Technical Description

Information Network Cabling

Information and Communication Technology

worldskills

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:

Effective 22.08.18

Stefan Praschl
Chair of the Competitions Committee

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Vice Chair of the Competitions Committee

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).

Cable is the medium through which information usually moves from one network device to another. There are several types of cable which are commonly used in network infrastructures. In some cases, a network will utilize only one type of cable, while other networks will use a variety of cable types. The type of cable chosen for a network is related to the network's topology, protocol, and size. Understanding the characteristics of different types of cable and how they relate to other aspects of a network is necessary for the development of a successful network.

The Network Cabling Technician constructs the infrastructure of all the telecommunication networks such as those for Wide Area Networks (WAN), Local Area Networks (LAN), and Cable TV (CATV). This work is highly technical and requires detailed specialized knowledge in order to independently design and install networks that meet clients' needs and conforms to recognized industry standards. The technician will create the foundation which is the basis for the network, install cables appropriate for the intended use, maintain, test, and commission the network.

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

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.

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 – Competition Rules
- WSI – WorldSkills Standards Specification framework
- WSI – WorldSkills Assessment Strategy
- WSI Online resources as indicated in this document
- WorldSkills Health, Safety, and Environment Policy and Regulations

2 THE WORLDSKILLS STANDARDS SPECIFICATION (WSSS)

2.1 GENERAL NOTES ON THE WSSS

The WSSS 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/WSSS).

The skill competition is intended to reflect international best practice as described by the WSSS, and to the extent that it is able to. The Standards Specification 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 Standards Specification 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 Specification. This is often referred to as the "weighting". The sum of all the percentage marks is 100.

The Marking Scheme and Test Project will assess only those skills that are set out in the Standards Specification. They will reflect the Standards Specification as comprehensively as possible within the constraints of the skill competition.

The Marking Scheme and Test Project will follow the allocation of marks within the Standards Specification to the extent practically possible. A variation of five percent is allowed, provided that this does not distort the weightings assigned by the Standards Specification.

2.2 WORLDSKILLS STANDARDS SPECIFICATION

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 organisations of poor or unreliable network installations • The situations when personal protective equipment (PPE) must be used, e.g. for ESD (electrostatic discharge) • 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 • Be actively working towards fulfilling 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) • Demonstrate thorough and efficient research methods to support knowledge growth • Demonstrate enthusiasm to try new methods, systems and embrace change	

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 team work • Techniques for resolving misunderstandings and conflicting demands • The process for managing tension and anger to resolve difficult situations	
	The individual shall be able to: • Demonstrate strong listening and questioning skills to deepen understanding of complex situations • Manage consistently effective verbal and written communications with colleagues • Pro-actively contribute to the development of a strong and effective team • Share knowledge and expertise with colleagues and develop a supportive learning culture • Manage tensions and anger in others, providing confidence that problems can be resolved • Discuss customer's requirements and provide Expert advice and consultancy • Liaise with other professional and suppliers to create a fully tailored package that fulfils the customer's needs • Respect the impact that cabling activity can have on a busy working environment, show consideration and care, causing least disruption always • Prepare quotations for planned work and present to customers	

3	Planning and design	5
	The individual needs to know and understand: • Campus and building cabling systems including backbone and horizontal • FTTH system, Data centre cabling system • Residential and office cabling systems • Outside plant cabling system • Wi-Fi applications • Network applications for CCTV, security, home automation • Network equipment • PoE • Smart home applications • Industry accepted terminology and symbols used in specifications and drawings • Principles of technical drawings and specifications that are recognized by the industry • The techniques of planning, scheduling, and prioritizing • Specialist terminology and symbols used in network cabling • Various types of information network technology and their applications including Ethernet technology, local area networks (LAN) technology • Mathematics and physics • The laws of electricity	
	The individual shall be able to: • Have strong problem-solving skills • Work independently by planning, ordering and prioritizing work to maximize efficiency and to adhere to planned time schedules • Schedule work required to achieve a given outcome • Prepare, design, interpret, and analyse specialist's technical drawings and specifications • Select the tools and systems that are most appropriate for the planned task • 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 • Design IP network system (Wi-Fi, Smart applications, etc.) • Maintain equipment and tools	

