

WorldSkills Standards Specification

Construction Metal Work

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).

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 | Work organization and management | 5 |
| | <p>The individual needs to know and understand:</p> <ul style="list-style-type: none"> • The standards and regulations relating to health and safety, security, and hygiene within the construction metal industry • The precautions and methods of operation for common hand tools • The precautions for the safe use, maintenance, and adjustment of mechanical and thermal cutting equipment • The safe use, adjustment, and maintenance of mechanical and hand bending and forming equipment • The requirements and possibilities for environmental management and sustainability within the industry • The selection, use, and maintenance of the range of Personal Protective Equipment used in the construction metalwork industry | |
| | <p>The individual shall be able to:</p> <ul style="list-style-type: none"> • Work safely with regard to self and others • Maintain a safe and clean working environment • Use hand and power tools safely • Use and adjust thermal and mechanical cutting and shearing equipment safely • Use and adjust hand and mechanical bending and forming equipment • Carry out work with consideration to the environmental and sustainability issues relating to the industry • Select and use appropriately the relevant personal protective equipment appropriate for the task | |
| 2 | Communication and interpersonal skills | 5 |
| | <p>The individual needs to know and understand:</p> <ul style="list-style-type: none"> • The roles and requirements of customers, architects and design engineers, and related tradespersons, and effective methods of communication • Detailed instructions from customers, architects, design engineers, and Engineering Supervisors. • Non-verbal communication such as drawings, guidelines, international standards, etc. • The importance of good team work | |

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| | <p>The individual shall be able to:</p> <ul style="list-style-type: none"> • Interpret and implement the customer's brief • Clarify any possible misunderstanding in the drawing by asking the relevant questions • Read and use all necessary manuals, drawings, guidelines, etc. to achieve a good result of the work • Work effectively as a member of a team | |
| 3 | Marking out techniques | 10 |
| | <p>The individual needs to know and understand:</p> <ul style="list-style-type: none"> • First and third angle orthographic projection • Drawing and welding symbols used on engineering drawings • ISO standard numbers • Mathematical calculation and unit translation • Geometrical development methods and practice • The selection, use, and maintenance of measuring and checking equipment • The differences between a cutting list and a material list • The techniques of flat pattern development • Structural joint connection types • Methods of interpreting and using information and instructions for production • Tolerances and their relationship to accuracy | |
| | <p>The individual shall be able to:</p> <ul style="list-style-type: none"> • Interpret engineering drawings and symbols • Perform standard mathematical calculations including areas, volumes, and unit conversion • Select and use measuring equipment • Prepare a comprehensive materials list • Develop and cut patterns using parallel, radial, and triangulation methods • Mark out, form, and assemble construction joint connections • Carry out cutting and assembly using production instructions to given tolerances | |
| 4 | Cutting techniques | 10 |
| | <p>The individual needs to know and understand:</p> <ul style="list-style-type: none"> • The selection, use, and maintenance of mechanical equipment used such as shears, corner shears, guillotine, saws, and grinders • Processes for cutting/grinding materials to given tolerances • The selection and use of thermal cutting equipment to include Oxy-Acetylene torch, cutting wheels, guides and circle cutters • The techniques for punching, countersinking, drilling, tapping, and reaming holes in a variety of metals and non-ferrous materials | |

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| | <p>The individual shall be able to:</p> <ul style="list-style-type: none"> • Use power tools and mechanical methods to cut/shear materials to given tolerances • Use thermal cutting equipment to cut low carbon steels using manual cutting wheels, straight edges, and circle cutters and guides • Use hand and power tools to cut, punch, drill, countersink, tap, and ream holes in a variety of metals | |
| 5 | Forming techniques | 15 |
| | <p>The individual needs to know and understand:</p> <ul style="list-style-type: none"> • The adjustment and operation of manual or mechanical forming machines • The adjustment and operation of brake presses • The adjustment and operation of pinch and pyramid rolls • The selection, adjustment and maintenance of oxy-acetylene gas heating equipment • The adjustment and operation of flat bar benders • The adjustment and operation of manual and mechanical folders | |
| | <p>The individual shall be able to:</p> <ul style="list-style-type: none"> • Use manual or mechanical forming machines to cold form metals • Adjust and use oxy/acetylene equipment to hot form plate and section • Bend low carbon steels using a flat bar bender • Use manual or mechanical break presses or folders to shape low carbon steels, stainless steels, aluminium, and alloys • Use pinch and pyramid rolls to produce required shapes • Use a mechanical brake press or folder to produce straight bends to any angle | |
| 6 | Assembly and finishing techniques | 35 |
| | <p>The individual needs to know and understand:</p> <ul style="list-style-type: none"> • Assembly techniques and symbols used in engineering drawings and project descriptions • The use of hand and power tools for assembly • The types, selection and operation of pivot and locking devices in common use • The range of mechanical fastenings used in the construction metalwork industry including: <ul style="list-style-type: none"> • Rivets; • Nuts and bolts; • Locking and flat washers; • Screws; • Manufacturers mechanical fasteners • The range of edge, surface and joint finishes available • The range of tools used to achieve required finishes • The use of standard techniques for checking dimensional stability | |

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| | <p>The individual shall be able to:</p> <ul style="list-style-type: none"> • Use correct assembly skills as required • Select and use hand and power tools for assembly • Construct moving pivots and locking devices as required • Select and place and fix mechanical fittings as required for assemble • Finish project edges, surfaces and joints as required using hand and power tools to include: <ul style="list-style-type: none"> • Files; • Wire brushes; • Abrasives; • Deburring tools • Use non-chemical weld cleaning techniques • Check structures for accuracy, square, and flatness | |
| 7 | Welding and joining techniques | 20 |
| | <p>The individual needs to know and understand:</p> <ul style="list-style-type: none"> • The selection and use of Welding processes including: <ul style="list-style-type: none"> • Manual metal arc welding (111); • Gas metal arc welding (135); • Gas Tungsten arc welding (141) • The range of welding consumables available, their selection, and storage • Polarities adopted for welding processes • Preparation techniques prior to welding • Weld faults and rectification | |
| | <p>The individual shall be able to:</p> <ul style="list-style-type: none"> • Select, adjust and use manual metal arc welding equipment to produce welded joints in steel • Select, adjust and use manual metal arc welding equipment to produce joints in low carbon steel and stainless steels • Select, adjust and use gas metal arc welding equipment to produce joints in low carbon steel and stainless steels • Select, adjust and use gas tungsten arc welding equipment to produce joints in stainless steels, aluminium and aluminium alloys with no need for weld penetration. • Select welding consumables to suit position, weld polarity and type of material: <ul style="list-style-type: none"> • MMAW (111) Carbon steel - E6013, S/S-E304L, E309L • GMAW (135) Carbon steel - E70S6 • GTAW (141) Carbon steel - ER70S2, S/S – E304L, E308L and Aluminium welding • Remove surface contamination and prepare joint for welding regarding, type, and material thickness • Interpret weld position standards to ISO standards (Sys A) <ul style="list-style-type: none"> • PA/1G • PB/2F • Identify and repair weld faults | |
| | 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 *Structural Metal Fabricators and Fitters*:
<https://www.onetonline.org/link/summary/51-2041.00>

The links also enable adjacent occupations to be reviewed.