

Technical Description

Autobody Repair

Transportation and Logistics



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

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1 INTRODUCTION

1.1 NAME AND DESCRIPTION OF THE SKILL COMPETITION

1.1.1 The name of the skill competition is

Autobody Repair

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

Autobody repairers realign both the structure and the panelling of both light and heavy duty vehicles after they have been involved in collisions. This can often be a complex process as each collision will present different degrees and directions of damage. The repaired vehicle must conform to the stringent specifications established by the vehicle manufacturer and meet both their tolerances and their safety specifications. An autobody repairer needs to be familiar with MET (mechanical/electrical/trim) components and their function as well as the specific and often complex safety restraint systems (SRS) fitted to modern vehicles. The autobody repairer returns the vehicle to a condition where it is ready for refinishing.

An autobody repairer works in a facility dedicated to repair and is equipped with the machinery and equipment suitable to repair a wide variety of modern passenger cars. An autobody repairer's work is often divided between major and minor collision damage; however, skills in both areas may often be used on the same vehicle. In a major collision repair the autobody repairer will mount the vehicle onto a specialized body jig with which he or she can diagnose the direction and extent of the misalignment to the car body structure. He or she then attaches heavy hydraulic pulling equipment to the body and uses this pulling force to reverse the damaging force.

After the misalignment has been rectified to the structure the repairer will normally have to remove damaged structural and non-structural members which are replaced with new sections or part sections using various welding processes and/or riveting and bonding. For a minor collision an autobody repairer may replace or repair non-structural panels to a condition suitable for refinishing. Repairers must be able to use vehicle body alignment benches and associated measuring equipment (universal and fixed bracket) as a means of assessing the extent of damage and reinstating the structure to its original specifications. An autobody repairer must be a skilled welder who is capable of joining a variety of metals such as low carbon steel, high strength steels or aluminium alloys using metal active gas welding (MAG), and resistance/inverter spot welding.

He or she must be able to select the correct consumables for the metal being welded and adjust the machine to provide an efficient high quality weld. In some circumstances body panels may be replaced using bonding and riveting equipment. The repairer must be able to prepare, adjust and use this equipment effectively following manufacturers specifications to reinstate damage panels.

Autobody repairers must be able to remove damaged sections with minimum disruption to surrounding body work and re-attach/re-align the parts to reinstate the integrity of the body shell. These parts or panels may be welded, bolted or riveted.

For minor damage that does not require the replacement of a part or panel an autobody repairer will use a variety of repair tools to remove the damage and reinstate the panel's original contours. These may involve a range of shaped hammers and 'dollies', bumping files, body files, pry bars and oil stones.

1.1.3 Number of Competitors per team

Autobody Repair is a single Competitor skill competition.

1.1.4 Age limit of Competitors

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

1.2 THE RELEVANCE AND SIGNIFICANCE OF THIS DOCUMENT

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

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

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

1.3 ASSOCIATED DOCUMENTS

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

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

2 THE WORLDSKILLS STANDARDS SPECIFICATION (WSSS)

2.1 GENERAL NOTES ON THE WSSS

The WSSS specifies the knowledge, understanding, and specific skills that underpin international best practice in technical and vocational performance. It should reflect a shared global understanding of what the associated work role(s) or occupation(s) represent for industry and business (www.worldskills.org/WSSS).

The skill competition is intended to reflect international best practice as described by the WSSS, and to the extent that it is able to. The Standards Specification is therefore a guide to the required training and preparation for the skill competition.

In the skill competition the assessment of knowledge and understanding will take place through the assessment of performance. There will only be separate tests of knowledge and understanding where there is an overwhelming reason for these.

The Standards Specification is divided into distinct sections with headings and reference numbers added.

Each section is assigned a percentage of the total marks to indicate its relative importance within the Standards Specification. This is often referred to as the “weighting”. The sum of all the percentage marks is 100.

The Marking Scheme and Test Project will assess only those skills that are set out in the Standards Specification. They will reflect the Standards Specification as comprehensively as possible within the constraints of the skill competition.

The Marking Scheme and Test Project will follow the allocation of marks within the Standards Specification to the extent practically possible. A variation of five percent is allowed, provided that this does not distort the weightings assigned by the Standards Specification.

