

# Technical Description

# **Welding**



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# 1 Introduction

## 1.1 Name and description of the skill competition

### 1.1.1 The name of the skill competition is

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.

## 1.2 The content, relevance and significance of this document

This document incorporates a Role Description and Occupational Standards which follow the principles and some or all of the content of the WorldSkills Occupational Standards. In doing so WSE acknowledges WorldSkills International's (WSI's) copyright. WSE also acknowledges WSI's intellectual property rights regarding 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:

- WSE – Competition Rules
- WSI – WorldSkills Occupational Standard framework
- WSE – WorldSkills Europe Assessment Strategy
- WSE – Online resources as referenced in this document
- WSE – Code of Ethics and Conduct
- Host Country – Health and Safety regulations

## 2 The Occupational Standards

### 2.1 General notes regarding WSOS / WSEOS

Where appropriate WSE has utilised some, or all, of the WorldSkills International Occupational Standards (WSOS) for those Skills Competitions that naturally align between the two international competitions. Where the Skill is exclusive to the EuroSkills Competition, WorldSkills Europe has developed its own Occupational Standards (WSEOS) using the same principles and framework to that used for the development of the WSOS. For the purposes of this document the use of the words “Occupational Standards” will refer to both WSOS and WSEOS.

The Occupational Standards 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. Helpfully, for the global consultation on the WSOS in 2014-2021, around 50 percent of responses came from European industry and business.

Each Skill Competition is intended to reflect international best practice as described by the Occupational Standards, and to the extent that it is able to. The Occupational Standards is therefore a guide to the required training and preparation for the Skill Competition.

In the Skill Competition the assessment of knowledge and understanding will take place through the assessment of performance. There will not be separate tests of knowledge and understanding.

The Occupational Standards are 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 Occupational Standards. 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 Occupational Standards. They will reflect the Occupational Standards 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 Occupational Standards to the extent practically possible. A variation of five percent is allowed, provided that this does not distort the weightings assigned by the Occupational Standards.

### 2.2 Occupational Standards

Section		Relative importance (%)
1	<b>Work organization and self-management</b>	10
	<b>The individual needs to know and understand:</b> <ul style="list-style-type: none"> <li>• The standards and laws relating to the health, safety, security and hygiene in the welding industry</li> <li>• The standards and regulations relating to safe working practices, accident procedures, evacuation procedures and escape routes</li> <li>• The range, use and maintenance of personal protective equipment used in the industry for any given circumstances</li> </ul>	

Section		Relative importance (%)
	<ul style="list-style-type: none"> <li>• The selection and use of safety equipment related to specific or dangerous tasks</li> <li>• The safety recommendations and regulations relating to the welding of materials in all conditions including wet/damp areas, confined spaces and situations where oxygen levels are likely to be below those required for safe working.</li> <li>• The recommendations, regulations and procedures required to prevent explosion, fire or combustion in all circumstances</li> <li>• Terminology and safety data supplied by manufacturers</li> <li>• The dangers of slips, trips and falls while engaged in welding operations</li> <li>• Primary electrical supply circuit terminology and its operation</li> <li>• Secondary electrical / welding circuit terminology and operation</li> <li>• The requirements and effects of welding production for the environment and sustainability issues</li> <li>• Basic mathematical manipulation and unit conversion</li> <li>• Geometrical principles, techniques and calculations</li> </ul>	
	<p><b>The individual shall be able to:</b></p> <ul style="list-style-type: none"> <li>• Work safely with regard to themselves and others.</li> <li>• Select, wear, and maintain PPE as required</li> <li>• Recognize hazardous situations and take appropriate actions with regard</li> <li>• To their own and others safety</li> <li>• Follow correct procedural processes when working in hazardous environments</li> <li>• Locate and identify dimensions and weld symbols</li> <li>• Adhere to manufacturers' safety data sheets</li> <li>• Maintain a clean working environment</li> <li>• Complete work within agreed timescales</li> <li>• Make essential connections for specific welding procedures</li> </ul>	
<b>2</b>	<b>Preparation and assembly techniques</b>	<b>10</b>
	<p><b>The individual needs to know and understand:</b></p> <ul style="list-style-type: none"> <li>• The interpretation of fabrication or engineering drawings and weld symbols</li> <li>• The classification and specific uses of welding consumables including: <ul style="list-style-type: none"> <li>• Coding and designation of welding rods</li> <li>• Diameters and specific use of welding wire</li> <li>• Choice and preparation of welding electrodes</li> </ul> </li> <li>• How surface contamination can influence the finished weld characteristics</li> <li>• The correct machine settings to be aligned to: <ul style="list-style-type: none"> <li>• Welding polarity</li> <li>• Welding position</li> </ul> </li> <li>• Material</li> </ul>	

