worldskills

Technical Description

CNC Turning

Skill 06

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

The Technical Description consists of the following:

1 Introduction

1.1 Name and description of the skill competition

1.1.1 The name of the skill competition is

CNC Turning

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

CNC Machining has become one of the most important current machining processes in modern industry. Parts are made for household-equipment, telecommunications, cars, ships, aeroplanes, oil rigs, bridges, aerospace etc. Customers come from virtually every sector.

CNC Machining covers a broad variety of machining processes, such as grinding, welding, electrical discharging, milling and also turning or turn-milling.

The CNC Machinist dictates the entire production-process through the choice of setup, tools and movements through their programming. Once correctly programmed and set up, these machines can produce almost any shape and can repeat the process infinitely. This offers great advantages for quality and efficiency.

Some may think that lathes (turning machines) are built to make only round parts; however, CNC lathes are capable of producing almost any shape and any part, especially with CNC-turn-mill machines.

Different requirements and demands are required for each customer application. Therefore workpieces are made of different materials with different properties and different geometries, tolerances and surface qualities. In order to provide the machinist with all the information they need, there is a technical drawing (finished part drawing) in digital or paper form for each workpiece. The digital data of the required part can be imported in software, which makes it a lot easier to achieve the desired geometry. Hoewer, the machinist must thoroughly check if and how the geometry can be achieved.

Machining starts with deciding how best to produce the part. There are many ways of doing this, like welding, milling, casting, and 3D Printing. One very important method is CNC Turning.

A CNC lathe is a very accurate computer-driven machine, where cutting tools, controlled by a program, are moved to cut away excess material to result in the expected work piece. The CNC Turning machinist receives the technical drawing and uses the lathe in many ways to find solutions to build the part. These machines are very expensive, because they can do remarkable things. To have an idea of this, think what it means to achieve accuracy below ten microns, which is six to10 times thinner than a human hair.

The CNC Turning machinist uses a computer to tell the lathe how to move the tools and cut the part to the desired shape. They must also set up the lathe with all the necessary clamping devices, support devices, and cutting tools. These tools can cut almost every material (stainless steel, plastic, soft steel, aluminium, bronze, and so on). But the machinist has to choose well to avoid temperature variations, tool wear and vibration. Those factors influence the product and can result in poor quality.

When the machine starts cutting material, the machinist must ensure that all dimensions exactly fit the workpiece specifications. This may require some modifications and very accurate inspection tools must be used. Once the machine is set up, the CNC-Turning machinist also monitors and optimizes the processes, to achieve even faster and better results for all the following parts.

When makeing very complex parts, the CNC Machinist sometimes must read and understand drawings that have been measured with GPS and transfer the data to the control of the machine.

Problem-solving strategies, logical thinking, a high sense of precission, and the understanding of technical communication are the basic requirements for the CNC Lathe Machinist,

1.1.3 Number of Competitors per team

CNC Turning is a single Competitor skill competition.

1.1.4 Age limit of Competitors

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

1.2 The relevance and significance of this document

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

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

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

1.3 Associated documents

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

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

2 The WorldSkills Occupational Standards (WSOS)

2.1 General notes on the WSOS

The WSOS specifies the knowledge, understanding, skills, and capabilities that underpin international best practice in technical and vocational performance. These are both specific to an occupational role and also transversal. Together they should reflect a shared global understanding of what the associated work role(s) or occupation(s) represent for industry and business (www.worldskills.org/WSOS).

The skill competition is intended to reflect international best practice as described by the WSOS, to the extent that it can. The Standard is therefore a guide to the required training and preparation for the skill competition.

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

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

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

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

The Marking Scheme will follow the allocation of marks within the Standards to the extent practically possible. A variation of up to five percent is allowed, if this does not distort the weightings assigned by the Standards.

2.2 WorldSkills Occupational Standards

Section		Relative importance (%)
1	**Work organization and management**	**5**
	The individual needs to know and understand: • The scope and limits of the workshop and the workspace • Standards for the environment, safety, hygiene, and prevention of accidents • When and how to use safety equipment, such as first aid kits, fire extinguishers • Types of energy supplies for the CNC Lathe (electric, hydraulic, pneumatic) and their sustainable management • Basic machine maintenance (Coolant-Maintenance, Machine-Lubrication, settings etc.)	

Section		Relative importance (%)
	• Machine accessories such as clamping devices, tailstock, and part-catching devices • The use and care of the available computer operating systems • Programming, setting, and operating of CNC lathe with live tooling and multiple axes • CNC-programming systems (Din-ISO (G-Code writing), CAM software) • Principles of technical design and process planning • Properties of ferrous and nonferrous materials • Mathematics - Geometry, especially calculations in trigonometry • Principles of cutting- and chip-removal technology • The importance of effective communications and teamwork • How to liaise with supervisors and team members • The proper and efficient use of machinery-handbooks, datasheets and manufacturers' operating instructions • The calibration, accuracy-limits and the use of measurement- and gauging tools.	
	The individual shall be able to: • Organize the workspace for optimal safety and performance • Check the condition and functionality of the workspace, equipment, tools and materials • Interpret and apply quality standards and regulations • Promote and apply health and safety regulations and best practice • Liaise with supervisors and team members as required and helpful • Set up and operate CNC lathes in a safe and environmentally well managed manner (e.g. in use of energy) • Select and use appropriate professional software • Apply mathematical and geometrical principles for programming processes • Select and apply appropriate cutting technology for the material, equipment, and cutting tools provided • Select and apply appropriate clamping methods • Select and apply the proper use of machine acessories (e.g. parts catcher, tailstock etc) • Interpret and apply manufacturers' instructions • Find appropriate data in handbooks, tables, and charts.	

Section		Relative importance (%)
2	**Interpret engineering drawings**	**10**
	The individual needs to know and understand: • ISO E and/or ISO A (European and American) drawing representation • Technical terms and symbols used in engineering drawings and plans • Related standards, symbols, and datasheets • Geometric dimensioning and tolerancing (ISO Standard) • Technical drawing-legends.	
	The individual shall be able to: • Interpret engineering drawings and apply to specifications • Locate and identify dimensions of features • Locate and identify surface finish requirements • Locate and identify geometric specifications • Make 3D mental representations of the projects requested on the drawing • Identify the materials that parts are made of • Identify critical sequences (with a high possibility of damage or unsafe practice) and develop appropriate approaches.	
3	**Process planning**	**10**
	The individual needs to know and understand: • The importance of good planning for reliable machining operations • The procedures and calculations required for scheduling time for programing and machining • Successful timing of selected sequences • Methods for Identiying critical sections • The behaviour of machines, clamping devices, materials, tools, and machine accessories in different cutting processes • Methods and techniques for work holding • Methods to avoid crashes or collisions for the selected sequences • Sustainability: methods to ensure best material use, energy use and waste management • Safe practice methods and plans for safety awareness for others if applicable • Appropriate actions to avoid heavy toolwear • The identification of workpiece features and the appropriate machining and measuring processes.	
	The individual shall be able to: • Find solutions using the capacities of the workshop environment, and according to the required work (size of batch, complexity)	

