

Standards and Assessment Guide

Electrical Installations

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.

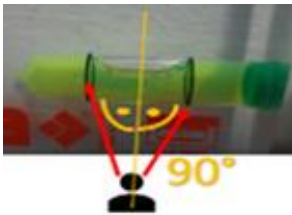
Thank you for your dedication to upholding these standards and contributing to the success of the WorldSkills Competition. Together, we can continue to champion skills excellence and celebrate the achievements of talented individuals from around the globe.

Skill 18 – Electrical Installations

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.

5	Level Measurements Level/plumb Yes or No	Yes	No
			

5	Measurement	All dimensions to be taken from either the vertical or horizontal datum lines. All equipment to be drawn to centre lines on the layout diagram grid (note equipment is not necessarily drawn to scale) Measurement +/- 2 mm
5	Wiring in boards	Wiring and terminations may focus on but not limited to: • No copper visible when looking at the connection from a 90-degree position; • No nicks or cuts in the copper conductors; • No plastic insulation inside the termination; • Terminations done correctly (no loose terminations, good electrical and mechanical connection) If ferrules are required the Competition Organizer must provide all equipment and materials to install;
5	Multifunction actuator Channel 3 Operates Light H6	Use a screwdriver to flip the switch from 0 to 1 on channel 3/C. If the device has buttons, you can turn the channel on/off with this. Verify that light H6 Turns ON when 1 and off when 0. 

Judgment

Judgment is used to assess the quality of performance. 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 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 judgment marking may vary from competition to competition depending on the Test Project.

Skill 18 MAT Practical Judgement

Part 1 (for all experts)

Pictures of different installation ways will be shown to the experts together with the judgment explanations of what the 0-3 scores mean.

For example, with the **installation of trunking**:

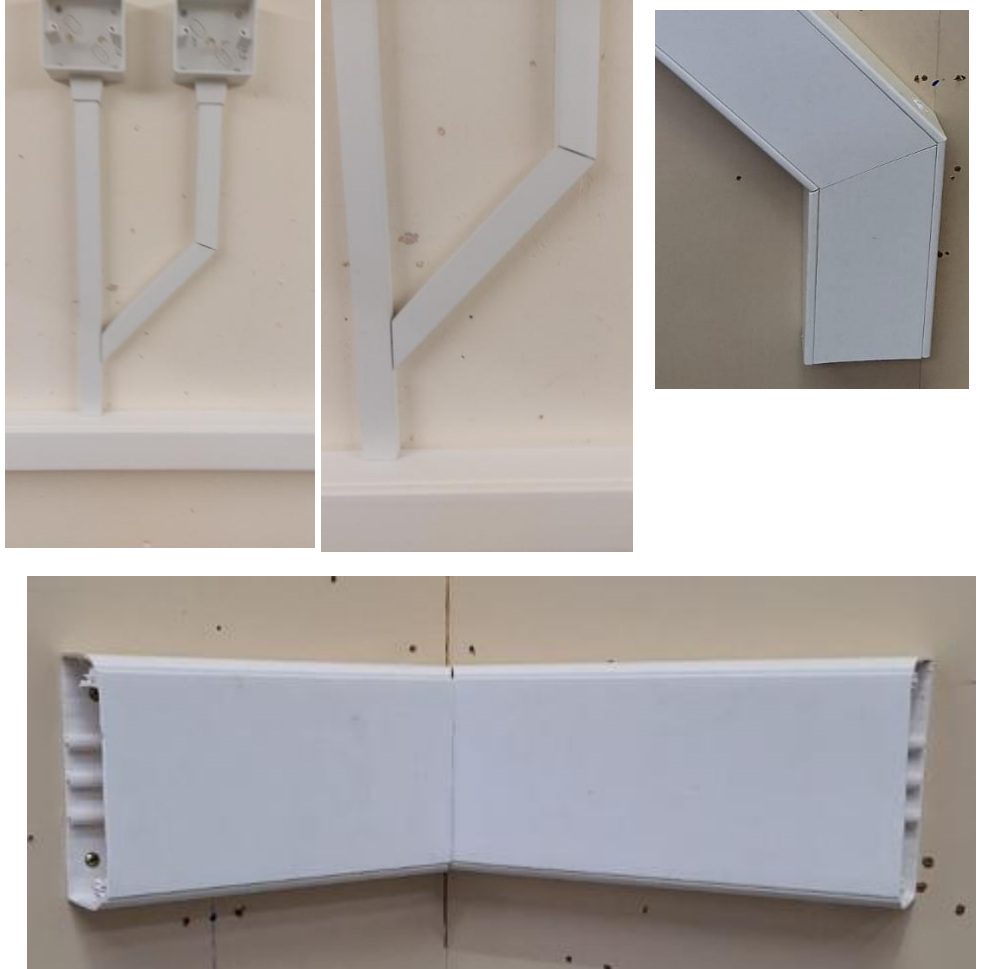
- Below industry standard or no attempt: Joints are badly cut with excessive gaps. Lids not fitted or not fitted correctly. Roll or movement of trunking.
- Meets industry standard: Joints are neat and even but with gaps. Covers fitted. No roll or movement.
- Industry standard with elements of good practice: Joints are neat with only some minor gaps. Covers fitted. No roll or movement.
- Excellent in comparison to industry standard: Joints are neat with no gaps. Covers fitted. No roll or movement.

Aspect – D2 - Installation of Wireways PVC Trunking

PVC Trunking. Securely fitted. The joints and angles are neat. Secure with no roll. Does not include any natural flexing of PVC Trunking.

