INTERNSHIP REPORT

FIELD STUDY ON DHAKA METRO RAIL PROJECT

A study submitted to the Department of EEE, Faculty of Engineering, DIU in partial fulfillment of the of the requirements for the Award of Degree of Bachelor of Science in Electrical and Electronic Engineering.

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CERTIFICATION

This to certify that is internship “Dhaka metro rail project overview and sub-station installation system’’ is done by the following student under my direct supervised by the work has been conducted by them in the electrical and electronic engineering departments under the faculty of engineering bachelor’s degree in electrical and electronic engineering presentation of the work was held at daffodil international university on.

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The project and thesis entitled “Dhaka metro rail project overview and sub-station installation’’ work has been carried out by them in the Submitted by **Md. Rajib Hossain, ID: 173-33-564**, & **Md. Sad Parvez, ID: 173-33-545** session spring 2021 has been accepted as satisfactory in partial fulfillment of the requirement for the degree of **Bachelor of Science in Electrical and Electronic Engineering on**

DEDICATED TO

OUR FAMILY

ACKNOWLEDGEMENT

First of all, we give thanks to Allah. Then we would like to take this opportunity to express my appreciation and gratitude to my Internship supervisor **Md. Mahbub- Ud- Jaman, Lecturer, Department of EEE,** Faculty of Engineering, Daffodil International University, for being dedicated in supporting, motivating and guiding me through this internship. This internship can't be done without his useful advice and helps. Also thank you very much for giving us opportunity to field study.

Also, I want to convey thankfulness to Engr. Enamul hasan sumon project manager (PM), ATS power limited, for this help, and thank you to all the members of ATS power limited, who helped me to learn works. And Support and encouragement in addition we would like to thank all our friends to share knowledge information.

To our dear family we would like to express our deepest love and gratitude to them for being extremely helpful and also for their inspiration and encouragement during our studies at this university.

ABSTRACT

I have done Internship under Dhaka Metro Rail Project a Larsen & Toubro (L&T) and Italian Thai Development (ITD) - SINOHYDRO JV Sub-contact of ATS Power Limited. I have set up Dhaka metro rail project a sub-station. I have learned well all the work done in this sub-station. Here are the things I saw and learned, A Sub-station is a part of the Electrical Generation, Transmission and Distribution system. Sub-stations convert voltage from high to low or vice versa or conduct in several other important work.

We have bus-bar connections on the primary and secondary side. Each gadget gains freely and processing transformer, circuit related power framework information breakers, disconnection, tap changers, CT & PT, SF6 circuit breakers, isolator, conductor, insulator, lightning arrester, really, and switchgear panels installation, Dry type transformer installation, and Earthing work and Underground cable laying and cable tray more.

Dhaka Mass Rapid Transit Development Project MRT LINE -6 has been given to control and manage all the works of Dhaka Metro Rail. Supervising all work and testing everything do this MRT LINE -6.

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CHAPTER 1

COMPANY PROFILE & MERTO RAIL OVERVIEW

1.0 Company profile:

Company name: ATS Power Limited

Factory Location: Dhaka – Mymensingh highway, Bormi road mawna union.

Head Office: House#58(Level-3, c1), Road#12, sector#10, Uttara.

1.1 Company Vision &Mission:

ATS Power Limited was founded in the year 2009 as an Electrical engineering and supplier company of Bangladesh. ATS power limited started its operation with a very professional approach as the sector. ATS power limited also provides opportunities for young energetic engineers.

From the year 2009, ATS power limited has way to establish itself as a supplier of low voltage and high voltage electrical accessories assembling. All type of electrical conventional works are done by smart design maintaining superior quality. With the self -assembled equipment. ATS power limited works for supplying, installing &commissioning of the Electrical and mechanical works.

ATS power limited delivers state -of the art design, installation and support to meet all your Electrical and mechanical goods. We service the commercial, industrial and public sector industries region.

1.2 Sales & Service Capability:

- High voltage system
- Low voltage system
- Bus bar trucking system
- Process machine installation
- Refrigeration system
- Steam and Compressed Air system
- Fire detector system
- Fire Hydrant system
- Water treatment plants
- Effluent treatment system
- Lightning protection system

- CCTV system
- LAN system
- PA system

1.3 Dhaka Metro Rail Overview:

Name of the overhead railway system to be built in Dhaka, the capital of Bangladesh.

