

WorldSkills Standards Specification

# Plastic Die Engineering

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>• Legislation and best practice for health and safety in the working environment</li> <li>• Range of tools and their proper use in relation to Plastic Die Engineering</li> <li>• Technical language and symbols used in plastic engineering design</li> <li>• The importance of effective communications and inter-personal working relationships</li> <li>• Customer focused attitude</li> <li>• Applied mathematics, technical terms and symbols</li> <li>• IT systems and related professional CAD/CAM software</li> <li>• CNC Machining centres, bench working and moulding machines</li> <li>• Manual and CAM programming</li> <li>• Cutting tool technology</li> <li>• The importance of accruing knowledge and skills</li> <li>• The role of providing innovative and feasible solutions to the design, manufacturing and moulding problems</li> </ul>	
	<p>The individual shall be able to:</p> <ul style="list-style-type: none"> <li>• Effectively apply all current health and safety regulations in the work place</li> <li>• Proactively promote best practice in health and safety in the working environment</li> <li>• Work independently on CNC machining centres</li> <li>• Create manual and CAM programs for various types of machining</li> <li>• Select suitable cutting parameters</li> <li>• Select and set the most appropriate tools for the planned work</li> <li>• Maintain all tools to ensure that they are in the best condition</li> <li>• Communicate and collaborate effectively with colleagues, team members, and other professionals</li> <li>• Engage with customers effectively, always prioritizing their needs</li> <li>• Explain complex technical details to non-specialists</li> <li>• Proactively engage in continuous professional development to promote excellence in the work and maintain expertise in current industrial practice</li> <li>• Analyse the manufacturing feasibility</li> <li>• Successfully apply mathematical principles to complex industrial scenarios</li> <li>• Demonstrate high degrees of critical thinking</li> </ul>	

<b>2</b>	<b>Engineering drawing and Design</b>	<b>10</b>
	<p>The individual needs to know and understand:</p> <ul style="list-style-type: none"> <li>• The principles of technical drawings</li> <li>• Symbols and features of both 2D and 3D drawings</li> <li>• Computer Aided Design (CAD) software</li> <li>• Currently recognized international design standards (ISO, ASME)</li> <li>• The importance of accurate and clear presentation of designs</li> <li>• The potential for problems with drawings and their implications</li> <li>• The role of providing innovative solutions</li> <li>• Design For manufacturing (DFM) concept</li> <li>• Design for Assembly (DFA) concept</li> <li>• Design for maintainability</li> </ul>	
	<p>The individual shall be able to:</p> <ul style="list-style-type: none"> <li>• Interpret technical drawings and specifications</li> <li>• Design in CAD software</li> <li>• Apply Geometric dimensioning and Tolerancing symbols as per ISO/ ASME standards</li> <li>• Design for economical manufacturability and ease of assembly</li> <li>• Create a design which can be easily maintained (or repaired) both economically and efficiently</li> <li>• Take design steps to minimize Time to Repair (TTR)</li> </ul>	
<b>3</b>	<b>Plastic material</b>	<b>5</b>
	<p>The individual needs to know and understand:</p> <ul style="list-style-type: none"> <li>• Working materials and their characteristics</li> <li>• Properties of plastic materials, for example:             <ul style="list-style-type: none"> <li>• Flow ability;</li> <li>• Heat deflection temperature;</li> <li>• Moulding temperature;</li> <li>• Stability;</li> </ul> </li> <li>• Percentage of shrinkage</li> </ul>	
	<p>The individual shall be able to:</p> <ul style="list-style-type: none"> <li>• Specify the size and position of the gate</li> <li>• Specify the dimensions of core and cavity as per the shrinkage of material</li> <li>• Set up moulding temperature</li> <li>• Handle all materials safely</li> <li>• Select appropriate materials for a given job</li> </ul>	