Section		Relative importance (%)
	<ul style="list-style-type: none"> <li>• Material thickness</li> <li>• Filler material and feed speed</li> <li>• Any fine adjustments needed to machine hardware, TIG electrode shape,</li> <li>• Wire type and diameter etc.</li> <li>• The methods of edge preparation to align with joint profile, strength, and material</li> <li>• Methods of distortion control in steels, alloys, and aluminium</li> </ul>	
	<p><b>The individual shall be able to:</b></p> <ul style="list-style-type: none"> <li>• Set up welding equipment to manufacturers' specifications including (but not limited to)</li> <li>• Welding polarity</li> <li>• Welding amperage</li> <li>• Welding voltage</li> <li>• Wire feed speed</li> <li>• Travel speed</li> <li>• Travel/electrode angles</li> <li>• Mode of metal transfer</li> <li>• Prepare material edges in line with specifications and drawing requirements</li> <li>• Set up and operate appropriate controls to minimize and correct distortion</li> <li>• Carry out appropriate procedures to control heat input</li> </ul>	
<b>3</b>	<b>Welding materials</b>	<b>10</b>
	<p><b>The individual needs to know and understand:</b></p> <ul style="list-style-type: none"> <li>• The mechanical and physical properties of: <ul style="list-style-type: none"> <li>◦ carbon steels</li> <li>◦ aluminium and its alloys</li> <li>◦ stainless steels;</li> </ul> </li> <li>• Correct the alignment of process with the material being used</li> <li>• The selection of welding consumables</li> <li>• The correct storage and handling of welding consumables</li> <li>• Terminology, characteristics, and safe use of welding and purging gases</li> <li>• The effects of welding on the structure of the material</li> </ul>	

Section		Relative importance (%)
	<p><b>The individual shall be able to:</b></p> <ul style="list-style-type: none"> <li>• Use materials with consideration to their mechanical and physical properties</li> <li>• Store welding consumables correctly with reference to type, use and safety considerations</li> <li>• Select and prepare materials with reference to drawing material list</li> <li>• Select methods used in shielding the weld area from contamination</li> <li>• Select gasses used for shielding and purging</li> </ul>	
4	<b>MMAW (111) and MAG (135) Process</b>	<b>25</b>
	<p><b>The individual needs to know and understand:</b></p> <ul style="list-style-type: none"> <li>• Drawing weld symbol interpretation</li> <li>• Weld positions, weld angles and travel speeds</li> <li>• The techniques for efficient stops/starts</li> <li>• The techniques utilised to deposit single sided root penetration welds</li> <li>• The techniques utilised to deposit defect free butt and fillet welds</li> </ul>	
	<p><b>The individual shall be able to:</b></p> <ul style="list-style-type: none"> <li>• Make welded joints in relation to international specifications</li> <li>• Interpret welding terminology to complete task to specification</li> <li>• Perform welding of carbon steel material in all positions (except vertical down) on pipe and plates deposit single sided full penetration root pass welds</li> <li>• Deposit full penetration butt and fillet welds on pipe and plate</li> <li>• Perform stop/starts</li> </ul>	
5	<b>FCAW (136) Process</b>	<b>10</b>
	<p><b>The individual needs to know and understand:</b></p> <ul style="list-style-type: none"> <li>• Drawing weld symbol interpretation</li> <li>• Weld positions, weld angles and travel speeds</li> <li>• The techniques for efficient stop/starts</li> <li>• The techniques utilised to deposit defect free butt and fillet weld</li> <li>• What is short arc, spray arc and pulsed arc.</li> </ul>	
	<p><b>The individual shall be able to:</b></p> <ul style="list-style-type: none"> <li>• Make welded joints in relation to international specifications</li> <li>• Interpret welding terminology to complete task to specification</li> <li>• Perform welding on carbon steel material in all positions (except vertical down) on pipe and plate</li> <li>• Perform stop/starts</li> <li>• Perform butt and fillet welds on pipe and plate (no root pass) in process 136</li> </ul>	



Section		Relative importance (%)
	<ul style="list-style-type: none"> <li>• Perform root, fill and cap passes on butt and fillet welds on plate and pipes.</li> <li>• Define when to use the correct arc type, like in industry.</li> </ul>	
6	<b>TIG (141) Process</b>	<b>15</b>
	<p><b>The individual needs to know and understand:</b></p> <ul style="list-style-type: none"> <li>• Drawing weld symbol interpretation</li> <li>• Weld positions, weld angles and travel speeds</li> <li>• The techniques for efficient stops/starts</li> <li>• The techniques utilised to deposit defect free butt and fillet welds</li> </ul>	
	<p><b>The individual shall be able to:</b></p> <ul style="list-style-type: none"> <li>• Make welded joints in relation to international specifications</li> <li>• Interpret welding terminology to complete task to specification</li> <li>• Perform welding on carbon steel, aluminium sheet and stainless-steel sheet material in all positions (except vertical down) on pipe and plate</li> <li>• Perform stop/starts</li> <li>• Deposit full penetration butt and fillet welds on pipe and plate</li> <li>• Deposit utilising a single pass on stainless steel and aluminium sheet, root and capping pass combination</li> </ul>	
7	<b>Finishing, quality assurance, and testing</b>	<b>20</b>
	<p><b>The individual needs to know and understand:</b></p> <ul style="list-style-type: none"> <li>• The international specifications for the control of weld quality</li> <li>• Specific terminology used in the welding industry</li> <li>• Imperfections/defects that may occur during welding</li> <li>• The importance of weld metal cleanliness in weld quality</li> <li>• Range of destructive and non – destructive testing</li> <li>• Welder certification test coupons in accordance with international standards</li> </ul>	
	<p><b>The individual shall be able to:</b></p> <ul style="list-style-type: none"> <li>• Produce welds to meet drawing and legislative specifications</li> <li>• Recognize weld defects and take appropriate action to rectify them</li> <li>• Utilize correct techniques to ensure weld metal cleanliness is maintained</li> <li>• Dress welds using wire brushes, scrapers, chisels, etc.</li> <li>• Check completed work against drawing requirements to reflect accuracy, square and flatness where necessary</li> <li>• Carry out basic non-destructive testing and be familiar with more advanced testing methods</li> <li>• Complete pressure vessels capable of withstanding hydrostatic pressure testing</li> </ul>	