1.3.1 Project Description:

The city-based railway system under construction in Dhaka, the capital of Bangladesh, is the Dhaka Metro, officially known as Mass Rapid Transit (MRT) for short. On 16 December 2012, the Dhaka Month Rapid Transit Development Project, one of the priorities of the Government of Bangladesh, was approved by the Executive Committee of the National Economic Council (ECNEC) for the first time. In 2013, a strategic transport plan was formulated to reduce the growing traffic congestion and road congestion in the overcrowded Dhaka metropolis, under which a metro rail was planned to be set up in Dhaka for the Second time. And In the first phase, a 20.10 km long road called MRT-6 was laid for construction. The total cost of the project is estimated at Taka 21,985.59 crore. Of this, JICA will provide Tk 18,594.48 crore as project assistance. Motijheel from Uttara as per project plan Until the Metro Rail is launched, it will be possible to transport 60,000 passengers per hour from both directions. The final route alignment of MRT-6 is Uttara Third Phase-Pallabi-Rokeya Sarani on the west side (Chandrima -Udyan Sangsad Bhaban) through Farmgate-Farmgate-Sonargaon Hotel-Shahbag-TSC-Doel Chattar-Topkhana Road to Bangladesh Bank. The 16 stations of thisroute are Uttara North, Uttara Center, Uttara South, Pallabi, Mirpur-11, Mirpur-10, Kazipara, Shawrapara, Agargaon, Vijay Sarani, Farmgate, Karwan Bazar, Shahbag, Dhaka University, Secretariat, Motijheel and Kamalapur. To run the train, **13.46 MW of electricity** will be required per hour which will be taken from the national grid. For this, there will be five power substations in Uttara, Pallabi, Taltola, Sonargaon and Bangla Academy areas.

On June 26, 2016, Prime Minister Sheikh Hasina officially inaugurated the construction work of MRT-6 project. This started the construction of Dhaka Metro. The construction of MRT-6 station and flyover was officially started on August 2, 2016. On this day construction of 12 km flyover and station from Uttara to Agargaon started.

On 25 February 2019, construction of the station and flyover in the Motijheel section began from Agarpagaon. The project is scheduled to open on December 16, 2021.

On 15 October 2019, the construction project of two lines named MRT- 1 and MRT-5 was approved. Under the MRT-1 project, a total of 31.24 km metro rail will be constructed from the airport to Kamalapur and from Natunbazar to Purbachal. The total cost of the project is estimated at Tk 52,561 crore. Of this, the Japanese government will provide Tk 39,450 crore, while the remaining Tk 13,111 crore will come from government funds. The MRT-1 project will cover 16.21

km from the airport to Kamalapur by subway and 11.36 km by air from Kuril to Purbachal depot. A 31.24 km railway line will be constructed from Natun Bazar to Kuril with 3.75 km underground transition line. This metrorail will have 12 stations under the ground and 6 on the flyover.MRT-5 construction project will construct 20 km line from Hemayetpur to Bhatara. Out of Tk 41,237 crore for this project, Japan will provide Tk 29,117 crore and the rest of the Tk 12,121 crore will be provided by the Bangladesh government. Out of the total 20 kilometers of the project, 13 kilometers will be underground and the remaining 8 and a half kilometers will be by air. There will be a total of 14 stations on this route, of which 9 will be underground and 5 will be by air

Dhaka Metro	
Overview	
Location	Dhaka, Bangladesh
Type of transport	High speed public transport system
Number of lines (orbits)	1 (under construction) 5 (planned)
Number of breaks (stations)	16 (under construction), 88 (planned)
Daily passenger numbers	60,000 (per hour) [1] (MRT line 8)
Head office	Dhaka, Bangladesh
Website	www.dmtcl.gov.bd
Movement	
Possible launch date	2021 [2]
Board of Directors	Dhaka Mass Transit Company Limited (DMTCL)
Technical information	
Total length of railroad	20.1 km (under construction) [3] 107.641 (planned)
Railway gauge	Ideal yard
ELECTRIFICATION	**1500 V DC Via overhead catenary**