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	
	The individual shall be able to: • Install cable setup • Install and pull cables, install rack cabinets, patch panels, and network equipment • Select the appropriate procedure for cabling • Prioritize work and comply with plans to minimize disruption and to meet agreed time scales • Clean the area after completing installation • Organize and label cabling to make future reconfiguring straightforward • Respect the client's building, keeping it 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 classification • 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 and optical fibre structured cabling system and FTTH system (Closure/Panel/Splice box/TO etc.) • Connect and terminate optical fibre cables (Fusion splicing/Mechanical splicing/Optical connector/Installable optical connector) • Optical fibre cable preparation • Proper storage for cabling media	
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	
	The individual shall be able to: • Install and copper structured cabling systems (Rack/Panel /TO/Network equipment, etc.) • Install and terminate copper cables (Unshielded Twisted Pair (UTP) cable/Shielded Twisted Pair/Coaxial Cable) • Copper cable preparation (remove jacket, etc.) • Use copper insulation displacement (IDC) termination to terminate RJ45 modular jack (U/UTP, SF/UTP, S/FTP), terminate RJ45 modular plug	

7	**Smart home technologies Home wireless connectivity**	**10**
	The individual needs to know and understand: • IEEE802.11 series • Smart home applications • Home network equipment	
	The individual shall be able to: • Install and basic configuration to provide office/home connectivity • Set-up a Wi-Fi system • Install smart application and equipment • Install and configuration of active equipment (IP camera/TV/etc.)	
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 individual shall be able to: • Identify, locate, and diagnose system faults • Rectify faults • Replace and reinstall Optical fiber cabling, copper cabling • Carry-out Wi-Fi network fault-finding. • Install updates to ensure systems meet emerging business needs • Provide expert advice and guidance on use of the system, its features, and limitations • Thoroughly fill out the troubleshooting and fault-finding log sheet.	
9	**Measurement**	**15**
	The individual needs to know and understand: • The principles and purposes of measuring devices • The practical uses of measuring devices • The purpose of measurement	
	The individual shall be able to: • Inspect and clean installed cabling and rectify if necessary • Certify optical fibre cables by Optical loss test set (OTLS)/Optical time domain reflect metre (OTDR) • Certify copper cable by cable/LAN tester • Certify/Verify quality of fibre optical connector end-faces • Optimize performance of 802.11 wireless network • Select appropriate test equipment	
	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 Specification. The Test Project is the assessment vehicle for the skill competition, and also follows the Standards Specification. The CIS enables the timely and accurate recording of marks, and has expanding supportive capacity.

The Marking Scheme, in outline, will lead the process of Test Project design. After this, the Marking Scheme and Test Project will be designed and developed through an iterative process, to ensure that both together optimize their relationship with the Standards Specification and the Assessment Strategy. They will be submitted to WSI for approval together, in order to demonstrate their quality and conformity with the Standards Specification.

Prior to submission for approval to WSI, the Marking Scheme and Test Project will liaise with the WSI Skill Advisors in order 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 standards that represent the skill. It is designed to allocate marks for each assessed aspect of performance in accordance with the weightings in the Standards Specification.

By reflecting the weightings in the Standards Specification, the Marking Scheme establishes the parameters for the design of the Test Project. Depending on the nature of the skill 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 Specification, if there is no practicable alternative.

The Marking Scheme and Test Project may be developed by one person, or several, or by all Experts. The detailed and final Marking Scheme and Test Project must be approved by the whole Expert Jury prior to submission for independent quality assurance. The exception to this process is for those skill competitions which use an independent designer for the development of the Marking Scheme and Test Project. Please see the Rules for further details.