WSOS section as per TD	Score	Descriptor	Resource
5	0	Below industry standard or no attempt: The joints are poorly cut, with burrs or excessive spacing (gaps/splits). Covers or accessories are not mounted or are poorly fitted. Trunkings, covers or accessories have excessive markings or damage. There is excessive movement or rolling of the trunkings when checking the fastening	

	1	Meets industry standard: The joints are cut cleanly, without burrs or spacing (gaps/splits). The covers and accessories are assembled and fitted. Trunkings, covers, and accessories are free of markings and excessive damage. There is no excessive movement or rolling of the trunkings when checking the fastening.	
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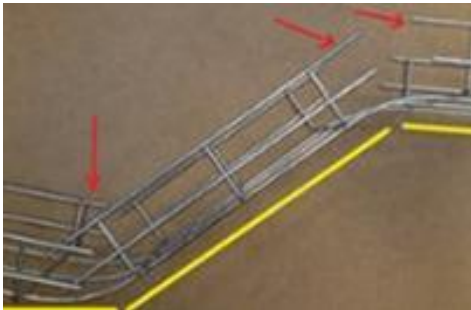
WSOS section as per TD	Score	Descriptor	Resource
	2	Industry standard with elements of good practice: The joints are clean (without burrs), well-cut, and mostly uniform (parallel), with only a few small spacing (gaps/splits). The covers and accessories are well-assembled and fitted. Trunkings, covers, and accessories are free of marks and damage. There is no movement or rolling of the trunkings when checking the fastening.	

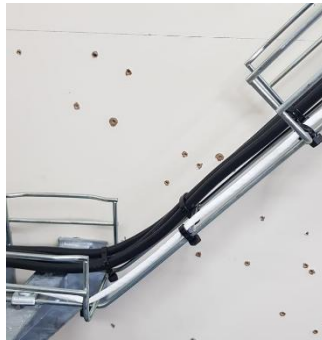
WSOS section as per TD	Score	Descriptor	Resource
	3	Excellent in comparison to industry standard: The joints are all clean (no burrs), very well cut and uniform (parallel), with all spacing adjusted (no gaps/splits). The covers and accessories are all well assembled and fitted. Trunkings, covers and accessories without any markings or damage. There is no movement or rolling of the trunkings when checking the fastening.	     

Aspect - D2 Installation of Wireways Mesh Tray

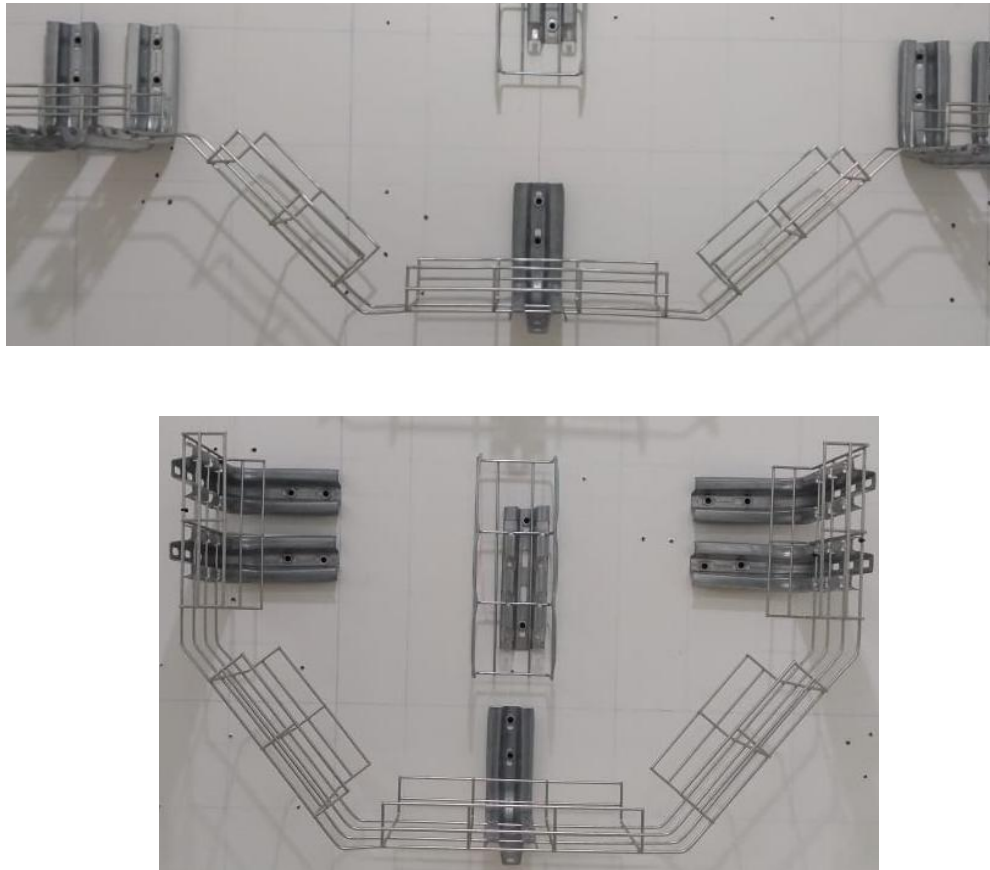
Mesh Tray.

Securely fitted. Bends are equally shaped. Secure with no roll or movement. Does not include any natural flexing of the mesh tray. **NOTE:** More sections removed on the mesh tray than required for fabrication/joint are used to assess excessive gaps.

WSOS section as per TD	Score	Descriptor	Resource
5	0	Below industry standard or no attempt: The edges are poorly cut, with excessive burrs or sharp points. Asymmetrical curves or excessive distortion. Poorly assembled or unused accessories. Mesh cable trays, supports or accessories with excessive damage. There is excessive movement or rolling of the mesh cable trays or supports when checking the fastening.	 

