Professional communication	• Competitors are encouraged to communicate clearly with Experts when raising questions or reporting issues. • Respectful and professional behavior is expected at all times in the workshop environment. • Collaboration or discussion between Competitors during active competition time is not permitted, but courtesy and mutual respect should always be maintained.

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7 Skill-specific safety requirements

7.1 Personal Protective Equipment

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

Task	Sturdy shoes with closed toe, no heel and with ESD	Safety glasses with both protective sides	Dust mask	Protective Gloves (with no breakage)	ESD robe
General PPE for safe areas	√	Optional			
At the workbench	√	Optional	Optional	Optional	Optional
Soldering, cutting, machining	√	√	√	√	Optional
Work with hazardous substances (e.g. cleaning)	√	√	√	√	Optional

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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.

8.6 Proposed workshop and workstation layouts

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

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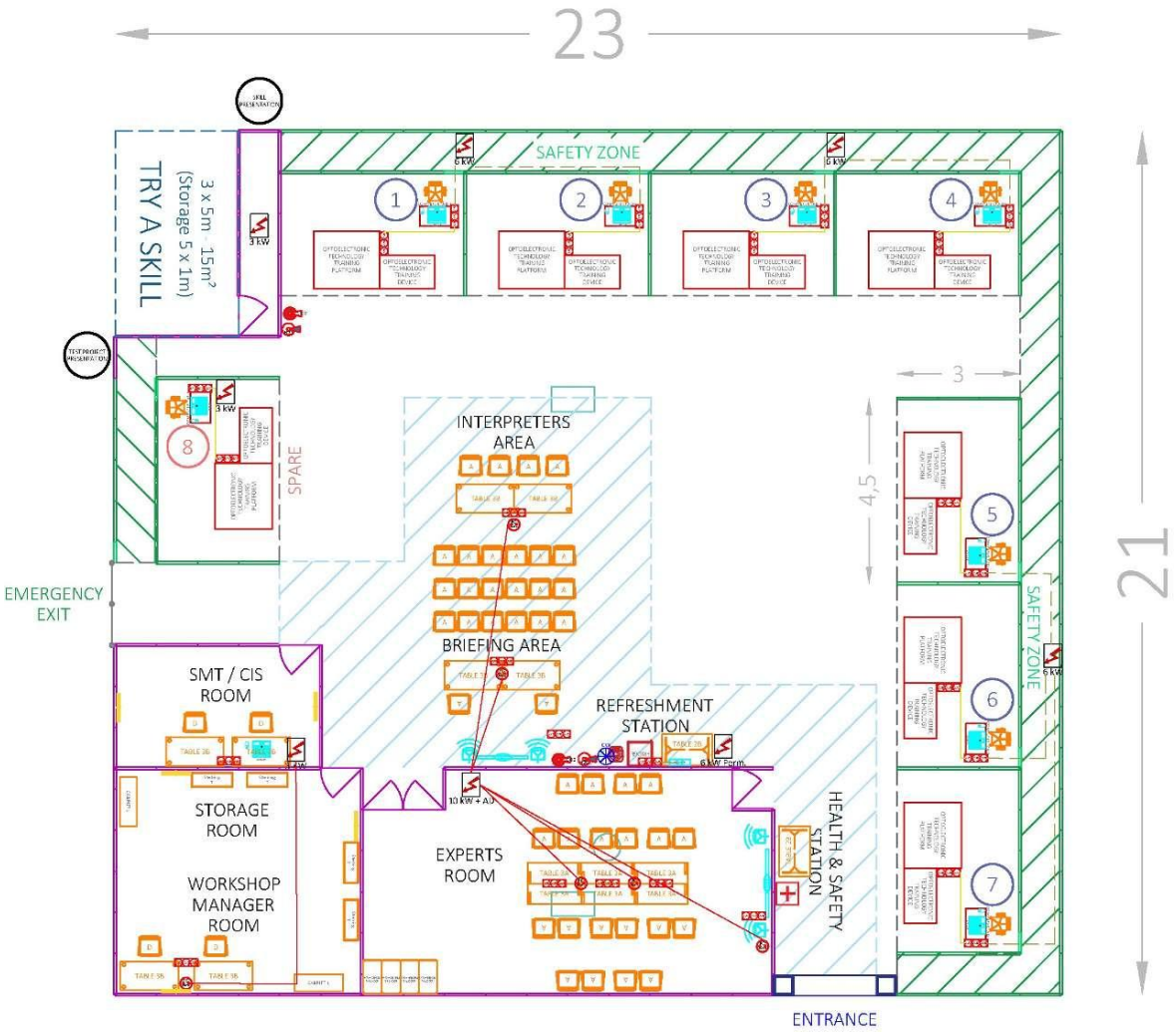
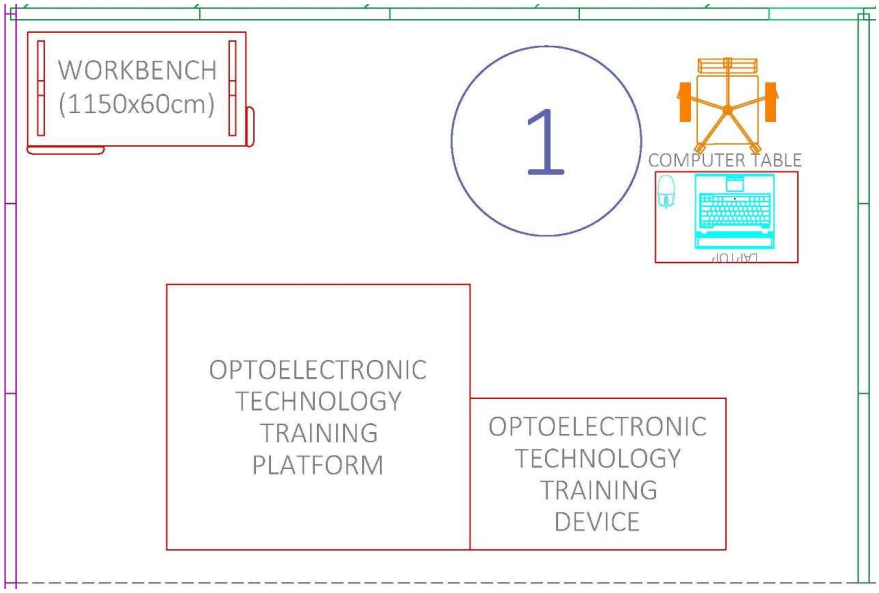
Example workshop layout





