

WorldSkills Standards Specification

# Water Technology

Manufacturing and Engineering Technology



# THE WORLDSKILLS STANDARDS SPECIFICATION (WSSS)

## 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](http://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.

## WORLDSKILLS STANDARDS SPECIFICATION

SECTION		RELATIVE IMPORTANCE (%)
1	<b>Work organization and management</b>	10
	<p>The individual needs to know and understand:</p> <ul style="list-style-type: none"> <li>• principles and applications of safe working in general and for water and waste water treatment and operation in the networks and in solid waste management</li> <li>• the purposes, uses, care, calibration and maintenance of all equipment and materials, together with their safety implications</li> <li>• environmental and safety principles and their application to good housekeeping in the work environment</li> <li>• principles and methods for work organization, control and management</li> <li>• principles of team working and their applications</li> <li>• the personal skills, strengths and needs that relate to the roles, responsibilities and duties of others, individually and collectively</li> <li>• the parameters within which activities need to be scheduled</li> </ul>	

	<p>The individual shall be able to:</p> <ul style="list-style-type: none"> <li>• prepare and maintain a safe, tidy and efficient work area</li> <li>• manage and dispose of the refuses produced in the work area</li> <li>• prepare for the tasks in hand, with full regard to health and safety</li> <li>• schedule work to maximize efficiency and minimize disruption</li> <li>• select and use all equipment and materials safely and in compliance with manufacturers' instructions</li> <li>• apply or exceed health and safety standards applying to the environment, equipment and materials</li> <li>• restore the work area to an appropriate state and condition</li> <li>• contribute to team performance broadly and specifically</li> <li>• give and take feedback and support</li> </ul>	
<b>2</b>	<b>Communication and interpersonal skills</b>	<b>10</b>
	<p>The individual needs to know and understand:</p> <ul style="list-style-type: none"> <li>• the range and purposes of documentation in both paper and electronic form</li> <li>• the technical language associated with the occupation and the industry</li> <li>• the standards required for routine and exception reporting in oral, written and electronic form (e.g. values, figures, units, minimal information, recommendations)</li> <li>• the required standards for communication with clients, team members and others</li> <li>• the purposes and techniques for generating, maintaining and presenting records</li> </ul>	
	<p>The individual shall be able to:</p> <ul style="list-style-type: none"> <li>• read, interpret and extract technical data and instructions from documentation in any available format</li> <li>• communicate by oral, written and electronic means to ensure clarity, effectiveness and efficiency</li> <li>• use a standard range of communication technologies</li> <li>• discuss complex technical principles and applications with others</li> <li>• complete reports and respond to issues and questions arising</li> <li>• respond to clients' needs face-to-face and indirectly</li> <li>• gather information and prepare documentation targeted to and as required by the client or client group</li> </ul>	
<b>3</b>	<b>Electrical</b>	<b>10</b>
	<p>The individual needs to know and understand:</p> <ul style="list-style-type: none"> <li>• The basic principles of electricity</li> <li>• The basic principles of electrical systems</li> <li>• The basics of electrical control of machines and actuators</li> <li>• Circuit- and P&amp;I-diagrams as well as operating manuals and/or instruction manuals</li> <li>• The protection methods of electrical systems</li> <li>• The dangers/hazards of electrical systems</li> <li>• Analytical techniques for fault finding</li> <li>• Strategies for problem solving</li> <li>• Methods and procedures for identifying high energy consumers</li> <li>• Strategies for energy efficiency</li> </ul>	

