



Skill India

कौशल भारत - कुशल भारत



In collaboration with :



MINISTÈRE
DE L'ÉDUCATION
NATIONALE

MINISTÈRE DE L'ENSEIGNEMENT
SUPÉRIEUR, DE LA RECHERCHE
ET DE L'INNOVATION

Sample Test Project

Regional Skill Competitions

Skill - Electrical Installation

Category: Construction and Building Technology

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Section - A

A. Preface

Skill Explained:

An electrician works on commercial, residential, agricultural, and industrial projects. There is a direct relationship between the nature and quality of the product required and the payment made by the customer. Therefore, the electrician has a continuing responsibility to work professionally in order to meet the requirements of the customer and thus maintain and grow the business. Electrical installation is closely associated with other parts of the construction industry and with the many products that support it, normally for commercial purposes.

The electrician works internally, including the homes of customers and on small and major projects. He or she will plan and design, select and install, commission, test, report, maintain, fault find, and repair systems to a high standard. Work organization and self-management, communication, and interpersonal skills, problem solving, flexibility and a deep body of knowledge are the universal attributes of the outstanding electrician.

Whether the electrician is working alone or in a team the individual takes on a high level of personal responsibility and autonomy. From working to provide a safe and reliable electrical installation and maintenance service, in accordance with relevant standards, through to diagnosing malfunctions, programming, and commissioning home and building automation systems, concentration, precision, accuracy, and attention to detail every step in the process matters and mistakes are largely irreversible, costly, and potentially life threatening.

With the international mobility of people, the electrician faces rapidly expanding opportunities and challenges. For the talented electrician there are many commercial and international opportunities; however, these carry with them the need to understand and work with diverse cultures and trends.

The diversity of skills associated with electrical installations is therefore likely to expand.

Eligibility Criteria (for IndiaSkills 2018 and WorldSkills 2019):

Competitors born on or after 01 Jan 1997 are only eligible to attend the Competition.