2.2 WORLDSKILLS STANDARDS SPECIFICATION

SECTION		RELATIVE IMPORTANCE (%)
1	Work organization and management and communication and interpersonal skills	10
	<p>The individual needs to know and understand:</p> <ul style="list-style-type: none"> • Current occupational health and safety regulations relating to the autobody repair industry • Correct use and maintenance of all personal protective equipment and clothing • All recommendations and information published by the suppliers or manufacturers of products and equipment • The process for maintaining and using specialized equipment • Terminology that relates to body repair processes • Terminology that relates to the car body structure and its construction • The importance of the correct handling and disposal of environmentally harmful products • Communication and interpersonal skills • The potential harmful impact that repair products and processes can have upon the environment • The range and purposes of documentation, including written and technical drawings including schematic and wiring diagrams, in both paper based and electronic forms • The technical language associated with the skill • The industry standards required for inspection and fault reporting in oral, written, and electronic formats • The required standards for customer service and care 	
	<p>The individual shall be able to:</p> <ul style="list-style-type: none"> • Apply occupational health and safety regulations and best practice to the autobody repair industry • Use correctly and maintain personal protective clothing and equipment • Set-up, use, adjust, and maintain all specialist repair equipment, promote health and safety practices in the workplace, apply all recommendations and guidance provided by suppliers and manufacturers of equipment or products • Adhere to MSDS (manufacturers safety data sheets) • Adopt correct procedures for handling and disposing of environmentally harmful products • Select and use products that are environmentally acceptable • Dispose of environmentally harmful products in a safe and responsible way 	

2	Diagnosis and correction	20
	<p>The individual needs to know and understand:</p> <ul style="list-style-type: none"> • The safety recommendations associated with mounting and pulling damaged vehicle bodies • Manufacturers' data and how this is translated to the vehicle body • The principles surrounding the construction of vehicle bodies, including light passenger, light commercial and commercial • Characteristics of body construction relating to strength and collision protection • Characteristics and purpose of structural and non-structural panels • The importance of positional correctness to retain vehicle safety and performance • The role played by direction and weight of damage force as well as the impact at the point of collision • How position, shape and strength of individual body assemblies affect the paths taken by collision forces • Methods of correcting forces including vectors of force • Principles of body jig measuring systems including bracket and computerized measuring systems • Principles of pulling systems including fixed post, swinging arm and vector systems 	
	<p>The individual shall be able to:</p> <ul style="list-style-type: none"> • Mount the vehicle on anchoring equipment • Interpret manufacturers specifications relating to the vehicle • Diagnose the extent of vehicle damage and rectify this damage with reference to the vehicle manufacturers recommendations • Determine the direction of the damaging force or impact • Determine the extent of the damaging force or impact • Determine structural damage using appropriate diagnostic equipment • Identify the correct and appropriate methods for the correction of vehicle body damage • Reinststate correct vehicle body alignment • 'Rough out' damaged sections or panels prior to removal for replacement • Straighten and align damaged structural components and reinststate their dimensional accuracy • Diagnose frame damage using any of: <ul style="list-style-type: none"> • Toe in gauge • Self-alignment gauge • Tram gauge • Vehicle manuals etc. • Repair and align full frame and suspension damage 	

3	Replace necessary welded on parts/panels	34
	<p>The individual needs to know and understand:</p> <ul style="list-style-type: none"> • The importance of following the manufacturers recommended repair methods and warranty procedures • Suitable methods of identifying fixing types weld positions and weld types • Methods of safely and cleanly removing fastenings to free damaged panels for replacement • Use, setting and maintenance of pneumatic tools used for panel removal and replacement • Principles of operation and adjustment of welding systems used for panel replacement including MAGS, Resistance spot and MIG brazing • Processes and procedures for preparing replacement panel work and panel fixing positions • The importance of realigning structural parts and assemblies to reinstate vehicle integrity and driving characteristics • Principles of reinstating suitable corrosion protection to replaced parts • The importance of working within agreed time schedules 	
	<p>The individual shall be able to:</p> <ul style="list-style-type: none"> • Repair or replace structural parts correctly including composites (GRP, carbon) • Remove structural panels with minimal disturbance to surrounding panels and prepare surfaces appropriately to receive new parts • Prepare replacement parts to ensure correct fit up and alignment • Remove welded panels (rails, rear quarter panels, pillars, structural body panels etc.) • Replace major welded panels or panel assemblies at manufacturers' seam positions • Carry out structural part replacement using sectioning methods and procedures • Use correct welding procedure when replacing structural parts taking into consideration materials being joined, identity of the parts and unforeseen hazards such as brake, fuel and electrical lines • Replace structural panels using any of the following jointing methods: <ul style="list-style-type: none"> • MIG welding • MIG brazing • Riveting and bonding • Carry out welding procedures necessary to complete the repair (MAGS) • Resistance spot, • MIG Brazing • Dress weld seams using sanding/grinding operations 	

