Test Project

Module 2.2 – Programmable LED Strip Architectural Lighting System

Optoelectronic Technology

Submitted by:

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Introduction

Professional project context

The Competition Organizer for WorldSkills Shanghai 2026 is preparing a Skills Café service area. To improve the visibility of the Skills Café, the clarity of on-site wayfinding, the presentation of the Competition brand, and the visual atmosphere associated with the Skills Café's services, the Competition Organizer has commissioned the optoelectronic technology team to design and implement a visual signage system based on programmable LED strips. Within the specified time, Competitors must complete strip cutting, forming, installation, soldering, wiring, controller connections, programme sequencing and effect commissioning, and retain the remaining material for measurement and recording by the designated assessment personnel.

Occupational context

Programmable LED strip systems are widely used for building façade lighting, commercial signage, wayfinding installations, themed retail displays, hotel and cultural tourism environments, event installations and visitor experience spaces. In real projects, this work typically involves interpreting design drawings, planning cutting and installation sequences, managing material quantities, installing LED strips neatly and safely, completing waterproofing and electrical connections, configuring the controller, and commissioning the final lighting effects for client acceptance.

The Competitor will act as the assigned optoelectronic lighting technician responsible for planning and preparing the LED strip work, reproducing the approved illuminated graphics, completing installation, soldering, wiring and waterproofing, configuring the controller, commissioning the specified lighting effects and retaining the finished installation and remaining reusable material for client handover and assessment.

Description of project and tasks

Competition time: 360 minutes.

- 2.2.1 Architectural Decorative Lighting Project Planning and Preparation
- 2.2.2 Programmable LED Strip Installation, Wiring, Waterproofing and Power-on Testing
- 2.2.3 Lighting Control Effect Design, Download to the Controller, Commissioning and File Submission

The client requires a complete illuminated feature wall that reproduces the approved graphics, is securely installed and safely wired, provides protected and waterproofed electrical connections, and runs the specified P1–P10 lighting effects in the required sequence for handover inspection.

Workstation number and record form notes

In this Test Project, XX represents the two-digit workstation number allocated to the Competitor by drawing lots. Replace XX in project names and filenames with your actual workstation number.

Table 2.2-2 shows an example of the format for recording remaining LED strip material. The designated assessment personnel will measure and verify the material and complete the table. Competitors are not required to complete, save or submit this table. It is shown only in this Test Project and will not be issued as a separate resource file.

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Drawings and materials information

The following drawings, visualisations, materials list and record form are part of the requirements for this project. Competitors must interpret and apply these resources throughout their work.

Index of drawings, materials lists and record forms

Figure 2.2-1 Architectural Decorative Lighting Design Visualisation

Figure 2.2-2 Architectural Decorative Lighting Installation Layout

Figure 2.2-3 Architectural Decorative Lighting Dimension Control Drawing

Figure 2.2-4 Architectural Decorative Lighting Control Area Drawing

Table 2.2-1 Architectural Decorative Lighting Installation Materials List

Table 2.2-2 Remaining LED Strip Material Record

Table 2.2-3 Programme Effect Requirements

Figure 2.2-5 Preconfigured Programme Content on the Equipment (No Competitor Action Required)

Figure 2.2-6 Overall Architectural Decorative Lighting Design Visualisation

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Instructions to the Competitor

Project brief from the client

The client is preparing an illuminated feature wall for a public technology and skills showcase and has appointed you as the optoelectronic lighting technician. The client has approved the graphic design and requires the installation team to create the illuminated outlines, mount them on the supplied installation wall, connect them to the LED lighting controller and DC power supply, and commission the programmed lighting effects.

You may use only the supplied materials, drawings, controller, power supplies, software, tools and accessories. Complete the work in accordance with the supplied design drawing, installation layout, dimension control drawing, programme area drawing, materials list and the requirements below.

This work comprises the following stages:

1. Plan the LED strip cutting and installation work, interpret the supplied drawings and control areas, and manage the supplied material responsibly.
2. Cut, form, install, solder, wire, waterproof and power-test the programmable LED strip system in accordance with the installation, safety and quality requirements.
3. Create the specified P1–P10 lighting-control programme, download and commission it on the installed system, and save the required final project file for assessment.

Technical requirements and conventions

Dimensions, segment identification and workstation number

Unless otherwise stated, all dimensions on the drawings are in millimetres. LED strip segments are identified by segment numbers ① to ⑱. Use these segment numbers consistently throughout planning, installation, wiring, effect programming and final verification.

Unless otherwise stated, XX in this Test Project is the two-digit workstation number allocated to the Competitor by drawing lots.

LED strip wiring conventions

For the LED strip DC supply and data connections, red is +12 V, black is 0 V/GND, and blue is the DATA conductor. These colour requirements do not apply to the AC input cable. Maintain correct polarity and data direction throughout the installation.

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Task 2.2.1 Architectural Decorative Lighting Project Planning and Preparation

Client requirement

Before cutting or installing any LED strip, study **Figure 2.2-1, Figure 2.2-2, Figure 2.2-3 and Figure 2.2-4**. Confirm the specified graphic outlines, installation positions, dimensional control requirements, programme control areas, controller position, power supply position and cable routing requirements.

