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Technical Description

Software Testing

Skill 11

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:

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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

Software Testing

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

Software testing is comprehensive and systematic work, which uses various testing technologies and methods to verify that the functionality, reliability, security, ease of use, robustness, and portability of the software meet requirements, to find defects or errors in the software, and to ensure the quality of the software product. With the rapid development of ICT technologies such as artificial intelligence, big data, and the Internet of Things, the digital industry has made rapid progress. ICT software is applied to various fields such as industry, agriculture, transportation, information and communication, education and health, finance and insurance, and has helped to reshape and develop the world economy. However, defects or errors in software can bring economic losses or even life-threatening risks to human beings.

A Software Tester may work in a large or medium-sized company using software to power its services and operations, or in a company that provides specialist software services. Alternatively, they may act as a contractor to a wide range of businesses and clients. In larger organisations or projects, they may work in teams in order to test faster and more often. They may be embedded with developers to undertake testing throughout the software development process. Software testing is key to quality assurance.

The testing process is both manual and automated. Its purpose is to identify bugs and issues and to ensure that the software is fit for purpose before its release to end users. In addition to correct functioning, testing may include evaluating the design for ease of use by and attractiveness for the user.

Software Testers need comprehensive professional knowledge and skill. They should be able to write test plans based on documentary requirements, design test cases, select test tools, execute tests, and write test reports as the basis for the quality and evaluation of software products.

Broadly, the tasks involved are as follows:

- liaison with developers on projects;
- communication with users to identify issues;
- monitoring of software, programmes and applications;
- planning projects;
- writing test scripts;
- use of coding languages;
- reviews of documents and paperwork;
- data collection and presentation of findings;
- provision of feedback to software development teams.

Software Testers always face strict deadlines and may need to work on several projects simultaneously.

This occupation has very strong growth potential, its importance being underlined by the scale of risk associated with a lack of quality control and assurance. For the same reason, entrants to the occupation are well supported by a wide range of global certifications which provide a baseline on which to grow outstanding performance.

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1.1.3 Number of Competitors per team

Software Testing 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)

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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**	**7**
	The individual needs to know and understand: • The purpose of software testing • The purpose and nature of standards, the industry’s standards, and procedural specifications for software testing • Corresponding requirements generated by software testing activities • Entry and exit requirements for software testing • Testing requirements for each quality characteristic • Procedures and processes for identifying, analysing and evaluating information from a variety of sources • The importance of correct project scheduling and resourcing	

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Section		Relative importance (%)
	• Common risks in testing activities and corresponding preventative measures • The interfaces for division of responsibilities between different testing roles • The importance of collecting, summarising, and accurately describing problems • Principles of confidentiality for customer information security • The importance of self-responsibility and stress resistance • The importance of improving team capabilities and motivating team members • The importance of environmental awareness and sustainable practices.	
	The individual shall be able to: • Plan each testing phase and testing activities according to the software testing accepted process • Use research techniques and skills to keep up to date with industry standards and new technologies • Prepare test process documentation that complies with test standards and specifications • Determine whether the software meets entry and exit requirements • Conduct testing using testing techniques according to the requirements of each quality characteristic • Check whether the planned work meets the needs of customers and the organization • Plan and allocate testing tasks and resources in a team environment to ensure successful completion of the testing project • Prepare risk plans based on the actual situation of each test assignment • Allocate test tasks and follow up the progress and quality of each task • Collect, summarize, and describe problems, applying them to the entire testing process: requirement confirmation, discussion of solutions, and defect compilation • Optimize sustainable practices, with particular attention to greenhouse gas emissions, resource consumption, and electronic waste. • Maintain the integrity and confidentiality of data, information and documents, and comply with confidentiality requirements for data storage and transmission • Conduct testing to the requirements of objectivity, impartiality, rigour, meticulousness, and disciplined curiosity • Reflect on personal and team performance and set challenging new targets.	
2	**Communication and interpersonal skills**	**8**