Experts and independent designers are required to submit their Marking Schemes and Test Projects for comment and provisional approval well in advance of completion, in order to avoid disappointment or setbacks at a late stage. They are also advised to work with the CIS Team at this intermediate stage, in order to take full advantage of the possibilities of the CIS.

In all cases a draft Marking Scheme must be entered into the CIS at least eight weeks prior to the Competition using the CIS standard spreadsheet or other agreed methods.

4.2 ASSESSMENT CRITERIA

The main headings of the Marking Scheme are the Assessment Criteria. These headings are derived in conjunction with the Test Project. In some skill competitions the Assessment Criteria may be similar to the section headings in the Standards Specification; in others they may be totally 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 Specification.

Assessment Criteria are created by the person(s) developing the Marking Scheme, who are free to define 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). It is advisable not to specify either the Assessment Criteria, or the allocation of marks, or the assessment methods, within this Technical Description.

The Mark Summary Form generated by the CIS will comprise a list of the Assessment 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) specified 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, or instructions for how the marks are to be awarded. Aspects are assessed either by measurement or 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 skill in the Standards Specification. 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)

		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

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, in all circumstances. The marking teams must be organized to ensure that there is no compatriot marking in any circumstances. (See 4.6.)

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, with a fourth to coordinate the marking and acting as a judge to prevent compatriot marking.

4.7 ASSESSMENT AND MARKING USING MEASUREMENT

Three Experts will be used to assess each aspect. 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.

4.8 THE USE OF MEASUREMENT AND JUDGEMENT

Decisions regarding the selection of criteria and assessment methods will be made during the design of the competition through the Marking Scheme and Test Project.

4.9 COMPLETION OF SKILL ASSESSMENT SPECIFICATION

The skill assessment criteria are clear concise aspect specifications which explain exactly how and why a particular mark is awarded. For each criterion, it is based on the "skill standards" which is discussed and released in advance on the discussion forum. This Skill Standard is the Assessment Guideline which the Experts develop and agree. This guideline will be used at subsequent competitions.

Each assessment criteria includes the following:

A - Quality

Assessing the condition of each cabling, route, design etc. It mainly includes the following things:

- The condition of cable management;
- Whether the cabling is based on the standard or Competition standard or not etc.
- Appropriate storing; including bending radius and stress for fiber
- Verify high quality, loss.

B - Proper Procedure

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

- Appropriate work planning;
- Select the appropriate cabling media and tool;
- Professional efficiency work;
- Appropriate installation at actual field;
- Correct procedure - splicing and terminating;
- Appropriate cleaning after completing;
- Keeping tidy and clean;
- Correct handling cable and fiber;
- Appropriate measurement setting;
- Appropriate preparation;
- Professional planning and installing - Completion, etc;
- Professional listening and questioning skills;
- Providing confidence;
- Professional advice and consultancy;
- Professional guidance.

C - Functionality

Assessing the quality of the Network Cabling using measuring devices. As for the quality, it includes the following things:

- Wire-map results;
- Certification test results;
- Optical fibre Loss results;
- Making an inspection sheet.

D – Fundamental Installation

Install number of successful fundamental connections (up to required skill standard) in cable systems.

Completion of the task in the allocated time.

- Correct cable fixing and route - access route;
- Label on the box;
- Correct mounting position;
- Correct mounting condition;
- Label on the cable;
- Correct cable fixing - entry point;
- Correct TM length;
- Appropriate fiber jacket condition;
- Appropriate manage fiber tube;
- Appropriate connector connection;
- Appropriate cable slack management in 19' main rack;
- Complete connection;
- Installation according to instructions;
- Installation smart application;
- Rectify faults and reporting.

E - Knowledge

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

- Diagnose trouble cause;
- Predict impact on network;
- Correct FO system fault-finding;
- Correct Copper system fault-finding;
- Correct survey;
- Correct setting configuration.

F - Safety

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

4.10 SKILL ASSESSMENT PROCEDURES

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

Every completed module will be 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 skills in each section of the WSSS.

