FIELD STUDY ON POWER DISTRIBUTION SYSTEM OF DPDC
Dhaka Power Distribution Company Limited

A field study submitted to the department of EEE (Electrical & Electronics Engineering). DIU in partial fulfillment of the requirement for the Award of Degree of Bachelor of Science in Electrical & Electronics Engineering.

Prepared By

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Id: 191-33-4925

Supervised By

Md. Rayid Hasan Mojumder

Lecturer, Department of EEE

Daffodil International University

Department Of Electrical & Electronics Engineering

Faculty Of Engineering

DAFFODIL INTERNATIONAL UNIVERSITY

DECLARATION

We hereby declare that , the scope and quality of this internship report are qualified for the certification of internship program in DPDC for Electrical and Electronics Engineering . This internship report is based on the theoretical and practical knowledge we acquired in our internship period . Some contents of work present here to enrich the report and they mentioned by reference .
This internship report has never been submitted before any degree , not whole or partial.

Signature of the Supervisor

Md Rayid Hasan Mojumder

Lecturer, Department of EEE

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Signature of the Candidate

Kamrun Nahar (Ritu)

Id : 191-33-4925

This report entitled **" Power Distribution System in DPDC "** submitted by **Kamrun Nahar (Ritu)** , ID : 191-33-4925 has been accepted as satisfactory in partial fulfillment of the requirements for the degree of **Bachelor of Science in Electrical & Electronics Engineering.**

BOARD OF EXAMINERS

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ACKNOWLEDGEMENT

First and foremost , I'm grateful to my **Almighty Allah** for his unending blessings . Then I would like to express my gratitude to my supervisor **Md. Rayid Hasan Mojumder** , Lecturer , Department of EEE, Faculty of Engineering , Daffodil International University , for his unwavering support . Without his advice and support this would not be possible to complete for me.

I'm grateful to Dhaka Power Distribution Company Ltd (DPDC) for carrying out our intern responsibilities and completing the report on time . I'd like to express my gratitude to our honorable **Md. Mohiul Alam sir** , Superintending Engineer (SE) , DPDC training & Development . I'm also grateful to all of the employees who treated us with dignity and assisted us whenever we needed it .

Apart from this , I would like to thank my entire friends for sharing knowledge , information and helping me .

To my **beloved family** , I don't have enough words to thank them for their support , inspiration and also trust me that I'm capable of doing this .

APPROVAL

ঢাকা পাওয়ার ডিস্ট্রিবিউশন কোম্পানী লিমিটেড
DHAKA POWER DISTRIBUTION COMPANY LIMITED
(An Enterprise of the Government of the People's Republic of Bangladesh)
website: www.dpdc.org.bd

Office of the
Superintending Engineer
Training & Development.
Training Bhaban, 6th Floor
3, Sonargaon Road, Katabon, Dhaka
Phone 9670731 Fax-8616738
E-mail: setd@dpdc.org.bd

Memo no: 87.410.450.06.00.079.2021.993 Date: 16/06/2022

Associate Professor and Head
Department of EEE
Faculty of Engineering
Daffodil International University
Dhaka.

Subject: Approval of Attachment Training for 08 (Eight) Students of Daffodil International University.

Based on your letters on 28/03/2022 we are pleased to inform you that following students have been granted permission for Attachment Training at DPDC. They can participate in the attachment training from 19/06/2022 to 29/08/2022.

Sl. No.	Student Name	Technology	Student ID	Mobile No.	Institute
01	Enamul Haque	B.Sc in EEE	191-33-4913	01627896881	Daffodil International University (DIU)
02	Istiak Ahmed Badhon	B.Sc in EEE	191-33-5066	01796339827	
03	Kamrun Nahar Ritu	B.Sc in EEE	191-33-4925	01704699488	
04	Md. Rayhan Majid	B.Sc in EEE	191-33-4932	01979453388	
05	Md. Mahafuz Hasan	B.Sc in EEE	191-33-5117	01752293414	
06	Mehedee Hasan Anik	B.Sc in EEE	191-33-4990	01907599818	
07	Mst. Mimuna Akter Mishu	B.Sc in EEE	191-33-4977	01759648249	
08	Walid Hosen	B.Sc in EEE	191-33-4923	01768931828	

The trainees are obliged to bear their identity card with them during training hour and are advised to make their food and accommodation arrangement at their own discretion.

This letter has been issued with the approval of the concerned authority.

