worldskills

Technical Description

Welding

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

1.1 Name and description of the skill competition

1.1.1 The name of the skill competition is

Welding

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

Welding is a critical process that is controlled by both national and international standards and specifications to regulate the quality of the deposited weld metal and the skill of the welder.

A welder prepares and joins a range of metals and metallic alloys using mainly processes where an electric arc is the heat source. Electric arc processes utilize a gas shield or a flux to protect the molten weld area from contamination by the surrounding atmosphere. A welder needs to be able to interpret engineering drawings, standards and symbols and correctly translate these requirements into accurate structures and fabrications.

Welders need to have a thorough knowledge and understanding of safe working practices, personal protection equipment and the hazards and practices associated with the welding and fabrication industries. They need to gain specific knowledge of a wide range of welding equipment and processes as well as an understanding of how welding will affect the structure of the material being welded. They need to be familiar with electricity and how it is utilized for welding.

A welder prepares, assembles and joins a wide range of metals and metal alloys using various welding processes including manual metal arc welding, shielded metal arc welding, metal arc gas shielded welding, gas metal arc welding, tungsten arc gas shielded welding, gas tungsten arc welding, and flux cored arc welding. A welder will use mainly processes where the heat utilized for welding will be an electric arc to join a range of materials including the commonly joined and fabricated materials – carbon steel, stainless steels, aluminium and copper and their associated alloys. They must be able to select the correct equipment, process variables, and welding technique, depending upon the material being joined.

Welders may use thermal cutting processes and should be able to identify the correct preparation for joining as applied to the type, thickness and intended use of the joint. They use grinding and cutting equipment to prepare welded joints. Modern methods of joining, as well as those noted above, include mechanized processes such as submerged arc, plasma arc, stud welding, and laser welding.

Welders join sections, pipe and plate and fabricate large and small pressure vessels. A welder can work in a unit or factory which produces fabrications and/or structures for industries as diverse as civil engineering, mechanical engineering, transport, marine engineering, construction, service, and leisure industries. Welders also work on site preparation, construction, and the repair and maintenance of structures. A welder can work in many locations and situations, ranging from a bench in a factory, to shipyards, power stations and off-shore structures. Welders also work in engineering, construction, power generating, and petro-chemical plants. The working environment may include hazards such as being off-shore, with extreme weather conditions and also in confined spaces where access to the joint to be welded is restricted.

The modern welder may specialize in one or a number of welding processes and environments. They may also be asked to work on exotic alloys such as duplex and super duplex stainless steels and cupronickels. Welders are required to carry out the finest work where faults and failure may have the most serious consequences in terms of cost, safety, and environmental damage.

1.1.3 Number of Competitors per team

Welding 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 – Code of Ethics and Conduct
- WSI – Competition Rules
- WSI – WorldSkills Occupational Standards framework
- WSI – WorldSkills Assessment Strategy
- WSI online resources as indicated in this document
- WorldSkills Health, Safety, and Environment Policy and Regulations
- WorldSkills Standards and Assessment Guide (skill-specific)

- ISO 5817-Welding - Fusion-welded joints in steel, nickel, titanium and their alloys
- ISO 9606-Qualification testing of welders Part 1: steels
- ISO 10042-Welding - Arc-welded joints in Aluminium and it's alloys
- ISO 9017-Destructive tests on welds in metallic materials- fracture tests
- ISO 15608-Welding - Guidelines for metallic materials grouping system.
- ISO 17635 - Non-destructive testing of welds – General rules for metallic materials
- ISO 10025 - Hot rolled products of structural steels. General Technical delivery conditions
- ISO 2553-Welding and allied processes – Symbolic representation on drawings – Welded joints
- ISO 9606-2 - Qualification testing of welders Part 2: Qualification Test of Welders—Fusion Welding-Part 2: Aluminium and Aluminium Alloys
- AWS A2.4-Standard Symbols for welding Brazing, and Non-Destructive Examination.
- AWS A3.0-Standard Welding Terms and Definitions

Note: Where a conflict arises, the ISO standards shall have precedence. If no ISO standard is applicable, then the relevant AWS standard shall be used.

2 The WorldSkills Occupational Standards (WSOS)

2.1 General notes on the WSOS

The WSOS specifies the knowledge, understanding, skills, and capabilities that underpin international best practice in technical and vocational performance. These are both specific to an occupational role and also transversal. Together they 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).

The skill competition is intended to reflect international best practice as described by the WSOS, to the extent that it can. 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 and capabilities that are set out in the WorldSkills Occupational Standards. 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, if this does not distort the weightings assigned by the Standards.

2.2 WorldSkills Occupational Standards

Section		Relative importance (%)
1	**Work organization and management**	**10**
	The individual needs to know and understand: • The standards and legislation relating to the health, safety, security, and hygiene in the welding industry • The range, use and maintenance of personal protective equipment used in the industry for any given circumstances • The selection and use of safety equipment related to specific or hazardous tasks • ISO A and/or E (American and European) drawing representation • Technical terms and symbols used in drawings and plans • Terminology and safety data supplied by manufacturers • The requirements and effects of welding production for the environment and sustainability issues • Basic mathematical manipulation and unit conversion • Geometrical principles, techniques, and calculations	

Section		Relative importance (%)
	• Time management	
	The individual shall be able to: • Work safely with regard to themselves and others • Select, wear, and maintain PPE as required • Recognize hazardous situations and take appropriate actions with regard to their own and others' safety • Follow correct procedural processes when working in hazardous environments • Locate and identify dimensions and weld symbols • Adhere to manufacturers' safety data sheets • Maintain a clean working environment • Complete work within agreed timescales • Make essential connections for specific welding procedures • problem solve efficiently • take account of the physical and mental demand of the tasks • Use hand and eye coordination with precision • Utilize fume extraction systems efficiently to remove emissions • Create efficient work practices to eliminate waste	
2	**Preparation and assembly techniques**	**10**
	The individual needs to know and understand: • The interpretation of fabrication or engineering drawings and weld symbols • The classification and specific uses of welding consumables including: ◦ Coding and designation of welding rods ◦ Diameters and specific use of welding wire ◦ Choice and preparation of welding electrodes • How surface contamination can influence the finished weld characteristics • The correct machine settings to be aligned to: ◦ Welding polarity ◦ Welding position ◦ Material ◦ Material thickness ◦ Filler material and feed speed • Any fine adjustments needed to machine hardware, TIG electrode shape, wire type and diameter etc. • The methods of edge preparation to align with joint profile, strength, and material • Methods of distortion control in steels, alloys, and aluminium	
	The individual shall be able to: • Set up welding equipment to manufacturers' specifications including (but not limited to) ◦ Welding polarity	

