

Technical Description

3D Digital Game Art

Creative Arts and Fashion



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.

The Technical Description consists of the following:

1 INTRODUCTION	2
2 THE WORLDSKILLS STANDARDS SPECIFICATION (WSSS)	4
3 THE ASSESSMENT STRATEGY AND SPECIFICATION	9
4 THE MARKING SCHEME	10
5 THE TEST PROJECT	13
6 SKILL MANAGEMENT AND COMMUNICATION	15
7 SKILL-SPECIFIC SAFETY REQUIREMENTS	16
8 MATERIALS AND EQUIPMENT	17
9 SKILL-SPECIFIC RULES	19
10 VISITOR AND MEDIA ENGAGEMENT	21
11 SUSTAINABILITY	22
12 REFERENCES FOR INDUSTRY CONSULTATION	23

Effective 22.08.18



Stefan Praschl
Chair of the Competitions Committee



Michael Fung
Vice Chair of the Competitions Committee

© WorldSkills International (WSI) reserves all rights in documents developed for or on behalf of WSI, including translation and electronic distribution. This material may be reproduced for non-commercial vocational and educational purposes provided that the WorldSkills logo and copyright notice are left in place.

1 INTRODUCTION

1.1 NAME AND DESCRIPTION OF THE SKILL COMPETITION

1.1.1 The name of the skill competition is

3D Digital Game Art

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

The games development sector comprises three occupations or work roles: the designer, the artist, and the programmer. The 3D Digital Game Artist takes a designer's brief and, through a combination of conceptualization, creativity, selectivity, technical, and specialist skills, completes the brief to the satisfaction of the client.

The 3D Digital Game Artist receives, conceptualizes, and interprets the design brief on the basis of their market knowledge and skill sets, and the given scope and limits of the brief. The skills required of the 3D Digital Game Artist can be broken down further into 2D concept art, texture painting, 3D modelling, rigging, and animating. This could be a process for one artist or a team that has specialized in each area of the pipeline process.

After interpreting the brief, the 3D Digital Game Artist must produce a 2D digital concept of the required assets for the game, which could include objects, characters, and environments. The skills required at this stage will be in developing good silhouettes so that designs can be recognized immediately without detail, to produce greyscale values that highlight the important details of an asset, to define a colour scheme based on their knowledge of colour balance, saturation, and mixing.

The 3D Digital Game Artist must then work from the concept art to produce a 3D mesh of the asset that employs the skills of good geometry decisions, triangle count, making good decisions in symmetry and silhouette, and modelling a good edgeflow. UV unwrapping must then be undertaken to flatten a 3D model into a 2D set of shells that a texture can be painted onto. Good UV unwrapping requires the ability to assign enough 3D mesh from the model to pixels on the texture, called texel density for the resulting model to render enough detail. A good artist will make the most of mirroring the UVs so that similar parts of a model will use the same parts of a texture. Space is important, and should not be wasted, so the placement of the UV shells is a meticulous job, however artefacts must also take into account the bleeding effect of colour on smaller versions of textures dependent on hardware, so shells should be grouped by base colour.

The textures are then produced to create materials that may be applied to the 3D model, taking into account the colours, specularities, and opacity of various parts of a model. Some textures are painted by hand, some require the use of photographic references and others require a digital process to calculate ambient occlusion and normal maps for shadows and detail.

After the UV unwrap and the textures have been painted successfully onto the model, it may be rigged with bones in the 3D software in order to animate it either in the 3D software or the games engine.

An artist often works with a team of other artists led by an Art Lead or Art Director. In smaller companies, the artist will work closely with the programmer and designer.

Depending on the size of the company, a large team of artists may work in an office and is likely to be open plan for creative involvement across the team. Sometimes an artist must work in isolation on strictly confidential assets in a game.

The sector has demonstrated tremendous growth in the last thirty years and the skills and software changes constantly, however the core pipeline has remained relatively constant. The artist's role has evolved and split into various specialisms, yet all require an appreciation of aesthetics, colour, structure and form as well as movement. More recent developments in virtual and augmented realities have led to a strong need for artists who can produce assets that operate in these 3D environments. The best artists are able to lead art teams solving visual errors and producing assets that operate on the fringes of the available technology to achieve the most absorbing experiences possible in a videogame.