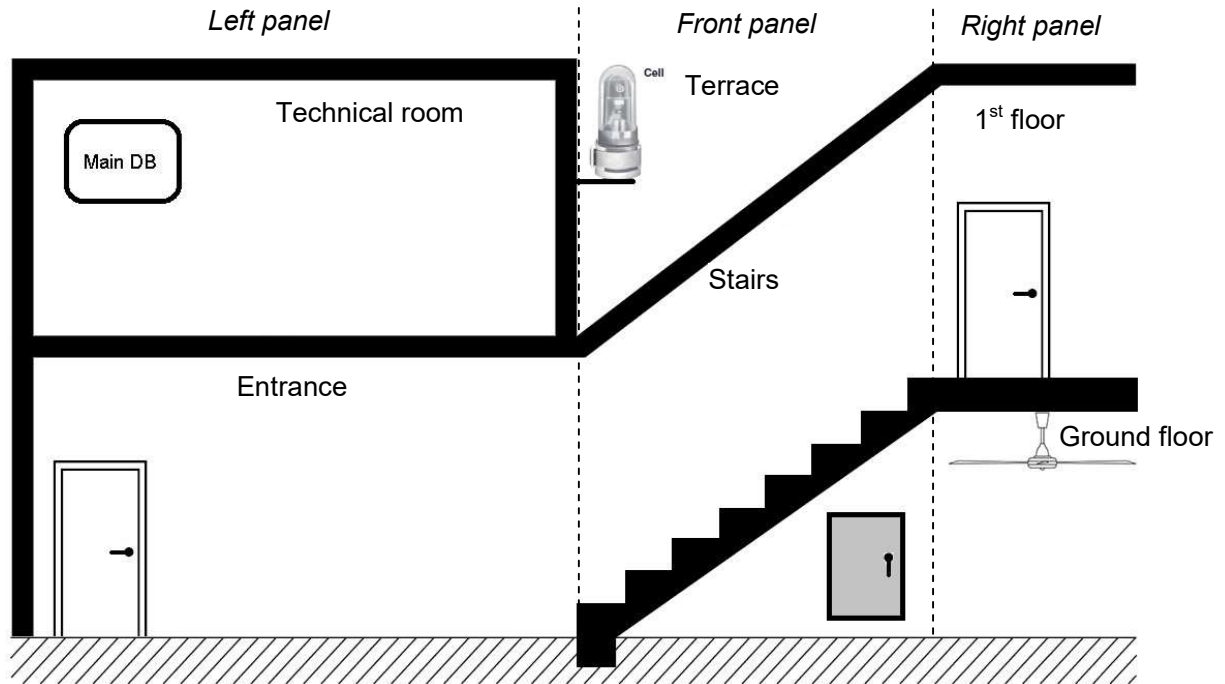
Total Duration: 1 day, 8 hours duration

Section - B

B. Test Project

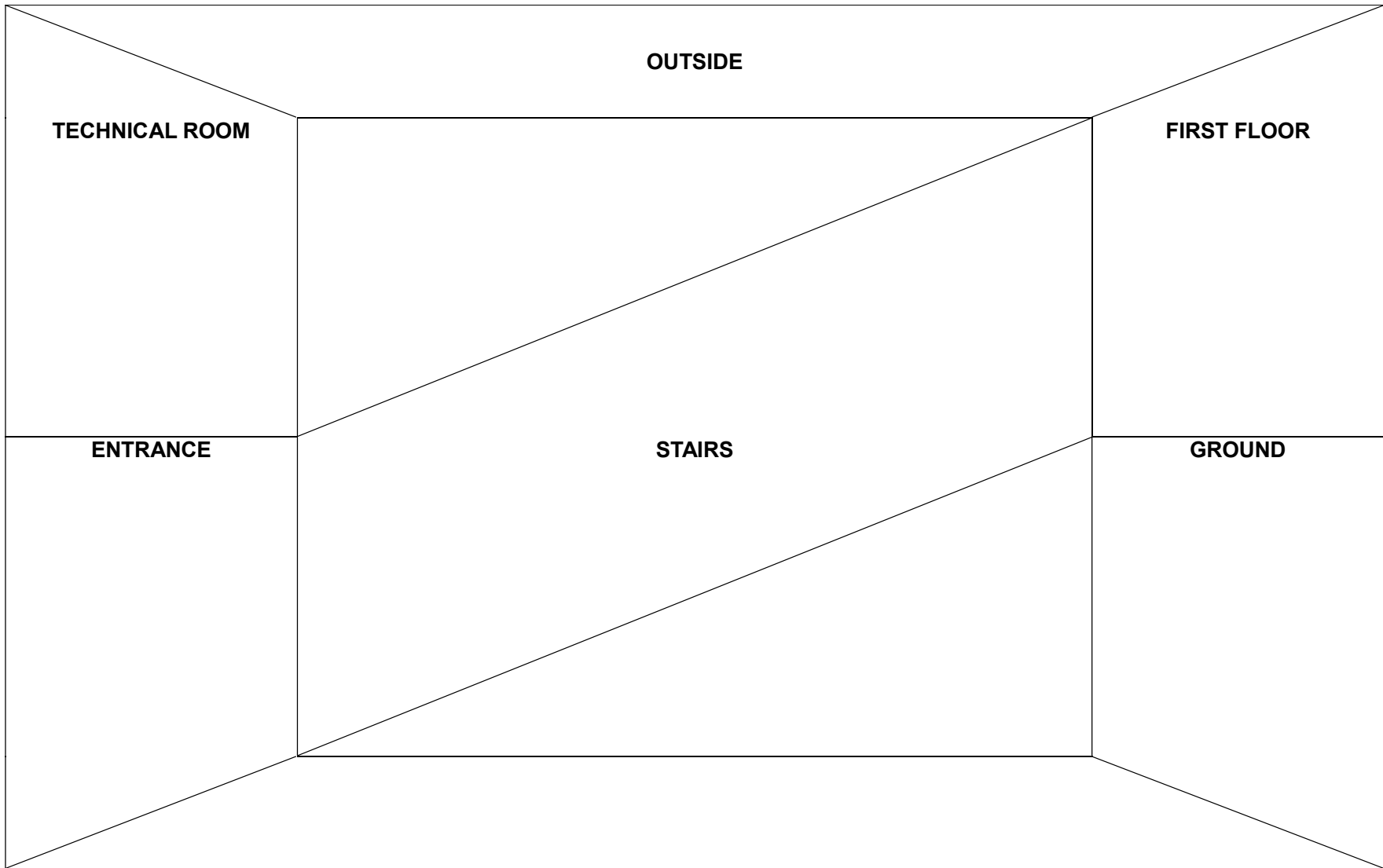
Competitors are required to design, construct, install, configure, test and demonstrate the electrical installation on the guidelines of the declared test project.

The electrical installation is given below :

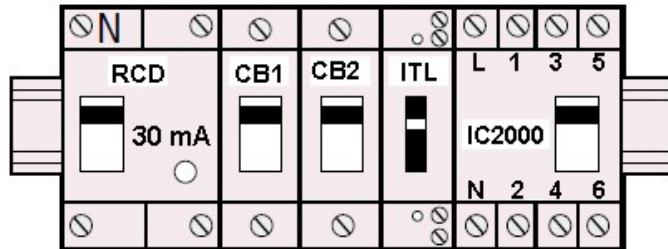


Description of operation :

- All of control devices and circuit-breakers have to be implemented in the technical room inside the enclosure you will consider as "**Main DB**" ;
- The main 230V AC supply should be connected to main DB with provided cable and gland. A Residual-Current Device "**RCD**" has to be implemented to protect people. Consider **RCD** as main MCB for whole circuit
- There are two light bulbs which can turned ON or OFF by either of three pushbuttons all managed by an impulse relay "**ITL**". This circuit has to be protected has well by the same MCB "**CB1**" ;
- Electric plugs are all single-phase 6-16A and have to be protected has well by the same MCB "**CB2**" ;
- The twilight switch **IC2000** and his cell **C1** have to be protected has well by MCB "**CB1**" ;
- Wiring should be done with proper size of cable for power circuit & light circuit. Color coding of the wire has to be maintained as per the Indian electricity rule by the competitor.



TECHNICAL ROOM



- DB** : Distribution box 10 ways
- RCD** : Residual-current device 30 mA, 16 A (for main circuit breaker)
- CB1** : MCB, SP, 16A (for impulse relay circuit and twilight switch circuit)
- CB2** : MCB, SP, 16A (for switch and sockets)
- ITL** : Impulse relay, 16A, 230V, 1 NO contact
- IC2000** : twilight switch, 1 NO/NC contact
- C1** : twilight switch cell