1.3.2 Route Map:

As of March 2020, the latest maps of Metrorail routes:
Currently Work Is in Progress At 16 Stations MRT Line – 6.
The Stations That Are in Progress Are Listed Below:
MRT Line-6:

- Uttara North
- Uttara Madhya
- Uttara South
- Pallavi
- Mirpur 11
- Mirpur 10
- Kazipara
- Shawrapara
- Agargaon
- Victory Street
- Farmgate
- Caravan Market
- Shahbag
- University of Dhaka
- Secretariat
- Motijheel & Kamalapur

CHAPTER 2

132 /33 KV SUB STATION FOR DHAKA METRO RAIL PROJECT

2.0 INTRODUCTION:

The project work assigned to us was to design a **132/33 KV sub-station**. We are considering incoming power at 132 KV and the power was transferred to main bus through isolator-circuit breaker-isolator combination. And this is the electricity we got from PGCB, the power from main bus was fed into a **40-50 MVA two transformer** which stepped the voltage down to 33KVA. The power is then fed into a 33KV bus from which different loads were tapped the power is then fed into a **33KV bus** from which different loads were tapped. In the process, the surge impedance loading of **132 KV and 33 KV** lines were calculated and they were used to estimate the maximum power that can be transferred by one transmission line... This is for running metro rail and only rail anymore. We designed this design to run all the load of the depot. The design is then submitted to our mentor for verification.

Figure: 2.1: 132/33 KVA sub-station

2.1 Major Equipment:

The 132/33 KV sub-station is composed of double open type 132KV Bus-Bars Four Feeder bays and two Transformer (40/50 MVA) and one bus coupler and one bus section.

1. The 132KV Bus-Bar of tubular copper are rated at 40/50MVA for 3 sec and 2000A continuous current.

2. The 132KV outdoor SF6 Insulated circuit breaker rating is as follow:

- One Bus coupler CB rated 40KA, 1250A.
- One Bus section CB rated 40KA, 1250A.
- Four Feeder CB rated at 40/50MVA, 2000A.
- Two Transformer CB rated at 40/50MVA, 2000A.

3. Isolator are rated as follow:

- Four Nos for the Bus section & Bus coupler at 40KA, 1250A.
- Two Nos For each Feeder & Transformer rated 40/50MVA, 2000A.

4. Two Nos 40/50MVA Power Transformer.

5. Current Transformer.

6. Potential Transformer.

7. Automatic Circuit Reclose.

8. Conductors.

9. Insulators.

10. Lightning Arrestors.

11. Relay.

12. Capacitor Banks.

13. 33KV metal clad indoor switchgear comprising panels.

2.1.1 Bus-Bar

A Bus-Bar is in electrical conductor that receives electricity from incoming feeders and distributes them to outgoing feeders is called feeder. The bus bar system consists the isolator and the circuit breaker. On the occurrence of a fault, the circuit breaker is tripped off and the faulty section of the bus bar is easily disconnected from the circuit.

The electrical bus bar is available in rectangular, cross-sectional, round and many other shapes. The rectangular bus bar is mostly used in the power system. The copper and aluminum are used for the manufacturing of the electrical bus bar.

Single Bus-Bar Arrangement

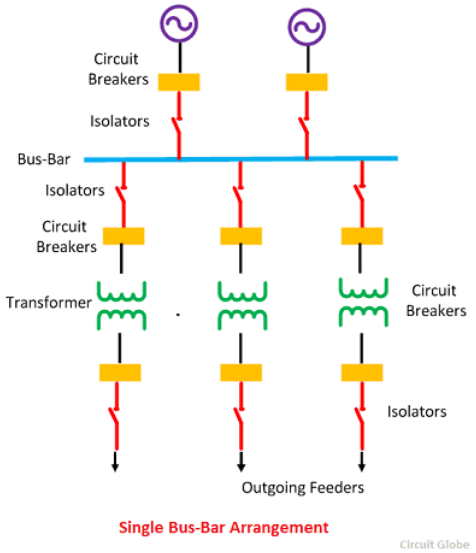

Figure: 2.2: Single Bus-Bar Arrangement

2.1.2 SF6 Circuit Breaker

Circuit Breaker in Sulfur Hexafluoride protect the power supply and distribution system by blocking the excess electrical voltage. A circuit breaker in which SF6 under pressure gas is used to extinguish the arc is called SF6 circuit breaker.