The supplied design represents a decorative illuminated feature wall made up of programmable LED strip segments. The final installation must reproduce the outlines, proportions and visual relationships of the approved design as accurately as possible.

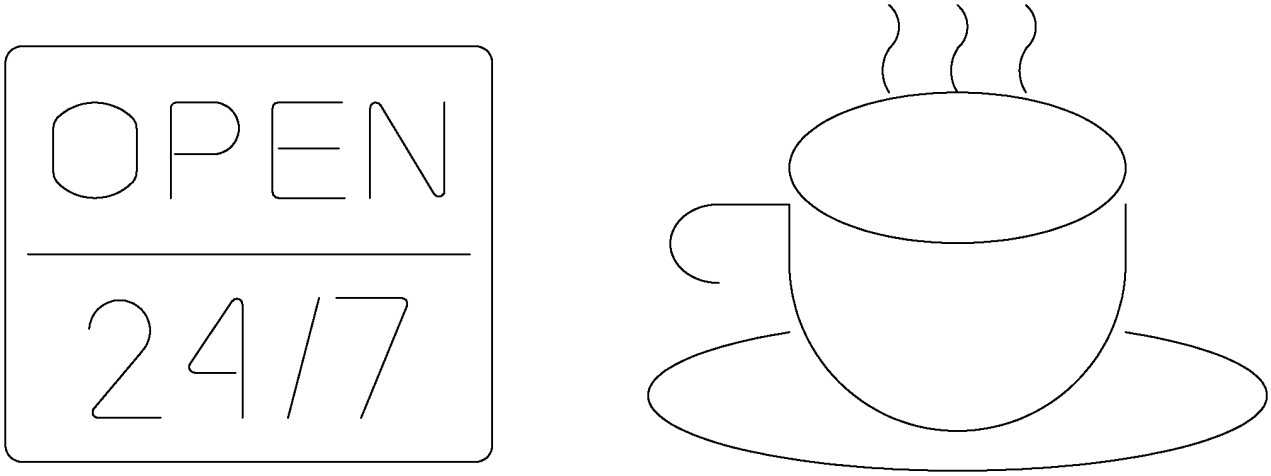


Figure 2.2-1 Architectural Decorative Lighting Design Visualisation

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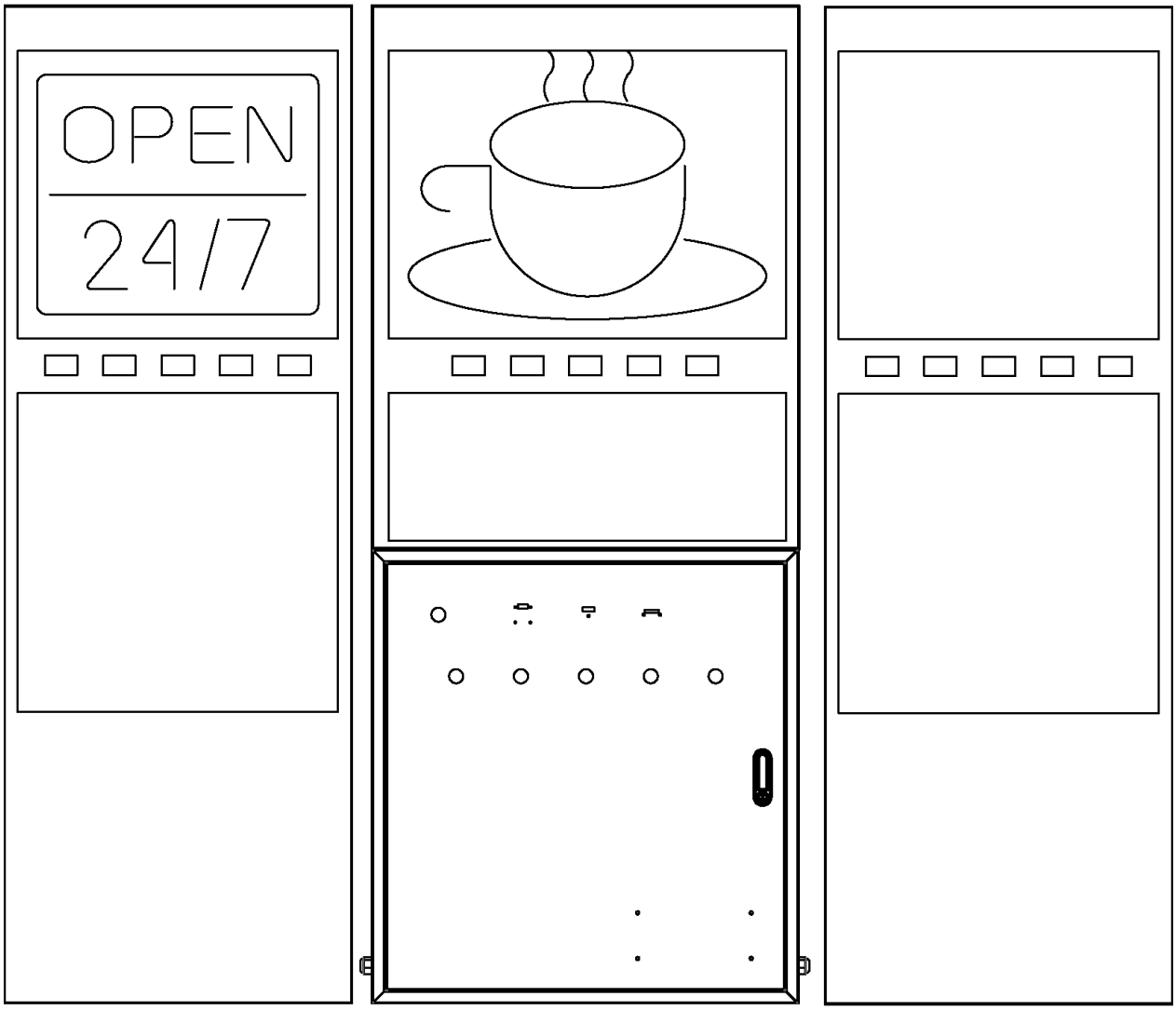