Section		Relative importance (%)
	• Identify the appropriate machining and measuring processes for each feature of each work-piece • Identify and prepare the best (safest) work holding methods • Identify, prepare, and calibrate appropriate measuring tools • Identify and prepare appropriate cutting tools • Identify critical sections (with a high possibility of damage or unsafe practice) and pick alternatives or safe practices to avoid accidents or damage • Apply methods for best material use to avoid exsessive waste • Find innovative ways of using the environment to solve technical issues • Find alternatives which will be reliable for each entire process • Weigh each solution and choose the best (considering context, speed, safety, price, and sustainability) • Make a final choice and lock the strategy accordingly • Plan the operations and sequences (workholding and machining strategy) based on specified data • Create awareness actions for critical operations where no alternative is available • If necessary, create safety awareness or measures for others around the machine (e.g. safety or caution tape) • Create an action plan for toolwear control.	
4	**Programming**	**10**
	The individual needs to know and understand: • CNC programming as the creation of a logical process plan • Different methods and techniques to generate programmes (manual, CAM, etc.) • CAM system programming and the techniques of part- and tool-modelling • Cutting-effect (temperature, vibrations, bending, force, etc.) on: ◦ Geometry of the work piece design ◦ Work holding devices ◦ Tool holding devices ◦ Tool wear ◦ Machine-accessories • The selection of cutting tools for machining the required material and features • Mathematics (especially geometry/trigonometry) • Appropriate speeds and feeds for different materials and tools and work holding devices • The basis for choosing correct postprocessors • The generation of G-Code • Dialoguing with the CNC Lathe (wireless technology, cables, memory devices etc.) • The proper use of canned cycles to programme work piece features (classical turning features as well as driven-tool features)	

Section		Relative importance (%)
	• Selection of suitable simulation options and simulation of the CNC programmes for the detection of process-critical and non-optimal machining on the workpiece.	
	The individual shall be able to: • Select and programme the best methods according to the production type and part specifications • Use skill-specific software and related hardware • Generate programmes using CAD/CAM systems • Create or edit programmes directly on the machine-control • Edit running programmes in CAD/CAM and reload to the machine-control • Use the proper simulation method of the CNC programme to avoid any unwanted (unexpected) errors • Document any related optimizations and up-load the optimized CNC programme to the company-server.	
5	**Metrology**	**5**
	The individual needs to know and understand: • The properties, uses, and handling of ferrous and non-ferrous materials • Different Material-Identification-Norms (DIN, ISO, ASI, SAE etc.) • The chip removal behaviour of provided materials and tools • The temperature-related behaviour of provided materials, tools and machine-accessories during the machining process • The effects of cutting force on material, clamping-devices, tools, and machine-accessories • The range of tools and gauging instruments as well as their applications • The influence of temperature and/or surface quality on measurements.	
	The individual shall be able to: • Identify the materials and their properties by DIN-, ISO-, AISI-SAE- or any other national norm and name (with the use of tables or machinery handbooks or other means) • Select and use appropriate cutting and clamping tools for the provided material • React accordingly to arising cutting forces, temperature problems, vibrations and other manufacturing-disturbing-factors • Select appropriate measuring and/or gauging instruments • Calibrate related measuring tools • Properly use the selected inspection tools to make measurements on all features of the products.	

Section		Relative importance (%)
6	**Setting and operating CNC lathes**	**55**
	The individual needs to know and understand: • The different steps and sequences that lead to the setup of the machine • The different modes of machine operation • The appropriate power up and Initializing sequence of CNC lathes • The proper manipulating of CNC lathes • Mounting tools and setting tool parameters • The modification of clamping devices, such as jaws, dual spindle etc • The transfer of CNC programmes to machine control or back to the company-server, using provided software, cables, memory devices, or wireless technology • The testing of CNC programmes (simulation, dry run, etc.) • The correct, efficient and safe clamping of workpieces • Settings of work shift and tool shift offsets • The safe running of CNC procedures • Stopping and restarting cycles • Emergency stopping.	
	The individual shall be able to: • Follow the selected process strategies • Appraise and follow a given process strategy when using external CNC programmes • Upload generated CNC programmes to CNC lathes and perform test runs • Identify and designate the different machining processes on CNC lathes • Mount and align selected tools • Mount and align selected work holding devices • Mount and align selected accessories (Tailstock, Parts-catcher, etc.) • Set measures to avoid vibration in machining sequences • Apply efficient burr-removal techniques on work pieces • Optimize machining strategies • Avoid or optimize toolwear • React quickly and appropriately to problems and emergencies • Obtain dimensions, geometries, surface roughness etc. from each workpiece • Make all necessary corrections to get the final part to conform to the blueprint • Report health, safety, and environmental issues to the appropriate personnel • Report equipment failures to the appropriate personnel.	

Section		Relative importance (%)
7	**Finalize and deliver work pieces**	**5**
	The individual needs to know and understand: • Appropriate procedures with documentation for re-using jobs • The importance of completing work pieces to the required standard within their capabilities • The circumstances in which referral should be made to other appropriate personnel.	
	The individual shall be able to: • Clean and deburr products • Make final optical and measurement checks • Dismount tools, clamping devices and machine accessories • Clean the machine and workplace • Set each environment to their initial state, ready for the next job • Document and save CNC Programs, work-holding and tooling information etc. for each organization's re-use of a production • Deliver related documentation, parts, drawings, CNC Procrams and digital memory devices to the appropriate locations and/or personnel as required by the organization.	
	Total	**100**

3 The Assessment Strategy and Specification

3.1 General guidance

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

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

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

The Marking Scheme must follow the weightings within the Standards. The Test Project is the assessment vehicle for the skill competition, and therefore also follows the Standards. The CIS enables the timely and accurate recording of marks; its capacity for scrutiny, support, and feedback is continuously expanding.

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

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

4 Assessment Design and Practice

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
STANDARDS SPECIFICATION SECTION		A	B	C	D	E	F	G	H			
	1	5.00								5.00	5.00	0.00
	2		2.00					7.50		9.50	10.00	0.50
	3								11.00	11.00	10.00	1.00
	4			5.00						5.00	5.00	0.00
	5				10.00	10.00	10.00			30.00	30.00	0.00
	6		8.00	5.00				2.50	9.00	24.50	25.00	0.50
	7			10.00				5.00		15.00	15.00	0.00
TOTAL MARKS		5.00	10.00	20.00	10.00	10.00	10.00	15.00	20.00	100.00	100.00	2.00

4.5 Assessment and marking

There is to be one marking team for each Sub Criterion, whether it is assessed and marked by Judgement, Measurement, or both. The same marking team must assess and mark all Competitors. Where this is impracticable (for example where an action must be done by every Competitor simultaneously, and must be observed doing so), a second tier of assessment and marking will be put in place, with the approval of the Competitions Committee Management Team. The marking teams must be organized to ensure that there is no compatriot marking in any circumstances. (Section 4.6 refers.)