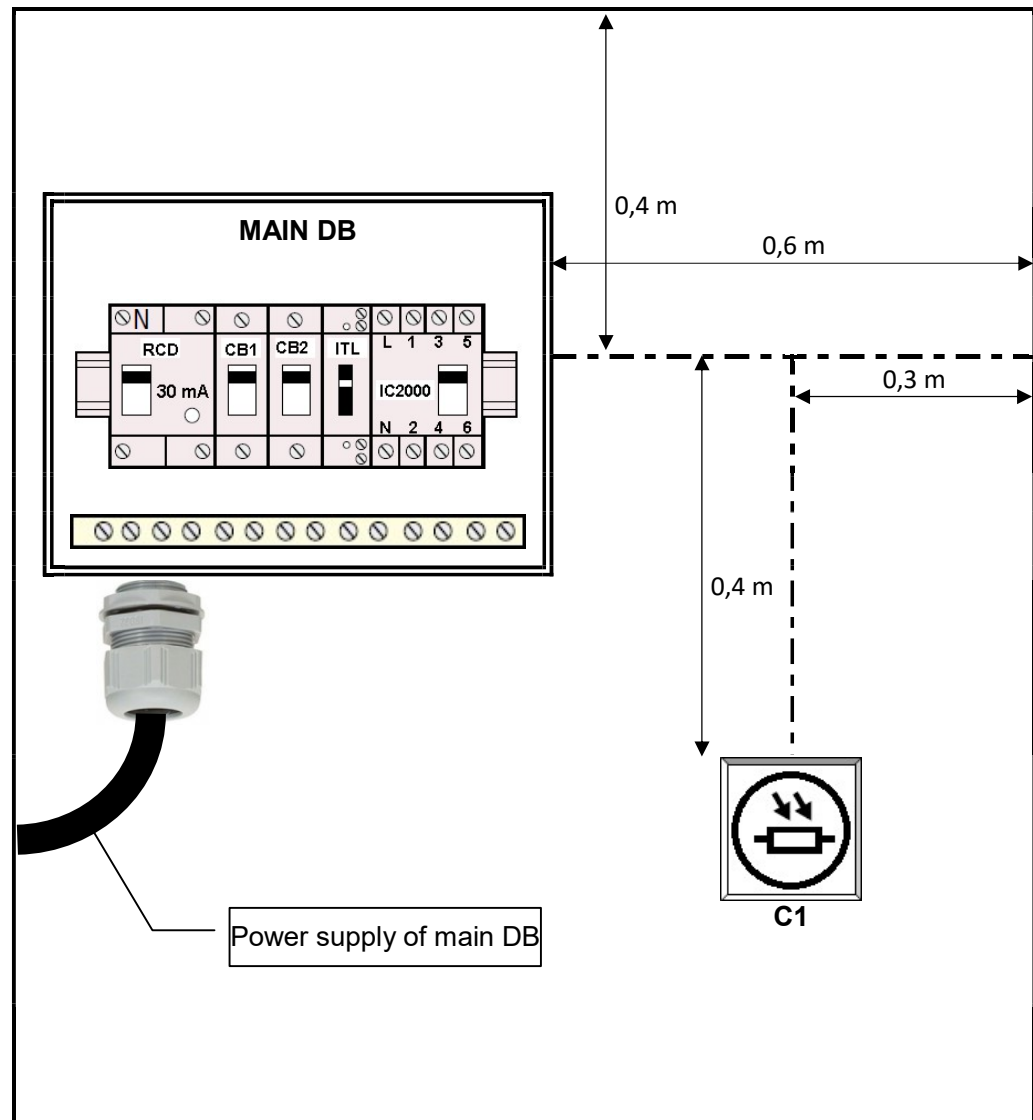
SIGNIFICATION of SYMBOLS

- - - - - : **axis** of PVC cable channel
- Horizontally cable channel → Main cable channel
→ Large width
- Vertically cable channel → Auxiliary cable channel
→ Middle width

DIMENSIONS and MEASUREMENTS

- All dimensions are in meter

General tolerance is $\pm 0,002$



ENTRANCE

DESCRIPTION of EQUIPMENTS

S1 : PUSHBUTTON FOR LIGHTS L1 & L2

L1 : LED LIGHT, 8W

H1 : SOCKET 3 PINS 16/6 A

SIGNIFICATION of SYMBOLS

- - - - - : **axis** of PVC cable channel

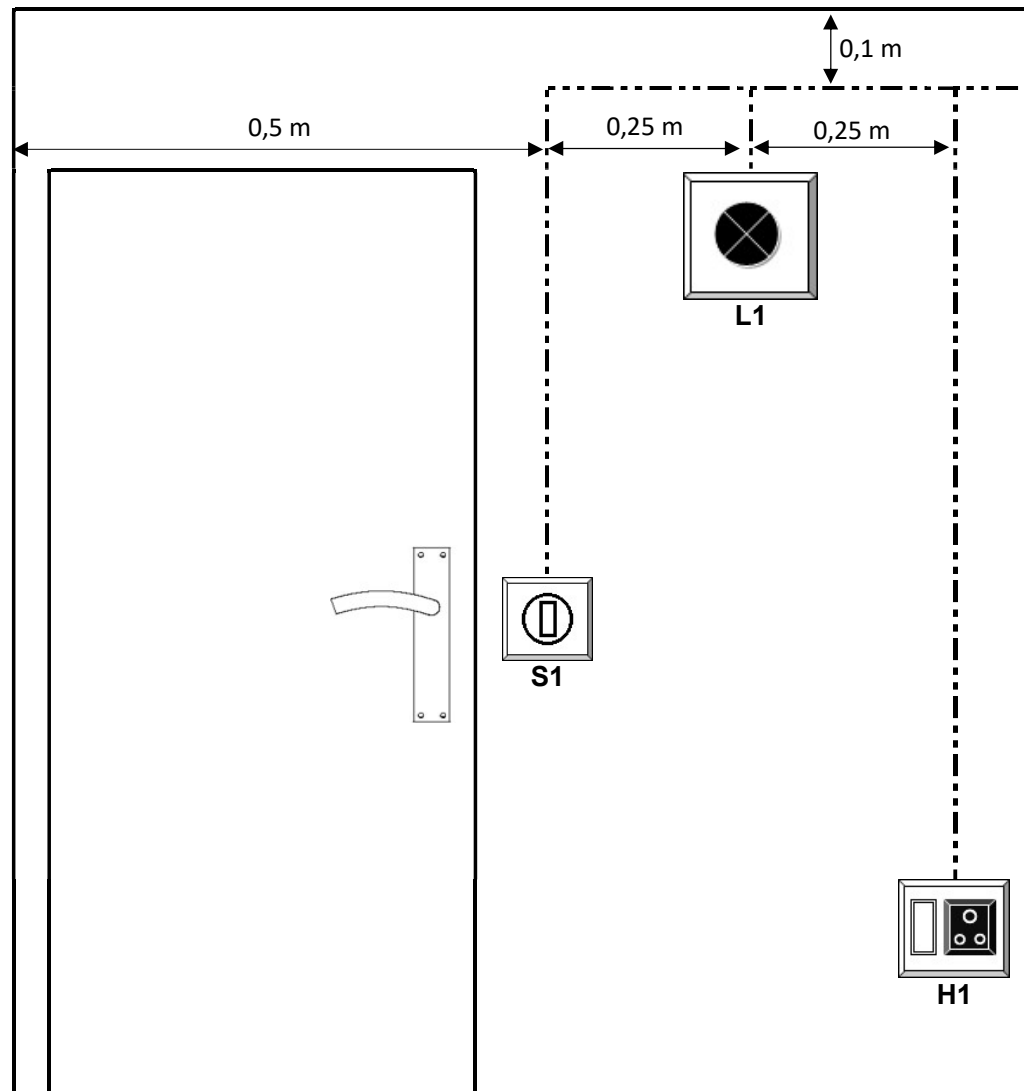
- Horizontally cable channel → Main cable channel → Large width
- Vertically cable channels → Auxiliary cable channel → Middle width