Figure 2.2-2 *Architectural Decorative Lighting Installation Layout*

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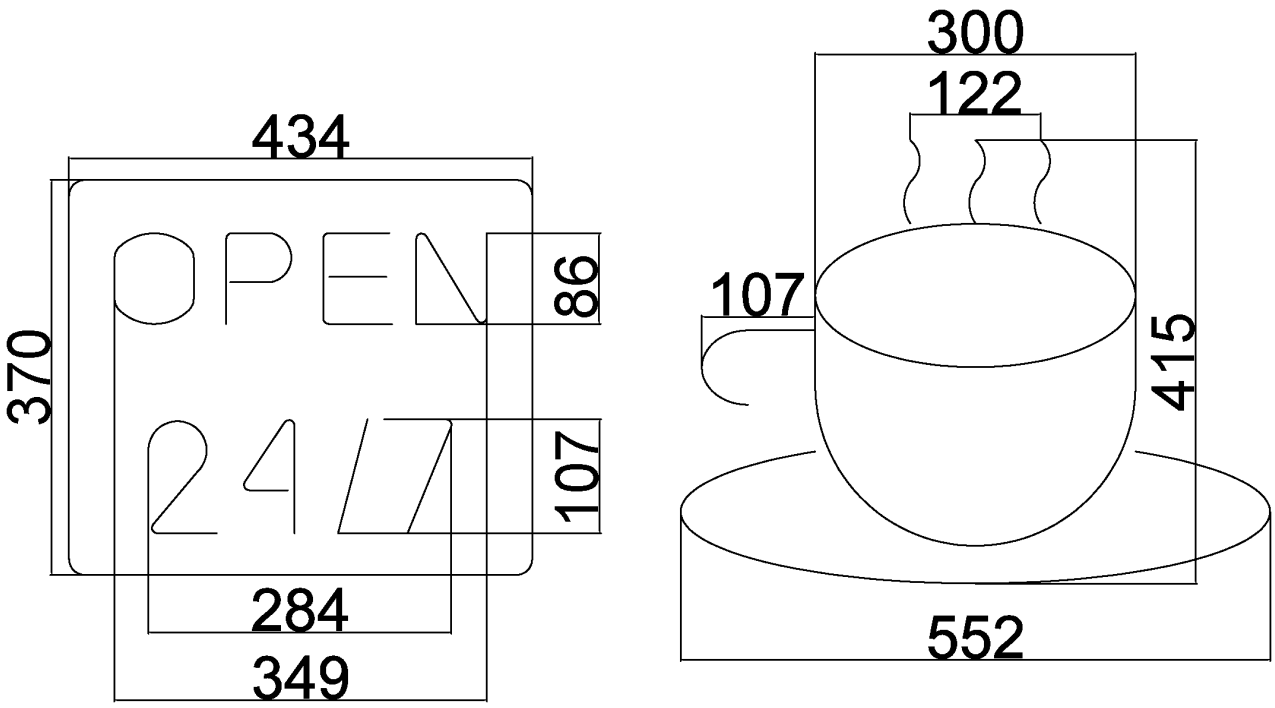


Figure 2.2-3 Architectural Decorative Lighting Dimension Control Drawing

The dimensions marked in **Figure 2.2-3** are the principal control dimensions. Other curves and shapes will be assessed against the supplied design reference for visual conformity and quality of installation workmanship.