4.6 Assessment and marking using Judgement

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

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

Three Experts will judge each Aspect, normally simultaneously, and record their scores. A fourth Expert coordinates and supervises the scoring, and checks their validity. They also act as a judge when required to prevent compatriot marking.

4.7 Assessment and marking using Measurement

Normally three Experts will be used to assess each Aspect, with a fourth Expert supervising. In some circumstances the team may organize itself as two pairs, for dual marking. Unless otherwise stated, only the maximum mark or zero will be awarded. Where they are used, the benchmarks for awarding partial marks will be clearly defined within the Aspect. To avoid errors in calculation or transmission, the CIS provides a large number of automated calculation options, the use of which is mandated.

4.8 The use of Measurement and Judgement

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

4.9 Skill assessment strategy and procedures

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

There shall be a clear understanding that ONLY the finished result (the machined part(s)) is evaluated. Not the process or any written documentation. On top of the quality of Test Project, awards will also be given for sustainability (use of material)

The marking of the Test Projects will take place daily.

After the Competitors have finished a module, the Test Projects are collected, and the Chief Expert will permanently mark the collected Test Projects with the secret number. Nobody in the assessment teams will have any reference of the secret number to any of the Competitors.

The SCM and the Chief Expert will divide the Experts into teams of three and assign the teams to specific criterion to evaluate. Having three Experts in an assessment team, all of who must measure the aspect, shall ensure that no errors are made in assessment.

Besides the Expert teams there will also be selected criterion which is inspected by measurement machines and independent technicians of the sponsor of such machines. For these criteria a minimum of one Expert must witness the process of each assessment.

The main criteria to be assessed include the following:

A. Conformity to drawing	Visual conformity of part to drawing (features, damage etc.)
B. Surface finish	Ra Values as per drawing
C. Main dimensions	Dimensions that are difficult to achieve
D. Secondary dimensions	Dimensions that are critical, but not so difficult to achieve
E. Sustainability/Use of Material	Does the Competitor achieve the test with the given material, or is any more requested?

5 The Test Project

5.1 General notes

Sections 3 and 4 govern the development of the Test Project. These notes are supplementary.

Whether it is a single entity, or a series of stand-alone or connected modules, the Test Project will enable the assessment of the applied knowledge, skills, and behaviours set out in each section of the WSOS.

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

The Test Project will not cover areas outside the Standards or affect the balance of marks within the Standards other than in the circumstances indicated by Section 2. This Technical Description will note any issues that affect the Test Project's capacity to support the full range of assessment relative to the Standards. Section 2.1 refers.

The Test Project will enable knowledge and understanding to be assessed solely through their applications within practical work. The Test Project will not assess knowledge of WorldSkills rules and regulations.

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

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

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

5.2 Format/structure of the Test Project

The Test Project is a series of three (3) standalone modules.

Each module is comprised of programming, set-up, and actual machining work.

The Competitor receives a Test Project (TP) Drawing, as well as a Digital file of the TP.

Options relevant for each Module can be :

a) STEP file

In most Industries it is standard that the programmer of a CNC Machine is given a digital file (mostly STEP File). In our competition the Competitor receives a paper drawing as well as such a digital file, however, the digital file is in many cases unfinished, and the Competitor must complete the TP according to the drawing. Such missing features must be clearly visible to the Competitor. There will be NO traps in the given STEP file and all dimensions are in MID-Tolerance. For design details refer to our document "Project design Criteria for Skill 06"

b) CNC file

It is a standard procedure that a CNC Machinist takes on an order that has been processed by another person in the past. Such CNC files are then usually saved on the company server to be used in the future again. In our competition it may be an option that the Competitor receives the

project drawing with the CNC file from the "past". Now the Competitor must look through the CNC file very thoroughly to set up the machine in the proper way to complete the "order". We may also include some "improvement" processes but NO ERRORS or traps in the CNC file. This could be speeds, feeds, or processes which a Competitor could improve to speed up the finishing of the TP. An option may also be a new element or feature (a small change to the "old" design), but then the drawing must clearly show a design change to the old order (the old CNC programme). For design details refer to our document "Project design Criteria for Skill 06"

c) Customer change

In our Design Criteria Document we elaborate on the possibility that a customer can change his "design" after the machining process started. We can also include such an element in our competition. For design details refer to our document "Project design Criteria for Skill 06"

d) Mass production

CNC Machines are not only used for projects with difficult shapes, but also for mass production. We may include the element of mass-production in our competition. For design details refer to our document "Project design Criteria for Skill 06"

e) Assembly

An option in the TP design may also be a project that requires assembly and assembly-measurements. The Competitor shall then align their processes and dimensions to ensure the assembly possibility and assembly dimensions. For design details refer to our document "Project design Criteria for Skill 06"

d) Pre cast

An option in the TP Design may also be a project where a "premanufactured part" (maybe a cast) must be machined to specification. In many cases the setup and the clamping of such TPs can be a challenge for the Competitor. For design details refer to our document "Project design Criteria for Skill 06"

e) Surprise tool

In our document "Project Design Criteria" we describe in details the tools needed for the Competitor. It happens sometimes in industry that for the completion of an order the "standard tools" of the company are not suitable for the job, and a "special" tool must be purchased. This can also be an option in our TP design. We shall call it "surprise tool". In such a case the Independent Test Project Designer must coordinate with the Competition Organizer that this "surprise tool" will be provided for each Competitor. It shall be the challenge to the Competitor to find the correct ways to use this tool. For design details refer to our document "Project design Criteria for Skill 06"

5.3 Test Project design requirements

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

The document *Project Design Criteria Skill 06*, which is made available by the Skill Competition Manager on the WorldSkills Discussion Forum after Competition Preparation Week, describes a variety of materials, sizes, and desired features. The Skill Competition Manager must coordinate and ensure that modern industry features and processes are included in the Test Project.

Such a Test Project is one complete module. One module is the work of a full Competition Day.

The modules must be designed in metric and to the standards described in the document "*Project Design Criteria Skill 06* – competition year XXX".

The Test Project design criteria are developed to:

- Ensure features on modules reflect modern industry;
- Minimize the amount of cutting tools for the Competitor to bring;
- Minimize the amount of inspection tools for the Competitor to bring;
- Minimize the Infrastructure List (materials the Competition Organizer needs to provde)
- Provide guidance to each participating Member for preparing a Competitor

The SCM, together with the Independent Test Project Designer, must ensure that the :

- Project design meets the criteria of document “Project Design Criteria Skill 06“
- Test Projects can be accomplished (manufactured and inspected) with the infrastructure given at the particular competition
- The drawings of the Test Projects have as little text as possible. In the project design the focus is on “technical language” only, like dimensions and international symbols, there shall be no need for translation;
- The Independent Test Project Designer brings a machined sample part of the design. This is needed to programme the CMM (Coordinate Measuring Machine);
- The Independent Test Project Designer includes the proposed Marking Scheme for each module.