WSOS section as per TD	Score	Descriptor	Resource
	1	Meets industry standard: The edges are cut, without burrs or excessive sharp points. Curves and distortions are present. Accessories are mounted. Mesh cable trays, supports and accessories are free from excessive damage. There is no excessive movement or rolling of the mesh cable trays and supports when checking the fastening.	    

WSOS section as per TD	Score	Descriptor	Resource
	2	Industry standard with elements of good practice: The edges are neatly cut, without burrs or sharp points. Curves are symmetrical and without distortion. Accessories are properly mounted. Mesh cable trays, supports, and accessories are undamaged. There is no movement or rolling of the mesh cable trays and supports when checking the fastening.	 

WSOS section as per TD	Score	Descriptor	Resource
	3	Excellent in comparison to industry standard: The edges are all very well cut, all without burrs or sharp points. All curves are symmetrical and without any distortion. Accessories are all well mounted. Mesh cable trays, supports and accessories without any damage. There is no movement or rolling of the mesh cable trays and supports when checking the fastening.	

Aspect – D2 Installation of Wireways, Metal Tray

Metal Tray. Securely fitted. The joints and angles are neat with no gaps. Secure with no roll. Does not include any natural flexing of the Metal Tray.

WSOS section as per TD	Score	Descriptor	Resource
5	0	Below industry standard or no attempt: The edges are poorly cut, with excessive burrs or sharp points. The joints have excessive spacing (gaps/splits). Accessories are poorly assembled or not used. Perforated cable trays, supports, or accessories have excessive markings or damage. There is excessive movement or rolling of the perforated cable trays or supports when checking the fastening.	

WSOS section as per TD	Score	Descriptor	Resource
	1	Meets industry standard: The edges are cut, without burrs or excessive sharp points. The joints have minimal spacing (gaps/splits). Accessories are installed. Perforated cable trays, supports, and accessories are free of markings and excessive damage. There is no excessive movement or rolling of the perforated cable trays and supports when checking the fastening.	  

WSOS section as per TD	Score	Descriptor	Resource
	2	Industry standard with elements of good practice: The edges are neatly cut, without burrs or sharp points. The joints are mostly uniform (parallel), with only a few small spacings (gaps/splits). Accessories are properly installed. Perforated cable trays, supports, and accessories are free of marks and damage. There is no movement or rolling of the perforated cable trays and supports when checking the fastening.	

WSOS section as per TD	Score	Descriptor	Resource
	3	Excellent in comparison to industry standard: The edges are all very well cut, all without burrs or sharp points. The joints are all uniform (parallel), with all spacing adjusted (no gaps/splits). Accessories are all well mounted. Perforated cable trays, supports and accessories without any marking or damage. There is no movement or rolling of the perforated cable trays and supports when checking the fastening.	

Aspect – D-3 - Installation of Wireways, Metal Conduit

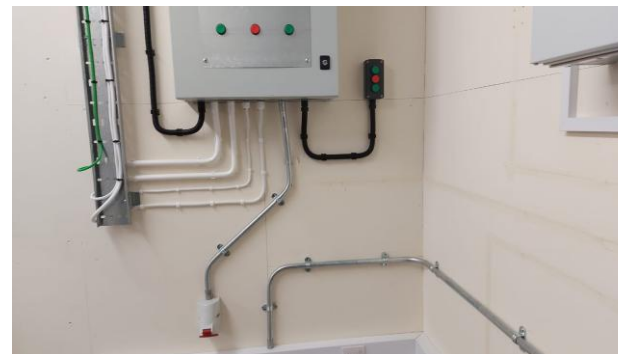
Metal Conduit. Sets, Jump overs, bends: even straight with no distortions.

WSOS section as per TD	Score	Descriptor	Resource
5	0	Below industry standard or no attempt: The visible edges are poorly cut, with excessive burrs or sharp points. Clamps are fixed with excessively disproportionate spacing or are not used. Curves, radii, and deviations are asymmetrical or excessively distorted. Accessories are poorly assembled or not used. Metal conduits, clamps, or accessories have excessive markings or damage. There is excessive movement of the metal conduits, accessories, or clamps when checking the fastening.	

1

Meets industry standard:

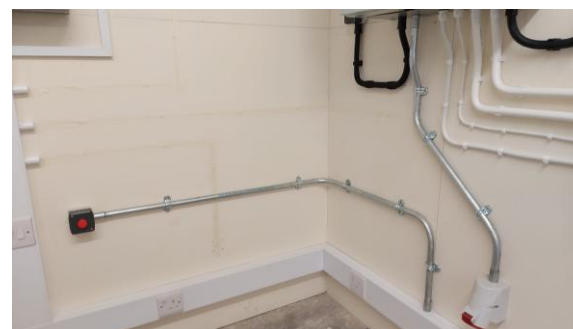
The visible edges are cut, without burrs or excessive sharp points. Clamps are secured without excessive disproportionate spacing. Curves, radii, and deviations have slight distortions. Accessories are mounted. Metal conduits, clamps, and accessories are free of markings and excessive damage. There is no excessive movement of the metal conduits, accessories, and clamps when checking the fastening.



