Technical Description
Water Technology

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:

1 Introduction

1.1 Name and description of the skill competition

1.1.1 The name of the skill competition is

Water Technology

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

Water Technicians may work on the supply of water, or the treatment of wastewater; they may work as Water Supply Technicians or Wastewater Technicians.

Water Supply Technicians work in local water supply facilities and industrial water treatment plants. They carry out their work independently based on technical documents, rules, and legal requirements. Water Supply Technicians collect information, plan, and coordinate their own work. They document their work and take measures to ensure quality assurance, safety, health, and environmental protection. They may work in large or small facilities for processing drinking water, performing a range of technical duties or management roles in the plants.

Wastewater Technicians work within sewer networks, for wastewater and sludge treatment in local or industrial wastewater treatment plants. As with Water Supply Technicians, they carry out their work independently based on technical documents, regulations, and legal requirements. They acquire information, plan, and coordinate their work. They document their work and take measures to ensure quality assurance, safety, good health, and environmental protection at work. They may be electro-technically qualified personnel. They may work in local or industrial wastewater treatment facilities in a wide range of technical roles, or as the manager.

Whether working in water supply or wastewater treatment facilities, the role of the Water Technician is to observe, identify, report, maintain, control, and repair equipment and processes at the plant and across the networks. They must have knowledge and expertise in mechanics, chemistry, biology, electricity, automation, and environmental protection. Above all, health and safety is most important.

Irrespective of where they work, or their responsibilities, the Water Technician's role is driven by the absolute requirement for quality in many respects, including:

• Continuity, consistency, and safety of supply;
• Safe removal, treatment, and recycling of wastewater;
• Environmental protection.

Since water is the earth's most critical resource, the importance of this occupation and the quality of those fulfilling it, is second to none.

1.1.3 Number of Competitors per team

Water Technology is a single Competitor skill competition.

1.1.4 Age limit of Competitors

The Competitors must not be older than 25 years in the year of the Competition.

1.2 The relevance and significance of this document

This document contains information about the standards required to compete in this skill competition, and the assessment principles, methods, and procedures that govern the competition.

Every Expert and Competitor must know and understand this Technical Description.

In the event of any conflict within the different languages of the Technical Descriptions, the English version takes precedence.

1.3 Associated documents

Since this Technical Description contains only skill-specific information it must be used in association with the following:

• WSI – Code of Ethics and Conduct
• WSI – Competition Rules
• WSI – WorldSkills Occupational Standards framework
• WSI – WorldSkills Assessment Strategy
• WSI online resources as indicated in this document
• WorldSkills Health, Safety, and Environment Policy and Regulations
• WorldSkills Standards and Assessment Guide (skill-specific)

2 The WorldSkills Occupational Standards (WSOS)

2.1 General notes on the WSOS

The WSOS specifies the knowledge, understanding, skills, and capabilities that underpin international best practice in technical and vocational performance. These are both specific to an occupational role and also transversal. Together they should reflect a shared global understanding of what the associated work role(s) or occupation(s) represent for industry and business (www.worldskills.org/WSOS).

The skill competition is intended to reflect international best practice as described by the WSOS, to the extent that it can. The Standard is therefore a guide to the required training and preparation for the skill competition.

In the skill competition the assessment of knowledge and understanding will take place through the assessment of performance. There will only be separate tests of knowledge and understanding where there is an overwhelming reason for these.

The Standard is divided into distinct sections with headings and reference numbers added.

Each section is assigned a percentage of the total marks to indicate its relative importance within the Standards. This is often referred to as the "weighting". The sum of all the percentage marks is 100. The weightings determine the distribution of marks within the Marking Scheme.

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

The Marking Scheme will follow the allocation of marks within the Standards to the extent practically possible. A variation of up to five percent is allowed, if this does not distort the weightings assigned by the Standards.