Section		Relative importance (%)
	<b>Total</b>	<b>100</b>

## 3 The assessment approach & principles

### 3.1 General guidance

**Note: this Section and Section 4 summarize a great deal of new information and guidance regarding assessment. Please refer to the Competition Rules for greater detail.**

The Competition Committee (CC) establishes the principles and techniques to which assessment at the EuroSkills Competition must conform.

Expert assessment practice lies at the heart of the EuroSkills 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 EuroSkills Competition: the Marking Scheme, Test Project, and Competition Information System (CIS).

Assessment at the EuroSkills Competition falls into two broad types: measurement and judgement. All assessments will be governed by explicit benchmarks, referenced to best practice in industry and business.

The Marking Scheme must include these benchmarks and follow the weightings within the Occupational Standards. The Test Project is the assessment vehicle for the Skill Competition, and also follows the Occupational Standards. 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 Technical Description and the principles for assessment as set out in the WSE Assessment Strategy. They will be agreed by the Experts and submitted to WSE for approval together, in order to demonstrate their quality and conformity with the Occupational Standards.

Prior to submission for approval to WSE, the Marking Scheme and Test Project will be reviewed by the WSE 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 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 Assessment overview

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

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 9606-1 Qualification of welders – fusion welding part 1: Steels and part 2: 9606-2 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.

ISO 10042 Arc – welded joints in Aluminium and its weldable alloys – Guidance on Quality levels for imperfections no less than level B.

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 in accordance with ISO 17635.

ISO 17636-1/-2 RX on film -1 and digital -2

ISO 10675 -1/-2 for acceptance criteria

	IMPERFECTION DESCRIPTION	EXPLANATION	LIMITS FOR IMPERFECTIONS
1.	Cracks	Is the weld free of all cracks?	Not permitted
1.	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 2 (PV) - $\leq 1.5\text{mm}$ Task 3 (AL) - $\leq 1.0\text{mm}$ Task 4 (SS) - $\leq 1.0\text{mm}$
1.	Stray Arc Strikes	Are stray arc strikes absent?	Not permitted
1.	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
1.	Grinding Marks	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
1.	Visual Inclusions	Is the weld metal free of short, solid imperfections? (slag, flux, oxide or metallic inclusions)	Task 2 (PV) Incremental marking Max. 2 defects
1.	Surface or internal Porosity and Gas pores	Is the weld metal free of porosity?	Task 1 (Coupon) - See International Standard ISO 5817 Task 2 (PV) Incremental marking Max. 2 defects Task 3 (AL) - Incremental marking Max. 2 defects Task 4 (SS) - Incremental marking Max. 2 defects
1.	Undercut	Is the weld joint free from undercut?	$\leq 0.5\text{mm}$ depth is allowed
1.	Overlap (Overall)	Is the weld joint completely free of overlap (overall)?	Not permitted

1.	Lack of penetration	Is the joint free from lack of penetration or root fusion?	Task 1 (Coupon)- See International Standard ISO 5817 Task 3 (AL) – Incremental marking Task 4 (SS) - Incremental marking
1.	Excessive root concavity (shrinkage groove)	Is the weld penetration free of excessive root concavity “suck back”?	Task 1 - See International Standard ISO 5817 Task 4 – Not permitted
1.	Excessive penetration	Is the joint free of excessive penetration?	Task 1 (Coupon)- ≤ 2.0mm Task 2 (PV)– N/A Task 3 (AL) - ≤ 3.0mm Task 4 (SS) - ≤ 2.5mm
1.	Excessive Face reinforcement (height)	Is the weld joint free of excessive face reinforcement?	Task 1 (Fillet)- ≤ 3.0mm Task 1 (Butt) - ≤ 2.5mm Task 2 (PV) – ≤ 2.5mm Task 3 (AL) - ≤ 1.5mm Task 4 (SS) - ≤ 1.5mm
1.	Incompletely filled groove	Is the butt weld groove and corner completely filled?	Not Permitted Task 1 Task 2
1.	Linear misalignment (high/low)	Is the joint free from linear (high/low) misalignment?	Task 1 - See International Standard ISO 5817 Task 2 (PV) - ≤ 1.0mm Task 3 (AL) - ≤ 1.0mm Task 4 (SS) - ≤ 1.0mm
1.	Fillet Weld sizes	Are fillet sizes in accordance with specifications? (Measurement leg length)	Task 1 (Coupon) -0/+2mm Task 2 (PV) -0/+2mm Task 3 (AL) -0/+2mm Task 4 (SS) -0/+1mm



1.	Full Radius contour	Does the joint exhibit a full radius contour = to plate thickness?	Full radius contour
1.	Excessive Width of butt weld face	Are bead widths uniform and regular? (Measure narrowest portion vs. widest portion)	Task 1 (Coupon) - $\leq 2.0\text{mm}$ Task 2 (PV) - $\leq 2.0\text{mm}$ Task 3 (AL) - $\leq 1.5\text{mm}$ Task 4 (SS) - $\leq 1.0\text{mm}$

## 4.10 Skill Assessment Procedures - Mark distribution

This section defines the assessment criteria and the number of marks (judgement and measurement) awarded. The total number of marks for all assessment criteria must be 100. The table below is advisory only for the development of the Test Project and Marking Scheme.

