

# IndiaSkills Test Project

## INFORMATION NETWORK CABLING

### State\_level



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## Introduction

This project is “Laying, Installation. Termination & Testing of UTP & fibre optic premises network cabling”.

The above-mentioned tasks namely Laying, Installation. Termination & Testing are one of the most important and highly skilled tasks to install the premises information cabling network and any discrepancies in the same would greatly affect the overall quality and performance of the work performed thereby resulting network disruptions and failures which will invariably increase in the project cost and time. In addition, the work quality greatly affects the overall quality of the information network cabling system.

## Description of project and tasks

This project is to prepare to lay, terminate & test a set of 4 UTP category 6 cables from a Category 6 patch panel to a Quad Information outlet placed in the user area and a 12 core distribution tight buffered fiber at its two end area link ends and in a complete manner, the work time is limited, and 4 UTP user connections & 6 fiber backbone premises terminations must be prepared at both the end of the respective link in the specified time. This module is a challenge by competing efficiently and correctly as per the standards and industry best practices and how well both the UTP & optical fiber end connections can be connectorized & spliced with good quality.

## Instructions to the Competitor

The work understanding, preparation and the competition time is 8 Hours (480 Minutes):

60 minutes for understanding, discussion and doubt solving with expert, 60 minutes for equipment setup & preparation and 300 minutes for cable pulling, laying, termination & testing. This module is whether competitor can the given task in the specified time adhering to the standard industry practices & WorldSkills standards of performance & safety. Each fiber connection loss shall be less than 1.0 dB and total link loss under 2.5 db. for a link of a maximum 50 meters and a minimum of 30 meters while the UTP links must pass the ISO/IEC 11801 class D standards requirements for a similar maximum distance of 50 meters and a minimum of 30 meters. There shall be 15-minute break in between these activities included in the total time of 300 minutes (UTP & Fiber) for time management. A competitor may choose to start with any of this activity based on his preference.

The total activity time therefore would be 300 minutes (including the intermediate 15 minute break between the two specified tasks) after which 60 minutes will be provided for work observation, testing and measurements, documentation and marks finalisation.

**The method of work process is as follows;**

### **1. Understanding (60 minutes)**

[1]. Read the provided connectivity diagram and the work expectations with the total number of fiber connectorisation intended with the correct colour code and order. Further understand the UTP integration process and the respective locations where it is prescribed to be connected.

[2]. Discuss the same with the expert and take his approval on the plan of action, Draw the connectivity plan on paper with the respective splice and fiber core to have a single continuous link for testing for all fiber links and similarly perform your actions for the UTP links prescribed.

### **2. Preparation (60 Minutes)**

[1]. Practice cable jacket removal of the introduced UTP & optical cables. Cable jacket removal means all the preparatory work to enable connectorisation later. However, coating-removal and color-coding of the optical fibers are prohibited, similarly UTP cable removal from boxes provided before the start of the activity for preparing bunches is also strictly prohibited.

[2]. The cable must be firmly laid using proper cable tying mechanism on the trays and the end panels. Any strength material present in cable must be removed and disposed of properly.

[3]. Competitors must fix the optical cables at the respective LIU provision locations to prevent them from moving.

[4]. Proper colour code for fiber (ANSI / TIA 598C).

[5]. Competitors may place the material at their destined places but are not allowed to start any activity related to cable laying, installation or termination

[6]. Preparation time is 60 minutes sharp. Competitors must open and verify all materials that they will need during their activity time.

[7]. Check electronic discharge and splicer operation along with the proper operation of tools during preparation time. Also check the test equipment and acquaint yourself with its work instructions and clear doubts if any.

[8]. Competitors may soak the wiping paper in alcohol before the test.

### **3. Work activity (300 Minutes)**

- [1]. Splicer and cleaver to use must be standardised ones preferably provided by the organiser / sponsor.
- [2]. Splicer and cleaver must be on the table while working.
- [3]. All necessary tools must be present for ease in work activity with especially eyewear present at all time.
- [4]. When achieving your target, be sure to connect a launch and a tail cord to the fiber link and connect it to the appropriate fiber number. If you could not connect the respective cords, the links will not be counted in testing
- [5]. These connection methods (colour code etc.) is as per the standard provided, get clear understanding of the same as adhering to the standardised colour code will help you gain points
- [6]. The number of linkconnections are 12, however at least6links are mandatory to be completed in the stipulated time
- [7]. Clean the fiber at least 3 times every time after fiber jacket removing by a new wiper.
- [8]. Clean optical fiber buffer stripper for every splice. You may be used to clean the optical fiber remover or clean it by simply blowing it.
- [9]. Clean optical fiber cleaver and fusion splicer properly, so that the parts of connection won't have any problems.
- [10]. Use only one fusion splicer, and cleaver. However, for the case of accidents, you can bring extras in the competition. Please note that if such accidents occurred due to mishandling by the competitor or inappropriate maintenance, the competitor may have his/her point deducted from his/her marks and even be asked to leave the competition based on the gravity of the same.
- [11]. Competitors can use a Visual Fault Locator during test to crosscheck if they are working in the right direction.
- [12]. Sleeve must be heated to make the connection point in the center of the sleeve.
- [13]. UTP cable links must initially be prepared in individual loops and bunched together before installing them. Only a maximum of 60mm of jacket removal is prescribed with a maximum of 10mm twist removal for better performance and operation.
- [14]. All prescribed links must be identified and labelled at both ends for easy identification.

