WORLDSKILLS STANDARD SPECIFICATION

Skill D3

Industrial Mechanics Millwright

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**	**5**
	The individual needs to know and understand: • Health and safety legislation, obligations and documentation • The principles of working safely with all forms of industrial equipment and industrial settings • 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 wastage and help to manage costs whilst maintaining quality • The principles of work flow and measurement • The significance of planning, accuracy, checking and attention to detail in all working practices • Impact of new technology	
	The individual shall be able to: • Follow health and safety standards, rules and regulations • Diligently follow industrial safety procedures • 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 • Measure accurately • 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**	**5**
	The individual needs to know and understand: • Different types of standards, blueprints, schematics, and installation descriptions • Procedures and manuals+ • Range of materials and installation techniques used in different environments	

	The individual shall be able to: • Read, interpret and revise drawings/blueprints and documentation including: • Layout and schematic drawings • Follow written instructions • Plan installation work using blueprints, schematics and protocol documentation provided	
3	**Communication and Interpersonal Skills**	**10**
	The individual needs to know and understand: • The significance of establishing and maintaining customer/employer confidence and trust • The importance of maintaining and keeping 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 individual shall be able to: • Interpret customer requirements and positively manage customer/employer expectations • Provide advice and guidance on products and or solutions e.g. new updated technologies • 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 written reports for customers/employers when required • 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 • Communicate effectively to avoid misunderstandings • Resolve conflicts in the workplace	
4	**Communication and Interpersonal Skills Problem Solving, Innovation and Creativity**	**10**
	The individual needs to know and understand: • The common types of problem that can occur within the work process • Diagnostic approaches to problem solving • Trends and developments in the industry including new technology, standards and working methods e.g. new and improved hydraulic fluid power components, the benefits of vibration analysis and thermography in industrial machinery.	

	The individual shall be able to: • Check work regularly to minimize problems at a later stage • Identify problems originating from the work of a related trade e.g. machine foundation for a conveyor system, a high vibration reading from a bearing • Challenge incorrect information to prevent problems • Recognize and understand problems swiftly and follow a self-managed logical process for resolving problems • Recognize 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 e.g. ready-made components and new types of monitoring equipment	

5	Installation	30
	The individual needs to know and understand: • Safety legislation, lock-out and isolation procedures, protective clothing and equipment and housekeeping rules • The selection, safe use and care of the cutting and non-cutting tools • Units of measurement used, and 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 of fasteners • Different types of lubricants their properties and applications. • 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, layout, measure, tack, weld and assemble metal and other components to specifications. • Prepare and pour a cement or polymeric grout foundation for a machine base or sole plate • The basic underpinning knowledge of electrical and electronic theory. Electric and electronic terminology, schematics, applications and associated tools • How to read & interpret engineering drawings/blueprints and schematics and have the ability to effectively use manufacturer's manuals • How to select, remove, install, and maintain anti-friction bearings and be able to interpret ISO charts and bearing catalogues • The need to identify, remove, select and install the appropriate power transmission system (chain, belt, gear) and/or components for a specific application, e.g. reduction gearbox worm shaft and worm/bull gear • 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, e.g. conveyors. • The principles and applications of hydraulics/pneumatics and safety as it relates to fluid power systems. The ability to identify, select, remove and install pipe systems, pumps and valves for specific applications and the ability to perform pertinent calculations, installations, maintenance and troubleshooting	

	The individual shall be able to: • Select and install equipment as per blueprints and documentation provided • Apply all machinery and equipment lock-out and de-energizing procedures (mechanical, electrical and hydraulic) before commencing work, maintenance or overhaul procedures • Correctly select and use hand cutting tools for shaping components to specifications, such as: files, drills, taps, reamers, countersinks and counterbores • Demonstrate the use of and interpret readings from the following devices: scales, micrometers, vernier calipers, dial indicators, feeler gauges, combination sets, squares and laser measurement and alignment devices and vibration and themography measurement. • Set up and safely operate a vertical milling machine and centre lathe. Use High Speed Steel and/or Carbide cutting tools to perform the following machining operations machining within a unit of tolerance: drilling, tapping, and countersinking, counter boring facing, slotting and cutting keyways. • 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, including: ropes, eye bolts and come-alongs • Apply metal inert gas (Oxy Fuel, SMAW,MIG and TIG) welding and fabrication techniques including: layout, joint preparation • tack, prevention and correction of distortion and fabricate materials to assemble components using drawings • Prepare a foundation, machine base or sole plate using the proper techniques for anchoring, shimming and leveling for a concrete or grouting pour • After correct lockout and tag-out, use a multi-meter to ensure electrical components are not "live" and to check current and voltage • Using 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 components including bill of material, title block and change orders, read and interpret basic principles of geometric tolerance and symbols • Remove, inspect, repair/replace, install, set clearance, fit and align anti-friction bearings, using the bearing manufacturers' catalogue • Effect the removal, inspection, repair or replacement and the installation, alignment and tensioning/or setting of "backlash", tooth pattern or impeller setting of a centrifugal pump, a reduction gearbox, chain drive, belt drive, or gear drive system. • Perform a removal and install on a material handling system for example a belt splice and fasten conveyor belt for a specific application • Identify, select and use appropriate measuring/alignment devices/tools to: align equipment and track material handling systems drives and take appropriate readings/ measurements e.g. vibration and thermography	

	reading on material handling systems drives. • Remove, repair and select/replace the correct flow control valves and circuit as per manufacturers' schematic drawing for a hydraulic/pneumatic system • Select the correct size and type of piping, tubes and hoses available for a hydraulic/pneumatic system	
6	**Testing, Reporting and Commissioning**	**20**
	The individual needs to know and understand: • Industrial regulations and standards applicable to different types of machines • Installations • Verification standards, methods and reports to be used to record verification results • Types of measuring instruments e.g. micrometres, vernier calipers, • 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	
	The individual shall be able to: • 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/repaired 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.	
7	**Maintenance, Fault Finding and Repair**	**20**
	The individual needs to know and understand: • Different types of installations/equipment for specific environments • Different generations of installations/equipment • The purpose of a specific installation/equipment • The customers/employers needs for various functions of installation/equipment	
	The individual shall be able to: • Adapt to changing circumstances • Troubleshoot electrical, mechanical, power transmission and fluid power installations and identify faults and repair as required • Verify that existing installations/equipment still meet current standards • Use, test and calibrate measuring equipment as needed	
	Total	**100**