### Procedure for performing visual assessment

The marking forms of the previous competition are a guide to the visual assessment of weld seams.

### Procedure for performing non-destructive testing

- Specified procedures shall be used for all non-destructive testing.
- The welded test coupons shall be radiographed in the as welded condition. (No removal of any excess weld metal)
- Radiography of the test coupons shall be performed in accordance with EN ISO 10675-1 or EN ISO 5817.

### Procedure for performing fracture tests on the Fillet welded coupon

- Each test piece shall be positioned for breaking in accordance with ISO 9017
- Each coupon shall be visually assessed after breaking for lack of fusion, inclusions and porosity.

### Procedure for the hydrostatic pressure test

The expert, whose competitor's vessel is being tested, is allowed to witness the test.

- Fill the vessel with water and ensure that all air is allowed to escape.
- Plug vessel and pressurize to city pressure.
- Ensure vessel is fully dry on outside.
- If vessel exhibits a leak – Score one point and test is complete.
- If no leaks are observed at city pressure, the vessel will be further pressurized in stages (minimum of SEVEN stages) to the maximum pressure normally 69bar (1000 psi) dependant on pressure pump available.
- Each hold point will be held for 60 seconds. If no leak is detected the pressure will be increased in stages until the vessel is pressurized to the maximum pressure.
- If the vessel leaks at any stage in the hydrostatic test the marks will be awarded appropriate to the last successful hold point.
- Drain all water from the vessel.
- Note: If a leak is detected, it shall be highlighted with a metal marker.

Section	Criterion	Marks		
		Judgement	Measurement	Total
A	Assembly, programming and commissioning of a Station (Task A1) and Maintenance and troubleshooting (Task A2)	7	26	33
B	Assembly, programming and commissioning of a production line (Task B)	7,5	26,5	34
C	Optimizing of a production line (Task C1) Maintenance and troubleshooting in a production line (Task C2)	5	28	33
	<b>Total =</b>	<b>19,5</b>	<b>80,5</b>	<b>100</b>

This mark distribution is given as an example only and doesn't match the evaluation sheets provided for each task.

## 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 Occupational Standards.

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

The Test Project will not cover areas outside the Occupational Standards, or affect the balance of marks within the Occupational Standards other than in the circumstances indicated by Section 2.1.

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 the EuroSkills Competition's 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 Standard Specification. Section 2.1 refers.

### 5.2 Format/ structure of the Test Project

- Series of standalone modules

### 5.3 Test Project design requirements

#### General Requirements

**International standards, industry standards used at the competition. The CIS is based on these international standards.**

- ISO 9606-1 Qualification testing of welders Part 1: steels
- ISO 5817- Welding—Fusion-welded joints in steel, nickel, titanium and their alloys.
  - As written in the 6520-1 and 5817 class B
- ISO 9606-2- Qualification testing of welders Part 2: Qualification Test of Welders—Fusion Welding Part 2: Aluminium and Aluminium Alloys.
- ISO 10042-Welding—Arc-welded joints in Aluminium and it's alloys.
  - As written in the 6520-1 and 5817 class B
- 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 17636-1/-2 RX on film -1 and digital -2
- ISO 10675 -1/-2 for acceptance criteria
- ISO 10025- Hot rolled products of structural steels. General Technical delivery conditions.
- ISO 2553-Welding and allied processes – Symbolic representation on drawings – Welded joints.

Overall, the Test Project shall be modular and are standalone assessments of the Competitors skill

Materials and Equipment: Welding power sources:

- 111 MMAW, SMAW,
- 141 TIG, GTAW: AC/DC, 220/300 Amps Inverter-Type with Hi-Frequency, AC- Frequency (Hz) and Pulse controls.
- 135 MAG, GMAW, 136 FCAW: DC, 350 Amps with Pulse or Synergic control.
- In proces 135: No special 135 processes as STT, Cold Arc, special or advenced root processes needed or allowed for/at the competition.
- **All semi-automatic welding processes shall be continuously welded, not spot welded/ intermittendy welded.**

## Welding accessoires

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

**Consumables:** (the following information is indicative – all the information about the consumables should be on the Infrastructure List)

- MMAW Electrodes - EN ISO 2560-A: E 42 4 B 42 H5 / AWS A5.1: E 7018 + 7016 Ø2.4,3.2, 4,0mm
  - competitor will have the choise between a 7016 or 7018 welding elektrode
- FCAW wire – EN 758: T 46 P M 1 H5 / AWS A5.20: E71T-1, Ø 1,2 mm
- MAG wire - EN 440: G3Si1 / AWS A5.18: ER70S-6, Ø 1,0 mm
- TIG Filler Wire – EN 440: G3 Si1 / AWS A5.18: ER70S-6, Ø 2, 2,4 mm
- TIG Filler Wire - EN 12072: W 19 9 L / AWS A5.9: ER308L Ø 1,6, 2 mm
- TIG Filler Wire – EN ISO 18273: AIMg5 / AWS 5.10: ER 5356 Ø 2, 2,4 and 3,2mm

**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 (100x50mm) of aluminum 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 20mm in length.

