



*Standards and  
Assessment Guide*

**Optoelectronic  
Technology**

# 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 60 – Optoelectronic Technology

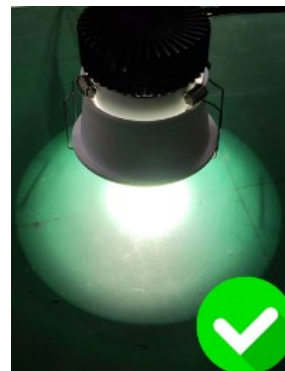
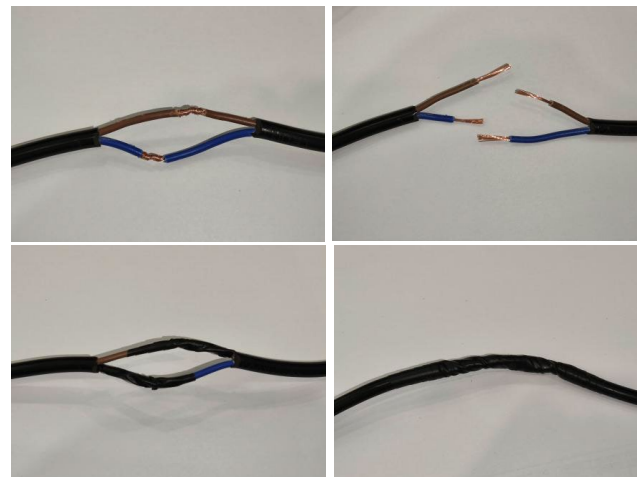
## Measurement

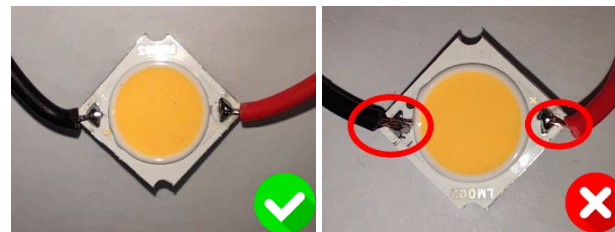
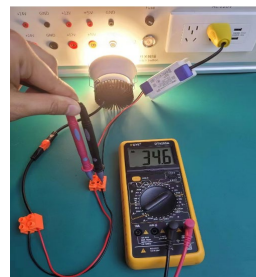
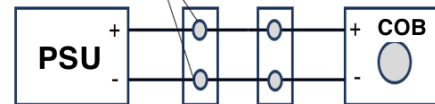
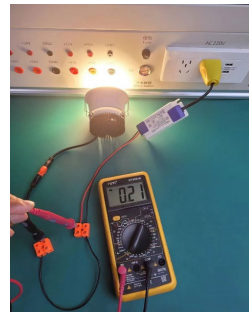
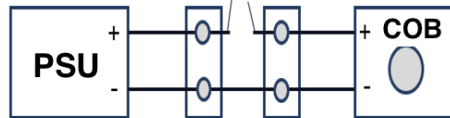
Measurement is used to assess accuracy, precision, and other performance that can be measured objectively. It is used where ambiguity must be avoided.

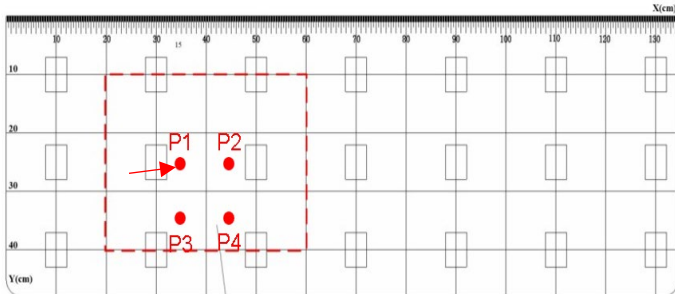
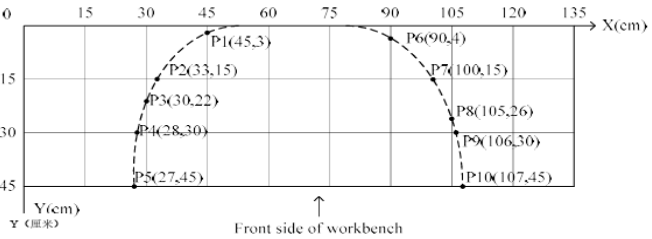
The total marks allocated to measurement marking may vary from competition to competition depending on the Test Project.

| Aspect           | WSOS section as per TD | Descriptor                                                                                                                                                                                                                                                                                                                      | Resource                                                                             |
|------------------|------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|
| Operation safety | 1                      | <ul style="list-style-type: none"> <li>An ESD wrist strap shall be worn correctly when handling electrical components or PCBs.</li> <li>Safety goggles shall be worn when soldering or when working with UV light.</li> <li>Non-compliance observed by at least two (2) Experts results in 0 for the relevant check.</li> </ul> |  |

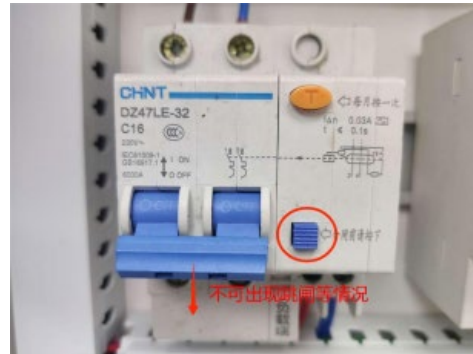
| Aspect               | WSOS section as per TD | Descriptor                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Resource                                                                             |
|----------------------|------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|
| Workplace management | 1                      | At the end of each module, all excessive consumables, equipment, and tools in the work area must be restored to their original position. All waste or garbage must be put in the trash can. It is suggested the cleanliness should be assessed and confirmed by at least two (2) Experts.                                                                                                                                                                         |   |
| Power                | 4                      | All parts of the luminaire shall be fully assembled. After power-on, all required light-emitting parts shall illuminate successfully and remain stable for at least 60 seconds (for marking purpose), with no visible flicker or intermittent failure. Under the prescribed test condition, the emitted spot shall match the required general shape and show no obvious dark area, distortion, or irregular edge when compared with the approved reference image. |  |

