

# *Standards and Assessment Guide*

## **Digital Construction**

# Introduction

Welcome to the Standards and Assessment Guide (SAG), a comprehensive resource designed to support excellence in assessment practices for all skills competitions hosted at the WorldSkills Competition. A key component of the SAG is the commitment to continuous improvement through ongoing review, ensuring that these guides consistently reflect the latest industry innovations and high standards of assessment in an open and transparent manner.

## Purpose

The primary purpose of this guide is to provide a structured framework for the consistent and fair assessment of each skill competition. It aims to ensure that all assessments are conducted with a high degree of accuracy, reliability, validity, and reflect global industry standards. By adhering to these guidelines, assessors can maintain the integrity of the competition and uphold the high standards associated with WorldSkills.

**Note:** this guide is not a replacement for the Marking Scheme and should only be used as a reference when required during the assessment process. Competitors are not allowed to have a copy of this SAG in the workshop in either digital or paper form.

## Scope

This document covers general assessment practices applicable to a diverse range of industry sectors including:

- Manufacturing and Engineering Technology
- Information and Communication Technology
- Construction and Building Technology
- Transportation and Logistics
- Social and Personal Services
- Creative Arts and Fashion

Each skill competition has its unique requirements and benchmarks, which are detailed within sections of this guide. The consistency of assessment across each skill is the overarching principle, ensuring a unified approach to evaluating Competitor performance to the highest standards.

# Key Components

The guide is structured into several key components, each addressing critical aspects of the assessment process:

## Assessment Principles and Objectives

- Emphasis on fairness, transparency, and objectivity in assessments.
- Alignment with global industry standards and best practices.

## Assessment Methods and Tools

- Description of various assessment methods in Measurement and Judgement.
- Guidance on the application of appropriate assessment tools and equipment (if applicable).

## Criteria and Benchmarks

- Examples of assessment criteria and aspects for each skill, outlining the expected competencies and performance standards.
- Benchmarks for different levels of proficiency i.e. Judgement award range 0, 1, 2, 3 or Yes/No criteria alongside clear measurable descriptors.

## Expert assessment requirements

- Completion of the Access Programme.
- Approved Curriculum Vitae (CV).
- Reaching 100% Expert preparedness.
- Full participation of online and in-person Mandatory Assessment Training (MAT).
- Completion of practical assessment testing at the Competition.

## Quality Assurance and Improvement

- Monitoring and evaluation: Ensuring assessments are carried out correctly and produce reliable results.
- Continuous improvement: Using feedback from Experts and Skill Competition Managers to enhance future assessments.
- Periodic review: Regularly updating processes to reflect current industry and WorldSkills standards.

## Implementation

For effective implementation, this guide should be used for guidance purposes only and in parallel with the Technical Description for each skill. Experts are encouraged to familiarize themselves thoroughly with both the general guidelines and the particular requirements of their respective skill areas. Collaborative efforts between the Skill Management Team, Experts, and Competitors are vital for achieving the ultimate goal of global skills development.

## Conclusion

The Standards and Assessment Guide embodies the commitment of the WorldSkills movement to nurturing talent and promoting the highest standards of vocational education and training worldwide. By providing clear and comprehensive guidance, we aim to empower Experts to conduct marking and assessment practices that are not only rigorous and equitable but also inspiring and transformative for all participants.

Thank you for your dedication to upholding these standards and contributing to the success of the WorldSkills Competition. Together, we can continue to champion skills excellence and celebrate the achievements of talented individuals from around the globe.

## Skill – 58 Digital Construction

### Measurement

Measurement is used to assess accuracy, precision, and other performance that can be measured objectively. It is used where ambiguity must be avoided.

The total marks allocated to measurement marking may vary from competition to competition depending on the Test Project.

Has something been done? Is it there? Does it work? Yes = full mark; or No = no mark.

It can ask how closely performance matches the requirement or facilitate the use of tolerances. This uses a scale, so that: Perfect match = full mark; Divergence = smaller or fewer mark(s); or Fewer marks on a descending scale.