2.2 WorldSkills Occupational Standards

Section		Relative importance (%)
1	**Work organization and management**	**10**
	The individual needs to know and understand: • Principles and applications of safe working in general and for water and wastewater treatment and operation in the networks and in solid waste management • The purposes, uses, care, calibration and maintenance of all equipment and materials, together with their safety implications • Environmental and safety principles and their application to good housekeeping in the work environment • Principles and methods for work organization, control, and management • Principles of team working and their applications • The personal skills, strengths and needs that relate to the roles, responsibilities, and duties of others, individually and collectively • The parameters within which activities need to be scheduled	
	The individual shall be able to: • Prepare and maintain safe, tidy, and efficient work areas • Manage and dispose of the refuse produced in the work area • Prepare for the tasks in hand, with full regard to health and safety • Schedule work to maximize efficiency and minimize disruption • Select and use all equipment and materials safely and in compliance with manufacturers' instructions • Apply or exceed health and safety standards applying to the environment, equipment, and materials • Restore work areas to an appropriate state and condition • Contribute to team performance broadly and specifically • Give and take feedback and support	
2	**Communication and interpersonal skills**	**5**
	The individual needs to know and understand: • The range and purposes of documentation in both paper and electronic form • The technical language associated with the occupation and the industry • The standards required for routine and exception reporting in oral, written, and electronic form (e.g., values, figures, units, minimal information, recommendations) • The required standards for communication with clients, team members and others • The purposes and techniques for generating, maintaining, and presenting records	

Section		Relative importance (%)
	The individual shall be able to: • Read, interpret, and extract technical data and instructions from documentation in any available format • Communicate by oral, written, and electronic means to ensure clarity, effectiveness, and efficiency • Use a standard range of communication technologies • Discuss complex technical principles and applications with others • Complete reports and respond to issues and questions arising • Respond to clients' needs face-to-face and indirectly • Gather information and prepare documentation targeted to and as required by the client or client group	
3	**Electrical**	**10**
	The individual needs to know and understand: • The basic principles of electricity • The basic principles of electrical systems • The basics of electrical control of machines and actuators • Circuit- and P&I-diagrams as well as operating manuals and/or instruction manuals • The protection methods of electrical systems • The dangers/hazards of electrical systems • Analytical techniques for fault finding • Strategies for problem solving • Methods and procedures for identifying high energy consumers • Strategies for energy efficiency	
	The individual shall be able to: • Disengage electrical equipment commonly used in water and wastewater treatment plants • Identify and resolve areas of uncertainty within the briefs or specifications • Identify the different components within control cabinets and their functionality • Exchange defective components within control cabinets • Take electrical measurements and interpret/verify the results • Connect wires/cables according to industrial standards • Install, set up and adjust/calibrate electrical and sensor systems as required • Ensure connection of all wiring according to circuit diagrams • Ensure the functionality of electrical systems (i.e. rotation direction	
4	**Mechanical**	**15**
	The individual needs to know and understand: • The basics of materials (metals, composites, plastics, etc.) • The basics in processing methods of different materials	

Section		Relative importance (%)
	• The basics of connection technology • The basics of mechanical engineering (mechanics, sealing methods, gear technology, etc.) • The basics of fluids • Criteria and methods for testing equipment and systems • Analytical techniques for fault finding • Techniques and options for making mechanical repairs • Strategies for problem solving • Principles and techniques for generating creative and innovative solutions • What water loss and leakage is, its potential causes and potential solutions for prevention	
	The individual shall be able to: • Repair components (up to systems) efficiently • Monitor and control process relevant equipment • Adjust and/or calibrate systems where necessary, according to instruction manuals • Use accessories efficiently • Ensure the correct function of systems • Adjust process relevant parameters • Identify cost drivers and define methods for their minimization • Work in a professional manner • Identify equipment that requires preventive maintenance and develop/take appropriate measures • Create quick and reliable makeshift solutions as an interim in emergencies	
5	**Environment Protection and Sustainability**	10
	The individual needs to know and understand: • The logical sequence of network flow and purification steps • The hazardous aspects/points for the environment (danger/risk analysis) • Different mitigation methods • The basic calculations required within water and wastewater network and treatment processes • New trends in environmental processes and protection • Dangers of relevant hazardous substances used on the networks and plants • The different potential hazardous sources in the vicinity, their potential contents, and their possible effects • Contingency plans • Sustainable practices which support human, ecological, economic health and vitality	

