

WorldSkills Standards Specification

Industrial Mechanic Millwright

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).

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	Work organization and management	5
	<p>The individual needs to know and understand:</p> <ul style="list-style-type: none"> • The individual needs to know and understand: • Health and safety legislation, obligations and documentation • Principles of risk management • Principles of energy isolation and the need for verification • The principles of working safely with all forms of industrial equipment and industrial settings • Hazardous area work permit regulations • The situations when personal protective equipment must be used • The purposes, uses, care, maintenance, and storage of all tools and equipment together with their safety implications • The purposes, uses, care, and storage of materials • The importance of keeping a tidy and organized work area • Sustainability measures applying to the use of 'green' materials and recycling • The ways in which working practices can minimize waste and help to manage costs whilst maintaining quality • The principles of work flow and measurement • The significance of planning, quality, accuracy, checking, and attention to detail in all working practices • Impact of new technology 	
	<p>The individual shall be able to:</p> <ul style="list-style-type: none"> • Follow health and safety standards, rules, and regulations • Apply Risk Management techniques • Apply and verify (test for "zero") energy isolation • Diligently follow industrial safety procedures • Apply Hazardous Work Area requirements • Identify and use the appropriate personal protective equipment including safety footwear, ear, and eye protection • Select, use, clean, maintain, and store all tools and equipment safely • Select, use, and store all materials safely • Identify and take care of industrial equipment • Plan the work area to maximize efficiency and maintain the discipline of regular tidying • Prioritize work and manage time effectively • Work efficiently and check progress and outcomes regularly • Establish and consistently maintain high quality standards and working processes • Proactively engage in continuous professional development in order to effectively apply new technologies and working practices 	

2	Planning and design	10
	<p>The individual needs to know and understand:</p> <ul style="list-style-type: none"> Standards, blueprints, schematics, work practices and installation requirements Procedures and technical manuals The management of materials and installation techniques used in different environments 	
	<p>The individual shall be able to:</p> <ul style="list-style-type: none"> Read, interpret, and revise drawings/blueprints and documentation including: <ul style="list-style-type: none"> layout and schematic drawings Incorporate written instructions and work procedures Plan work using the provided blueprints, schematics, and technical documentation 	
3	Communication and interpersonal skills	5
	<p>The individual needs to know and understand:</p> <ul style="list-style-type: none"> The significance of establishing and maintaining customer/employer/stakeholder confidence and trust The importance of maintaining and keeping one's knowledge base up-to-date The roles and requirements of related trades The value of building and maintaining productive working relationships Techniques of effective teamwork The importance of swiftly resolving misunderstandings and conflicting demands The importance of accurate and concise reporting 	
	<p>The individual shall be able to:</p> <ul style="list-style-type: none"> Interpret customer requirements and positively manage customer/employer expectations Provide advice and guidance on products and/or solutions, for example using new technology applications such as preventative maintenance diagnostic tools Visualize and translate customer/employer wishes making recommendations which meet/improve their design and budgetary requirements Question customers/employers to fully understand requirements Provide clear instructions Introduce related trades to support customer/employer requirements Produce detailed written reports for work completed Produce a cost and time estimate for customers/employers Recognize and adapt to the changing needs of related trades Work effectively individually and as a member of a team Use oral communication to avoid misunderstandings Control personal conflicts in the workplace 	

4	Problem solving, innovation, and creativity	10
	<p>The individual needs to know and understand:</p> <ul style="list-style-type: none"> • The common types of problem that can occur within the work process • Diagnostic approaches to problem solving and troubleshooting • Trends and developments in the industry including new technology, standards, and working methods, such as precision shaft alignment and thermography in preventing problems in industrial machinery 	
	<p>The individual shall be able to:</p> <ul style="list-style-type: none"> • Check work regularly to minimize problems at a later stage in the process • Identify problems originating from the work of a related trade • Challenge incorrect technical information to prevent problems • Recognize and troubleshoot problems swiftly by following a self- managed logical process • Respond to opportunities to contribute ideas to improve the solution and overall level of customer/employer satisfaction • Demonstrate a willingness to try new methods and embrace change 	
5	Installation	30
	<p>The individual needs to know and understand:</p> <ul style="list-style-type: none"> • Units of measurement used, & the skilled use of these measuring devices • Principles of metal cutting and in the relationship between speeds and feeds during the various machining operations with work holding devices, accessories, and cutting tools • Machining operations of the milling machine and centre lathe to produce component parts to prescribed tolerances and standards • The applications and correct use of fasteners • Different types of lubricants their properties, applications and effects • Lifting protocols, correct hand signals, lifting, rigging, hoisting procedures, and SWL calculations for the removal and installation of mechanical industrial equipment • How to set-up and operate Oxy Fuel, SMAW, MIG, and TIG welding equipment • How to read welding drawings/blueprints • How to layout, develop, measure, assemble and tack fabricated metal parts and components together to specification and weld • The principles of foundation preparation and installation of a machine base or sole plate • Basic electrical and electronic theory • Basic electric and electronic terminology, schematics, applications, associated tools, installation and troubleshooting techniques • How to read and interpret engineering drawings/blueprints and schematics and use manufacturer's manuals • How to select, remove, install, and maintain anti-friction bearings and interpret ISO charts and bearing catalogues • The need to identify, remove, select, and install the appropriate power transmission system and/or components for a specific application • The use of precision measuring equipment as it pertains to part sizes, machine installation, set-up, alignment, and preventative maintenance • Types and principles of operation of various material handling systems • The principles and applications of hydraulics/pneumatics and safety as they relate to fluid power systems. 	