4	Remove, re-install or replace, and align exterior and/or interior parts and panels	10
	<p>The individual needs to know and understand:</p> <ul style="list-style-type: none"> • The principles underpinning the use of any of the above fastening system • The types, availability and varieties of the above system • The range of tools used to carry out remove and replace operations and their safe/correct uses • The range of methods for removing and replacing individual panels and parts methods used to align replaced parts and panels to reinstate manufacturers original settings 	
	<p>The individual shall be able to:</p> <ul style="list-style-type: none"> • Remove and re-install or attach parts and/or body panels (hoods, fenders, doors etc.) using any of the following methods: • Screwed • Riveted • Bolted • Clipped • Bonded • Tag removed items for replacement • Re-align replaced parts to manufacturers' given tolerances where available for panel alignment and/or torque settings • Remove, replace and adjust exterior/interior trim and/or other part necessary to complete the repair 	
5	Operate and/or manipulate any tools or equipment necessary to perform autobody repairs	14
	<p>The individual needs to know and understand:</p> <ul style="list-style-type: none"> • The range, selection and assembly of hydraulic pull/push equipment • The characteristics of common metals such as low carbon steel, high strength steels (HSS), ultra-high strength steels (UHSS) • The direct effects of correct positioning, direction of push/pull etc. • The principles behind the operation and maintenance of hydraulic push/pull equipment • The range of set ups, ram ends and their purposes 	
	<p>The individual shall be able to:</p> <ul style="list-style-type: none"> • Select, assemble and correctly operate hydraulic push/pulling equipment such as bench mounted, rack or Porto-Power etc. • Manipulate body hammers, spoons, pick and pry bars, body files and any other tools used in the straightening process • Safely and efficiently operate the range of pneumatic tools used in the repair process (e.g. air hammer, disc grinder, file board, shears, adhesive/sealer and rivet guns to include self-piercing riveters etc.) • Safely and efficiently operate electric tools (e.g. welders, pulling tools, power tools) • Use a push set up to execute a pull direction • Prepare the push base to prevent induced damage 	

6	Cosmetic repair of plastic non-structural components	12
	The individual needs to know and understand: <ul style="list-style-type: none"> • The safety recommendations placed around correct repairs of non-structural cosmetic panels, e.g. bumpers, headlights, plastic outer trims • The operation of the range of plastic panels and bumpers which may include parking sensors and ADAS systems • Manufacturers' removal, replacement, repair, and testing procedures • Health and safety procedures around safe repairs directly from the OEM guidance 	
	The individual shall be able to: <ul style="list-style-type: none"> • Remove, replace, repair of plastic non-structural components • Understand and correct use OEM repair methods for both manufacturer and product supplier • Perform repairs needed to complete safe repairs to the components • Manually test sensors or systems to a "road safe" standard before handing vehicle back to the customer. 	
	Total	100

3 THE ASSESSMENT STRATEGY AND SPECIFICATION

3.1 GENERAL GUIDANCE

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

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

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

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

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

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

4 THE MARKING SCHEME

4.1 GENERAL GUIDANCE

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

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

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

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

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

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

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

4.2 ASSESSMENT CRITERIA

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

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

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

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

4.3 SUB CRITERIA

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

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

4.4 ASPECTS

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

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

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

	CRITERIA								TOTAL MARKS PER SECTION	WSS MARKS PER SECTION	VARIANCE		
	A	B	C	D	E	F	G	H					
STANDARDS SPECIFICATION SECTION	1	5.00								5.00	5.00	0.00	
	2		2.00					7.50			10.00	0.50	
	3								11.00		10.00	1.00	
	4			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	10.00	10.00	10.00	15.00	20.00		100.00	100.00	2.00	

4.5 ASSESSMENT AND MARKING

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

4.6 ASSESSMENT AND MARKING USING JUDGEMENT

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

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

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

4.7 ASSESSMENT AND MARKING USING MEASUREMENT

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

4.8 THE USE OF MEASUREMENT AND JUDGEMENT

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

4.9 COMPLETION OF SKILL ASSESSMENT SPECIFICATION

Experts will prepare the aspects of criterion.

Test Project marking document

- The Test Project marking scheme (used by the Experts at the Competition) must include the assessment criteria and all explanations for mark deductions (penalties).

