



Sample Test Project

District / Zonal Skill Competitions
Skill- Electrical Installation

Category: Construction and Building Technology

Table of Contents

A. Preface.....	3
B. Test Project.....	4
C. Marking Scheme	6
D. Infrastructure List	18
E. Instructions for candidates	19
F. Health, Safety, and Environment.....	20

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.

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: 4 Hrs

Section - B

B. Test Project

Competitor Instruction Sheet

You have **4 hours** to complete this task.

Each competitor has to do following to complete the given task:

1. Design the electrical circuit and submit to the expert.
2. Do wiring and installation as per the instruction while following the measurement guidelines.
3. Commissioning and testing of installation as per standard.
4. Do give utmost care to all personal and health safety while working.

Example of Test Project- Electrical Installation

“Staircase Wiring”

Introduction

The circuit is to be designed to operate staircase light.

The staircase system taken into consideration here has one floor.

The ground floor and first floor has two switches to operate a light bulb mounted on roof of staircase of the house/flat.

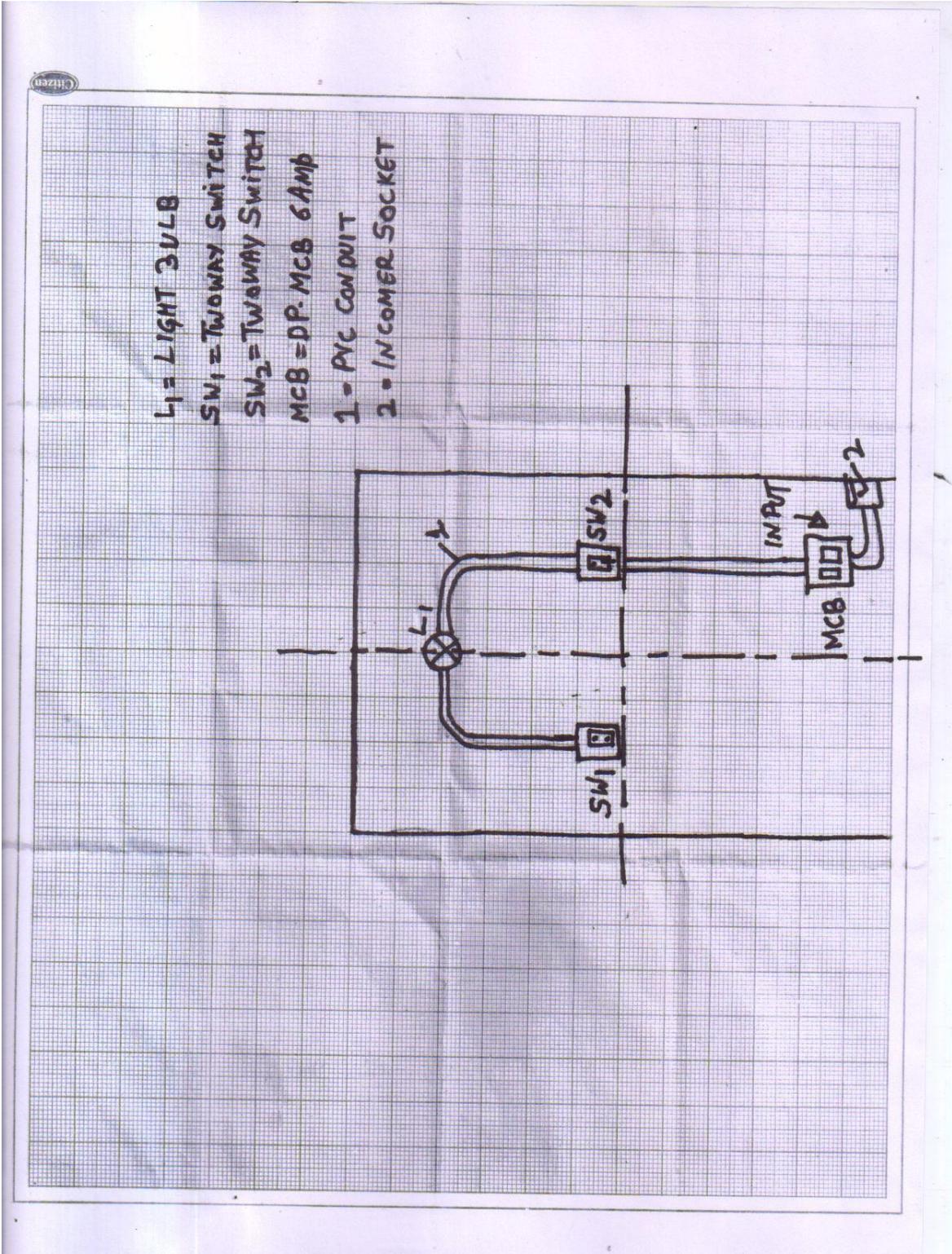
The competitors need to do electrical wiring to achieve following functions:

1. To switch ON the light bulb (L1) from ground floor by switch (SW1),if switched OFF by first floor switch (SW2).
2. To switch OFF the light bulb (L1) from first floor by switch (SW2),if switched ON by ground floor switch (SW1).
3. It means, the light bulb can be switched ON or OFF from both SW1 and SW2.
4. The neutral wire should connect directly to light bulb L1 and phase wire of input line
5. voltage should connect to light bulb L1 through SW1 and SW2.

Competitors need to complete the given tasks, keep in the mind the following observations

- a. Competitor need to draw the electrical circuit diagram on paper by giving all connection details of staircase wiring.
- b. The wiring and connection to be made on given wooden plank which is assumed as walls and roof of staircase.
- c. The competitor should take care of all electrical and personal safety.

Electrical Drawing



Section – C

C. Marking Scheme

The Assessment is done by awarding points by adopting two methods, Measurement and Judgments

- Measurement - One which is measurable
- Judgments - Based on Industry expectations

Aspects are criteria's which are judged for assessment.

In Electrical installation skill markings are done on both measurement and judgmental basis. For measurement marks awarded will be 0 or full marks and for judgmental marks will be awarded as

- 0- Below industry standard or no attempt:
- 1- Meets industry standard
- 2- Industry standard with elements of good practice
- 3- Excellent in comparison to industry standard

Example: If maximum marks for Judgment criteria is 1 and if all 3 Experts (Juries) give 3 points to a candidate, the candidate will get 1 mark for that aspect. If 2 Experts give 3 and 1 Expert gives 2 points, then candidate will get $(3+3+2)/9*1 = 0.89$ marks for that aspect out of 1 mark.

	<u>Criteria</u>	<u>Max. Marks</u>
A	Safety (electrical and personal)	10.00
B	Commissioning and function	25.00
C	Circuit design	15.00
D	Measurements	10.00
E	Installation of equipment and wire-ways	15.00
F	Wiring and termination	15.00
G	Installation testing	10.00

Sub Criteria Name or Description	Aspect Type M = Meas J = Judg	Aspect - Description	Judge Score	Max Mark	Marks Obtained
A1- Health & Safety					
	M	No breaches and maintained a tidy workspace = 0.5 marks		0.50	
		Any breach must be confirmed by at least 2 Experts and recorded in a skill log book			
	M	No breaches and maintained a tidy workspace = 0.5 marks		0.50	
		Any breach must be confirmed by at least 2 Experts and recorded in a skill log book			
A2- Health & Safety					
	M	No breaches and maintained a tidy workspace = 0.5 marks		1.00	
		Any breach must be confirmed by at least 2 Experts and recorded in a skill log book			
	M	No breaches and maintained a tidy workspace = 0.5 marks		1.00	
		Any breach must be confirmed by at least 2 Experts and recorded in a skill log book			
A3- Health & Safety					
	M	No breaches and maintained a tidy workspace = 0.5 marks		1.50	

		Any breach must be confirmed by at least 2 Experts and recorded in a skill log book			
	M	No breaches and maintained a tidy workspace = 0.5 marks		1.50	
		Any breach must be confirmed by at least 2 Experts and recorded in a skill log book			
A4- Health & Safety					
	M	No breaches and maintained a tidy workspace = 0.5 marks		2.00	
		Any breach must be confirmed by at least 2 Experts and recorded in a skill log book			
	M	No breaches and maintained a tidy workspace = 0.5 marks		2.00	
		Any breach must be confirmed by at least 2 Experts and recorded in a skill log book			
B1- Commissioning process					
	M	Installation fully complete (all equipment and covers in place) when electrical supply is requested - confirmed by at least 2 Experts with a visual check		3.00	
	M	Installation electrically safe (all equipment fixed in place and all cables connected) when electrical supply is requested - confirmed by at		3.00	