### Judgement

Judgement is used to assess the quality of performance about which there may be small differences of view when applying the external benchmarks.

The Resources column in the table below may include all kinds/formats of resources such as: a link to a YouTube video, a website link, an illustration, a photo, a reference to a book, and so on. It needs to be as detailed as possible to show the differentiation between 0, 1, 2, 3.

#### Generic rules:

The assessment group comprises three Experts plus one Expert who acts as the supervisor. The supervising Expert will replace an Expert in the marking group to prevent compatriot marking.

The difference of the three Experts' scores may not exceed 1. If this is the situation the Experts must re-score until there is a maximum difference of 1. As long as the three Experts judge within 1, the result can be entered into the CIS.

The total marks allocated to judgement marking may vary from competition to competition depending on the Test Project.

### Skill Specific Additional Notes

**Where possible, efforts must be made to evaluate Tasks / Criteria by Measurement as opposed to Judgement within Skill 58 – Digital Construction.**

## Primary Assessment Method by Module

The below table outlines the primary assessment method by module and a number of sample tasks.

| Module No. | Module Title                              | Sample Tasks                                                                                                                                                                                                                                                                                                                                | Primary Assessment Method |
|------------|-------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------|
| 01         | CDE Setup                                 | <ul style="list-style-type: none"> <li>Set up the Common Data Environment with adherence to BEP and ISO19650 Standards Series.</li> <li>Populate BIM model with project-specific information following BEP guidelines.</li> <li>Design and finalize a digital safety checklist tailored for the Construction Site.</li> <li>Etc.</li> </ul> | Measurement               |
| 02         | Conceptual Design Modelling and Rendering | <ul style="list-style-type: none"> <li>Create a conceptual mass family that consists of one cubic building cut with a cylinder shaped building.</li> <li>Produced a rendered image from provided base model.</li> </ul>                                                                                                                     | Measurement/Judgement     |
| 03         | Structural Modelling                      | <ul style="list-style-type: none"> <li>Develop a work-shared Structural BIM Model as instructed by the BEP.</li> <li>Federate structural, architectural, and specialist designer PIMs within the CDE in accordance with BEP.</li> <li>Etc.</li> </ul>                                                                                       | Measurement               |
| 04         | Architectural Modelling and Collaboration | <ul style="list-style-type: none"> <li>Develop a work-shared Architectural BIM Model as instructed by the BEP.</li> <li>Complete the modelling of external and internal walls on the ground floor plan per the requirements of the BEP and the provided drawings.</li> <li>Etc.</li> </ul>                                                  | Measurement               |

|    |                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |             |
|----|-------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|
| 05 | Model Coordination                  | <ul style="list-style-type: none"> <li>• Establish an Interdisciplinary Cloud Coordination Space for clash detection purposes.</li> <li>• Conduct Hard Clash Inspections in line with BEP directives.</li> <li>• Assure the quality of the federated project model with a comprehensive “Walk around” of the CDE hosted model.</li> <li>• Pinpoint coordination issues in the new build that were overlooked in hard clash tests.</li> <li>• Etc.</li> </ul>                                                            | Measurement |
| 06 | Asset Information Management        | <ul style="list-style-type: none"> <li>• Validate that all assets are populated with the essential COBie data.</li> <li>• Implement classification info to model elements, making reference to the project BEP.</li> <li>• Etc.</li> </ul>                                                                                                                                                                                                                                                                              | Measurement |
| 07 | Data Creation and Management        | <ul style="list-style-type: none"> <li>• Generate dimensioned Floor Plan drawings and elevation sketches from the updated federated project model.</li> <li>• Design custom tags to depict technical data extracted from the specific parameters visually.</li> <li>• Finalize and export a sheet set as a PDF, submitting it through BEP to CDE.</li> <li>• Etc.</li> </ul>                                                                                                                                            | Measurement |
| 08 | Modelling for Sustainability and AI | <ul style="list-style-type: none"> <li>• Using the site automation tool in Forma Design, generate a building layout in according to the provided functional area diagram.</li> <li>• Turn on AI rendering for the give site and project.</li> <li>• Conduct a rapid wind analysis for the site with the conditions given.</li> <li>• Evaluate and integrate sustainable materials into BIM models.</li> <li>• Simulate energy consumption using BIM to identify energy-saving opportunities.</li> <li>• Etc.</li> </ul> | Measurement |

## Measurement Method 01: Yes / No, Number of Yeses, Task Complete or Incomplete

Measurement is used to assess accuracy, precision, and other performance that can be measured objectively. It is used where ambiguity must be avoided.