Section		Relative importance (%)
	The individual needs to know and understand: • The importance of listening as part of effective communication • The roles and requirements of colleagues and the most effective ways to communicate • The importance of developing effective working relationships with colleagues and managers • What constitute effective teamwork skills • Skills and techniques to resolve misunderstandings and conflicts, and solve problems during tension and conflict • The importance of staying calm and expressing oneself carefully and accurately • The importance of inspiring and guiding ideas.	
	The individual shall be able to: • Listen to customers' needs to help set out clear test requirements and deepen their understanding of tests' purposes and benefits • Maintain effective oral, written, and digital communication with colleagues and managers, and communicate efficiently • Contribute to developing a strong and effective team, sharing knowledge and expertise with colleagues, helping to develop a culture of mutual support and learning, and continuously improve testing skills • Maintain a positive demeanour and proactively support others to resolve problems during times of tension and conflict • Describe and explain one's intentions accurately, with clear logic, checking to ensure understanding without ambiguity • Give customers confidence and guidance, with suggestions and consultation as necessary, such as when change is required in their thinking or approach.	
3	**Test preparation and test planning**	**10**
	The individual needs to know and understand: • Methods of software testing requirements analysis • The principles of formulating test indicators such as performance testing and reliability testing • The requirements of the test environment • Test preparation • The requirements of test plans and programs • The changes that are possible and acceptable • Configuration management requirements.	
	The individual shall be able to: • Analyze, extract and summarize test requirements and obtain customer approval • Help customers determine a reasonable test scope and test indicators	

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Section		Relative importance (%)
	• Build test environments by oneself • Assist developers to build test environments • Carry out or promote test preparation work, including but not limited to (for example) data initialisation, test account creation, and business training • Prepare test plans and programs, and make reasonable plans for (for example) project tasks, progress, personnel, communication mechanisms, risk management, configuration management, change management, defect levels, and test strategies • Take countermeasures in advance for possible changes • Plan project configuration management.	
4	**Testing design**	**25**
	The individual needs to know and understand: • The business model of the software under test • The key points and difficulties of each test type, including ◦ functional testing ◦ performance testing ◦ security testing ◦ reliability testing ◦ compatibility testing ◦ maintainability testing ◦ usability testing ◦ portability testing ◦ automation testing ◦ mobile application testing ◦ white box testing • The principles of test case priority division • Common test case design methods, such as equivalence class, cause-and-effect diagram, decision table, error guessing method, and scenario method • Commonly used performance testing, security testing, automated testing, code auditing and other tools, and master mainstream programming languages such as Java, Python, and JavaScript • The preparation and debugging of automated test scripts • The preparation and debugging of performance test scripts • The preparation of interface test scripts • The design methods of white-box test cases, including statement coverage, judgement coverage, logic coverage, condition coverage, and path coverage • The content and writing requirements of test cases.	
	The individual shall be able to: • Design use cases based on the characteristics of the business model to ensure test case coverage	

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Section		Relative importance (%)
	• Clarify the test focus and test difficulties according to different test types, and improve the test cases in a targeted manner • Prioritize test cases based on the business of the system under test • Design test cases using common methods such as equivalence classes, cause-and-effect diagrams, decision tables, error guessing methods, and scenario methods • Prioritize test cases on a well-reasoned basis • Use common testing tools and corresponding programming languages to design and debug test scripts • Design automated test cases according to scenarios and debug automated test scripts, with complete, clear and highly executable logical judgements • Design performance test cases according to software performance requirements, and debug performance test scripts, with reasonable parameter and judgement settings to fully meet concurrent testing requirements • Analyze interface input parameters, design interface test cases, and configure interface test scripts • Design white-box test cases and test data based on unit logic • Write test cases with complete content, fully ensuring case coverage, ease of execution, readability, and reusability.	
5	**Test implementation**	**35**
	The individual needs to know and understand: • Commonly used performance testing, security testing, automated testing, code auditing and other tools • The use of Linux and Windows operating systems, and common databases such as MySQL, Oracle, and SQLite • Principles for evaluation and determination of test results • The requirements for writing test records and defect reports • The definition of defect severity and priority, and the causes of common problems • Common problems and solutions in the testing process • Software testing suspension and restart conditions • The principles of determining regression testing scope • Determination of the final test results of the software.	
	The individual shall be able to: • Use testing tools to assist in functional testing, performance testing, interface testing, automated testing, white box testing, etc. • Execute Linux and Windows commands and SQL statements to carry out testing when the use case contains relevant descriptions • Accurately determine whether the test results have passed and whether the expected test purpose has been achieved • Describe defects accurately, clearly, and concisely, avoiding ambiguity and redundancy	