<b>4</b>	<b>Mould design</b>	<b>20</b>
	<p>The individual needs to know and understand:</p> <ul style="list-style-type: none"> <li>• Principles and practice of 2D and 3D mould design</li> <li>• How to apply CAD/CAM systems for a range of solutions</li> <li>• Current ISO drawing standards</li> <li>• Specifications and fixtures of measuring equipment</li> <li>• Methods to split parting lines</li> <li>• Styles and types of layout</li> <li>• Set up for ejector pins</li> <li>• Set up for coolant line</li> <li>• Principles of low cost design</li> <li>• Coating requirements for mould and component</li> <li>• Material selection for various mould elements</li> <li>• Heat treatment requirements</li> <li>• Design principles that ensure mass production capability and product life expectancy</li> <li>• Holes are easily produced in moulded component by providing core pins</li> <li>• Design requirements for easy maintenance of mould and repair work in case of failure</li> </ul>	
	<p>The individual shall be able to:</p> <ul style="list-style-type: none"> <li>• Read and interpret drawings in both first and third angle projections</li> <li>• Interpret various geometrical tolerance/dimensioning and dimensional tolerances</li> <li>• Create technical engineering drawings that conform to international standards and clearly convey the details to the end user</li> <li>• Write reports to describe the concept of designing dies</li> <li>• Design moulds using 2D and 3D methods</li> <li>• Calculate shrinkage</li> <li>• Split parting lines, core and cavity</li> <li>• Design a position and size of a gate</li> <li>• Design a position and size of an ejector pin</li> <li>• Design a coolant line, position, and size coolant line</li> <li>• Apply principles that ensure mass production capability and maximize product life expectancy</li> <li>• Design easy manufacturing and assembly</li> <li>• Design for easy maintainability</li> </ul>	
<b>5</b>	<b>Machining</b>	<b>30</b>
	<p>The individual needs to know and understand:</p> <ul style="list-style-type: none"> <li>• Functions and features of Computer Aided Manufacturing (CAM)</li> <li>• Settings for cutting conditions according to the mould material</li> <li>• Settings for working procedures</li> <li>• Settings for a piece of work and the way to measure it</li> <li>• The importance of inspecting machines and tools</li> </ul>	

	<p>The individual shall be able to:</p> <ul style="list-style-type: none"> <li>• Apply the principles and processes of Computer Aided Manufacturing (CAM)</li> <li>• Set up and use a machine centre</li> <li>• Position and do machining for ejector pins</li> <li>• Consider, plan and account for the proper size and layout of the injection points and ejector pins</li> <li>• Input data into the CNC machine controller (tool offset, work offset, etc.)</li> <li>• Machine each part of the die in consideration of the requirement of the plastic product measure a piece of work accurately</li> <li>• Fabricate parts to commercial standards using:               <ul style="list-style-type: none"> <li>• Machine centre;</li> <li>• Pin cut off grinder;</li> <li>• Drilling machine;</li> <li>• Bench grinder;</li> </ul> </li> <li>• Troubleshoot dies, find innovative solutions to complex problems</li> </ul>	
<b>6</b>	<b>Assembly</b>	<b>5</b>
	<p>The individual needs to know and understand:</p> <ul style="list-style-type: none"> <li>• The purpose and method of polishing a component</li> <li>• Standards (ANSI/SPI) currently used in Plastics and Die Industry</li> <li>• Ways to match the face between the core and cavity</li> <li>• Processes to assemble a mould</li> </ul>	
	<p>The individual shall be able to:</p> <ul style="list-style-type: none"> <li>• Polish components using polishing tool</li> <li>• Drill components</li> <li>• Apply the principles of pin cutting</li> <li>• Apply principles of surface contact</li> <li>• Assemble components in preparation for testing</li> </ul>	
<b>7</b>	<b>Try out of mould</b>	<b>15</b>
	<p>The individual needs to know and understand:</p> <ul style="list-style-type: none"> <li>• Setting up moulds on injection moulding machine for try out</li> <li>• Settings and conditions for defects free products such as:               <ul style="list-style-type: none"> <li>• Pressure;</li> <li>• Time;</li> <li>• Speed;</li> <li>• Temperature</li> </ul> </li> <li>• Distance</li> </ul>	

	<p>The individual shall be able to:</p> <ul style="list-style-type: none"> <li>• Change:           <ul style="list-style-type: none"> <li>• Injection pressure;</li> <li>• Back pressure;</li> <li>• Holding pressure;</li> <li>• Clamping pressure;</li> <li>• Injection time;</li> <li>• Injection speed;</li> <li>• Ejection speed;</li> <li>• Melt temperature;</li> <li>• Stroke (metering, opening, ejection, etc.)</li> </ul> </li> <li>• Run the machine in semi-automatic mode</li> </ul>	
<b>8</b>	<b>Plastic Products</b>	<b>10</b>
	<p>The individual needs to know and understand:</p> <ul style="list-style-type: none"> <li>• Types of defect and how to identify these defects in plastic products</li> <li>• Most likely defects and their causes</li> <li>• Solutions for remedying defects in plastic products</li> </ul>	
	<p>The individual shall be able to:</p> <ul style="list-style-type: none"> <li>• Locate and identify defects in plastic products, for example:           <ul style="list-style-type: none"> <li>• Weld line;</li> <li>• Crack;</li> <li>• Whitening;</li> <li>• Flow mark;</li> <li>• Burn mark;</li> <li>• Sinking mark;</li> <li>• Plastic material incompletely injected</li> </ul> </li> <li>• Propose solutions for identified defects</li> <li>• Implement proposed solutions</li> <li>• Accurately measure the dimensions of a product</li> <li>• Check the condition on both the interior and exterior of a product</li> <li>• Modify and develop the plastic product</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 to match most closely the occupation of *Tool and Die Makers*:  
<https://www.onetonline.org/link/summary/51-4111.00>

Adjacent occupations can also be explored through these links.