5.4 Test Project coordination and development

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

5.4.1 Test Project coordination (preparation for Competition)

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

5.4.2 Who develops the Test Project/modules

The Test Project/modules are developed by an Independent Test Project Designer in collaboration with the Skill Competition Manager.

5.4.3 When is the Test Project developed

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

Time	Action
Fifteen (15) months prior to the Competition	The ITPD is identified and a Confidentiality Agreement between WSI and the ITPD is organized.
Five (5) months prior to the Competition	The Independent Test Project Designer starts to develop TP in accordance with the TD and IL. IL must be finished to accomplish smart design.
No later than two (2) months prior to the Competition	The Independent Test Project Designer completes the design of the Test Project and Marking Scheme. The Test Project documents are sent to the WorldSkills International Skills Competitions Administration Manager.

Time	Action
At the Competition at the beginning of each Module	The Test Project/modules are presented to Competitors. Experts and inspection teams will see the Test Project after the competition started.

5.5 Test Project initial review and verification

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

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

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

5.6 Test Project validation

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

The Independent Test Project Designer (ITPD) shall bring machined sample parts of their design for each module.

The ITPD is also required to produce and bring any inspection gauges or inspection support gauges for the inspection teams if appropriate and needed for a speedy inspection.

5.7 Test Project circulation

The Test Project/modules are not circulated prior to the Competition. The Test Project/modules are presented to Competitors at the beginning of each module. After the competition has started and there is no opportunity for any Expert to coach their compatriot Competitor, the Test Project will be presented to Experts and inspection teams, who will now develop the inspection strategy to fit to the Test Project accordingly.

5.8 Test Project change

Due to the Test Project being developed by an Independent Test Project Designer (ITPD), there is no change required to be made to the Test Project/modules at the Competition. Exceptions are amendments to technical errors in the Test Project documents and according to infrastructure limitations.

5.9 Material or manufacturer specifications

Specific material and/or manufacturer specifications required to allow the Competitor to complete the Test Project will be supplied by the Competition Organizer and are available from www.worldskills.org/infrastructure located in the Expert Centre. However, note that in some cases details of specific materials and/or manufacturer specifications may remain secret and will not be released prior to the Competition. These items may include those for fault finding modules or modules not circulated.

The Competition Organizer is to provide the technical specifications of the provided equipment on the Infrastructure List at least twelve (12) months prior to the Competition.

Free training on machine and software, where possible, must be provided at least four (4) months prior to the Competition. Travel, lodging, and food expenses for this training are to be carried by the Competitors or their sponsor. The scheduling of the training is to be done by the Competition Organizer or the equipment sponsor. The Competitors are notified about the training at least six (6) months prior to the Competition. Participating in the provided training is the choice of the Competitors and/or their sponsor, but is higly reccomended. Due to shift rotation the familiarization time at the Competition is very limited (i.e. less than 4 hours on the machine), so the knowledge of the correct use of the machine is a requirement coming to the Competition. There is not enough time to teach anybody during familiarization.

Sponsors of CNC machines, inspection equipment, and CAM-software must supply specialists and service staff in adequate numbers to ensure that the competition runs smoothly. These specialists should be available at any time prior to, and during the competition, as well as during the marking of the Test Projects.

Minimum machine requirements:

- 2-axes universal turning centre with driven tools, C-axis and Y-axis
- 12-stations servo turret VDI 30 with 12 driven tool stations (coupling DIN5480)
- Direct measuring system for X/Y axis
- Turning length min: 500 mm
- Y-axis +/- 40 mm – ore more
- Hydraulic feeding tailstock
- Hydraulic 3-jaw chuck, through hole min Dia 50 mm, with set of hard jaws and with connecting elements. Clamping chuck diam. approx. 210 mm
- Chip conveyor (optional for the competition, but better for reselling)
- Reinforced cooling pump, minimum 12 bar
- Tool pre-setting probe in the machine (Or an external tool-presetter is needed – One or the other must be)

6 Skill management and communication

6.1 Discussion Forum

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

6.2 Competitor information

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

This information includes:

- Competition Rules
- Technical Descriptions
- Mark Summary Form (where applicable)
- Test Projects (where applicable)
- Infrastructure List
- WorldSkills Health, Safety, and Environment Policy and Regulations
- Other Competition-related information

6.3 Test Projects and Marking Schemes

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

6.4 Day-to-day management

The day-to-day management of the skill competition during the Competition is defined in the Skill Management Plan that is created by the Skill Management Team. The Skill Management Team comprises the Skill Competition Manager, Chief Expert, and the Expert Leads. The Skill Management Plan is progressively developed in the six (6) months prior to the Competition and finalized at the Competition. The Skill Management Plan can be viewed in the Expert Centre (www.worldskills.org/expertcentre).

6.5 General best practice procedures

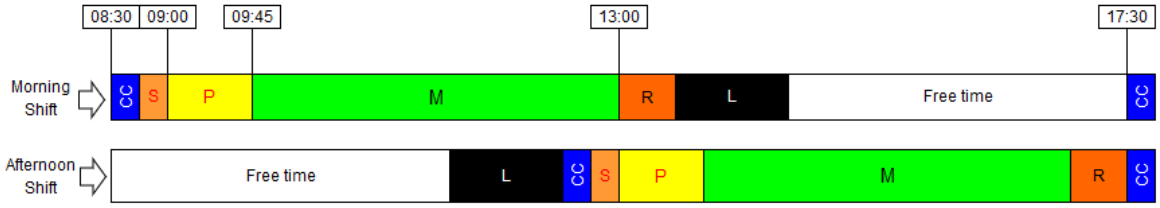
General best practice procedures clearly delineate the difference between what is a best practice procedure and skill-specific rules (section 9). General best practice procedures are those where Experts and Competitors CANNOT be held accountable as a breach to the Competition Rules or skill-specific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

