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

The Technical Description consists of the following:

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2 THE WORLDSKILLS STANDARDS SPECIFICATION (WSSS) ............................................................................ 4
3 THE ASSESSMENT STRATEGY AND SPECIFICATION ....................................................................................... 10
4 THE MARKING SCHEME ......................................................................................................................................... 11
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6 SKILL MANAGEMENT AND COMMUNICATION .................................................................................................. 18
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Effective 12.08.14

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Vice Chair Technical Committee

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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
Sheet Metal Technology

1.1.2 Description of the associated work role(s) or occupation(s).
A sheet metal technician interprets drawings, develops suitable patterns, cuts and forms sheet materials into complex shapes and assemblies both manually and by machine. He or she works in a range of materials including ferrous and non-ferrous materials and therefore needs to understand the joining and fastening of all of these materials.

Sheet metal technicians work in factories and workshops specifically equipped with a range of hand tools, power tools and specialist machines capable of forming and assembling sheet metal into simple and complex shapes.

Sheet metal workers interpret drawings and transfer dimensions to sheet materials and sections to meet the required specification. Sheet metal workers develop patterns both manually and using CAD to allow materials to be formed into the correct shapes. Formed panels are sometimes connected to box section frameworks to form assemblies to suit the required purpose.

Sheet metal workers may be required to programme forming and shaping machinery and operate this machinery to fabricate accurately shaped panels and assemblies.

A sheet metal worker will need to be proficient in a range of joining and fastening processes including metal active gas, Tungsten Inert Gas and resistance spot welding processes. Assemblies can be arranged using hot work processes or cold fixings such as riveting, screwing and bonding.

A sheet metal worker will manually assemble, dress and finish sheet metal panels and assemblies using a range of hand and bench tools.

A sheet metal worker will be able to operate all types of welding equipment, manual and CNC forming equipment, sheet metal hand fabrication and dressing tools as well as a range of power operated tools. A sheet metal worker will use a computer to develop patterns for machine use as well as manually developing simple patterns on a drawing board.

Sheet metal workers serve a wide range of sectors including the marine, aviation, food, pharmaceutical, ventilation, transport, architectural and furniture industries.

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 (when available)
- WSI – Online resources as indicated in this document
- Host Country – Health and Safety 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 not be separate tests of knowledge and understanding.

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. 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

<table>
<thead>
<tr>
<th>SECTION</th>
<th>RELATIVE IMPORTANCE (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Work organization and management</td>
</tr>
</tbody>
</table>

The individual needs to know and understand:
- The current health and safety regulations and recommendations for the modern sheet metal industry
- The range of PPE required for work within the industry
- The procedures for disposing of off cuts, swarf, used cleaning products and cleaning materials
- Interpret simple and complex drawings
- First angle, third angle and isometric projection
- The conversion of common imperial and metric measurements between units
- The use of simple mathematical formulae to calculate additional measurements, check for accuracy and estimate amounts of material required
- The relevance of verifying measurements
- The most suitable methods of arranging shapes to make the most economic use of materials
- The common characteristics such as malleability, ductility and tenacity of a range of sheet metal to include:
  - Low carbon steels
  - Aluminium and aluminium alloys
  - Tin/brass/copper
  - Galvanized and anodized sheet
  - Stainless steel

The individual shall be able to:
- Operate a safe working environment with regard to themselves, work colleagues and any outside personnel
- Choose, maintain and wear suitable PPE as required for the operation being undertaken
- Handle sheet and section materials safely and with regard to the local environment
- Prepare materials to be marked out, cut, shaped and assembled
- De-burr/make safe sheet materials and sections
- Accurately transfer measurements and profiles to sheet metal and sections
- Accurately use manual and digital measuring equipment
- Arrange shapes and forms to make the most economic use of available material and reduce scrap material
- Cut, shape and manipulate sheet metal materials to account for elasticity, malleability and ductility
- Use mathematical formulae to calculate allowances, finished sizes and material quantities
- Work within predetermined time scales to complete all work
- Manipulate simple mathematical measurements and sizes
<table>
<thead>
<tr>
<th>2</th>
<th>Pattern Development</th>
<th>10</th>
</tr>
</thead>
<tbody>
<tr>
<td>The individual needs to know and understand:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• How to interpret drawings in First and Third angle Orthographic projection</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• The methods and principles of manual pattern development for parallel line, radial line and triangulated developments</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• The principles and methods for developing patterns using AutoCAD 2D for parallel line, radial line and triangulation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• How to verify patterns and the methods to transfer to sheet metal</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The individual shall be able to:
• Accurately transfer drawing information and dimensions to sheet metal and section  
• Develop patterns manually by triangulation, parallel line and radial line development  
• Use AutoCAD 2D to develop simple and complex patterns  
• Transfer generated patterns to sheet metal  

