INTERNSHIP REPORT

National Projects Construction Corporation Limited

(A Government of India Enterprise, under Ministry of Water Resources, River Development and Ganga Rejuvenation)

Electrical Department

03.07.2018-13.08.2018

Submitted By:

RISHABH KUMAR

DTU/2K16/EL/068

DELHI TECHNOLOGICAL UNIVERSITY

ACKNOWLEDGEMENT

First I would like to thank Mr. Kamal Dev, the Zonal Manager of National Projects Construction Corporation Limited (NPCC), for giving me the opportunity to do an internship within the organization. For me it was a great experience to be part of engineering team of Electrical Department of NPCC.

I would like to extend my sincere and heartfelt obligation towards all the personages who helped me in this internship. Without their active guidance and cooperation, I would not have made headway in this internship. Furthermore I want to thank all the students, with whom I did the fieldwork.

I am grateful to Mr. Mahendra Pal Singh (Site Manager), for the consistent guidance and enlightening words during the course of the internship. I would be doing injustice if I forgot to thank all the shift in-charges and engineering assistances who made me aware of the process undergoing at the site. Last but not the least, I would like to thank my parents and friends for their support and guidance.

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SUMMARY

I have done my summer internship at **NATIONAL PROJECTS CONSTRUCTION CORPORATION LIMITED (NPCC), New Delhi**. The internship was for the duration of 6 weeks and it involved a lot of learning activities. The internship was concentrated on Electrical Power Supply installation at second floor of Undergoing Construction site of transit accommodation for Railway Operational Staff. At the beginning of the internship I had set several learning goals regarding the improvement of knowledge and skills on Electrical power supply and its components.

Internship Objectives:

- Understanding Electrical Drawing
- Learn about types of components used in Electrical power supply
- Component Selection on the basis of future estimated load
- Methods and Planning involved
- Testing of supply network

This internship gave me insights of how a project is executed from start to end. From reading electrical drawing to delivering the tested power supply network to site manager. Overall, it was a great experience which helped me improving my management, communication and planning skills. This internship also helped me in understand how important it is to pre-plan everything or have atleast a structured plan before any execution to deliver the work fast and efficiently.

1. Introduction

This report is a short description of my six weeks internship. This internship was carried out at Construction site of transit accommodation for Railway Operational Staff at Railway Colony, Tilak Bridge, New Delhi under National Projects Construction Corporation Limited. As I am pursuing Bachelor in Electronics and Electrical Engineering, I was given an opportunity to learn in Electrical Department of the Corporation. The work during my time of internship was concentrated on the Installation of Electric Power Supply network on the second floor of the building.

At the beginning of the internship I formulated several learning goals, which I wanted to achieve:

- To use my gained skills and knowledge;
- To see what skills and knowledge I still need to work in a professional environment;
- To enhance my communication skills;
- To see what is like to work in a professional environment;
- To get fieldwork experience;
- To understand the functioning and working of how a project is carried out.

This internship report contains my activities that have contributed to achieve a number of stated goals. In the following chapter, a description of the National Projects Construction Corporation Limited and the activities is given. After that, a reflection on my functioning and the learning goals achieved during the internship are described. Finally I give a conclusion on the internship experience according to my learning goals.

2. Description of the Internship

2.1 National Projects Construction Corporation Limited (NPCC)

National Projects Construction Corporation Limited (NPCC) was established on 9th January 1957 as a premier construction company to create necessary infrastructure for economic development of the country in the core sectors of irrigation and water resources, power and heavy industries. Its administrative control was transferred from Ministry of Irrigation and Power to Ministry Water Resources, River Development and Ganga Rejuvenation (earlier named as Ministry of Water Resources) in 1989. NPCC ltd comply with Quality management requirements of ISO 9001-2008 for execution of Civil Works for Thermal & Hydro Electric Projects', River Valley Projects, Industrial Structures, Project Management Consultancy services for buildings, Housings, Roads, Bridges and Infrastructure Projects. In its 58 years of existence the Corporation has successfully associated itself with completion of several National Projects from concept to commissioning stage. Some of them in remote and hazardous location over the country. Besides completion of projects in India and contributing to the socio-economic growth of country, the corporation has also successfully executed several overseas projects. The corporation is making profit for the last five years and now has a positive net worth. Today as a Team, NPCC is gearing up to achieve greater heights for "Mini Ratna" status. The corporation has also been awarded credit rating as A+ company by ICRA.

