

Technical Description

Prototype Modelling

Manufacturing and Engineering Technology



WorldSkills International, by a resolution of the Competitions Committee and in accordance with the Constitution, the Standing Orders, and the Competition Rules, has adopted the following minimum requirements for this skill for the WorldSkills Competition.

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1 INTRODUCTION

1.1 NAME AND DESCRIPTION OF THE SKILL COMPETITION

1.1.1 The name of the skill competition is

Prototyping Modelling

1.1.2 Description of the associated work role(s) or occupation(s).

The prototype modelling practitioner is involved with the design, creation, testing, and modification of prototypes. In many fields, there is great uncertainty as to whether a new design will actually do what is desired. New designs often have unexpected problems. A prototype is often used as part of the product design process to give engineers and designers the ability to explore design alternatives, test theories, and confirm performance prior to starting production of a new product. Prototype modelling practitioner use their experience to tailor the prototype according to the specific unknowns still present in the intended design. For example, some prototypes are used to confirm and verify consumer interest in a proposed design, whereas other prototypes will attempt to verify the performance or suitability of a specific design approach.

In general, an iterative series of prototypes will be designed, constructed, and tested as the final design emerges and is prepared for production. In most cases, multiple iterations of prototypes are used progressively to refine the design. It is common to design, test, evaluate, and then modify the design based on analysis of the prototype.

In many product development organizations, prototyping specialists are employed. These are individuals with specialized training and skills in general fabrication techniques that can help bridge theoretical designs and fabrication of prototypes. For a company engaged in rapid prototyping and manufacturing or functional testing, prototype models are crucial for troubleshooting potential problems in the design process.

A team with excellent interpersonal and communication skills will provide clients with confidence that the specialist advice and guidance resulting from prototyping fully supports their production plans. The prototyping engineer will require a range of skills including 3D CAD systems, CAM systems such as milling, printing, and other CAM machining, vacuum casting, prototype model making by hand tools and machines, and spray painting and finishing.

1.1.3 Number of Competitors per team

Prototyping Modelling is a single Competitor skill competition.

1.1.4 Age limit of Competitors

The Competitors must not be older than 22 years in the year of the Competition.

1.2 THE RELEVANCE AND SIGNIFICANCE OF THIS DOCUMENT

This document contains information about the standards required to compete in this skill competition, and the assessment principles, methods and procedures that govern the competition.

Every Expert and Competitor must know and understand this Technical Description.

In the event of any conflict within the different languages of the Technical Descriptions, the English version takes precedence.

1.3 ASSOCIATED DOCUMENTS

Since this Technical Description contains only skill-specific information it must be used in association with the following:

- WSI – Competition Rules
- WSI – WorldSkills Standards Specification framework
- WSI – WorldSkills Assessment Strategy
- WSI Online resources as indicated in this document
- WorldSkills Health, Safety, and Environment Policy and Regulations

2 THE WORLDSKILLS STANDARDS SPECIFICATION (WSSS)

2.1 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.

2.2 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"> Principles and applications of safe working generally and as applied to prototype modelling The purposes, uses, care, and maintenance of all equipment and materials, together with their safety implications Environmental and safety principles and their application to good housekeeping in the work environment Principles and methods for work organization, control, and management Principles of communication and collaboration The scope and limits of one's own and others' roles, responsibilities and duties individually and collectively The parameters within which activities need to be scheduled Principles and techniques for time management 	
	<p>The individual shall be able to:</p> <ul style="list-style-type: none"> Prepare and maintain a safe, tidy, and efficient work area Prepare self for the tasks in hand, including full regard to health and safety Schedule work to maximize efficiency and minimize disruption Select and use all equipment and materials safely and in compliance with manufacturers' instructions Apply or exceed the health and safety standards applying to the environment, equipment, and materials Restore the work area to an appropriate state and condition Contribute to team and organizational performance both broadly and specifically Give and take feedback and support 	
2	Design prototypes	5
	<p>The individual needs to know and understand:</p> <ul style="list-style-type: none"> The proposed function of the final production model of the prototype Design principles The importance of effective collaboration with other professionals Principles and methods of formal and informal communication 	

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

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

	The individual shall be able to: <ul style="list-style-type: none"> • Finish prototype model surfaces • Paint prototype models using a spray can • Polish painted models • Decorate prototype models with appropriate stickers • Innovate and test new paints and finishes to satisfy clients' needs 	
	Total	100

3 THE ASSESSMENT STRATEGY AND SPECIFICATION

3.1 GENERAL GUIDANCE

Assessment is governed by the WorldSkills Assessment Strategy. The Strategy establishes the principles and techniques to which WorldSkills assessment and marking must conform.