## Basic materials

Steel groups according to CR ISO/TR 15608 (2005), Group one, two or three for low carbon steel.

Group eight for stainless steel (300 series), and aluminum in the 5000 and 6000 series. Chosen material shall be listed on the infrastructure list with full detail of the material grouping and classification. MTR's 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, 6 to 12 mm thick to ISO 10025;
- For pressure vessel, plates are to have through-thickness tested certification;
- Austenitic stainless steel, 2 mm thick e.g. 18/8 types X5CrNi 18;
- Aluminum, 3 mm thick e.g. 5000 or 6000 series.

## Pipes

- High quality low carbon steel pipes to ISO 10025, dia. 40mm to 150mm, wall thickness 3mm to 10mm;
- Stainless steel, diameter 25mm to 50mm, wall thickness 2mm.
- Aluminium diameter 25mm to 50mm, wall thickness 3mm.

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

### General Description:

- Module one: welding of test plates / pipes
  - Butt welds in 10mm and 16mm plate
  - Fillet welds plate on plate in 12mm plate
  - Butt weld pipe on pipe in 10mm thickness
- Module two: welding of a pressure vessel
- Module three: welding of an aluminum structure
- Module four: welding of a stainless-steel structure

The sequence should be the following: module one, three, four and two

## Module one - Test coupons - details

In the table below is a summary of the possibilities of selection for all tests this module. The position, the process for the root pass and the process for the fill and cap passes for each one is listed and the selection will be drawn at random just prior to the Competitor familiarization period (C-1). If an Independent Designer develops the test project, the Designer can do the selection from this table. The Competitors shall be informed of the selection at the earliest opportunity during the familiarization period.

Fillet weld test 12mm		
Positions	Process	
PB, PF or PD	MMAW - 111	
	MAG - 135	
	FCAW - 136	
Test Plate 10mm		
Positions	Root pass	Fill and cap passes
PC, PF or PE	MMAW - 111	MMAW - 111

	MAG - 135	MAG - 135
Test Plate 16mm		
PA, PF or PC	MAG - 135	MAG - 135
		FCAW - 136
Test pipe		
PC, PH or PH-L045	TIG - 141	TIG - 141
		MMAW - 111
		MAG - 135
	MAG - 135	MAG - 135
	MMAW - 111	MMAW - 111

## Module one - Test coupons - general notes

- Time: allow four to five hours approximately;
- Quantity: three to five specimens, either Single V-groove butt joint welds or fillet welds;
- Welding processes: See table above
- Welding positions: See table above
- Drawings: See table above
- For all test plates, 20mm 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 30° to a featheredge. (No root face)
- **Process of tack welds must be the same as the process for the root pas.**
- **All semi-automatic welding processes shall be continuously welded, not spot welded/ intermittently welded. . No special 135 processes as STT, Cold Arc, special or advanced root processes needed or allowed for/at the competition.**
  - **Zero mark awarded for the aspects associated with the applicable weld joints.**

### 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 (2) pieces each 12mm in thickness, one-piece 125mm wide in length and the other 100mm wide, 250mm in length.

The fillet weld coupon shall have a leg dimension of 10mm, with an allowable tolerance of (+2mm – 0mm). 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 would be affected assessments shall receive no marks.

- Grinding for the intent to enhance the cap pass shall not be allowed. The aspects for the assessment of an enhanced cap pass shall not be evaluated and a zero mark awarded.
- **The fillet weld coupon shall contain a stop start in the middle 75mm of the joint. The stop start shall be located in either root or capping run to be decided by a jury vote at the Competition.**
- **The stop/start to be inspected and verified by stamping.**

### 10 and 16mm Test Coupon

- One test plate coupon shall consist of two (2) pieces, each 10mm in thickness, 100mm wide and 250mm in length.
- The second test plate coupon shall consist of two (2) pieces, each 16mm x 150mm x 250mm.

### 10 mm Test Coupon notes

Grinding for the intent to enhance the root pass or cap pass shall not be allowed. The aspects for the assessment of an enhanced root pass or cap pass shall not be evaluated and a zero mark awarded.

- 135 MAG is the only semi-automatic process to be used for root pass runs. FCAW (136) shall not be considered for making root passes.
- **The Butt weld coupon shall contain a stop start in the middle 75mm of the joint. The stop start shall be located in either root or capping run to be decided by a jury vote at the Competition.**
- If 111 process is drawn for the root, fill and cap passes, it is not necessary to show a start/stop place in the root. Because it is assumed that the root cannot be done with one electrode.
- TIG shall not be used on the 10mm test coupon.
- If hold points were not conducted, all would be affected assessments associated with the hold point shall receive no marks.