POSITION of EQUIPMENTS

- All electric plugs are 150 mm from the floor
- All pushbuttons or switches are 600 mm from the floor
- All lights points or ceiling fan points are 900 mm from the floor

DIMENSIONS and MEASUREMENTS

- All dimensions are in meter
- **General tolerance is $\pm 0,002$**



STAIRS

DESCRIPTION of EQUIPMENTS

S2 : PUSHBUTTON FOR LIGHTS L1 & L2

L2 : LED LIGHT, 8W

H2 : SOCKET 3 PINS 16/6 A

SIGNIFICATION of SYMBOLS

- - - - - : **axis** of PVC cable channel

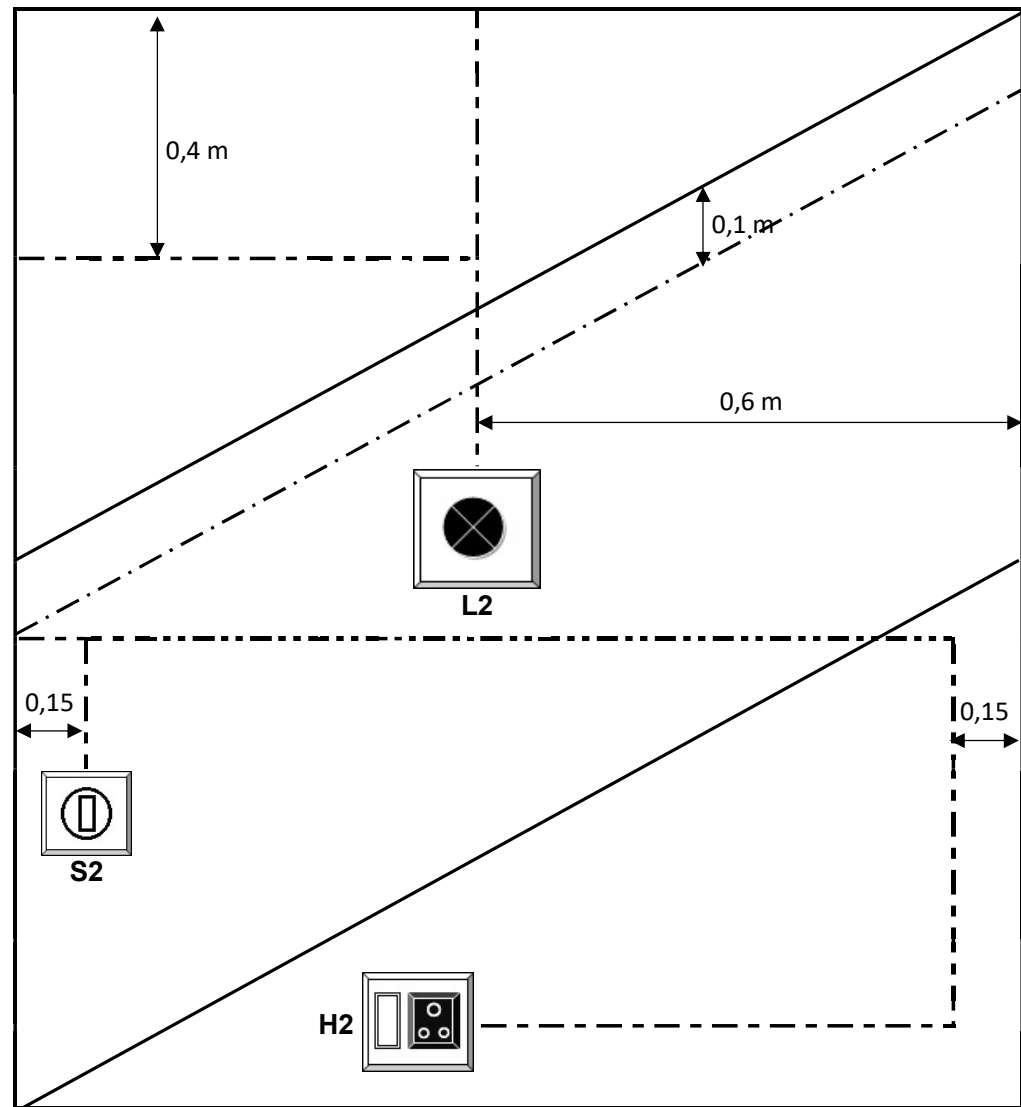
- Horizontally and oblique cable channels → Main cable channel → Large width
- Vertically cable channels → Auxiliary cable channel → Middle width

POSITION of EQUIPMENTS

- All electric plugs are 150 mm from the floor
- All pushbuttons or switches are 600 mm from the floor
- All lights points or ceiling fan points are 900 mm from the floor/stair step