Section		Relative importance (%)
	◦ Welding amperage ◦ Welding voltage ◦ Wire feed speed ◦ Travel speed ◦ Travel/electrode angles ◦ Mode of metal transfer • Prepare material edges in line with specifications and drawing requirements • Set up and operate appropriate controls to minimize and correct distortion • Carry out appropriate procedures to control heat input	
3	**Welding materials**	**10**
	The individual needs to know and understand: • The mechanical and physical properties of: ◦ Carbon steels ◦ Aluminium and its alloys ◦ Stainless steels • Correct the alignment of process with the material being used • The selection of welding consumables • The correct storage and handling of welding consumables • Terminology, characteristics, and safe use of welding and purging gases • The effects of welding on the structure of the material	
	The individual shall be able to: • Use materials with consideration to their mechanical and physical properties • Store welding consumables correctly with reference to type, use and safety considerations • Select and prepare materials with reference to drawing material list • Select methods used in shielding the weld area from contamination • Select gasses used for shielding and purging	
4	**SMAW (111) and GMAW (135) Process**	**25**
	The individual needs to know and understand: • Drawing weld symbol interpretation • Weld positions, weld angles and travel speeds • The techniques for efficient stops/starts • The techniques utilised to deposit single sided root penetration welds • The techniques utilised to deposit defect free butt and fillet welds	

Section		Relative importance (%)
	The individual shall be able to: • Make welded joints in relation to international specifications • Interpret welding terminology to complete task to specification • Perform welding of carbon steel material in all positions (except vertical down) on pipe and plates deposit single sided full penetration root pass welds • Deposit full penetration butt and fillet welds on pipe and plate • Perform stop/starts	
5	**FCAW-G (136) Process**	**10**
	The individual needs to know and understand: • Drawing weld symbol interpretation • Weld positions, weld angles and travel speeds • The techniques for efficient stop/starts • The techniques utilised to deposit defect free butt and fillet welds	
	The individual shall be able to: • Make welded joints in relation to international specifications • Interpret welding terminology to complete task to specification • Perform welding on carbon steel material in all positions (except vertical down) on pipe and plate • Perform stop/starts • Deposit full penetration butt and fillet welds on pipe and plate	
6	**GTAW (141) Process**	**15**
	The individual needs to know and understand: • Drawing weld symbol interpretation • Weld positions, weld angles and travel speeds • The techniques for efficient stops/starts • The techniques utilised to deposit defect free butt and fillet welds	
	The individual shall be able to: • Make welded joints in relation to international specifications • Interpret welding terminology to complete task to specification • Perform welding on carbon steel, aluminium sheet, and stainless-steel sheet material in all positions (except vertical down) on pipe and plate • Perform stop/starts • Deposit full penetration butt and fillet welds on pipe and plate • Deposit utilising a single pass on stainless steel and aluminium sheet, root and capping pass combination	

Section		Relative importance (%)
7	**Finishing, quality assurance, and testing**	**20**
	The individual needs to know and understand: • The international specifications for the control of weld quality • Specific terminology used in the welding industry • Imperfections/defects that may occur during welding • The importance of weld metal cleanliness in weld quality • A range of destructive and non-destructive testing • Welder certification test coupons in accordance with international standards	
	The individual shall be able to: • Produce welds to meet drawing and legislative specifications • Recognize weld defects and take appropriate action to rectify them • Utilize correct techniques to ensure weld metal cleanliness is maintained • Dress welds using wire brushes, scrapers, chisels, etc. • Check completed work against drawing requirements to reflect accuracy, square and flatness where necessary • Carry out basic non-destructive testing and be familiar with more advanced testing methods • Complete pressure vessels capable of withstanding hydrostatic pressure testing • Be creative in weld bead sequencing and weld bead tie ins to achieve uniform aesthetic appearances for faster finishing • Develop efficient welding procedures to reduce rework and waste during finishing	
	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. The Test Project is the assessment vehicle for the skill competition, and therefore also follows the Standards. The CIS enables the timely and accurate recording of marks; its capacity for scrutiny, support, and feedback is continuously expanding.

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

Prior to submission for approval to WSI, the Marking Scheme and Test Project will liaise with the WSI Skill Advisors for quality assurance and 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 standard that represents each skill competition, which itself represents a global occupation. It is designed to allocate marks for each assessed aspect of performance in accordance with the weightings in the Standards.

By reflecting the weightings in the Standards, the Marking Scheme establishes the parameters for the design of the Test Project. Depending on the nature of the skill competition 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, if there is no practicable alternative.

For integrity and fairness, the Marking Scheme and Test Project are increasingly designed and developed by one or more Independent Test Project Designer(s) with relevant expertise. In these instances, the Marking Scheme and Test Project are unseen by Experts until immediately before the start of the skill competition, or competition module. Where the detailed and final Marking Scheme and Test Project are designed by Experts, they must be approved by the whole Expert group prior to submission for independent validation and quality assurance. Please see the Competition Rules for further details.

Experts and Independent Test Project Designers are required to submit their Marking Schemes and Test Projects for review, verification, and validation well in advance of completion. They are also expected to work with their Skill Advisor, reviewers, and verifiers, throughout the design and development process, for quality assurance and in order to take full advantage of the CIS's features.

In all cases a draft Marking Scheme must be entered into the CIS at least eight weeks prior to the Competition. Skill Advisors actively facilitate this process.

4.2 Assessment Criteria

The main headings of the Marking Scheme are the Assessment Criteria. These headings are derived before, or in conjunction with, the Test Project. In some skill competitions the Assessment Criteria may be similar to the section headings in the Standards; in others they may be 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.

Assessment Criteria are created by the person or people developing the Marking Scheme, who are free to define the 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). **The Assessment Criteria, the allocation of marks, and the assessment methods, should not be set out within this Technical Description. This is because the Criteria, allocation of marks, and assessment**

methods all depend on the nature of the Marking Scheme and Test Project, which is decided after this Technical Description is published.