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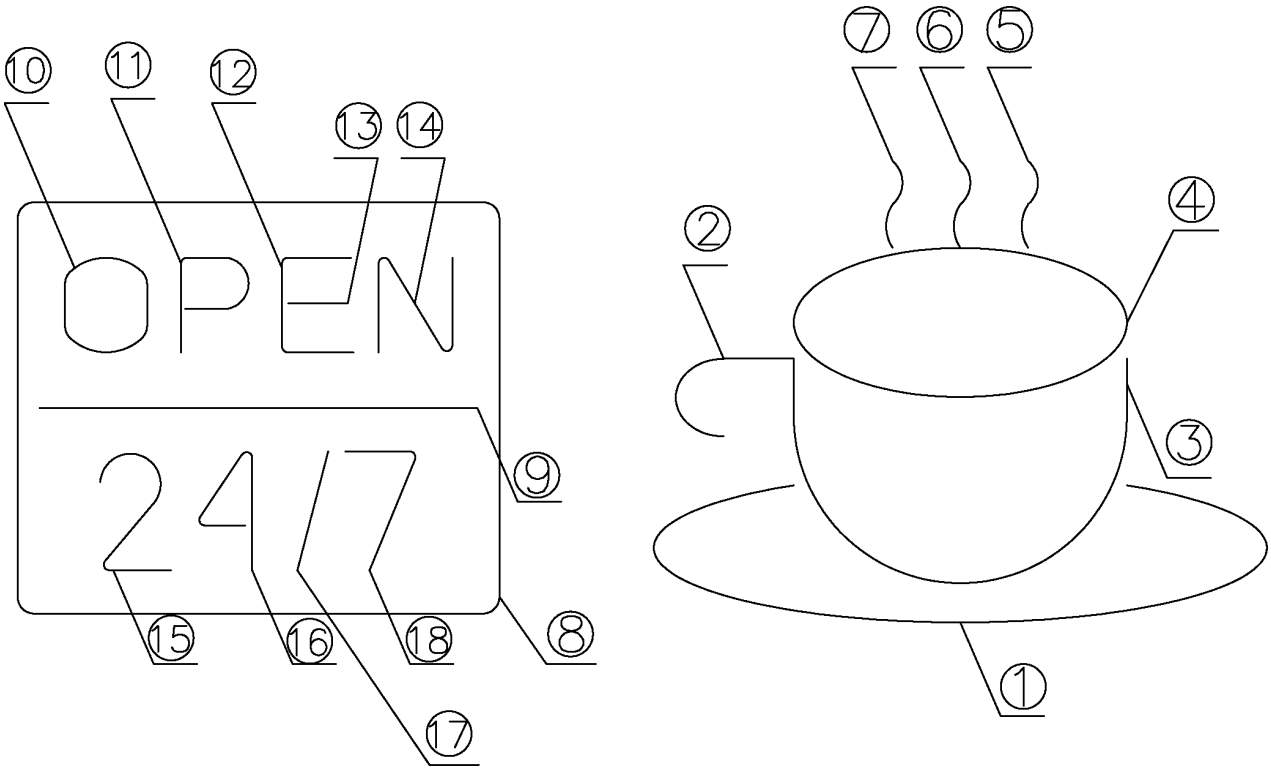


Figure 2.2-4 *Architectural Decorative Lighting Control Area Drawing*

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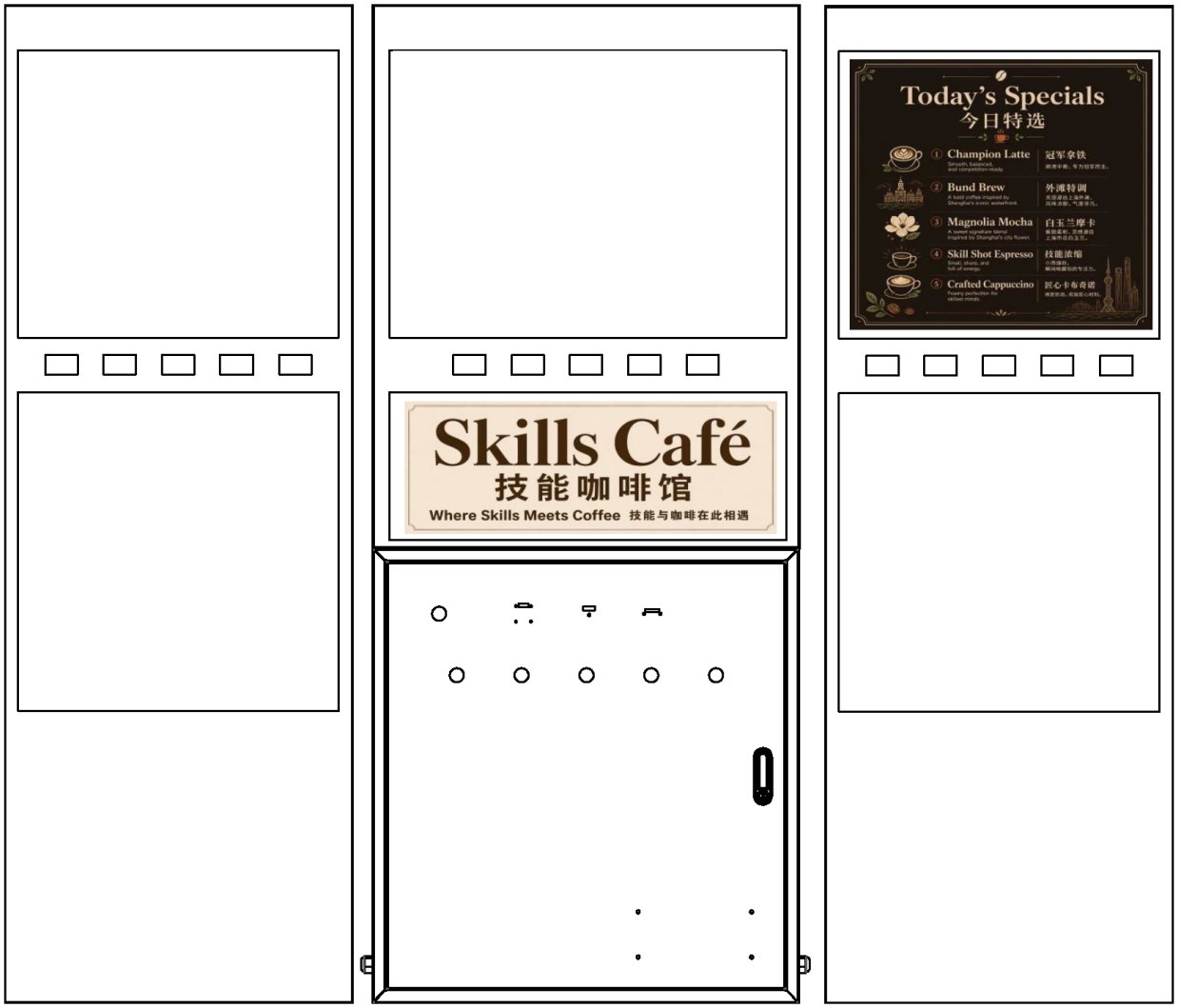