DIMENSIONS and MEASUREMENTS

- All dimensions are in meter
- **General tolerance is $\pm 0,002$**



FIRST FLOOR

DESCRIPTION of EQUIPMENTS

S3 : PUSHBUTTON FOR LIGHTS L1 & L2

H3 : SOCKET 3 PINS 16/6 A

SIGNIFICATION of SYMBOLS

- - - - - : **axis** of PVC cable channel

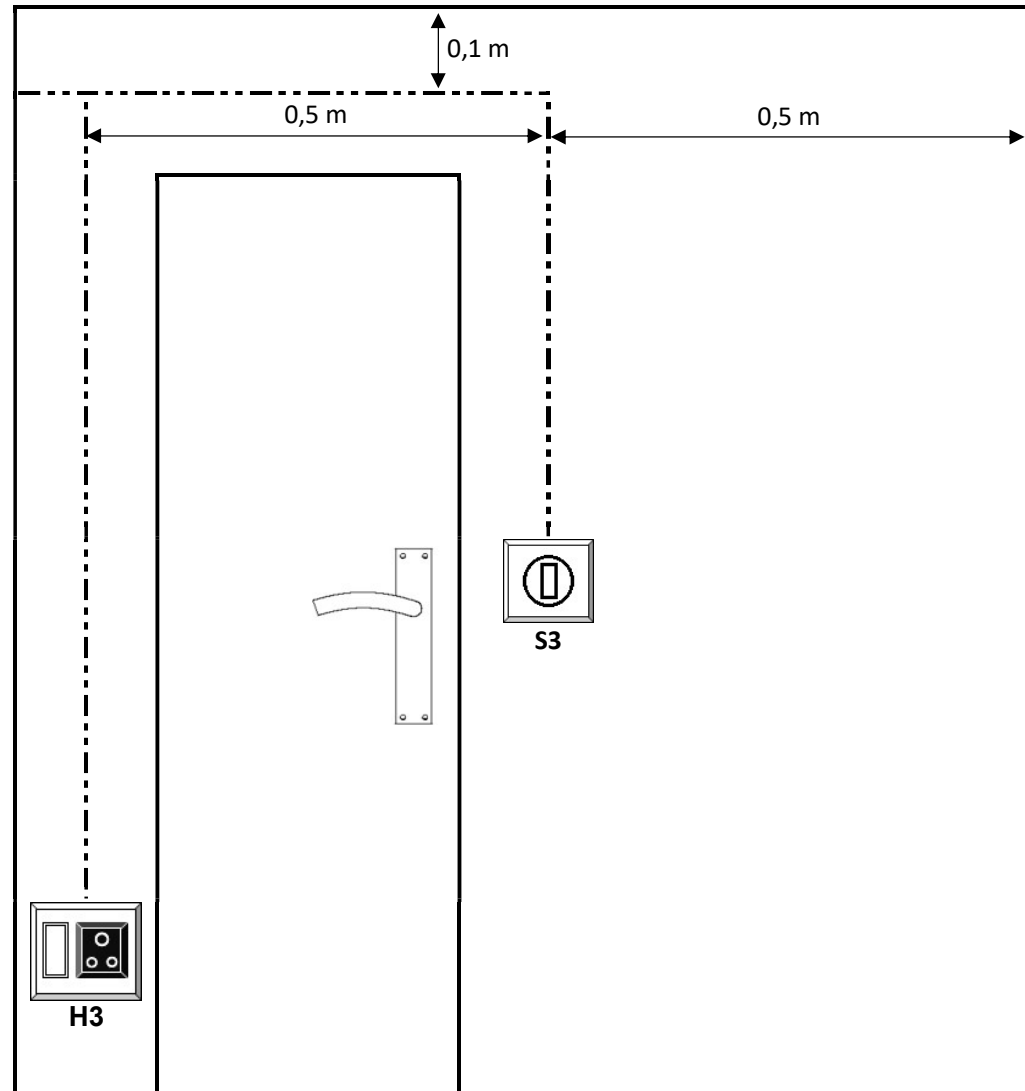
- Horizontally cable channel → Main cable channel → Large width
- Vertically cable channels → Auxiliary cable channel → Middle width

POSITION of EQUIPMENTS

- All electric plugs are 150 mm from the floor
- All pushbuttons or switches are 600 mm from the floor
- All lights points or ceiling fan points are 900 mm from the floor

