

Information Network Cabling



Technical Description

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

Information Network Cabling

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

The occupations related to “Information Network Cabling” are deeply related to the technology that supports modern information societies in which lives can be more comfortable and sustainable.

All technologies that are utilizing AI, Big data, and Cloud services, and that are deeply penetrating our lives, are based on high-quality information networks. The infrastructure to enable this depends on “Information Network Cabling”.

Information network cabling comprises the construction of the infrastructure of telecommunication networks such as those for data centres, mobile networks, Local Area Networks (LANs), Cable TV (CATV), industrial automation, and building automation. With the progress of the information society in recent years, the scope of work has expanded greatly, and expertise in the Internet of Things (IoT), and in Industrial Internet of Things (IIoT) connectivity is also becoming ever more important.

This role of information network cabling technician is complex, and requires detailed specialized knowledge in order, independently, to design and install networks that meet clients’ needs and conform to recognized industry standards. The technician will create the foundations for the network, install cables appropriate for the intended use, maintain, test, and commission the network.

Communications networks are crucial to the efficiency of business and commerce. Network failure can result in wasted time and lost revenue. Robust and reliable communications networks are therefore critical to business success.

The technician/installer may work for either a telecommunication or an electrical installation company. They will install network cabling for businesses both large and small, or for domestic users, for services such as cable TV, telephone, and broadband installations.

1.1.3 Number of Competitors per team

Information Network Cabling 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.

2 The WorldSkills Occupational Standards (WSOS)

2.1 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.

2.2 WorldSkills Occupational Standards

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
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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 (%)
<p>The individual shall be able to:</p> <ul style="list-style-type: none"> Plan and design requirements, or make recommendations, for the following systems and applications; <ul style="list-style-type: none"> 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 (%)
<p>The individual shall be able to:</p> <ul style="list-style-type: none"> • 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
<p>The individual needs to know and understand:</p> <ul style="list-style-type: none"> • 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 	
<p>The individual shall be able to:</p> <ul style="list-style-type: none"> • 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
<p>The individual needs to know and understand:</p> <ul style="list-style-type: none"> • Copper cabling systems • Types and uses of different types of copper • Cable connecting hardware • How to plan for and install cable 	

Section	Relative importance (%)
<p>The individual shall be able to:</p> <ul style="list-style-type: none"> • 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 	
<p>7 Wireless connectivity for IoT and IIOT applications</p> <p>The individual needs to know and understand:</p> <ul style="list-style-type: none"> • 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 	10
<p>The individual shall be able to:</p> <ul style="list-style-type: none"> • 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 	
<p>8 Troubleshooting and ongoing maintenance</p> <p>The individual needs to know and understand:</p> <ul style="list-style-type: none"> • Where potential system faults may occur • Potential disruption to business activity resulting from system faults • The requirements for documentation • The requirements of administration systems 	10
<p>The individual shall be able to:</p> <ul style="list-style-type: none"> • 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
<p>The individual needs to know and understand:</p> <ul style="list-style-type: none"> • 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 	
<p>The individual shall be able to:</p> <ul style="list-style-type: none"> • 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

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, in order to demonstrate their quality and conformity with the Standards.

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

4 The Marking Scheme

4.1 General guidance

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

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

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

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

For integrity and fairness, the Marking Scheme and Test Project are increasingly designed and developed by one or more independent people 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 Rules for further details.

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

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

4.2 Assessment Criteria

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

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

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

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

4.3 Sub Criteria

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

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

4.4 Aspects

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

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

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

4.5 Assessment and marking

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

4.6 Assessment and marking using judgement

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

- benchmarks (criteria) for detailed guidance for each Aspect (in words, images, artefacts or separate guidance notes)
- 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

WorldSkills is committed to continuous improvement. This particularly applies to assessment. The SMT is expected to learn from past and alternative practice and build on the validity and quality of assessment and marking.

The skill assessment specification are clear concise aspect specifications which explain exactly how and why a particular mark is awarded. For each criterion, it is based on the "skill02 guideline" which is released before the competition.

Each assessment criteria includes the following:

A – Quality

Assessing the quality of each cabling. It mainly includes the following things:

- Terminating,
- Cable management,
- Connection.

B – Proper Procedure

Evaluating whether the Test Projects have been performed in the correct procedure or not. General evaluating points are as follows:

- Working process,
- Report; Work Plan, Daily Work, Work Completion, Connection, Maintenance,
- Working environment & process.