2

Industry standard with elements of good practice:

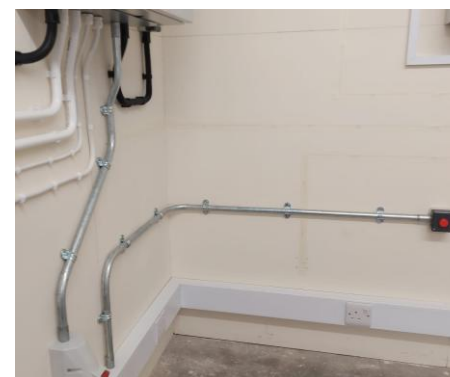
The visible edges are neatly cut, without burrs or sharp points. Clamps are secured with proportional spacing. Curves, radii, and deviations are symmetrical and without distortion. Accessories are properly assembled. Metal conduits, clamps, and accessories are free of markings and damage. There is no movement of the metal conduits, accessories, and clamps when checking the fastening.



3

Excellent in comparison to industry standard:

The visible edges are all very well cut, all without burrs or sharp points. Clamps are all fixed with proportional spacing. All curves, radii, and deviations are symmetrical and without any distortion. Accessories are all well assembled. Metal conduits, clamps, and accessories are free of any markings or damage. There is no movement of the metal conduits, accessories, and clamps when checking the fastening.



Aspect – D-3 – Installation of Wireways, PVC Conduit

PVC Conduit. Sets, Jump overs, bends: even straight with no distortions.

WSOS section as per TD	Score	Descriptor	Resource
	0	Below industry standard or no attempt: The visible edges are poorly cut, with excessive burrs. Clamps are fixed with excessively disproportionate spacing or are not used. Curves, radii, and deviations are asymmetrical or excessively distorted. Accessories are poorly assembled or not used. PVC conduits, clamps, or accessories have excessive markings or damage. There is excessive movement of the PVC conduits, accessories, or clamps when checking the fastening.	

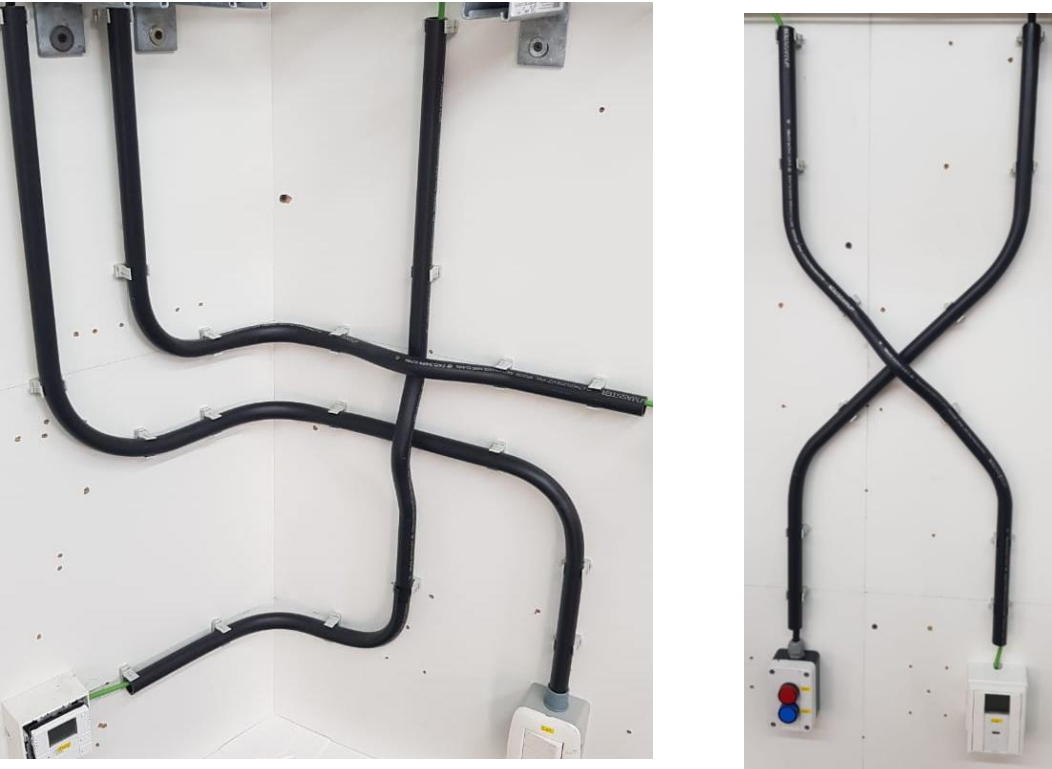
1

Meets industry standard:

The visible edges are cut without excessive burrs. Clamps are fixed without excessive disproportionate spacing. Curves, radii, and deviations have slight distortions. Accessories are mounted. PVC conduits, clamps, and accessories are free of markings and excessive damage. There is no excessive movement of the PVC conduits, accessories, and clamps when checking the fastening.



WSOS section as per TD	Score	Descriptor	Resource
	2	Industry standard with elements of good practice: The visible edges are neatly cut without burrs. Clamps are secured with proportional spacing. Curves, radii, and deviations are symmetrical and without distortion. Accessories are properly assembled. PVC conduits, clamps, and accessories are free of marks and damage. There is no movement of the PVC conduits, accessories, and clamps when checking the fastening.	

WSOS section as per TD	Score	Descriptor	Resource
	3	Excellent in comparison to industry standard: The visible edges are all very well cut and free of burrs. Clamps are all fixed with proportional spacing. All curves, radii, and deviations are symmetrical and without any distortion. All accessories are well assembled. PVC conduits, clamps, and accessories are free of any markings or damage. There is no movement of the PVC conduits, accessories, and clamps when checking the fastening.	