<table>
<thead>
<tr>
<th>3</th>
<th>Cutting and Forming</th>
<th>30</th>
</tr>
</thead>
<tbody>
<tr>
<td>The individual needs to know and understand:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Calculation of bend allowances and setback allowances</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• The selection, care and maintenance of a range of hand tools used for cutting and shaping materials</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• The selection, care and adjustments of the range of manually operated forming machines</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• The selection and programming principles when using CNC machines for shaping sheet materials</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Primary folding, rolling, flanging and forming operations</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• The operation and adjustment of mechanical sawing machines</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• The selection, care and maintenance of the range of cutting tools used to cut out patterns accurately</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• The selection of manual cutting techniques available for pattern cutting</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• The operation and adjustment of machines used for cutting and forming sheet metal</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• The adjustment and operation of mechanical sawing equipment</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
The individual shall be able to:
• Use drawings and calculations to include bend allowance/setback to produce accurate forms and folds, including the use of templates
• Use the full range of hand tools to cut, shape, and form, sheet metal
• Adjust and operate manual forming equipment
• Programme CNC machinery to perform forming operations
• Perform primary forming operations
• Adjust and operate power operated bench tools for forming and shaping materials
• Adjust and operate mechanical sawing equipment
• Use the range of manual cutting tools to produce accurate patterns. This range should include:
  • Snips
  • Shears
  • Nibblers
  • Deburring tools and drills
• Use power tools to produce accurate patterns. The range should include:
  • Snips
  • Shears
  • Nibbling
  • Punching
  • Guillotining/shearing
  • Press Forming
  • Notching
  • Grinding and drilling equipment
• Utilise CNC cutting equipment to produce accurate patterns. The range should include:
  • Laser
  • Water jet
  • Plasma
  • Punching
• Check patterns for accuracy and correct errors before use
• Adjust and operate mechanical sawing equipment

4 Assembly Processes

The individual needs to know and understand:
• The selection and operation of the range of mechanical fasteners used to assemble sheet metal and sectional components
• The selection, adjustment, maintenance and of Welding processes used to assemble metal structures
• The range of joints used for assembly
• The choice and operation of common adhesives used in the sheet metal industry
• The range of sheet metal joints available
• The methods used to check dimensional accuracy, square and flatness
• The international welding standards
The individual shall be able to:

- Select and use the range of mechanical fasteners to include:
  - Screws
  - Rivets
  - Bolts
  - Manufacturers patent fasteners
- Prepare surfaces to accept common adhesives
- Select and use common construction adhesives
- Produce common sheet metal joints for assembly to include:
  - Lock
  - Seamed
  - Knocked up
  - Hemming
  - Safety edges
- Adjust and operate GMAW and GTAW and MMAW welding equipment to produce welded joints to include:
  - Butt
  - Seam
  - T fillet
  - Lap
  - Corner
  - Hollow section to flat sheet
- Adjust and operate Oxygen/Fuel gas welding equipment for brazing and soldering
- Produce welded joints to international standards
- Adjust and operate resistance spot welding equipment to join sheet metal
- Check work for dimensional accuracy, square, flatness

### Finishing

The individual needs to know and understand:

- The range of finishing processes available
- The characteristics of each type of finish
- The range of tools and equipment required to operate finishing processes
- The preparation for the range of surface finishes available including:
  - Powder coating
  - Anodizing
  - Painting
  - Polishing
  - Plating
  - Galvanizing
The individual shall be able to:

- Use hand tools to planish and finish sheet metal items
- Use power tools and equipment to finish sheet metal items including surface texturing equipment
- Achieve high quality finishes on assembled sheet metal articles
- Leave the completed article in a finished condition
- Finish welds to achieve suitable finished profiles
- Polish sheet metal and sections to achieve a saleable finish
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 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 judgment. These are referred to as objective and subjective, respectively. For both types of assessment the use of explicit benchmarks against which to assess each Aspect is essential to guarantee quality.

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

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

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

4.1 GENERAL GUIDANCE

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

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

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

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

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

In addition, Experts are encouraged 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 the complete and approved 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 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).

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 of assessment 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) has a specified day on which it will be marked.

Each marking form (Sub Criterion) contains either objective or subjective Aspects to be marked. Some Sub Criteria have both objective and subjective aspects, in which case there is a marking form for each.

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 objectively or subjectively and appear on the appropriate marking form.

The marking form lists, in detail, every Aspect to be marked together with the mark allocated to it and a reference to the section of the skill as set out in the Standards Specification.