These projects, which are only representative to the NPCC's capabilities, still serve their purpose are living monuments to the Engineering skills, quality and workmanship of NPCC.

Fields in which NPCC is specialized and interested to work:

- Township and Buildings
- Public Health Engineering and Environmental Projects
- Surface Transport Projects
- Dams / Weirs
- Barrages
- Canal
- Industrial Structure
- Hydroelectric Projects
- Thermal Power Projects
- Chimney / Transmission Projects
- Project Management Consultancy
- International Projects

2.2 Internship activities

My internship was completely focused on fieldwork of Installation of Electrical Power System.
In the next paragraphs each activity is discussed in more detail. A time schedule of the activities during my internship is given in Appendix I.

2.2.1 Instructions and Understanding Electrical Drawing

Instructions:

On Day-1 of the internship, Safety and precautions instructions given by our supervisor. As we were going to work in environment involving electricity, it was important for us to carefully understand the instructions. Furthermore, an instruction manual was also given us to read which was “THE INDIAN ELECTRICITY RULES - CHAPTER IV GENERAL SAFETY REQUIREMENTS”. This manual was about different safety measures to take while working.
I have included the said manual with this report.

Understanding Electrical Drawing:

Electrical drawings, sometimes referred to as wiring diagrams, are a type of technical drawing that provide visual representation describing electrical systems or circuits. They are used to explain the design to electricians or other workers who will use them to help install or repair electrical systems.
A set of electrical drawings on a project include:

- A site plan which shows the location of the building and any external wiring.
- Floor plans which show the positions of electrical systems on each floor.
- Wiring diagrams which show the physical connections and layout of electrical circuits.

Electrical drawings for buildings tend to include the following details:

- How the electrical wires and other parts of the system are interconnected and switched.
- Where fixtures and other components connect to the system.
- Incoming power lines and their voltage, size, capacity and rating.
- Power transformers and their winding connection and means of grounding.
- The main switches, fused switches and tie breakers.

I have included the Electrical Drawing of the floor with this report. As described in the drawings, each floor had 3 Flats of 3BHK and our task was to Install Electric wiring at the second floor of the building.
Being with the expert in the field, I was able to understand the Drawing very easily and properly.
Drawing describes the overall picture of electrical network to be installed and our supervisor assigned the task accordingly.

2.2.2 Components and Wire Selection, List and Description

Components and Wire Selection

Components are selected on the basis on equipments which going to be installed by customer in future. Here is the list of equipments which are usually present in common household having high power rating:

- AC (2 Ton) : Living Room
- AC (1.5 Ton) : Bedroom
- Geyser/Hair Dryer: Bathroom
- Microwave/Refrigerator : Kitchen

Secondly, selecting Wire size involves the cross section area of wire. Thicker the wire, more current it can carry but cost will also increase. So right thickness of wire has to be selected in order to run the load without any faults and keeping cost as low as possible. Given below table can be used for Wire Selection.

SINGLE CORE, TWIN INSULATED CABLES IN VOLTAGE GRADE 1100 V.

Nominal area of Conductor	Number/Nom. Dia. of Wires	Thickness of Insulation (Nom.)	Approx. Overall Diameter	Current Carrying Capacity* 2 wires single phase	Resistance (Max.) per Km. @ 20°C
Sq. mm.	No./mm.	mm.	mm.	Amps.	Ohms
0.75	24/0.2	0.6	2.5	7	26.00
1.0	14/0.3	0.7	2.65	12	18.10
1.5	22/0.3	0.7	2.95	16	12.10
2.5	36/0.3	0.8	3.55	22	7.41
4.0	56/0.3	0.8	4.0	29	4.95
6.0	84/0.3	0.8	4.6	37	3.30
10.0	80/0.4	1.0	5.8	51	1.91
16.0	126/0.4	1.0	6.8	68	1.21

Standard Colours : Red, Yellow, Blue, Black and Green (for earthing). * As per IS 3961 (PartV)-1968
Supplied in 90 metre coils in attractive cartons. Conforms to IS 694:1990. ISI Licence No. CM/L-7167980

With the help of table, we can select wire according to the load. For ex. AC of 1.5 ton having an average rated power of 2.5-3KW which equals to 13.6A at 220V (2500W/220V, ohm's law) with additional safety factor of 1.25x, comes out around 17A. Also length of wire plays important role as the length increases so does the resistance which leads to I^2R losses. According to table, for 1.5 ton AC, 2.5 Sq. mm will be selected.