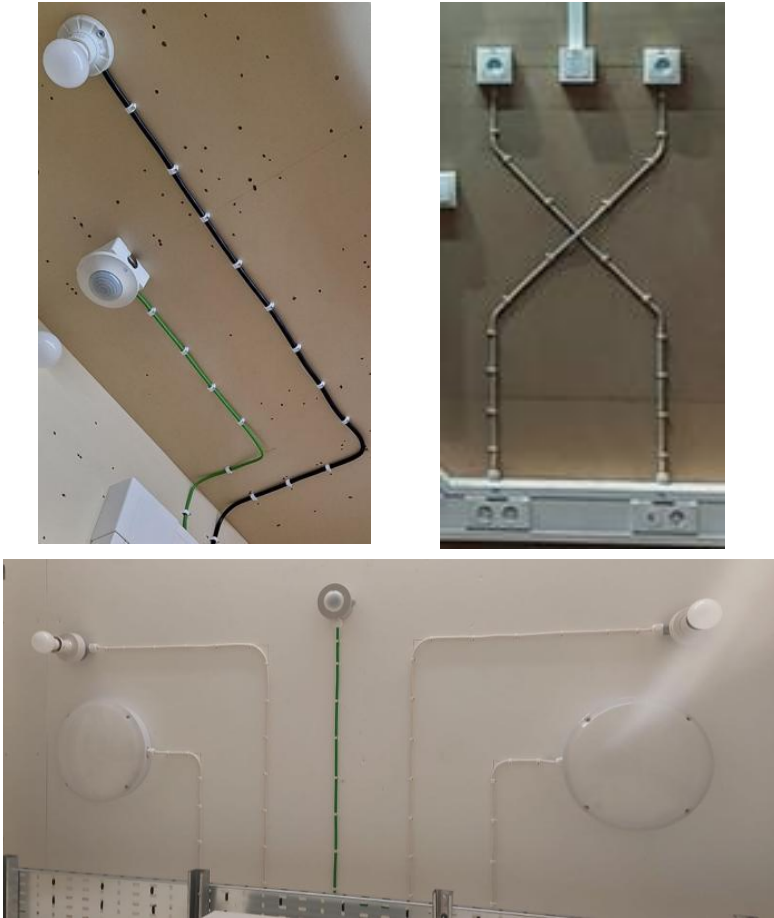
Aspect – D3 Installation of Wireways, Cable Clipping

Cable Clipping. Correctly clipped with straight runs and even bends.

WSOS section as per TD	Score	Descriptor	Resource
	0	Below industry standard or no attempt: Clamps are installed with excessively disproportionate spacing. Curves, radii, and deviations are asymmetrical or excessively distorted. Cables are excessively misaligned. Cables are excessively damaged. There is excessive movement of the cables or clamps when checking the fastening.	

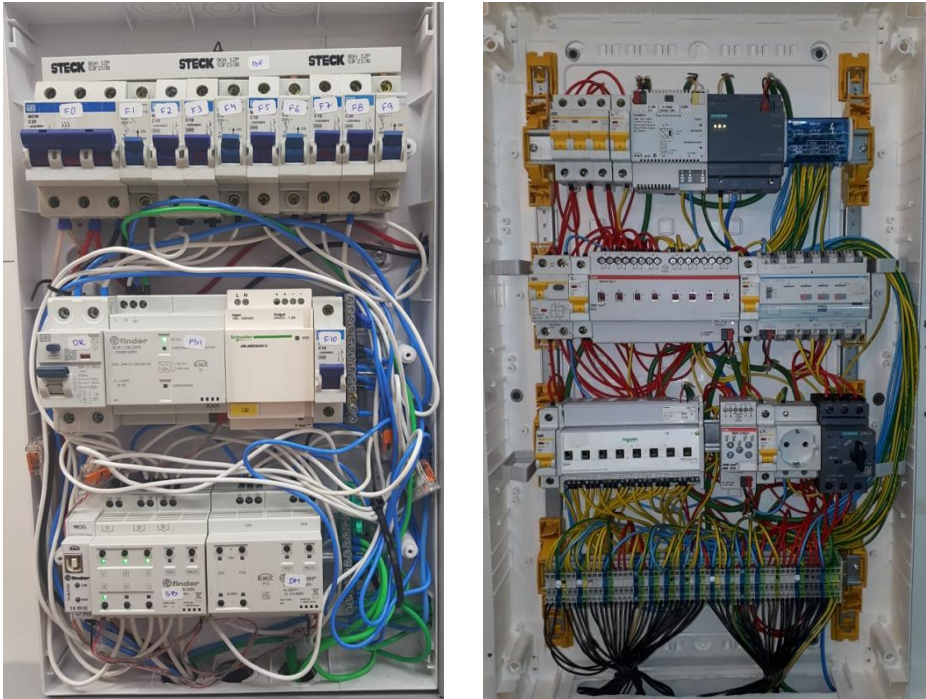
WSOS section as per TD	Score	Descriptor	Resource
	1	Meets industry standard: Clamps secured without excessive disproportionate spacing. Curves, radii, and deviations with slight distortions. Cables are aligned. Cables without excessive damage. There is no excessive movement of cables and clamps when checking the fastening.	