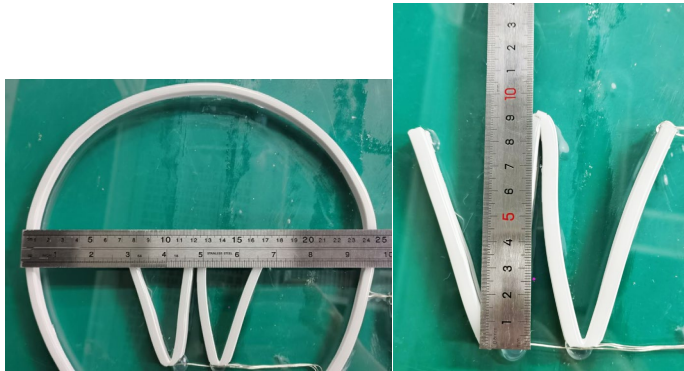
| Aspect                      | WSOS section as per TD | Descriptor                                                                                                                                                                                                       | Resource                                                                             |
|-----------------------------|------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|
| Beam/Spot quality           | 4                      | Under the prescribed test condition, the emitted spot shall match the required general shape and show no obvious distortion, dark sector, or irregular boundary when compared with the approved reference image. |   |
| Luminaire assembly - wiring | 4                      | Complete the wire connection by electrical tape, and the power cord meeting the tensile requirements.                                                                                                            |  |

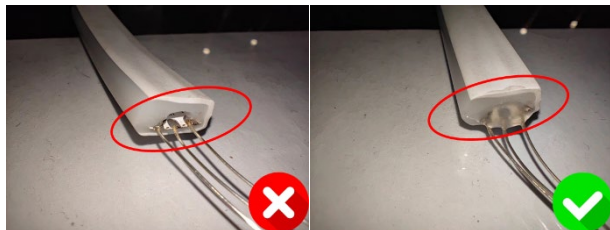
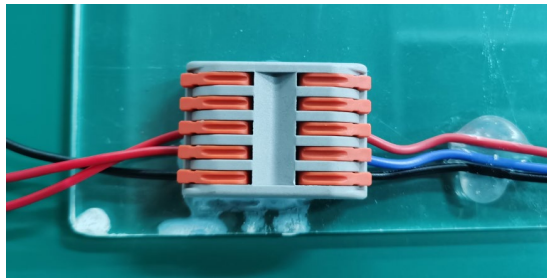
| Aspect                                 | WSOS section as per TD | Descriptor                                                                                                                                                                                                                     | Resource                                                                                                                                                                                                     |
|----------------------------------------|------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Luminaire assembly - electrical safety | 4                      | Meeting the electrical safety requirements, soldering tin wrapped around the wire core, no copper and no wire core exposed, power cord does not knot.                                                                          |                                                                                                                           |
| Voltage                                | 1                      | After the light source is powered on, the voltage value measured should be within $\pm 0.1$ margin of error comparing to the value measured by Experts (ME = Expert Measured Value - Competitor measured Value = $\pm 0.1$ V). |  <p><b>Voltage Measurement</b></p>     |
| Current                                | 1                      | After the light source is powered on, the current value measured should be within $\pm 0.1$ margin of error comparing to the value measured by Experts (ME = Expert Measured Value - Competitor measured Value = $\pm 0.1$ A). |  <p><b>Current Measurement</b></p>  |

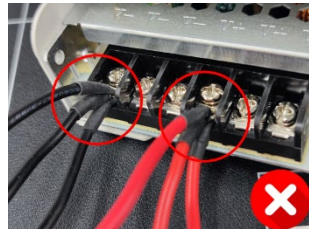
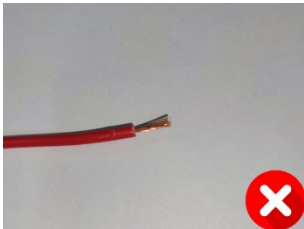
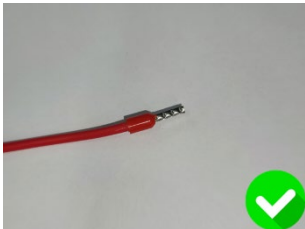
| Aspect                                  | WSOS section as per TD | Descriptor                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Resource                                                                              |
|-----------------------------------------|------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|
| Surface Illuminance                     | 1                      | At any assigned location of the work surface, the illuminance measured should be within $\pm 10\%$ margin of error (excluding 10%) comparing to the value measured by Experts (ME = [(illuminance measured by Experts - illumination measured by contestant)/illuminance value measured by Expert] * 100%).                                                                                                                                                         |    |
| Average illuminance calculation steps   | 3                      | To receive the mark, the answer sheet shall show: <ol style="list-style-type: none"> <li>1. The measured illuminance values used in the calculation;</li> <li>2. The correct TP-specified formula;</li> <li>3. Correct substitution of the values into the formula;</li> <li>4. The correct number of points used in the calculation;</li> <li>5. The calculation process leading to the result; and</li> <li>6. The final answer with the correct unit.</li> </ol> |                                                                                       |
| Average illuminance calculation results | 3                      | On answer sheet, the calculation results of average illuminance should be within $\pm 10\%$ margin of error comparing to the value calculated by Experts (based on the calculation methods suggested in TP).                                                                                                                                                                                                                                                        |  |