The purpose of the Test Project is to provide full, balanced and authentic opportunities for assessment and marking across the Standards Specification, in conjunction with the Marking Scheme. The relationship between the Test Project, Marking Scheme and Standards Specification 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 Specification, or affect the balance of marks within the Standards Specification other than in the circumstances indicated by Section 2.

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.

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 Specification. Section 2.1 refers.

5.2 FORMAT/STRUCTURE OF THE TEST PROJECT

The format of the Test Project is a series of standalone modules.

5.3 TEST PROJECT DESIGN REQUIREMENTS

In order to assess Competitor's skills effectively, the TP design should enable at least 1/3 of the Competitors the possibility to finish the TP. For this, the TP draft shall be with a similar standard to TPs in previous competition's, as well as reflecting current vocational training and industry.

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

Module 1: Optical fibre cabling system

- Plan and design cabling system;
- Install FO distribution box, termination box, TO and enclosure/FO closure;
- Fibre optical cabling;
- Cable management;
- Measurement.

Module 2: Structure cabling system

- Plan and design cabling system;
- Install FO distribution box, termination box, TO, and patch panel;
- Install to 19'inch rack;
- Install to cable rack;
- xTP cabling;
- Fibre optical cabling;
- Cable management;
- Measurement;

Module 3: Smart Home/Office Applications

Introduce IP based systems (security) and building control (automation) as follows:

- Install DD box, TO;
- Install Ethernet applications such as Wi-Fi, CCTV, network camera, etc.;
- xTP and Fibre cabling;
- Cable management;
- Configuration of network devices;
- Measurement;

Module 4: Speed test

- Speed and quality test of fibre optical fusion splicing

Module 5: Troubleshooting for copper and/or fibre cabling

- Detecting obstacles that and finding out the cause in Optical Fibre and Twist Pair Cable Link.

All Test Project proposals shall comply with this Technical Description and the Test Project checklist. In addition, at the time of the proposal of all the Test Project modules, the proposer must check if their proposals 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

All Test Project modules are developed by an Independent Designer.

5.4.2 How and where is the Test Project or modules developed

The independent agency is to produce all modules.

The presence of the independent designers at the Competition during all pre-competition and Competition period is desirable.

5.4.3 When is the Test Project developed

The Test Project is developed according to the following timeline:

TIME	ACTIVITY
Twelve months before 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 months before the Competition	Identify the independent agency and agreement between WSI and the independent agency.
One month before the competition	The independent agency must submit the Test Project to WorldSkills International for validation.

5.5 TEST PROJECT VALIDATION

Before the competition, the Skill Competition Manager and the Workshop Manager will decide together that it is possible for all modules to be completed. Time, Competitor skill, and materials will be taken into consideration.

At the competition, all Experts will be divided into groups. Each group will be given the task to verify the validity the modules. The group will be required to:

- Verify that all documents are present;
- Ensure that the module can be completed within the time frame;
- The volume should be set, so as to have at least one third of the Competitors can finish the Test Project. (This doesn't guarantee that Competitors can complete the task.);
- Prepare well enough to be able to explain the contents of the module thoroughly to the Competitors and other Experts;
- Take responsibility for preparation of necessary materials/equipment for the module.

5.6 TEST PROJECT SELECTION

Note applicable.

5.7 TEST PROJECT CIRCULATION

The Test Project is circulated via the website as follows:

The Test Project is not circulated.

5.8 TEST PROJECT COORDINATION (PREPARATION FOR COMPETITION)

Coordination of the Test Project will be undertaken by:

The Skill Competition Manager.

5.9 TEST PROJECT CHANGE AT THE COMPETITION

No changes will be made to the Test Project developed by the independent agency prior to the Competition except for amendments to technical errors in the Test Project document and the judgement by the SMT.

5.10 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.

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 Skill Competition Manager (or an Expert nominated by the Skill Competition Manager) 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
- Marking Schemes
- Test Projects
- 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).

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.

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 Competition Manager on behalf of the Experts for the next Competition. The Competition Organizer will progressively update the Infrastructure List specifying the actual quantity, type, brand, and model of the items. Items supplied by the Competition Organizer are shown in a separate column.