Diagnosis

- Set-up
 - Deductions for each anchoring clamp not installed according to equipment maker's recommendations;
 - Measuring system;
 - Deductions for the incorrect installation of the measuring bridge and locking braces;
 - Deductions for each measuring point not recorded or displayed;
 - Deductions for each jig (if used) with excessive tension on the pin or bolts.

Correction

- If measuring system is used each measuring point must not exceed manufacturer's tolerances; but only judged on measurement points previously out of alignment when first measured.
 - Deductions for each measuring point (length, width, height) exceeding manufacturer's tolerances, but only judged on measurement points previously out of alignment when first measured.
 - Deductions for each tear or deforming caused by incorrect pulling or incorrect clamping;
- Jig bolts and sill clamp nut torque must be checked using a torque wrench according to the equipment manufacturer's specifications;
 - Deductions for each bolt or nut without proper torque;
 - Deductions for each bolt missing.

Panel removal (structural and non-structural)

- Deductions for each hole left by drilling or grinding unless they are to be used for a MIG plug weld where required by the manufacturer and/or Competitor Instructions;
- Other drilling damage criteria must be clearly defined (i.e. drilling depth and scoring);
- Deductions for every tear in adjacent panels;
- Deductions for each 5 mm of reinforcement cut when cutting off panel;
- Deduction for each spot remnant not removed by grinding or panel finishing;
- Deduction for each 25 mm of flange not repaired/straightened.

Panel preparation (structural and non-structural)

- Paint/sealer removal in preparation for welding;
- Resistance spot welding – all four flange surfaces;
- Butt MIG weld joints – inside and outside of the joint;
- Plug MIG weld joints – the first three surfaces (back side is not required);
- Deductions for each 50mm of flange or section not cleaned;
- Weld through primer must be applied to all joint matting surfaces in preparation for resistance spot and MIG plug welding;
- Deductions for each 50mm without weld-through primer applied in weld site;
- Removal of weld through primer after inspection and during assembly is not permitted;
- Deductions for each 50mm of weld through primer removed.

Install replacement panel/part (fit-up)

- Butt joint gaps in preparation for welding as per manufacturer's specifications;
- If manufacturer's specifications are not available, the following should apply:
 - Metal up to 1mm thickness – close butt to a maximum gap of 1mm;
 - Metal exceeding 1mm thickness – minimum gap should be one metal thickness and maximum, twice the metal thickness;
 - Deductions for each 5mm of overlap or gap larger than specified gap;
 - Hole diameter for plug welding as per instructions, tolerance +/- 0.5mm;
 - Deduction for each incorrect hole size;
 - Drilling depth for multi panel plug welds as per instructions;
 - Deduction for each hole drilled incorrect depth.
- Swage/fold lines:
 - Deductions for each swage/fold line not aligned correctly where welded. This will be measured using a template that matches the swage/line contour. Tolerance + or -1mm;
- Panel flanges:
 - Deductions for every area (at or between plug welds) where there is a gap greater than 0.5mm between the two panels. On 1mm low carbon steel only.

MIG tack welding for butt and lap joints

- No minimum tack weld spacing required, unless specified otherwise; (1 per 20mm);
- Tack may be ground flush before applying final weld.

MIG continuous welds

- Butt and lap MIG welding runs (minimum length):
 - There is no minimum length required, unless specified otherwise;
 - Weld quality;
 - Deductions for every 5mm of weld having any of the following defects (holes, skips, voids, porosity, etc.);
 - Deductions for every 5mm of weld exceeding 2mm high;
 - Deductions for each 5mm of no visible penetration.

MIG plug welds

- Weld quality:
 - Deductions for each incorrect placement or number of plug welds;
 - Deductions for each plug weld where the hole hasn't been completely welded;
 - Deductions for each plug weld exceeding 2mm high;
 - Deductions for plug welds that exceed 1.5 times the diameter (elongation) of the hole;
 - Deductions for each faulty weld, tested at random.

Resistance spot welds

- Weld quality:
 - Deductions for each incorrect placed or number of spot welds;
 - Deductions for each spot weld which has blown a hole;
 - Deductions for each spot weld where metal edge is missing due to “splashing or explosion”;
 - Deductions for each faulty weld, tested at random.

Metal adhesive bonding technique

- Panel preparation, procedure and finishing as per manufacturer’s instructions;
- Deductions for incorrect panel preparation, procedure or finishing;
- Incorrect formation of mechanical fastening rivets.