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Section		Relative importance (%)
	• Accurately determine the severity and priority of defects, make a preliminary assessment of the causes of defects, and provide repair suggestions in defect reports • Solve common non-software defect problems during the testing process, such as network problems, environment compatibility problems, and script execution exceptions. • Accurately determine when to terminate the test and when to restart the test • Precisely determine the scope of defects and possible impact of defect repairs, determine the scope of regression testing, and create regression test suites • Use the final test report to determine whether the test exit requirements are met.	
6	**Testing reports**	**15**
	The individual needs to know and understand: • The purpose of test reports • The structure of test reports • The requirements for writing test report opinions and explanation • The composition of the delivery documents • Requirements for delivery of test reports • The importance of summarizing the inductive testing experience and accumulating knowledge.	
	The individual shall be able to: • Prepare test reports with complete content, accurate description, detailed data and clear conclusions • Analyze and interpret test data, evaluate the overall quality of the software and the quality of each feature, and provide suggestions on discovered defects and subsequent optimization directions • Review, archive and deliver all test process documents • Deliver test reports while meeting customer requirements and confidentiality requirements • Summarize Test Project experience and archive test assets and knowledge.	
	Total	**100**

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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.

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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**

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

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

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

4.3 Sub Criteria

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

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

4.4 Aspects

Each Aspect defines, in detail, a single item to be assessed and marked, together with the marks, and detailed descriptors or instructions as a guide to marking. Each Aspect is assessed either by Measurement or by Judgement.

The marking form lists, in detail, every Aspect to be marked together with the mark allocated to it. The sum of the marks allocated to each Aspect must fall within the range of marks specified for that section of the Standards. This will be displayed in the Mark Allocation Table of the CIS, in the following format, when the Marking Scheme is reviewed from C-8 weeks. (Section 4.1 refers.)

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

SAMPLE OF TABLE FROM CIS

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.)

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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.

Marking teams are formed in accordance with the Competition Rules.

The Assessment Criteria developed by the Independent Test Project Designer are clear concise aspect specifications which explain exactly how and why a particular mark is awarded.

The marking process should prioritize recognizing the achievements of Competitors rather than penalizing omissions. At least 80% of the approach should employ the 'Add to Zero Marks' method on a predetermined progressive scale when necessary.

Each Expert at the Competition is eligible to serve as a member of the marking team, depending upon the completion of all mandatory preparations. The Skill Competition Manager and the Chief Expert will determine both the composition of the marking teams and the proportion of marks each team is responsible for. The Chief Expert's involvement in the marking process remains optional.

Experts are divided into different regions of the world and levels of experience for marking where possible.

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The Independent Test Project Designer will provide the marking criteria. Experts will discuss these marking criteria upon arrival at the Competition.

To ensure a strong connection with the requirements of the software industry, in designing the Marking Scheme the international standards for Software Testers will act as reference material. These are itemized below:

ISTQB Certified Tester: FL: covers six major areas including testing basics, testing in the software development life cycle, static testing, test design techniques, test management and tool-supported testing.

ISTQB Certified Tester: AL: includes three modules: Test Manager, Test Analyst and Technical Test Analyst.

ISTQB Certified Tester: EL: covers topics such as test management, improving the testing process, and automated test engineering.

ISO/IEC 12207: Provides guidance on software testing during the software life cycle, including test strategy, test design, test execution, and evaluation.

ISO/IEC 9126: defines the quality characteristics of software products, including functionality, reliability, usability, efficiency, maintainability, and portability.

IEEE 829: is the IEEE standard for software and system test documentation, including test plans, test design specifications, test reports, etc.

ISO/IEC 25010: Provides guidance on software product quality requirements and evaluation (SQuaRE) and is part of the ISO 250xx series of standards.

ISO/IEC 20246: Provides international standards for software testing, including test concepts and test techniques.

ISO/IEC 14598 (Software Engineering - Product Evaluation): covers all aspects of software product evaluation, including evaluation methods, evaluation process, interpretation of evaluation results, etc.

5 The Test Project

5.1 General notes

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

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

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

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

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

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

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

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

5.2 Format/structure of the Test Project

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

5.3 Test Project design requirements

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

The main purpose of the Test Project is to closely reflect the scenarios and challenges of real-world software testing, globally, where risk is constant, and professional standards and ethics are vital to sustainable economies and societies.