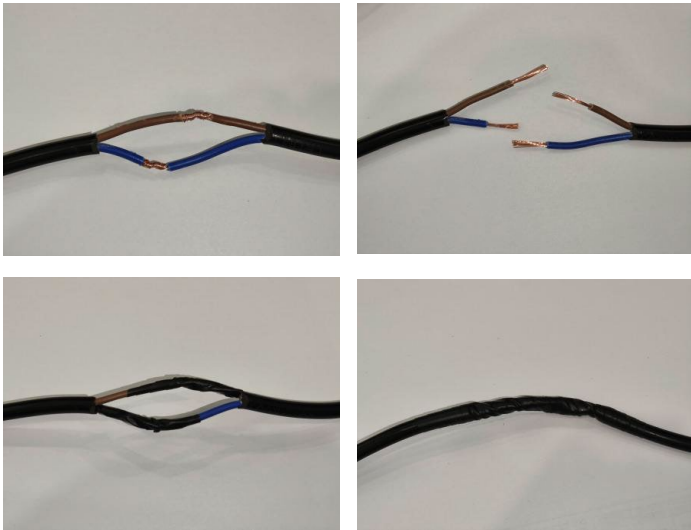
| Aspect                                       | WSOS section as per TD | Descriptor                                                                                                                                                                                                                                | Resource                                                                                                     |
|----------------------------------------------|------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------|
| Iso-luminance curve drawing                  | 1                      | The iso-illuminance curve shall be correctly drawn according to the TP requirements. Equal-value points shall be connected logically, the curve direction shall be correctly indicated, and all required labels/arrows shall be complete. |                                                                                                              |
| Safety installation of smart lighting system | 4                      | Before powering up the system, all peripheral installation and connection has been completed, all circuit protection covers are in place, and there are no exposed wires. State should be visually confirmed by at least two (2) Experts. |                           |
| Safety: short circuit                        | 4                      | Before powering the system, a multimeter should be used to measure whether there is a short circuit present. The test should be checked and confirmed by at least two (2) Experts.                                                        |  <p>No circuit short</p> |

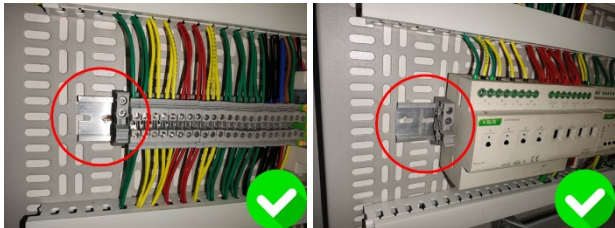
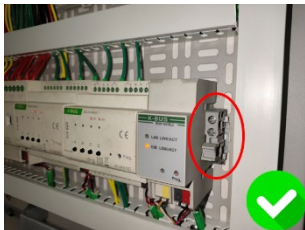
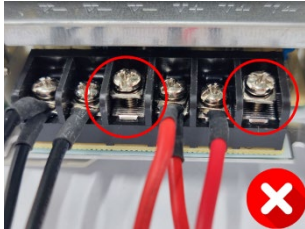
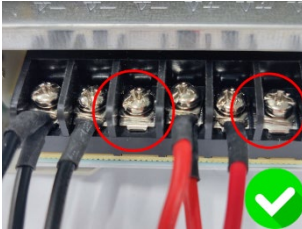
| Aspect               | WSOS section as per TD | Descriptor                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Resource                                                                                                                                  |
|----------------------|------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------|
| Safety: grounding    | 4                      | Before powering the system, a multi-meter should be used to measure the grounding condition of the circuit and enclosure. The test should be checked and confirmed by at least two (2) Experts.                                                                                                                                                                                                                                                                              |  <p>Frame and Distribution Box with good grounding</p> |
| System power-on test | 4                      | After first system power-up, the circuit should have no short circuits or ground faults and no switch tripping. After the first power-up test, the circuit breakers are closed sequentially, and there are no short circuits, ground faults, or trips. If a trip or any short circuit or ground fault occurs, the power-on fault test be marked as 0 points after confirmation by at least two (2) Experts. One extra test may be granted if the first power-on test failed. |  <p>Breaker shouldn't be tripped during test</p>      |

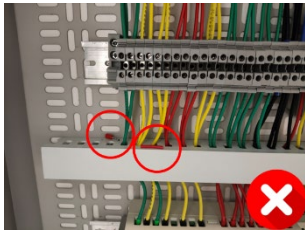
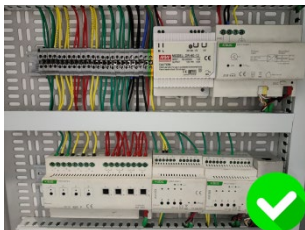
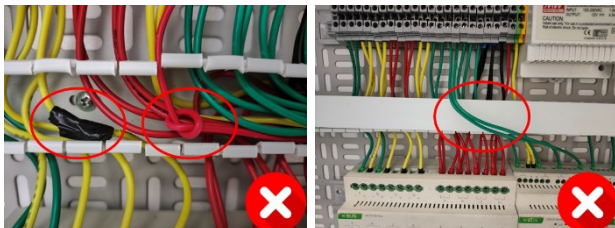
| Aspect                     | WSOS section as per TD | Descriptor                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Resource                                                                                                                  |
|----------------------------|------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------|
| Operation safety           | 1,4                    | During configuration, commissioning, testing, and fault-checking, the Competitor shall not carry out wiring changes or other unsafe operations on an energized circuit unless explicitly required by the TP. Unsafe actions include working on exposed live conductors, rewiring before power isolation, energizing the system while protective covers are missing, or using the multimeter in an unsafe manner. If any such unsafe action is directly confirmed by at least two (2) Experts, the aspect scores 0. | <br>Can't operate when circuit is live |
| Manufacturing of LED strip | 4                      | When comparing against the TP illustration, the measured finishing LED Strip product's length and width error does not exceed $\pm 0.5\text{cm}$ (excluding 0.5cm).                                                                                                                                                                                                                                                                                                                                                |                                       |

