WORLDSKILLS STANDARD SPECIFICATION

Skill 15
Plumbing and Heating

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).

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 not be separate tests of knowledge and understanding.

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. 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	**Work organization and management**	**10**
	The individual needs to know and understand: • The purposes, uses, maintenance and care of all equipment, together with their safety implications • The purposes, uses, care and potential risks associated with materials and chemicals • The purposes and uses of manufacturers' specifications and drawings • Search methods for specific and non-specific information, specifications and guidance • The time available an associated with each activity • The parameters within which activities need to be scheduled • The health and safety standards applying at any one time • The use of new technologies as a work aid • Principles and their application to good housekeeping in the work environment	
	The individual shall be able to: • Prepare and maintain a safe, tidy and efficient work area • Prepare and if need be remedy the surfaces to which systems and appliances will be fixed • Select and use appropriate personal protective clothing in all circumstances • Select and use appropriate hand tools to complete every task safely • Use the specified precautions when manual handling items and for long and heavy items • Use the specified precautions for working with electrically powered hand tools • Use the appropriate and specified precautions for welding or soldering • Schedule work to maximize efficiency and minimize disruption • Plan, prepare and complete each task within the available time • Restore the work area to an appropriate condition	
2	**Communication and interpersonal skills**	**10**
	The individual needs to know and understand: • The range and purposes of documentation, including text, graphical, paper based and electronic • Drawing notation and the symbols for pipe work, fittings and appliances • The technical language associated with the skill • The standards required for routine and exceptional reporting in oral, handwritten and electronic form • The nature of the reports provided by measuring equipment, together with their interpretation • The required standards for customer service and care	

3	**Design and Adapt installation systems**	**10**
	The individual needs to know and understand: • The information requirement underpinning the design of any installation system: • The principles and conventions used in specifications and drawings • The range of specifications and drawings in use, and their purposes • The uses and limitations of the generally available drawing tools	
	The individual shall be able to: • Design installation systems within given parameters • Produce simple freehand sketches including isometric to support given architect drawings to aid install process, using standard conventions and symbols • Estimate the requirement for equipment and materials • Select the equipment and materials according to given criteria, including price • Check the price, recommend alternatives and either order the equipment and materials or amend the design of the system	
4	**Install plumbing and heating pipe-work brackets and clips and prefabricate the required pipe-work layouts into sub-assemblies**	**40**

	The individual needs to know and understand:
	• The uses and limitations of the specified bending and jointing methods, materials and fittings in order to complete a leak-free installation
	• Methods of connection to services from utilities provider
	• The range and characteristics of bending/jointing methods, materials and fittings
	• Properties of the piping material available:
	  • for example:
	  • Copper
	  • Steel
	  • Stainless steel
	  • Cast – iron
	  • Polymer pipe
	  • Plastic (single- or multi-layered)
	• In order to handle, cut, bend, joint and form sub-assemblies
	• The safe operation of the cutting, bending, threading, soldering, welding and testing equipment provided
	• The applications appropriate to:
	  • Pre-wall (boundary) installation systems
	  • Surface wall installation
	  • Hot water installations
	  • Cold Water Installations
	  • Heating systems
	  • Rainwater Harvesting/grey water systems
	  • Underfloor heating
	  • Solar/photo voltaic heating
	  • Air to water systems of heating
	  • Ground source/geo-thermal heating systems
	  • Fire-fighting systems	

	The individual shall be able to: • Read and interpret drawing for a range of systems and appliances • Interpret drawings to facilitate pipe-work fabrication and the installation of appliances • modify the area and surfaces, as required, to permit fixing and assembly • take and transfer measurements and angles from given drawings to surfaces and piping materials • Select suitable fixing methods for the available surfaces, appliances and environment • Fix an appropriate number and diameter of pipe brackets/clips in the correct or specified configuration • Determine the optimal way to use the given materials to complete the assembly in a sustainable manner • Create freehand sketches for the purposes of pipe bending and assembly • Limit the generation of scrap and waste • Determine and use the correct positions for cutting the piping material • Measure, set out and mark the materials and pipe-work • Determine the correct positions for bending the piping material • Select an appropriate method and safe method for cutting the piping material • Utilize the chosen method to bend the piping material safely • Utilize the chosen jointing method to form the pipe-work sub-assemblies • Install the pipe-work sub-assemblies utilizing the previously fitted brackets/clips • Connect the pipe-work to the appliances/utilities • Build up gas, water, heating and effluent pipe installations • Process commercial materials into installations	
5	**Connect and test completed pipe-work modules/Commission plumbing and heating assemblies and appliances**	**15**
	The individual needs to know and understand: • The procedures, equipment and legislative requirements for applying soundness tests to systems • The methods of establishing that utilities adequately supply all components within the system • The actions to take where pre-commissioning checks or tests reveal system or component defects • How to complete commissioning documentation confirming the safe commissioning of systems and components • The sources of information on the performance of systems or components • The procedures for establishing correct system or component performance and checking against the design specification • The routines and sequences for commissioning systems or components • The actions to take when components being commissioned do not meet design requirements • System handover procedures and demonstrating the operation of systems and components to end users	

	The individual shall be able to: • Perform all pre-commissioning/commissioning tasks • Connect test equipment to the pipe-work • Pressure test the pipe-work to ensure conformity to specification • Flush and drain the installation • Sterilize the installation as per specifications • Fill the pipe-work and appliance and assess the flow rate/pressures to specifications • Hand over the installation to the customer including documentation • Provide the customer with all appropriate user information and answer questions	
6	**Repair, maintain or replace a range of plumbing and heating appliances/Problem solving, innovation and creativity**	**15**
	The individual needs to know and understand: • Features of excellent customer service • Kinds of questioning and listening techniques would you use to find out what your customer is looking for • The range of information that should be available on the routine and non-routine service and maintenance requirements of systems and components • The methods of protecting customers' property within the range of locations in which the work is carried out • The maintenance procedures necessary to ensure compliance with industry requirements for routine and non-routine maintenance activities • How to complete records and reports of the maintenance of systems and components • The action to take when the system or component does not work to full performance specification • The measures to ensure that systems do not present a safety hazard to potential users, or the workforce, when carrying out rectification procedures • How to isolate unsafe systems and components • Research the main features of each possible option, including risk factors • Select and use different methods for exploring the problem, including dividing it into sub-problems, and analyse its features • System handover procedures and demonstrating the operation of systems and components to end users	

	The individual shall be able to: • Prepare the work area, safeguarding surrounding areas • Diagnose the quality or deficiencies of appliances, components and systems • Identify the relative advantages or possibilities of maintenance, repair or replacement • Identify the method of maintaining, repairing or replacing the appliances or systems • Acquire components or replacements as determined • Isolate and Drain the installation to enable repair or replace • Maintain, repair or replace the appliances or systems, as advisable and agreed • Open isolating valves, recharge with water and check for leaks • Re-commission system • Check for correct function (flow, pressure, performance etc. as specification • Restore the area to its former condition • Hand over the installation to the customer • Provide the customer with all appropriate user information and answer questions	