C – Functionality

Assessing the functionality of cabling systems using measuring devices. As for the functionality, it mainly includes the following things:

- Wire-Map/Visible test,
- Fiber link/insertion loss,
- Certification test,
- Connectivity.

D – Fundamental Installation

Assessing the fundamental installation in cable systems. As for the functionality, it mainly includes the following materials or works:

- Generic cabling systems for customer premises,
- Underground closure,
- FO enclosure,
- FO box,
- Telecommunications Outlet,
- Voice Panel/Unshielded Panel/Shield Panel,
- Smart home equipment and applications,
- 19' Rack Cable management,
- Cable ladder & fibre channel management,
- Sustainability & Maintainability,
- Repair faults & Reporting.

E - Knowledge

Assessing the knowledge of standards, measurement methods, and cabling standards.

- Design,
- Setting and configuration,
- Fault finding.

F - Safety

All tasks performed in accordance with the WorldSkills Health, Safety, and Environment Policy and Regulations.

4.10 Skill assessment procedures

Assessment and marking are an intense process that depends upon skilful leadership, management, and scrutiny.

The Experts are divided into marking groups to assess each section of the marking criteria.

Every completed module is marked on the same day in which it was completed.

To ensure transparency, each Competitor is provided the same Mark Summary Form as used by the Experts.

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 Developer, 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 five (5) standalone modules.

5.3 Test Project design requirements

Test Project consists of a mandatory task, and several optional tasks to work on after completion of the mandatory task. The mandatory task should be designed to enable 80% or more Competitors to complete. Necessary information to do the mandatory task is disclosed prior to the competition; and competitors do their work based on diagram(s) presented on the competition day. Assumed scenarios for respective modules are disclosed prior to the competition.

The Competitors should be able to deliver accordingly to customers' various demands.

Module 1: Optical fibre cabling system

Install optical cabling systems for customer premises such as Industrial premises, Data centre, FTTH services. The following skills are required:

- Plan, design and manage a cabling system and the process;
- Optical fibre cabling and management;
- Install equipment, devices, and materials of the optical cabling system;
- Measurement;
- Maintenance.

Module 2: Generic cabling system

Install generic cabling systems for customer premises such as office remises, Industrial premises, Single tenant home, Data centre and Distributed building services. The following skills are required:

- Plan, design and manage a cabling system and the process;
- xTP/ optical fibre Cabling and management;
- Install equipment and materials of the system;
- Measurement;
- Maintenance.

Module 3: Smart Home/Office Applications

Install smart home/office equipment and applications and improve the connectivity. The following skills are required:

- Install a FTTH system;
- Install smart home/office system;
- Set up applications;
- xTP/coaxial/optical fibre cabling and management;
- Configuration of network devices;
- Measurement.

Module 4: Speed test

Splice optical fibres by fusion splicer. The following skills are required:

- Fibre optical fusion splicing as quickly as possible.

Module 5: Troubleshooting for copper and/or fibre cabling

Find and repair faults in generic cabling system. The following skills are required:

- Measurement;
- Fault finding;
- Repair the system.

For some or all of the tasks in module 5, Competitors use Mixed Reality (MR) devices.

All Test Project proposals shall comply with this Technical Description and the Test Project scenario. In addition, at the time of the proposal of all the Test Project modules, the Independent Test Project Designer must check if their modules can be enforced and, also indicate the details.

5.4 Test Project 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 Who develops the Test Project or modules

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

5.4.2 When is the Test Project developed

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

Time	Activity
Twelve (12) months prior to the Competition	The Skill Competition Manager is to take responsibility of all modules and create Test Project scripts and Marking Schemes required for the Competition.
Ten (10) months prior to the Competition	The Independent Test Project Designer is identified and a Confidentiality Agreement between WSI and the Independent Test Project Designer is organized.
Six (6) months prior to the Competition	Pre-Competition information and the scenario of the mandatory module is circulated on the WorldSkills website.
No later than one (1) month prior to the Competition	The Test Project documents are sent to the WorldSkills International Skills Competitions Administration Manager.
At the Competition on C-4	The Test Project/modules are presented to Experts.
At the Competition on C-2	The Test Project/modules are presented to Competitors.

5.5 Test Project initial review and verification

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

To support Test Project design and development, a rigorous quality assurance and design process is in place (Competition Rules sections 10.6-10.7 refer.) Once approved by WorldSkills, the Independent Test Project Designer is expected to identify one or more independent, expert, and trusted individuals initially to review the 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 and will ensure that the Test Project/modules can be completed within the material, equipment, knowledge, and time constraints of Competitors.