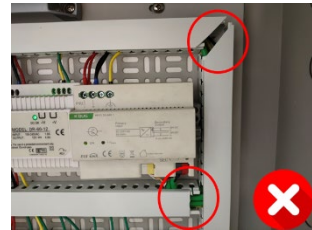
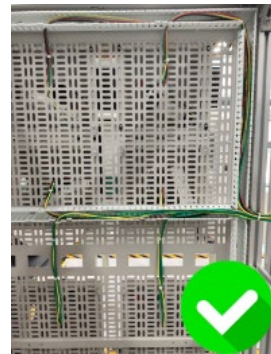
| Aspect                           | WSOS section as per TD | Descriptor                                                                                                                                      | Resource                                                                              |
|----------------------------------|------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|
| LED strip wiring                 | 4                      | The core of LED strips are not exposed.                                                                                                         |    |
| LED strip waterproofing          | 4                      | Both ends of the strip should be waterproof with UV glue, and there is no exposure in the internal components or soldering points of the strip. |   |
| Wiring of LED strip power supply | 4                      | The power wire is correctly wired through the quick-connect terminals.                                                                          |  |

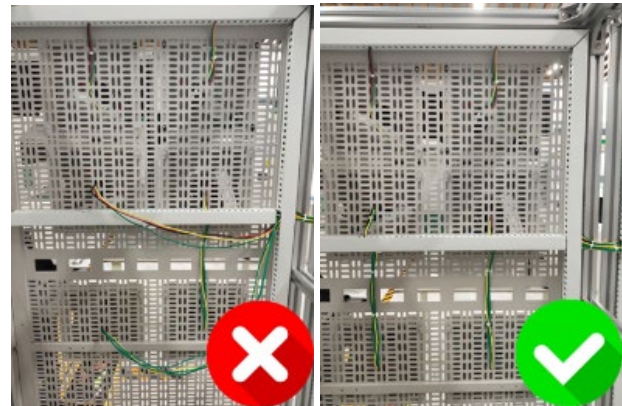
| Aspect                          | WSOS section as per TD | Descriptor                                                                                                                                                                                           | Resource                                                                                                                                                                  |
|---------------------------------|------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Installation of DC5V power cord | 4                      | The same terminal cannot be connected to more than two (2) terminals.                                                                                                                                |                                                                                        |
| Wiring installation             | 2                      | Wire specification colour selection is correct, L is for brown wire, N is for blue wire, DC positive for red wire, DC negative electrode for black wire, PE for yellow and green double colour wire. |                                                                                                                                                                           |
| Wiring installation             | 2                      | Cold pressure pin (terminals) must be installed on wire core.                                                                                                                                        |   |

| Aspect              | WSOS section as per TD | Descriptor                                                                                              | Resource                                                                            |
|---------------------|------------------------|---------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Wiring installation | 3                      | Wire connection with electrical tape wrapped, and the connection points should avoid the same position. |  |

| Aspect                                          | WSOS section as per TD | Descriptor                                                                                                                                                | Resource                                                                                                                                                                  |
|-------------------------------------------------|------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Layout and installation of the electrical panel | 2                      | The components are firmly installed on the guide rail in the correct way, and the plug is installed. No obvious loosening on the equipment or components. |     |
| Layout and installation of the electrical panel | 3                      | Unconnected wiring port screw lock.                                                                                                                       |   |

| Aspect                                          | WSOS section as per TD | Descriptor                                                                           | Resource                                                                             |
|-------------------------------------------------|------------------------|--------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|
| Layout and installation of the electrical panel | 4                      | No discarded residue in the box.                                                     |   |
| Wiring connection in electrical panel           | 4                      | The equipment component wiring is arranged neatly, horizontal and vertical.          |   |
| Wiring installation in cable trunks             | 4                      | Wires should go inside the cable trunks as possible, no knot, no intermediate joint. |  |

| Aspect                                        | WSOS section as per TD | Descriptor                                                                                                             | Resource                                                                             |
|-----------------------------------------------|------------------------|------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|
| Installation of the cable trunks              | 4                      | Excluding for wire in/out hole, Cable trunks should be enclosed without open holes.                                    |   |
| Installation of the cable trunks              | 4                      | Trunk cover tightly closed.                                                                                            |   |
| Wire installation outside of the cable trunks | 4                      | Wiring should be clean and clear, horizontal and vertical, easy to maintain, no loose and no knot, fixed with ribbons. |  |

| Aspect                                               | WSOS section as per TD | Descriptor                                                                                                                                                | Resource                                                                            |
|------------------------------------------------------|------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Installation of the outside wires of the control box | 4                      | Wire in the engineering wall wiring with wire groove protection, the places without groove protection are fixed with wire buckle or bundled with ribbons. |  |

## 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.

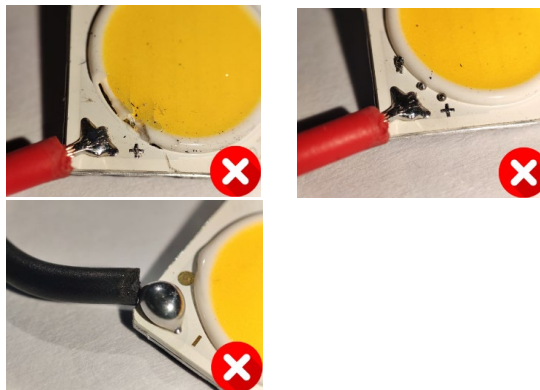
### Generic rules:

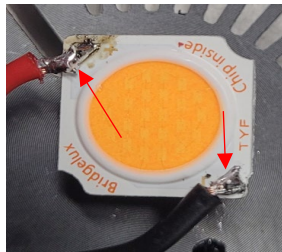
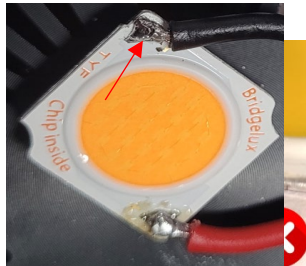
The assessment group comprises three Experts plus one Expert who acts as the supervisor. The supervising Expert will replace an Expert in the marking group to prevent compatriot marking.

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.