Figure 2.2-5 *Preconfigured Programme Content on the Equipment (No Competitor Action Required)*

The preconfigured display content in **Figure 2.2-5** is supplied by the Competition Organizer solely as part of the final scene. It is outside the scope of Competitor work and marking.

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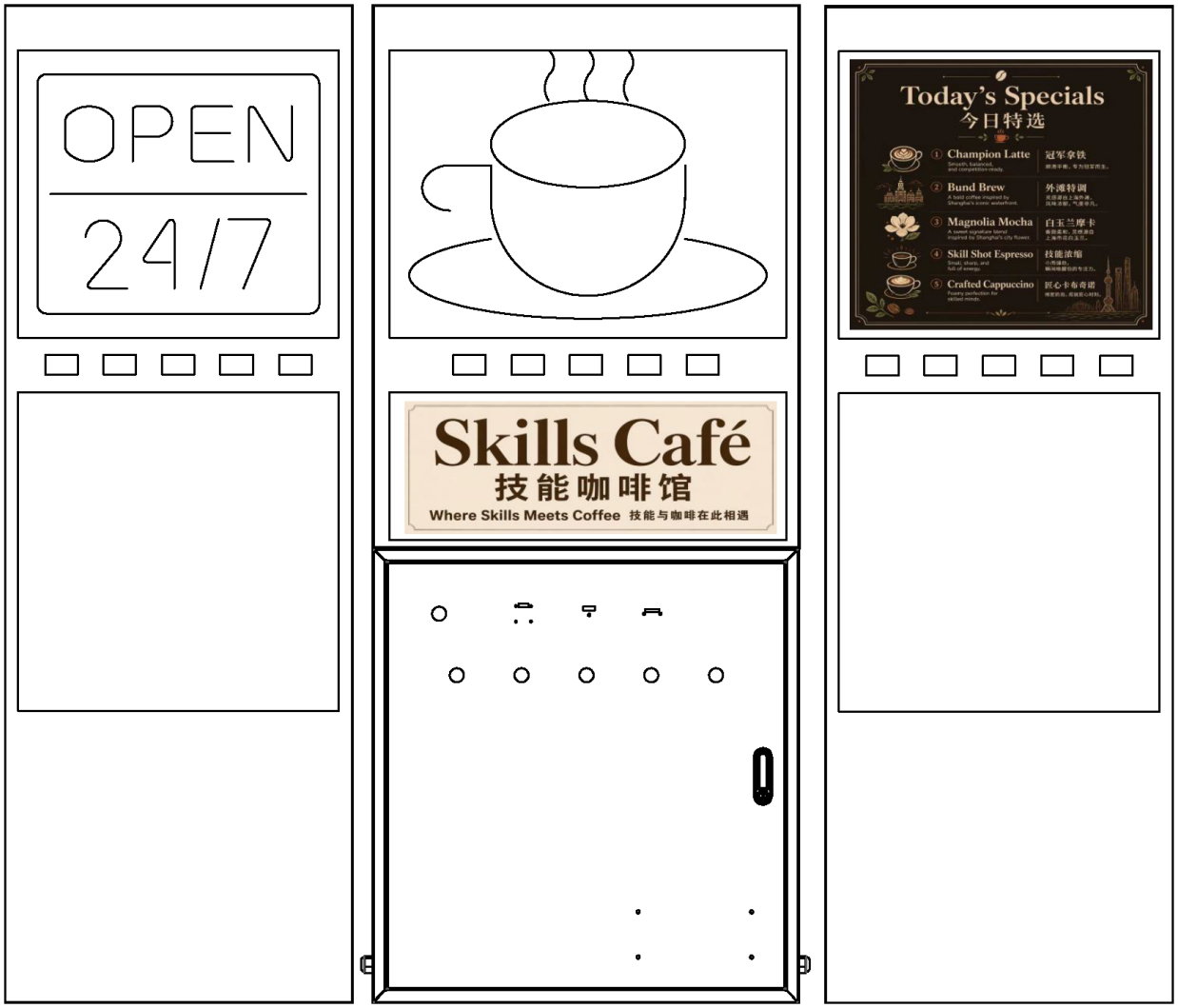