1.1.3 Number of Competitors per team

3D Digital Game Art 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"> • Regulations and requirements for safe working practices • Terminology specific to the sector and role • How to plan for and manage time and tasks • Saving regular backups of work to avoid file corruption • File management and structure for interpretation by the team and for optimal use transferring between hardware 	
	<p>The individual shall be able to:</p> <ul style="list-style-type: none"> • Conform to professional standards at all times • Take responsibility for all production processes • Set-up and maintain file structures and naming conventions • Manage their own time • Recover from setbacks • Communicate and work with others for the common benefit 	
2	Interpretation of the design brief	5
	<p>The individual needs to know and understand:</p> <ul style="list-style-type: none"> • The 3D digital game market • Art styles and how to read and work to a particular set style • Platform specifications and the restrictions and opportunity they afford to polygon counts and texture sizes. • Asset list priorities to determine what are the most important assets to spend time on and what can utilise duplication/re-use. 	
	<p>The individual shall be able to:</p> <ul style="list-style-type: none"> • Conform to the art style, colours and themes • Select an appropriate approach based on platform, genre, audience and game type. • Produce an asset list and determine timescales, polycounts, and texture sizes 	
3	Concept art	13
	<p>The individual needs to know and understand:</p> <ul style="list-style-type: none"> • Silhouette of object/s and character/s to portray shape, mood, mass, and movement. • Values of greyscale to draw viewers' attention to important aspects of the asset • Colour theory for choosing base colours, secondary, mixing, and balance. 	

	<p>The individual shall be able to:</p> <ul style="list-style-type: none"> Digitally paint demonstrating form, line, shading, perspective, proportion, light, and shadow. Use digital techniques to produce appropriate effects and make efficient use of time Choose appropriate software to paint the concept art pieces in with maximum production in the swiftest time Review and select each piece of concept art to inform the look of the finished 3D model/s 	
4	3D Modelling	28
	<p>The individual needs to know and understand:</p> <ul style="list-style-type: none"> Geometric principles in determining how to build the asset/s Symmetry in creating a base model that allows for efficient use of material/s later on in the process. Polygon counts that are proportional to detail and focus on the asset/s. Edgeflow that evenly distributes vertex points over the model/s for a balanced texel density and even silhouette. 	
	<p>The individual shall be able to:</p> <ul style="list-style-type: none"> Select an appropriate piece of 3D modelling software to begin the model. E.g. 3DS Max or Maya for hard surface modelling, or a sculpting tool like ZBrush for organic sculpts. Utilise skills in sculpting, edge modelling, or box modelling to produce the basic form of the model/s Use tools and modifiers to create further details on the model/s Constantly review the model from all angles to determine refinements, improvements, and additional detail Use optimization techniques on the model/s 	
5	UV unwrapping	10
	<p>The individual needs to know and understand:</p> <ul style="list-style-type: none"> Mirroring shells to maximize texture space and texel density. Proportions equitable by important sections of the asset. Spacing of shells that maximize the usage of the texture sheet but avoid colour bleeding between shells Grouping of shells by colour to further avoid colour bleeding 	
	<p>The individual shall be able to:</p> <ul style="list-style-type: none"> Use UV unwrapping tools to project maps on to all the surfaces of the 3D asset Separate the surface into appropriate shells to flatten over the UV space. Organize the shells to make the most of space Group shells with similar colours together Export the UV coordinates to a texture tool or painting software Bake UV from the 3D asset 	