Following the instructions and guidance in the Technical Description, the Test Project will be designed, developed, and implemented to:

- Provide an authentic and accurate representation of the role of a software tester. This relates to the occupation's context, purpose, processes, and outcomes;

- Assess only the knowledge, skills, and behaviours that are specified or indicated in the WSOS;
- Provide sufficient, balanced, and authentic opportunities to assess performance adequately and to make well-evidenced decisions;
- Enable a clear relationship with and between it, the Marking Scheme, and the WSOS;
- Avoid requirements that lie outside the WSOS, or are artificial, or incorporate bias;
- Minimize expense for Members and the Competition Organizer.
- To be relevant and authentic, initially and continuously, the median technical standard will be what a competent practitioner would normally expect to achieve. Refer to standards in **4.9**.

The Test Project is to be modular, its proportions, incorporating transversal skills, being as follows.

Module A: Interface testing (5 hours)

To analyze the interface of the object under test, use interface testing tools, apply network protocols, set interface parameters, variables, assertions, etc., execute interface testing, analyze interface response results, determine whether the test case passes, and provide feedback on interface test results.

Module B: Performance testing (5 hours)

To write performance test scripts for the object under test, add configuration elements and associated variables, set test data and assertions, build test scenarios, monitor software and hardware resource consumption, etc., execute performance tests, identify performance bottlenecks, analyze the root causes of performance defects, and generate performance test reports.

Module C: Functional testing (6 hours)

To use the provided automated testing tools to create automated testing projects based on the testing framework, to design automated testing data, write and execute automated testing scripts, and generate automated testing reports.

Module D: Secret challenge (4 hours)

To analyze the test object, use common test case design methods such as equivalence class, cause-and-effect diagrams, decision tables, error guessing methods, scenario methods, etc., apply static or dynamic analysis to the object under test, design test cases and test data, execute tests, find defects, and generate test reports.

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 (ITPD) 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.
No later than two (2) months prior to the Competition	The Test Project documents are sent to the WorldSkills International Skills Competitions Administration Manager.
At the Competition on C-4	The Test Project/modules are presented to Experts.
At the Competition on C-2	The Test Project/modules are presented to Competitors.

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.

5.7 Test Project circulation

The Test Project/modules are not circulated prior to the Competition. The Test Project/modules are presented to Experts on C-4 and to Competitors on C-2.

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 Test Project translation and use of Interpreters

The Test Project documentation and the Mark Summary Form for this skill competition are translated into the language of the Competitors' choice using an approved AI platform. It is the

responsibility of the Technical Delegate to request the translation, and in which language, via the official process managed by WSI.

The Secretariat will manage the process. **Refer to Competition Rule 10.12.**

The following applies:

- Interpreters may be present during the Test Project briefing for Competitors.
- Interpreters are allowed to be used for communication as per **Competition Rule 6.13.**
- Interpreters and Experts are not allowed to review the translated documents prior to their release as per section **5.4.3**

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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.

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Topic/task	Best practice procedure
Use of technology – personal laptops, tablets, and mobile phones	• Those who require computers for the review of the AI generated Test Project translation need to notify the Workshop Manager before arrival so they can be accommodated.
Software (language)	• Competitors can only use the software in English. • The Interpreters may not be asked to translate any part of the software or related documentation.
Translation of Test Project	• The Test Projects will be translated by an AI tool if requested. The process is managed by WSI. Refer to section 5.9 of this Technical Description.

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7 Skill-specific safety requirements

7.1 Personal Protective Equipment

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

Task	Sturdy shoes with enclosed toe and no heel
General PPE for safe areas	√

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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 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.

8.3 Competitors toolbox

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

8.4 Materials, equipment, and tools supplied by Competitors

It is not applicable for Competitors to bring materials, equipment, and tools to the Competition.

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

8.5 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.