Example workstation layout

Each workstation is around 13.5 m^2

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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 – USB, memory sticks	• Competitors, Experts, and Interpreters are only allowed to use memory sticks provided by the Competition Organizer. No other memory sticks are permitted to be inserted into the Competitor computers. • Competition memory sticks or any other portable memory devices must not be taken outside the workshop. • Competition memory sticks or other portable memory devices must be submitted to the Skill Competition Manager at the end of each day for safe keeping. Note: The Competition Organizer may use specific software to check that the three previous rules are strictly followed. • The Chief Expert and Skill Competition Manager are exempt from this rule.
Use of technology – personal laptops and tablets	• Skill Competition Manager, Chief Expert, Experts, and Interpreters are allowed to bring laptops and tablets into the Expert Meeting Room. Laptops are allowed to be taken outside of the meeting room at the end of each day. • Competitors are not allowed to have personal laptops or tablets in the workshop.
Use of technology – mobile devices	• Skill Competition Manager, Chief Expert, Experts, Competitors, and Interpreters are not allowed to bring electronic devices to any Competitors workstations under any circumstances unless with the approval of the Chief Expert. • Competitors must leave any Electronic devices (Including mobile phones) in their personal locker during competition time (switched off or on silent).
Use of technology – personal photo and video taking devices	• 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.

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Topic/task	skill-specific rule
	• Competitors cannot take photos of workstations from outside the competition area during the competition. • Competitors, Chief Expert, Experts, Workshop Manager, and Interpreters are not allowed to use personal photo and video recording devices in the workshop before the competition modules begin and during the translation and presentation of the module by the Skill Competition Manager. • Once competition begins Competitors may not use photo and video recording devices. • Competitors, Experts, Interpreters, Workshop Manager, and visitors should obtain the consent of one of the Skill Management Team and those they wish to photograph.
Test Project Translation	• Experts and Interpreters are allowed to bring their personal laptops or devices to the translation session per competition rules. However, the TP file will not be distributed/transferred to any personal device. • Upon request, the TP file may be transferred onto a laptop provided by the Competition Organiser (if available) for translation digitally and will be removed at the end of each translation session. • The Chief Expert or Skill Competition Manager will copy all the digital translated TP files (if applicable) and collect all printed TP files at the end of each translation session for safe keeping. • Use of AI translation tools (e.g. ChatGPT, DeepL, Google Translate) is permitted only during TP translation sessions, not during Competitor tasks.
Software and digital tools	• Competitors may only use competition-provided or authorized software (e.g. lighting design, simulation, programming, or sensor configuration tools). • Unauthorized software or personal applications must not be installed or run on competition computers. • Configuration files, code, and logs created during the Competition are considered part of the Test Project deliverables and must be saved to competition-provided storage devices only.
Templates, aids, etc.	• 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	• Competitors are not allowed to bring any prepared drawings or documented information to the Competition.
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.