Expert assessment practice lies at the heart of the WorldSkills Competition. For this reason, it is the subject of continuing professional development and scrutiny. The growth of expertise in assessment will inform the future use and direction of the main assessment instruments used by the WorldSkills Competition: the Marking Scheme, Test Project, and Competition Information System (CIS).

Assessment at the WorldSkills Competition falls into two broad types: measurement and judgement. For both types of assessment, the use of explicit benchmarks against which to assess each Aspect is essential to guarantee quality.

The Marking Scheme must follow the weightings within the Standards Specification. The Test Project is the assessment vehicle for the skill competition, and also follows the Standards Specification. The CIS enables the timely and accurate recording of marks, and has expanding supportive capacity.

The Marking Scheme, in outline, will lead the process of Test Project design. After this, the Marking Scheme and Test Project will be designed and developed through an iterative process, to ensure that both together optimize their relationship with the Standards Specification and the Assessment Strategy. They will be agreed by the Experts and submitted to WSI for approval together, in order to demonstrate their quality and conformity with the Standards Specification.

Prior to submission for approval to WSI, the Marking Scheme and Test Project will liaise with the WSI Skill Advisors in order to benefit from the capabilities of the CIS.

4 THE MARKING SCHEME

4.1 GENERAL GUIDANCE

This section describes the role and place of the Marking Scheme, how the Experts will assess Competitors' work as demonstrated through the Test Project, and the procedures and requirements for marking.

The Marking Scheme is the pivotal instrument of the WorldSkills Competition, in that it ties assessment to the standards that represent the skill. It is designed to allocate marks for each assessed aspect of performance in accordance with the weightings in the Standards Specification.

By reflecting the weightings in the Standards Specification, the Marking Scheme establishes the parameters for the design of the Test Project. Depending on the nature of the skill and its assessment needs, it may initially be appropriate to develop the Marking Scheme in more detail as a guide for Test Project design. Alternatively, initial Test Project design can be based on the outline Marking Scheme. From this point onwards the Marking Scheme and Test Project should be developed together.

Section 2.1 above indicates the extent to which the Marking Scheme and Test Project may diverge from the weightings given in the Standards Specification, if there is no practicable alternative.

The Marking Scheme and Test Project may be developed by one person, or several, or by all Experts. The detailed and final Marking Scheme and Test Project must be approved by the whole Expert Jury prior to submission for independent quality assurance. The exception to this process is for those skill competitions which use an independent designer for the development of the Marking Scheme and Test Project. Please see the Rules for further details.

Experts and independent designers are required to submit their Marking Schemes and Test Projects for comment and provisional approval well in advance of completion, in order to avoid disappointment or setbacks at a late stage. They are also advised to work with the CIS Team at this intermediate stage, in order to take full advantage of the possibilities of the CIS.

In all cases a draft Marking Scheme must be entered into the CIS at least eight weeks prior to the Competition using the CIS standard spreadsheet or other agreed methods.

4.2 ASSESSMENT CRITERIA

The main headings of the Marking Scheme are the Assessment Criteria. These headings are derived in conjunction with the Test Project. In some skill competitions the Assessment Criteria may be similar to the section headings in the Standards Specification; in others they may be totally different. There will normally be between five and nine Assessment Criteria. Whether or not the headings match, the Marking Scheme as a whole must reflect the weightings in the Standards Specification.

Assessment Criteria are created by the person(s) developing the Marking Scheme, who are free to define criteria that they consider most suited to the assessment and marking of the Test Project. Each Assessment Criterion is defined by a letter (A-I). It is advisable not to specify either the Assessment Criteria, or the allocation of marks, or the assessment methods, within this Technical Description.

The Mark Summary Form generated by the CIS will comprise a list of the Assessment Criteria.

The marks allocated to each Criterion will be calculated by the CIS. These will be the cumulative sum of marks given to each Aspect within that Assessment Criterion.