### Equipment, machinery, installations, and materials required - Fiber

The materials required are required per participant for conducting this test module are mentioned as under in the following list.

Item No	Description	Classification	Quantity	Remarks
1	Fusion splicer with benchtop cleaver.	Equipment	1	For splicing
2	2/ 3-hole Fiber Stripper	Tool	1	For fiber stripping
3	Alcohol dispenser & lint free wipes	Consumables	1	For fiber cleaning
4	Splice protection sleeves	Consumables	15	For splice protection
5	Splice Tray	Equipment		For installing prepared splices
6	SC fiber Pigtail	Consumables	3	For end connectivity plus one spare
7	Visual Fault Locater – Universal 2.5mm (10mw)	Equipment	1	For preliminary testing
8	OTDR	Equipment	1	SM / MM high resolution type to segregate intersplice results
9	Cable Ties & Tie Holder	Consumables	10	Of requisite type based on the setup
10	Worktable		1	Atleast 3 x 1.5 ft minimum with proper working surface
11	Kevlar scissors	Tools	1	For Kevlar removal during cable preparation
12	Fiber cable jacket stripper	Tool	1	For cable jacket removal with damaging fiber.
13	Eye protection eyewear	Tool	1	Safety
14	Cut resistant gloves	Consumable	1	If required based on cable type
15	Fiber simplex patch cord with couplers	Consumable	2	Depending on the connector and VFL type
16	12 core tight buffer indoor distribution cable (35 Meters Velcro dressed)	Consumable	1	For connectorisation
17	Permanent Marker pen & measurement scale	Tool / Consumable	1	For marking and measuring purposes

### Equipment, machinery, installations, and materials required - Copper

The materials required are required per participant for conducting this test module are mentioned as under in the following list.

Item No	Description	Classification	Quantity	Remarks
1	Cat6 patch panel 24 port	Equipment	1	For termination
2	Network rack (4U)	Equipment	1	For each contestant
3	Cat6 cable box (305 Mtr)	Consumables	1	preferably one per contestant.
4	Cat6 I/O with face plate and box	Consumables	4	Quantity depends on contestants
5	Link continuity and Wiremap tester	Equipment	1	For preliminary testing
6	Fluke DSX 5000 Analyser with copper and fiber modules with OTDR functionality	Equipment	1	For final testing
7	Punch down tool	Tool	1	For preliminary testing
8	Cable cutter	Tool	1	For cable cutting,
9	Cable Ties	Consumables	10	Of requisite type based on the setup
10	Cat6 patch cords	Consumables	2	
11	Screw driver	Tool	1	For mounting patch panel in rack
12	cable jacket stripper	Tool	1	For cable jacket removal
13	Eye protection eyewear	Tool	1	Safety
14	Cut resistant gloves	Consumable	1	If required based on cable type
15	Permanent Marker pen & measurement scale	Tool / Consumable	1	For marking and measuring purposes
16	Disposal bin	Accessories	1	For
17	Worktable		1	At least 3 x 1.5 ft minimum with proper working surface

**Please Note:** for Fiber & UTP – Copper, The Quantity depends on contestants, all material mentioned is per contestant at all cases other than test equipment.