DIMENSIONS and MEASUREMENTS

- All dimensions are in meter
- **General tolerance is $\pm 0,002$**



OUTSIDE

DESCRIPTION of EQUIPMENTS

L3 : TERASSE LIGHT, 6A

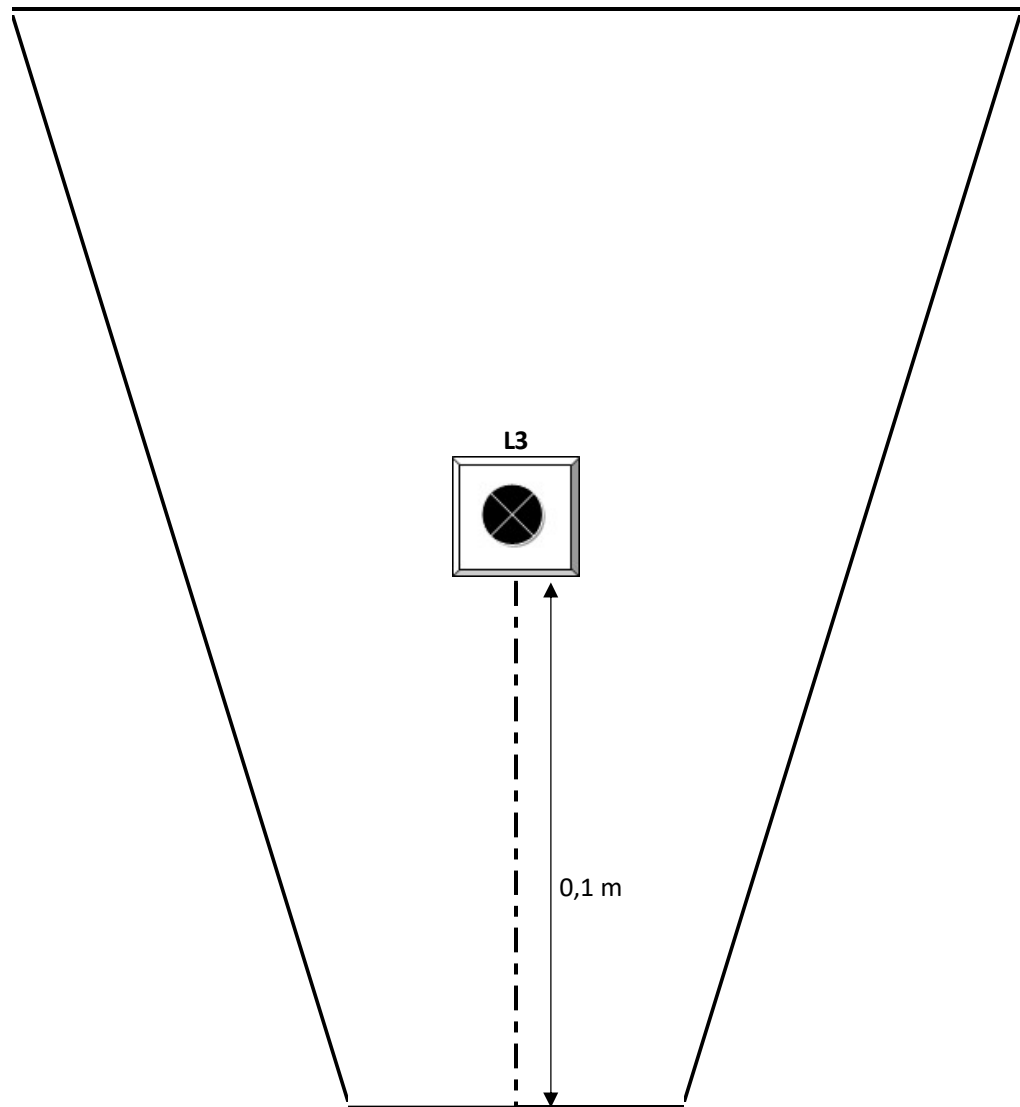
SIGNIFICATION of SYMBOLS

----- : **axis** of PVC cable channel

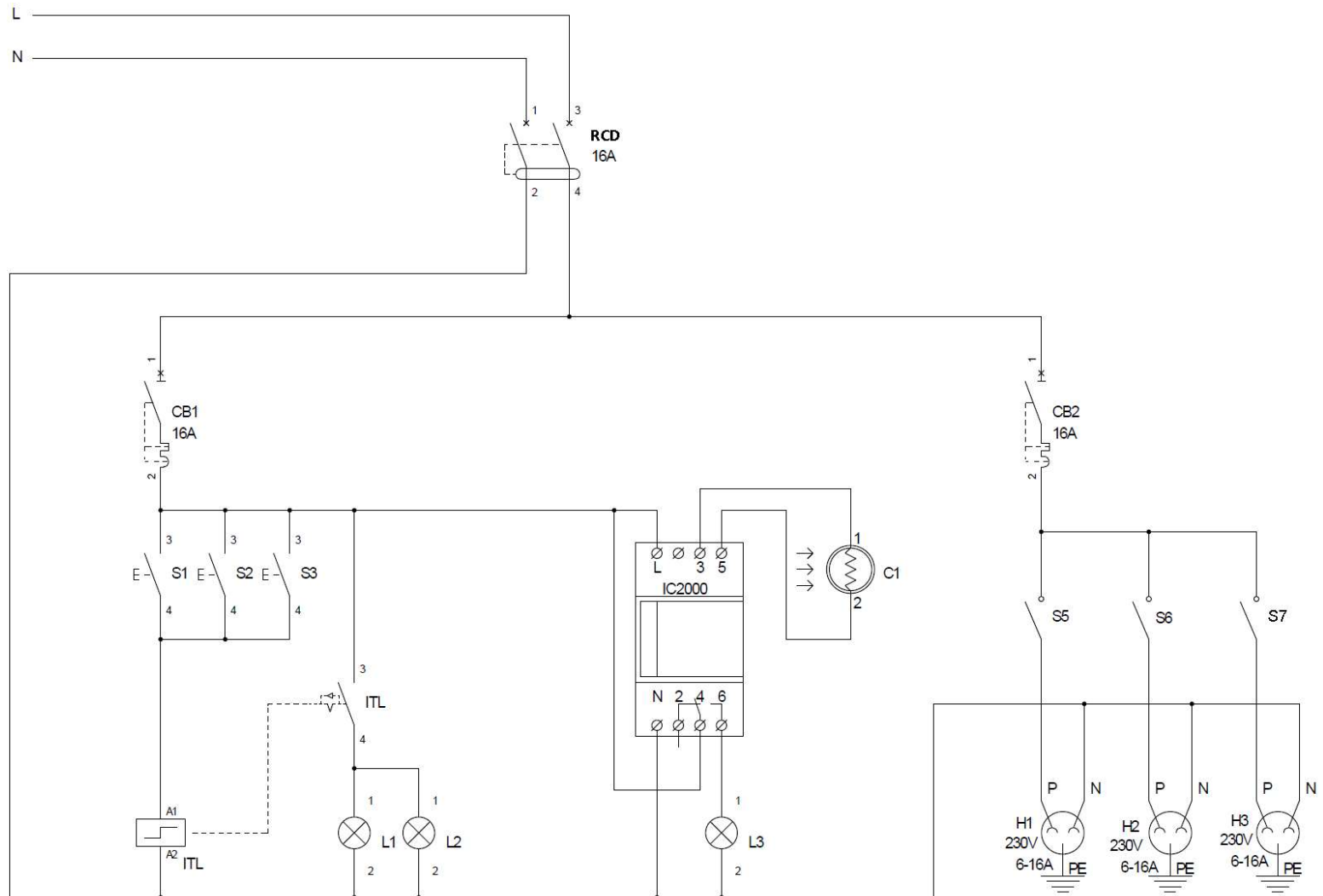
- Vertically cable channel → Auxiliary cable channel →
Middle width

DIMENSIONS and MEASUREMENTS

- All dimensions are in meter
- **General tolerance is $\pm 0,002$**



DIAGRAM



Section - C

C. Assessment

The Assessment is done by one expert. Aspects are criteria's which are judged for assessment from the following table.

	Criteria	Percentage of final result
A	Safety (electrical and personal)	10%
B	Commissioning and function	9,25%
C	Circuit design	18,25%
D	Measurements	6,75%
E	Installation of equipment and wire-ways	25%
F	Wiring and termination	20,75%
G	Installation testing	10%

The assessment and marking has to be done whether by measurement with a binary system (yes or no) or by judgement using a scale regarding to industry requirements as following :

Fourth level industry scale :

- performance below industry standard
- performance meets industry standard with mistakes
- performance meets industry standard
- performance wholly exceeds industry standard and is judged as excellent

Different expectations for each criteria can be evaluated. The tab on next pages give details.