Dressing (Grinding/Sanding) of welds

- Completed welds must not be altered or reduced in size by grinding, chiselling or mechanical buffing, before marking takes place;
- Deductions for each plug weld and each 5 mm of continuous weld altered or reduced in size;
- Deductions for each 5 mm of continuous weld that has been ground too deep or not ground enough;
- Deductions for each MIG plug weld ground too deep or not enough.

Panel gaps and alignment

- All “bolt-on” panels/parts must be replaced as per manufacturer’s specifications:
 - Deductions for each panel gap, swage/body line, inward and outward alignment in excess of tolerance;
- 0.5mm tolerance will be applied where manufacturer’s tolerance is not specified.

Panel repairs (finishing)

- Judgement marking:
 - The repaired panel may be coated (with a solvent or similar) to produce a glossy surface and looked at in the light for imperfections (visual inspection);
 - The repaired area may be felt by hand;
- Templates:
 - The contour of a panel is checked by using a metal template. Expert’s templates are constructed with the correct contour and shape;
 - Where the panel contour/shape is lower than the template the largest gap is measured;
 - Where the panel is too high/full, one end only the template is held against the panel and the size of the gap is measured at the other end;
 - Deductions for each 1mm in excess of 1mm tolerance;
- Safety Restraint System SRS:
 - Remove and replace faulty SRS components;
 - Reset fault codes;

Deductions for each incorrect procedure.

4.10 SKILL ASSESSMENT PROCEDURES

The following will be used as a guide for the Experts for marking the Test Project modules completed by the Competitors:

- The Experts will be divided into marking groups (a minimum of three per group) with a designated leader;
- Once the provisional marking scheme has been prepared the marking team leader will present and summarize their section of the Competitor Instructions and the marking scale;
- All templates and other tools used for marking must be displayed and checked for accuracy;
- Every completed module will be marked on the same day in which it was completed;
- To ensure transparency, each Competitor is provided with a copy of the same Mark Summary Form as used by the Experts;
- Where a clarification on marking criteria or process is required throughout the Competition the Chief Expert must ensure that all Experts are present and aware of any decision made and the result documented for future reference;
- Agree on a solution for disputes concerning marks awarded etc. by way of majority vote;
- Certain tasks need to be marked by Experts “while in progress” these are indicated in the Competitor’s instructions where STOP is shown;
- A “request for judging chart” must be centrally located near the Experts’ office;
- This chart will be numbered in the same manner as the Competitor Instructions and the assessment document. When the Competitor is ready to be marked on STOP A.0.1 (for example) they will write down the time in the appropriate STOP box on the chart. After the Experts have finished marking that component, the Competitor is verbally advised;
- An individual “request for judging chart” is also installed in the Competitor’s workstation, the Experts will record on that chart that the marking has been completed;
- The Competitor can proceed with another task while the marking is taking place, providing there is no interference with the evaluation taking place where possible.

5 THE TEST PROJECT

5.1 GENERAL NOTES

Sections 3 and 0 govern the development of the Test Project. These notes are supplementary.

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

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

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

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

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

This Technical Description will note any issues that affect the Test Project's capacity to support the full range of assessment relative to the Standards Specification. Section 2.1 refers.

5.2 FORMAT/STRUCTURE OF THE TEST PROJECT

The format of the Test Project is a series of modules.

The Competitor instructions document must be written in a consistent style and format.

5.3 TEST PROJECT DESIGN REQUIREMENTS

In the Competitor's instructions, STOP must be written with a border at each evaluation point/section. The STOP must clearly define what is to be evaluated. All STOPS on the Competitor instructions must be numbered in this manner:

- A1
- A2
- B1
- B2
- C1
- C2
- D1
- D2
- E1
- E2 etc.

The evaluation criteria must also be numbered so that each STOP number matches the STOPS on the Competitor instructions. These STOP numbers must appear in the assessment criteria.

The Competitor must be tasked to demonstrate a range of skills in Autobody Repair. There should be at least five (5) different modules prepared.

- Module A - Diagnosis and Correction
- Module B - Structural Part Replacement
- Module C - Non-Structural Part Replacement
- Module D - Panel Repair
- Module E – MET (mechanical electrical and trim) and Safety Restraint System SRS.