Figure 2.2-6 *Overall Architectural Decorative Lighting Design Visualisation*

Architectural Decorative Lighting Installation Materials List

No.	Item	Material/Specification/Model	Unit	Quantity per set
1	Programmable multicolour LED strip	DC12V 6*12mm	m	10
2	LED lighting controller	VCOMLC	Each	1
3	Transparent cable	3*0.3mm2/3-core	m	10
4	Power supply wire	RV 0.5mm2 (red)	m	10
5	Power supply wire	RV 0.5mm2(black)	m	10
6	Power supply wire	RV 0.5mm2(blue)	m	10
7	Power supply cable	RVV 3*1.0	m	2
8	Three-pin plug	AC220,10A	Each	1
9	Switching power supply	DC12V 100	Each	2
10	UV adhesive curing lamp	Power 8W	Each	1
11	UV-curing adhesive	50g	Tube	1
12	LED strip mounting clip	White, plastic	Each	150
13	Plastic fixing plug	For fixing to the VCOM perforated panel	Each	150
14	Self-tapping screw	3*12/cross-recessed round head	Each	150
15	Network patch cable	5 m	Each	1
16	Cable tie	4*200mm	Each	200
17	Wire-end ferrule	/	Each	Several

Table 2.2-1 Architectural Decorative Lighting Installation Materials List

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Work instructions

1. Confirm the position and orientation of all LED strip segments before cutting.
2. Plan the cutting sequence to minimise unnecessary offcuts and preserve the longest possible reusable length of remaining LED strip.
3. Cut LED strips only at the cutting points specified by the manufacturer or at positions permitted by the construction of the supplied strip.
4. Do not cut, pierce, twist, crush or sharply bend LED strips in any way that could damage the LEDs, copper pads, internal conductors or waterproof layer.
5. Confirm the controller's data output direction and the LED strip's data flow direction before soldering and installation.
6. Before installation begins, prepare the mounting surface, clips, fixings, wiring routes, UV adhesive, curing lamp, power supply wires and transparent connecting cable.
7. Keep the work area orderly, with reusable material, damaged waste, tools and completed assemblies clearly separated.

Material control and sustainability record

For this module, the designated assessment personnel will measure and verify the length of remaining LED strip and complete **Table 2.2-2**. Only the longest single length of unused, reusable LED strip will be recorded. Short offcuts, damaged segments, strips already cut into installation segments, and strips with exposed or damaged conductors must not be counted as remaining reusable LED strip.

The recorded remaining length must reflect careful planning and responsible use of materials. The lighting installation must still be completed in accordance with the drawings and functional requirements. Saving material by omitting specified segments, shortening specified shapes or reducing installation quality is not acceptable.

Competitors must retain the remaining LED strip appropriately and keep it separate from waste for inspection by the assessment personnel. The table below shows only the assessment record format. Competitors are not required to complete, save or submit this table, and no separate form file will be issued.

Workstation number	Remaining LED strip length / m	Installation completion (partial / complete)
/	/	/

Table 2.2-2 Remaining LED Strip Material Record

The example record format is for reference only; the actual values will be entered by the marking Expert.

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Task 2.2.2 Programmable LED Strip Installation, Wiring, Waterproofing and Power-on Testing

Client requirement

The client requires all programmable LED strip segments to reproduce the approved graphic outlines and proportions, to be securely mounted and professionally wired, and to have protected and waterproofed connections so that the completed feature wall is safe and ready for lighting-effect commissioning.

Installation requirements

1. Cut and install the LED strip segments in accordance with **Figure 2.2-1, Figure 2.2-2 and Figure 2.2-3.** The graphic outlines, proportions, dimensions and relationships between the numerals, letterforms and coffee cup must conform to the design drawings.
2. Use the supplied plastic fixing plugs and LED strip mounting clips to mount the LED strips on the installation wall. Cable ties must not be used as the primary fixing method to secure LED strips directly to the installation wall.
3. LED strips must be securely held in the clips. After installation, they must not sag, twist, detach or undergo uncontrolled deformation.
4. No uniform spacing is specified for LED strip mounting clips. Competitors must determine a suitable number and arrangement of fixing points according to the strip shape, bend radius and installation conditions. However, the finished strips must be securely installed, with no obvious sagging, loosening or uncontrolled deformation.
5. At tight corners, mounting clips may overlap slightly where this is genuinely necessary to achieve the specified shape. However, they must not compress or damage the LED strip or cause obvious deformation.
6. Straight sections must appear straight. Curved sections must be smooth and continuous, without sharp kinks or local compression that could damage the strip.
7. The light-emitting surface of each LED strip must face outwards and remain visible. The strip installation orientation and the orientation of the light-emitting surfaces must be consistent.
8. Segment numbers ① to ⑱ must correspond to the programme area drawing in **Figure 2.2-4**. The segments must be installed so that the lighting effects can be correctly programmed and verified. The required segment groups are: ① coffee cup saucer; ②-④ coffee cup; ⑤-⑦ steam; ⑧-⑨ sign frame; ⑩-⑭ "OPEN" lettering; and ⑮-⑱ opening hours.