The total marks allocated to measurement marking may vary from competition to competition depending on the Test Project.

If stated within the Marking Scheme, some marks may be deducted for partially incomplete or incorrect tasks.

**Has something been done? Is it there? Does it work? Yes = full mark; or No = no mark.**

Sample tasks:

| WSOS section<br>as per TD                                                            | Task / Criterion                                                                                                                                                                                                                                                                           | Score   | Descriptor                                                                                                                | Resource                                                                                                 |
|--------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------|---------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------|
| <ul style="list-style-type: none"> <li>1</li> <li>3</li> <li>4</li> <li>5</li> </ul> | Establish an Interdisciplinary Cloud Coordination Space for clash detection purposes:<br>In Autodesk Forma Coordination → [settings] → [Coordination spaces]: Is the shared folder there with status = active.                                                                             | Y/N     | Y - Full mark<br>N - 0 mark                                                                                               | Can vary, please refer to Test Project BEP and any additional specific Test Project marking guidance.    |
| <ul style="list-style-type: none"> <li>2</li> <li>3</li> <li>4</li> </ul>            | Federate structural, architectural, and specialist designer PIMs within the CDE in accordance with BEP:<br>Check folder xxx/shared/arch to see if all these are true?<br>1. A Revit file exists,<br>2. It contains all three sub-models,<br>3. All three models share the same coordinates | Y/N     | When all items are required to be correct:<br>Y if all three are true - Full mark<br>N if not all three are true - 0 mark | Can vary, please refer to Test Project BEP and any additional specific Test Project marking guidance.    |
| <ul style="list-style-type: none"> <li>2</li> <li>3</li> <li>4</li> <li>5</li> </ul> | Develop a work-shared architectural BIM Model as instructed by the BEP:<br>In Autodesk Forma, go to project [Docs], Competitor's M2 folder:<br>1. An architecture model exists?                                                                                                            | n (0-3) | When not all items are required to be correct:<br>$n * \text{FullMark} / 3 = 0$<br>(rounded to CIS default or 0.01)       | The marking team will be directed to refer to an identified figure in the instruction/BEP/Marking guide. |

|                                                                                 |                                                                                                                                                                                                                                                                                                                                                               |                |                                                                   |                                                                                                                 |
|---------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|-------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------|
|                                                                                 | <p>2. Is the file named exactly as ESGD42-XXXX-02-ZZ-M3-A-0001.rvt; (XXXX is Competitor's skill team originator)</p> <p>3. The file is work shared (with a cloud symbol)</p> <p>Enter the number of yeses to these three questions.</p>                                                                                                                       |                |                                                                   |                                                                                                                 |
| <ul style="list-style-type: none"> <li>• 1</li> <li>• 2</li> <li>• 3</li> </ul> | <p>Create the folder structure in the ACC in accordance with the BEP.</p> <p>Check folder structure for the following aspects:</p> <ol style="list-style-type: none"> <li>1. Are ALL folders there and in the correct position?</li> <li>2. Are all folders spelled correctly?</li> <li>3. Is the folder "Shared" enforced with naming convention?</li> </ol> | <b>n (0-3)</b> | $n * \text{FullMark} / 3 = 0$<br>(rounded to CIS default or 0.01) | <p>The marking team will be directed to refer to an identified figure in the instruction/BEP/Marking guide.</p> |

## Measurement Method 02: Measurement With Tolerances

Measurement is used to assess accuracy, precision, and other performance that can be measured objectively. It is used where ambiguity must be avoided.

The total marks allocated to measurement marking may vary from competition to competition depending on the Test Project.