### 16 mm Test Coupon notes

- If MAG is drawn for the root pass, a stop/start will be required in the center 75mm of the plate;
- **The Butt weld coupon shall contain a stop start in the middle 75mm of the joint. The stop start shall be located in root and capping run to be decided by a jury vote at the Competition. If the capping run consists of more than 1 layer, only in the last bead will have a start/stop.**
- If any semi-automatic processes (MAG/FCAW) are drawn for the fill and cap passes, a stop/start in the center 75mm of the cap pass only will be required. A weave or the last pass of a multi-pass stringer bead cap is considered for the stop and restart.
- 141 and 111 shall not be used on the 16mm test coupon. This is mainly to save time during competition, save time in preparations to competition and because they are less prevalent on thicker material in the industry.
- MAG is the only semi-automatic process to be used for root pass runs. FCAW (136) shall not be considered for making root passes.
- If hold points were not conducted, all would be 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. The aspects for the assessment of an enhanced root pass or cap pass shall not be evaluated and zero marks awarded.

### Pipe Test Coupon - notes

- The pipe test coupon shall consist of two (2) pieces of 114.3mm diam. x 8.56-10mm wall (4" SCH 80) carbon steel pipe.

- **The 12o-clock position must be marked at the start of the test if the position PH or PH-L045 is indicated.**
  - **It's allowed to have 5° of clearance at 6H and 12H, as written in the 5817.**
- 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. The aspects for the assessment of an enhanced root pass or cap pass shall not be evaluated and zero marks awarded.
- **If the test pipe coupon must be welded in a two process combination, it will be not allowed to make two passes with the process of the root pas.** Example: 141+111 T BW FM1 SB s3/7 D114,3 PH-L045 ss-nb -> 3mm 141 and 7mm 111

## Module two - 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: eight to nine hours approximately;
- Size: Overall dimensional space, approximately 350mm x 350mm x 400mm;
- Plate thickness: 6, 8 and 10 mm;
- Pipe wall thickness 3 to 10 mm;
- Pressure test minimum normally 1000psi (69 bar).

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

- **All semi-automatic welding processes shall be continuously welded, not spot welded/ intermittently welded. . No special 135 processes as STT, Cold Arc, special or advanced root processes needed or allowed for/at the competition.**
  - **Zero mark awarded for the aspects associated with the applicable weld joints.**

The Experts reserve the right to amend the design test pressure of any pressure vessel prior to the start of the Competition.

## Module three - Aluminium structure

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

- Time: two hours approximately;
- Size: Overall dimensional space approximately 200mm x 200mm x 250mm;
- Aluminum plate/pipe material thickness 3mm. Pipe Diameter 25-60,3mm.
- All seams shall be welded in **one run/pass with filler metal**. The deposit of second run with or without filler will result in
  - **Zero mark awarded for the aspects associated with the applicable weld joints. Both on the outside and inside of the project.**
- The Test Project module may be sawn in half, where necessary, to enable weld penetration inspection and marking to be carried out.
- Skewed aluminum plate seams referenced as square groove welds with the joint open to the inside of the project, shall be prepped to achieve a true square groove and shown as such on the drawing piece part.
- During assembly and welding of the aluminum structure, there shall be no gaps in any weld seam.
- No weld preparation allowed on the entire project. The project must be manufactured as described on the drawings.



## Module four - Stainless steel structure

- Description: A partially enclosed structure of stainless, which shall be welded with TIG (141).
- Time: two hours approximately;
- Size: Overall dimensional space approximately 150mm x 150mm x 200mm;
- Stainless steel plate/pipe material thickness 2mm. Pipe Diameter 25-60,3mm.
- All seams shall be welded in **one run/pass with filler metal**. The deposit of second run with or without filler will result in
- **Zero mark awarded for the aspects associated with the applicable weld joints. Both on the outside and inside of the project.**
- The Test Project module may be sawn in half, where necessary, to enable weld penetration inspection and marking to be carried out.
- Skewed stainless steel plate seams referenced as square groove welds with the joint open to the inside of the project, shall be prepped to achieve a true square groove and shown as such on the drawing piece part.
- During assembly and welding of the aluminum structure, there shall be no gaps in any weld seam.
- No weld preparation allowed on the entire project. The project must be manufactured as described on the drawings.

## 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 two).
- Machine brushing is not permitted with the intention of hiding faults.
- Wire brushing is NOT permitted on any of the completed welds of the aluminum project (Module three) or the stainless-steel project (Module four).

Backing bars/plates and restraining devices

- No copper (Cu) chill plates, ceramic backing tapes/bars or un off tabs are to be used in the Competition

- Purging equipment may only be used with the Tungsten Inert Gas 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 will be stopped immediately if grinding is being accomplished in an unsafe manner.