Topic/task	Best practice procedure
Release of Test Project	• Step 1 Competitors in a Group get a general verbal instruction of the expectations. This is done by the SCM and the Independent Test Project Designer – typically 5-10 minutes. Competitors, Experts, and Interpreters are present in this session. The Test Project is NOT shown at this point! NO documentation allowed! • Step 2 After clarification of expectations, ONLY the Competitors (no Expert and no interpreter) receive the Test Project to study and plan their work. Duration 15 minutes. During this time the SCM and the Independent Test Project Designer are present to clarify any possible discrepancies. • Step 3 At the given time the Competitors start their work. Now a designated team of Experts (team leaders of the marking teams) get the Test Project to study and clarify the inspection plan the Independent Test Project Designer and the SCM prepared. This is to clarify the marking methods, possibilities with the given Infrastructure, and prepare a timetable for inspection. • Step 4 Now the designated Inspection Teams [Experts and independent marking people (such as Mitutoyo)] review the Test Project and their marking tasks assigned by the team leaders. • Step 5 Skill Competition Manager shares the TP with the entire group of Experts after the marking is finished.
Marking teams	• The Skill Competition Manager and the Chief Expert define a sufficient amount of marking teams based on the individual WorldSkills experience and mixture of cultures. Each group has a team leader assigned by the Skill Competition Manager and the Chief Expert and rotate their duties in the course of the different modules.
Use of digital memory devices	• The Skill Competition Manager and the Chief Expert will use specific software to check if banned memory devices have been used on Competitor's computers or machine controls.
Equipment failure	• If equipment or tools which are brought by the Competitor fail, no extra time is allowed. • If equipment or tools supplied by the Competition Organizer fail, extra time may be allowed only if the technician of the sponsor or supplying company specifies and proves it is not a "user error", but truly an equipment failure without the fault of the user, e.g. power outage … this is in most cases is NOT the fault of the user.

One module covers the tasks for a complete Competition Day (or a shift) and shall not be interrupted with work from other modules.

The floor-space and the CNC machine requirements are so intensive, that it is impossible to get a working situation where Competitors have a CNC machine totally at their disposal.

Therefore, the shift rotation basis will apply, meaning Competitors have to share the CNC machine in a shift rotation (morning shift/afternoon shift). This reflects common industry situations:



Considering that one hour of CAM programming can lead to approximately four hours of uninterrupted machining (set-up and turnaround included), it is desired to keep the scheduled machining time at the maximum.

It is important to have the reset-time between shift changes. During this reset-time the control-unit is cleared by Sponsor-technicians and the machine parameters are reset to original stage. The competitors takes the tools and tool holders and the clapming jaws out and the machine is cleaned and made ready for the next shift to start their Test Project.

The sequence of a module is (example morning shift):

1: 8:30 CC : Compatriot Communication (without Test Project)

Includes explanation of expectations with independent Test Project Designer (Experts and Interpreters present)

2: 8:45 S : Competitors receive drawings and materials (including data transfer equipment e.g.

memory stick) and have 15 minutes for planning their work (without any other person except the Independent Test Project Designer for clarification).

3: 9:00 P : Buzzer will indicate the beginning of the programming time.

Competitor can use the provided computer for writing the CNC programm, no action at the machine is allowed.

4: 9:45 M : Buzzer will indicate beginning of the machining time.

At this point the Competitor is allowed to use both, the computer and the CNC machine.

5: 13:00 R : Buzzer will indicate the finishing of the module. Technicians mus now Delete and RESET the Machine control.

The reason that during the programming time (CAM, indicated above in yellow) the Competitor is only allowed to use the computer and not the machine, is the shift rotation system. (equal situation for both shifts)

7 Skill-specific safety requirements

7.1 Personal Protective Equipment

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

Task	Safety glasses with side protection	Cut protection gloves (without breakage)	Safety shoes with protective cap	Sturdy shoes with closed toe and no heel	Tight fitting work clothes	Headgear, hat or cap, or any other means to hold long hair out of the Danger Zone
General PPE for safe areas				√		
Operating machine	√ (only if machine has door open)		√		√	√ (only if Competitor has long hair)
Handling chips from the chip-bin and/or raw material that is not deburred (Sharp corners)	√	√		√	√	
Use of compressed air	√	Optional				Optional

8 Materials and equipment

8.1 Infrastructure List

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

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

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

At each Competition, the Skill Management Team must review and update the Infrastructure List in preparation for the next Competition. The Skill Competition Manager must advise the Director of Skills Competitions of any increases in space and/or equipment.

At each Competition, the Technical Observer must audit the Infrastructure List that was used at that Competition for the upcoming WorldSkills Competition.

The Infrastructure List does not include items that Competitors and/or Experts are required to bring and items that Competitors are not allowed to bring – they are specified below.

8.2 Competitors toolbox

Competitors may bring more than one toolbox with the total external volume not exceeding 1.2 m³.

(Volume = Length x Height x Width, or V = L x H x W)

Volume Measurement is taken from the outsie dimensions of the toolbox, but does not include pallet for transportation or wheels

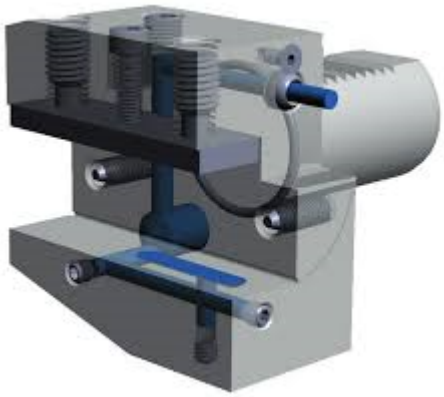
8.3 Materials, equipment, and tools supplied by Competitors

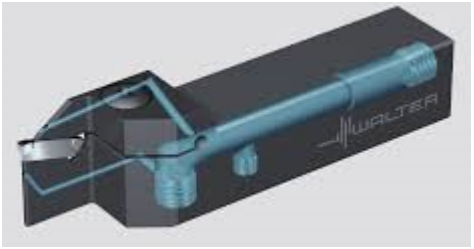
- To allow for innovation and learning from each other, the Competitor has no restrictions in bringing any equipment or accessories, as long as it conforms to the provided equipment and WSI- duplication rules. Of course, it must be within reasonable limits, for example: Competitors shall not bring their own tailstock or a control-unit. In any debatable case the Skill Competition Manager shall make the final decision.
- Competitors must bring their own tooling, cutting tools, and measurement instruments to the Competition. (See document “Project design Criteria for Skill 06” in the WorldSkills Discussion

Forum). The Competition Organizer will not be providing these infrastructure items for the Competitors, the items described and available in Infrastructure List are only spares in very limited quantity.

- The Competitors must supply their own cutting tools; these must be compatible with the clamping system of the machine (Specifications of the machine to be supplied are to be considered – example tool shank metric/standard.)
- The Competitors are allowed to bring additional tools in relation to the list described in the project design criteria which is published on the WorldSkills Discussion Forum (be aware of the maximum diameter permitted by the machine tool manufacturer).
- The quantities and type of cutting tools to bring is a decision of participating country/region or Competitor only. (The IL is a good source of inspiration.)
- VDI holders that allow for internal coolant will not be supplied by the Competition Organizer. Such holders are expensive, and there are so many different systems available, and they must correspond with each other. Therefore, a limited amount (4) of such VDI Holders shall be allowed by the Competitor to bring to the Competition.

See Pictures for clarification.