At each Competition, the Skill Competition Manager must review, audit, and update the Infrastructure List in partnership with the Technical Observer in preparation for the next Competition. The Skill Competition Manager must advise the Director of Skills Competitions of any requests for increases in space and/or equipment.

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 COMPETITOR'S TOOLBOX

The external measurement of the toolbox should not exceed a volume of 0.13 cubic metres, regardless of the size of its cargo case. However, fusion splicer, measuring equipment, or other specified equipment does not have to be included in this toolbox.

8.3 MATERIALS, EQUIPMENT, AND TOOLS SUPPLIED BY COMPETITORS IN THEIR TOOLBOX

- See point in section 8.5 about fabrication of jigs and special fixtures;
- Competitors must bring the equipment and tools which they are accustomed to show in list A;
- Competitors MUST NOT bring any equipment or tools that are listed on Infrastructure List, with the exception of the equipment and tools listed on list B;
- The equipment and tools on list B maybe brought by Competitors. If Competitors bring their own, they must inform the Chief Expert, Deputy Chief Expert, and the Workshop Manager six months prior to the competition. In this case, the Workshop Manager shall provide the number of equipment or tools excluding the Competitors who are bringing their own;
- Competitors can bring the equipment and tools listed on List C. This is a list of jigs and other special tools which can be used. To have something included in the list, you need to obtain permission over the Discussion Forum;
- The list of equipment to be provided by the Competitors will be confirmed with the proposal of the Test Project, six months prior to the Competition.

Competitors should bring the equipment and tools which they are accustomed to shown in List A. These pictures are samples, and the Competitors can actually use an alternative tool but with the same function:

NO.	NAME	PHOTO	NOTE
1	Toolbox		
2	Combination Pliers		
3	Pliers (long nose)		
4	Wrench (set)		Adjustable wrenchs
5	Pliers		
6	Nipper		For Electrical Installation
7	Copper conductor snipping tool		
8	Screwdriver (+/—)		
9	Precision screwdriver set		
10	Measure		5m

NO.	NAME	PHOTO	NOTE
11	Scale		
12	Fiber buffer stripper (025/09)		
13	Cable jacket stripping tool		
14	Optical cable stripper		
15	Fiberl loose tube stripper		
16	Fiber cord stripper		
17	Coaxal stripper		
18	Scissors		
19	Fiber Kevlar shears.		
20	Single Wire punchdown Tool		Single wire replacement blade
21	KRONE type punchdown tool		
22	Case or plastic container/box		For sorting of components and parts ex. Nuts, screw..

NO.	NAME	PHOTO	NOTE
23	Dust box		
24	Fiber dispenser box		
25	Cleaning tool For Desk and working area.		
26	Marking pen		
27	Knife		
28	Safety glasses		
29	Hexagon wrench		
30	Crimp tool for RJ45 modular plugs		
31	Level measure		
32	Drill/Screwdriver and accessories		Electrical Driver
33	Wire-map checker		With patch test cord

NO.	NAME	PHOTO	NOTE
34	Visible checker		Light source, with FO patch test cord

Competitors can bring and use any equipment or tools listed on List B even if it is on IL but must inform on Discussion Forum to adjust IL. These pictures are samples, and the Competitors can actually use an alternative tool but with the same function.

NO.	NAME	PHOTO	NOTE
1	Fiber cleaning paper		
2	Alcohol dispensing bottle (empty)		Spray bottle also permits.
3	LAN Cable analyser		A sponsor provides six devices. Ex. DTX-1200 Fluke, with Accessories. DTX-1800 Fluke, with Accessories. DSX-5000 Fluke, with Accessories.
4	Singlemode fiber module		A sponsor provides six devices. Ex. DTX-SF2
5	OTDR		A sponsor provides six devices.

The following countries/regions bring DSX:

CN, SG, JP, MO, RU, KR, CO.