4.3 SUB CRITERIA

Each Assessment Criterion is divided into one or more Sub Criteria. Each Sub Criterion becomes the heading for a WorldSkills marking form. Each marking form (Sub Criterion) contains Aspects to be assessed and marked by measurement or judgement, or both measurement and judgement.

Each marking form (Sub Criterion) specified both the day on which it will be marked, and the identity of the marking team.

4.4 ASPECTS

Each Aspect defines, in detail, a single item to be assessed and marked together with the marks, or instructions for how the marks are to be awarded. Aspects are assessed either by measurement or judgement.

The marking form lists, in detail, every Aspect to be marked together with the mark allocated to.

The sum of the marks allocated to each Aspect must fall within the range of marks specified for that section of the skill in the Standards Specification. This will be displayed in the Mark Allocation Table of the CIS, in the following format, when the Marking Scheme is reviewed from C-8 weeks. (Section 4.1)

	CRITERIA								TOTAL MARKS PER SECTION	WSSS MARKS PER SECTION	VARIANCE	
	A	B	C	D	E	F	G	H				
STANDARDS SPECIFICATION SECTION	1	5.00							5.00	5.00	0.00	
	2		2.00				7.50		9.50	10.00	0.50	
	3							11.00	11.00	10.00	1.00	
	4			5.00					5.00	5.00	0.00	
	5				10.00	10.00	10.00		30.00	30.00	0.00	
	6		8.00	5.00				2.50	9.00	24.50	25.00	0.50
	7			10.00				5.00	15.00	15.00	0.00	
TOTAL MARKS	5.00	10.00	20.00	10.00	10.00	10.00	15.00	20.00	100.00	100.00	2.00	

4.5 ASSESSMENT AND MARKING

There is to be one marking team for each Sub Criterion, whether it is assessed and marked by judgement, measurement, or both. The same marking team must assess and mark all competitors, in all circumstances. The marking teams must be organized to ensure that there is no compatriot marking in any circumstances. (See 4.6.)

4.6 ASSESSMENT AND MARKING USING JUDGEMENT

Judgement uses a scale of 0-3. To apply the scale with rigour and consistency, judgement must be conducted using:

- benchmarks (criteria) for detailed guidance for each Aspect (in words, images, artefacts or separate guidance notes)
- the 0-3 scale to indicate:
 - 0: performance below industry standard
 - 1: performance meets industry standard
 - 2: performance meets and, in specific respects, exceeds industry standard
 - 3: performance wholly exceeds industry standard and is judged as excellent

Three Experts will judge each Aspect, with a fourth to coordinate the marking and acting as a judge to prevent compatriot marking.

4.7 ASSESSMENT AND MARKING USING MEASUREMENT

Three Experts will be used to assess each aspect. Unless otherwise stated only the maximum mark or zero will be awarded. Where they are used, the benchmarks for awarding partial marks will be clearly defined within the Aspect.

4.8 THE USE OF MEASUREMENT AND JUDGEMENT

Decisions regarding the selection of criteria and assessment methods will be made during the design of the competition through the Marking Scheme and Test Project.

4.9 COMPLETION OF SKILL ASSESSMENT SPECIFICATION

Module A – 3D CAD Design 100% measurement

A.1 Completeness of 3D drawings (measurement)

A.2 Compare the original solids to the designed solids by CAD system (measurement)

Module B – Preparation of drawings 100% measurement

B.1 Completeness of 2D drawings views and sections (measurement)

B.2 Dimension completed (measurement)

Module C – Modelling/Manufacturing 20% judgement and 80% measurement

C.1 Originality of design (judgement)

C.2 Functionality of design (judgement)

C.3 Conformity to specifications (measurement)

C.4 Conformity to specified dimensions (measurement)

C.5 Conformity to 2D and 3D drawings (measurement)

C.6 Conformity to 3D drawing (judgement)

Module D - Painting 100% judgement

D.1 Finish of the painted surface (judgement)

D.2 Attractive display of colours (judgement)

Measurement Marking

NOTE: Marks are calculated by CIS 'Ranged Score' calculations. Mark deductions are as a percentage of maximum mark

Lengths

- Tolerance of +/- 0.1 mm, deduct 0%
- Tolerance of +/- 0.15 mm, deduct 20%
- Tolerance of +/- 0.2 mm, deduct 40%
- Tolerance of +/- 0.25 mm, deduct 60%
- Tolerance of +/- 0.3 mm, deduct 80%
- Tolerance greater than +/- 0.3 mm, deduct 100%

Angles

- Tolerance +/- 0.5°, deduct 0%
- Tolerance +/- 1.0°, deduct 50%
- Tolerance greater than +/- 1.0°, deduct 100%

Plastic fillets and radii

- Tolerance +/- 0.5 mm, deduct 0%
- Tolerance +/- 1.0 mm, deduct 40%
- Tolerance +/- 1.5 mm, deduct 70%
- Tolerance greater than +/- 1.5 mm, deduct 100%

Minimum one fillet, radii and angle must be measured.