If stated within the Marking Scheme, some marks may be deducted for partially incomplete or incorrect tasks.

**It can ask how closely performance matches the requirement or facilitate the use of tolerances. This uses a scale, so that: Perfect match = full mark; Divergence = smaller or fewer mark(s); or Fewer marks on a descending scale.**

Sample tasks:

| WSOS section as per TD                            | Task / Criterion                                                                                                                                                                                                             | Score               | Descriptor                                                                                                                                                                                                                                                    | Resource                                   |      |        |     |        |    |        |   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |             |                                             |                     |                 |                                            |         |      |     |            |                                 |        |      |     |           |       |      |     |            |       |      |     |   |
|---------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------|------|--------|-----|--------|----|--------|---|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|---------------------------------------------|---------------------|-----------------|--------------------------------------------|---------|------|-----|------------|---------------------------------|--------|------|-----|-----------|-------|------|-----|------------|-------|------|-----|---|
| <ul style="list-style-type: none"><li>5</li></ul> | <p>Complete the modelling of external and internal walls on the ground floor plan per the requirements of the BEP and the provided drawings:</p> <p>Check the wall schedules for internal wall volumes grouped by types.</p> | n                   | <p>=n*Full mark</p> <p>In the example:<br/>0.9 * Full mark</p> <p>If the reference work is:</p> <table><tr><td>Type 1</td><td>1234</td></tr><tr><td>Type 2</td><td>113</td></tr><tr><td>Type 3</td><td>98</td></tr><tr><td>type 4</td><td>0</td></tr></table> | Type 1                                     | 1234 | Type 2 | 113 | Type 3 | 98 | type 4 | 0 | <p>=<math>\sum \max(0, 1 -  \Delta\%_i ) * w_i</math></p> <p>Example:</p> <table><tr><th>Comp's work</th><th>Comp's prime score =MAX(0, 1-ABS(Diff)/Ref)</th><th>Pre-defined weights</th><th>weighted scores</th><th>Final score (to be filled by marking team)</th></tr><tr><td>1235.91</td><td>1.00</td><td>0.7</td><td>0.69891821</td><td rowspan="4">0.90<br/>=sum of weighted scores</td></tr><tr><td>113.21</td><td>1.00</td><td>0.1</td><td>0.0998145</td></tr><tr><td>96.98</td><td>0.99</td><td>0.1</td><td>0.09894824</td></tr><tr><td>36.71</td><td>0.00</td><td>0.1</td><td>0</td></tr></table> <p>The calculation is performed with the help of either a pre-coded script or excel sheet.</p> | Comp's work | Comp's prime score =MAX(0, 1-ABS(Diff)/Ref) | Pre-defined weights | weighted scores | Final score (to be filled by marking team) | 1235.91 | 1.00 | 0.7 | 0.69891821 | 0.90<br>=sum of weighted scores | 113.21 | 1.00 | 0.1 | 0.0998145 | 96.98 | 0.99 | 0.1 | 0.09894824 | 36.71 | 0.00 | 0.1 | 0 |
| Type 1                                            | 1234                                                                                                                                                                                                                         |                     |                                                                                                                                                                                                                                                               |                                            |      |        |     |        |    |        |   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |             |                                             |                     |                 |                                            |         |      |     |            |                                 |        |      |     |           |       |      |     |            |       |      |     |   |
| Type 2                                            | 113                                                                                                                                                                                                                          |                     |                                                                                                                                                                                                                                                               |                                            |      |        |     |        |    |        |   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |             |                                             |                     |                 |                                            |         |      |     |            |                                 |        |      |     |           |       |      |     |            |       |      |     |   |
| Type 3                                            | 98                                                                                                                                                                                                                           |                     |                                                                                                                                                                                                                                                               |                                            |      |        |     |        |    |        |   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |             |                                             |                     |                 |                                            |         |      |     |            |                                 |        |      |     |           |       |      |     |            |       |      |     |   |
| type 4                                            | 0                                                                                                                                                                                                                            |                     |                                                                                                                                                                                                                                                               |                                            |      |        |     |        |    |        |   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |             |                                             |                     |                 |                                            |         |      |     |            |                                 |        |      |     |           |       |      |     |            |       |      |     |   |
| Comp's work                                       | Comp's prime score =MAX(0, 1-ABS(Diff)/Ref)                                                                                                                                                                                  | Pre-defined weights | weighted scores                                                                                                                                                                                                                                               | Final score (to be filled by marking team) |      |        |     |        |    |        |   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |             |                                             |                     |                 |                                            |         |      |     |            |                                 |        |      |     |           |       |      |     |            |       |      |     |   |
| 1235.91                                           | 1.00                                                                                                                                                                                                                         | 0.7                 | 0.69891821                                                                                                                                                                                                                                                    | 0.90<br>=sum of weighted scores            |      |        |     |        |    |        |   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |             |                                             |                     |                 |                                            |         |      |     |            |                                 |        |      |     |           |       |      |     |            |       |      |     |   |
| 113.21                                            | 1.00                                                                                                                                                                                                                         | 0.1                 | 0.0998145                                                                                                                                                                                                                                                     |                                            |      |        |     |        |    |        |   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |             |                                             |                     |                 |                                            |         |      |     |            |                                 |        |      |     |           |       |      |     |            |       |      |     |   |
| 96.98                                             | 0.99                                                                                                                                                                                                                         | 0.1                 | 0.09894824                                                                                                                                                                                                                                                    |                                            |      |        |     |        |    |        |   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |             |                                             |                     |                 |                                            |         |      |     |            |                                 |        |      |     |           |       |      |     |            |       |      |     |   |
| 36.71                                             | 0.00                                                                                                                                                                                                                         | 0.1                 | 0                                                                                                                                                                                                                                                             |                                            |      |        |     |        |    |        |   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |             |                                             |                     |                 |                                            |         |      |     |            |                                 |        |      |     |           |       |      |     |            |       |      |     |   |