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

8.4 Materials, equipment, and tools supplied by Experts

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

Experts are responsible that Interpreters bring their own PPE.

8.5 Materials and equipment prohibited in the skill area

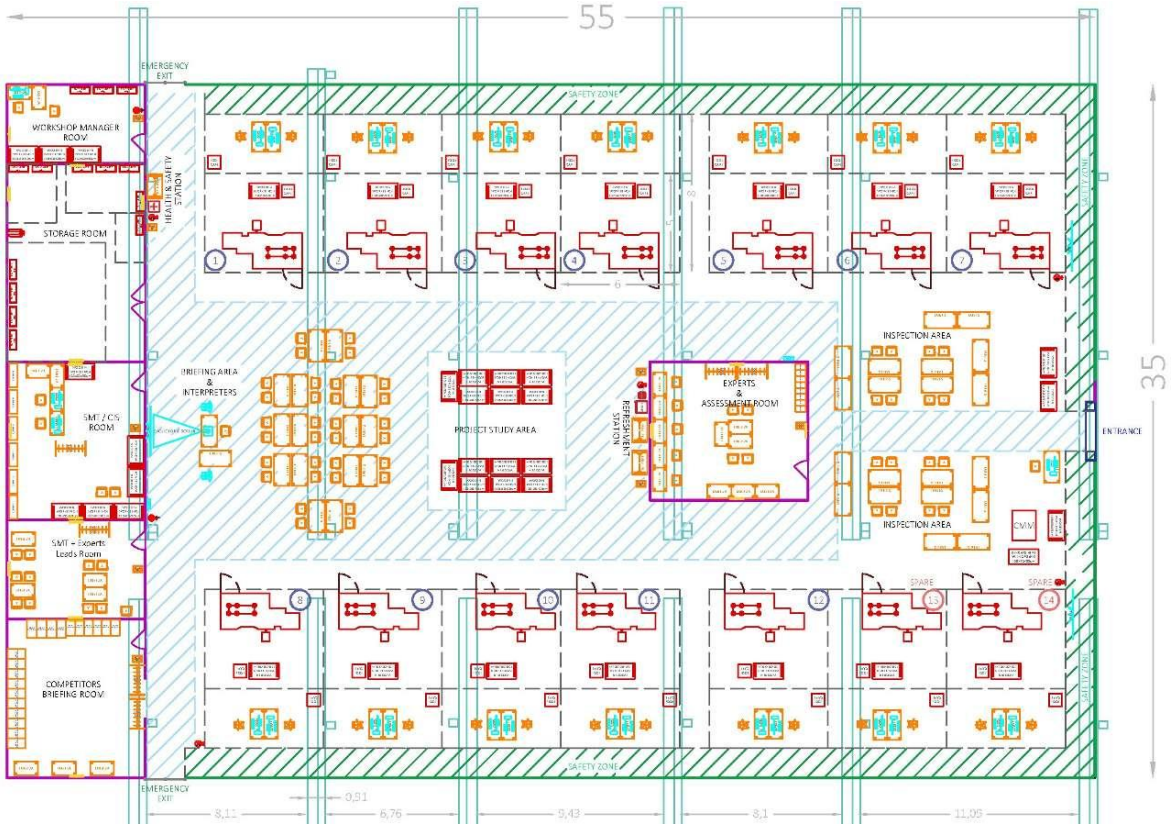
Competitors and Experts are prohibited to bring any materials or equipment not listed in section 8.3 and section 8.4.

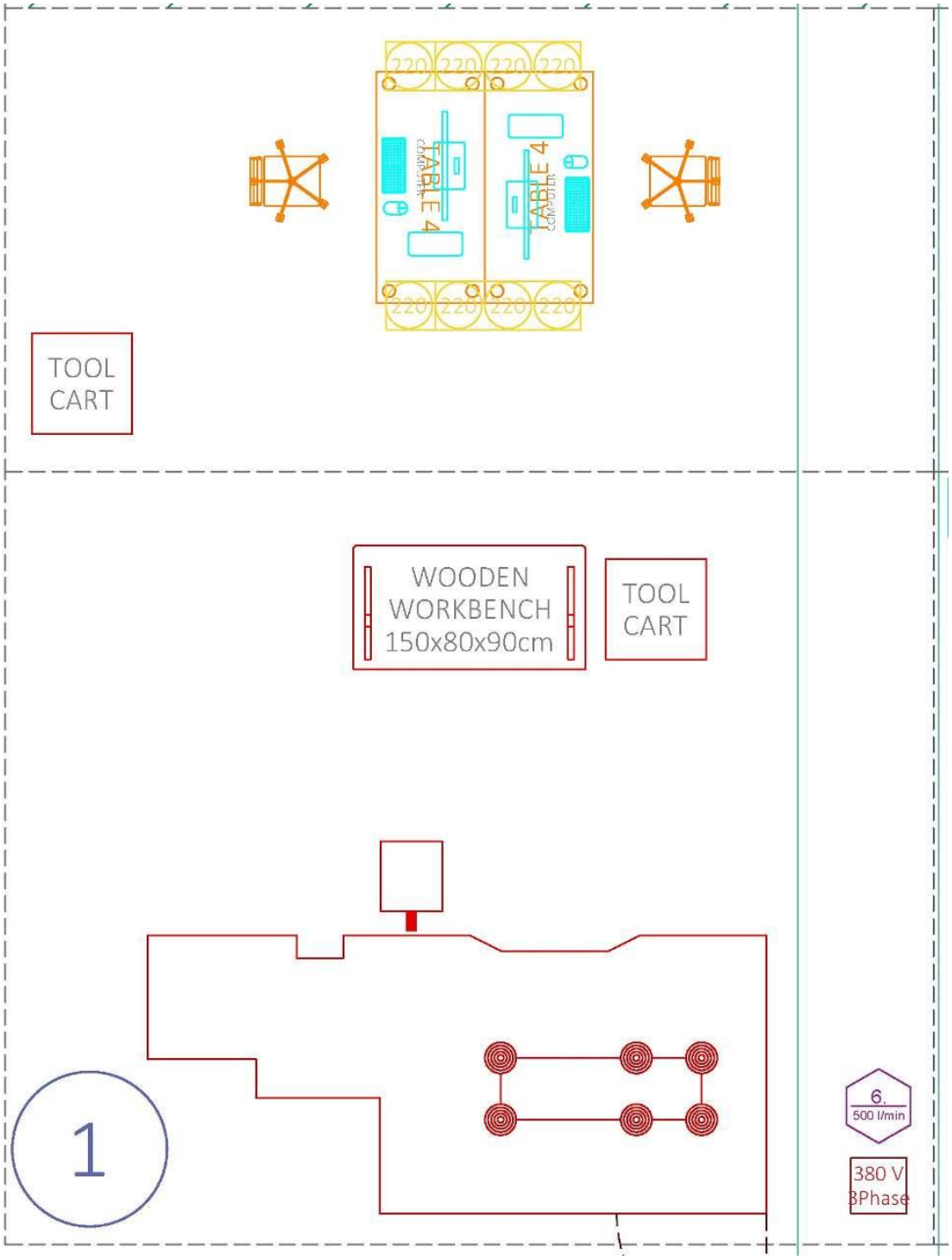
- Tools and holders that allow for pre-programmed offsets are NOT allowed;
- Any device that clearly reflects prior knowledge of the Test Project is confiscated. This could be for example a special sleeve that was manufactured specifically for the Test Project;
- See section 9 skill-specific rules for further information.