- "M" means that the assessment is done according to the binary system of measurement.
- "J" means that the assessment is done regarding to industry requirements. In this case, the level reached by each competitor (one of four level) determines the percentage of maximal mark.

MARKING SCHEME

	Criteria	Percentage of final result	Mark
A	Safety (electrical and personal)	10%	
M	PPE are correctly implemented during non-electrical activities	2	
M	Workplace is properly organized, tidy and clean	2	
M	The choice of tool is relevant considering the task to be done	2	
M	Safe work practices during commissioning and power-up (Circuits powered)	2	
M	Safe work practices during testing (PPE, tools...)	2	
B	Commissioning and function	9,25%	
M	Installation fully complete (all equipment and covers in place) when electrical supply is requested	2	
M	Installation electrically safe (all equipment fixed in place and Cables connected) when electrical supply is requested	2	
M	All equipment labeled correctly following commissioning.	2	
M	Push on S1 turn ON light L1, push on S1 turn OFF light L1	0.25	
M	Push on S1 turn ON light L2, push on S1 turn OFF light L2	0.25	
M	Push on S2 turn ON light L1, push on S2 turn OFF light L1	0.25	
M	Push on S2 turn ON light L2, push on S2 turn OFF light L2	0.25	
M	Push on S3 turn ON light L1, push on S3 turn OFF light L1	0.25	
M	Push on S3 turn ON light L2, push on S3 turn OFF light L2	0.25	
M	Operation of MCB CB1 is in accordance as expected	0.25	
M	Operation of Socket H1 is in accordance as expected	0.25	
M	Operation of Socket H2 is in accordance as expected	0.25	
M	Operation of Socket H3 is in accordance as expected	0.25	
M	Operation of MCB CB2 is in accordance as expected	0.25	
M	Operation of Light L3 is in accordance as expected	0.25	
M	Operation of RCD is in accordance as expected	0.25	
C	Circuit design	18,25%	
M	Size - supply cabling of Impulse relay circuit is correct	2	
M	Size - supply cabling of sockets is correct	2	
M	Size - supply cabling of twilight switch circuit is correct	2	
M	Size - supply cabling between Main RCD and MCBs is correct	2	
M	The color code is used as per rule	1.5	
M	Supply power of Main DB is correctly provided	0.75	
M	Main PVC cable channel of Technical room has been correctly chosen	0.5	
M	Auxiliary PVC cable channel of Technical room has been correctly chosen	0.5	
M	Main PVC cable channel of Entrance panel has been correctly chosen	0.5	
M	Auxiliary PVC cable channel of Entrance panel has been correctly chosen	0.5	
M	Auxiliary PVC cable channel of Entrance panel has been correctly chosen	0.5	
M	Auxiliary PVC cable channel of Entrance panel has been correctly chosen	0.5	
M	Main PVC cable channel of Stairs panel has been correctly chosen	0.5	
M	Main PVC cable channel of Stairs panel has been correctly chosen	0.5	
M	Main PVC oblique cable channel of Stairs panel has been correctly chosen	0.5	
M	Auxiliary PVC cable channel of Stairs panel has been correctly chosen	0.5	

	Criteria	Percentage of final result	Mark
M	Auxiliary PVC cable channel of Stairs panel has been correctly chosen	0.5	
M	Auxiliary PVC cable channel of Stairs panel has been correctly chosen	0.5	
M	Main PVC cable channel of First floor panel has been correctly chosen	0.5	
M	Auxiliary PVC cable channel of First floor panel has been correctly chosen	0.5	
M	Auxiliary PVC cable channel of First floor panel has been correctly chosen	0.5	
M	Auxiliary PVC cable channel of Outside panel has been correctly chosen	0.5	
D	Measurements	6,75%	
M	Horizontal distance of Main DB is respected	0.25	
M	Vertical distance of Main DB is respected	0.25	
M	Horizontal distance of Cell C1 is respected	0.25	
M	Vertical distance of Cell C1 is respected	0.25	
M	Horizontal distance of Pushbutton S1 is respected	0.25	
M	Vertical distance of Pushbutton S1 is respected	0.25	
M	Horizontal distance of Light L1 is respected	0.25	
M	Vertical distance of Light L1 is respected	0.25	
M	Horizontal distance of Socket H1 is respected	0.25	
M	Vertical distance of Socket H1 is respected	0.25	
M	Vertical distance of Entrance main cable channel is respected	0.25	
M	Horizontal distance of Pushbutton S2 is respected	0.25	
M	Vertical distance of Pushbutton S2 is respected	0.25	
M	Horizontal distance of Light L2 is respected	0.25	
M	Vertical distance of Light L2 is respected	0.25	
M	Horizontal distance of Socket H2 is respected	0.25	
M	Vertical distance of Socket H2 is respected	0.25	
M	Vertical distance of Stairs main cable channel from Main DB is respected	0.25	
M	Vertical distance of Stairs main cable channel from Entrance is respected	0.25	
M	Vertical distance of oblique main cable channel is respected	0.25	
M	Horizontal distance of Pushbutton S3 is respected	0.25	
M	Vertical distance of Pushbutton S3 is respected	0.25	
M	Horizontal distance of Socket H3 is respected	0.25	
M	Vertical distance of Socket H3 is respected	0.25	
M	Vertical distance of First floor main cable channel is respected	0.25	
M	Horizontal distance of Light L3 is respected	0.25	
M	Vertical distance of Light L3 is respected	0.25	
E	Installation of equipment and wire-ways	25%	
M	Main DB is in correct location in Technical room panel	1	
M	RCD is in correct location in Main DB	1	
M	MCB CB1 is in correct location in Main DB	1	
M	MCB CB2 is in correct location in Main DB	1	
M	Twilight switch IC2000 is in correct location in Main DB	1	
M	Impulse relay ITL is in correct location in Main DB	1	
M	Twilight switch Cell C1 is in correct location on Technical room panel	1	