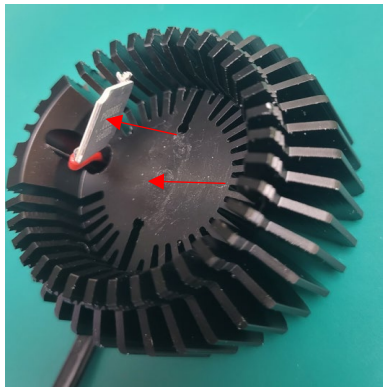
The total marks allocated to judgement marking may vary from competition to competition depending on the Test Project.

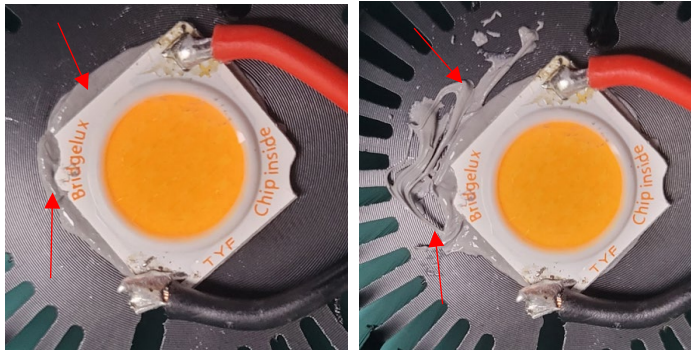
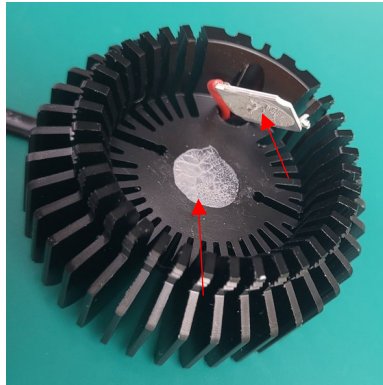
### Aspect – Luminaire manufacturing, soldering quality

| WSOS section as per TD | Score | Descriptor                                                                                                                                                                                                                                                                                                                                                                                                   | Resource                                                                             |
|------------------------|-------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|
| 4                      | 0     | <ul style="list-style-type: none"> <li>Key components soldering is not visible all the way around the luminaire.</li> <li>And/or visible major misalignment between the soldering component and PCB</li> <li>And/or excessive solder is visible, including solder droplets, bridging, or obvious overflow.</li> <li>And/or PCB is visibly damaged</li> <li>And/or the solder caused short-circuit</li> </ul> |  |

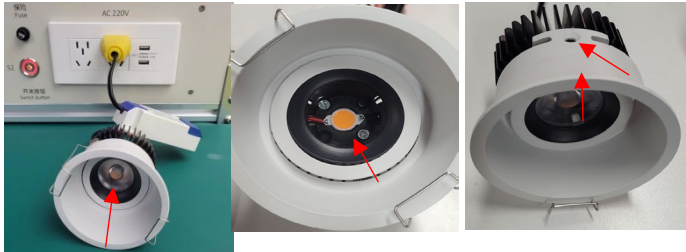
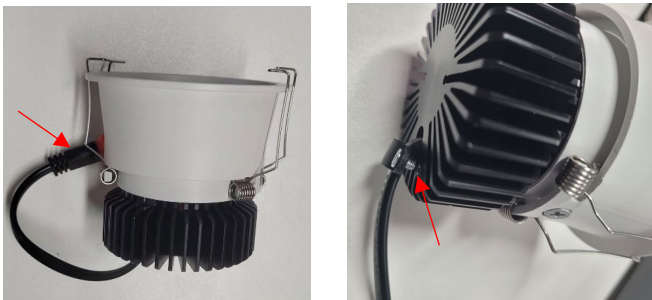
| WSOS section as per TD | Score | Descriptor                                                                                                                                                                                                                     | Resource                                                                             |
|------------------------|-------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|
|                        | 1     | <ul style="list-style-type: none"> <li>The solder joint is poorly formed, with weak surface shape or incomplete wetting</li> <li>And/or heat shrink tubing is not used</li> </ul>                                              |   |
|                        | 2     | <ul style="list-style-type: none"> <li>Meets the industry standard and exceeds it in some respects – slightly misalignment of the soldering or no obvious solder overuse.</li> </ul>                                           |   |
|                        | 3     | <ul style="list-style-type: none"> <li>Is excellent relative to and exceeds the industry standard – ideal amount of solder applied, with no sign of damage or fading on PCB, and heat shrink tubing used correctly.</li> </ul> |  |

## Aspect – Luminaire manufacturing, thermal paste/silicone pad application quality

| WSOS section<br>as per TD | Score | Descriptor                                                                                                                                                                                                                                        | Resource                                                                             |
|---------------------------|-------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|
| 3                         | 0     | <ul style="list-style-type: none"> <li>Thermal paste/silicone is not applied</li> <li>Surface of the lamp bead is stained</li> <li>A severely excessive amount of thermal paste is applied, causing obvious overflow or contamination.</li> </ul> |   |
|                           | 1     | <ul style="list-style-type: none"> <li>Amount of paste/silicone used is too small and the PCB aluminium plate is not completely covered.</li> </ul>                                                                                               |  |