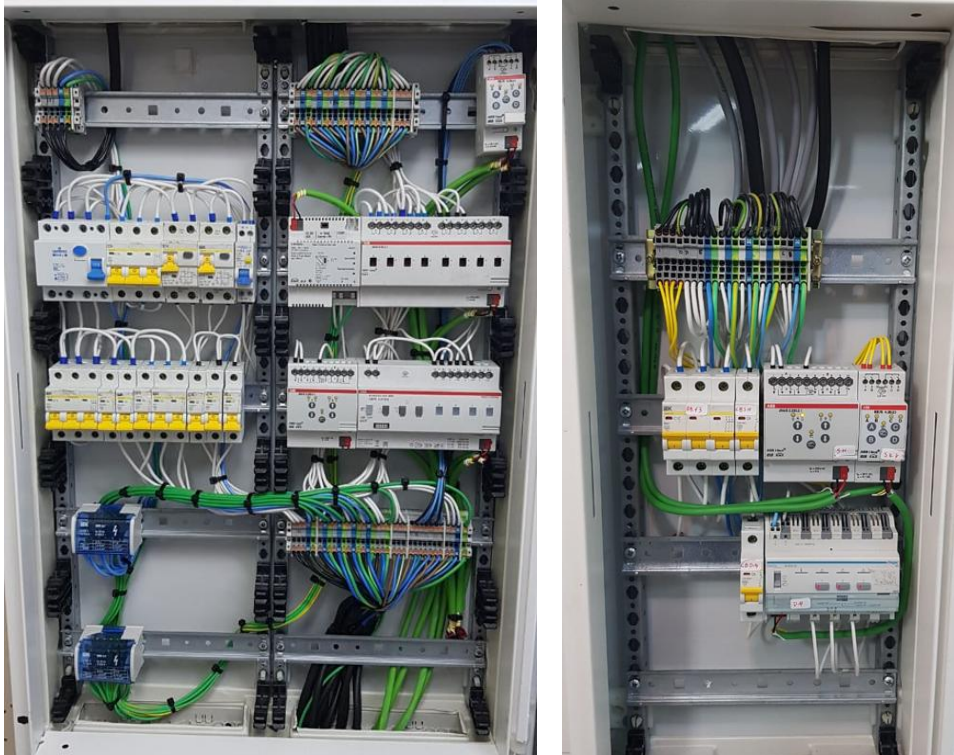
WSOS section as per TD	Score	Descriptor	Resource
	2	Industry-standard with elements of good practice: Clamps secured with proportional spacing. Curves, radii, and deviations are symmetrical and without distortion. Cables are mostly well aligned. Cables are undamaged. There is no movement of the cables and clamps when checking the fastening.	 

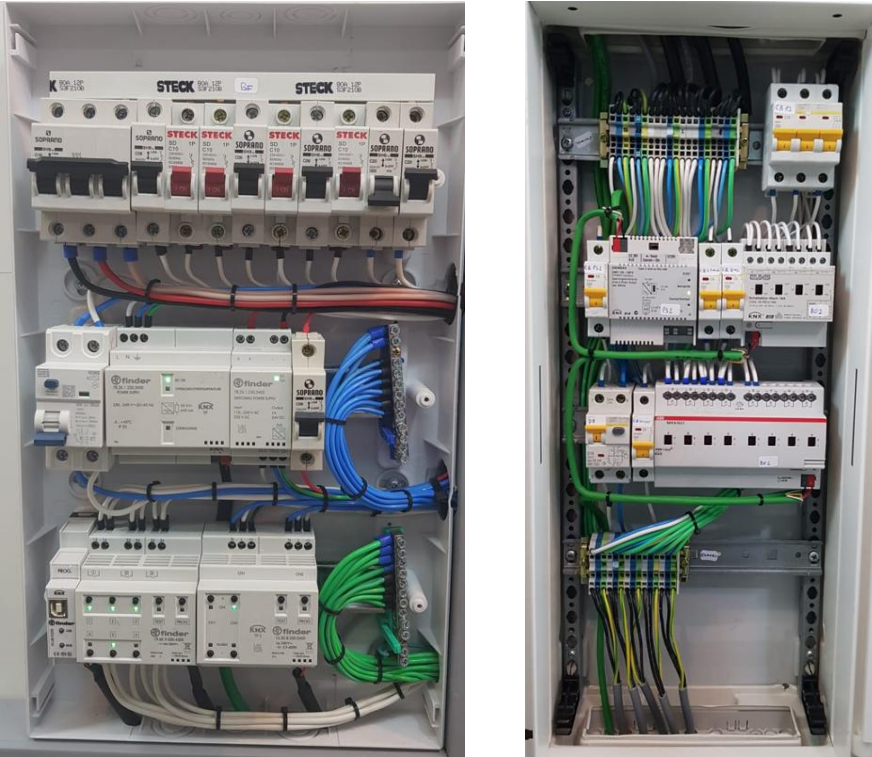
WSOS section as per TD	Score	Descriptor	Resource
	3	Excellent in comparison to industry standard: All clips are securely fastened with proportional spacing. Curves, radii, and deviations are symmetrical and without any distortion. All cables are very well aligned. Cables are undamaged. There is no movement of the cables or clips when checking the fastening.	