Competitors CAN BRING and USE the equipment and tools listed on List C if permission on the Discussion Forum. This is a list of jigs and other special tools which are able to be used.

NO.	NAME	PHOTO	NOTE
1	File		
2	Sheet		For working area
3	Timer		
4	Labelling tool		
5	Safety gloves		Latex glove also permits.
6	Hand tool back		
7	Parallel pliers		
8	Clamp/clip		
9	Re-usable adhesive		Blu tack etc.
10	Fishing tape		
11	LED table lamp		
12	Magnets		Allow any number of pieces

8.4 MATERIALS, EQUIPMENT, AND TOOLS SUPPLIED BY EXPERTS

- Materials and equipment prohibited in the skill area;
- The Competitors are not allowed to bring their own tables, chairs, and special jigs or fixtures;
- Competitors can use jigs and special fixtures listed in list C;
- Jigs and special fixtures may be fabricated by the Competitor using the materials supplied in the Infrastructure List during Competition time;
- If the Competitor wants to use special jigs or tools, then it must be posted on the Discussion Forum prior to the Competition with a picture and explanation of its use. A majority of Experts must agree.
- List C will be will be decided by the Skill Management Team and agreed for in the Discussion Forum. This will happen three months prior to the competition.

8.5 PROPOSED WORKSHOP AND WORKSTATION LAYOUTS

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

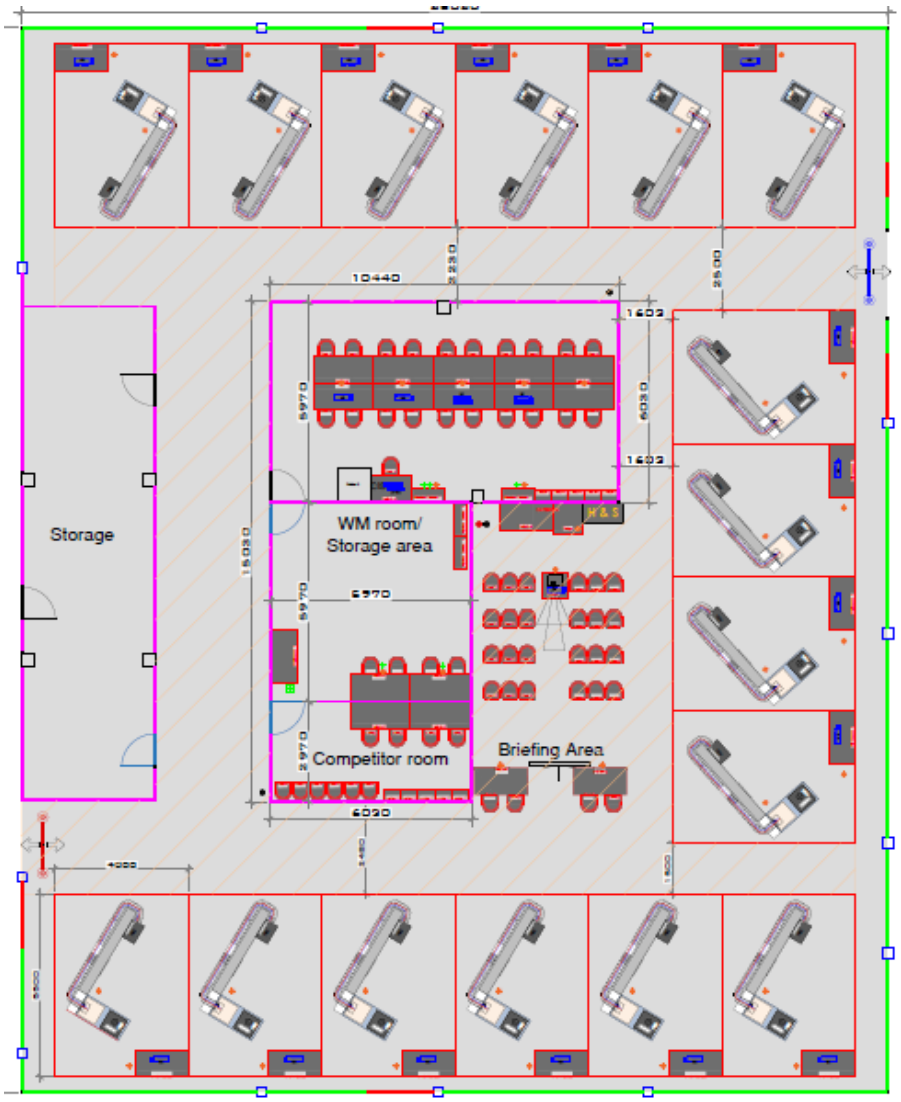
Please note that the following in an example of the layout and is not definitive. Approximate space for work area of a Competitor is 6m x 4m.