With the equipment list, we can estimate future load of each flat which comes out to be around 12KW.
Here is the list of selected components after considering the appropriate load of each equipment and keeping financials in mind:

Sno.	Equipment	Power Rating	Components Selected
1.	AC (2 ton)	3-3.5KW	MCB 40A, Wire CSA – 4mm^2
2.	AC(1.5 ton)	2.5KW	MCB 32A, Wire CSA – 2.5mm^2
3.	Geyser	2KW	MCB 20A, Wire CSA– 2.5mm^2
4.	Hair Dryer/ Microwave	1-2KW	MCB 20A, Wire CSA– 2.5mm^2
5.	Other Low power appliances like lights, fan, TV etc.	<1KW	MCB 16A, Wire CSA– 1.5mm^2
	Overall Network	Up to 12KW	MCB 63A, Wire CSA– 6mm^2

*CSA-Cross Section Area

Component List
Here is the list of the components used in the installation. I have also included the separate detailed PDF file of each component with this report.

SNo.	Image	Component Type, Brand and Product Name	Specifications
1.		Type: MCB Brand: Schneider Electric Product Name: Acti9 iK60N-2p-C63	Rated Current: 63A at 30^{o}C Poles Description: 2P Network Type: AC Network Frequency: 50/60Hz Rated Voltage: 230V Magnetic tripping limit: 5..10x

2.		Type: RCCB Brand: Schneider Electric Product Name: Acti 9 iID	Rated Current: 63A Earth-Leakage current: 30mA Poles Description: 2P Network Type: AC Network Frequency: 50/60Hz Rated operational Voltage: 220…240V AC
3.		Type: MCB Brand: Schneider Electric Product Name: iK60N-1P-B40	Rated Current: 40A at 30^{o}C Poles Description: 1P Network Type: AC Network Frequency: 50/60Hz Rated Voltage: 230V Magnetic tripping limit: 3..5x
4.		Type: MCB Brand: Schneider Electric Product Name: iK60N-1P-B32	Rated Current: 32A at 30^{o}C Poles Description: 1P Network Type: AC Network Frequency: 50/60Hz Rated Voltage: 230V Magnetic tripping limit: 3..5x
5.		Type: MCB Brand: Schneider Electric Product Name: iK60N-1P-B20	Rated Current: 20A at 30^{o}C Poles Description: 1P Network Type: AC Network Frequency: 50/60Hz Rated Voltage: 230V Magnetic tripping limit: 3..5x

6.		Type: MCB Brand: Schneider Electric Product Name: iK60N-1P-B16	Rated Current: 16A at 30^{o}C Poles Description: 1P Network Type: AC Network Frequency: 50/60Hz Rated Voltage: 230V Magnetic tripping limit: 3..5x
7.		Type: 3 pin Power Socket Brand: Havells Name: COMBINED SHUTTERED	Rated Current: 16A Rated Voltage: 240V FR Grade: Yes
8.		Type: 3 pin Socket Brand: Havells Name: SHUTTERED SOCKET	Rated Current: 6A Rated Voltage: 240V FR Grade: Yes
9.		Type: SWITCH Brand: Havells Name: 6 AX 1WAY SWITCH	Rated Current: 6A Rated Voltage: 240V FR Grade: Yes

10.		Type: SWITCH Brand: Havells Name: 6 AX 2WAY SWITCH	Rated Current: 6A Rated Voltage: 240V FR Grade: Yes
11.		Type: SWITCH Brand: Havells Name: 16 AX 1WAY SWITCH	Rated Current: 16A Rated Voltage: 240V FR Grade: Yes

Component Description

RCCB

Residual Current Circuit Breaker or RCCB is basically a gadget that senses current and disengages any low voltage (uneven current) circuit whenever a fault occurs. The main purpose of installing a Residual Current Circuit Breaker fundamentally is to protect people from electric shocks or death caused by them.