Section	Relative importance (%)
The individual shall be able to: • Operate all steps within a water or wastewater network and treatment plants • Execute proper preventive or correction actions in order to maintain efficiency within all treatment steps • Perform calculations based on given facts • Identify potential problem zones and devise remedies accordingly • Communicate with defined target groups, in order to give the correct information about the types of refuse that can be disposed of in wastewater collection systems • Communicate with the defined target groups, in order to give the correct information about water distribution systems, its possible flaws, water quality and shortage periods • Take measurements and carry out analyses for process and quality control • Monitor and document information and data in compliance with legal requirements • Work in a cost, environmental and hygiene-conscious manner • Use different energy forms (electricity, oil, gas, air, water, and steam) • Review the possibilities of economical energy use (i.e.: mitigation of leakage or usage of heat) • Avoid the use of hazardous substances and make proposals for their replacement • Create and evaluate contingency plans • Implement sustainable practices, e.g., reducing consumption of resources like water, energy, or materials • Reduce, reuse, and recycle resources if possible	
6 **Chemical/Biological – Quality Assurance**	**25**
The individual needs to know and understand: • The basics and principles of solvents and solution preparation, mixing and dilution, including basics calculation • The proper use of each specific glassware, analytical equipment, or instrument • How to read and execute standard analytical assay protocols • The basics and principles of sample pre-treatment, storage, sample preserving and sample taking • The basics and principles of measuring samples using different techniques (classical and instrumental analysis) • Basic principles of chemical analysis for quality assurance • Basic principles of biological analysis for quality assurance • The basics and principles of statistical analyses that concern specific samples (e.g. standard calibration curves, quantification limit, standard deviation) • Basic operation/function of laboratory equipment	

Section		Relative importance (%)
	The individual shall be able to:	
	• Prepare any kind of chemical reactants or solutions • Execute analytical measurement using the proper glassware, equipment, and instrument, according to specific assay protocols • Clean and calibrate equipment and instruments before starting an assay protocol • Take samples, including their preservation and pre-treatment • Select and use laboratory equipment according to their function • Follow chemical and biological analysis protocols and quality • Clean and store the equipment and instruments used • Estimate the concentration of unknown samples, using proper analytical methods, protocols, and statistical analysis • Document results/findings • Provide information about water or wastewater quality, in order to identify any kind of problem within the water or wastewater treatment steps • Acquire information about water or wastewater quality, in order to identify and execute preventative or corrective actions along the treatment steps • Provide information about water or wastewater quality in order to fulfil laws and regulations, aiming to keep the population safe and healthy	
7	**Automation and documentation**	15
	The individual needs to know and understand: • The basic principles of sensor technology • The basic principles and functionality of closed loop technology • The basic principles of actuators • The basic principles of control technology • Analytical techniques for fault finding and solving	
	The individual shall be able to: • Identify cost drivers and define methods for its minimization • Interpret and differentiate circuit diagrams • Regulate and adjust components for efficient use • Identify different automation components within systems and make qualified adjustments • Identify elements within process control, together with their functionality • Monitor, control and regulate systems manually and by using control and communication systems • Document all data in electronic and/or paper form	
8	**Application of health and safety measures**	10

Section	Relative importance (%)
The individual needs to know and understand: • Basics principles and practices of hygiene • Risk assessment for (biological, chemical, electrical, thermal and mechanical-operations) • Health and work-related regulations • The meaning of relevant danger and safety symbols/signage • Health maintaining regulations, personal protection equipment (PPE)	
The individual shall be able to: • Recognize risks • Create/develop safety instructions • Apply and adhere to work related safety and accident mitigation regulations • Identify health and safety hazards as well as dangerous situations in the workspace environment and generate actions/steps towards their mitigation	
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, 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.

Water Technology

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 Test Project Designer(s) with relevant expertise. In these instances, the Marking Scheme and Test Project are unseen by Experts until immediately before the start of the skill competition, or competition module. Where the detailed and final Marking Scheme and Test Project are designed by Experts, they must be approved by the whole Expert group prior to submission for independent validation and quality assurance. Please see the Competition Rules for further details.

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

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

4.2 Assessment Criteria

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

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

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.)

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

(SAMPLE OF TABLE FROM CIS)

4.5 Assessment and marking

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

4.6 Assessment and marking using Judgement

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

- benchmarks (criteria) for detailed guidance for each Aspect (in words, images, artefacts, or separate guidance notes). This is documented in the Standards and Assessment Guide.
- the 0-3 scale to indicate:
  ◦ 0: performance below industry standard
  ◦ 1: performance meets industry standard
  ◦ 2: performance meets and, in specific respects, exceeds industry standard
  ◦ 3: performance wholly exceeds industry standard and is judged as excellent

Three Experts will judge each Aspect, normally simultaneously, and record their scores. A fourth Expert coordinates and supervises the scoring, and checks their validity. They also act as a judge when required to prevent compatriot marking.