Module A – Diagnosis and Correction

- Safe work practices must always be adhered to and apply to Host Country's regulations;
- Diagnose, repair and realign structural damage on a vehicle mounted on a realignment bench provided by the host country;
- Remove bolt-on parts for access as necessary;
- Ensure that the sill clamps and/or centring jigs are in recommended position and secure (tightened);
- Vehicle must be measured by either a jig system or a universal mechanical measuring system;
- A misalignment report will be compiled as required;
- Realign and repair components that are not being replaced;
- Repair all structural components to manufacturer's contours and shape that are not to be removed and replaced. The repair must be finished to a state that could be chemically treated and primed.
- The repair must not lose its strength due to over thinning of steel;
- There may be upper engine bay measuring points given to assist you to realign front engine bay to manufacture's measurements;
- All front-end bolt on panels supplied must be refitted to manufacturers' specifications;
- After the repairs are completed the engine bay must be realigned to the specification provide by the equipment manufacturer. A printout should be provided for verification if applicable;
- Manufacturer's specifications and tolerances should be respected. If none are available, and using a universal measuring system, + or - 3mm is the tolerance used for each measuring point (dimension).

Module B – Structural Part(s) Replacement

- Safe work practices must always be adhered to and apply to Host Country's regulations;
- Remove bolt-on parts for access as necessary;
- Assessment will be done as the module evolves as determined by the stop points in the Competitor instructions and at the end of the four days of the Competition.

Panel Removal

- Remove parts damaged beyond repair listed in the Competitor's instructions (full or partial) following the vehicle repair manual using manufacturers' specifications. If unavailable, the Experts will supply necessary procedural information;
- Remove corrosion protection and paint materials as necessary in areas where panels or panel flanges will be heated by any welding method;
- Straighten (repair) all parts and components deformed during the repair process and dress/clear appropriately.

Panel Preparation

- Drill or punch holes for plug welds on flanges as necessary;
- Welding primer should be applied to all weld areas, according to the vehicle manufacturer's guidelines;
- Prepare reinforcements as required;
- Apply adhesive on correct areas should the part be bonded.

Install replacement panel/parts (fit-up)

- Produce joint gaps to within manufacturer's tolerances;
- Ensure the correct alignment of swage/fold lines of the replacement parts to existing vehicle part locations;
- Produce flush mating flange fit-up.

Replace panel/part(s) by welding and/or metal adhesive bonding technique

- Replace parts listed in the Competitor's instructions (full or partial) following the vehicle repair manual using manufacturers' specifications. If unavailable, the Experts will supply necessary procedural information.
- All placement and type of welding is to be completed as specified by the vehicle manufacturer. If none are available, the Test Project sample (located at the Competition in a stall with Competitor and Expert access) will be used.
- Welding procedures will be performed as per manufacturers repair manual instructions unless otherwise specified because of lack of manufacturer repair information or the project design.
- All MIG plug and continuous welds must be marked before grinding takes place unless directed otherwise.
- Welds will be tested for strength (random selection).
- Welded areas must be finished in a state that would enable the areas to be chemically treated and primed.
- Metal adhesive bonding as per manufacturer's instructions

Dress/Grind/Sand Welds

- After MIG welding (plug or continuous welds) the welds must be ground (as determined by the Experts at the competition) flat and finished;
- Welded areas must be finished in a state that would enable the areas to be chemically treated and primed;
- When you finish grinding/sanding welds, they must be checked, Inspection and marking may be required before fitting bolt on parts;
- Metal finishing in the polyester filling location is not required;
- Metal finishing - sand to P80g or finer;
- Paint edges feathered to P120g or finer.
- Panel gaps
Reinstall all "bolt-on" parts removed for repair operations using manufacturer's specifications and tolerances.

Module C – Non-Structural Part(s) Replacement

- Safe work practices must always be adhered to and apply to the Host Country's regulations;
- Remove bolt-on parts for access as necessary;
- Assessment will be done as the module evolves as determined by the stop points in the Competitor Instructions and at the end of the four days of the Competition.

Panel Removal

- Remove a panel/part following sectioning guidelines in the Competitor's instructions;
- Remove corrosion protection and paint materials as necessary in areas where panels or panel flanges will be heated by any welding method;
- Straighten (repair) all deformation and remove spot weld remnants.

Panel Preparation

- Drill or punch holes for plug welds on flanges as necessary;
- Welding primer should be applied to all weld areas, according to the vehicle manufacturer's guidelines.

Install replacement panel/parts (fit-up)

- Produce joint gaps to within manufacturer's tolerances;
- Ensure the correct alignment of swage/fold lines at the replacement part to existing vehicle part locations;
- Produce flush mating flange fit-up;
- The panel must be fitted to suit manufacturer's measurements and gaps with adjacent panels.