5.7 Test Project selection

The Test Project/modules are selected by the Skill Competition Manager in collaboration with the Independent Test Project Designer

5.8 Test Project circulation

If applicable, the Test Project is circulated via the website as follows:

The Test Project/modules are not circulated prior to the Competition. The Test Project/modules are presented to Experts on C-4 and to Competitors on C-2.

Pre-Competition information and the scenario of the mandatory module are circulated six (6) months prior to the Competition.

5.9 Test Project coordination (preparation for Competition)

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

5.10 Test Project change

There is no 30% change required to be made to the Test Project/modules at the Competition. Exceptions are amendments to technical errors in the Test Project documents and to infrastructure limitations.

5.11 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 such items may include those for fault finding modules or modules not circulated.

6 Skill management and communication

6.1 Discussion Forum

Prior to the Competition, all discussion, communication, collaboration, and decision making regarding the skill competition must take place on the skill specific Discussion Forum (<http://forums.worldskills.org>). Skill related decisions and communication are only valid if they take place on the forum. The Chief Expert (or an Expert nominated by the Chief Expert) will be the moderator for this Forum. Refer to 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 during the Competition is defined in the Skill Management Plan that is created by the Skill Management Team led by the Skill Competition Manager. The Skill Management Team comprises the Skill Competition Manager, Chief Expert, and Deputy Chief Expert. The Skill Management Plan is progressively developed in the six months prior to the Competition and finalized at the Competition by agreement of the Experts. The Skill Management Plan can be viewed in the Expert Centre (www.worldskills.org/expertcentre).

6.5 General best practice procedures

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

Topic/task	Best practice procedure
The process of and timing of the release of modules of an uncirculated Test Project	<ul style="list-style-type: none"> • The modules of the uncirculated Test Project will be published on C-4 to interpreters that need to translate, • CE and DCE see the Test Project ahead of Experts. • After all the translations are finished, it will be published to all Experts at the same time on C-3. • CE and DCE must prepare for the C-4 presentation to all Experts, the composition of the marking team, and the preparation of materials and equipment immediately after being published at C-3.
The process of and timing for the translation of the Test Project	<ul style="list-style-type: none"> • An Interpreter can translate from C-4 to C-3 until the time specified by the SCM. If the translation is not completed, extension may be permitted, but each event described in the Skill Management Plan must be prioritized. (Time extension is allowed after all events are over)
The tools that an Interpreter can use for the translation process	<ul style="list-style-type: none"> • An Interpreter can use a specified personal computer that has been inspected by the SMT for the translation process. • Software necessary for translation (Word, Excel, etc., including dictionary and translation software) may be used. An internet connection may be used if the software requires it. • Email software and browser cannot be used, and they cannot be installed.
The process for marking by marking teams	<ul style="list-style-type: none"> • Before the start of marking, the leaders of each marking team (designated by the SMT) must confirm and coordinate with each other to ensure consistency and quality of assessment, and that they all have the same understanding and agreement of the standards. • During the entire marking process, the marking team leader must immediately check with the SMT in case of any doubt. • After the marking, the marking team must report to the SMT about the marking especially what was evaluated, what was not evaluated (including the reason), and what was discussed at the time of marking, according to the defined format/template. • If requested by the SMT, the marking team leader must discuss the marking details with the SMT (complaints handling etc.).

Topic/task	Best practice procedure
The process for assessing suggestion and complaint	<ul style="list-style-type: none"> • If there is a request regarding marking (including matters that should be evaluated, matters that should not be evaluated, procedures violations, etc.), all Experts should describe in a prescribed format/template and submit it to the SCM in writing. Verbal complaints will not be accepted. • After discussing the submitted contents within the SMT, the SCM will reply in writing. • Similarly, Experts make complaints regarding marking results in writing. Complaints must be made within the designated time.

7 Skill-specific safety requirements

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

Skill-specific safety requirements are:

- All Competitors must use safety glasses when working with fibre or using any hand, power, or machine tools or equipment likely to cause or create chips or fragments that may injure the eyes;
- All Competitors must wear sturdy shoes during the entire competition;
- All Competitors must wear gloves when stripping loose tube cables;
- Experts will use the appropriate Personal Protective Equipment (PPE) when inspecting, checking, or assessing a Competitor's Test Project.
- All Competitors must wear full hand cover gloves when using a sharp knife, etc.