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

Work station should meet the following requirements. And these requirements should be examined and approved by SCM no later than six months before the competition. The requirements will be disclosed to Experts immediately after approval by SCM.

- With assumption of Campus structured cabling system;
- Including the followings;
- Cable ladder, TO, board to set a termination box, 19-inch rack (2 racks for 22U and 12U), fiber cable tray (upper part of the work station), flexible conduit;
- Front panel should consist of multiple boards, which can be replaced;
- Be robust;
- Detailed design should have been disclosed.

Example workshop layout:



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 work flow, and documentation management and distribution.

TOPIC/TASK	SKILL-SPECIFIC RULE
Use of technology – USB, memory sticks	• Competitors are not to have memory devices of any kind in the workshop except for DSX's memory. • Experts and Interpreters are allowed to have memory devices in the Expert room except as expressly permitted by the SMT.
Use of technology – personal laptops, tablets and mobile phones	• 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.
Use of technology – personal photo and video taking devices	• Experts are allowed to use personal photo and video taking devices in the workshop. • Competitors and Interpreters are not allowed to use personal photo and video taking devices in the workshop.
Tools/infrastructure	• The only tools to be brought by the Competitor are those listed on the approved tool lists A, B, and C.
Templates, aids, etc.	• Templates, jigs etc. must not: • Be brought into the workshop; • Be present in the Competitor toolbox unless they are permitted in List C; • Be constructed outside competition time.
Installation method	• Competitors must install: • According to the guidelines and manuals which has been distributed. • By procedures that are intended at the real installation field.
Drawings, recording information	• No drawings are to be used except for those provided in the Test Project.
Health, Safety, and Environment	• Refer to the WorldSkills Health, Safety, and Environment policy and guidelines document.

10 VISITOR AND MEDIA ENGAGEMENT

The following list provides examples of how this skill competition may be more attractive for the media and visitors:

- 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;
- Size of the shipping box;
- With a view to minimizing carbon emissions due to the transportation of equipment and materials to the Competition, participants ought to use shipping containers not larger than 0.4 cubic metre.

12 REFERENCES FOR INDUSTRY CONSULTATION

WorldSkills is committed to ensuring that the WorldSkills Standards Specifications 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 Standards Specification 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.**oneto**nline.org/)

This WSSS (Section 2) most closely to relate to *Telecommunication Line Installers and Repairers:*

https://www.onetonline.org/link/summary/49-9052.00.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 Standards Specification in place for WorldSkills Kazan 2019.

ORGANIZATION	CONTACT NAME
Fujikura Ltd (Japan)	Toshiro Mizushima, General Manager
Fujikura (China) Co., LTD	Zhao Lin, Fiber Optics Engineering Center
Fluke Networks	Yin Gang, role not stated
ISO/IEC JTC1/SC25 (Japan)	Yoshiaki Miyajima, Committee Member
Xi'an Kaiyuan Electronic Company, Ltd (China)	Wang Gongru, Chairman and CEO
China Telecom Corporation Limited, Shanghai Branch (China)	Jun Xu, senior technician of communication line, Senior Evaluation Officer of Skills identification
Guangdong VCom Education Technology Co.,Ltd	Shaohong Wu, Technical Director