Replace panel/part(s) by welding and/or metal adhesive bonding technique

- All welding is to be completed as specified by the vehicle manufacturer and/or Experts instructions.
- All welded butt joints that would normally require polyester filler are to be dressed ready for a thin application of filler however, filler will not be applied;
- All MIG continuous and plug welds must be marked before grinding takes place unless directed otherwise;
- Welds will be tested for strength (random selection);
- Welded areas must be finished in a state that would enable the areas to be chemically treated and primed;
- Metal adhesive bonding as per manufacturer's instructions.

Dress/Grind/Sand Welds and bonded areas.

- After inspection the MIG plug or continuous welds must be ground flat and finished;
- Welded areas must be finished in a state that would enable the areas to be chemically treated and primed;
- Bonded areas need to be prepared for metal filler.

Module D – Panel Repair

- Safe work practices must always be adhered to and apply to the Host Country's regulations;
- Repaired area must have the original contour and shape on secured (welded) panels only
- Repaired area must be file finished, this should be completed if marks are to be awarded
- Panel shrinking must be done with electrical equipment or cold shrinking as needed, miracle/welded dent pull systems only to be used if agreed in the Test Project and specified on the IL and provided by the sponsors only.
- Repaired area is to be carried out without filler to a standard ready for chemical treatment and primer;
- Repaired areas must not have deep file marks;
- Metal finishing - sand to P80g or finer;
- Paint edges feathered to P120g or finer;
- The panel repair area must not be damaged by excessive filing or sanding (example, file or grind through body lines and folds).

Module E – Cosmetic repair on plastic and non-structural components

- Safe work practices must always be adhered to and apply to the WorldSkills Health, Safety, and Environment policy and guidelines;
- Thermal joining or cold adhesive repairs methods to be followed by either OEM or manufacturers methods or standards;
- Repairs finished to a standard ready for primer in the paint shop (P180 or higher);

- Any ADAS systems e.g. parking sensors to be manually tested before and after the task where possible but should not be required for the electronic diagnosis equipment;
- Correct storage of all bolts and fastening should be followed;
- Correct torque settings and repair times adhered to in line with OEM methods where possible;
- Any systems (ADAS) worked upon should be checked before the vehicle is passed back to the customer/judges;

5.4 TEST PROJECT DEVELOPMENT

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

5.4.1 Who develops the Test Project or modules

The Skill Competition Manager (SCM) will work with Independent Designers to develop the Test Project modules. The Independent Designers may include technicians from the major sponsors and the Workshop Manager. They shall be known as the Test Project Design Team.

5.4.2 How and where is the Test Project or modules developed

The availability and costs associated with the body shell procured by the Competition Organizer will determine the development options. The SCM will make the final decision on who, how, and where this will be done. The Test Project must align with the WSSS.

5.4.3 When is the Test Project developed

The Test Project is developed according to the following timeline:

TIME	ACTIVITY
As close to CPW as possible	As soon as possible the Competition Organizer advises the make and model of the car body shell for the Competition by listing it on the IL
Four (4) months prior to the Competition (if the body shell has been identified and is available for development)	A minimum of five Test Project modules are developed by the Test Project Design Team.
Three (3) months prior to the Competition	A Test Project general template will be circulated on the WorldSkills website
At the Competition	The technical details of the Test Project will be circulated, there will not be a 30% change.

5.5 TEST PROJECT VALIDATION

Upon development of the Test Project, the marking scheme will be tested to confirm the validity of both it and the modules according to the manufacturer's data on repair methods and in alignment with the WSSS.

5.6 TEST PROJECT SELECTION

The selection of the Test Project is done by the Independent Designer.

5.7 TEST PROJECT CIRCULATION

The Test Project is circulated via the website as follows:

The Test Project general template is circulated three months prior to the Competition. The technical details of the Test Project are not circulated.

5.8 TEST PROJECT COORDINATION (PREPARATION FOR COMPETITION)

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

5.9 TEST PROJECT CHANGE AT THE COMPETITION

There is no 30% change required to be made to the Test Project at the Competition as the technical details are not circulated.

5.10 MATERIAL OR MANUFACTURER SPECIFICATIONS

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

The Competition Organizer shall advise all Experts via the Infrastructure List of the make and model of the body shell and the realignment and measuring system that will be supplied for the Competition as soon as possible after the CPW in order that the design team can commence their project design. As far as possible the make and model of the body shell should be a globally available car.

The Workshop Manager will post the car manufacturer's repair manual and the measuring system datasheet in the Infrastructure List as soon as the make and model is confirmed.