Figure: 2.3: SF6 circuit breaker

2.1.3 Isolator

In electrical engineering, a disconnect or, disconnect switch or isolator switch is used to ensure that an electrical circuit is completely de-energized for service or maintenance.

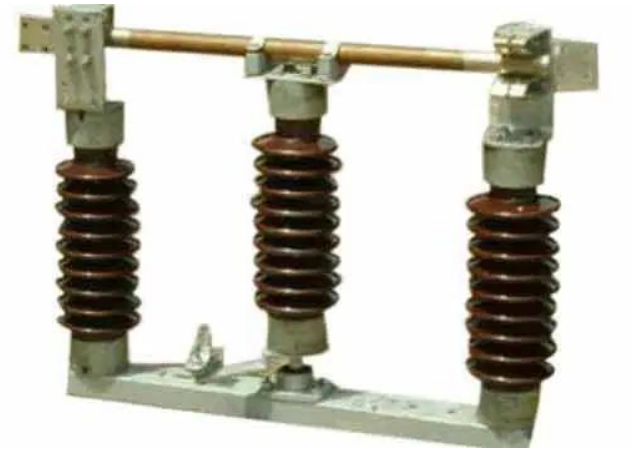

Figure: 2.4: Double break type isolator

2.1.4 Power Transformer

Transformer: A transformer is an electric device that stabilizes current and power leaving voltage converts from one place to another.

Figure: 2.5: Power Transformer

This is a power transformer which is given below

Nominal power (MVA)		Nominal voltage (KV)		Nominal Current (AMP)	
ONAN	ONAF	HV	LV	HV	LV
40	50	132	33	174.95	699.82

Main Parts of a transformer

1. Windings.
2. Main Tank.
3. Transformer Oil.
4. Radiator.
5. Cooling System of Transformer.
6. Bushing.
7. Laminated Core.

8. Conservator.
9. Oil Temperature Meter.
10. Breather.
11. Buchholz relay.
12. Tap Changing Switch.

2.1.5 Current Transformer

Current transformer is an electrical device could be a current measuring system want to measure this in high voltage distribution lines directly by stepping down the currents to measurable values by means that of magnetic attraction circuit is called current transformer.

Figure: 2.6: Current transformer (CT)

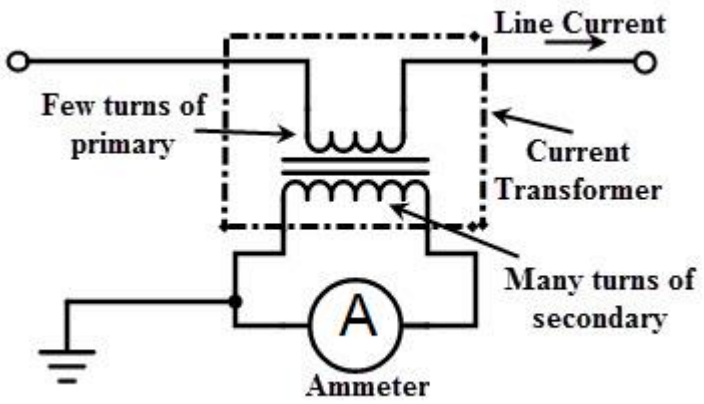

Figure: 2.7: Circuit diagram of current transformer

2.1.6 Potential transformer

Potential transformers are also called voltage transformers by which voltage is measured; Potential transformer is a voltage step-down transformer which reduces the voltage of a high voltage circuit to a lower level for the purpose of measurement.

Figure: 2.8: Potential transformer (PT)

2.1.7 Automatic circuit recloses:

In electrical power distribution, automatic circuit recloses (ACRs) are a class of switchgear which is designed for use on overhead electricity distribution networks.

2.1.8 Conductor:

In physics and electrical engineering, a conductor is an object or type of material that allows the flow of charge (electrical current) in one or more directions. Materials made of metal are common electrical conductors. Electrical current is generated by the flow of negatively charged electrons, positively charged holes, and positive or negative ions in some cases.