8.6 Proposed workshop and workstation layouts

Workshop layouts from previous competitions are available at www.worldskills.org/sitelayout.

Example workshop layout





Space requirements for 32 Competitors (subject to space availability) include:

- Number of Workstations: 18
  - A workstation consists of one machine, one workbench, two programming stations and has an approx. size of 6 m x 8 m = 48 m²
  - For 20 Competitors or less: Number of Competitors divided by two PLUS ONE
  - For 21 Competitors or more: Number of Competitors divided by two PLUS TWO
  - The PLUS-Workstations are used when a Competitor gets in trouble and needs time-extension.
- Expert and judgmental marking room: approx. 45 m²
  - This room is needed for Experts meetings, storage and for Judgment Marking

- Competitor briefing room: approx. 65 m².
  - This room is needed to brief the Competitors as a group on each of the Test Project modules.
  - This room is extremely important when briefing the 2nd shift Competitors on the test module, while the 1st shift Competitors are still working on the shared workplaces
- Sponsor room: approx. 50 m²
  - Sponsors need a place to store their tools, spare parts, their personals and a place to work on their laptops, have meetings in a quite environment to communicate with their company to find solutions for troubleshooting.
  - We have four major sponsors (CNC Machine, CAD-CAM System, inspection tools, tools and holders)
- Workshop Manager room: approx. 55 m²
  - Serves also as storage room for Test Project raw material
- Material storage room: approx. 50 m²
  - Materials, Pallets, Boxes, Tools etc. need a place to be stored.
  - Also a place where Sponsors can store bulky items and tools.
- Skill Management Team room: approx. 55 m²
  - Serves also as a room for storage and lockup of Test Projects from all Competitors
- Inspection area: approx. 130 m²
- Expert work area: approx. 200 m²
- Project Study Area: approx. 100 m²
- Space for PR and the CNC Team Challenge: approx. 80 m²

Add in some space for columns as well as Competitors toolboxes.

Add in minimum of 1.5 m clearance around the visitor-barrier.

Very important – we need to keep in mind the evacuation route, as well as pathways to drive with the pallet jacks.

Based on 32 Competitors, 32 Experts, Workshop Managers, Independent Test Project Designer, SCM, equipment technicians and some Interpreters, the required space is approx. 2300 m². (In the example floorplan above you see that the U-shape includes an audience walkway within the 2300 m².)

This is of course based on the footprint available and can be changed based on the layout of the workstation arrangement (Especially the supply channels on the floor. CNC Machines must be placed on a stable underground and can NOT be placed on a supply channel-cover)

9 Skill-specific rules

9.1 General notes

Skill-specific rules cannot contradict or take priority over the Competition Rules. They do provide specific details and clarity in areas that may vary from skill competition to skill competition. This includes but is not limited to personal IT equipment, data storage devices, Internet access, procedures and workflow, and documentation management and distribution. Breaches of these rules will be solved according to the Issue and Dispute Resolution procedure including the Code of Ethics and Conduct Penalty System.

9.2 Skill-specific rules

Topic/task	skill-specific rule
Use of technology – digital memory devices (such as memory stick, CD or DVD Rom, Bluetooth or Wi-Fi devices, media players etc.)	• Competitors are only allowed to use digital memory devices provided by the Competition Organizer. No other memory devices are to be inserted into or connected with the Competitor computers or machines. • All provided digital memory devices are to be submitted to the Chief Expert at the end of each module (day) for safe keeping and must not be taken out of the workshop. • The Skill Competition Manager and the Chief Expert, Competition Organizer IT team, and technicians from sponsors are allowed to insert their devices for checking or installation of software. • Headphones, wireless earbuds, or similar devices that would allow music, communication, or any other distraction are not allowed for the Competitors.
Use of technology – personal laptops, tablets, mobile phones, smart watches, WIFI-capable headphones etc.	• Competitors are not allowed to bring personal laptops, tablets, or mobile phones into the workshop, including other communication devices such as smartwatches. In the event that Competitors do bring these to the competition, they shall be locked in the personal locker and shall not be taken to the workstation. This rule is valid for C-2 until the end of C4. • No Wi-Fi or Bluetooth is allowed at the workstations for Competitors • Skill Competition Manager, Chief Expert, Experts, and Interpreters are allowed to use personal laptops, tablets, and mobile phones in assigned areas only from C-6 until C+1.
• Use of technology – personal photo and video taking devices	• Skill Competition Manager, Chief Expert, Competitors, Experts, Workshop Managers, and Interpreters are allowed to use personal photo and video taking devices in the workshop. Restrictions may be set by the Skill Competition Manager and the Chief Expert in situations where sensitive information is in the area. Any photos or videos must be approved by the Skill Competition Manager and the Chief Expert prior to taking.

Topic/task	skill-specific rule
	• This rule is valid for C-6 until C+1.

10 Expert knowledge and experience

10.1 Requirements

Experts appointed for this skill competition must have the following knowledge and experience for the appropriate occupation or work role as documented in **section 1.1.2**.

1. Industry experience

A minimum of five (5) years of professional experience in the CNC turning industry or in Technical and Vocational Education and Training (TVET) related to CNC machining is required.

2. Technical competence – Measurement techniques

Experts must demonstrate strong practical knowledge of measurement techniques specific to CNC turning. A mandatory hands-on assessment in measurement will be conducted during the competition to verify this competence.

3. Blueprint reading

Proficiency in interpreting technical drawings and symbols is essential. Experts must be able to apply appropriate measuring techniques, standards, and norms based on these specifications.

4. Online Expert test

Successful completion of the Online Expert Test is mandatory. Experts must be able to clearly explain and justify their answers to demonstrate personal understanding and to ensure responses are not AI-generated.

5. English language proficiency

Fluency in English (reading, writing, speaking, and listening) is essential. This is required for completing the Expert Test, participating in the Access Program, understanding competition rules, and effective communication throughout the event, which is conducted entirely in English. In some cases an interpreter from the participating member can be assigned, however, this may be difficult to follw the conversations at the event.

6. Teamwork and professional conduct

Experts must demonstrate strong teamwork skills and professional behavior throughout the competition. A commitment to fairness, objectivity, and adherence to established rules and procedures is essential to ensure consistency and integrity.