6	Texturing	22
	<p>The individual needs to know and understand:</p> <ul style="list-style-type: none"> • Painting colour and details to represent a variety of physical materials like wood, plastic, metal, fabrics, etc. • Diffuse colour maps that represent base colour of a material • Specular maps that represent the shine in order to produce realistic metal, plastic, or wet and oily surfaces. • Opacity maps that use alpha maps to produce complex objects on a 3D flat plane, e.g. grass, hair, branches, wire. • Normal maps and producing high resolution models to project using cages onto low resolution models. • Ambient occlusion that uses the 3D information to render shadows onto a flat texture based on proximity of polygons 	
	<p>The individual shall be able to:</p> <ul style="list-style-type: none"> • Select an appropriate piece of software to produce textures and materials e.g. Photoshop and Substance Designer etc. • Paint a variety of physical materials and adapt to the art style set out in the brief (e.g. hand-painted and/or PBR etc) • Paint or engineer a specular map for controlling shine and glossiness of a surface • Paint an opacity map (if required) to handle complex objects or sections of an asset • Export a variety of maps (normal, specular, ambient occlusion etc) from an appropriate piece of software and import into the preferred 3D software 	
7	Rigging and Animation	12
	<p>The individual needs to know and understand:</p> <ul style="list-style-type: none"> • That bones are created to move 3D models in a games engine and can be built in chains of hierarchy to affect parts of a 3D model dynamically. • That forward kinematics is a top down structure where parents move each child. Inverse kinematics is a bottom up structure that allows the child to move the parent objects all the way up the chain. • The tool to set up appropriate IK chains with relevant constraints. • Skinning a model so that each bone is given influence over vertex points on the 3D mesh, either absolutely, or in combination with other bones for organic motion. • Key frame animation to allow animators to place fixed points of movement, rotation, and scale across a timeline for the software to interpolate motion between them • How to make animation into the asset 	
	<p>The individual shall be able to:</p> <ul style="list-style-type: none"> • Create an appropriate bone structure to form a working rig for the in-game asset. • Set up a parent child structure for FK or IK chain. • Skin the mesh and paint how the bones influence the 3D model. • Set simple animation keys to test the motion of the asset in an engine. 	

8	Export to game engine	5
	<p>The individual needs to know and understand</p> <ul style="list-style-type: none"> • How to utilize material shaders and lighting to represent the asset that should be posed by the artist to show off the asset's most important aspects. • Exported files must be set up correctly and in the appropriate format to be imported to engine. • Importing to engine requires varied approaches based on the game engine being used, and may require some set up in the engine. • Testing the asset in the engine should encompass any animation and deformation, as well as checking textures and lighting apply in the correct way intended. 	
	<p>The individual shall be able to:</p> <ul style="list-style-type: none"> • Choose and use a renderer, pose the object and select appropriate lighting and settings to highlight the best qualities of the asset. • Export 3D models and rig/animation into a games engine. • Select an appropriate game engine and test the asset for model, UV, and deformation errors. 	
	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 it.

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	WSS 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	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				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

It is anticipated that the criteria will follow the WSSS sections.

4.10 SKILL ASSESSMENT PROCEDURES

The Test Project will be externally designed and developed. The Marking Scheme will be designed and developed by the SMT in collaboration with the Experts.

Assessment will be based on process and outcome, using measurement and judgement.

There will be daily marking to the extent that does not limit Competitors' reasonable choice of timing and sequence.

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 2.1 refers.

5.2 FORMAT/STRUCTURE OF THE TEST PROJECT

The Test Project will comprise a design brief that can reasonably be expected to be completed by one Competitor within 22 hours. The theme for the design brief will relate to the values and concerns of the Host country and WorldSkills.

5.3 TEST PROJECT DESIGN REQUIREMENTS

The Test Project will be developed within the assessment criteria framework given in paragraph 4.7.

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 for 3D Digital Game Art is a single Test Project. The Test Project will be designed and developed externally in conjunction with representatives of the sector trading in the general area of the Host Member.

5.4.2 How and where is the Test Project or modules developed

The external designer will not disclose the Test Project until C1. However, advice on the scope and limits of software will be circulated to Members in advance, to enable all Competitors to prepare accordingly.

5.4.3 When is the Test Project developed

The Marking Scheme and Test Project will be sent to the Director of Skills Competitions for quality assurance three months before the competition. It will not be disclosed to either Competitors or Experts prior to C1.