The Mark Summary Form generated by the CIS will comprise a list of the Assessment Criteria and Sub 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) specifies 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, and detailed descriptors or instructions as a guide to marking. Each Aspect is assessed either by Measurement or by 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 Standards. 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 refers.)

		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. Where this is impracticable (for example where an action must be done by every Competitor simultaneously, and must be observed doing so), a second tier of assessment and marking will be put in place, with the approval of the Competitions Committee Management Team. The marking teams must be organized to ensure that there is no compatriot marking in any circumstances. (Section 4.6 refers.)

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). This is documented in the Standards and Assessment Guide.
- 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, normally simultaneously, and record their scores. A fourth Expert coordinates and supervises the scoring, and checks their validity. They also act as a judge when required to prevent compatriot marking.

4.7 Assessment and marking using Measurement

Normally three Experts will be used to assess each Aspect, with a fourth Expert supervising. In some circumstances the team may organize itself as two pairs, for dual marking. 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. To avoid errors in calculation or transmission, the CIS provides a large number of automated calculation options, the use of which is mandated.

4.8 The use of Measurement and Judgement

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

4.9 Skill assessment strategy and procedures

WorldSkills is committed to continuous improvement including reviewing past limitations and building on good practice. The following skill assessment strategy and procedures for this skill competition take this into account and explain how the marking process will be managed.

The skill assessment criteria are clear concise aspect specifications which explain exactly how and why a particular mark is awarded. The following table is a guide to the visual assessment of weld seams.

The level of imperfection assessment to be no less than that expected for the qualification of a welder to ISO 9606 Qualification of welders – fusion welding part 1: Steels and part 2: Aluminium and Aluminium alloys. The level of imperfection no less than level “B” of ISO 5817 Welding – Fusion welded joints in steel, nickel titanium and their alloys (beam welding excluded) – Quality levels. For RT inspections of the test plates and pipe, digital RT shall be used where possible, but if not possible, double loaded film practices shall be used. Both practices to be performed IAW ISO 17635.

ISO 10042 Arc – welded joints in Aluminium and its weldable alloys – Guidance on Quality levels for imperfections.

Imperfection Description	Explanation	limits for imperfections
1. Cracks	Is the weld surface free of all cracks?	Not permitted
2. Weld starts and craters	Are weld bead craters and starts completely filled? (From crown to crater bottom, or crown of stop and crown of restart)	Task two (PV) ≤ 1.5 mm
3. Stray Arc Strikes and stray grinding	Arc projects free of arc strikes? Is stray grinding present?	Not permitted (Projects shall be free from stray grinding for the intent to remove arc strikes.)
4. Slag and Spatter Removed	Is all surface slag and spatter removed from the joint and surrounding area?	Greater than 99% of all slag and spatter to be removed
5. Grinding Marks	Is the weld surface free from grinding or other metal removal on the cap pass (es) and penetration, for the purpose of enhancing the finished weld?	No metal removal permitted from the finished weld
6. Visual Inclusions	Is the weld metal free of short, solid imperfections? (slag, flux, oxide or metallic inclusions)	Task two (PV) Incremental marking max. two defects
7. Surface or internal Porosity and Gas Pores	Is the weld metal free of porosity?	Task one (Coupon X-Ray) - See International Standard IS0 5817 Task one (Coupon destructive testing) - Incremental marking. Two defects Task two (PV) Incremental marking max. two defects Task three (AL) - Incremental marking max. two defects Task four (SS) - Incremental marking max. two defects
8. Undercut	Is the weld joint free from undercut?	≤ 0.5 mm

Imperfection Description	Explanation	limits for imperfections
9. Overlap (Over roll)	Is the weld joint completely free of overlap (over roll)?	Not permitted
10. Lack of Penetration	Is the joint free from lack of penetration or root fusion?	Task one (Coupon X-Ray) See International Standard IS0 5817 Task one (Coupon Visual) – Not permitted. Task three (AL) – Incremental marking Task four (SS) - Incremental marking
11. Excessive root concavity (shrinkage groove)	Is the weld penetration free of excessive root concavity “suck back”?	Task one - See International Standard IS0 5817
12. Excessive Penetration	Is the joint free of excessive penetration?	Task one (Coupon) - ≤ 2.0 mm Task two (PV)– N/A Task three (AL) - ≤ 3.0 mm Task four (SS) - ≤ 2.5 mm
13. Excessive Face Reinforcement (height)	Is the weld joint free of excessive face reinforcement?	Task one (Butt) - ≤ 2.5 mm Task two (PV) - ≤ 2.5 mm Task three (AL) - ≤ 1.5 mm Task four (SS) - ≤ 1.5 mm
14. Incompletely filled groove	Is the butt weld groove completely filled?	Not Permitted
15. Linear Misalignment (high/ low)	Is the joint free from linear (high/low) misalignment?	Task one - See International Standard IS0 5817 Task two (PV) - ≤ 1.0 mm Task three (AL) - ≤ 1.0 mm Task four (SS) - ≤ 1.0 mm
16. Fillet Weld Sizes	Are fillet sizes in accordance with specifications? (Measurement leg length)	Task one (Coupon) -0/+2 mm Task two (PV) -0/+2 mm

Imperfection Description	Explanation	limits for imperfections
		Task three (AL) -0/+2 mm Task four (SS) -0/+1 mm
17. Full Radius Contour	Does the joint exhibit a full radius contour = to plate thickness?	Full radius contour (To be assessed by Judgement Marking)
18. Excessive Width variation of Butt Weld Face	Are bead widths uniform and regular? (Measure narrowest portion vs. widest portion)	Task one (Coupon) - ≤ 2.0 mm Task two (PV) - ≤ 2.0 mm Task three (AL) - ≤ 1.5 mm Task four (SS) - ≤ 1.0 mm

Procedure for performing non-destructive testing

1. Specified procedures shall be used for all non-destructive testing
2. The welded test coupons shall be radiographed in the as welded condition. (No removal of any excess weld metal.)
3. Radiography of the test coupons shall be performed in accordance with ISO 5817. Welds with no recordable imperfections are an “A” category pass