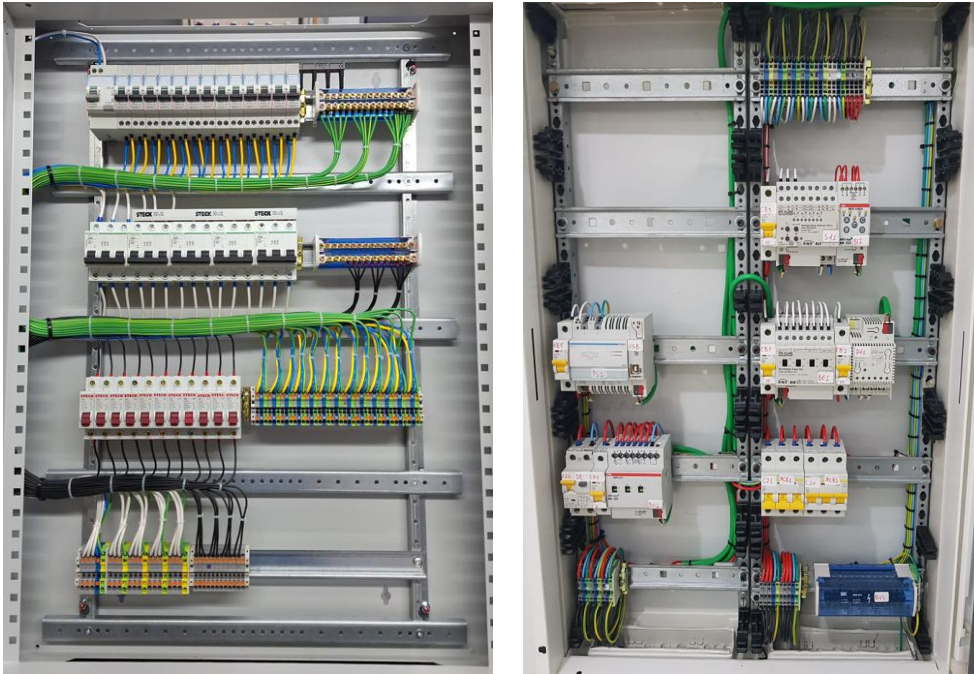
Aspect – E1 – Wiring on Boards, KNX board

Neatness of wiring **NOTE:** Straight and vertical refers to coming out of a suitable slot in the slotted trunking, or suitable place in the cable loom

WSOS section as per TD	Score	Descriptor	Resource
E1	0	Below industry standard or no attempt: Cables not loomed or loomed but untidy. Cabling with lots of crossover. The majority of cabling is not straight and vertical into switchgear.	

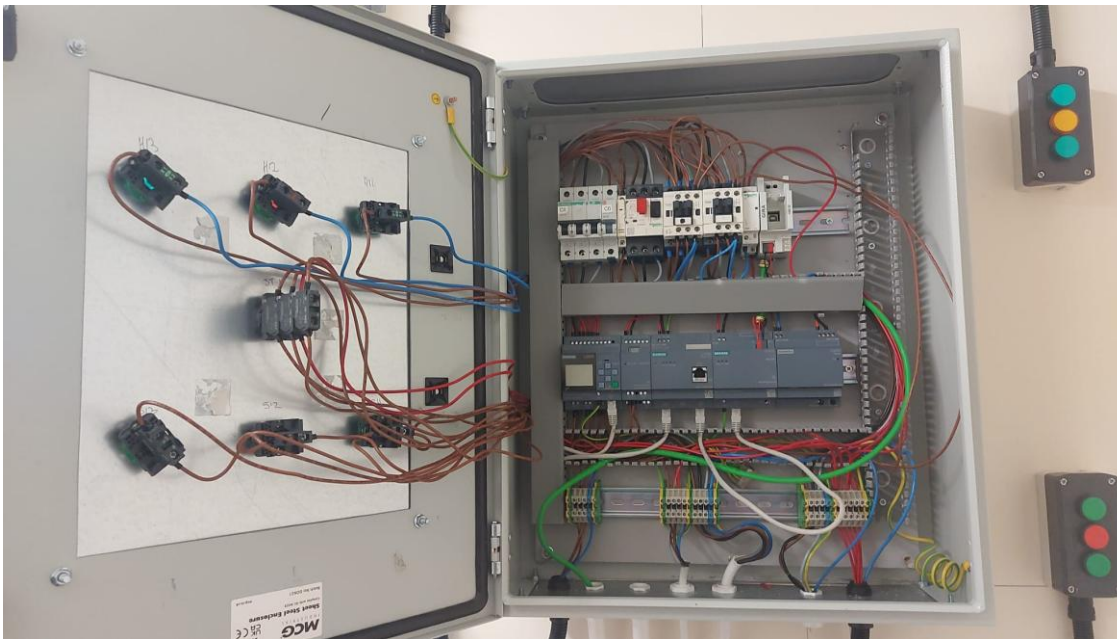
WSOS section as per TD	Score	Descriptor	Resource
	1	Meets industry standard: All looms are neat and tidy but with some cabling crossover. Some cabling is straight and vertical into switchgear.	

WSOS section as per TD	Score	Descriptor	Resource
	2	Industry standard with elements of good practice: All looms are neat with very few cabling crossovers. The majority of cabling is straight and vertical into switchgear.	

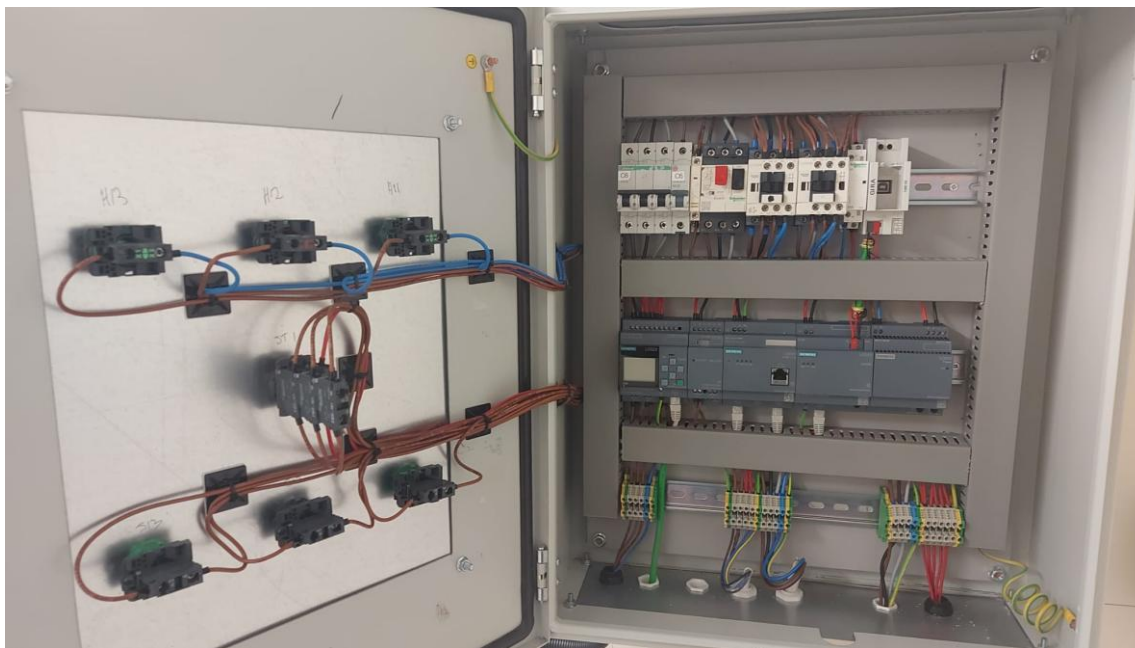
WSOS section as per TD	Score	Descriptor	Resource
	3	Excellent in comparison to industry standards: All looms with no cabling crossovers. All cabling is straight and vertically into the switchgear.	