TIMELINE	ACTIVITY
Three (3) months prior to the competition	The external designer submits the completed Test Project and SMT submits the completed Marking Scheme to the Director or Skills Competitions for quality assurance
At the competition	The Test Project is presented to both the Competitors and Experts during the briefing on C1

5.5 TEST PROJECT VALIDATION

The Test Project shall be validated by the Director of Skill Competitions in conjunction with an industry professional prior to the competition. Validation will ensure that

- the project can be completed in 22 hours
- the project can be completed with the provided materials and software
- the marking scheme is appropriately developed
- the Test Project meets the Technical Description

5.6 TEST PROJECT SELECTION

The Test Project will be as designed and developed by the independent designer, subject only to validation by the Director of Skill Competitions.

5.7 TEST PROJECT CIRCULATION

The Test Project is circulated via the website as follows:

Not circulated

5.8 TEST PROJECT COORDINATION (PREPARATION FOR COMPETITION)

The Test Project development is coordinated by the Director of Skills Competitions and the Chief Expert.

5.9 TEST PROJECT CHANGE AT THE COMPETITION

Since the Marking Scheme and Test Project will remain confidential, there will not be a change at the Competition.

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.

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
- Mark Summary Form (where applicable)
- Test Projects (where applicable)
- 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 WorldSkills Health, Safety, and Environment Policy and Regulations for Host country or region regulations.

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

Competitors are not required to bring a toolbox.

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

Competitors may supply the following:

- Pantone swatches or similar swatch books;
- Sketching paper and pens;
- Calibration charts;
- Keyboard in own language.

8.4 MATERIALS, EQUIPMENT, AND TOOLS SUPPLIED BY EXPERTS

Experts are not required to supply any materials, equipment, or tools.