	Criteria	Percentage of final result	Mark
M	Lights L1 is in correct location on Entrance panel	1	
M	Socket H1 & switch S5 are in correct location on Entrance panel	1	
M	Pushbutton S1 is in correct location on Entrance panel	1	
M	Lights L2 is in correct location on Stairs panel	1	
M	Socket H2 & switch S6 are in correct location on Stairs panel	1	
M	Pushbutton S2 is in correct location on Stairs panel	1	
M	Lights L3 is in correct location on Outside panel	1	
M	Socket H3 & switch S7 are in correct location on First floor panel	1	
M	Pushbutton S3 is in correct location on First floor panel	1	
J	Equipments securely installed	3	
J	Cable channels : Securely fitted. Joints and angles are neat with no gaps. Secure with no movement.	3	
J	Cable : Correctly clipped with straight runs and even bends.	3	
F	Wiring and termination	20.75%	
J	Neatness of electrical wiring (Lights, switches, PB, sockets, cell) is satisfactory	6	
J	Neatness of cables on cable channels is satisfactory	3	
M	Conductors of RCD securely terminated with no bare copper showing	1	
M	Conductors of MCB CB1 securely terminated with no bare copper showing	0.5	
M	Conductors of MCB CB2 securely terminated with no bare copper showing	0.5	
M	Conductors of relay ITL (relay) securely terminated with no bare copper showing	0.5	
M	Conductors of relay ITL (switch) securely terminated with no bare copper showing	0.5	
M	Conductors of Twilight switch IC2000 (power supply) securely terminated with no bare copper showing	0.5	
M	Conductors of Twilight switch IC2000 (cell C1) securely terminated with no bare copper showing	0.5	
M	Conductors of Twilight switch IC2000 (NO switch) securely terminated with no bare copper showing	0.5	
M	Conductors of Cell C1 securely terminated with no bare copper showing	0.5	
M	Conductors of PB S1 securely terminated with no bare copper showing	0.5	
M	Conductors of Light L1 securely terminated with no bare copper showing	0.5	
M	Conductors of Socket H1 securely terminated with no bare copper showing	0.75	
M	Conductors of Switch S5 securely terminated with no bare copper showing	0.5	
M	Conductors of PB S2 securely terminated with no bare copper showing	0.5	
M	Conductors of Light L2 securely terminated with no bare copper showing	0.5	
M	Conductors of Socket H2 securely terminated with no bare copper showing	0.75	
M	Conductors of Switch S6 securely terminated with no bare copper showing	0.5	
M	Conductors of PB S3 securely terminated with no bare copper showing	0.5	
M	Conductors of Socket H3 securely terminated with no bare copper showing	0.75	
M	Conductors of Switch S7 securely terminated with no bare copper showing	0.5	
M	Conductors of Light L3 securely terminated with no bare copper showing	0.5	
G	Installation testing	10%	
M	Insulation resistance test - instrument and procedure are correctly performed	4	
M	Earth Continuity test - instrument and procedure are correctly performed	4	
M	Overall operation testing of circuit	2	
	TOTAL	100%	

Section - D

D. Infrastructure List

Workshop Installation-Tools & Equipment provided by Organizers of Test Project

Mechanical equipment & Tubing

1. Consumables, cleaning materials, paper, pens
2. 1 table and 1 chair ; 1 ladder or height workstation
3. 1 wood cubicle per competitor (with simulation of walls and roof). Panels are 1,2 m x 3,4 m

Instruments, electrical items, cables and accessories

1. 1 Residual Current Device 16A - 30 mA, 2 SP MCB 16A
2. 3 pushbuttons with NO contacts, 3 one way flush switch with NO contact,
3. 3 single-phase electric plugs 230V – 6-16A
4. 3 light bulbs 230 V
5. Power supply 230V 2P+E by a provided plug connected with a cable
6. Electrical accessories like switch/fuse units, junction boxes as required
Cables (different sections and colors), cable ends, glands, labels
PVC cable channels in different size, bends, screws, clips,
Plastic enclosure, connectors, terminal connections, branch boxes
7. Digital multimeter
8. 1 impulse relay Schneider A9C30811, 1 twilight switch Schneider CCT15368 with cell

Tools, Kit-Tool & Equipment allowed to be brought by competitors for competitions

1. Set of screwdrivers, insulated and not, wire stripper, nose plier, combination plier
 2. Measuring tape, poker, centre punch, level, miter box with saw, file
 3. Electrician Knife, Jokari cable knife, drill machine
- All other tools not mentioned in the list above to be provided by the organizers
 - During practical session change in the provided diagram is not allowed without any authorisation given by member(s) of jury
 - Time will be allocated to check the working condition of the component, declaration on not working condition should be done that time
 - The working methodologies are considered for marking
 - Any damage in the component will not be replaced if declared after starting of the competition
 - Competitors can check for the working of the circuit any number of time before declaration

Section - E

E. Instructions for candidates

The Health, Safety, and Environment Policy and Regulations are given below for the skill competition on electrical installation.

During the competition, competitors :

- MUST wear ear protection and eye protection at all times.
- All marking points regarding health and safety marks will be made clear to Competitors before competition begins

If the supervising expert, who are watching the competitors, witness any breach of the Health, Safety and Environment requirements during the Competition, he will:

- On the first occasion: Warn the Competitor and make a note of the breach;
- On the second occasion: Warn the Competitor and make a note of the breach;
- On the third occasion: A record of the breach will be made and result in a loss of the Health and Safety marks.

Section - F

F. Health, Safety, and Environment

1. All accredited participants, and supporting volunteers will abide by rules and regulations with regards to Health, Safety, and Environment of the Competition venue.
2. All participants, technicians and supporting staff will wear the required protective personnel clothing.
3. All participants will assume liability for all risks of injury and damage to property, loss of property, which might be associated with or result from participation in the event. The organizers will not be liable for any damage, however in case of injury the competitor will immediately inform the immediate organizer for medical attention.