It avoids accidents by disengaging the main circuit just in a fraction of a second. The working of RCCB electrical devices is based on the principle – Kirchhoff's Current Law, which means that the incoming and the outgoing current in the circuit should be equal.

There are 2 types of RCCB: 2 pole and 4 pole. In this Internship, we have used 2 pole RCCB.

2 Pole RCCB: It is utilized in a single-phase supply which only contains a neutral wire and a live wire. It has two ends and at those ends, the neutral wire and live wire are connected. With the help of a rotary switch, you can switch the RCCB on and off. It also has a test button that assists in periodically testing the functionality of the RCCB.

MCB

MCB (Miniature Circuit Breaker) is an automatic switch that opens when excessive current flows through the circuit. It can be reclosed without any manual replacement. In the case of a fuse, once a fuse has been operated, it must be replaced or rewired, depending on the type of the MCB. Hence, fuse is known as one of the sacrificial devices. This is the main reason why MCBs are used as an alternative to the fuse in most of the circuits. Also, whenever there is a fault in the circuit, the switches in the MCB automatically shut down and the fault of the device can be easily detected.

Types of Miniature Circuit Breaker

MCB trip curve decides the type of MCB that has to be used for different types of appliances or devices. There are 6 types of MCBs, they are:

1. A Type MCB trips off the circuit when the current exceeds 2-3 times the actual current rating. A type MCB – Miniature Circuit Breaker is highly sensitive to the short circuit and hence we can find its application in the manufacturing of semiconductors.

2. B Type MCB trips off the circuit when the current exceeds 3-5 times the actual current flow and finds its application in the cable protection.

3. C Type MCB trips off the circuit when the current exceeds 5-10 times the actual current flow and finds its application in the domestic as well as commercial appliances like transformers, fluorescent lighting circuits, IT equipment like personal computers, servers, and printers.

4. D Type MCB trips off the circuit when the current exceeds 10-20 times the actual current flow and offers high resistance. It finds its application in motors.

5. K Type MCB can withstand up to 8-12 times the actual current flow and finds its application in the heavy-duty load devices like compressors, winding motors, and X-ray machines.

6. Z Type MCB operates for a current value between 2 to 3 times the rated current with an operating time of less than 0.1 Second.

Here we have used **B-type MCB** for single pole (1P) MCB (for equipments) and **C-type MCB** for double pole (2P) MCB (for complete Network).

Socket

Electrical sockets, or outlets, allow us to plug in appliances to attach them to the electrical grid and provide power for them to run. There are two types of sockets: Normal socket (6A) and Power socket (16A).

Normal socket have low power rating (less than 1KW) and Power socket as name describes are used for power devices having high power rating (up to 3KW).

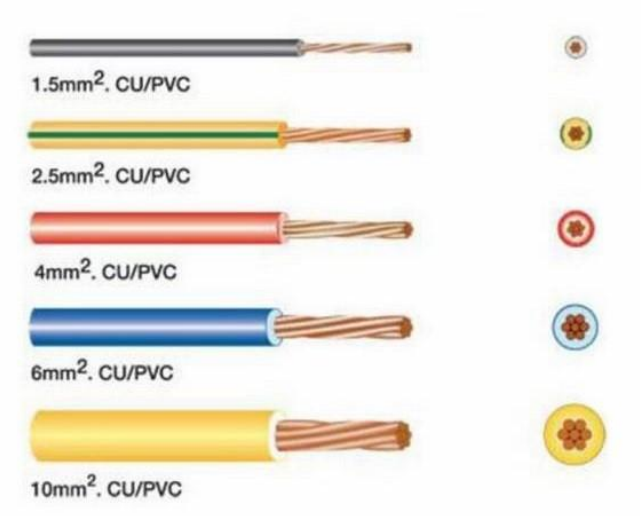
Switch

In electrical engineering, a switch is an electrical component that can disconnect or connect the conducting path in an electrical circuit, interrupting the electric current or diverting it from one conductor to another. Here also, there are two types of switches: Normal switch (6A) and Power Switch (16A).