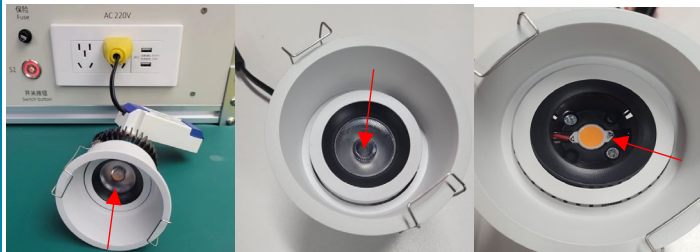
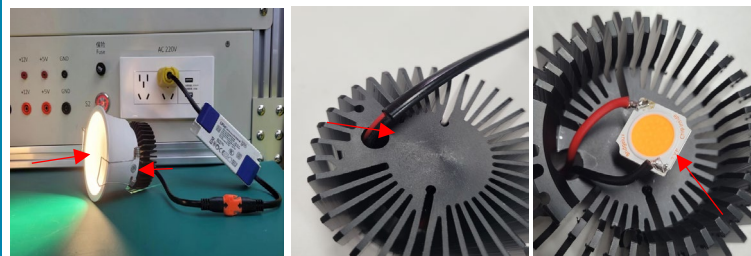
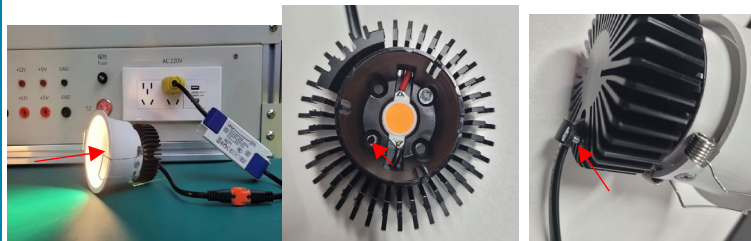
| WSOS section as per TD | Score | Descriptor                                                                                                                                                                                             | Resource                                                                             |
|------------------------|-------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|
|                        | 2     | <ul style="list-style-type: none"> <li>A sufficient amount of thermal paste/silicone pad is applied to achieve effective coverage</li> <li>Slightly excessive paste applied around the edge</li> </ul> |   |
|                        | 3     | <ul style="list-style-type: none"> <li>Appropriate amount of paste and silicone pad is applied</li> <li>Thermal paste is evenly spread</li> <li>Shows no visible overflow around the edges</li> </ul>  |  |

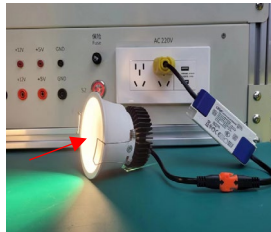
## Aspect – Luminaire manufacturing, lamp assemble quality

| WSOS section as per TD | Score | Descriptor                                                                                                                                                                                                                                  | Resource                                                                              |
|------------------------|-------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|
| 4                      | 0     | <ul style="list-style-type: none"> <li>The assemble of luminaire is not complete, including but not limited to light housing, driver board, power supply, or other accessories (O-ring, waterproof sealer, etc.).</li> </ul>                |    |
|                        | 1     | <ul style="list-style-type: none"> <li>The assemble is partially complete (internal and external), with some cosmetic parts missing (light housing, clips, etc.)</li> </ul>                                                                 |   |
|                        | 2     | <ul style="list-style-type: none"> <li>Meets the industry standard and exceeds it in some respects – the luminaire assemble is complete, with minor defects like light housing being loosen and missing screws or not tightened.</li> </ul> |  |

| WSOS section as per TD | Score | Descriptor                                                                                                                                                                          | Resource                                                                            |
|------------------------|-------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
|                        | 3     | <ul style="list-style-type: none"> <li>Is excellent relative to and exceeds the industry standard – the luminaire assembly is complete with no visible flaws or defects.</li> </ul> |  |

## Aspect – Interior lighting module, lamp overall assembly

| WSOS section as per TD | Score | Descriptor                                                                                                                                                                                                                                                                                                                                                                                                         | Resource                                                                              |
|------------------------|-------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|
| 6                      | 0     | <ul style="list-style-type: none"> <li>The installation of lighting module is not installed and/or incomplete</li> <li>And/or the module is not able to function lit up.</li> </ul>                                                                                                                                                                                                                                |    |
|                        | 1     | <ul style="list-style-type: none"> <li>The installation is incomplete, but part of the module is able to function and/or lit up.</li> <li>And/or the wiring is not attached.</li> <li>And/or the led strips are not fixed correctly on the back.</li> <li>And/or the light panel is not fixed correctly on the back.</li> </ul>                                                                                    |    |
|                        | 2     | <ul style="list-style-type: none"> <li>The installation is complete, and all parts of the module is functional and/or lit up correctly.</li> <li>And the wiring is fixed but not tightened</li> <li>And/or the power cabling are overlapping or tagged.</li> <li>And/or the led strips are fixed on the back but not tightened.</li> <li>And/or the light panel is fixed on the back but not tightened.</li> </ul> |  |

| WSOS section as per TD | Score | Descriptor                                                                                                                                                                                                                                                                                                                             | Resource                                                                                                                                                                                                                                                    |
|------------------------|-------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                        | 3     | <ul style="list-style-type: none"> <li>The installation is complete, and all parts of the module is functional and/or lit up correctly.</li> <li>And the power wiring are neatly fixed, routed, and tightened without overlapping.</li> <li>And the led strips and light panels are neatly fixed and tightened on the back.</li> </ul> |    |

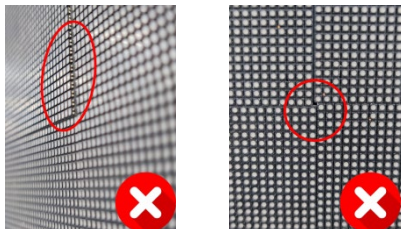
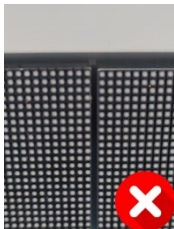
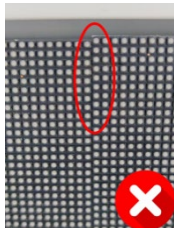
## Aspect – Interior lighting module, lamp installation and mounting

| WSOS section<br>as per TD | Score | Descriptor                                                                                                                                                                                                                                                                                    | Resource |
|---------------------------|-------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|
| 6                         | 0     | <ul style="list-style-type: none"> <li>The distance between the lamp mounted position and the specified position on TP is greater than 5cm (not including 5cm) or</li> <li>The mounted lamp is visibly loose or tilted</li> </ul>                                                             |          |
|                           | 1     | <ul style="list-style-type: none"> <li>The distance between the lamp mounted position and the specified position on TP is between 3-5cm (including 3cm and 5cm) or</li> <li>The mounted lamp is visibly slightly loose or tilted or</li> <li>Not all mounting screws are installed</li> </ul> |          |
|                           | 2     | <ul style="list-style-type: none"> <li>The distance between the lamp mounted position and the specified position on TP is between 1-3cm (including 1cm and 3cm) or</li> <li>The mounted lamp is not visibly tilted but slightly loose when pulling it</li> </ul>                              |          |
|                           | 3     | <ul style="list-style-type: none"> <li>The distance between the lamp mounted position and the specified position on TP is less than 1 (not including 1cm) or</li> <li>The mounted lamp is not tilted and loose when pulling it</li> </ul>                                                     |          |