## Weld cleaning of TIG projects

The weld faces on the aluminum 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
- The maximum length of any one tack weld for any project is 15 mm, except for the preparation of stop starts on the stainless-steel project
- For pressure vessel, Stainless Steel, and Aluminum tacking, 15 mm tacks may be combined about the X, Y and Z axis
- Tacking in module 1 and 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 will be asked to remove them. Time will not be compensated for this
- For Fillet weld coupons Only, two sufficient tack welds will be placed on the strong back in such a manner that they can be easily removed and 2 tacks at each start and ending edge of the coupon;
- When tacking the test coupons, 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
- 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 will be asked to reassemble the coupon to remove the gap. Time will not be compensated for this
- HOLD POINT: A stop start must be conducted in the center 75mm of the root for the fillet weld coupon
- HOLD POINT: A stop start must be conducted in the center 75mm of the root and cap pass for the 16mm coupon. If MMAW is chosen for the root pass, no root pass hold point will be 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 stamping 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 will be awarded zero marks, except for RT aspects. Maximum Class C marks will be given
- If a Competitor welds a coupon with the incorrect process or in the incorrect position, no further inspection and testing will be carried out and no marks are awarded to that coupon

## Welding of 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 aluminum 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 or filing shall be carried out on the structure. **MODULES 3 AND 4 MUST BE WELDED IN ONE PASS ONLY WITH FILLER ADDED**

Note: A Competitor who is seen to be carrying out an operation that compromises any of rules or guidelines of this Technical Description will be 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.

## 5.4 Test Project development

The Test Project **MUST** be submitted using the templates provided by WSE. Use the Word template for text documents and DWG template for drawings. Please contact [jordy.degroot@worldskillseurope.org](mailto:jordy.degroot@worldskillseurope.org) for guidance.

**If the Test Project is designed by an Independent Test Project designer, then the Test Project must be designed in accordance with the WSE Independent Test Project Guide v1.1.**

**If your Skill wishes to have an Independent Test Project designer, you must ensure that WorldSkills Europe is made aware of this, so that it can be assured that there is proper funding in place, or that the Independent Test Project designer is aware that he/she will do this task free of charge.**

### 5.4.1 Who develops the Test Projects or modules

The Test Project / modules are developed under the supervision of:

- All Experts

Preferably, the Test Project should be developed by all Experts.

Every country has its specialties in welding, its specialties in industry. It is very important that all the experts continue to work together to develop a test project based on all the needs of the industry, linked to all the countries together. Not linked to one specialty of one particular country.

### 5.4.2 How and where is the Test Projects or modules developed

The Test Project or modules are developed in the following manner:

- The Test Project is developed jointly on the Discussion Forums by all Experts

Experts can each put forward a proposal for multiple modules. A voting session will be held to determine the final projects.

At C-2, a 30% change in the test project will be changed by all experts together by vote.

That change of 30% can be done over module 1 or 2. Not over the other modules to ensure sustainability during the preparations of each participant and the preparations of the organizer or sponsor.

### 5.4.3 When is the Test Project developed

The Test Project is developed according to the following timeline:

TIME	ACTIVITY
At the previous Competition	Not applicable
6 months prior to the Competition	The experts should submit their proposals to be voted in the forum.
At the Competition	30% of change

## 5.5 Test Project validation

All projects must comply with the Technical Description. The Chief Expert and the Deputy Chief Expert will validate each project submitted for selection prior to voting in forum using the project checklist below. If an Independent Designer makes the Test Project, an external Expert with experience in WorldSkills should check it.

Welding Project Selection Criteria (YES / NO). (Module 1 - Test Coupons is indicated in the TD)

Submitted by: <b>Name:</b> _____ <b>Country:</b> _____	Pressure Vessel	Aluminium Structure	Stainless Steel Structure
Requirement			
Project Drawings ISO E Weld symbols as per ISO 2533 Electronic Format			
Material/Cutting list			
Photograph of completed tasks			
Pressure Vessel weight		N/A	N/A
Project Major Dimensions			
Additional instructions on drawings			

## 5.6 Test Project selection

- By vote of Experts on the Discussion Forums

## 5.7 Test Project circulation

Please note that if a Test Project is known by the Chief- and/or Deputy Chief Experts, and/or any of the other Experts, it must be shared via the forums before the start of the Competition. This also means that this Test Project is subject to a 30% change before the start of the Competition.

The Test Project is circulated via the website as follows:

- Submitted to the Secretariat for circulation 6 months before the current Competition

## 5.8 Test Project coordination (preparation for competition)

Coordination of the Test Project will be undertaken by:

- Chief Expert and Deputy Chief Expert

## 5.9 Test Project change at the competition

The 30% change to the Test Project is implemented according to the Competition Rules.

## 5.10 Material or manufacturer specifications

Specific material and/or manufacturer specifications required to allow the Competitors to complete the Test Project will be supplied by the Host Organization and are available via the forums. 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.

Not applicable.

## 5.11 Software specifications

Not applicable.

## 6 Skill management and communication

### 6.1 Discussion forum

Prior to the EuroSkills Competition, all discussion, communication, collaboration, and decision making regarding the Skill Competition must take place on the skill specific Discussion Forum, which can be reached via [www.worldskillseurope.org](http://www.worldskillseurope.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 WorldSkills Europe website [www.worldskillseurope.org](http://www.worldskillseurope.org). Please contact [jordy.degroot@worldskillseurope.org](mailto:jordy.degroot@worldskillseurope.org) for guidance.

The information includes:

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

### 6.3 Test Projects and Marking Schemes

Circulated Test Projects will be available at the WorldSkills Europe website from [www.worldskillseurope.org](http://www.worldskillseurope.org). Please contact [jordy.degroot@worldskillseurope.org](mailto:jordy.degroot@worldskillseurope.org) for guidance.