Procedure for performing fracture tests on the Fillet welded coupon

1. Each test piece shall be positioned for breaking in accordance with ISO 9017 Destructive tests on welds in metallic materials – Fracture tests
2. Each coupon shall be visually assessed after breaking for lack of fusion, inclusions, and porosity

Procedure for the hydrostatic pressure test

1. The Expert, whose Competitor’s vessel is being tested, is allowed to witness the test
2. Fill the vessel with water and ensure that all air is allowed to escape
3. Plug vessel and pressurize to city pressure
4. Ensure vessel is fully dry on outside
5. If vessel exhibits a leak – Score one point and test is complete
6. If no leaks are observed at city pressure, the vessel is further pressurized in stages (minimum of FOUR stages) to the maximum pressure normally 69bar (1000 psi) dependant on pressure pump available
7. Each hold point is held for 60 seconds. If no leak is detected the pressure is increased in stages until the vessel is pressurized to the maximum pressure
8. If the vessel leaks at any stage in the hydrostatic test the marks are awarded appropriate to the last successful hold point
9. Drain all water from the vessel.

Note: If a leak is detected, it shall be highlighted with a metal marker.

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 applied knowledge, skills, and behaviours set out in each section of the WSOS.

The purpose of the Test Project is to provide full, balanced, and authentic opportunities for assessment and marking across the Standards, in conjunction with the Marking Scheme. The relationship between the Test Project, Marking Scheme, and Standards 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 or affect the balance of marks within the Standards other than in the circumstances indicated by Section 2. 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. Section 2.1 refers.

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.

Most Test Projects and Marking Schemes are now designed and developed independently of the Experts. They are designed and developed either by the Skill Competition Manager, or an Independent Test Project Designer, normally from C-12 months. They are subject to independent review, verification, and validation. (Section 4.1 refers.)

The information provided below will be subject to what is known at the time of completing this Technical Description, and the requirement for confidentiality.

Please refer to the current version of the Competition Rules for further details.

5.2 Format/structure of the Test Project

The Test Project is a series of four (4) standalone modules.

5.3 Test Project design requirements

Test Projects should reflect the purposes, structures, processes, and outcomes of the occupational role they are based on. They should aim to be a small-scale version of that role. Before focusing on practicalities, SMTs should show how the Test Project design will provide full, balanced, and authentic opportunities for assessment and marking across the Standards, as set out in Section 5.1.

General Requirements

Overall, the Test Project shall be modular which are standalone assessments of the Competitor's skill

Materials and equipment: Welding power sources:

- 111 SMAW, MMAW, 141 GTAW, TIG: AC/DC, 300 Amps Inverter-Type with Hi-Frequency, AC-Frequency (Hz) and Pulse controls;
- 135 GMAW, MAG, 136 FCAW: DC, 350 Amps with Pulse or Synergic control.

Welding accessories

- 111 SMAW, MMAW Welding cable and electrode holder;
- 141 GTAW, TIG gun and accessories, contact tips, diffusers, shielding gas accessories, regulator, hoses, remote variable amperage controls, foot or hand-operated, hose for purging;
- 135 GMAW, MAG gun and accessories, contact tips, diffusers, shielding gas accessories, regulator, hoses, etc.
- 136 FCAW gun and accessories, contact tips, diffusers, shielding gas accessories, regulator, hoses, etc.

During the Competition only the materials provided by the Competition Organizer may be used.

Practice plates for the Competition.

The Competition Organizer shall provide two sets (four pieces each) of material for each of the test coupons and ten pieces each (100x50 mm) of aluminium and stainless steel material in the thickness of the tasks, to be used for practice plates. These plates shall be made available to the Competitor for practice on the day set aside for testing the installations before the Competition and for adjusting the welding parameters during the Competition.

Dimensions of practice plates

The practice plates shall be the same width and thickness as the actual Test Project module pieces but they shall each be shorter by 20 mm in length.

Basic materials

Steel groups according to CR ISO/TR 15608 (2017), group one, and equivalent for low carbon steel;

Group eight for stainless steel (300 series), and aluminium in the 5000 and 6000 series. Chosen material shall be listed on the Infrastructure List with full detail of the material grouping and classification. MTRs shall be provided to the Experts to review for accuracy and to approve before cutting of the material commences.

Plates

- High quality low carbon steel, 2 mm to 12 mm thick to ISO 10025;
- For pressure vessel, plates are to have through-thickness tested certification;
- Austenitic stainless steel, 2 mm to 3 mm thick e.g. 18/8 types X5CrNi 18;
- Aluminium, 3 mm thick only e.g. 5000 or 6000 series.

Pipes

- High quality low carbon steel pipes to ISO 10025, dia. 40 mm to 150 mm, wall thickness 1.6 mm to 10 mm;
- Stainless steel and aluminium, diameter 25 mm to 50 mm, wall thickness 1.6 mm to 6 mm.

Test coupons shall be cut, milled, or turned, so that they are smooth and parallel.

Module 1 - Test coupons general notes

- Time: allow three to four hours approximately;
- Quantity: three to five specimens, either Single V-groove butt joint welds or fillet welds;
- Welding processes: See Appendix 13.1;
- Drawings including welding positions: See https://worldskills.org/internal/competition-documentation/Lyon-2024/test-projects/
- For all test plates, 20 mm at the start and finish will not form part of the inspection or marking process.

- The preparation for all butt weld test coupons shall be milled or turned at 30º to a featheredge. (No root face). See test coupon drawings.

Fillet weld notes

The Competitor shall submit the test coupons fully assembled to the Experts for stamping prior to welding.

The fillet weld coupon/s shall consist of two pieces each 12 mm in thickness, one-piece 125 mm width and the other 100 mm width, 250 mm in length.

The fillet weld coupon shall have a leg length of 10 mm, with an allowable tolerance of (+2 mm /– 0 mm). The fillet welds must be completed with a minimum of two runs and a maximum of three runs.

The weld must be MULTI RUN with a maximum of THREE runs. Single run or welds with more than three runs will NOT be allocated any marks for that coupon.

- If the hold point was not conducted, all affected assessments shall receive no marks;
- Grinding for the intent to enhance the cap pass shall not be allowed. All aspects for the assessment of an enhanced cap pass shall not be evaluated and a 0 mark awarded.