Task	Safety glasses with side protection	Sturdy shoes with closed toe and heel	Tight fitting work clothes (long trousers)	Leather gloves	Vinyl gloves
General PPE for safe areas		√			
Cabling				√	
Fibre jelly cleaning					√
All installation	√	√	√		

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 such 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.




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 the Information Network Cabling skill competition for Competitors to bring materials, equipment, and tools to the Competition. However, Competitors are allowed to bring ten (10) personal tools on the morning of C-2, Familiarization Day, as defined in the table below. It is recommended that these tools be brought in the luggage of the Competitor or purchased locally.

Description	Quantity	Photo
Combination Pliers		
Pliers		
Nipper		

Description	Quantity	Photo
Fibre buffer stripper (025/09)		
Cable jacket stripping tool		
Optical cable stripper		
Fibre loose tube stripper		
Fibre cord stripper		

Furthermore, Competitors are required to supply their own Personal Protective Equipment as specified in [section 7](#) skill-specific safety requirements.

If the Competitor wants to use special jigs or tools, then it must be posted on the WorldSkills Discussion Forum prior to the Competition with a picture and explanation of its use. A majority of Experts must agree.

8.4 Materials, equipment, and tools supplied by Experts

Experts are not required to bring materials, equipment, or tools. All is supplied by the Competition Organizer.

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

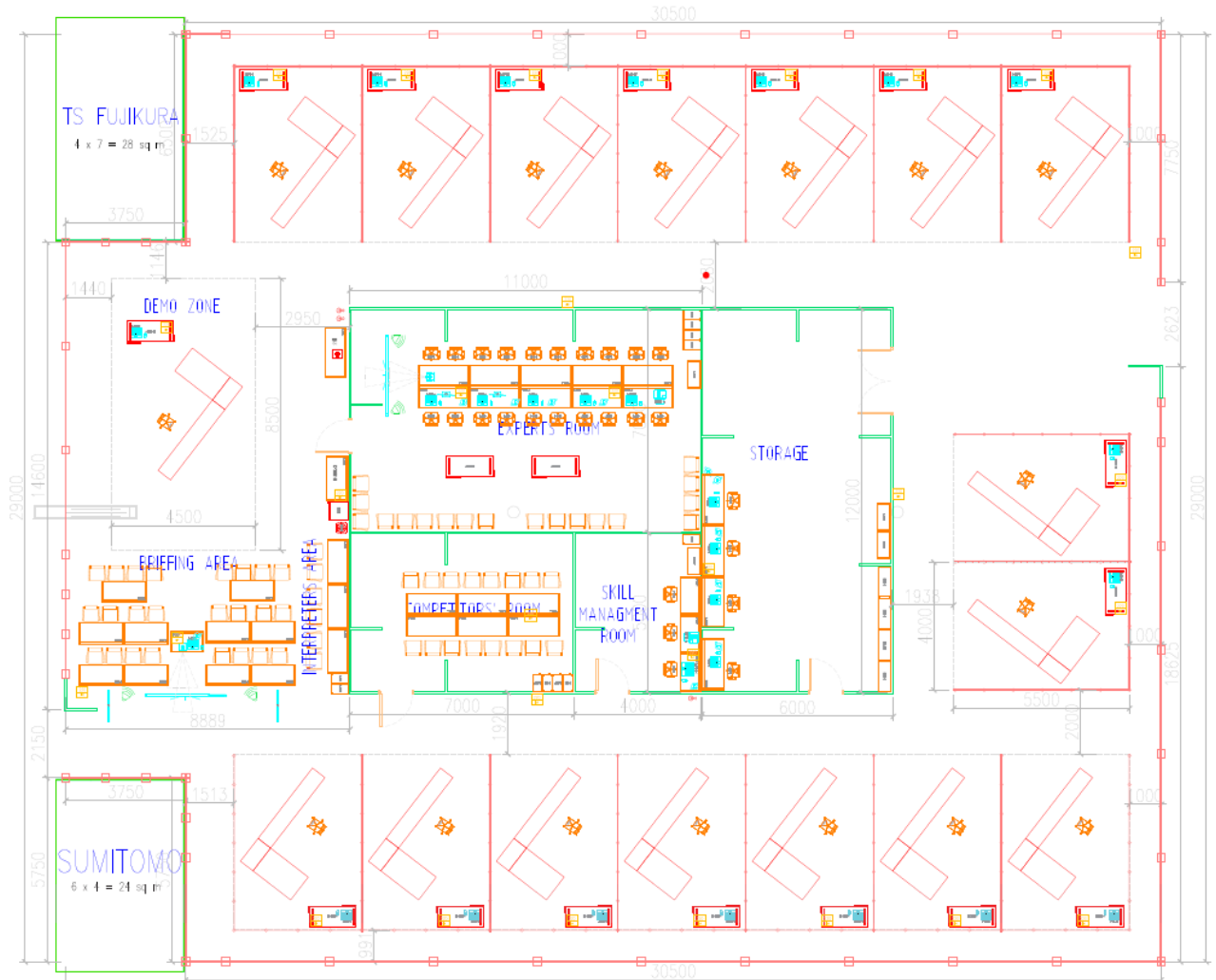
8.5 Materials and equipment prohibited in the skill area