	<p>The individual shall be able to:</p> <ul style="list-style-type: none"> <li>• Disengage electrical equipment commonly used in water and wastewater treatment plants</li> <li>• Identify and resolve areas of uncertainty within the briefs or specifications</li> <li>• Identify the different components within a control cabinet and their functionality</li> <li>• Exchange defective components within a control cabinet</li> <li>• Take electrical measurements and interpret/verify the results</li> <li>• Connect wires/cables according to industrial standards</li> <li>• Install, set up and adjust/calibrate electrical and sensor systems as required</li> <li>• Ensure connection of all wiring according to the circuit diagram</li> <li>• Ensure the functionality of the electrical system (i.e.: rotation direction)</li> </ul>	
<b>4</b>	<b>Mechanical</b>	<b>10</b>
	<p>The individual needs to know and understand:</p> <ul style="list-style-type: none"> <li>• The basics of materials (metals, composites, plastics, etc.)</li> <li>• The basics in processing methods of different materials</li> <li>• The basics of connection technology</li> <li>• The basics of mechanical engineering (mechanics, sealing methods, gear technology, etc.)</li> <li>• The basics of fluidics</li> <li>• Criteria and methods for testing equipment and systems</li> <li>• Analytical techniques for fault finding</li> <li>• Techniques and options for making mechanical repairs</li> <li>• Develop strategies for problem solving</li> <li>• Principles and techniques for generating creative and innovative solution</li> <li>• What water loss and leakage is, its potential causes and potential solutions for prevention</li> </ul>	
	<p>The individual shall be able to:</p> <ul style="list-style-type: none"> <li>• Repair components (up to systems) efficiently</li> <li>• Monitor and control process relevant equipment</li> <li>• Adjust and/or calibrate systems where necessary, according to instruction manuals</li> <li>• Use accessories efficiently</li> <li>• Ensure the correct function of the system</li> <li>• Adjust process relevant parameters</li> <li>• Identify cost drivers and define methods for its minimization</li> <li>• Work in a professional manner</li> <li>• Identify equipment that requires preventive maintenance and develop/take appropriate measures</li> <li>• Create quick and reliable makeshift solutions as an interim in emergencies.</li> </ul>	

5	Environment Protection	10
	<p>The individual needs to know and understand:</p> <ul style="list-style-type: none"> <li>• The logical sequence of network flow and purification steps</li> <li>• The hazardous aspects/points for the environment (danger/risk analysis)</li> <li>• Different mitigation methods</li> <li>• The basic calculations required within water and wastewater network and treatment processes</li> <li>• New trends in environmental processes and protection</li> <li>• Dangers of relevant hazardous substances used on the networks and plants</li> <li>• The different potential hazardous sources in the vicinity, their potential contents and their possible effects</li> <li>• Contingency plans</li> </ul>	
	<p>The individual shall be able to:</p> <ul style="list-style-type: none"> <li>• Operate all steps within a water or wastewater network and treatment plants</li> <li>• Execute proper preventive or correction actions in order to maintain efficiency within all treatment steps</li> <li>• Perform calculations based on given facts</li> <li>• Identify potential problem zones and devise remedies accordingly</li> <li>• Communicate with the defined target groups, in order to give the correct information about the types of refuse that can be disposed in the wastewater collection system</li> <li>• Communicate with the defined target groups, in order to give the correct information about a water distribution system, its possible flaws, water quality and shortage periods</li> <li>• Take measurement and carry out analyses for process and quality control</li> <li>• Monitor and document in compliance with legal requirements</li> <li>• Work in a cost, environmental and hygiene-conscious manner</li> <li>• Use different energy forms (electricity, oil, gas, air, water and steam)</li> <li>• Review the possibilities of economical energy use (i.e.: mitigation of leakage or usage of heat)</li> <li>• Avoid the use of hazardous substances and make proposals for their replacement</li> <li>• Create and evaluate contingency plans</li> </ul>	

