MANUFACTURING AND ENGINEERING TECHNOLOGY

Renewable Energy



Technical Description

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WorldSkills Occupational Standards (WSOS)

General notes on the WSOS

The WSOS specifies the knowledge, understanding, and specific skills that underpin international best practice in technical and vocational performance. It 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, and to the extent that it is able to. 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 that are set out in the Standards Specification. 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, provided that this does not distort the weightings assigned by the Standards.

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
- Safety procedures when working with electricity
- 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 tidy work area
- 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 individual shall be able to:

- Develop and follow health, safety, and environment 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 care of expensive 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**	**15**

The individual needs to know and understand:

- The significance of establishing and maintaining customer confidence and trust
- The importance of maintaining and keeping knowledge base up to date
- The roles and requirements of related trades
- The value of building and maintaining productive working relationships
- Techniques of effective teamwork
- The importance of rapidly resolving misunderstandings and conflicting demands

Section		Relative importance (%)
	The individual shall be able to: • Interpret customer requirements and positively manage customer expectations • Provide advice and guidance on products/solutions e.g. technological advancements • Visualize and translate customer wishes, making recommendations which meet/improve their design and budget requirements • Question customers closely/deeply to fully understand requirements • Introduce related trades to support customer requirements • Provide clear instructions • Produce written reports for customers and the organization • Produce cost and time estimates for customers • Recognize and adapt to the changing needs of related trades • Work effectively as a member of a team.	
3	**Problem solving, innovation, and creativity**	**15**
	The individual needs to know and understand: • Common types of problems that may occur in the work process • Diagnostic troubleshooting approaches • Industry trends and developments including new technologies, standards and working methods, e.g. "smart grid" and energy storage systems • Potential problems with providers and alternate solutions • The impact of new technology (installation methods and equipment and products).	
	The individual shall be able to: • Check work regularly to minimize problems at a later stage • Identify problems originating from a related trade • Identify incorrect information to prevent problems • Recognize and understand problems quickly and follow a self-managed process for resolve them • Recognize opportunities to contribute to improve the solution and overall customer satisfaction level • Demonstrate willingness to try new methods and embrace change • Implement new installation technologies and techniques to improve productivity, quality of installation, and energy generation capabilities.	
4	**Planning and design**	**15**
	The individual needs to know and understand: • Different types of standards, drawings, installation descriptions, and manuals • Different types of materials and installation techniques to be used in different environments • Different design software available in the market and the main products used by design teams • Customers' requirements to meet their generation needs	

Section		Relative importance (%)
	• The value and uses of energy potential charts for different renewable energies sources i.e. PV (Photovoltaic), Wind Power, geothermic and available biomass sources (different sources of straw, sugarcane residues, garbage, etc) • Local standards and specifications for installation and grid connection • The use of digital twins to design and simulate different renewable sources.	

	The individual shall be able to:
	• Choose the most suitable renewable energy source according to customer needs and local characteristics
	• Develop small Grid Tie (connected to the electrical grid) or Off Grid (not connected to the electrical grid) projects for renewable energy systems up to 75kW
	• Meet customer demands regarding their energy generation needs
	• Use design software accordingly to the chosen renewable energy source
	• Create the required documentation and drawings according to the local standards and government and utilities' requirements
	• Read, interpret, and revise drawings and documentation, including:
	  • Layout and circuit drawings
	  • Written instructions
	• Plan activities using drawings and documentation provided.	

5	**Installation**	**15**
	The individual needs to know and understand: • Ducting, wiring and connectors systems for commercial, domestic, residential agricultural and industrial use and when and identify their applications used for PV and Wind installation in several conditions (i.e. different types of roofs and ground installation) • The variety of electrical switchboards used for commercial, domestic, residential, agricultural, and industrial uses, and when and where to use a specific switchboard system • Different mechanical and electrical technical solutions for assembly structures • Engineering drawings/blueprints, schematics and manufacturers' manuals • International and locally applicable standards and regulations for safety procedures related to installation • Local and applicable international standards related to the required configuration of generation that will be connected to the electrical grid • Specification and installation techniques related to PV panels and small wind generators • The difference in specification, equipment, and installation for grid, tie, and off grid systems, and configuration of the equipment to improve their functionality and generation capabilities.	

Section		Relative importance (%)
	The individual shall be able to: • Select and install equipment and cable lines supplied drawings and documentation • Install ducting and cable systems on different surfaces according to manufacturers' instructions and current industry standards • Select and install single and double insulated cables inside ducts, conduits, and flexible conduits • Install and securely fix double insulated cables onto cable ladders, cable trays, and different surfaces, according to manufacturers' instructions and current industry standards • Install metal and plastic ducting (trunking): accurately measure and cut duct at specified lengths/angles; and assemble without distortion to joints and to specified tolerances • Assemble different termination adaptors, including cable glands onto ducts and securely connect ducts of different types to surfaces • Install metal and plastic conduits/flexible conduits and attach securely onto surfaces, maintaining even radius bends, without distortion to conduits • Choose the correct termination adapters used for entry of conduits into boxes, boards, and ducts • Install and securely attach different types of cable ladder and cable tray to surfaces • Connect equipment as per provided instructions and current industry standards and regulations, and including structured cabling systems • Identify equipment and correct installations, comparing Grid Tie (connected to the electrical grid) and Off Grid (not connected to the electrical grid) systems • Set configurations for PV and Wind Inverters to connect systems to local electric grids • Connect renewable energies generators to local electrical grids.	
6	**Testing, reporting, and commissioning**	**15**
	The individual needs to know and understand: • Industrial regulations and standards applicable to different types of installations • Verification standards, methods and reports to be used to record verification results • Types of measuring instruments • Tools and software used for parameterization, programming, and commissioning • The correct operation of the electrical installation in accordance with planned specifications and customer requirements	
	The individual shall be able to: • Test installations before energizing to ensure personal, electrical, and mechanical safety	

Section		Relative importance (%)
	• Test installations when energized by checking complete function on all equipment installed to ensure correct operation of new, repaired or refurbished installation, as per instructions • Set installations to fully functioning and ensure operators can safely, effectively, and efficiently perform required functions to meet customer/employer satisfaction • Set installations to fully functioning according to design parameters • Advise and assist customers for proper operation and maintenance procedures • Compile test results data and complete detailed commissioning reports, including recommendations on optimization.	
7	**Maintenance, fault-finding, and repair**	**15**

	The individual needs to know and understand:
	• Different types of installations and equipment for specific environments
	• Different generations of installations and equipment
	• The purpose of a specific installation and equipment
	• The customers' needs for various functions of installation and equipment
	• Different measuring and control equipment used to verify and ensure the restoration of the proper functioning of the system.
	• Market developments about new technologies applied to renewable energies
	• Legislation and best practices for:
	  • Sustainability
	  • Waste disposal and recycling.	

	The individual shall be able to: • Adapt to changing circumstances • Disassemble equipment for maintenance and/or repair • Troubleshoot electrical faults, mechanical and structural installations • Use, test and calibrate measuring and diagnose equipment to find and locate faults during regular maintenance and troubleshooting actions • Verify if existing installations and equipment still meets current standards and design parameters • Repair or replace worn, damaged or defective installation parts or equipment • Propose actions to prevent recurrence of defects • Propose and implement changes (equipment or processes) to optimize and or upgrade existing systems in order to enhance system's work and/or operation.	
	Total	**100**

References for industry consultation

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.**onet**online.org/)

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 2021.

There were no responses to the requests for feedback this cycle