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)
4.5 **SUBJECTIVE MARKING**

Subjective marking uses the 10 point scale below. To apply the scale with rigour and consistency, subjective marking should be conducted using:

- benchmarks (criteria) to guide judgment against each Aspect
- the scale to indicate:
  - 0: non attempt;
  - 1-4: below industry standard;
  - 5-8: at or above industry standard;
  - 9-10: excellence.

4.6 **OBJECTIVE MARKING**

A minimum of three experts will be used to judge each aspect. Unless otherwise stated only the maximum mark or zero will be awarded. Where they are used, partial marks will be clearly defined within the Aspect.

4.7 **THE USE OF OBJECTIVE AND SUBJECTIVE ASSESSMENT**

The final deployment of objective or subjective assessment will be agreed when the Marking Scheme and Test Project are finalized. The table below is advisory only for the development of the Test Project and Marking Scheme.

<table>
<thead>
<tr>
<th>SECTION</th>
<th>CRITERION</th>
<th>MARKS</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Pattern development</td>
<td>Subjective</td>
<td>Objective</td>
<td>Total</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>B</td>
<td>Dimensions, square and parallel</td>
<td>0</td>
<td>45</td>
<td>45</td>
</tr>
<tr>
<td>C</td>
<td>Forming and welding</td>
<td>0</td>
<td>25</td>
<td>25</td>
</tr>
<tr>
<td>D</td>
<td>Assembly and finish, material use and safety</td>
<td>0</td>
<td>20</td>
<td>20</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>0</td>
<td>100</td>
<td>100</td>
</tr>
</tbody>
</table>
4.8 COMPLETION OF SKILL ASSESSMENT SPECIFICATION

A - Pattern development
- Pattern template;
- Radius – measured on major parts with a tolerance for measurements.

B – Dimensions
- Measurements taken in specified places to be indicated;
- Diameter;
- Width;
- Height;
- Square;
- Stability;
- Flatness.

C – Forming and welding
- Free of broken backs;
- Free of manual deformations;
- Fit of joints;
- Size of MIG welding;
- Size of TIG welding;
- Free of arc strikes and weld spatter.

D – Assembly and finish, material use and safety
- Overall completion;
- Safety in the workshop;
- General safe working;
- Use of materials – quantity;
- Regular finishing.

4.9 SKILL ASSESSMENT PROCEDURES

The Experts who attend the Competition will be divided into marking groups based on industry experience, Competition experience, specific competencies and geographical spread.

Completed modules will be marked on the same day in which they were completed where possible.

Measurement and inspection:
- Measuring range (overall measurements) up to 1000mm by 1000mm by 1800mm (callipers, vernier height gauge and rulers);
- Angle measuring with a protractor (manual or digital);
- Checking for flatness, square and level;
- Inspection of patterns by templates.
5 THE TEST PROJECT

5.1 GENERAL NOTES
Sections three and four 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 and balanced 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.

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 0 refers.

5.2 FORMAT/STRUCTURE OF THE TEST PROJECT
The Test Project is modular.

All joints will be completed as per drawing the Test Project instructions.

5.3 TEST PROJECT DESIGN REQUIREMENTS
Test Projects proposals must include the following requirements:

- Modular design;
- Be in accordance with the current Technical Description;
- Comply with WorldSkills International requirements and numbering standard;
- Be accompanied by a marking scale that will be finalized at the Competition in accordance with paragraphs 4.7 and 4.8;
- Be accompanied by proof of function/proof of construction/completion in the set time etc. – as appropriate to this skill category. For example, a photograph of the completed project according to the Test Project instructions and within material, equipment, knowledge and time constraints;
- All project modules must be contained within 1000x1000x1800mm high;
- Project elements must be possible to construct using the supplied tools and equipment.
5.4 **TEST PROJECT DEVELOPMENT**

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

5.4.1 Who develops the Test Project or modules

The Test Project/modules are developed by Experts independently and/or Expert groupings, taking account of geographical areas and Competition experience.

Experts/groups design Test Project proposals and post them on the Discussion Forum for consideration for the following Competition.

5.4.2 How and where is the Test Project or modules developed

The Test Project/modules are developed independently by Experts and/or Expert groups.

The Discussion Forum is to be used on a regular basis for discussion, collaboration and communication.