4.7 Assessment and marking using Measurement

Normally three Experts will be used to assess each Aspect, with a fourth Expert supervising. In some circumstances the team may organize itself as two pairs, for dual marking. Unless otherwise stated, only the maximum mark or zero will be awarded. Where they are used, the benchmarks for awarding partial marks will be clearly defined within the Aspect. To avoid errors in calculation or transmission, the CIS provides a large number of automated calculation options, the use of which is mandated.

4.8 The use of Measurement and Judgement

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

4.9 Skill assessment strategy and procedures

WorldSkills is committed to continuous improvement including reviewing past limitations and building on good practice. The following skill assessment strategy and procedures for this skill competition take this into account and explain how the marking process will be managed.

The Assessment Criteria is completed once the Test Project modules have been drafted. Both measurement marking and judgement marking are used. The choice of measurement or judgment marking will depend on the Aspects to be marked.

There is daily marking. Each Sub Criterion is marked on a daily basis. Subject to Expert's expertise, the rules and quality requirements, there is a reasonable balance of marking by each Expert.

Each Test Project module will be developed with reference to the relevant standards. The Assessment Criteria will largely or entirely follow the sections of the WorldSkills Occupational Standards.

5 The Test Project

5.1 General notes

Sections 3 and 4 govern the development of the Test Project. These notes are supplementary.

Whether it is a single entity, or a series of stand-alone or connected modules, the Test Project will enable the assessment of the applied knowledge, skills, and behaviours set out in each section of the WSOS.

The purpose of the Test Project is to provide full, balanced, and authentic opportunities for assessment and marking across the Standards, in conjunction with the Marking Scheme. The relationship between the Test Project, Marking Scheme, and Standards will be a key indicator of quality, as will be its relationship with actual work performance.

The Test Project will not cover areas outside the Standards or affect the balance of marks within the Standards other than in the circumstances indicated by Section 2. This Technical Description will note any issues that affect the Test Project's capacity to support the full range of assessment relative to the Standards. Section 2.1 refers.

The Test Project will enable knowledge and understanding to be assessed solely through their applications within practical work. The Test Project will not assess knowledge of WorldSkills rules and regulations.

Most Test Projects and Marking Schemes are now designed and developed independently of the Experts. They are designed and developed either by the Skill Competition Manager, or an Independent Test Project Designer, normally from C-12 months. They are subject to independent review, verification, and validation. (Section 4.1 refers.)

The information provided below will be subject to what is known at the time of completing this Technical Description, and the requirement for confidentiality.

Please refer to the current version of the Competition Rules for further details.

5.2 Format/structure of the Test Project

The Test Project is a series of modules of either independent or integrated with other modules.

5.3 Test Project design requirements

Test Projects should reflect the purposes, structures, processes, and outcomes of the occupational role they are based on. They should aim to be a small-scale version of that role. Before focusing on practicalities, SMTs should show how the Test Project design will provide full, balanced, and authentic opportunities for assessment and marking across the Standards, as set out in Section 5.1.

Overall the Test Project must:

• Be modular;
• Be prepared in accordance with the Section 2 WorldSkills Occupational Standards (WSOS);
• Be validated according to section 5.6 Test Project validation.

Test Project may be designed in a way that it can be conducted in a rotation by different groups of Competitor, in order to save the quantity of equipment to be prepared for the competition.

The recommended structure below may be followed:

Time	Day 1 - 4
09:00 - 17:00 **with lunch break and assessment**	• Activities of Water or Wastewater Treatment plant process control, automation, mechanical repair, lab analysis, reporting writing, and troubleshooting the plant operation problems. • Water or wastewater treatment process understanding by software simulation, or pictograph. • Water supply or water/wastewater treatment process proposal and design with given scenario could also be considered.

Additional tasks for consideration in the Competition

Water Leak Detection

Water losses in the water supply network are common in many countries. In this context, Water Supply or Wastewater Technician (WSWWT) has to work and find out where the leaking parts of the water supply pipeline are. The purpose of this work is to know the main leaking part of the pipe.