Normal switch have low power rating (less than 1KW) and Power switch have high power rating (up to 3KW).

Wires

As stated in the above list, wire with cross sectional area of 1.5 mm^2, 2.5 mm^2, 4.0 mm^2 and 6.0 mm^2 are selected for the network installation.



There is one another type of wire which is used the network is Ground wire. Ground wire is very important for the safety purposes as it grounds any residual current and prevents the user from getting electric stock. The cross-sectional area of wire used in ground wire is 0.75mm^2. Other than ground wire, wires carrying load current can have different-multi colors but ground wire is always GREEN color.

2.2.3 Installation

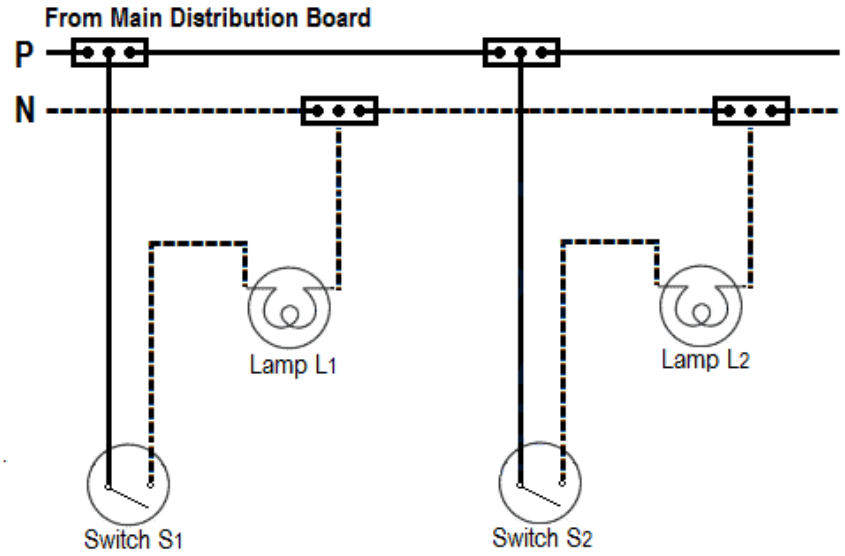
Methods of Electrical Wiring Connection

Wiring is a process of connecting various accessories for distribution of main distribution board (or electric meter in household) to appliances such as AC, lamps, fans and other domestic appliances. Wiring can be done using two methods which are:

1. Joint Box or Tee or Jointing System

In this method of wiring, connections to appliances are made through joints. These joints are made in joint boxes by means of suitable connectors or joints cutouts. This method of wiring doesn't consume too much cables size.

You might think because this method of wiring doesn't require too much cable it is therefore cheaper. It is of course but the money you saved from buying cables will be used in buying joint boxes, thus equation is balanced. This method is suitable for temporary installations and it is cheap.



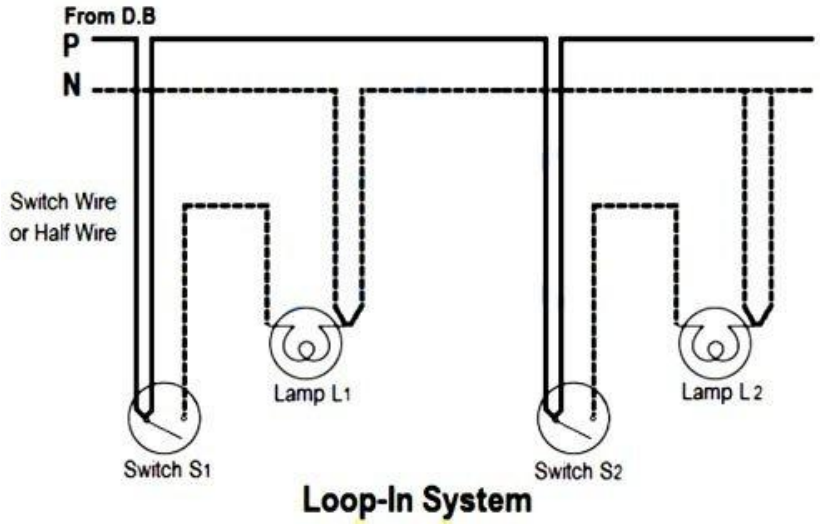
Joint Box System

2. Loop-in or Looping System

This method of wiring is universally used in wiring. Lamps and other appliances are connected in parallel so that each of the appliances can be controlled individually. When a connection is required at a light or switch, the feed conductor is looped in by bringing it directly to the terminal and then carrying it forward again to the next point to be fed.