4.10 SKILL ASSESSMENT PROCEDURES

- Items to be assessed and the allocation of marks are decided by Experts at the Competition;
- A judgement form identical to the one used by Experts is provided to each Competitor to ensure transparency;
- The Chief Expert or Deputy Chief Expert divides all Experts into several marking teams. In such cases, WorldSkills experience at a previous Competition is taken into consideration as well as culture, language, and continent;
- If Experts have the possibility to measure the dimensions for measurement marking by a digital measuring machine, the Experts can decide and organize it at the Competition. In this case, the measurement will be done by a professional assistant who is familiar with it;
- When the judgement marking and measurement marking are performed on a module, the measurement marking should be performed first (every marking day);
- Progressive marking is used for each completed module.

5 THE TEST PROJECT

5.1 GENERAL NOTES

Sections 3 and 4 govern the development of the Test Project. These notes are supplementary.

Whether it is a single entity, or a series of stand-alone or connected modules, the Test Project will enable the assessment of the skills in each section of the WSSS.

The purpose of the Test Project is to provide full, balanced and authentic opportunities for assessment and marking across the Standards Specification, in conjunction with the Marking Scheme. The relationship between the Test Project, Marking Scheme and Standards Specification will be a key indicator of quality, as will be its relationship with actual work performance.

The Test Project will not cover areas outside the Standards Specification, or affect the balance of marks within the Standards Specification other than in the circumstances indicated by Section 2.

The Test Project will enable knowledge and understanding to be assessed solely through their applications within practical work.

The Test Project will not assess knowledge of WorldSkills rules and regulations.

This Technical Description will note any issues that affect the Test Project's capacity to support the full range of assessment relative to the Standards Specification. Section 2.2 refers.

5.2 FORMAT/STRUCTURE OF THE TEST PROJECT

The total time for the Test Project has to be between the minimum and maximum time according the WSI rule.

- Module A: Designing the given Test Project from the 2D drawing by using 3D CAD;
- Module B: Make a 2D drawing based on their own 3D CAD from module A;
- Module C: Manufacturing the prototype model(s) from their own 2D drawing (Module B);
- Module D: Finishing surfaces painting and decorating.

5.3 TEST PROJECT DESIGN REQUIREMENTS

The Test Project can be any new products.

Competitors are given a 2D drawing and document of instruction to do all modules.

The Test Project can have minor product details for a modification.

The drawing of the Test Project need to include at least 50 specified dimensions.

5.4 TEST PROJECT DEVELOPMENT

The Test Project MUST be submitted using the templates provided by WorldSkills International (www.worldskills.org/expertcentre). Use the Word template for text documents and DWG template for drawings.

5.4.1 Who develops the Test Project or modules

The Test Project/modules are developed by all Experts. Only one Test Project proposal is allowed per Expert.

5.4.1 How and where is the Test Project or modules developed

The Test Project is developed by individual Experts.

Three months before the Competition the Experts have to submit their Test Project proposal to the Director of Skills Competition.

Two months before the Competition WSI will upload all Test Project proposals in the Discussion Forum for all Experts to download prior to the voting.

5.4.2 When is the Test Project developed

The Test Project is developed according to the following timeline:

TIME	ACTIVITY
Four (4) months before the Competition	The Test Projects are sent to the Director of Skills Competitions
Three (3) months before the Competition	The Director of Skills Competitions uploads the proposed Test Projects in to the Experts forum to download.
Between two (2) and one (1) month before the Competition	All Experts can vote to select which of these Test Project proposals would be challenging and good enough for the Competition.
One (1) month before the Competition	Three Test Projects receiving the maximum number of votes will be shortlisted and the actual Test Project is randomly selected from the Test Project pool by the Director of Skills Competitions. The randomly selected Test Project is sent to an External Designer to make the 30% change.
C-4 at the Competition	The Director of Skills Competitions announces the selected Test Project to the Experts and hands over the updated drawings to the Chief Expert. All other remaining qualified Test Project proposals will be valid for the next Competition and will go into the pool together with the new qualified Test Project proposals from next competition.