The Competitor shall use the given instruments in a proper way and has to show the good way to handle the equipment. The Competitor needs to find out the fault by using the noise detection device and to document the values. After knowing the fault, the next process is to document the finding and to enable the construction company to repair the fault. The outcome of this work is to minimize the water supply losses. That will reduce treatment and pumping costs and saves water resource. The Competitor shall work systematically, has to use the equipment in a safe way, has to draw a good sketch, and document the findings. They shall write a report with all findings and report to the supervisor.

CCTV Inspection of pipes, wells, and sewers

CCTV cameras are commonly used in the water wells, pipes, drains, and sewers. This modern device is widely used in the water industry. In this context, the water technician should be able to use this device properly. The purpose is to use the CCTV camera in a professional way, to know the related procedure, the inspection processes, and the systematic handling approach. The inspection shall be done according to the health and safety regulations. Inspections can be done at wells, water supply pipes, and wastewater sewers. The outcome is the documentation of the inspection. This report shall be given to the supervisor.

5.4 Test Project coordination and development

The Test Project MUST be submitted using the templates provided by WorldSkills International (www.worldskills.org/expertcentre). Use the Word template for text documents and DWG template for drawings.

5.4.1 Test Project coordination (preparation for Competition)

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

5.4.2 Who develops the Test Project/modules

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

5.4.3 When is the Test Project developed

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

Time	Action
Ten (10) months prior to the Competition	The ITPD is identified and a Confidentiality Agreement between WSI and the ITPD is organized.
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-3	The Test Project/modules are presented to Experts and Interpreters.
At the Competition on the beginning of each Module	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 (ITPD) is expected to identify one or more independent expert(s), and trusted individuals initially to review the Independent Test Project Designer's ideas and plans, and subsequently to verify the Test Project, prior to validation.

A Skill Advisor will ensure and coordinate this arrangement, to guarantee the timeliness and thoroughness of both initial review, and verification, based on the risk analysis that underpins Section 10.7 of the Competition Rules.

5.6 Test Project validation

The Skill Competition Manager coordinates the validation of the Test Project/modules and will ensure that it can be completed within the material, equipment, knowledge, and time constraints of Competitors.

5.7 Test Project circulation

The Test Project/modules are not circulated prior to the Competition. The Test Project/modules are presented to Experts on C-3 and to Competitors at the beginning of each Test Project/module.

5.8 Test Project change

Due to the Test Project being developed by an Independent Test Project Designer (ITPD), there is no change required to be made to the Test Project/modules during the Competition. Exceptions are amendments to technical errors in the Test Project documents and according to infrastructure limitations.

5.9 **Material or manufacturer specifications**

Specific material and/or manufacturer specifications required to allow the Competitor to complete the Test Project will be supplied by the Competition Organizer and are available from www.worldskills.org/infrastructure located in the Expert Centre. However, note that in some cases details of specific materials and/or manufacturer specifications may remain secret and will not be released prior to the Competition. These items may include those for fault finding modules or modules not circulated.

6 Skill management and communication

6.1 Discussion Forum

Prior to the Competition, all discussion, communication, collaboration, and decision making regarding the skill competition must take place on the WorldSkills skill-specific Discussion Forum. (http://forums.worldskills.org). Skill related decisions and communication are only valid if they take place on the WorldSkills Discussion Forum. The Chief Expert (or an Expert Lead appointed by the Skill Management Team) will be the moderator for this Discussion Forum. Refer to the Competition Rules for the timeline of communication and competition development requirements.

6.2 Competitor information

All information for registered Competitors is available from the Competitor Centre (www.worldskills.org/competitorcentre).

This information includes:

• Competition Rules
• Technical Descriptions
• Mark Summary Form (where applicable)
• Test Projects (where applicable)
• Infrastructure List
• WorldSkills Health, Safety, and Environment Policy and Regulations
• Other Competition-related information

6.3 Test Projects and Marking Schemes

Circulated Test Projects will be available from www.worldskills.org/testprojects and the Competitor Centre (www.worldskills.org/competitorcentre).

6.4 Day-to-day management

The day-to-day management of the skill competition during the Competition is defined in the Skill Management Plan that is created by the Skill Management Team. The Skill Management Team comprises the Skill Competition Manager, Chief Expert, and the Expert Leads. The Skill Management Plan is progressively developed in the six (6) months prior to the Competition and finalized at the Competition. The Skill Management Plan can be viewed in the Expert Centre (www.worldskills.org/expertcentre).