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.

Example workshop layout



Please note that this is an example of the layout and is not definitive. Approximate space for work area of a Competitor is 6 m x 4 m.

Set up one booth to use for measurement training and demonstration purposes.

A workstation should meet the following requirements. These requirements should be examined and approved by the Skill Competition Manager no later than six (6) months prior to the Competition. The requirements are disclosed to Experts immediately after approval by the Skill Competition Manager.

- With assumption of Campus structured cabling system;
- Including the followings;
- Cable ladder, TO, board to set a termination box, 19-inch rack (two racks), fibre cable tray (upper part of the workstation), fibre channel, flexible conduit;
- Front panel should consist of multiple boards, which can be replaced;
- Be robust;
- Detailed design should have been disclosed.

9 Skill-specific rules

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.

Topic/task	Skill-specific rule
Use of technology – USB, memory sticks	<ul style="list-style-type: none"> Competitors are not to have memory devices of any kind in the workshop except for DSX's memory. Experts and Interpreters are not allowed to have memory devices in the Expert room except as expressly permitted by the SMT. The SMT is exempt from this rule.
Use of technology – personal laptops, tablets and mobile phones	<ul style="list-style-type: none"> Skill Competition Manager, Chief Expert, Deputy Chief Expert, Experts and Interpreters are allowed to use personal laptops, tablets, and mobile phones in the Expert room only. Competitors are not allowed to bring personal laptops, tablets, or mobile phones into the workshop. Competitors must leave them on C-2 and the full duration of competition hours (C1 to C4) with the ESR before the start of the competition. If needed, such as during lunchtime, they can make a request of the Expert and use them if permitted.
Use of technology – personal photo and video taking devices	<ul style="list-style-type: none"> SMT and Experts are allowed to use personal photo and video taking devices in the workshop for references record for marking during the competition. Competitors and Interpreters are not allowed to use personal photo and video taking devices in the workshop. Competitors must leave them on C-2 and the full duration of competition hours (C1k to C4) with the ESR before the start of the competition. If needed, such as during lunchtime, they can make an offer the Expert in charge of management and use them if permitted.
Tools/infrastructure	<ul style="list-style-type: none"> The only tools to be brought by the Competitor are those listed on the approved tool lists in the Technical Description and the WorldSkills Discussion Forum.

Topic/task	Skill-specific rule
Templates, aids, etc.	<ul style="list-style-type: none"> • Competitors must not bring jigs, etc. into the workshop, except those approved in the WorldSkills Discussion Forum • Competitors may not use any jigs etc. except for those created during the competition time of C-2 and C1 to C4. In addition, the created jigs must be left inside the workshop.
Installation method	<ul style="list-style-type: none"> • Competitors must install: <ul style="list-style-type: none"> • according to the guidelines and manuals which has been distributed. • by procedures that are intended at the real installation field.
Drawings, recording information	<ul style="list-style-type: none"> • No drawings are to be used except for those provided in the Test Project.

10 Visitor and media engagement

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

- Try-a-Skill;
- Display screens;
- Test Project descriptions;
- Enhanced understanding of Competitor activity;
- Competitor profiles;
- Career opportunities;
- Daily reporting of competition status.

Out of consideration for other Member countries and regions, continuous filming of a Competitor is not allowed.

11 Sustainability

This skill competition will focus on the sustainable practices below:

- Recycling;
- Use of “green” materials;
- Use of completed Test Projects after Competition.

12 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.onetonline.org/)

This WSOS (Section 2) 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.	laojie Li, Fusion Splicer Division
Xi'an Kaiyuan Electronic Industry Co., Ltd (China)	Wang Gongru, Chairman and CEO