**Marking Scheme.**

Criteria							
ID	Name					Mark	Achieved weighted points
A	Quality					4.40	4.4
B	Proper Procedure					16.50	16.5
C	Functionality					17.40	17.4
D	Fundamental installation					46.40	46.4
E	Knowledge					11.80	11.8
F	Safety					3.50	3.5
G							
H							
Total						100.00	100.00
Sub Criterion ID	Sub Criterion Name or Description	Aspect Type M = Meas J = Judg	Aspect - Description	Judg Score	Extra Aspect Description (Meas or Judg) OR Judgement Score Description (Judg only)	Max Mark	
A1	Fiber Link & Splicing quality	M	OTDR loss & Sleeve condition (Min 6 links to be operational)		0.3 mark loss if link loss is 2.5dB or more. 0.3 mark less per splice if a sleeve is in bad condition.	12.00	
A2	UTP Termination & installation Quality	M	Unshield cable -Appropriate termination (jacket/untwist/location/code)		0.5 mark loss per one error. Examine all four modular jacks. Bending wire, IDC impact, wire condition, etc.0.5 mark loss per error.	8.00	
B1	Working process & procedure	M	Installation method		Correct handling cable & fiber and selection of the appropriate cabling media and tool,etc) 0.5 mark less if not followed	1.00	
		M	Splicing procedure		Correct procedure - splicing and terminating - (Appropriate fiber cleaning(3 times new wipe/cleaning, procedure,etc.) 0.5 mark less if not followed	1.00	
		M	Working method & procedure. Appropriate installation at actual field		1 mark loss per mistake in installation.Select the appropriate location terminating with labelling	4.00	
		M	Working environment - Copper		Neat and tidy all the work time. 2 point deduction if have dirtied or broken the facility. Photo is necessary to deduct any point	3.00	
		M	Working environment - Fiber		Neat and tidy with Inspected, cleaned & installed cabling and connector ready for final testing. 3 point deduction if not according to the mark	5.00	
C1	Link Performance & Test Results	M	Done Visible testing - Fiber Links		Correct visible testing and selection of the appropriate links with correct polarity. 0.5 mark less if not done for each link. No points to be granted if 6 links not completed to a minimum. 0.5 for each correct link	6.00	
		M	Satisfied insertion loss - Fiber Links		1.0 mark loss per one mistake (loss > 2.5 db). Satisfied insertion loss all links gets 1 point per link	12.00	
		M	Satisfied certification test - Copper Links		1.0 mark loss per one mistake ISO/IEC 11801 Class D test failure. Satisfied insertion loss all links gets 1 point per link	4.00	
		M	Satisfied wiremap test - Copper Links		1.0 mark loss per one mistake in wiremap failure. Satisfied insertion loss all links gets 1 point per link	4.00	
D1	FO LIU 1 & 2 - Wall mount -	M	Serious installation defect - Fiber		Incoming distribution cable not secured properly and can be pulled back thereby damaging the terminations. 2 point reduction for each LIU location error.	5.00	
		M	Minor installation defect - Fiber		0.5 mark loss per one mistake of improper dressing, loose coupling etc	5.00	
		M	Fiber job completion (minimum 6 links physically operational)		No marks for less than 46 links. 1.0 mark loss per one per link less than the specified 12	12.00	
		M	Copper Job completion - (all 4 Copper Links)		No marks for less than 4 links.	4.00	
		M	Serious installation defect - Copper		2 point reduction for each LIU location error.0. (Completion) Completion links.1. (Mounting position & condition): Mounting correct unit. Firmly fixing, correct number of screws.2.(Bending) Bending radius_ 4 times cable diameter. 3.(Connector/Adaptor)Firmly connect to adaptor. Cap insert blank adaptor.4(Cable damage) The end of the cable jacket is managed properly. No damage.	5.00	
		M	Minor installation defect - Copper		0.5 mark loss per one error.1. (Cable fixing - entry point) Firmly fixing_TM is trough the support hole. , Using cable tie. 2.(Jacket) Appropriate cable jacket condition. 3.	5.00	
E1	Design	M	Description and approval		Everything is described and approved by Expert.	5.00	
		M	Satisfied wiremap test - Copper Links		1.0 mark loss per one mistake in wiremap failure. Satisfied insertion loss all links gets 1 point per link	4	
		M	Health and Safety1		H & S during work: One violation acceptable. 1.0 mark loss on the second same violation or two different violations and then for every continual violation	5.00	
		M	Health and Safety2		H & S after work completed: Neat and tidy. No remaining waste. Tools and equipment are put in order.One violation acceptable,1.0 mark loss on the second same violation or two different violations and then for every continual violation	5.00	

**Points to Remember:**

The important point of this module is to complete both the activities in copper and fiber (in the order of the competitors choice which needs to be made beforehand and communicated to the expert during the preparation stage) and connectorize as many as possible optical fiber links (minimum 6 of the 12) and all 4 UTP links within the stipulated time. The right procedure and method must be applied for this purpose.

OTDR Equipment for SM / MM high resolution type to test & segregate intersplice results will be required in common with the expert.

**The total marks in the assessment criteria includes the following:**

**Quality** -Assessing the work quality of fiber and copper links and installation.

**Proper Procedure** -Assessing during the Competition whether the Test Projects have been performed in the correct work procedure or not. General assessing points are as follows:

- Appropriate work planning,
- Professional planning and installing with desired completion results.

**Functionality** - Assessing the quality and performance of the Information network links

**Fundamental Installation** – adhering to Industry standards and work practices in an efficient manner.

**Knowledge** – Basic design understanding and communicating skill to understand the requirement and implement as desired.

**Safety** -All tasks performed in accordance with the Health, Safety, and Environment Policy and Regulations.



Test project Setup Picture for Reference & Understanding:

1. UTP copper installation – Category 6



## 2. Premises Tight buffered distribution Fiber installation



## Other

Competitors are required to adhere to the following instructions:

1. Wearing of safety goggles always during all installation procedures.
2. All competitors should observe safety and tools should be properly and correctly used to prevent any mishap.
3. In case of an accident, competitor will have to stop and cancel the competition.

Identify the problems that may exist and check with experts if he may continue. There can be a situation where the competitor might be asked to leave the competition in between if he is observed to be causing harm to himself or other competitors by his actions or work practices

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**For any queries or additional information required, please get in touch with the expert.**