2.1.9 Insulator:

Insulator is a material through which no electricity can pass from one end to the other is called insulator.

Figure: 2.9: Insulator

2.1.10 Lightning Arrester:

A lightning arrester is a electric device use this electric power transmission line and all systems protect the conductors system from the damaging effects of lightning arrester. Lightning arrester has a high terminal directly ground terminal.

Figure: 2.10 Lightning arrester.

2.1.11 Really:

A relay is an electrically open or close switch or operated switch. Input terminal for single or multiple control signal and set the operating contact terminals.

Figure: 2.11: Really

2.1.12 Capacitor bank:

A Capacitor Bank is a group of several capacitors of the same rating that are connected in series or parallel with each other to store electrical energy. The resulting bank is then used to counteract or correct a power factor lag or phase shift in an alternating current (AC) power supply. They can also be used in a direct current (DC) power supply to increase the ripple current capacity of the power supply or to increase the overall amount of stored energy.

Figure: 2.12: Capacitor Bank

2.1.13 33KV metal clad indoor switchgear comprising panels:

Figure: 2.13: 33KV Switchgear Panels

I. **Switchgear:** Switchgear is an electrical and protective device used for controlling, regulating and switching on and off the electrical circuit in the electrical power system is known as switchgear.

II. **Rectifier Transformer**: A rectifier transformer is a circuit that converts alternating current (AC) to direct current (DC) is called rectifier transformer.
The method used in rectifiers is called rectification.
It basically converts alternating current (AC) to pulsating direct
Current (DC).

Type of rectifier circuit:

a) Half Wave Rectifier:

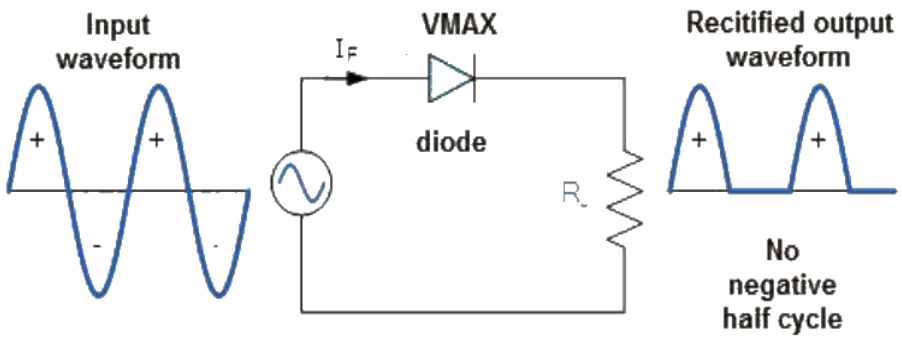

Figure: 2.14(a) half wave rectifier circuit diagram

b) Full Wave Rectifier:

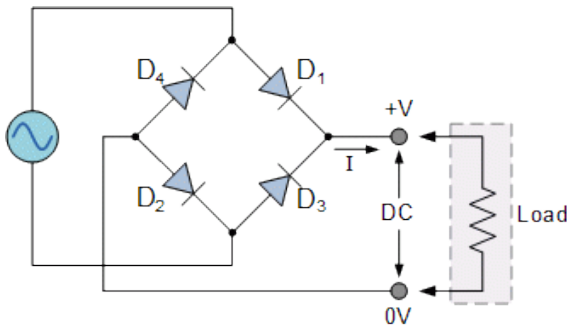

Figure: 2.14(b) Full wave rectifier circuit diagram

III. Auxiliary Transformer: Auxiliary transformer is used to supply low voltage for AC power system inside substation such as lighting, air conditioners and other AC supply system and DC power system such as protection relays, batteries, SCADA & telecom system and other DC supply.

2.2 Dry Type Transformer:

A dry type transformer is a type of transformer which never uses any insulating liquid where its winding or core are immerged in liquid. Rather, the windings and core are kept within a sealed tank that is pressurized with air.