5.4.3 When is the Test Project developed

The Test Project is developed according to the following timeline:

<table>
<thead>
<tr>
<th>TIME</th>
<th>ACTIVITY</th>
</tr>
</thead>
<tbody>
<tr>
<td>At the previous Competition</td>
<td>Experts bring proposed Test Projects. The Test Project is selected from the proposals by vote of Experts</td>
</tr>
<tr>
<td>Immediately after the previous Competition</td>
<td>The selected Test Project is circulated on the WSI website</td>
</tr>
<tr>
<td>At the Competition</td>
<td>30% change is made to the Test Project</td>
</tr>
</tbody>
</table>

5.5 **TEST PROJECT VALIDATION**

Test Project proposals must be accompanied by proof of function/proof of construction/completion in the set time etc. – as appropriate to this skill category. This will be demonstrated by including a photograph with the proposal.

5.6 **TEST PROJECT SELECTION**

The Test Project is selected by vote of Experts at the previous Competition and if required additional information will be available on the Discussion Forum nine months before the current Competition.

5.7 **TEST PROJECT CIRCULATION**

The Test Project is circulated via the website as follows:

Immediately after the previous 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

Proposals for the minimum of 30% change to the Test Project are brought to the Competition by Experts. The Experts consider the proposals and vote which one will be used. The minimum 30% change should have regard to the Infrastructure List as provided by Competition Organizer and the materials specified in original proposal.

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.

Specific material for use in project should be outlined at the Test Project development stage before Expert voting. Material and equipment specifications and Material Safety Data Sheets are to be supplied by the Workshop Manager prior to the Competition on the Discussion Forum.
6 SKILL MANAGEMENT AND COMMUNICATION

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

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

This information includes:
• Competition Rules
• Technical Descriptions
• Marking Schemes
• Test Projects
• Infrastructure List
• Health and Safety documentation
• 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 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 in the Expert Centre (www.worldskills.org/expertcentre).
7 SKILL-SPECIFIC SAFETY REQUIREMENTS

Refer to Host Country/Region Health and Safety documentation for Host Country/Region regulations.

The following skill-specific safety requirements must be adhered to:

- Safety gloves (leather welding and kevlar glazer gloves for all forming);
- Safety shoes (leather and steel cap);
- Safety eye protection (glasses, goggles and shields);
- Must wear flame retardant long sleeve shirts and long pants/boiler suits.
8 MATERIALS AND EQUIPMENT

8.1 INFRASTRUCTURE LIST

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

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

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

At each Competition, the Experts must review and update the Infrastructure List in preparation for the next Competition. Experts must advise the Technical Director 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 MATERIALS, EQUIPMENT AND TOOLS SUPPLIED BY COMPETITORS IN THEIR TOOLBOX

The following is a recommended list of tools the Competitor should bring to the Competition:

- Toolbox excluding packing to be no bigger than one cubic metre total, one or two boxes unpacked (10% over is acceptable over that will not be able to use in competition);
- Welding helmet;
- Assortment of sheet metal hammers;
- Assortment of nylon or wooden hammers;
- Assortment of files;
- Assortment of hand snips;
- Assortment of locking pliers (vice and c grips);
- Assortment of sheet metal dollies;
- Assortment of chisels and dressing punches;
- Pop rivet pliers;
- Wire brush and or rotary wire brush;
- Set of screwdrivers;
- Set of drills up to 13mm;
- Hand brush (clean up);
- Inside and outside callipers;
- Protractor (manual or digital);
- Electric hand shears or nibblers;
- Electric drill;
- Electric sander and or angle grinder (100 or 125mm dia. and all discs required);
- Electric polisher;
- Polishing buffs, mops, scotch wheels etc. (polishing stainless steel to a required finish on project. Finish will not change in 30% changes);
- Plastic Film (for protective film and or for transferring patterns).

8.3 MATERIALS, EQUIPMENT AND TOOLS SUPPLIED BY EXPERTS

No equipment to be supplied by Experts.

8.4 MATERIALS AND EQUIPMENT 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;
- The only items allowed are listed in paragraph 8.2.
8.5 PROPOSED WORKSHOP AND WORKSTATION LAYOUTS

Workshop layouts from previous competitions are available at [www.worldskills.org/sitelayou](http://www.worldskills.org/sitelayou).

Example workshop layout:

An example of the general layout of the workshop is as per the following diagram with sufficient space for the Competitors working area and with the usual facilities for Experts, material and tool storage. The layout of the workshop in the diagram is only a guide, but the size of the Competitor's work areas and other installations must be the specified size and if not as specified, of a suitable size to fit the number of Competitors/Experts.
9 VISITOR AND MEDIA ENGAGEMENT

The following ideas may be considered to maximize visitor and media engagement:

- Test Project descriptions;
- Enhanced understanding of Competitor activity by meeting with Competitors during their downtime;
- Competitor profiles;
- Career opportunities;
- Daily reporting of competition status;
- Display of Host Member projects.
10 SUSTAINABILITY

- Recycling;
- Use of ‘green’ materials;
- Use of completed Test Projects after Competition.