5.5 TEST PROJECT VALIDATION

Upon completion of the Test Project modules, all Experts must confirm that Competitors can complete the Test Project modules by using the materials and equipment provided and expected level of knowledge.

5.6 TEST PROJECT SELECTION

The Test Project will be randomly selected by the Director of Skills Competitions from all qualified Test Project proposals by vote of Experts on the Discussion Forum between one and two months before the Competition.

5.7 TEST PROJECT CIRCULATION

The Test Project is circulated via the website as follows:

The Test Project is not circulated.

5.8 TEST PROJECT COORDINATION (PREPARATION FOR COMPETITION)

Coordination of the Test Project will be undertaken by the Chief Expert. Coordination of the 30% change will be undertaken by the Director of Skills Competitions.

5.9 TEST PROJECT CHANGE AT THE COMPETITION

The randomly selected Test Project is sent to an Independent Designer to make the 30% change.

5.10 MATERIAL OR MANUFACTURER SPECIFICATIONS

Specific material and/or manufacturer specifications required to allow the Competitor to complete the Test Project will be supplied by the Competition Organizer and are available from www.worldskills.org/infrastructure located in the Expert Centre.

The Competition Organizer informs Experts of material specifications required for the Test Project through the Infrastructure List provided by WorldSkills International six months prior to the Competition.

6 SKILL MANAGEMENT AND COMMUNICATION

6.1 DISCUSSION FORUM

Prior to the Competition, all discussion, communication, collaboration, and decision making regarding the skill competition must take place on the skill specific Discussion Forum (<http://forums.worldskills.org>). Skill related decisions and communication are only valid if they take place on the forum. The Chief Expert (or an Expert nominated by the Chief Expert) will be the moderator for this Forum. Refer to Competition Rules for the timeline of communication and competition development requirements.

6.2 COMPETITOR INFORMATION

All information for registered Competitors is available from the Competitor Centre (www.worldskills.org/competitorcentre).

This information includes:

- Competition Rules
- Technical Descriptions
- Marking Schemes
- Test Projects
- Infrastructure List
- WorldSkills Health, Safety, and Environment Policy and Regulations
- Other Competition-related information

6.3 TEST PROJECTS [AND MARKING SCHEMES]

Circulated Test Projects will be available from www.worldskills.org/testprojects and the Competitor Centre (www.worldskills.org/competitorcentre).

6.4 DAY-TO-DAY MANAGEMENT

The day-to-day management of the skill during the Competition is defined in the Skill Management Plan that is created by the Skill Management Team led by the Skill Competition Manager. The Skill Management Team comprises the Skill Competition Manager, Chief Expert and Deputy Chief Expert. The Skill Management Plan is progressively developed in the six months prior to the Competition and finalized at the Competition by agreement of the Experts. The Skill Management Plan can be viewed in the Expert Centre (www.worldskills.org/expertcentre).

7 SKILL-SPECIFIC SAFETY REQUIREMENTS

Refer to Host country or region WorldSkills Health, Safety, and Environment Policy and Regulations for Host country or region regulations.

- No pneumatic tools are allowed for creative modelling;
- Only electric hand tools with dust extractors are allowed, if this item is not in the Infrastructure List.

8 MATERIALS AND EQUIPMENT

8.1 INFRASTRUCTURE LIST

The Infrastructure List details all equipment, materials and facilities provided by the Competition Organizer.

The Infrastructure List is available at www.worldskills.org/infrastructure.

The Infrastructure List specifies the items and quantities requested by the Experts for the next Competition. The Competition Organizer will progressively update the Infrastructure List specifying the actual quantity, type, brand, and model of the items. Items supplied by the Competition Organizer are shown in a separate column.

At each Competition, the Experts must review and update the Infrastructure List in preparation for the next Competition. Experts must advise the Director of Skills Competitions of any increases in space and/or equipment.

At each Competition, the Technical Observer must audit the Infrastructure List that was used at that Competition.