### 6.4 Day-To-Day management

The day-to-day management of the Skill Competition during the EuroSkills Competition is defined in the Skill Management Plan that is created by the Skill Management Team led by the Chief Expert. The Skill Management Team comprises the Jury President, 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 at [www.worldskillseurope.org](http://www.worldskillseurope.org). Please contact [jordy.degroot@worldskillseurope.org](mailto:jordy.degroot@worldskillseurope.org) for guidance.

## 7 Skill specific safety requirements

### 7.1 Requirements

Refer to Host Country/Region Health and Safety documentation for Host Country/Region regulations. This document will be shared via the forums. One overall Health and Safety document will be published, as well as Skill specific safety requirements.

## 8 Materials and equipment

### 8.1 Infrastructure List

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

The Infrastructure Lists will be available at the WorldSkills Europe website from [www.worldskillseurope.org](http://www.worldskillseurope.org). Please contact [jordy.degroot@worldskillseurope.org](mailto:jordy.degroot@worldskillseurope.org) for guidance.

The Infrastructure List specifies the items and quantities requested by the Experts for the next Competition. The Host Organization will progressively update the Infrastructure List specifying the actual quantity, type, brand, and model of the items.

At each Competition, the Experts must advise the Competition Manager 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 Competitors toolbox

WorldSkills Europe aims to minimize the sending of toolboxes as much as possible. We therefore ask you to keep this in mind when writing the section below. Please be advised that competitors should bring as little as possible and what they do bring **MUST** be true hand tools. Only items are allowed that would significantly affect their ability to perform the task and deliver the Test Project to a high standard.

Each Competitor is allowed one toolbox in the workshop with a maximum external volume of 0.5m<sup>3</sup>. For example, 1000mm x 600mm x 840mm. Competitors with toolboxes larger than this will be asked to remove them from the workshop and store them offsite.

### 8.3 Materials, equipment and tools supplied by Competitors in their toolbox

The Competitor shall bring tools and equipment in a toolbox and it is encouraged to bring other new tools and devices that are being used in today's industry.

The following list as a minimum shall be supplied by the Competitor.

- Welding safety glasses
- Grinding goggles
- Welder's helmet, speed lenses are permitted
- Safety boots with protective toes
- Ear protection
- Hand angle grinder with guard, maximum 125mm (5inch)
- Wire brush wheels to suit grinder
- Fire retardant clothing
- Chipping hammer (slag hammer)



- Inter-weld run cleaning, blade scrapers
- Chisels
- Scriber
- Files
- Wire brushes
- Hammer
- Weld gauge (fillet gauge)
- Metric steel ruler (tape measure)
- Square
- Chalk/soapstone
- Dividers
- G-clamps and/or c-clamps and quick gripping devices
- Power transformer (if required) and extension leads
- Other personal hand tools that are approved by experts

#### Notes:

- All working clothes and all tools must comply with host country safety regulations.
- Alignment aids for setting up test samples may be used, provided they are removed prior to welding.
- Competitors may use their own MMAW - 111, TIG - 141, MAG - 135 and FCAW - 136 hand pieces/torches, provided the Competitor does not damage the Host Country equipment. The Competitor's equipment must comply with safety regulations.
- The Competitor's equipment shall comply with safety regulations.
- Should any Competitor supplied equipment fail or become unserviceable during the competition, no additional time allowance shall be made.
- All working clothes and all tools shall comply with Host Country safety regulations. Alignment aids for setting up test samples may be used, provided they are removed prior to welding.

## 8.4 Materials, equipment and tools supplied by the Experts

Not applicable.

## 8.5 Materials, equipment and tools prohibited in the Skill area

Any material that may be used to assemble a project or part of a project is not allowed to be brought to the Competition.

No additional consumables or practice materials are allowed to be brought to the Competition. Only items in section 8.3 are allowed.

## 8.6 Workshop Layout

Workshop layouts from previous competitions are available by contacting the Competition and IT Coordinator at: [jordy.degroot@worldskillseurope.org](mailto:jordy.degroot@worldskillseurope.org). New Workshop Layouts will be communicated via the forums when completed.

Please be advised that you will have the opportunity to discuss your Workshop Layout proposal with the Host Organization during the Skills Development Workshop (SDW) and the Competition Preparation Meetings (CPM).

For workshop layout development, please refer to the forums.

## 9 Skill-specific rules

### 9.1 Introduction

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 Personal laptops – USB – memory sticks – mobile phones

Experts and Competitors are allowed to use personal laptops, USB-memory sticks and mobile phones in the workshop.

### 9.3 Personal photo cameras – video taking devices

Experts and Competitors are allowed to use personal photo cameras and video taking devices in the workshop.

### 9.4 Communication between compatriot experts and competitors

Communication between compatriot experts and competitors may take place as indicated in the Competition Rules.

### 9.5 Other

## 10 Visitor and media engagement

### 10.1 Engagement

Following is a list of possible ways to maximize visitor and media engagement, within the remit of the Competition Rules:

- Try a trade
- Display screens
- Test Project descriptions
- Enhanced understanding of Competitor activity
- Competitor profiles
- Career opportunities
- Daily reporting of competition status
- Welding simulator

# 11 Sustainability

## 11.1 Sustainability

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.