6 SKILL MANAGEMENT AND COMMUNICATION

6.1 DISCUSSION FORUM

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

6.2 COMPETITOR INFORMATION

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

This information includes:

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

6.3 TEST PROJECTS [AND MARKING SCHEMES]

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

6.4 DAY-TO-DAY MANAGEMENT

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

7 SKILL-SPECIFIC SAFETY REQUIREMENTS

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

- All Competitors must wear or use the appropriate Personal Protective Equipment (PPE) including; clothing, footwear, eyewear, hearing, and hand protection whilst in their work area;
- Experts must wear or use the appropriate Personal Protective Equipment (PPE) when entering a Competitor's work area for the purpose of communication and inspection.

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

At each Competition, the Skill Competition Manager must review, audit, and update the Infrastructure List in partnership with the Technical Observer in preparation for the next Competition. The Skill Competition Manager must advise the Director of Skills Competitions of any requests for increases in space and/or equipment.

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

The Competitor's toolbox must be suitably sized to fit within the boundaries of the workstation without encroaching on walkways, neighbouring Competitor workstations or cause obstruction to the free and safe movement of the Competitor or Experts within the work area.

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

The Competitor must supply any tools, special equipment, and individually desired materials not covered in the Infrastructure List. These must be presented to the Experts for inspection before the start of the Competition.

All Competitors must use the Metal Inert Gas MIG and Resistance Spot Welders supplied by the Competition Organizer.

8.4 MATERIALS, EQUIPMENT, AND TOOLS SUPPLIED BY EXPERTS

Experts are required to supply their own Personal Protective Equipment as specified in the WorldSkills Health, Safety, and Environment policy and guidelines.

9 SKILL-SPECIFIC RULES

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

TOPIC/TASK	SKILL-SPECIFIC RULE
Use of technology – USB, memory sticks	Competitors, Experts, and Interpreters are not allowed to bring memory sticks into the workshop.
Use of technology – personal laptops, tablets and mobile phones	Competitors, Experts, and Interpreters are not allowed to bring personal laptops, tablets or mobile phones into the workshop.
Use of technology – personal photo and video taking devices	Competitors, Experts, and Interpreters are only allowed to use personal photo and video taking devices in the workshop at the conclusion of the competition.
Tools/infrastructure	Competitor's toolbox must be suitably sized to fit within the boundaries of the workstation without encroaching on walkways, neighbouring Competitor workstations or cause obstruction to the free and safe movement of the Competitor or Experts within the workshop.
Templates, aids, etc.	Experts may decide to remove any items brought to the Competition by the Competitor, which are not considered normal autobody tools and would give any Competitor an unfair advantage. This applies specially to prefabricated, pre-formed or pre-drawn templates or repair jigs of any kind. These are not allowed to be brought to the Competition. Everything of this nature must be made or fabricated on site if so desired. Profile gauges must not be pre-adjusted before the start of the Competition.
Drawings, recording information	Competitors may only record information and make notes on the Test Project documentation.
Health, Safety, and Environment	Refer to the WorldSkills Health, Safety, and Environment policy and guidelines document.

10 VISITOR AND MEDIA ENGAGEMENT

To maximize visitor and media engagement for Autobody Repair the following ideas will be considered:

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

11 SUSTAINABILITY

This skill competition will focus on the sustainable practices below:

- Recycling;
- Use of 'green' materials;
- Use of completed Test Projects after Competition;
- Reducing the duplication of equipment.

12 REFERENCES FOR INDUSTRY CONSULTATION

WorldSkills is committed to ensuring that the WorldSkills Standards Specifications fully reflect the dynamism of internationally recognized best practice in industry and business. To do this WorldSkills approaches a number of organizations across the world that can offer feedback on the draft Description of the Associated Role and WorldSkills Standards Specification on a two-yearly cycle.

In parallel to this, WSI consults three international occupational classifications and databases:

- ISCO-08: (<http://www.ilo.org/public/english/bureau/stat/isco/isco08/>)
- ESCO: (<https://ec.europa.eu/esco/portal/home>)
- O*NET OnLine (www.onetonline.org/)

This WSSS (Section 2) appears to relate closely to *Automotive Body and Related Repairers*:
<https://www.onetonline.org/link/summary/49-3021.00>.

These links can also be used to explore adjacent occupations.

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

ORGANIZATION	CONTACT NAME
The National Institute for Automotive Service Excellence (ASE) (USA)	Teresa Bolton, Director, Collision Repair Test Development