The Infrastructure List does not include items that Competitors and/or Experts are required to bring and items that Competitors are not allowed to bring – they are specified below.

8.2 COMPETITOR'S TOOLBOX

The maximum external size of the toolbox is 0.5m³.

8.3 MATERIALS, EQUIPMENT, AND TOOLS SUPPLIED BY COMPETITORS IN THEIR TOOLBOX

Individual Competitors must bring equipment such as shoes, work clothes. Competitors must bring only their own hand tools. A tool list is provided below for reference purposes.

ITEM	TYPE	QTY	PICTURE
Space Mouse and Keyboard: *Required software will be installed by the CAD assistant	Un	01	
Hand tools for processing			
Wood Chisels	Set	01	
Wood Planes	Set	01	

ITEM	TYPE	QTY	PICTURE
Cutting tools such as Stiletto and Scissors	Un	02	
Files	Set	01	
Electric tools for processing (allowed only with dust extractor), if this item is not in the Infrastructure List.	Un	01	
Measuring tools			
Scale rule – 150 and 300 mm	Un	01	
Vernier caliper – 150 and 300 mm	Un	02	
Depth gage – 150 mm	Un	01	
Micrometer – 0 to 25 mm; 25 to 50 mm and 50 to 75 mm	Un	03	
Gage blocks rectangular – Steel - 56 pc	Set	01	
Dial indicator – 10 mm; 0,01 mm	Un	01	
Compass of steel (Spring Divider) – 150 mm	Un	01	

ITEM	TYPE	QTY	PICTURE
Radius gage – 1 to 7 mm; 7.5 to 15 mm and 15.5 to 25 mm	Un	03	
Universal Bevel Protractor – 360°	Un	01	
Resin material tools			
Spatulas	Set	01	
Painting tools			
Masking tape *if this item is not in the Infrastructure List	Un	01	
A gas mask that conforms to the Health, Safety, and Environment standard * if this item is not in the Infrastructure List	Set	01	

8.4 MATERIALS, EQUIPMENT AND TOOLS SUPPLIED BY EXPERTS

Not allowed.

8.5 MATERIALS AND EQUIPMENT PROHIBITED IN THE SKILL AREA

CAD systems and software other than those provided at the Competition.

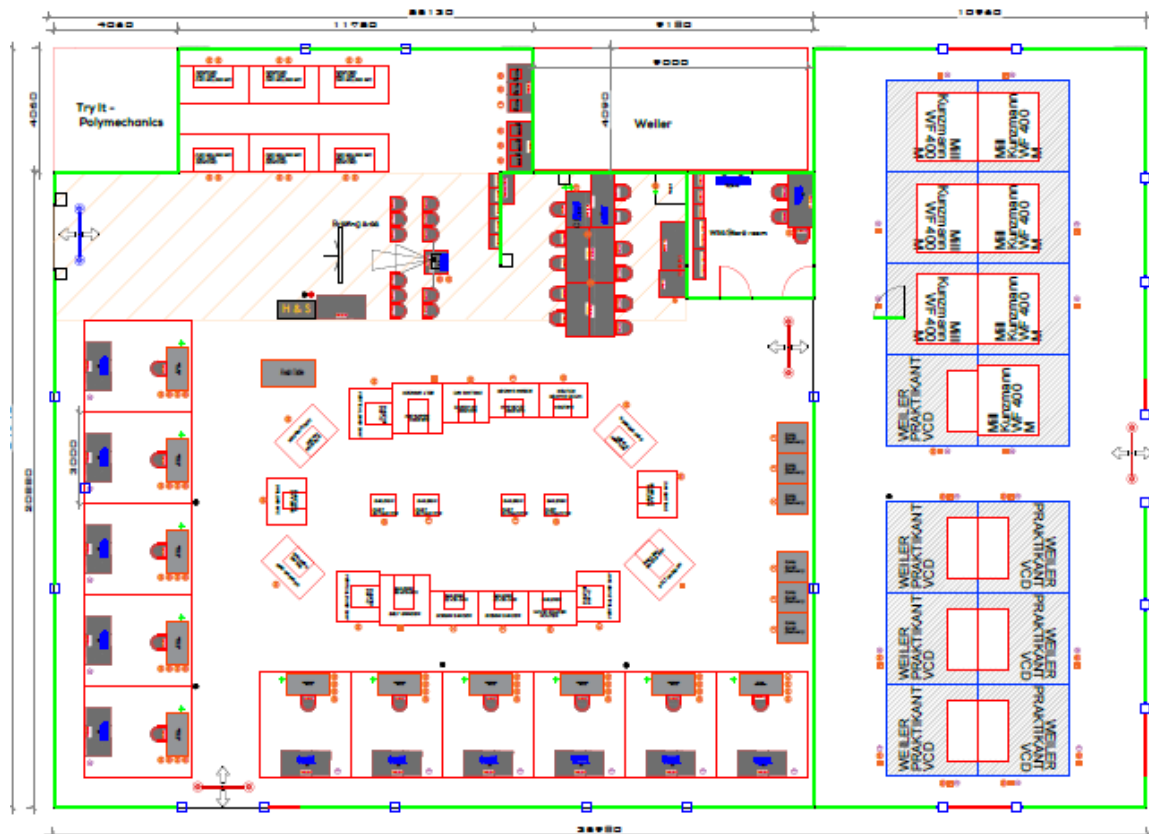
Computerized machines and tools other than those provided at the Competition.