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8.6 Materials and equipment prohibited in the skill area

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

8.7 Proposed workshop and workstation layouts

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

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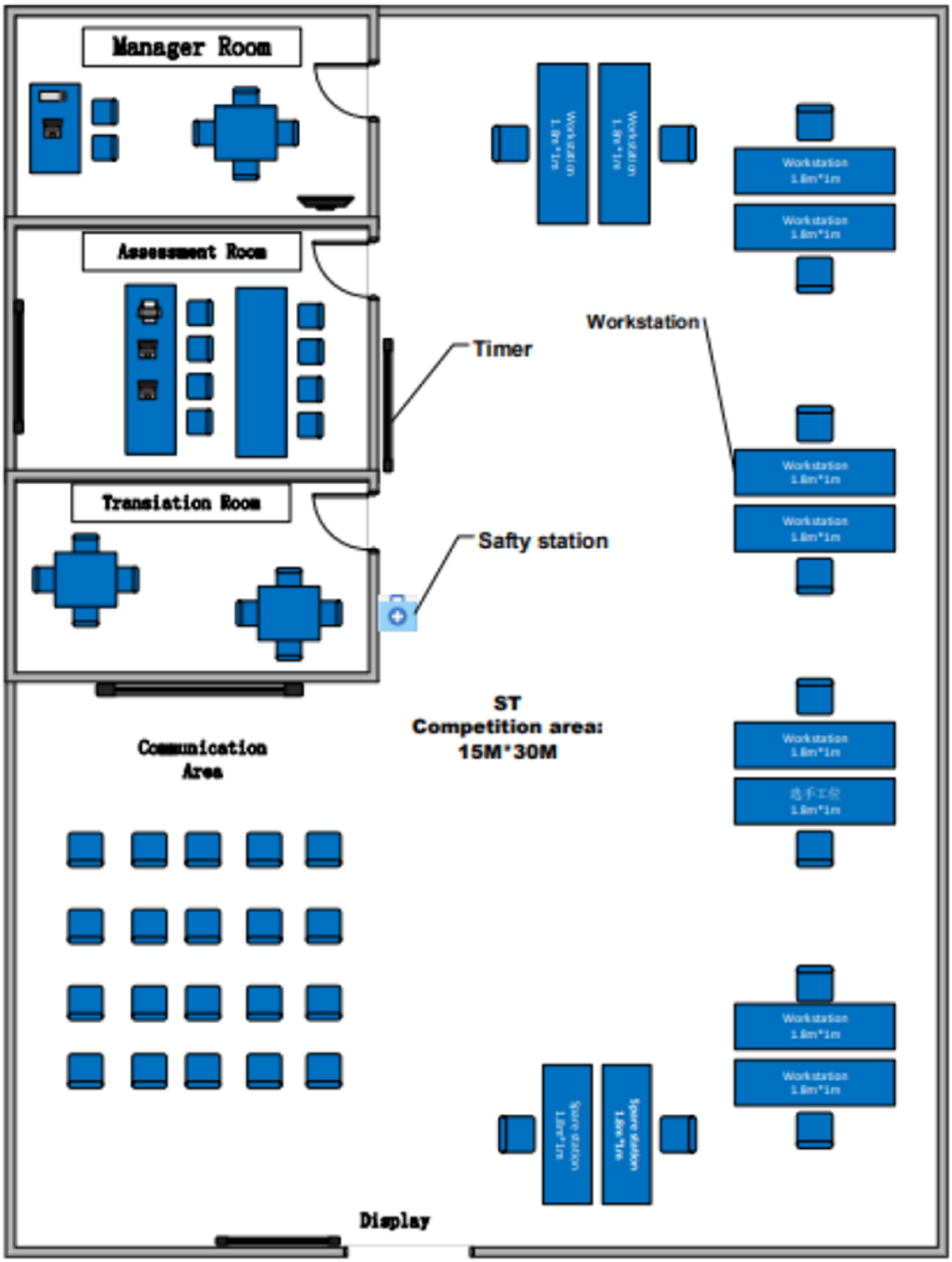
Example workshop layout