The switch and light feeds are carried round the circuit in a series of loops from one point to another until the last on the circuit is reached. The phase or line conductors are looped either

in switchboard or box and neutrals are looped either in switchboard or from light or fan. Line or phase should never be looped from light or fan.



Loop-In System

Advantages of Loop-In Method of Wiring

- It doesn't require joint boxes and so money is saved
- In loop – in systems, no joint is concealed beneath floors or in roof spaces.
- Fault location is made easy as the points are made only at outlets so that they are accessible.

In this internship, Loop-in method was used for Power socket and Low power appliances. For ACs and Geysers direct connection was made from distribution box.

Types of Conduit

Following conduits are used in the conduit wiring systems (both concealed and surface conduit wiring) which are shown in the above image.

1. Metallic Conduit

Metallic conduits are made of steel which are very strong but costly as well.

2. Non-metallic Conduit

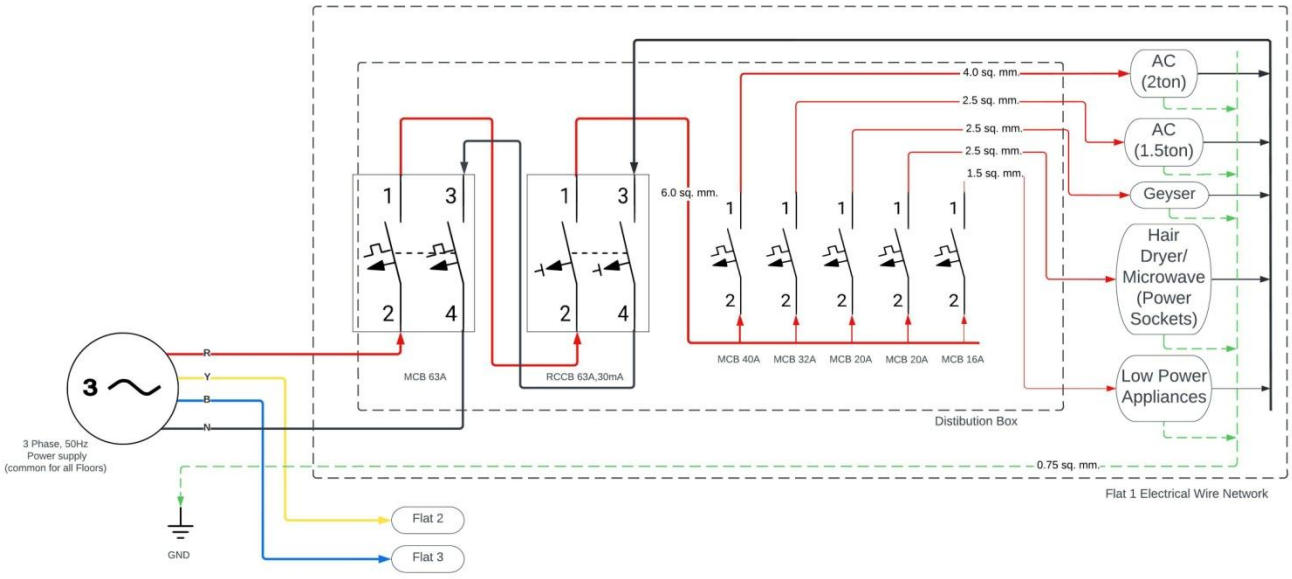
A solid PVC conduit is used as non-metallic conduit, which is flexible and easy to bend. The common conduit pipes are available in different sizes genially, 13, 16.2, 18.75, 20, 25, 37, 50, and 63 mm (diameter) or ½ , 5/8, ¾ , 1, 1.25, 1.5, and 2 inch in diameter.