Figure: 2.15: Dry Type Transformer

Dry Type Transformer Technical Specification of 33/.415 KV, 630 KVA Distribution Transformer

Total capacity (KVA)	Rated voltage (V)		Rated Current (A)	
	H (V)	L (V)	H (V)	L (V)
630 KVA	33000 V	425 V	11.0 A	876.5 A

2.3 What is Earthing?

Earthing: Earthing is unwanted electricity earthing is the process by which an electric current is transmitted to the earth by a conductor to protect electrical equipment and people is called earthing.

2.4 Type of Earthing:

1. Pipe earth
2. Rod earth
3. GI flat bar earth
4. Plate earth
5. Strip earth
6. Chemical earth

The Earthing that has been done in the metro rail is given below.

1. Pipe earth
2. Rod earth
3. GI flat bar earth

2.4.1 Pipe earth:

Pipe earthing is the use of pipes to protect electrical equipment and people from excess electricity and transmits excess electricity to the earth's surface is called pipe earthing.

Which takes to need do pipe earthing:

a) GI pipe /Copper pipe 1.5 inch -minimum 7 fit.
b) Copper wire as needed.
c) Nut &bolts.
d) Wood coal - 5-7 kg.
e) Salt - 5-7 kg.

Figure: 2.16: pipe earthing

2.4.2 Rod earth:

Pipe earthing is the use of pipes to protect electrical equipment and people from excess electricity and transmits excess electricity to the earth's surface is called rod earthing.

Which takes to need do rod earthing:

i. Copper rod 12.5mm (1/2 inch)
ii. Galvanized steel 25 mm (1 inch)
iii. Galvanized iron 2.5m (8.2ft)

Use of GI rod earthing.

Figure: 2.17: Rod earthing

2.4.3 GI flat bar earth:

GI flat bar earthing is the use of pipes to protect electrical equipment and people from excess electricity and transmits excess electricity to the earth's surface is called GI flat bar earthing.GI flat bar size 50*6 mm.

Figure: 2.18: GI flat bar earthing

CHAPTER 3

Underground cable laying

3.0 Introduction

Since the loads having the trends towards growing density. This requires the better appearance, rugged construction, greater service reliability and increased safety.An underground cable essentially consists of one or more conductor covered with suitable insulation and surrounded by a potecting cover. The interference from external disturbances like storms ,lightening . The cables may be buried directly in the groung ,or may be installed in ducts buried in the ground. The underground cable is a direct system, but 6 inch PVC pipe can be installed on a 6 inch PVC pipe or a vector, and a PVC pipe can be installed on a vector.

3.1 Underground cable

The cables that is puller under the ground is called underground cable. They distribute electrical power or telecommunication. Overhead cables are ofter replaced with underground cables.HT cables can also be installed in the buried trenches. For this the cables are directly buried inside to ground.

Figure: 3.1: underground cable laying

3.2 Methods of Cable Laying

There are various methods of cable lying, such as

- During in ducts.
- Laying along building and structure.
- Laying directly into the ground.
- Laying on rack inside a cable tunnel.
- Laying on racks in air.

3.3 Cable Laying and Installation

Underground cables must be installed or laid underground. Underground reliability depends on keeping the cable network properly cables, quality of wire joint, and branch connection. When a few things need to be considered install and install underground cables that is.

- Route Selection.
- On the side of the read.
- We have to keep in mind to increase the route in future.
- Route with least obstacle should be preferred.

3.4 Underground Cables Equipment & tool

1. Cable puller and tensioner.

2. Cable roller.

3. Reel elevator.

4. Cable stripper and cutter.

5. Cable installation devices.

Cable puller and tensioner

Cable roller

Reel elevator

3.5 Classification of Underground Cables:

I. Low-tension (LT) cables - up to 1000 V.
II. High-tension (HT) cables - up to 11000 V.
III. Supper-tension (ST) cables -from 22 KV to 33 KV.
IV. Extra high -tension (EHT) cables-from 33 KV to 66 KV.
V. Extra super voltage cables- beyond 132 KV.

3.6 Advantage &Disadvantage:

Advantage:

- Better general appearance.
- Less liable to damage through storms or lighting.
- Maintenance cost low.
- Voltage drops low.
- The risk is low.

