WORLDSKILLS STANDARD SPECIFICATION

Skill 05
Mechanical Engineering Design - CAD

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**	15
	The individual needs to know and understand: • The various purposes and uses for CAD designs • Current internationally recognized standards (ISO) • Standards currently used and recognized by industry • Health and safety legislation and best practice including specific safety precautions when using a visual display unit (VDU) and in a work station environment • Relevant theory and applications of mathematics, physics and geometry • Technical terminology and symbols • Recognized IT systems and related professional design software • The importance of accurate and clear presentation of designs to potential users • The importance of effective communications and inter-personal skills between co-workers, clients and other related professionals • The importance of maintaining knowledge and skill in new and developing technologies • The role of providing innovative and creative solutions to technical and design problems and challenges	

The individual shall be able to:
- Apply consistently the internationally recognized standards (ISO) and standards currently used and recognized by industry
- Apply and promote health and safety legislation and best practice in the workplace
- Apply a thorough knowledge and understanding of mathematics, physics and geometry to CAD projects
- Access and recognize standard component and symbol libraries
- Use and interpret technical terminology and symbols used in preparing and presenting CAD drawings
- Use recognized IT systems and related professional design software to consistently produce high quality designs and interpretations
- Deal with systems problems such as error messages received, peripherals which do not respond as expected, and obvious faults with equipment or connecting leads
- Produce work that consistently meets high standards of accuracy and clarity in the design and presentation of designs to potential users
- Demonstrate effective communications and inter-personal skills between co-workers, clients and other related professionals to ensure that the CAD process meets requirements
- Describe to clients and other professionals the role and purposes for CAD designs
- Explain complex technical images to experts and non-experts, highlighting key elements
- Maintain proactive continuous professional development in order to maintain current knowledge and skill in new and developing technologies and practices
- Provide and apply innovative and creative solutions to technical and design problems and challenges
- Visualize the desired product in order to fulfil the client's brief accurately

2	Materials, Software and Hardware	15

The individual needs to know and understand:
- Computer operating systems to be able to use and manage computer files and software correctly
- Peripheral devices used in the CAD process
- Specific specialist technical operations within design software
- The range, types and uses of specialist product available to support and facilitate the CAD process
- The production process for designs
- The limitations of design software
- Formats and resolutions
- The use of plotters and printers

	The individual shall be able to: • Power up the equipment and activate the appropriate modelling software • Set up and check peripheral devices such as keyboard, mouse, 3D mouse, plotter and printer • Use computer operating systems and specialist software to create and manage and store files proficiently • Select correct drawing packages from an on-screen menu or graphical equivalent • Use various techniques for accessing and using CAD software such as a mouse, menu or tool bar • Configure the parameters of the software • plan the production process effectively to produce efficient work processes • Use plotters and printers to print and plot work		
3	**3D Modelling**	**20**	
	The individual needs to know and understand: • Programs in order to be able to configure the parameters of the software • Computer operating systems in order to use and manage computer files and software • Mechanical systems and their functionality • Principles of technical drawing		
	The individual shall be able to: • Model components, optimizing the constructive solid geometry • Create families of components • Ascribe characteristics to the materials (density) • Ascribe colours and textures to the components • Produce assemblies from 3D models of components • Structure assemblies (sub-assemblies) • Review base information to plan work effectively • Access information from data files • Model and assemble base components of project pieces • Estimate approximate values for any missing dimensions • Assemble modelled parts into sub-assemblies as required • Apply graphics decals such as logos as required onto images		
4	**Create Photo Rendered Images (2D)**	**10**	
	The individual needs to know and understand: • The use of lighting, scenes and decals to produce photo rendered images		

The individual shall be able to:
- Save and label images to access for further use
- Interpret source information and accurately apply to the computer generated images
- Apply material properties using information supplied from source drawings
- Create photo rendered images of components or assemblies
- Adjust colours, shading, backgrounds and camera angles to highlight key images
- Print completed images for presentation purposes

5	3D Modelling	10

The individual needs to know and understand:
- Mechanical systems and their functionality
- How a component is assembled
- How to demonstrate the working of an image

The individual shall be able to:
- Create functions relative to the operation of the system being designed using industry programmes
- Create animations that demonstrate how different parts work or are assembled
- Save work for future access

6	Reverse Engineering of Physical Models	10

The individual needs to know and understand:
- Materials and processes for obtaining unprocessed work pieces:

  - Castings
  - Welding
  - Machining
  - Simulation

- The process to transfer a real object to a 3D image and then to a technical drawing

The individual shall be able to:
- Determine dimensions on physical parts by using industry accepted instruments
- Create freehand sketches
- Use measuring instruments to produce accurate replicas

7	Technical Drawing and Measuring	20

The individual needs to know and understand:
- Working drawings in ISO standard together with any written instruction
- Standards for conventional dimensioning and tolerancing and geometric dimensioning and tolerancing appropriate to the ISO standard
- Rules of technical drawing and the prevailing latest ISO standard to govern these rules
  the use of manuals, tables, list of standards and product catalogues

The individual shall be able to:
- Generate working drawings in ISO standard together with any written instructions
- Apply standards for conventional dimensioning and tolerancing and geometric dimensioning and tolerancing appropriate to the ISO standard
- Apply the rules of technical drawing and the prevailing latest ISO standard to govern these rules
- Use manuals, tables, lists of standards and product catalogues
- Insert written information such as explanation balloons and parts lists with more than one column using annotation styles that meet ISO standards
- Create 2D detail technical drawings
- Create exploded isometric views