## Aspect – Specialty lighting environment, design

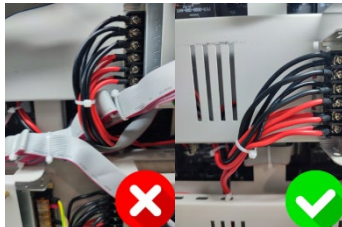
| WSOS section<br>as per TD | Score | Descriptor                                                                                                                                                                                                                                                                                                                                                | Resource |
|---------------------------|-------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|
| 6                         | 0     | <ul style="list-style-type: none"> <li>The lighting environment design is incomplete.</li> <li>None of the assigned tasks are satisfied.</li> </ul>                                                                                                                                                                                                       |          |
|                           | 1     | <ul style="list-style-type: none"> <li>The lighting environment design is partially complete.</li> <li>One (1) of the assigned tasks is complete (e.g. basic scene modelling).</li> </ul>                                                                                                                                                                 |          |
|                           | 2     | <ul style="list-style-type: none"> <li>The lighting environment design is mostly complete and meets the industry standard</li> <li>Two (2) of the major assigned tasks are complete with no errors (e.g. basic scene modelling, correct luminaries' selection).</li> </ul>                                                                                |          |
|                           | 3     | <ul style="list-style-type: none"> <li>Is excellent relative to and exceeds the industry standard – the entire lighting environment design project is complete with no potential issues.</li> <li>All assigned tasks are completed perfectly (e.g. basic scene modelling, correct luminaries' selections, correct calculation of illuminance).</li> </ul> |          |

## Aspect – LED display, installation quality

| WSOS section as per TD | Score | Descriptor                                                                                                                                         | Resource                                                                             |
|------------------------|-------|----------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|
| 4                      | 0     | Incomplete or clear gaps between unit boards, the panels are noticeably uneven, which affect normal display of the image.                          |   |
|                        | 1     | Below industry standard: gap between individual panels, the panels are noticeably uneven, which affect normal display of the image to some extent. |   |
|                        | 2     | Meets industry standard: invisible gap between panels, individual panels are uneven, which do not affect normal display of the image.              |  |

| WSOS section<br>as per TD | Score | Descriptor                                                                                                                             | Resource                                                                            |
|---------------------------|-------|----------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
|                           | 3     | Industry standard with elements of good practice: completely invisible gap between panels, all the panels are even, display perfectly. |  |

## Aspect – LED display wiring organization

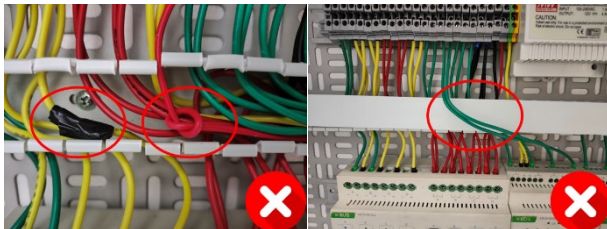
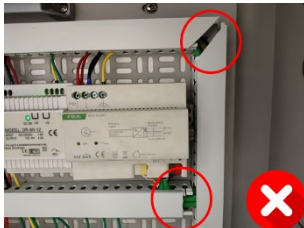
| WSOS section as per TD | Score | Descriptor                                                                                                                                                                                                                                                                         | Resource                                                                             |
|------------------------|-------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|
| 4                      | 0     | <ul style="list-style-type: none"> <li>No effective cable organization is shown behind the LED display.</li> <li>Power cables and signal/flex cables are mixed together without separation, and there are obvious tangles, crossovers, or unfinished routing.</li> </ul>           |   |
|                        | 1     | <ul style="list-style-type: none"> <li>Some effort is shown in organizing the cables.</li> <li>However, cable routing is incomplete or inconsistent; multiple tangles/crossovers remain, and power cables are not clearly separated from signal/flex cables.</li> </ul>            |   |
|                        | 2     | <ul style="list-style-type: none"> <li>Most cables are organized and routed in a generally neat manner.</li> <li>Only minor crossovers or tangles remain.</li> <li>Power cables are generally routed separately from signal/flex cables, with only minor inconsistency.</li> </ul> |  |

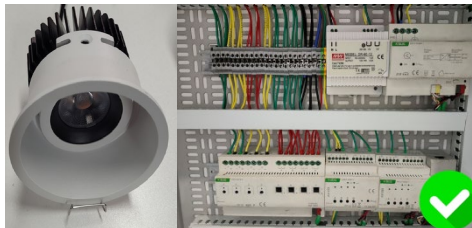
| WSOS section as per TD | Score | Descriptor                                                                                                                                                                                                                                                                                                                                                                                                  | Resource                                                                            |
|------------------------|-------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
|                        | 3     | <ul style="list-style-type: none"> <li>Industry standard with elements of good practice: all cables are cleanly sorted, routed, and secured.</li> <li>Power cables are clearly separated from signal/flex cables and routed beneath or away from the signal cables in a consistent manner.</li> <li>The final arrangement supports safe operation, clear inspection, and easy later maintenance.</li> </ul> |  |