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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.
Experts/Interpreters	• 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. • Interpreters can use for the translation process tools such as dictionary, Internet, translation devices, etc. However, the entire process must be completed by themselves and no emails or messages can be sent to communicate with others.
Marking Rooms	• Experts and Interpreters are not allowed to bring additional items in or out of the marking rooms unless approved by the Chief Expert or Skill Competition Manager. • No Competitors are allowed in the marking rooms.

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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**.

- A minimum qualification of a diploma or degree in Optoelectronics, Photonics, Electronics, Electrical Engineering, Mechanical Engineering, or a closely related discipline.
- At least three years of relevant industry or Technical and Vocational Education and Training (TVET) experience in the design, manufacture, installation, maintenance, or optimization of optoelectronic products, projects, or systems.
- Proven knowledge of the principles of optics, electronics, mechanics, and their integration in optoelectronic applications such as lighting, displays, sensors, photovoltaic systems, and laser systems.
- Demonstrated ability to interpret and produce engineering drawings, wiring diagrams, schematics, technical manuals, and project documentation to international standards.
- Hands-on expertise with the selection, configuration, and integration of optical and electronic components, control platforms, and heat dissipation/drive modules for optoelectronic applications.
- Practical experience in the commissioning, fault diagnosis, repair, and optimization of optoelectronic systems across varied environments and sectors.
- Familiarity with optoelectronic-related software for design, simulation, testing, and optimization of applications.
- Ability to perform basic programming and software configuration tasks, such as parameter adjustment, light control programming, and device integration, relevant to optoelectronic applications.
- Strong understanding of health, safety, and environmental standards relevant to optoelectronic work, including ESD protection, PPE usage, and sustainable practices (e.g., lead-free solder, energy-saving designs).
- Experience in quality assurance, inspection, and adherence to industry standards and specifications for optoelectronic products.
- Effective communication and interpersonal skills, including the ability to develop training materials, mentor others, and work in multicultural, multidisciplinary teams.
- Up-to-date knowledge of emerging technologies, industry trends, and innovative practices in optoelectronics to ensure the competition reflects current and future industry demands.

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11 Visitor and media engagement

11.1 Engagement methods

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

- Try-a-Skill;
- Display screens outlining the tasks being performed;
- Test Project descriptions;.
- Competitor profiles;
- Career opportunities;
- Daily reporting of Competition status;
- Display of interesting optoelectronic project;
- Display of interesting optoelectronic games, so as to attract the youth to the occupation of optoelectronic technicians.
- Encourage independent suppliers to develop Test Projects that are visually interesting and exciting;
- Encourage independent supplier to allow open-ended solutions to tasks;
- Sponsor set up a project exhibition area near the competition area.

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12 Sustainability

12.1 Sustainable practices

This skill competition will focus on the sustainable practices below:

- Introduce and integrate "sustainable practice" into competition module;
- Recycling;
- Using project from previous competition for different task;
- Encourage use of industry donated components;
- Use datasheets/answer sheets in PDF form;
- Use of “green” materials, e.g. lead-free solder is used;
- Use of components available from global suppliers;
- Ensure that all items on IL are used.

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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 appears most closely to relate to an Optoelectronics Engineering Technician: ESCO: https://esco.ec.europa.eu/en/classification/occupation?uri=http%3A%2F%2Fdata.europa.eu%2Fesco%2Foccupation%2Fdcfeb6e4-f39d-49fb-96cd-23292fb3e037

and a Photonics Technician: O*Net: https://www.onetonline.org/link/summary/17-3029.08

These links can also be used to search adjacent occupations.

ILO 3114

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
Guangdong VCOM Education Technology Co., Ltd.	Cathy (Yanfeng) Wang, Chief Executive Officer

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14 Appendix

14.1 Appendix information

Not applicable.

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