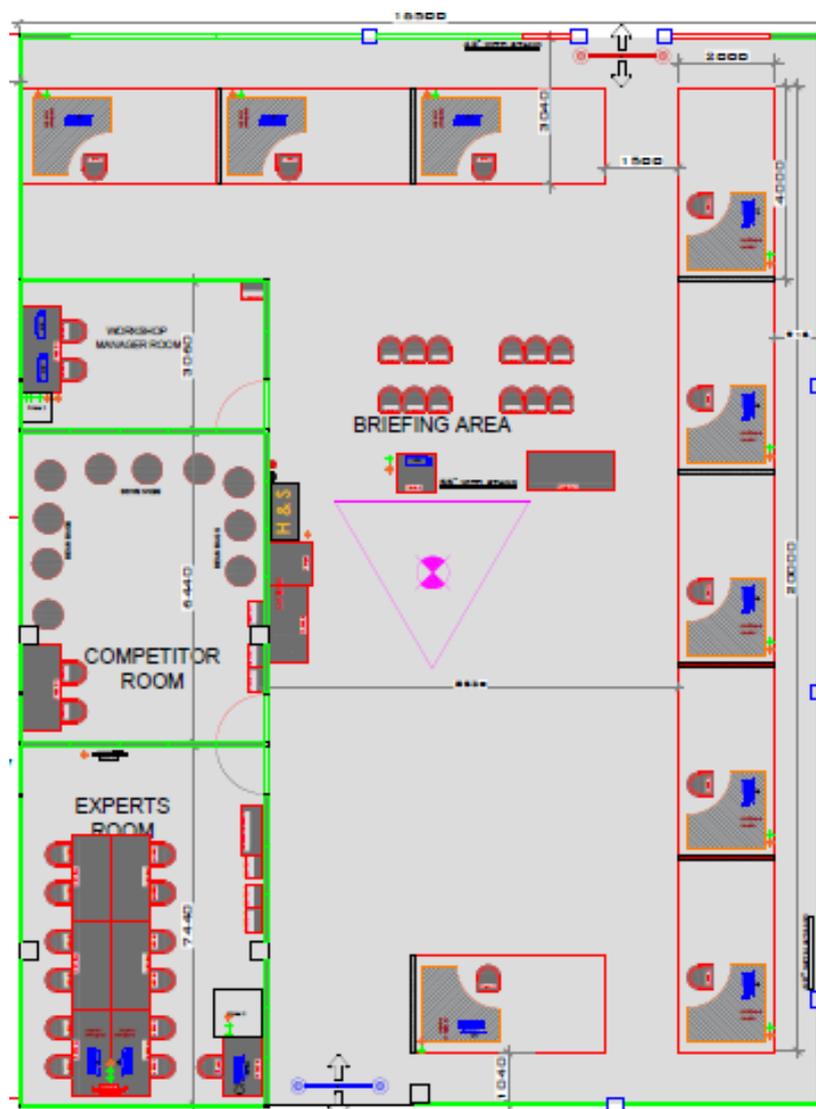
8.5 MATERIALS AND EQUIPMENT PROHIBITED IN THE SKILL AREA

- Extra RAM;
- Extra hard drives;
- Books with design references;
- Images/clip art;
- Mobile phone;
- Tablet equipment;
- Photo/video equipment;
- Memory stick;
- Equipment with internal memory storage device

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 must not bring any form of digital storage (ram/hard drive) into the workshop.
Use of technology – personal laptops, tablets and mobile phones	<ul style="list-style-type: none"> Experts and Interpreters are allowed to use personal laptops, tablets and mobile phones in the Expert room only. Personal tablets and laptops brought to the competition must remain locked in the workshop until the conclusion of competition on C4. Competitors are not allowed to use personal laptops, tablets, and mobile phones.
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 at the conclusion of the competition only on C4.
Use of technology – other devices	<ul style="list-style-type: none"> Competitors, Experts and Interpreters must not bring a keyboard or mouse with internal memory. Competitors may use an MP3 player, but the device must not have Wi-Fi/Internet access capabilities.
Tools/infrastructure	<ul style="list-style-type: none"> Competitors are not allowed to access the internet while in the workshop. Competitors are not allowed the following in the competition area: <ul style="list-style-type: none"> Books with design references Images/clip art Spray adhesive (or any other adhesive that does not comply to the safety standards) Mounting board, guillotine or cutting mat (or any other tool deemed to give the Competitor an unfair advantage).
Drawings, recording information	<ul style="list-style-type: none"> Competitors are not permitted to bring notes into the workshop under any circumstances. All notes made at the Competitor workstation must remain on the Competitors desk at all times. No notes may be taken outside of the workshop until the competition has concluded on C4.
Equipment failure	<ul style="list-style-type: none"> In the occurrence of equipment failure Competitors must notify Experts immediately by raising their hand. Experts will take note of the time that the Competitor is not able to make use of their equipment. Any time lost due to equipment failure will be provided to the Competitor at the end of the standard Module time. No additional time will be granted for work not saved prior to the equipment failure.

TOPIC/TASK	SKILL-SPECIFIC RULE
Health, Safety, and Environment	<ul style="list-style-type: none"> Refer to the WorldSkills Health, Safety, and Environment policy and guidelines document.
Other	<ul style="list-style-type: none"> Experts must not attend a Competitor workstation without their marking group. Access to the compatriot Competitor workstation is strictly prohibited. The Workshop Manager (or Workshop Manager Assistant) is the only person allowed to load any software/devices onto the Competitor's competition computer. Test Projects are not circulated and distribution of the Test Project before the competition to Competitors is prohibited.

10 VISITOR AND MEDIA ENGAGEMENT

Following is a list of possible ideas to maximize visitor and media engagement:

- Try-A-Skill;
- Display screens showing a combination of Competitor profile and screen capture of current work;
- Test Project descriptions;
- Enhanced understanding of Competitor activity;
- Career opportunities;
- People's Choice Award

11 SUSTAINABILITY

This skill competition will focus on the sustainable practices below:

- Recycling - No printing for Competitor workstations;
- Use of 'green' materials;
- Use of completed Test Projects after Competition;
- Limit the amount of software to be installed on Competitor workstations;
- Open source software

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/)