<b>6</b>	<b>Chemical/Biological – Quality Assurance</b>	<b>25</b>
	<p>The individual needs to know and understand:</p> <ul style="list-style-type: none"> <li>• The basics and principles of solvents and solution preparation, mixing and dilution, including basics calculation</li> <li>• The proper use of each specific glassware, analytical equipment or instrument</li> <li>• How to read and execute standard analytical assay protocols</li> <li>• The basics and principles of sample pre-treatment, storage, sample preserving and sample taking</li> <li>• The basics and principles of measuring samples using different techniques (classical and instrumental analysis)</li> <li>• Basic principles of chemical analysis – quality assurance</li> <li>• Basic principles of biological analysis – quality assurance</li> <li>• The basics and principles of the statistical analysis that concern the specific sample (e.g. standard calibration curves, quantification limit, standard deviation)</li> <li>• Basic operation/function of laboratory equipment</li> </ul>	
	<p>The individual shall be able to:</p> <ul style="list-style-type: none"> <li>• Prepare any kind of chemical reactants or solutions</li> <li>• Execute analytical measurement using the proper glassware, equipment and instrument, according to the specific assay protocol</li> <li>• Clean and calibrate equipment and instruments before starting the assay protocol</li> <li>• Take samples, including its preservation and pre-treatment</li> <li>• Laboratory equipment according to their function</li> <li>• Follow chemical and biological analysis protocols and quality</li> <li>• Clean and store the equipment and instruments used</li> <li>• Estimate the concentration of an unknown sample, using the proper analytical method, protocol and statistical analysis</li> <li>• Document results/findings</li> <li>• Provide information about the water or wastewater quality, in order to identify any kind of problem within the water or wastewater treatment steps</li> <li>• Acquire information about the water or wastewater quality, in order to identify and execute preventative or corrective actions along the treatment steps</li> <li>• Provide information about the water or wastewater quality in order to fulfil laws and regulation aspects, aiming to keep the population safe and healthy</li> </ul>	
<b>7</b>	<b>Automation and documentation</b>	<b>15</b>
	<p>The individual needs to know and understand:</p> <ul style="list-style-type: none"> <li>• The basic principles of sensor technology</li> <li>• The basic principles and functionality of closed loop technology</li> <li>• The basic principles of actuators</li> <li>• The basic principles of control technology</li> <li>• Analytical techniques for fault finding and solving</li> </ul>	

	<p>The individual shall be able to:</p> <ul style="list-style-type: none"> <li>• Identify cost drivers and define methods for its minimization</li> <li>• Interpret and differentiate circuit diagrams</li> <li>• Regulate and adjust components for efficient use</li> <li>• Identify different automation components within a system and make qualified adjustments</li> <li>• Identify elements within process control, together with their functionality</li> <li>• Monitor, control and regulate systems manually and by using control and communication systems</li> <li>• Document all data in electronic and/or paper form</li> </ul>	
<b>8</b>	<b>Application of health and safety measures</b>	<b>10</b>
	<p>The individual needs to know and understand:</p> <ul style="list-style-type: none"> <li>• Basics principles and practices of hygiene</li> <li>• Risk assessment for (biological, chemical, electrical, thermal and mechanical-operations)</li> <li>• Health and work-related regulations</li> <li>• <b>The meaning of relevant danger and safety symbols/signage</b></li> <li>• Health maintaining regulations, personal protection equipment (PPE)</li> </ul>	
	<p>The individual shall be able to:</p> <ul style="list-style-type: none"> <li>• Recognize risks</li> <li>• Create/develop safety instructions</li> <li>• Apply and adhere to work related safety and accident mitigation regulations</li> <li>• Identify health and safety hazards as well as dangerous situations in the workspace environment and generate actions/steps towards their mitigation.</li> </ul>	
	<b>Total</b>	<b>100</b>

## 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.onetonline.org/](http://www.onetonline.org/))

This WSSS appears to be a more senior version of *Water and Wastewater Treatment Plant and System Operators*: <https://www.onetonline.org/link/summary/51-8031.00>

and a more junior version of *Water/Wastewater Engineers*:  
<https://www.onetonline.org/link/summary/17-2081.01> .

It appears to be a better fit with *Water Plant Technician*:  
<http://data.europa.eu/esco/occupation/7f800e7d-9d86-406a-9116-b5eca7526869>

Adjacent occupations can also be explored through these links.