### Aspect – Smart lighting, PVC piping installation

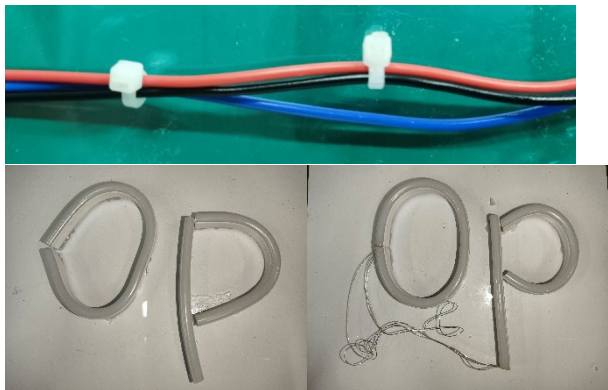
| WSOS section<br>as per TD | Score | Descriptor                                                                                                                                                                         | Resource |
|---------------------------|-------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|
| 5                         | 0     | Some PVC conduits are not clamped by pipe saddles, saddle spacing is irregular, conduit joints show obvious gaps, or visual installation defects are present.                      |          |
|                           | 1     | All of the PVC conduits are clamped by pipe saddles, the pipe saddles are mainly uniform distributed, the gap at the connection of conduits is small.                              |          |
|                           | 2     | All of the PVC conduits are clamped by pipe saddles, the pipe saddles are uniform distributed, the gap at the connection of conduits is very small.                                |          |
|                           | 3     | All of the PVC conduits are clamped by pipe saddles, the pipe saddles are uniform and symmetric distributed, no gap at the connection of conduits, no defect by visual inspection. |          |

## Aspect – Smart lighting, wiring Distribution Box installation

| WSOS section as per TD | Score | Descriptor                                                                                                                                                                           | Resource                                                                             |
|------------------------|-------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|
| 5                      | 0     | Neatness of wiring in the distribution box.<br>Below industry standard or no attempt: All wires not loomed or loomed but untidy. Wires not straight and vertical into the equipment. |   |
|                        | 1     | Meets industry standard: All looms are neat and tidy but with some wire crossovers. Some wires straight and vertical into the equipment.                                             |   |
|                        | 2     | Industry standard with elements of good practice: All looms neatly with very few wire crossovers. Majority of wires straight and vertical into the equipment.                        |  |

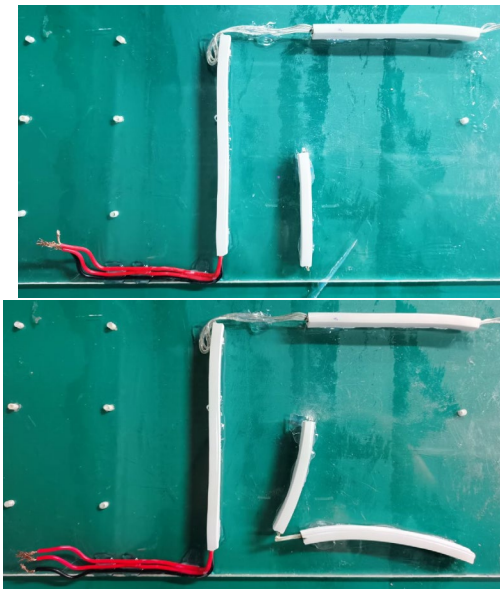
| WSOS section<br>as per TD | Score | Descriptor                                                                                                                            | Resource                                                                            |
|---------------------------|-------|---------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
|                           | 3     | Excellent in comparison to industry standards: All looms with no wire crossovers. All wires straight and vertical into the equipment. |  |

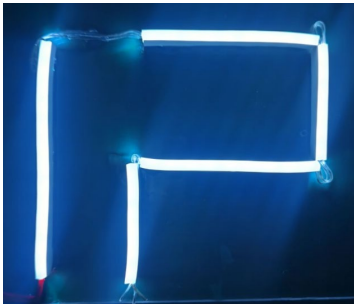
## Aspect – Smart lighting, LED strip manufacture and design

| WSOS section<br>as per TD | Score | Descriptor                                                                                                                                                                                                                         | Resource                                                                             |
|---------------------------|-------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|
| 4                         | 0     | Very low degree of completion does not meet any of the following aspects.                                                                                                                                                          |   |
|                           | 1     | Unfinished LED strip product, including uneven layout, messy cable ties, the excess part of the cable tie is not cut off, uneven bending of the strip, deformed font and graphics when comparing to the TP specified requirements. |  |

| WSOS section as per TD | Score | Descriptor                                                                                                                                                                                                                                             | Resource                                                                             |
|------------------------|-------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|
|                        | 2     | LED strip is well made, beautiful and neat shape, the overall layout is relatively uniform, cable ties are clearly organized, and the excess parts are mostly cut off (> 2/3), font and graphics show little discrepancy comparing to TP illustration. |   |
|                        | 3     | LED strip is perfectly made, with very even uniform layout, neatly ordered cable ties and all excessive ends are all cut off, font and graphics show no discrepancy and match with the TP illustration.                                                |  |

## Aspect – Smart lighting, LED strip wiring

| WSOS section as per TD | Score | Descriptor                                                                                                                                                                                     | Resource                                                                              |
|------------------------|-------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|
| 4                      | 0     | Incomplete wiring connection. Wires are not connected; LED strips cannot be lit or have other conditions which does not meet any of the following aspects.                                     |    |
|                        | 1     | At least 50% (including 50%) of the LED strip wiring are completed, the wires are correctly connected, and the LED strips can be lit up normally (not judging any colour or display patterns). |  |

| WSOS section<br>as per TD | Score | Descriptor                                                                                                                                                                     | Resource                                                                             |
|---------------------------|-------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|
|                           | 2     | At least 70% (including 70%) of the LED strip wiring are completed, the wires are correctly connected and can be lit up normally (not judging any colour or display patterns). |   |
|                           | 3     | 100% of the LED strip wiring are completed, the wires are perfectly connected and can be lit normally (not judging any colour or display patterns).                            |  |