7. Mentorship and pedagogical skills

During the preperation for the championship, Experts are expected to mentor and support Competitors. Strong teaching and coaching abilities, along with a sound pedagogical approach, are highly valued.

8. Technical and educational network

For National championships and in the preparation of a Competitor, access to relevant tools, software, and machine training resources is beneficial. The ability to leverage professional networks to support Competitor preparation is an advantage.

9. Institutional and employer support

Full support from the expert's employer and national or regional Skills Organization is strongly encouraged, as the role requires a significant time commitment. Experts not only participate in the championship, but spend much time in the preparation of a Competitor.

10. Commitment to Youth development

A genuine passion for supporting young people in skills development is essential. Empathy, patience, and dedication to their growth and success are key attributes.

11. Additional background

Former Competitors in CNC Turning are highly encouraged to apply. Their experience and insights are considered especially valuable.

12. Familiarity with WorldSkills Standards and procedures

Experts should have a solid understanding of WorldSkills competition standards, assessment criteria, and procedural workflows. Prior involvement in WorldSkills events (national or international) is advantageous.

13. Digital competence

Good understanding of digital tools relevant to CNC turning, including CAM software, simulation tools, and digital documentation platforms used during the competition.

14. Safety and sustainability awareness

Knowledge of occupational safety standards and sustainable practices in CNC machining. Experts should promote safe working environments and resource-efficient processes.

15. Conflict resolution and mediation skills

In case of disputes or misunderstandings during the competition, experts should be able to mediate constructively and maintain a calm, solution-oriented approach.

16. Availability for pre-Competition activities

Experts must be available for preparatory meetings, training sessions, and documentation tasks prior to the competition. This includes participation in the Expert Forum and Access Program.

17. Cultural sensitivity and international collaboration

As WorldSkills is a global event, experts should be open to working with people from diverse cultural backgrounds and demonstrate respect and adaptability in international settings.

11 Visitor and media engagement

11.1 Engagement methods

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

- Organize an area that has local instructor, apprentice or industry explaining the CNC turning machinist role in industry, local opportunities for training, career details etc.
- Display screens (video of CNC Turning Machining);
- Display Test Project (description, parts, and drawings) from past Competitions
- Display Competitor profiles - national flag, name of Competitor and a brief description of their studies;
- A display of industry parts, measuring tools, drawings, MasterCam running on a laptop. The CNC machine supplier could bring sample parts which they use at trade shows.
- The Try-a-Skill (where audience gets to try a hands-on an activity that reflects CNC Machining) option is a valuable way to draw interest, sample keychains where they programme their name and it becomes a take-away. Another possibility would be the use of digital twins, which is less expensive, less dangerous and more achievable.
- Competitions should try to capitalize on the visitor experience, in addition to running the competition, plan the media engagement in the process. For example, spare machine, volunteers in this trade to help engage audience, software running, sample parts, exposure of CMM measuring activity so audience see's the technology applied to trade.
- CNC Turning places ALL inspection activities visible to the audience. Not only does this showcase the equipment of the sponsors and the engagement of the international group of Experts, but also the importance of precision in the skill.
- In CNC Turning there is a "Team-Challenge" on C4. This is usually very good for visitors and media engagement.

Possible text for Media and Marketing

CNC Turning is a branch of engineering. Engineers are faced with customer-requests of making complex assembly parts and have to find mechanical solutions that make these designs possible.

There are many different single parts in things that you see or use on a daily basis. Like in cars, smartphones, aircraft, aero-Space, and so on; the possibilities are endless. For example, there are between 30,000 and 90,000 parts in just one car - or more than half-a-million parts in a Boeing 747. Engineers create assemblies of many parts and use a huge variety of different materials.

But who will build these parts? Many times it is the CNC machinist…. we have to decide the best way to produce each part. With a CNC Lathe we can build very complex parts. We control the CNC-Machine with a Computer programme to cut and shape the material to the desired configuration.

You, as the machinist receive the blueprint from the customer …. and here it begins – blueprint reading is not as simple as many people think. You must develop a strategy to make this part. Which tools to use? Which clamping method? What sequence to develop? Are there alternatives? Are there faster, better, less dangerous or more efiicient ways? Can you produce the desired quality in the desired time with the method's you developed?

These machines are very expensive, because they can do remarkable things. To have an idea of this, think what it means to achieve accuracy below ten microns, which is six times thinner than a human hair.

The CNC Turning machinist uses a computer to tell the Lathe how to move the tools and cut the part. He/she also has to set up the Lathe with all the selected cutting tools. Such tools can cut

almost every material (stainless steel, plastic, soft steel, aluminium, bronze and so on). But we have to choose well - there are so many possible tools for the desired materials. Also the best clamping method (are there alternatives?) and support devices must be chosen and correctly set up.

The machinist also has to make sure that the dimensions exactly fit the blueprint specifications. For this, very accurate inspection tools are used. A smart machinist will get the part to fit at the first attempt, which not only gives you good quality, but a better price. Have you finished the part? Quality control ok? Now send it to the assembly line, where in the end all parts must fit together.

And in the end, if everyone has done their job well, the finished assembly will meet expectations and the car can drive, the plane can fly, and the rocket can fly into space.

12 Sustainability

12.1 Sustainable practices

This skill competition will focus on the sustainable practices below:

- Use of shift rotation system (i.e. shared workstations) to reduce floorspace;
- Recycling and waste management;
- Reduction of Test Project spareparts based on history and experience in the skill management
- Eliminating the need for sawing machines by using the Independent Test Project Designer and the secrecy of all TPs.
- Smart management of Infrastructure List to safe resources;
- Multiple use of offices to reduce needed floorspace (Expert room is also Judgement Marking room, Competitor room is also briefing room);
- Use of Team Challenge outcome as present to the Competition Organizer;
- Better use of digital technology to reduce paper.
- Test Project drawings can be given to vocational schools as training and teaching materials.
- Participating Members are asked to bring sample projects from their industry to showcase to the public. Such samples can sometimes be donated to schools.

13 References for industry consultation

13.1 General notes

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

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

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

13.2 References

This WSOS appears most closely to relate to “lathe and turning machine tool setters, operators, and tenders, metal and plastic”:
https://www.onetonline.org/link/summary/51-4034.00

and/or “lathe and turning machine operator”
http://data.europa.eu/esco/occupation/63042e8f-dd59-47fe-87f3-3b2ce21f196a

Adjacent occupations can also be explored through these links.

ILO 7223

The following table indicates which organizations were approached and provided valuable feedback for the Description of the Associated Role and WorldSkills Occupational Standards in place for WorldSkills Lyon 2024.

Organization	Contact name
CHIRON Group SE	Herbet Mattes, Head of Training
DMG MORI	Joerg Harrings, Head of Training Division
DMG MORI SINGAPORE PTE. LTD.	Kevin Goh, Technical Director

14 Appendix

14.1 Appendix information

Not applicable.