		least 2 Experts with a visual check			
	M	Safe work practices during power-up (all circuits powered). If any unsafe practices observed and confirmed by at least 2 experts = 0 marks		4.00	
	M	Safe work practices during commissioning. If any unsafe practices observed and confirmed by at least 2 experts = 0 marks		4.00	
	M	Safe work practices during testing. If any unsafe practices observed and confirmed by at least 2 experts = 0 marks		4.00	
	M	No short circuits or earth faults during power-up and commissioning. If any short circuit or earth fault observed and confirmed by 2 experts = 0 marks		3.00	
	M	All equipment labelled correctly following commissioning.		2.00	
	M	Function chart completed by competitor reflecting actual function		2.00	
C1-Circuit design					
	M	Size - supply cabling Switch 1		1.50	
	M	Colour code as per instructions		1.50	
	M	Size - supply cabling Switch 2		1.50	

	M	Colour code as per instructions		1.50	
	M	Size - supply cabling MCB		1.50	
	M	Colour code as per instructions		1.50	
	M	Size - supply cabling Socket		2.00	
	M	Size - cabling for lights		2.00	
	M	Size - cabling for power outlets		2.00	
D1- Measurements					
	M	Measurement 1 (Centres of socket to MCB)		2.00	
	M	Measurement 2 (Centres of MCB to Switch2)		2.00	
	M	Measurement 3 (Centres of Switch2 to Lamp1)		2.00	
	M	Measurement 4 (Center of Lamp1 to Switch2)		2.00	
	M	Measurement 5 (Center of Socket to Switch 1)		2.00	
E1-Installation of Equipment					
	M	Correct equipment in correct locations on back wall of cubicle as per drawing		1.25	
	M	Correct equipment in correct locations on left hand wall of cubicle as per drawing		1.25	
	M	Socket securely installed		1.25	
	M	Switch 1 securely installed		1.25	
	M	Switch 2 securely installed		1.00	
	M	Lamp 1 securely installed		1.00	

E2-Installation of Wire ways (Trunking and tray)					
	J	PVC Trunking. Securely fitted. Joints and angles are neat with no gaps. Secure with no roll.		2.00	
		Below industry standard or no attempt: Joints are badly cut with excessive gaps. Lids not fitted or not fitted correctly. Roll or movement of trunking.	0		
		Meets industry standard: Joints are neat and even but with gaps. Covers fitted. No roll or movement.	1		
		Industry standard with elements of good practice: Joints are neat with only some minor gaps. Covers fitted. No roll or movement.	2		
		Excellent in comparison to industry standard: Joints are neat with no gaps. Covers fitted. No roll or movement.	3		
	J	Cable tray. Securely fitted. Joints and angles are neat with no gaps. Secure with no roll or movement.		2.00	
		Below industry standard or no attempt: Joints are badly cut with excessive gaps Cuttings have sharp edges and/or burrs. Roll or movement of tray or brackets.	0		

		Meets industry standard: Joints are neat and even but with gaps. Some cuttings have sharp edges and/or burrs. No roll or movement of tray or brackets	1		
		Industry standard with elements of good practice: Joints are neat with only some gaps. Cuttings have no sharp edges but some burrs. No roll or movement of tray or brackets	2		
		Excellent in comparison to industry standard: Joints are neat with no gaps. Cuttings have no sharp edges or burrs. No roll or movement of tray or brackets	3		
E3-Installation of wire ways (Cable and conduits)					
	J	Cable. Correctly clipped with straight runs and even bends.		2.00	
		Below industry standard or no attempt: Clips unevenly spaced. Cable not straight and even. Bends too sharp or too long.	0		
		Meets industry standard. Cable straight and even with good bends but clips not evenly spaced.	1		
		Industry standard with elements of good practice: Cable straight and even with good bending and the majority of cable clips evenly spaced.	2		

		Excellent in comparison to industry standard: Cable straight and even with good bending and all cable clips evenly spaced.	3		
	J	PVC and metal conduit. Bends, angles and jumps are even with no distortions		2.00	
		Below industry standard or no attempt: Saddles not evenly spaced, poor termination to trunking or boxes, poor bends with uneven radius and distortions. Jump overs not matching	0		
		Meets industry standard: Majority of bends have even radius with some minor distortion. Saddles evenly spaced and correct terminations to trunking and boxes. Jump overs not matching.	1		
		Industry standard with elements of good practice: All of the bends have even radius with no distortion. Saddles evenly spaced and correct terminations to trunking and boxes. Jump overs closely matching.	2		
		Excellent in comparison to industry standard: All of the bends are smooth, have identical bend radius and are at the correct angles. Jump overs are matching.	3		
F1-Wiring in boards					
	J	Neatness of wiring in Switch1		2.00	

