Information Network Cabling

WorldSkills Occupational Standards

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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.

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Section	Relative importance (%)
1 Work organization and management	**5**

The individual needs to know and understand:

- Health and safety legislation, obligations, regulations, and documentation
- Basic first aid
- The negative impacts on businesses and organizations of poor or unreliable network installations
- The situations when personal protective equipment (PPE) must be used
- The correct procedures for working with laser technologies
- The purposes, uses, care, maintenance, safe handling, and storage of equipment in an ESD friendly environment
- The importance of integrity and security when dealing with user equipment and information
- The importance of safe disposal of waste for re-cycling
- The significance of accuracy, checking, and attention to detail in all working practices
- The importance of methodical working practices
- Research methods and techniques
- The value of managing own continuing professional development

The individual shall be able to:

- Follow health and safety standards, rules, and regulations
- Maintain a safe working environment including the use of ladders for access to high work
- Use personal protective equipment correctly
- Identify and use the appropriate personal protective equipment for ESD
- Select, use, clean, maintain, and store tools and equipment safely and securely
- Plan the work area to maximize efficiency and maintain the discipline of regular tidying
- Regularly schedule and re-schedule and multi-task according to changing priorities
- Work efficiently and check progress and outcomes regularly
- Actively work to fulfil industry certification requirements and keep up to date with 'license to practice' requirements (determined by their own country) and to complete regular Continued Professional Development (CPD)
- Use thorough and efficient research methods to support knowledge growth
- Proactively try new methods, and systems, and embrace change

Section	Relative importance (%)
2 Communication and interpersonal skills	**5**

The individual needs to know and understand:

- The importance of listening as part of effective communication
- The roles and requirements of colleagues and the most effective methods of communication
- The importance of building and maintaining productive working relationships with colleagues and managers
- Techniques for effective teamwork
- Techniques for resolving misunderstandings and conflicting demands
- The process for managing tension and anger to resolve difficult situations

The individual shall be able to:

- Use strong listening and questioning skills to deepen understanding of complex situations
- Manage consistently effective verbal and written communications with colleagues
- Proactively contribute to the development of a strong and effective team
- Share knowledge and expertise with colleagues and develop supportive learning cultures
- Manage tensions and disputes, providing confidence that problems can be resolved
- Discuss customers' requirements and provide Expert advice and consultancy
- Liaise with other professionals and suppliers to create a fully tailored package that fulfils customers' needs
- Respect the impact that cabling activity can have on a busy working environment, showing consideration and care, and causing least disruption in all circumstances
- Prepare quotations for planned work and present to customers

3 Planning and design	**5**

The individual needs to know and understand:

- Terminology and symbols used in specifications, and drawings that are recognized by the industry
- Principles of technical drawings and specifications that are recognized by the industry
- Installation requirement and specifications
- The techniques of planning, scheduling, and prioritizing
- Various types of information network technology and their applications
- Mathematics and physics
- The laws of electricity and telecommunications

Section	Relative importance (%)

The individual shall be able to:

- Plan and design requirements, or make recommendations, for the following systems and applications;

  - Generic cabling systems for customer premises such as office remises, Industrial premises, Single tenant home, Data centre and Distributed building services
  - Cabling systems for Building automation systems, Lighting systems, Elevator and escalator control systems, Access control systems, Security and fire alarm systems, Industrial automation, robotics and process control (IIoT)
  - FTTH system
  - CATV system
  - Pathway system
  - Outside plant cabling system
  - IoT applications
  - Smart home/office/factory applications

- Plan and specify installations, according to principles and criteria for best practice
- Solve a range of problems, including complex ones
- Work independently by planning, ordering and prioritizing work to maximize efficiency and to adhere to planned time schedules
- Schedule work required to achieve given outcomes
- Prepare, design, interpret, and analyse specialists' technical drawings and specifications
- Select the tools and systems that are most appropriate for the planned tasks
- Select the appropriate cabling media based on usage requirements
- Assess work sites to effectively identify risks and thereby prevent or minimize hazards
- Assess buildings and plan the location of cables to minimize damages, unsightliness, and risks
- Read, understand, and apply manufacturers' instructions
- Interpret and analyse complex plans and specifications
- Consider sustainability in each system's life cycle
- Maximize sustainability in processes

4	Cabling	10

The individual needs to know and understand:

- The different types of cable, their characteristics, uses, and how they affect other aspects of the network
- Installation requirements and specifications

Section	Relative importance (%)

The individual shall be able to:

- Install generic cabling systems for customer premises such as office s, Industries, Single tenants' homes, data centres, and distributed building services
- Install cabling systems for building automation systems, lighting systems, elevator and escalator control systems, access control systems, security and fire alarm systems, industrial automation, robotics, and process control (IIoT)
- Install pathway systems
- Install cables within pathway systems/closures
- Install rack cabinets, patch panels, and network equipment
- Select the appropriate procedures for cabling
- Prioritize work and comply with plans to minimize disruption and to meet agreed time scales
- Clean areas after completing installations
- Maximize sustainability during work processes
- Respect clients' buildings, keeping them tidy and clean

5	Optical fibre structured cabling system	20

The individual needs to know and understand:

- Optical fibre cables and connecting hardware
- Optical fibre cable classifications
- The uses of various connectors for optical fibre cables
- Planning processes for optical fibre structured systems
- Processes for installing optical fibre cables
- The cabling appropriate for commercial and domestic use

The individual shall be able to:

- Install optical fibre structured cabling systems and FTTH systems (Cable/Closure/Panel/Splice box/TO etc.)
- Connect and terminate optical fibre cables (fusion splicing/mechanical splicing/optical connectors/Installable optical connectors)
- Manage and maintain optical fibre cables
- Manage and maintain equipment/tools on a daily basis

6	Copper structured cabling system	20

The individual needs to know and understand:

- Copper cabling systems
- Types and uses of different types of copper
- Cable connecting hardware
- How to plan for and install cable

Section	Relative importance (%)

The individual shall be able to:

- Install and copper structured cabling systems (Cable/Rack/Panel /TO/Network equipment, etc.)
- Install single pair cabling systems
- Terminate copper cables (Unshielded twisted pair cable/shielded twisted pair cable/coaxial cable)
- Manage and maintain copper cables
- Manage and maintain equipment/tools on a daily basis

7	**Wireless connectivity for IoT and IIOT applications**	**10**

The individual needs to know and understand:

- Wi-Fi configurations and applications
- Smart home applications and equipment
- Smart office applications and equipment
- Smart factory applications and equipment
- IoT and IIOT applications and equipment

The individual shall be able to:

- Install and complete basic configurations to provide smart home/home/factory connectivity
- Install and setup smart applications and equipment
- Install and setup IoT/IIoT applications and equipment
- Set-up Wireless systems

8	**Troubleshooting and ongoing maintenance**	**10**

The individual needs to know and understand:
- Where potential system faults may occur
- Potential disruption to business activity resulting from system faults
- The requirements for documentation
- The requirements of administration systems

The individual shall be able to:
- Identify, locate, and diagnose system faults
- Rectify faults and repair cabling systems
- Replace and reinstall optical fibre cabling, and copper cabling
- Carry out Wi-Fi network fault-finding.
- Install updates to ensure systems meet emerging business needs
- Provide customers with advice and guidance on use of the systems, their features, and limitations
- Complete troubleshooting and fault-finding log sheets thoroughly and clearly
- Label systems for users' information and guidance
- Complete all records and documentation

Section	Relative importance (%)
9 Measurement	**15**

The individual needs to know and understand:

- The principles and purposes of measuring devices
- The practical uses of measuring devices
- The purposes of measurement
- Required and discretionary levels of inspection
- Test result documentation
- Inspection documentation

The individual shall be able to:

- Inspect cabling systems
- Certify optical fibre cables by optical loss test set (OTLS)/Optical time domain reflect metre (OTDR)
- Certify copper cables by cable/LAN tester
- Certify/Verify the quality of fibre optical connector end-faces
- Optimize the performance of 802.11 wireless networks
- Select appropriate test equipment for the work in hand

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/) ILO 7422
- ESCO: (https://ec.europa.eu/esco/portal/home)
- O*NET OnLine (www.**onet**online.org/)

This WSOS most closely to relate to *Telecommunication Line Installers and Repairers*:
https://www.onetonline.org/link/summary/49-9052.00,

and to *Telecommunications Technician:*
http://data.europa.eu/esco/occupation/056bef79-c125-47ab-b6b9-8eed05c9458c

This link also enables adjacent occupations to be explored.

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.

Organization	Contact name
China Telecom Corporation Limited Shanghai Branch (China)	Jun Xu, Senior Technician of Communication Line, Senior Evaluation Officer of Skills Identification
Fluke Corporation (China)	Gang Yin, Technical Manager, Fluke Networks
FujiKura (China) Co Ltd.	Iaojie Li, Fusion Splicer Division
Xi'an Kaiyuan Electronic Industry Co., Ltd (China)	Wang Gongru, Chairman and CEO