- The fillet weld coupon shall contain a stop start in the middle 75 mm for both root and final cap pass;
- The stop/start to be inspected and verified by stamping.
- The tack length of back bracket shall not be longer than 15 mm.

10 mm Test Coupon notes

- Grinding for the intent to enhance the root pass or cap pass shall not be allowed. All aspects for the assessment of an enhanced root pass or cap pass shall not be evaluated and a 0 mark awarded;
- GMAW (MAG) is the only semi -automatic process to be used for root pass runs. FCAW (136) shall not be considered for making root passes;
- One test plate coupon shall consist of two (2) pieces, each 10 mm in thickness, 150 mm width and 250 mm in length.

16 mm Test Coupon notes

- If GMAW (MAG) is drawn for the root pass, a stop/start is required in the centre 75 mm of the plate;
- If any semi- automatic processes (GMAW/FCAW) are drawn for the fill and cap passes, a stop/start within the given 75 mm range documented on the drawing for the cap pass shall happen. A weave or the last pass of a multi-pass stringer bead cap is considered for the stop and restart;
- GTAW (141) shall not be used on the 16 mm test coupon;
- GMAW (135) is the only semi -automatic process to be used for root pass runs. FCAW-G (136) shall not be considered for making root passes;
- If hold points were not conducted, all affected assessments associated with the hold point shall receive no marks;
- Grinding for the intent to enhance the root pass or cap pass shall not be allowed. All aspects for the assessment of an enhanced root pass or cap pass shall not be evaluated and zero marks awarded;
- The test coupon dimension shall consist of two pieces, each 16 mm x 150 mm x 250 mm;
- Each of the two plate test coupons shall be welded with a different process. If a combination process joint is selected from the table for the 16 mm coupon as listed in Appendix 13.1 this rule shall not apply;
- The stop/start to be inspected and verified by stamping.

Pipe Test Coupon notes

- The pipe test coupon shall consist of two pieces of 114.3 mm dia x 8.56 mm wall (4” Sch 80) carbon steel pipe;
- The pipe coupon shall be welded with the process or processes selected from the table listed in Appendix 13.1;
- Grinding for the intent to enhance the root pass or cap pass shall not be allowed. All aspects for the assessment of an enhanced root pass or cap pass shall not be evaluated and zero marks awarded.

Module 2 - Pressure vessel notes

Description: A completely enclosed plate/pipe structure, which shall encompass all four of the process listed and all weld positions as described in this Technical Description.

- Time: seven to eight hours approximately;
- Size: Overall dimensional space, approximately 350 mm x 350 mm x 400 mm;
- Plate thickness: 6.8 mm and 10 mm;
- Pipe wall thickness 3 mm to 10 mm;
- Pressure test minimum normally 1000 psi (69 bar).

The pressure vessel shall not weigh more than 35 kg in the welded condition.

The Skill Competition Manager reserves the right to amend the design test pressure of any pressure vessel prior to the start of the Competition.

Module 3 - Aluminium structure

Description: A partially enclosed structure of aluminium, which shall be welded with TIG (141).

- Time: two or three hours approximately;
- Size: Overall dimensional space approximately 200 mm x 200 mm x 250 mm;
- Aluminium plate/pipe material thickness 3 mm;
- All seams shall be welded in one run/pass with filler metal. The deposit of second run with or without filler will result in NO marks being awarded for the entire structure;
- The Test Project module may be sawn in half, where necessary, to enable weld penetration inspection and marking to be carried out;
- During assembly and welding of the aluminium structure, there shall be no gaps in any weld seam.

Module 4 - Stainless Steel structure

Description: A partially enclosed structure of stainless, which shall be welded with GTAW (141).

- Time: two or three hours approximately;
- Size: Overall dimensional space approximately 150 mm x 150 mm x 200 mm;
- Stainless steel plate/pipe material thickness 2 mm to 3 mm;
- This Test Project module may be sawn in half, where necessary, to enable weld penetration inspection and marking to be carried out;
- All seams shall be welded in one run/pass with filler metal. The deposit of a second run with or without filler will result in no marks being awarded for the entire structure;
- During assembly and welding of the stainless-steel structure, there shall be no gaps in any weld seam.

Competition specific instructions

Welding machines, tools, and equipment usage

- It is a requirement that the Competition Organizer supplies welding machines that can be used in basic modes of operation;
- Welding machines may be used to their full technical potential;
- It is a requirement that the Competition Organizer makes available detailed operation manuals to all participating countries/regions at least six (6) months prior to the Competition;
- The welding machines provided shall have the capability to be operated using both standard amperage control and remote amperage control. Remote variable amperage devices shall be made available;

Remote hand-held and foot controls switching controls must be provided.

Grinding and the use of abrasive materials and equipment:

- Material removal is not permitted on any of the root penetration or cap weld surfaces. “Cap pass” shall be defined as the final layer of the weld that meets the weld size, grooves, and fillets.

Restarts may be prepared before welding over them.

- Grinding the surfaces of the fillet coupon material before welding is permitted but the machined preparation angle shall remain at 90 degrees.
- Wire brushing:
  - Wire brushing, manual or powered, may be used on all weld surfaces of the test plates/pipes (module one) and the pressure vessel (module 2).
  - Wire brushing or chemical cleaning is NOT permitted on any of the completed welds of the aluminium project (module 3) or the stainless-steel project (module 4).

Backing bars/plates and restraining devices

- No chill plates, ceramic backing tapes/bars or run off tabs are to be used in the Competition; no additional practice plates;
- Purging equipment may only be used with the Gas Tungsten Arc Welding process on the stainless-steel project;
- Restraining devices shall not be used during welding of the test plates Such devices include:
  - Clamps, jigs, fixtures or steel plates, tack welded to the test plates;
- Welding of the test plates is to be carried out without the aid of restraining devices; (except that the provided restraining material for the fillet weld coupons) this is so the Experts can assess the control of distortion;
- Only standard fixture or positioning aids (positioners), supplied by the Competition Organizer may be used when welding the test coupons. Depending on the selected projects, they shall at all times be welded and ground 100% on the workbench. Only when instructed can a Competitor grind a coupon while still located in the positioner as long as grinding does not throw sparks over the top of the weld cell. Competitor is stopped immediately if grinding is being accomplished in an unsafe manner.