Time	Day 1	Time	Day 2	Time	Day3	Time	Day 4
7:45	Access to workshop by Experts Workshop preparation for task	7:45	Access to workshop by Experts Workshop preparation for task	7:45	Access to workshop by Experts Workshop preparation for task	7:45	Access to workshop by Experts Workshop preparation for task

Time	Day 1	Time	Day 2	Time	Day3	Time	Day 4
8:00	Access to workshop by Competitors Workstation preparation and Daily Safety Talk (HSE)	8:00	Access to workshop by Competitors Workstation preparation and Daily Safety Talk (HSE)	8:00	Access to workshop by Competitors Workstation preparation and Daily Safety Talk (HSE)	8:00	Access to worksho by Competit Worksta preparati and Dail Safety T (HSE)
08:30	Compatriot Communication Expert- Competitor	08:30	Compatriot Communication Expert- Competitor	08:30	Compatriot Communication Expert- Competitor	08:30	Compat Commu Expert- Compet
08:45	Module A1 - Reading Time (Q&A)	08:45	Module A2 - Reading Time (Q&A)	08:45	Module A3 - Reading Time (Q&A)	08:45	Module Reading (Q&A)
9:00	A1 Water/ wastewater Treatment Plant Process	9:00	A2 Water/ wastewater Treatment Plant Process	9:00	A3 Water/ wastewater Treatment Plant Process	9:00	A4 Water/ wastewa Treatme Plant Pr
9:45	Module D1 - Reading Time (Q&A)	9:45	Module B1 - Reading Time (Q&A)	9:45	Module B2 - Reading Time (Q&A)	9:45	Module Reading (Q&A)
10:00	Module D1 - Automation in water and wastewater treatment plant - task Edukit 1	10:00	Module B1 - Laboratory work (chemical and biological analysis) - B1 titration	10:00	Module B2 - Laboratory work (chemical and biological analysis) - B2 water quality	10:00	Module Automat water an wastewa treatmen – task E
12:00	Lunch	12:00	Lunch	12:00	Lunch	12:00	Lunch
12:45	Module D3 - Reading Time (Q&A)	12:45	Module C1 and C2 - Reading Time (Q&A)	12:45	Module B3 - Reading Time (Q&A)		

Time	Day 1	Time	Day 2	Time	Day3	Time	Day 4
13:00	Module D3 - Automation in water and wastewater treatment plant – task EDS 1	13:00	Module C1 and C2- Mechanical maintenance in water and wastewater treatment plant - C1 pump and C2 valves	13:00	Module B3 - Laboratory work (chemical and biological analysis) - B3 Chloride testing		
14:45	Compatriot Communication Expert-Competitor	16:30	Compatriot communication Expert-Competitor	14:00	Module A5 - Reading Time (Q&A)		
				14:15	Module A5 – Magnetic cards		
				16:00	Compatriot Communication Expert-Competitor		
15:00	Assessment time	16:45	Assessment time	16:30	Assessment time	13:30	Assessment time
C-Time	4:30	C-Time	6:00	C-Time	5:30	C-Time	2:45
	Total: 18:45 hrs						

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
Interpreter communication with Expert during the competition	• Competitor must raise their hand or communication card to get the attention of an Expert other than the compatriot Expert and show the Expert that they need help from the Interpreter. • The Expert called by the Competitor must, as quickly as possible, get the Interpreter and another neutral Expert to attend to the Competitor

Topic/task	Best practice procedure
	• Communication between an Interpreter and Competitor may only take place in the presence of a neutral Expert.
Tools used for translation	• Interpreters can use a dictionary, Internet, and translation devices to translate documents, including the Test Project. However, during the Competition, if the Interpreter is asked to help their compatriot Competitor, the Interpreter cannot use the dictionary, Internet, or translation devices in front of the Competitor.
Tools/infrastructure	• All equipment must be handled with care and used in a professional manner. Any damage to equipment, tools, work pieces, etc., shall result in mark reductions as stated in the assessment.
Equipment failure	• If equipment or tools which are brought by the Competitor fail, no extra time is allowed. • If equipment or tools supplied by the Competition Organizer fail, extra time is allowed only if the technician of the sponsor or supplying company specifies and proves it is not a "user error".
Test Project documentation	• All Test Project documents must be stored in the Expert room in lockers by the Chief Expert.