## Judgement Method 01: Score Card

Judgement is used to assess the quality of performance about which there may be small differences of view when applying the external benchmarks.

The Resources column in the table below may include all kinds/formats of resources such as: a link to a YouTube video, a website link, an illustration, a photo, a reference to a book, and so on. It needs to be as detailed as possible to show the differentiation between 0, 1, 2, 3.

### Generic rules:

The assessment group comprises three Experts plus one Expert who acts as the supervisor. The supervising Expert will replace an Expert in the marking group to prevent compatriot marking. The difference of the three Experts' scores may not exceed 1. If this is the situation the Experts must re-score until there is a maximum difference of 1. As long as the three Experts judge within 1, the result can be entered into the CIS.

The total marks allocated to judgement marking may vary from competition to competition depending on the Test Project.

### Sample tasks:

| WSOS section as per TD                                         | Task / Criterion                                    | Score | Descriptor                                                                                                                                                                                     | Resource                                                                             |
|----------------------------------------------------------------|-----------------------------------------------------|-------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|
| <ul style="list-style-type: none"> <li>1</li> <li>5</li> </ul> | Produced a rendered image from provided base model. | 0     | Materials not applied. Additional scene entourage and/or vegetation not added. Little or no updates to scene lighting. Little or no consideration given to image composition and camera angle. |  |

| WSOS section as per TD | Task / Criterion | Score | Descriptor                                                                                                                                                                                                                                                                                                         | Resource                                                                              |
|------------------------|------------------|-------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|
|                        |                  | 1     | Some materials applied and improvements to base model made. Some Additional scene entourage and/or vegetation added. Some updates to scene lighting. Consideration given to image composition and camera angle.                                                                                                    |    |
|                        |                  | 2     | Majority of materials applied and improvements to base model made. Considerable amount of additional scene entourage and vegetation added. Considerable updates made to scene lighting. Consideration given to image composition and camera angle, incorporating concepts such as rule-of-thirds and focal length. |   |
|                        |                  | 3     | Materials applied and improvements to base model made. All Additional scene entourage and vegetation added. Complete updates made to scene lighting. Excellent image composition and camera angle, incorporating concepts such as rule-of-thirds and focal length.                                                 |  |