Wiring requirements

The relevant wiring information has been provided during the pre-competition training and through IntSkills. No separate complete wiring scheme is provided in this Test Project. Competitors must independently complete the installation and wiring on the basis of the information provided, the equipment requirements and the client's needs, and must comply with electrical safety requirements. All earthing connections inside the electrical control cabinet are already complete.

Use the supplied transparent 3-core cable to connect the LED strip segments at the positions required by the installation design.

Before soldering, identify the positive supply, negative supply/common ground and signal/data conductors on the LED strips and connecting cables.

Maintain correct polarity and data direction throughout the installation. Reversed polarity, incorrect data flow direction, short circuits and loose connections are not permitted.

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Use the supplied red, blue and black wires to connect the LED strip system, controller and DC power supply in accordance with the wiring arrangement requirements. For the LED strip DC supply and data connections, red is +12 V, black is 0 V/GND, and blue is the DATA conductor. These colour requirements do not apply to the AC input cable.

Where practicable, route cables through cable trunking. Cables outside the trunking must be grouped and neatly secured, without applying tension to solder joints or LED strip pads.

Cable joints insulated with electrical insulating tape must be placed inside the cable trunking wherever possible, with safe insulation maintained.

The LED lighting controller and DC switching power supplies must be installed inside the electrical control cabinet. Competitors may determine their precise positions within the cabinet and the routes of the low-voltage wiring, but must meet the requirements for safety, heat dissipation, accessibility for inspection and professional wiring. The installation must allow safe inspection and prevent exposed conductors from contacting the cabinet.

Waterproofing and insulation requirements

All LED strip ends, soldered joints, exposed pads and cable entry points must be sealed with UV-curing adhesive after the electrical connections and checks have been completed.

Use the UV curing lamp to cure the adhesive fully, securing the joints and ensuring that exposed conductive parts are protected.

After sealing, copper pads, solder joints, wire cores and other conductive parts must be fully covered and protected. No bare conductive parts may remain unprotected.

Do not apply excessive adhesive that could obscure the LED light-emitting surfaces, interfere with correct installation or create an untidy appearance.

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Power-on testing requirements

Before energising the system, check the DC supply voltage, controller connections, polarity, data direction and all visible connections.

Competitors must first complete all wiring and their own safety self-check. Before energising the AC 220 V system for the first time, raise your hand to request a visual safety confirmation by the designated Expert/sponsor technical support personnel, in accordance with the Competition requirements. Energisation is permitted only after authorisation has been obtained.

This safety confirmation is limited to identifying safety risks. It does not confirm the functionality of the Competitor's circuit, and must not involve providing technical guidance or assistance in completing the task.

After energisation, all installed LED strip segments must light up correctly under control. Non-functioning LEDs, missing colours, severely insufficient brightness, flickering caused by poor connections, or an obviously inadequate power supply must be rectified before final commissioning.

If any supplied equipment or material is suspected of being defective, faulty or damaged, the Competitor must immediately raise their hand and notify an on-site Expert. Replacement must take place within the first 30 minutes, as specified under "Replacement of Faulty Equipment and Materials" in this Test Project. Competitors must not replace items themselves.

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Task 2.2.3 Lighting Control Effect Design, Download to the Controller, Commissioning and File Submission

Client requirement

The client requires the completed feature wall to run the specified P1–P10 lighting sequence with the defined control areas, colours, directions and durations, and to remain correctly connected and playing in a continuous loop for handover inspection and Expert assessment.

Work instructions

Use the LED lighting control software to create the specified programme project and download the completed programme to the LED lighting controller. The programmed effects must correspond to the installed LED strip segments and the control areas shown in **Figure 2.2-4**.

No.	Programme name	Effect	Control area	Effect requirements	Duration (seconds)
1	P1	Static Color	①	Green	3
2	P2	Static Color	②③④	Red	3
3	P3	Static Color	⑤⑥⑦	Yellow	5
4	P4	Color Scroll	⑧⑨	Red→Blue Left to Right	3
5	P5	Static Color	⑩⑪⑫⑬⑭	Blue	5
6	P6	Static Color	⑮⑯⑰⑱	Green	3
7	P7	Color Scroll	①②③④⑤⑥⑦	Red → Green Bottom to Top	5
8	P8	Color Scroll	⑧⑨⑩⑪⑫⑬⑭⑮⑯⑰⑱	White→ Green Right to Left	3
9	P9	Color Scroll	①-⑱	Red→Green Left to Right	3
10	P10	Color Scroll	①-⑱	Red → white Bottom to Top	3

Table 2.2-3 Programme Effect Requirements

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Project file naming requirements

Use LightingControlXX as the project name, where XX is your two-digit workstation number. For example, workstation 01 must use the project name LightingControl01.