Weld cleaning of GTAW (141) projects

- The weld faces on the aluminium and stainless steel GTAW (TIG) projects are to be presented in the “as welded” condition. Cleaning, grinding, steel wool, wire brushing or chemical cleaning is NOT permitted on any of the welds except for the preparation of stop starts on the stainless-steel project.

Tack welds

- Tack weld inspection is a HOLD POINT;

- For pressure vessel 15 mm tacks may be combined about the X, Y, and Z axis;
- For stainless steel, and aluminium tacking, 10 mm tacks may be combined about the X, Y, and Z axis;
- Tacking in Module 1 and Module 2, i.e. fillet welds, test pipe, test plates, and pressure vessel, the Competitor may use any of the welding processes listed in this Technical Description for tack welding in any position;
- No tack welds shall be made on the inside of any project. If found during presentation, Competitor is asked to remove them. Time are not compensated for this;
- For fillet weld coupons, only two sufficient tack welds are placed on the strong back in such a manner that they can be easily removed. Two tacks at each start and ending edge of the coupon are permitted.

Welding of test plates/pipes and fillet coupons

- Once welding has commenced, the test plates may not be separated and then re-tacked. Re-tacking may only take place, if root welding has not commenced;
- There shall be no gap present in the fillet weld joint between plates after tacking. If such condition exists, Competitor is asked to reassemble the coupon to remove the gap. Time will not be compensated for this;
- HOLD POINT: The fillet weld coupon shall contain a stop start in the middle 75 mm for both root and final cap pass;
- HOLD POINT: A stop start must be conducted within the given 75mm specified on the drawing of the root and cap pass for the 16 mm coupon. If SMAW (111) is chosen for the root pass, no root pass hold point is conducted;
- HOLD POINT: The test pipe coupon shall be secured in the positioner provided and mark the 12 o'clock position before welding commences. This is to be confirmed by permanent marking and will also act as a reference point for any inspection or testing;
- If hold points are not conducted in the root pass or cap pass of any coupon, all aspects of the effected pass are awarded zero marks except for RT aspects. Class D RT marks will automatically be given;
- If a Competitor welds a coupon with the incorrect process or in the incorrect position, no further inspection and testing are carried out and no marks are awarded to that coupon.

Welding of the pressure vessel

If any of the joint configurations on the pressure vessel i.e. butt, fillet or outside corners are welded with the incorrect process or in the incorrect position, that joint configuration shall not be visually assessed, and no marks are awarded.

Welding of the Aluminium or stainless-steel structures

If any of the joints are welded in the incorrect position, no further inspection shall be carried out and no marks are awarded for the complete structure.

After tacking, inspection and verification by stamping there can be no further material removal, no grinding, filing, or cleaning shall be carried out on the structure.

Note: A Competitor who is seen to be carrying out an operation that compromises any of rules or guidelines of this Technical Description is notified immediately, to carry out no further work on the project until the matter is brought to a conclusion. The Competitor shall not be penalized by any time penalty during any investigation.

The standard list for test coupons will detail the position of the coupon, the process for the root pass, and the process for the fill and cap passes. The Skill Competition Manager will determine the four test coupons to be welded.

Once Competition started:

The modules listed below are to be completed in the order specified by the Skill Competition Manager in the following order. Test order in module one is to be determined prior to C-2.

• Module 1 - Fillet weld (Day one)
• Visual assessment, Destructive testing and competency, and assembly assessment
• Module 1 – 10 mm Test plate (Day one)
• Visual assessment, Radiographic testing, competency, and assembly assessment.
• Module 1 – 16 mm Test Plate (Day one)

Visual assessment, Radiographic testing, competency, and assembly assessment

• Module 1 - Test Pipe (Day one to two)

Visual assessment, Non-destructive testing and Competency and assembly assessment.

• Module 2 - Pressure Vessel (Day one to three)

Visual assessment, Pressure test and Competency and assembly assessment.

• Module 3 - Aluminium Structure (Day three to four)

Visual assessment and Competency and assembly assessment.

• Module 4 - Stainless Steel Structure (Day four)

Visual assessment and Competency and assembly assessment.

ALL WELDING OF VERTICAL OR SLOPING WELDS MAY ONLY BE DONE WITH AN UPWARD PROGRESSION.

MODULES 3 AND 4 MUST BE WELDED IN ONE PASS ONLY WITH FILLER ADDED

5.4 Test Project coordination and 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 Test Project coordination (preparation for Competition)

Coordination of the Test Project/modules will be undertaken by the Skill Competition Manager.

5.4.2 Who develops the Test Project/modules

The Test Project/modules are developed independently and selected by all Experts.

5.4.3 When is the Test Project developed

The Test Project/modules are developed according to the following timeline:

Time	Activity
Prior to the previous Competition	Experts develop and propose Test Project modules individually.
At the previous Competition	A panel of Experts validates each proposal and a vote for Modules 2 to 4 is conducted for the selection of the modules to be used at the following competition. Experts indicate their preferred test coupon for the following

Time	Activity
	Competition. The preferred test coupons are listed as possible test coupons for the following Competition in this Technical Description, Appendix 13.1
Prior to the current Competition	The Independent Test Project Designer will make the 30% change which is presented at the Competition on C-2.
At the current Competition on C-2	The Skill Competition Manager will select five test coupons for the current Competition from the Technical Description, Appendix 13.1 Competitors are notified of the test coupon selection on C-2.

5.5 Test Project initial review and verification

The purpose of a Test Project is to create a challenge for Competitors which authentically represents working life for an outstanding practitioner in an identified occupation. By doing this, the Test Project will apply the Marking Scheme and fully represent the WSOS. In this way it is unique in its context, purpose, activities, and expectations.

To support Test Project design and development, a rigorous quality assurance and design process is in place (Competition Rules sections 10.6-10.7 refer.) Once approved by WorldSkills, the Independent Test Project Designer (ITPD) is expected to identify one or more independent expert(s), and trusted individuals initially to review the Independent Test Project Designer's ideas and plans, and subsequently to verify the Test Project, prior to validation.

A Skill Advisor will ensure and coordinate this arrangement, to guarantee the timeliness and thoroughness of both initial review, and verification, based on the risk analysis that underpins Section 10.7 of the Competition Rules.