Non-metallic Conduit was used in building. PVC non-metallic conduit of diameter ¾ inches was used and installed inside the walls. PVC conduit was chosen because:

- It is the safest wiring system
- Appearance is very beautiful
- No risk of mechanical wear & tear and fire in case of metallic pipes.
- There is no risk of damage the cables insulation.
- It is safe from corrosion (in case of PVC conduit) and risk of fire.
- It can be used even in humidity, chemical effect and smoky areas.
- No risk of electric shock.
- It is reliable and popular wiring system.
- Sustainable and long-lasting wiring system.

Though it also has some disadvantages like it is very hard to find the defects in the conduit wiring system and installation is not easy but advantages outweigh the disadvantages.

Installation Schematic



This is each flat Electric wiring network Schematic which I made on lucidchart.com. Three phase power is supplied to each floor from which each flat uses RYB phase respectively. This is a good practice if we consider the load balancing.

In the Schematic, I have shown the connection between each appliance type and distribution box. This can be replicated for rest of the similar appliances. Total components used per flat after installation were:

Sno.	Component	Number of components
1.	MCB 63A 2P	1
2.	RCCB 63A, 30mA 2P	1
3.	MCB 40A 1P	1
4.	MCB 32A 1P	3
5.	MCB 20A 1P	8
6.	MCB 16A 1P	5

I have included the PDF file of this schematic with this report.

2.2.4 Testing

After the completion of Installation, testing was done to ensure that there is no short circuit or bad connection. Each endpoint was tested using a small load to check the proper connection between Distribution box and endpoint. All the testing was done by the supervising team. Finally, after the completion of work the site was handed over to the site manager.

3. Reflection on the internship

In this chapter, I reflect on the internship. Regarding my learning goals, if I have achieved them or whether I experienced difficulties.

Learning goals

- **Gain skills and knowledge**

From the staring of this internship, I kept learning new things whether they are soft skills like communication, management or technical skills like understanding Electrical drawings.
Though I was not able to work on the Main building distribution and Generator but overall I learned many new skills.

- **Skills and knowledge I still need to work in a professional environment**

As this internship was completed in very professional work environment, I learned the importance of chain of command and how beneficial is it for the any project or task to take place efficiently and properly. The management skill of our supervisor was great which lead to completion of the task without any issue and as I got the work with him, I learned about managing a team and how planning of project takes place.

- **Enhance my communication skills**

The assistant engineering team whom which I worked with explained any questions put up by us. So the communication between us was great and which helped me improving my communication skills in a professional environment.

- **Get fieldwork experience**

This whole internship was a fieldwork, there was rarely a time when we were sitting expect in starting when planning took place. Though sometimes it became tiring as I never had a field experience but it was informative experience.

- **Understand the functioning and working of how a project is carried out**

Being able to see a project carried out from beginning to end, gave me a very good insight of the steps to take while managing or working on a project.

4. Conclusion

On the whole, this internship was a useful experience. I have gained new knowledge, skills and met many new people. I achieved several of my learning goals. I gained a lot of insights regarding many aspect of site which involves electrical work.

I got insight into professional practice. I learned the different facets of working in an organization. I experienced that financing, as in many organizations, is an important factor for the progress of projects.

The internship was also good to find out what my strengths and weaknesses are. This helped me to define what skills and knowledge I have to improve in the coming time. I am very much thankful for the enlightening experience from NPCC, this experience will surely help me in my future.

APPENDICES

Appendix I

Weekly overview of internship activities

Week 1 (03-07, New Delhi)

- Electrical Drawing Read
- Planning and Discussion about the project
- Project assignment to individuals involved

Week 2 (10-07, New Delhi)

- Components Description and List
- Site Inspection
- Supervising required changes before installation

Week 3 (17-07, New Delhi)

- Component Inspection
- Wiring Installation of Right wing

Week 4 (24-07, New Delhi)

- Components installation of Right and Middle wing
- Wiring Installation of Middle wing

Week 5 (31-07, New Delhi)

- Wiring and Components Installation of left wing.

Week 6 (07-08, New Delhi)

- Testing of power network
- Writing Internship report