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Effect programming and commissioning requirements

1. In the control software, set the canvas dimensions to Width = 100 and Height = 60.
2. The programme sequence must contain P1 to P10 in the order shown in **Table 2.2-3**.
3. Each programme must run for its specific duration given in **Table 2.2-3** before advancing to the next programme.
4. After P10 ends, return to P1 and repeat the sequence continuously.
5. P1–P10 are independent programme states. When the next programme begins, the display state of the previous programme must end. Unless the next programme explicitly includes the same control area, the previous programme's lighting state must not be retained.
6. For static programmes such as P1, P2, P3, P5 and P6, only the specified control areas must be illuminated in the specified colour. All other LED strip segments outside the current programme's control areas must remain off.
7. Dynamic effects must display the specified colour changes and directions of movement. Bottom-to-top, left-to-right and right-to-left effects must visually correspond to the orientation of the installed feature wall.
8. The standard colours used in the programmes must be set to the RGB values below. Within the capabilities of the supplied LED strips and controller, the displayed colours must match the specified colours as closely as possible. Missing colour channels, incorrect colours and incorrect control area mapping must be rectified.

Red: RGB (255, 0, 0)

Green: RGB (0, 255, 0)

Blue: RGB (0, 0, 255)

Yellow: RGB (255, 255, 0)

White: RGB (255, 255, 255)

9. During normal demonstration operation, the controller must operate the installed system stably, without obvious flickering, stuttering, uncontrolled restarts, skipped programmes, communication failures or incorrect responses from LED strip segments.
10. On completion of commissioning, hand over an illuminated feature wall that meets the client's requirements and uses the Skills Café theme. The lighting system must remain correctly connected, with the programme playing in a loop.
11. At the end of the module, retain the computer and network connections required for normal loop playback of the lighting system. This task does not require standalone operation after the network patch cable is disconnected.

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File submission requirements

After programming and commissioning, save the completed project file to the following location:

C:\Users\Competitor\Desktop\LightingControlXX.json

Replace XX with your two-digit workstation number. The saved file must match the final programme downloaded to the controller. Unless otherwise instructed by an Expert, do not save the file under a different filename, with a different extension or in a different location.

Table 2.2-2 is an example of the material record format for assessment personnel. It is not a file that Competitors are required to complete, save or submit.

Required deliverables for Module 2.2

The client will inspect completion of the illuminated feature wall, the installed LED strip system, the commissioned lighting programmes, the retained reusable material and the required project file. The Competitor must ensure that the following deliverables are complete and available for verification.

DELIVERABLE	REQUIRED STATE FOR ASSESSMENT
LED strip installation	Completed LED strip installation on the installation wall in accordance with the supplied drawings.
Functional LED strip system	A completed, functional LED strip system connected to the LED lighting controller and DC power supply.
Lighting programmes	Commissioned lighting programmes P1 to P10 that can run on the installed system.
Remaining LED strip material	Remaining LED strip retained appropriately, with reusable offcuts separated from unusable waste, for the designated assessment personnel to measure, verify and record in **Table 2.2-2**. Competitors are not required to complete or submit this table.
Project file	The final project file saved as C:\Users\Competitor\Desktop\LightingControlXX.json.

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Other

General quality, safety and sustainability requirements

The completed work must demonstrate professional installation quality, safe electrical working practices, accurate interpretation of drawings, correct software configuration, reliable commissioning and responsible use of materials.

Wiring, soldering or disconnecting connections while energised is prohibited.

Do not energise the system before checking polarity, insulation, controller connections and power supply connections. Before the first AC 220 V energisation, the safety confirmation and authorisation specified in Section Task 2.2.2 must also be completed.

Keep AC 220 V input wiring separate from DC 12 V output wiring and low-voltage control wiring.

Apply appropriate strain relief and cable management to prevent damage to solder joints and LED strip pads.

Avoid unnecessary repeated cutting, rework and material damage. Rework caused by planning errors may reduce the amount of reusable LED strip remaining.

Collect and separate unusable waste from reusable offcuts. Do not mix damaged LED strip segments with reusable remaining material.

Before the end of this module, ensure that the final installation is safe to inspect, has clearly defined cable routes and complete waterproofing, and is ready for assessment.

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Replacement of faulty equipment and materials

The first 30 minutes after the start of each module constitute the replacement period for faulty equipment and materials. This rule applies to all modules.

Within the first 30 minutes after the start of this module, if supplied equipment or materials are found to be defective, faulty or damaged, the Competitor must immediately raise their hand to notify an on-site Expert. The sponsor's technical personnel will verify the issue and carry out the replacement. Equipment and materials will not be replaced after 30 minutes have elapsed from the start of the module.

Whether or not the replacement period is still in effect, the safe working requirements in this Test Project must be followed when a fault is identified.

End condition for assessment

At the end of the module, the completed illuminated feature wall must be left safe, tidy and ready for inspection. The lighting system must remain correctly connected, with P1–P10 playing continuously in the specified sequence for the client's handover inspection and Expert assessment.

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