

MANUFACTURING AND ENGINEERING TECHNOLOGY

# Plastic Die Engineering



**WorldSkills Occupational Standards**

# WorldSkills Occupational Standards (WSOS)

## Occupation description and WSOS

### The name of the occupation is

Plastic Die Engineering

### Description of the associated work role(s) or occupation(s)

Plastic Die engineering is the mass production of plastic products of high quality at low cost. Plastic injection moulded components are used in telecommunications, medical, aerospace, and automobile industries, home appliances, office automation, entertainment, and electronics. Within this sector, plastic die technicians, otherwise known as mould makers, carry out a range of different duties which vary depending on the organisation they work for. Based on occupational data, mould makers must:

- Create and develop new tooling for plastic moulding dies using the specifications provided by separate design teams
- Plan the moulds initially by studying and interpreting the drawings or computer aided design (CAD) models supplied to them. They usually work with the design teams because they need to be familiar with each mould design concept, and with the CAD software used for making the designs. They study the dimensions and tolerances of each mould elements and ensure they are appropriate for the assembly and function of the mould. They also analyse the feasibility of the manufacture, given the available resources
- Set up equipment by interpreting the design and drawing of each mould's parts and the properties of the materials. Since much of the machining process uses computer numerical controlled (CNC) machines, they also must know how to operate CNC machines, and create programmes. They should be familiar with various mould polishing equipment and techniques. Once each mould is assembled and ready for testing, they conduct trials and prove each mould on an injection moulding machine. They must set up and control the moulding parameters in order to produce defect-free mouldings (plastic parts)
- Maintain and repair all equipment to ensure that each mould run is as required.

Plastic die technicians may also create prototype of products, jigs, and fixtures to facilitate production (machining, assembly, and inspection) etc.

Mould makers need good technical skills and dexterity to work with precision equipment and tools, as well as strong mathematical and problem-solving skills. To liaise with design teams and colleagues they require both formal and informal communication and interpersonal skills.

## General notes on the WSOS

The WSOS 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/WSOS](http://www.worldskills.org/WSOS)).

The skill competition is intended to reflect international best practice as described by the WSOS, and to the extent that it is able to. The Standard 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 Standard 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. This is often referred to as the “weighting”. The sum of all the percentage marks is 100. The weightings determine the distribution of marks within the Marking Scheme.

Through the Test Project, the Marking Scheme will assess only those skills that are set out in the Standards Specification. They will reflect the Standards as comprehensively as possible within the constraints of the skill competition.

The Marking Scheme will follow the allocation of marks within the Standards to the extent practically possible. A variation of up to five percent is allowed, provided that this does not distort the weightings assigned by the Standards.

# WorldSkills Occupational Standards

Section	Relative importance (%)
<b>1 Work organization and management</b>	<b>5</b>

The individual needs to know and understand:

- Legislation and best practice for health and safety in the working environment
- Range of tools and their proper use in relation to Plastic Die Engineering
- Technical language and symbols used in plastic engineering design
- The importance of effective communications and inter-personal working relationships
- The importance of a customer focused attitude
- Applied mathematics, technical terms, and symbols
- IT systems and related professional CAD/CAM software
- CNC Machining centres, bench working and moulding machines
- Manual and CAM programming
- Cutting tool technology
- The importance of accruing knowledge and skills
- The role of providing innovative and feasible solutions to design, manufacturing, and moulding problems

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The individual shall be able to:

- Effectively apply all current health and safety regulations in the workplace
- Proactively promote best practice in health and safety in the working environment
- Work independently on CNC machining centres
- Create manual and CAM programs for various types of machining
- Select suitable cutting parameters
- Select and set the most appropriate tools for the planned work
- Maintain all tools to ensure that they are in the best condition
- Communicate and collaborate effectively with colleagues, team members, and other professionals
- Engage with customers effectively, always prioritizing their needs
- Explain complex technical details to non-specialists
- Proactively engage in continuous professional development to promote excellence in the work and maintain expertise in current industrial practice
- Analyse the manufacturing feasibility
- Successfully apply mathematical principles to complex industrial scenarios
- Demonstrate high levels of critical thinking

Section	Relative importance (%)
<b>2 Interpretation of designs and drawings</b>	<b>10</b>

The individual needs to know and understand:

- The principles of technical drawings
- Symbols and features of both 2D and 3D drawings
- Computer Aided Design (CAD) software
- Currently recognized international design standards (ISO, ASME)
- Geometric Dimensioning and tolerancing methods
- Quality requirements
- The purposes and roles of innovative solutions
- Design For manufacturing (DFM) concepts
- Design for Assembly (DFA) concepts
- Design for maintainability (DfM) concepts,

The individual shall be able to:

- Interpret technical drawings and specifications
- Identify critical features
- Analyze manufacturability with the available resources
- Identify and prepare for potential assembly issues if any
- Identify and prepare for any maintenance issues that may arise during production
- Specify stock to be kept for different operations
- Plan the production of parts according to specifications

<b>3 Process planning</b>	<b>5</b>
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The individual needs to know and understand:

- The importance of planning to improve efficiency
- Procedures to manufacture moulds with the available resources
- Machining operations and their sequences
- Method of clamping work pieces
- Choices of cutting tools and cutting parameters
- Machine and work piece setting
- Measuring tools and equipment
- Bench work and assembly techniques

The individual shall be able to:

- Identify and set different machining features
- Correctly clamp and set work pieces for machining or bench work
- Select correct cutting tools and machining strategies
- Make correct measurements

Section	Relative importance (%)
<b>4 Programming and setting up equipment</b>	<b>20</b>

The individual needs to know and understand:

- Programming in a logical sequence
- Different methods of programming (manual, Canned cycles, CAM etc.)
- Methods for transferring programs from computers to machine controllers in the case of CAM programming
- Methods for setting work pieces relative to machine co ordinates

The individual shall be able to:

- Select the best sequence for machining each specific work piece
- Program manually and in CAM software
- Transfer programs to machines
- Set work pieces and tools.

<b>5 Machining</b>	<b>30</b>
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The individual needs to know and understand:

- The functions and features of Computer Aided Manufacturing (CAM)
- Settings for cutting conditions according to the mould material
- Settings for working procedures
- Settings for each piece of work and the way to measure it
- The importance of inspecting machines and tools

The individual shall be able to:

- Apply the principles and processes of Computer Aided Manufacturing (CAM)
- Set up and use machine centre input data into CNC machine controllers (tool offset, work offset, etc.)
- Create machining programs in software, and transfer to machine controllers
- Test the finished products and assess them for accuracy in accordance with the specified drawings
- Machine each part of the dies, taking account of each plastic product's requirements
- measure pieces of work accurately
- set offsets according to measured size
- achieve the required geometry and finish
- Fabricate all parts to commercial standards using:
  - Machine centres
  - Pin cut off grinders
  - Drilling machines
  - Bench grinders.

Section	Relative importance (%)
<b>6 Assembly</b>	<b>5</b>

The individual needs to know and understand:

- The purposes and methods of polishing components
- Standards (ANSI/SPI) currently used in the Plastics and Die Industry
- Ways to match the face between each core and cavity
- Processes to assemble moulds

The individual shall be able to:

- Use range of hand and power tools for assembly
- Polish components using polishing tools
- Drill components
- Apply the principles of pin cutting
- Apply the principles of surface contact
- Assemble components in preparation for testing.

<b>7 Try out of moulds</b>	<b>10</b>
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The individual needs to know and understand:

- Setting up moulds on injection moulding machine for try out
- Settings and conditions for defects free products such as:
  - Pressure
  - Time
  - Speed
  - Temperature

The individual shall be able to:

- Change:
  - Injection pressures
  - Back pressures
  - Holding pressures
  - Clamping pressures
  - Injection times
  - Injection speeds
  - Ejection speeds
  - Melt temperatures
  - Strokes (metering, opening, ejection, etc.)
- Run machine in semi-automatic mode.

Section	Relative importance (%)
<b>7 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>• The most frequent and common defects and their causes</li> <li>• Solutions for remedying defects in plastic products</li> <li>• Solutions for achieving specified product dimensions and finishes</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 lines</li> <li>• Cracks</li> <li>• Whitening</li> <li>• Flow marks</li> <li>• Burn marks</li> <li>• Sinking marks</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 products</li> <li>• Achieve product dimensions as in drawings or models</li> <li>• Check the condition of both the interiors and exteriors of products</li> <li>• Modify moulding parameters and develop the plastic products.</li> </ul>	
<b>9 Maintenance and repair</b>	<b>5</b>
<p>The individual needs to know and understand:</p> <ul style="list-style-type: none"> <li>• The importance of injection mould maintenance</li> <li>• The importance of cleaning and repairs needed to keep moulds in good working order</li> <li>• Types of maintenance work required to improve the quality and longevity of moulds</li> </ul>	
<p>The individual shall be able to:</p> <ul style="list-style-type: none"> <li>• Do preventative maintenance to avoid issues arising</li> <li>• Make repairs when problem arise.</li> </ul>	
<b>Total</b>	<b>100</b>



## References for industry consultation

WorldSkills is committed to ensuring that the WorldSkills Occupational Standards 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 Occupational Standards 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 WSOS 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.

The following table indicates which organizations were approached and provided valuable feedback for the Description of the Associated Role and WorldSkills Occupational Standards in place for WorldSkills Shanghai 2022.

There were no responses to the request for feedback from industry and business.