

WorldSkills Standards Specification

# Prototype Modelling

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>	5
	<p>The individual needs to know and understand:</p> <ul style="list-style-type: none"> <li>Principles and applications of safe working generally and as applied to prototype modelling</li> <li>The purposes, uses, care, 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 communication and collaboration</li> <li>The scope and limits of one's own and others' roles, responsibilities and duties individually and collectively</li> <li>The parameters within which activities need to be scheduled</li> <li>Principles and techniques for time management</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>Prepare self for the tasks in hand, including 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 the 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 and organizational performance both broadly and specifically</li> <li>Give and take feedback and support</li> </ul>	
2	<b>Design prototypes</b>	5
	<p>The individual needs to know and understand:</p> <ul style="list-style-type: none"> <li>The proposed function of the final production model of the prototype</li> <li>Design principles</li> <li>The importance of effective collaboration with other professionals</li> <li>Principles and methods of formal and informal communication</li> </ul>	

	<p>The individual shall be able to:</p> <ul style="list-style-type: none"> <li>• Grasp and visualize complex and abstract ideas</li> <li>• Convert descriptive text, either written or verbal, into design</li> <li>• Discuss design concepts with clients and colleagues</li> <li>• Interpret complex technical drawings and convert them into designs</li> <li>• Provide expert advice and guidance on limitations and opportunities to clients and colleagues</li> <li>• Engage with product designers and engineers to support design and test parts</li> <li>• Provide innovative solutions to challenges and problems</li> </ul>	
<b>3</b>	<b>Technical drawings</b>	<b>10</b>
	<p>The individual needs to know and understand:</p> <ul style="list-style-type: none"> <li>• Features from the available CAD systems</li> <li>• Technical terminology and symbols used in technical drawings and specifications</li> </ul>	
	<p>The individual shall be able to:</p> <ul style="list-style-type: none"> <li>• Prepare accurate 2D technical drawings providing clear and unambiguous information to future users</li> <li>• Prepare and dimension a 2D technical drawing from 3D CAD data</li> <li>• Clearly label drawings</li> <li>• Accurately measure dimensions and transcribe to drawings and technical specifications</li> </ul>	
<b>4</b>	<b>Computer Aided Design 3D - CAD</b>	<b>15</b>
	<p>The individual needs to know and understand:</p> <ul style="list-style-type: none"> <li>• Benefits, limitations, and advantages of various CAD software systems</li> <li>• Reverse Engineering &amp; its uses in Industry.</li> </ul>	
	<p>The individual shall be able to:</p> <ul style="list-style-type: none"> <li>• Work effectively and creatively with internationally known and recognized 3D CAD systems</li> <li>• Create 3D CAD Data of complete prototypes and exploded parts</li> <li>• Apply clear and accurate dimensioning</li> <li>• Use reverse engineering techniques</li> </ul>	
<b>5</b>	<b>Computer Aided Manufacturing - CAM</b>	<b>5</b>
	<p>The individual needs to know and understand:</p> <ul style="list-style-type: none"> <li>• Benefits, limitations, and advantages of various CAM software systems</li> <li>• Machine and Machining Parameters</li> <li>• Tools suitable for CNC machining</li> <li>• Programming as the creation of a logical process plan</li> <li>• Different methods and techniques to generate a programme (CAM/CAD or manual)</li> <li>• CAM system programming</li> <li>• Skill related software</li> </ul>	

	<p>The individual shall be able to:</p> <ul style="list-style-type: none"> <li>• Use CAM software and milling machine to produce accurate models, production prototypes, and engineering components</li> <li>• Use 3D CAD data to generate cutter paths using specialist machining software</li> <li>• Select the best methods according to the production type and part specification</li> <li>• Effectively use skill specific software and related hardware</li> <li>• Generate programmes using CAD/CAM systems and taking into account the format of the initial data</li> </ul>	
<b>6</b>	<b>Manufacturing prototype models</b>	<b>50</b>
	<p>The individual needs to know and understand:</p> <ul style="list-style-type: none"> <li>• Types and characteristics of materials used in prototype model making</li> <li>• Methods of model production</li> <li>• Importance of accuracy in detail and dimension</li> <li>• Methods of finishing prototype models</li> <li>• Use and care of tools and equipment used in prototype model making</li> </ul>	
	<p>The individual shall be able to:</p> <ul style="list-style-type: none"> <li>• Manufacture prototype models according to design criteria, specified materials and specifications</li> <li>• Transfer and manufacture copies of parts</li> <li>• Tailor the prototype according the specific unknowns still present in the intended design</li> <li>• Use hand tools and conventional machines to produce prototype models</li> <li>• Use CNC machines to produce prototype models</li> <li>• Finish prototype model's surface</li> <li>• Use measuring equipment</li> <li>• Produce models from standard plastic materials; PU-Chemical Wood, casting resin, celcoat, laminating resin, acryl glass, polyurethane, aluminium, composites, PVC, etc.</li> <li>• Use polyurethane and fast cast resin to produce parts through to accurate multiple components for pre-production assemblies</li> <li>• Use different resins to produce parts that can be clear, heat resistant, flame retardant and flexible</li> <li>• Adapt resins to be tinted or pigmented, add glass filler to stiffen parts and be over moulded</li> <li>• Apply production tasks; cutting, sanding, gluing</li> <li>• Apply negative and positive mouldings</li> <li>• Modify minor product details</li> <li>• Create and assemble parts</li> <li>• Modify prototypes based on feedback from engineers and potential users</li> </ul>	
<b>7</b>	<b>Paint and decorate prototype models</b>	<b>10</b>
	<p>The individual needs to know and understand:</p> <ul style="list-style-type: none"> <li>• Types of paints and paint finishes required for prototype models</li> <li>• Purposes for labels and stickers</li> <li>• Safe usage of paints and polishes</li> </ul>	

	The individual shall be able to: <ul style="list-style-type: none"> <li>• Finish prototype model surfaces</li> <li>• Paint prototype models using a spray can</li> <li>• Polish painted models</li> <li>• Decorate prototype models with appropriate stickers</li> <li>• Innovate and test new paints and finishes to satisfy clients' needs</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 (Section 2) appears most closely to relate to *Model Maker: Metals and Plastic*:  
<https://www.onetonline.org/link/summary/51-4061.00>

and *Model Maker*: <http://data.europa.eu/esco/occupation/3cbbdb83-7c36-4ae5-8c45-6c284186f477>

Adjacent occupations can also be explored through these links