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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 – personal laptops, tablets and mobile phones	• Experts and Interpreters are allowed to use personal laptops, tablets, or mobile phones in the Experts room, except when there are documents or discussions relevant to the competition in the room. This applies from C-4 until the end of competition on C4. • The Skill Competition Manager and Chief Expert, along with the WM, may hold onto their communication devices at all times. • The use of personal laptops and other communication devices while marking are prohibited. • The Interpreters and Experts may only use laptops or computers supplied by the Competition Organizers to review the AI generated translations. Such devices will not have access to the Internet. Connecting or using any personal communication or storage devices to these computers are not allowed.
Use of technology – personal photo, audio and video taking devices	• Experts and Interpreters are allowed to use personal photo, audio, and video taking devices in the Experts room, except when there are documents or discussions relevant to the competition in the room. This applies from C-4 until the end of competition on C4. • Competitors, Experts, and Interpreters are allowed to use personal photo, audio, and video taking devices in the workshop at the conclusion of the competition only. • Skill Competition Manager, Chief Expert, and Workshop Manager are exempt from this rule.
Use of Internet	• The Competitors do not have Internet access in the Competition area.
Listening to music while competin	• On Familiarization Day (C-2) Competitors are allowed to supply a memory stick containing a maximum of 30 songs. All music is collated, verified, and shared/streamed amongst all Competitors. • The music streaming/sharing service may be stopped if at any stage, if the Competition Organizers feel that it will affect the performance or integrity of the competitions. • Each Competitor may bring one wired headphone/headset that utilizes the standard headphone jack. They will need to be

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Topic/task	Skill-specific rule
	approved by the Chief Expert, and Workshop Manager before the start of the competition.

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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. Skilled in applying mainstream test case design methods such as equivalence class, cause-and-effect diagram, and decision table.

2. Proficient in programming languages like Python, Java and JavaScript, capable of independently developing automated test scripts.

3. Master the configuration and advanced application of automated testing tools such as Selenium and Appium.

4. Familiar with API and performance testing tools like JMeter and Postman, able to design concurrent scenarios and analyze bottlenecks.

5. Capable of using interface testing tools and proficient in applying network protocols such as HTTP and HTTPS.

6. Familiar with database operations such as MySQL, able to write SQL queries for test data preparation.

7. Master white-box testing methods, able to design test cases for statement coverage and path coverage based on code logic.

8. Able to accurately determine the severity and priority of software defects and write standardized defect reports.

9. Proficient in the execution processes and verification standards of multiple types of testing such as functional, security, and compatibility testing.

10. Capable of writing test plans, able to reasonably plan test resources, schedules, and risk response strategies.

11. Master the use of static code analysis tools, able to assist in identifying potential code risks.

12. Able to analyze software quality characteristics based on test results and put forward optimization suggestions.

13. Familiar with software testing suspension and restart conditions, able to scientifically determine test exit nodes.

14. Able to build Linux and Windows multi-environment test platforms and solve environment compatibility issues.

15. Master the principles of determining regression testing scope, able to design efficient regression test case sets.

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11 Visitor and media engagement

11.1 Engagement methods

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

Innovate product experiences by organizing events that allow audiences and media to experience the performance and functionality of smart terminal devices such as handheld tablets, phones, smart wristbands, smart sports equipment, and unmanned car models. Participants can freely test these devices and identify any potential bugs.

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12 Sustainability

12.1 Sustainable practices

This skill competition will focus on the sustainable practices below:

- Recycling of competition process documents;
- The Test Project provides media files;
- Use the full test programme after the competition;
- Limit the types of software that entrants can install on their workstations;
- Open-source software;
- Make sure to use all objects in the IL.

Cost

First, the value of the required equipment is not high, because they are all smart devices commonly used in daily work. It is estimated that the cost of the equipment required for each participant is around USD 2000-3000, and these devices can be reused. Secondly, it is likely to obtain technical and financial support from sponsors such as desktop, tablet, smartphone and software companies, so that the total cost of the competition can be kept at a low level.

Workspace

In the competition, each Competitor is given a high-performance computer and two monitors according to the requirements of the Test Project. According to the actual working environment of the industry, each Competitor needs to occupy about 2-3 square meters.

Impact on the environment

Software testing is a kind of digital product testing work, and its working produces no direct negative environmental impact.

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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 is classified within ISCO-08 Unit Group 2519: Software and Applications Developers not elsewhere classified (p.166)

In greater detail it closely relates to Software Quality Assurance Analysts and Testers (15-1253): https://www.onetonline.org/link/summary/15-1253.00

and to Software Tester (2519.7): http://data.europa.eu/esco/occupation/106f79e4-6264-45f1-9e7a-297435cd684b

Unfortunately no feedback was received from business and industry for WorldSkills Shanghai 2026.

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14 Appendix

14.1 Appendix information

Not applicable.

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