Already prepared parts and tools cannot be used for the Test Project to manufacture the Test Project.

8.6 PROPOSED WORKSHOP AND WORKSTATION LAYOUTS

Workshop layouts from previous competitions are available at www.worldskills.org/sitelayout.

Example workshop layout:



9 SKILL-SPECIFIC RULES

Skill-specific rules cannot contradict or take priority over the Competition Rules. They do provide specific details and clarity in areas that may vary from skill competition to skill competition. This includes but is not limited to personal IT equipment, data storage devices, internet access, procedures and work flow, and documentation management and distribution.

TOPIC/TASK	SKILL-SPECIFIC RULE
Use of technology – USB, memory sticks	<ul style="list-style-type: none"> Competitors, Experts, and Interpreters are not allowed to bring memory sticks into the workshop. The Chief and Deputy Chief Expert is exempt from this rule.
Use of technology – personal laptops, tablets and mobile phones	<ul style="list-style-type: none"> Competitors, Experts, and Interpreters are not allowed to bring personal laptops, tablets, personal photo and video taking devices and mobile phones into the workshop. The Chief and Deputy Chief Expert is exempt from this rule.
Use of technology – personal photo and video taking devices	<ul style="list-style-type: none"> Competitors, Experts, and Interpreters are allowed to use personal photo and video taking devices in the workshop from C1 until C+1.
Templates, aids, etc.	<ul style="list-style-type: none"> Competitors are not permitted to bring or use own templates or aids at any time.
Drawings, recording information	<ul style="list-style-type: none"> Competitors, Experts and Interpreters are not permitted to bring drawings or prepared information into the workshop from C-4 until C+1.
Test Project and Assessment	<ul style="list-style-type: none"> Competitors, Experts, and Interpreters are not permitted to take Test Project drawings or Marking Scheme out of the workshop from C-4 until the conclusion of the Competition.
Equipment failure	<ul style="list-style-type: none"> If equipment or tools which are brought by the Competitor fail, there no extra time will be allowed.
Health, Safety, and Environment	<ul style="list-style-type: none"> Refer to the WorldSkills Health, Safety, and Environment policy and guidelines document.

10 VISITOR AND MEDIA ENGAGEMENT

To maximize visitor and media engagement the following ideas may be considered:

- Try-A-Skill;
- Display screens;
- Test Project descriptions;
- Career opportunities;
- Daily reporting of competition status;
- Live demonstration while machining;
- 3D Print technology demonstration;
- Digital measuring demonstration by supplier.

11 SUSTAINABILITY

This skill competition will focus on the sustainable practices below:

- Recycling;
- Use of 'green' materials.

12 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 *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

The following table indicates which organizations were approached and provided valuable feedback for the Description of the Associated Role and WorldSkills Standards Specification in place for WorldSkills Kazan 2019.

ORGANIZATION	CONTACT NAME
HFM Modell- und Formenbau GmbH (Germany)	Horst Fularczyk, CEO
Habich & Martin GmbH Modell und Formenbau	Peter Habich, CEO
Zech und Waibel Modellbau GbR (Europe)	Johannes Zech, Owner
Autodesk	Mike Westlake, UKI & CEE Manager