5.6 Test Project validation

The Skill Competition Manager coordinates the validation of the Test Project/modules and will ensure that it can be completed within the material, equipment, knowledge, and time constraints of Competitors.

This is demonstrated by including the following information with submissions for any Test Project module for selection:

- A separate cutting list for all the required materials for the Test Project modules shall be included to assist the Competition Organizer;
- A photograph of the welded stainless steel and aluminium structures;
- A photograph of the pressure vessel under pressure test with the pressure attained visible, 1000 psi (69 bar);
- Any additional instructions for Competitors to aid in the completion of the Test Project.

5.7 Test Project circulation

The Test Project Modules 2, 3, and 4 are circulated immediately after the Competition via the WorldSkills website.

The test coupons nominated for the upcoming Competition shall be made available as part of this Technical Description and constitute Module 1. The specific selection of five test coupons are made by the Skill Competition Manager at the current Competition.

5.8 Test Project change

Due to the Test Project/modules being developed by one or more Experts, an Independent Test Project Designer or the Skill Competition Manager must develop a 30% change as required by WorldSkills. This change is presented to the Experts and Competitors at the Competition on C-2.

5.9 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. However, note that in some cases details of specific materials and/or manufacturer specifications may remain secret and will not be released prior to the Competition. These items may include those for fault finding modules or modules not circulated.

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 WorldSkills skill-specific Discussion Forum. (http://forums.worldskills.org). Skill related decisions and communication are only valid if they take place on the WorldSkills Discussion Forum. The Chief Expert (or an Expert Lead appointed by the Skill Management Team) will be the moderator for this Discussion Forum. Refer to the 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 competition during the Competition is defined in the Skill Management Plan that is created by the Skill Management Team. The Skill Management Team comprises the Skill Competition Manager, Chief Expert, and the Expert Leads. The Skill Management Plan is progressively developed in the six (6) months prior to the Competition and finalized at the Competition. The Skill Management Plan can be viewed in the Expert Centre (www.worldskills.org/expertcentre).

6.5 General best practice procedures

General best practice procedures clearly delineate the difference between what is a best practice procedure and skill-specific rules (section 9). General best practice procedures are those where Experts and Competitors CANNOT be held accountable as a breach to the Competition Rules or skill-specific rules which would have a penalty applied as part of the Issue and Dispute Resolution procedure including the Code of Ethics and Conduct Penalty System. In some cases, general best practice procedures for Competitors may be reflected in the Marking Scheme.

Topic/task	Best practice procedure
Equipment failure	• If equipment or tools which are brought by the Competitor fail there is no extra time allowed. • If equipment or tools supplied by the Competition Organizer fail extra time is allowed only if the Technician of the sponsor or supplying company specifies and proves it is not a “user error”. • Wire nesting is not to be considered as equipment failure.
Welding Techniques	• All semi-automatic welding processes shall be continuously welded; not spot welded/intermittently welded. • Zero mark awarded for the aspects associated with the applicable weld joints.

7 Skill-specific safety requirements

7.1 Personal Protective Equipment

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

Task	Safety glasses with side protection	Welding mask	Dust/ respirator mask	Welding gloves	Cut protection gloves	Rubber gloves	Safety shoes with protecti cap
General PPE for safe areas							
Grinding	√	√	√ Optional		√		√
Welding	√	√	√ Optional	√			√
Chemical Cleaning Acetone	√		√			√	√
Handling of gases	√				√		√
Hot work surfaces	√			√			√
Hydrostatic pressure test	√				√		√

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 Skill Management Team for the next Competition. The Competition Organizer will progressively update the Infrastructure List specifying the actual quantity, type, brand, and model of the items. Note that in some cases details of specific materials and/or manufacturer specifications may remain secret and will not be released prior to the Competition. These items may include those for fault finding modules or modules not circulated.

At each Competition, the Skill Management Team must review and update the Infrastructure List in preparation for the next Competition. The Skill Competition Manager 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 for the upcoming WorldSkills 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 Competitors toolbox

Competitors are not allowed to send a toolbox to the Competition. All tools are provided by the Competition Organizer.

8.3 Materials, equipment, and tools supplied by Competitors

It is not applicable for Competitors to bring materials, equipment, and tools to the Competition. However, Competitors are allowed to bring personal tools in the morning of C-2 on Familiarization Day as defined in the table below. It is recommended that these tools be brought in the luggage of the Competitor or purchased locally.

Furthermore, Competitors are required to supply their own Personal Protective Equipment as specified in section 7 skill-specific safety requirements.

Item	Photo
Inter-weld run cleaning, blade scrapers	
Chisels	

Item	Photo
Scriber	
Weld gauge (fillet gauge)	
Metric steel ruler (tape measure)	
Square	
Chalk/soapstone	
Dividers	

8.4 Materials, equipment, and tools supplied by Experts

Experts are required to supply their own Personal Protective Equipment as specified in section 7 skill-specific safety requirements.

Experts are responsible that Interpreters bring their PPE.