Aspect – Wiring on boards, control cabinet

Neatness of wiring NOTE: Straight and vertical refers to coming out of a suitable slot in the slotted trunking or a suitable place in the cable loom.

WSOS section as per TD	Score	Descriptor	Resource
	0	Below standard or no attempt: All cables not loomed or loomed but untidy. Conductors are misaligned, twisted, or have excessive crossing. Conductors are not vertical at most device connections or entrances of PVC slotted trunkings.	

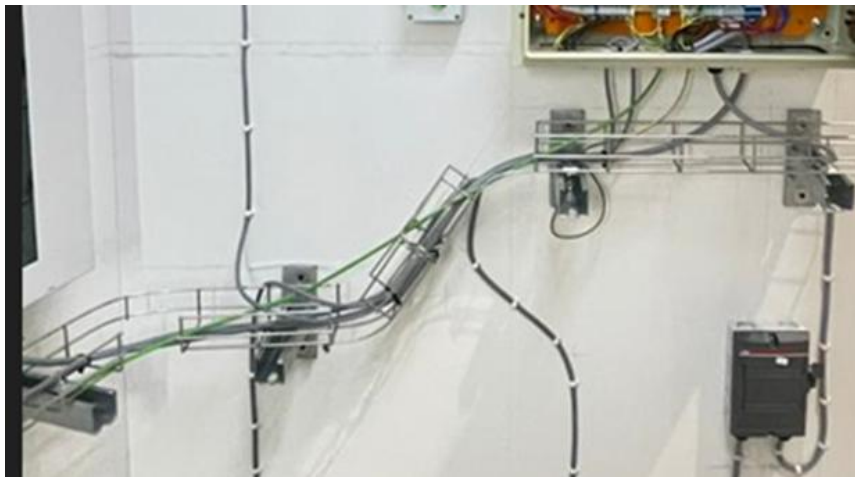
WSOS section as per TD	Score	Descriptor	Resource
	1	Meets industry Standard: The cabling is not straight and vertical into the switchgear. Conductors are aligned, with slight twists or crossings. Conductors are vertical at most device connections and entrances of PVC slotted trunkings.	

WSOS section as per TD	Score	Descriptor	Resource
	2	Industry standard with elements of good practice: The cabling is not straight and vertical into the switchgear. Conductors are well aligned, mostly without twisting or crossing. Conductors are vertical in the vast majority of device connections and entrances of PVC slotted trunkings.	

WSOS section as per TD	Score	Descriptor	Resource
	3	Excellent in comparison to industry standard: All looms with no cabling crossovers. All cabling is straight and vertical into the switchgear. All conductors are very well aligned, without any twisting or crossing. All conductors are vertical at the device connections and entrances of PVC slotted trunkings.	

Aspect – E-2 - Cabling on Tray or Mesh Tray

Neatness of cables on Tray. Note segregation of Data cable

WSOS section as per TD	Score	Descriptor	Resource
	0	Below industry standard or no attempt: Cable ties secured with excessively disproportionate spacing. Asymmetrical or excessively distorted curves and radii. Cables are misaligned, twisted, or crossed excessively. Cables are excessively damaged. There is excessive cable movement when checking the fastening. Data/network and energy/power cables are bundled together (same wiring loom).	

WSOS section as per TD	Score	Descriptor	Resource
	1	Meets industry standard: Cable ties secured without excessive disproportionate spacing. Curves and radii with slight distortions. Cables are aligned, with slight twisting or crossing. Cables without excessive damage. There is no excessive movement of the cables when checking the fastening. Data/network and energy/power cables are separated for most of the run (different wiring looms).	

WSOS section as per TD	Score	Descriptor	Resource
	2	Industry standard with elements of good practice: Cable ties secured with proportional spacing. Symmetrical curves and radius without distortion. Cables are well aligned, mostly without twisting or crossing. Cables are undamaged. There is no movement of the cables when checking the fastening. Data/network and energy/power cables are separated for most of the route (different wiring looms).	

WSOS section as per TD	Score	Descriptor	Resource
	3	Excellent in comparison to industry standard: All cable ties straps are properly secured with proportional spacing. Curves and radii are symmetrical and without any distortion. All cables are very well aligned, without any twisting or crossing. Cables are undamaged. There is no movement of the cables when checking the fastening. Data/network and energy/power cables are separated throughout the entire route (different wiring looms).	