		Below industry standard or no attempt: All cables not loomed or loomed but untidy. Cabling not straight and vertical into switchgear.	0		
		Meets industry standard: All looms are neat and tidy but with some cabling crossover. Some cabling straight and vertical into switchgear.	1		
		Industry standard with elements of good practice: All looms neatly with very few cabling crossovers. Majority of cabling straight and vertical into switchgear.	2		
		Excellent in comparison to industry standards: All looms with no cabling crossovers. All cabling straight and vertical into switchgear.	3		
	J	Neatness of wiring in Switch2		2.00	
		Below industry standard or no attempt: All cables not loomed or loomed but untidy. Cabling not straight and vertical into switchgear.	0		
		Meets industry standard: All looms are neat and tidy but with some cabling crossover. Some cabling straight and vertical into switchgear.	1		
		Industry standard with elements of good practice: All looms neatly with very few cabling crossovers. Majority of cabling straight and vertical into switchgear.	2		
		Excellent in comparison to industry standards: All looms with no cabling crossovers.	3		

		All cabling straight and vertical into switchgear.			
	J	Neatness of wiring in Lamp1		2.00	
		Below industry standard or no attempt: All cables not loomed or loomed but untidy. Cabling not straight and vertical into switchgear.	0		
		Meets industry standard: All looms are neat and tidy but with some cabling crossover. Some cabling straight and vertical into switchgear.	1		
		Industry standard with elements of good practice: All looms neat with very few cabling crossovers. Majority of cabling straight and vertical into switchgear.	2		
		Excellent in comparison to industry standards: All looms with no cabling crossovers. All cabling straight and vertical into switchgear.	3		
F2-Cabling on tray					
	J	Neatness of cables on cable tray		1.50	
		Below industry standard or no attempt: All cables not cable tied or cable tied but untidy. Cables not secured properly to tray. Bends on cables are uneven. No segregation of cabling	0		
		Meets industry standard: Cables neat and tidy but cable ties are unevenly spaced. No kinks or twists on cables. Most of the bends on	1		

		cables are even. Cables segregated correctly.			
		Industry standard with elements of good practice: Cables neat and tidy and cable ties are evenly spaced. No kinks or twists on cables. Most of the bends on cables are even. Cables segregated correctly.	2		
		Excellent in comparison to industry standards: Cables well grouped and stacked, very neat and tidy and cable ties are evenly spaced. No kinks or twists on cables. All of the bends on cables are even. Cables segregated correctly.	3		
F3-Terminations					
	M	Switch1: All conductors securely terminated with no bare copper showing		1.50	
	M	Switch2: All conductors securely terminated with no bare copper showing		1.50	
	M	MCB: All conductors securely terminated with no bare copper showing		1.50	
	M	Lamp1: All conductors securely terminated with no bare copper showing		1.50	
	M	Socket: All conductors securely terminated with no bare copper showing		1.50	

G1-Installation Testing					
	M	Insulation resistance test - instrument and procedure		2.00	
	M	Insulation resistance test - value and unit report sheet		2.00	
	M	Earth Continuity test - instrument and procedure		2.00	
	M	Earth Continuity test - value and unit report sheet		2.00	
	M	Overall operation testing of circuit		2.00	
		Total		100.00	

Section - D

D. Infrastructure List

Infrastructure List (Tool and equipment including raw material)

The quantity is given for each candidate

S. No.	Item	Requirement/specification
1	Multi Screw Drive	1 Set
2	Plier Insulated	1 Per Competitor
3	Measuring tape	1 Per Competitor
4	Spirit Lever	1 Per Competitor
5	Chuck	1 Per Competitor
6	Light Hammer	1 Per Competitor
7	Multimeter (Digital 3 ½ digit)	1 Per Competitor
8	Line Tester	1 Per Competitor

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 all Competitors before competition begins.

If the supervising Experts, who are watching the Competitors, witness any breach of the Health, Safety and Environment requirements during the Competition they 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.