7 Skill-specific safety requirements

7.1 Personal Protective Equipment

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

Task	Safety glasses with side protection	Cut protection gloves	Latex or nitrile gloves	Safety shoes with protective cap	Sturdy shoes with closed toe and heel	Tight fitting work clothes (long trousers)	Heari prote
General PPE for safe areas					√	√	
During working/ commissioning time in the workshop		√		√		√	
During working/ commissioning in the Lab workstation	√		√	√		√	
Working with pressure	√	√		√		√	
Working with machines and tool over 85 dB		√		√		√	√

8 Materials and equipment

8.1 Infrastructure List

The Infrastructure List details all equipment, materials, and facilities provided by the Competition Organizer.

The Infrastructure List is available at www.worldskills.org/infrastructure.

The Infrastructure List specifies the items and quantities requested by the Skill Management Team for the next Competition. The Competition Organizer will progressively update the Infrastructure List specifying the actual quantity, type, brand, and model of the items. Note that in some cases details of specific materials and/or manufacturer specifications may remain secret and will not be released prior to the Competition. These items may include those for fault finding modules or modules not circulated.

At each Competition, the Skill Management Team must review and update the Infrastructure List in preparation for the next Competition. The Skill Competition Manager must advise the Director of Skills Competitions of any increases in space and/or equipment.

At each Competition, the Technical Observer must audit the Infrastructure List that was used at that Competition for the upcoming WorldSkills Competition.

The Infrastructure List does not include items that Competitors and/or Experts are required to bring and items that Competitors are not allowed to bring – they are specified below.

8.2 Competitors toolbox

Competitors are not allowed to send a toolbox to the Competition. All tools are provided by the Competition Organizer.

8.3 Materials, equipment, and tools supplied by Competitors

It is not applicable for Competitors to bring materials, equipment, and tools to the Competition.

However, Competitors are required to supply their own Personal Protective Equipment as specified in section 7 skill-specific safety requirements.

8.4 Materials, equipment, and tools supplied by Experts

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

Experts are responsible that Interpreters bring their PPE.

When Experts are required to bring something additionally, this will be announced at the WorldSkills Discussion Forum at least one (1) month prior to the Competition.

## 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.

List of tools not allowed will be announced in the WorldSkills Discussion Forum at least three (3) months prior to the competition.

8.6 Proposed workshop and workstation layouts

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

Example workshop layout
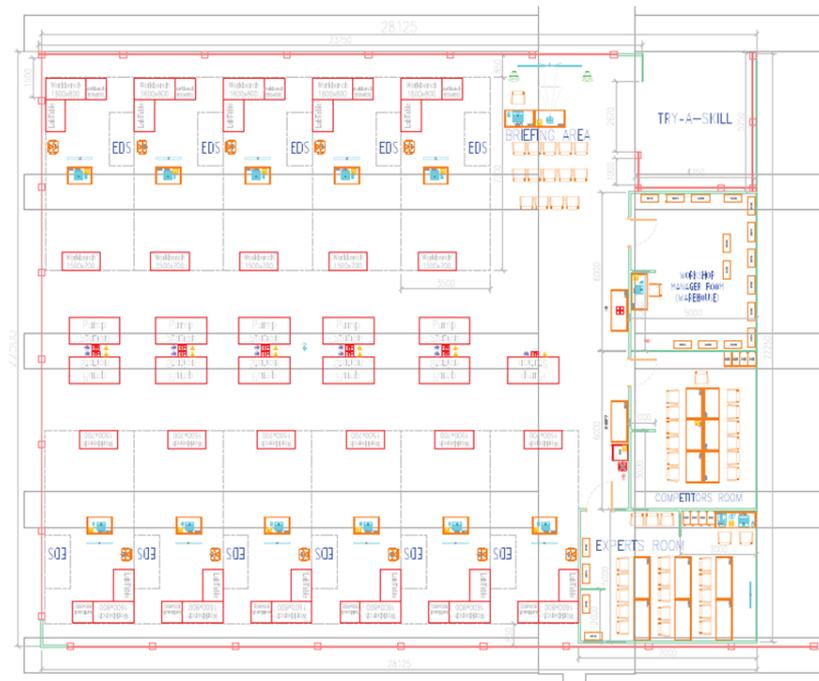
The Competitors have their own workstation with a space about 4 m x 6 m for lab testing, mechanical repair and other tasks.