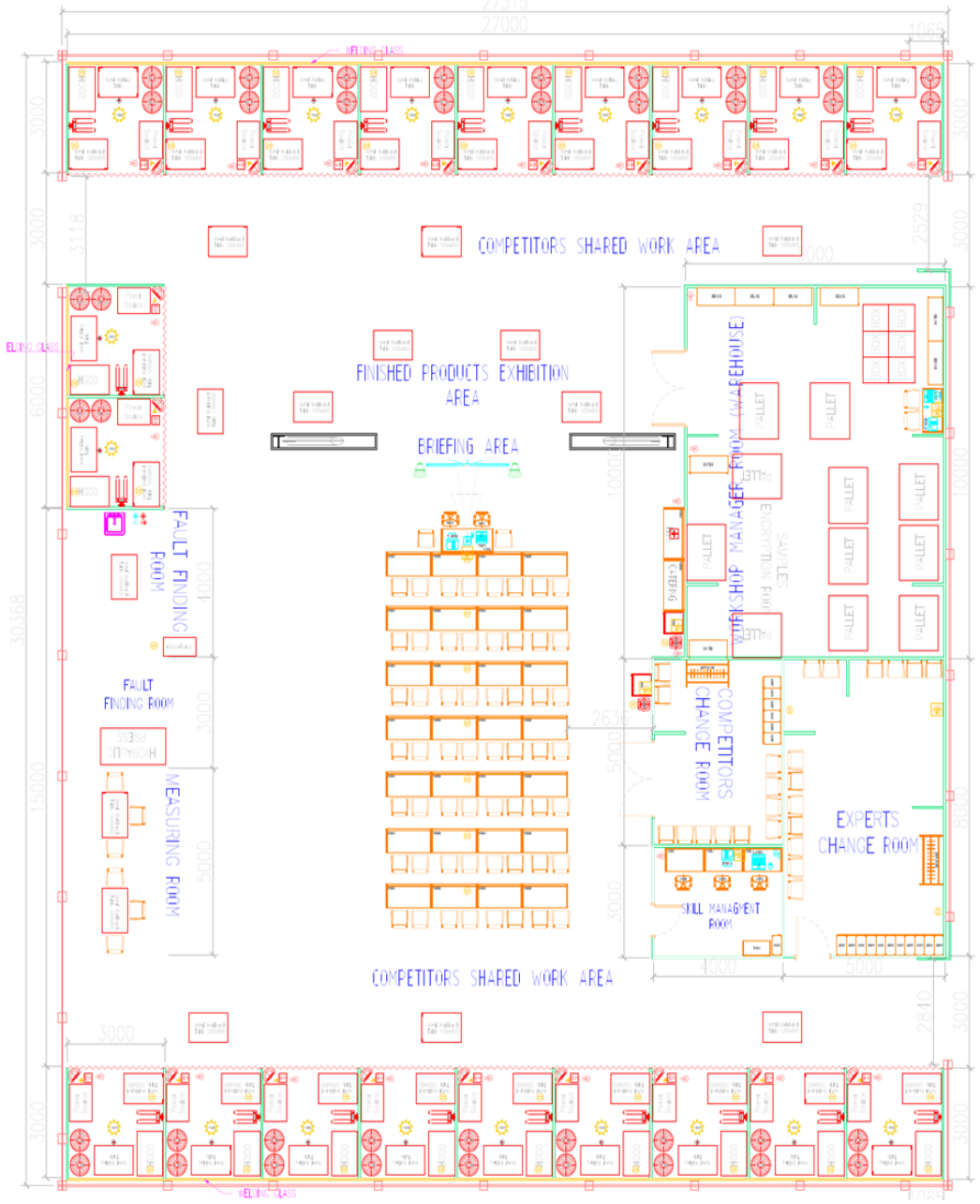
8.5 Materials and equipment prohibited in the skill area

Competitors and Experts are prohibited to bring any materials or equipment not listed in section 8.3 and section 8.4.

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

9.1 General notes

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 workflow, and documentation management and distribution. Breaches of these rules will be solved according to the Issue and Dispute Resolution procedure including the Code of Ethics and Conduct Penalty System.

9.2 Skill-specific rules

Topic/task	Skill-specific rule
Use of technology – USB, memory sticks	• Skill Competition Manager, Competitors, Chief Expert, Experts, and Interpreters are allowed to have memory devices in the workshop from C-4 until C+1.
Use of technology – personal laptops, tablets, and mobile phones	• Skill Competition Manager, Competitors, Chief Expert, Experts, and Interpreters are allowed to use personal laptops, tablets, and mobile phones in the workshop from C-4 until C+1.
Use of technology – personal photo and video taking devices	• Skill Competition Manager, Competitors, Chief Expert, Experts, and Interpreters are allowed to use personal photo and video taking devices in the workshop from C-4 until C+1.

10 Visitor and media engagement

10.1 Engagement methods

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

- Try-a-Skill;
- Display screens;
- Test Project descriptions and displays;
- Enhanced understanding of Competitor activity;
- Competitor profiles;
- Career opportunities;
- Daily reporting of competition status.

11 Sustainability

11.1 Sustainable practices

This skill competition will focus on the sustainable practices below:

- Recycling;
- Use of “green” materials;
- Use of completed Test Projects after Competition.
- By minimizing competition footprint via equipment selection, shift changes, and or competition layout.

12 References for industry consultation

12.1 General notes

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/)

12.2 References

The WSOS appears to relate most closely to Welders, Cutters, and Welder Fitters: https://www.onetonline.org/link/summary/51-4121.06

and/or Welder: http://data.europa.eu/esco/occupation/7aedaa07-3884-4c5b-88f9-80997b2aa54b

These links can also be used to explore adjacent occupations.

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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 Lyon 2024.

Organization	Contact name
China Engineering Construction Welding Association (CECWA)	Liu Jingfeng, Executive Vice President
Lincoln Electrics	Paul Smith, Marketing Manager

13 Appendix

13.1 Appendix information

Selection of coupons, weld process and position

Coupon	Root pass	Fill and capping	Position
Pipe			
1	TIG/GTAW (141)	MMA/SMAW (111)	H-LO45/6G
2	TIG/GTAW (141)	MAG/GMAW (135)	PH/5G
3	TIG/GTAW (141)	FCAW -G (136)	PC/2G
4	MMAW/SMAW (111)	MMAW/SMAW (111)	H-LO45/6G
10 mm Plate			
5	MMAW/SMAW (111)	MMAW/SMAW (111)	PE/4G
6	MMAW/SMAW (111)	MMAW/SMAW (111)	PC/2G
7	MAG/GMAW (135)	MAG/GMAW (135)	PC/2G
8	MAG/GMAW (135	MAG/GMAW (135)	PF/3G
16 mm Plate			
9	MAG/GMAW (135)	FCAW-G (136)	PA/1G
10	MAG/GMAW (135)	FCAW-G (136)	PC/2G
11	MAG/GMAW (135)	FCAW-G (136)	PF/3G
12	MAG/GMAW (135)	FCAW-G (136)	PE/4G
Fillet Weld			
13	MAG/GMAW (135)		PF/3F
14	MAG/GMAW (135)		PB/2F
15	FCAW-G (136)		PB/2F
16	FCAW-G (136)		PF/3F

Coupon	Root pass	Fill and capping	Position
17	FCAW-G (136)		PD/4F
18	MMAW/SMAW (111)		PB/2F