	<p>The individual shall be able to:</p> <ul style="list-style-type: none"> • Select and install equipment from blueprints, plans and documentation Apply all machinery and equipment isolation (lock-out) and de-energizing procedures (mechanical and fluid power) before commencing work, maintenance, or overhaul procedures • Select and use hand cutting tools for shaping components to specifications • Use and interpret readings from a range of devices • Set up and safely operate the required machine tool • Use High Speed Steel and/or Carbide cutting tools to perform machining operations within a unit of tolerance • Identify and select bolts, nuts, dowels, snap rings, chemical fasteners, adhesives, and fasteners for specific applications • Comply with all safety rules, manufacturers' specifications and proper usage protocols' and environmental legislation when handling and storing lubricants • Select, inspect, and use the correct hoisting and rigging equipment and SWL calculations for specific applications • Apply metal inert gas (Oxy Fuel, SMAW, MIG, and TIG) welding and fabrication techniques including layout and joint preparation • Tack, prevent, and correct distortion, assemble fabricated components and weld as per supplied drawings and blueprints • Prepare foundations, machine bases or sole plates using the proper techniques for anchoring, shimming, and levelling for concrete or grouting pours • Apply correct lockout and tag-out and use a multi-meter to ensure electrical components are not "live" and to check for current and voltage • Using basic electrical testing instruments safely trouble shooting, remove, and reset electrical and electronic overload devices • Read and interpret 1st and 3rd orthographic projections, multi-view projections and auxiliary views of machine components, read, and interpret assembly and detail drawings of machine Remove, inspect, repair/replace, install, set clearance, fit, and align anti-friction bearings, using the bearing manufacturers' catalogues • Removal, inspect, repair or replace and install, align and tension/or sett "backlash", tooth pattern or impeller setting of a centrifugal pump, a reduction gearbox, chain drive, belt drive, or gear drive system • Identify, select, and use appropriate measuring/alignment devices/tools • Remove and install devices on material handling system • Identify, select and use appropriate measuring/alignment devices to align equipment and tack material handling systems drives and take appropriate readings/measurement • Repair, select, replace or remove as required the correct fluid power (pneumatic/hydraulic) device / piece of equipment to allow fluid power circuits and systems as per manufacturers' schematic drawings and requirements to function properly • Select the correct size and type of piping, tubes and hoses available for fluid power systems. 	
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6	Testing, reporting, and commissioning	20
	<p>The individual needs to know and understand:</p> <ul style="list-style-type: none"> • The essential features of quality assurance • Industrial regulations and standards applicable to different types of machines • Installation standards • Verification standards, methods and reports to be used to record verification results • Types of measuring instruments such as micrometres, vernier callipers, • Laser alignment/measuring tools/vibration analysis/thermography • Tools and software used for programming and commissioning • The correct operation of the machine installation in accordance with the planned specification and customer/employer requirements • Test equipment and safe work instructions 	
	<p>The individual shall be able to:</p> <ul style="list-style-type: none"> • Conduct tests safely, barricade isolate the work area • Test installations before energizing to ensure personal, electrical, and mechanical safety to include a complete visual inspection • Test installations when energized by checking complete function on all equipment installed to ensure correct operation of new/repared or refurbished installation as per instructions • Set the installation to fully functioning and ensure operator can safely, effectively, and efficiently perform required functions to meet customer/employer satisfaction • Complete detailed commissioning reports 	
7	Maintenance, fault finding, and repair	20
	<p>The individual needs to know and understand:</p> <ul style="list-style-type: none"> • Different types of installations and equipment for specific environments • Different generations of installations and equipment • The purpose of specific installations and equipment • The customers/employer's needs for the various functions of installations and equipment • Diagnostic approaches to problem solving (Failure Modes and Root Causes analogies) 	
	<p>The individual shall be able to:</p> <ul style="list-style-type: none"> • Adapt to changing circumstances in "real time" • Use, test, and calibrate measuring and diagnostic equipment to find and locate faults during regular maintenance and troubleshooting protocols • Troubleshoot basic electrical faults, mechanical, power transmission and fluid power installations/systems • Repair faults once identified • Verify that existing installations and equipment still meet current standards • Use, test, and calibrate measuring and diagnostic equipment to find and locate faults during regular maintenance and troubleshooting protocols 	
	Total	100

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/)

This WSSS (Section 2) appears most closely to relate to *Industrial Machinery Mechanics*:

<https://www.onetonline.org/link/summary/49-9041.00>

and *Industrial Machinery Mechanic*: <http://data.europa.eu/esco/occupation/269c47e7-9017-4aa6-bce8-49e89a696a64>

These links also allow adjacent occupations to be explored.