The workstation can be used to perform various tasks for the competition, for example, lab testing on water quality, mechanical equipment repair, e.g., pump and valve commonly used in water/

wastewater treatment plant, process control, e.g., level senor setting, etc. An example of past competition venue setup is shown below.

9 Skill-specific rules

9.1 General notes

Skill-specific rules cannot contradict or take priority over the Competition Rules. They do provide specific details and clarity in areas that may vary from skill competition to skill competition. This includes but is not limited to personal IT equipment, data storage devices, Internet access, procedures and workflow, and documentation management and distribution. Breaches of these rules will be solved according to the Issue and Dispute Resolution procedure including the Code of Ethics and Conduct Penalty System.

9.2 Skill-specific rules

Topic/task	Skill-specific rule
Interpreter communication with Expert during the competition	• During the competition the Interpreter is strictly not allowed to communicate with their compatriot Expert. They may only provide interpretation when requested.
Use of technology – USB, memory sticks	• Chief Expert, Experts, Interpreters, and Competitors are not allowed to bring personal memory sticks into the workshop. If these items are brought into the workshop they must be locked in the personal locker and only removed at the end of the Competition on C4. • Skill Competition Manager is exempt from this rule.
Use of technology – personal laptops, tablets, and mobile phones	• Competitors may bring tablets or mobile phones into the workshop, but they must be locked in the personal locker. They may be removed during lunch time and at the end of the Competition day. • Skill Competition Manager, Chief Expert, Experts, and Interpreters are allowed to bring and use personal laptops, tablets, and mobile phones into the workshop.
Use of technology – personal photo and video taking devices	• Skill Competition Manager, Chief Expert, Experts, Competitors, and Interpreters are allowed to use personal photo and video taking devices in the workshop at the conclusion of the competition on C4 only.
Templates, aids, etc.	• The Competitors may bring pocket calculators to the Competition.
Assessment	• Skill Competition Manager, Chief Expert, Competitors, Experts, and Interpreters are not permitted to take paper or digital copies of the Assessment out of the workshop until the competition has finished on C4.

10 Visitor and media engagement

10.1 Engagement methods

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

- Test Project description;
- Enhanced understanding of Competitor activity;
- Site layout to enable public and media to get close to Competitors – have access bays;
- Active assessment involving timed and active tasks – use announcer to inform public of what is happening;
- Display screens – some web cams could be dispatched on the Competition area and show details of the task to the public and on a website;
- Competitor profiles – for each Competitor: provide a sticker with the national flag, the name of the Competitor and a brief description of their studies;
- Daily reporting of the Competition status;
- Try-a-Skill – in the Water Technology workshop to provide an area where young people and public can try individual exercise. This activity could be managed by a couple of students from the Host Country/Region. Those students could explain the way to become a Water technician and answer public questions;
- Display video, which shows how Water technicians work, what they do in their daily work, how the machines work (with which they interact, maintain and repair), and what they do and learn in during their studies.

11 Sustainability

11.1 Sustainable practices

This skill competition will focus on the sustainable practices below:

• Recycling.
• Use of "green" materials.
• Use less resources if possible, including water and electricity, and generate less waste or wastewater.
• Transfer or share files electronically instead of printing out on paper if possible.

Water Technology

12 References for industry consultation

12.1 General notes

WorldSkills is committed to ensuring that the WorldSkills Occupational Standards fully reflect the dynamism of internationally recognized best practice in industry and business. To do this WorldSkills approaches a number of organizations across the world that can offer feedback on the draft Description of the Associated Role and WorldSkills Occupational Standards on a two-yearly cycle.

In parallel to this, WSI consults three international occupational classifications and databases:

• ISCO-08: (http://www.ilo.org/public/english/bureau/stat/isco/isco08/)
• ESCO: (https://ec.europa.eu/esco/portal/home)
• O*NET OnLine (www.onetonline.org/)

12.2 References

The WSOS in section 2 appears to relate most closely to Welders, Cutters, and Welder Fitters:
https://www.onetonline.org/link/summary/51-4121.06

and/or Welder:
http://data.europa.eu/esco/occupation/7aedaa07-3884-4c5b-88f9-80997b2aa54b

These links can also be used to explore adjacent occupations.

ILO 3119

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 Lyon 2024.

Organization	Contact name
Adiro Automatisierungstechnik GmbH	
Novexx Pte Ltd	Lee Tze Kang, Executive Director

13 Appendix

13.1 Appendix information

Not applicable.