Disadvantage:

- Construction cost high.
- Repair cost high.
- Potential risk from careless digging.
- The damage is more likely when the underground cable is pulled or movement.

3.7 Cable size, type& length list:

SL NO.	Size	Type
1	3.5c*150 sq mm	2*RaY-FRLS
2	3.5c*120 sq. mm	2*RaY-FRLS
3	3.5c*95 sq mm	2*RaY-FRLS
4	3.5c*50 sq mm	2*RaY-FRLS
5	4c*25 sq. mm	2*RaY-FRLS
6	4c*16 sq. mm	2*RaY-FRLS
7	4c*10 sq. mm	2*RaY-FRLS
8	4c*6 sq. mm	2*RaY-FRLS
9	3.5c*70 sq. mm	2*RaY-FRLS
10	3.5c*240 sq. mm	2*RaY-FRLS
11	4c*300 sq. mm	2*RaY-FRLS
12	3.5c*185 sq. mm	2*RaY-FRLS
13	3.5c*300 sq mm	2*RaY-FRLS
14	3.5c*400 sq mm	2*RaY-FRLS
15	4c*35 sq. mm	2*RaY-FRLS

CHAPTER 4

Cable Tray

4.0 Introduction:

Today cable trays have become an essential part of industrial and commercial construction through cable supplies Economical and flexible solution to these Problem. Only trays are capable of supporting all kinds of wires.

- High voltage power lines.
- Power distribution cable.
- Sensitive Control wining.
- Telecommunication wining.
- Optical cables.

4.1 cable tray:

The cable tray is a kind of building of electrical wiring that is beautifully arranged is called cable tray. And electrical cables used for power distribution, control, and communication.

4.2 Cable Tray Materials:

Most cable tray system are mode of corrosion resistant metal (Low carbon steel,) or metal with a corrosion resistant finish.

Particular installation depends on the installation environment (corrosion and electrical considerations) and cost.

1. Aluminum

2. Steel

3. Stainless Steel

4.3 Finishing of Cable Tray:

1. Galvanized Coatings
2. 2.Pre-Galvanized
3. 3.Hot -Dip Galvanized

4.4 Type of cable tray:

1. Ladder cable tray
2. Perforated cable tray
3. Channel cable tray
4. Solid bottom cable tray
5. Wire mesh cable tray
6. Single rail cable tray
7. Raceway cable tray

4.4.1 Ladder cable tray:

Ladder Cable tray has two side rails connected by rungs. This type of cable tray is effective because the ladder rungs give you easy accessibility to the cables, from the top or bottom.

The rungs of the ladder cable trays provide convenient anchors for tying down the cables in the non-horizontal cable tray runs or where the positions of the cables must be maintained in the horizontal cable tray runs.

Figure: 4.1: Ladder cable tray

4.4.2 Perforated Cable Tray:

Perforated cable tray consists of a ventilated bottom with side rails. It provides more support to cables than the ladder-type.

Figure: 4.2: Perforated Cable Tray

4.4.3 Channel cable Tray:

Channel cable tray nothing more than a metal tray that can be used for very small cable installations.

Figure: 4.3: Channel cable Tray

4.4.4 Solid bottom cable tray:

Solid-bottom Cable trays for fiber-optic cable installations where drooping of cables may affect system performance, solid-bottom (non-ventilated) cable trays are preferred.

However, the main reason for selecting solid-bottom trays is a concern for electromagnetic/ radio-frequency interference protection.

Figure: 4.4: Solid bottom cable tray

CHAPTER 5

Analysis & Conclusion

Analysis

Sir, first of all let me say that if we give a plan, they will not do it because their plan has already been made. Bringing everything analysis. However, if there is a problem with the work, it is solved. For example, switchgear panels were tied to the cable tray during installation. And there is a problem with the drawing. By the grace off Allah, I have worked to solve all those Problem.

Conclusion

I am very happy to get the opportunity to work in Dhaka Metro rail because in Dhaka metro rail. I can learn a lot by working which I have never seen before there is a 40/50 MVA power transformer, 132 KVA, SF6, 132 KVA switchgear, 1000 /630 KVA dry type transformer. I have worked on it and learned the work very well. We did the work with great pleasure and with great attention.

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