Sincerely,
16/6/22
(Md Mohiul Alam)
Superintending Engineer
Training & Development, DPDC

Copy to (not as per seniority):
1. Executive Director (Admin & HR), DPDC
2. Chief Co-ordination Officer to Managing Director, DPDC
3. Executive Engineer/ Manager (HR), this office
4. AKM Badrul Alam, Assistant Engineer, this office (will work as Course Co-ordinator)
5. Alavi Afrida Labonno, SAE, this office (will work as Assistant Course Co-ordinator)
6. Office Copy/ Master File

CERTIFICATION

ঢাকা পাওয়ার ডিস্ট্রিবিউশন কোম্পানী লিঃ
DHAKA POWER DISTRIBUTION COMPANY LTD (DPDC)
(An Enterprise of the Government of the People's Republic of Bangladesh)
Website: www.dpdc.org.bd

Office of the
Superintending Engineer
Training & Development
Training Bhaban, 6th Floor
Katabon, Dhaka-1000
Phone: 9670731, Fax: 8616738
e-mail: setd@dpdc.org.bd

স্মারক নং: ৮৭.৪১০.৪৫০.০৬.০০.০৭৯.২০২২.১৩৭ তারিখ: ৩০/০৮/২০২২ খ্রি.

Associate Professor & Head
Department of EEE
Faculty of Engineering
Daffodil International University
Dhaka.

বিষয়: ড্যাফোডিল ইন্টারন্যাশনাল ইউনিভার্সিটি (ডি.আই.ইউ) এর ০৭ জন শিক্ষার্থী ডিপিডিসি'তে এটাচমেন্ট ট্রেনিং এ অংশগ্রহণ প্রসঙ্গে।
Memo No: 87.410.450.06.00.079.2021.993 Date: 16/06/2022

বর্ণিত বিষয়ে জানানো যাচ্ছে যে, Daffodil International University এর EEE ডিপার্টমেন্ট এর নিম্নবর্ণিত ০৭ জন শিক্ষার্থী ডিপিডিসি'তে গত ১৯/০৬/২০২২ হতে ৩০/০৮/২০২২খ্রি. পর্যন্ত এটাচমেন্ট ট্রেনিং এ অংশগ্রহণ করেন।

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07	Walid Hosen	B.Sc in EEE	191-33-4923	01768931828	

এটাচমেন্ট ট্রেনিং এ নিম্নলিখিত বিষয়ে আলোকপাত করা হয়:

(ক) বিদ্যুৎ সরবরাহের সূচনা, বিদ্যুৎ সেক্টরের রিফর্মের আওতায় সরকার কর্তৃক ক্রমান্বয়ে পিডিবি, আরইবি, ডেসা, ডেসকো ও ডিপিডিসি গঠন।
(খ) ডিপিডিসি'তে বিদ্যুৎ সরবরাহ ব্যবস্থা।
(গ) ডিপিডিসি'তে নেটওয়ার্ক অপারেশন ও কাস্টমার সার্ভিস (এনওসিএস) কার্যক্রম।
(ঘ) এনওসিএস এর সহায়ক অফিসসমূহের (যেমন- এইচ.আর, ফিন্যান্স, আইসিটি, অডিট, পরিকল্পনা, উন্নয়ন, মিটারিং, সিস্টেম প্রটেকশন, গ্রীড, ট্যারিফ এন্ড এনার্জি অডিট) কার্যক্রম।
(ঙ) ডিপিডিসি'র প্রশিক্ষণ ও উন্নয়ন দপ্তরের কার্যক্রম।
(চ) ১৩২/৩৩ কেভি জিআইএস উপকেন্দ্র ও ৩৩/১১ কেভি উপকেন্দ্র পরিদর্শন।
(ছ) ডিপিডিসি'র স্ক্যাডা সিস্টেম, ওয়ার্কশপ, মিটার টেস্টিং ল্যাব, কেন্দ্রীয় ভান্ডার, মেডিকেল সেন্টার পরিদর্শন।

শিক্ষার্থীদের উত্তরোত্তর সাফল্য কামনায়,

(মোঃ মহিউল আলম)
তত্ত্বাবধায়ক প্রকৌশলী
প্রশিক্ষণ ও উন্নয়ন, ডিপিডিসি।
ই-মেইল: setd@dpdc.org.bd

বিতরণ:
১। নির্বাহী পরিচালক (এডমিন ও এইচ.আর), ডিপিডিসি।
২। সিসিও টু ব্যবস্থাপনা পরিচালক মহোদয়, ডিপিডিসি।

ABSTRACT

Electrical energy for system protection, supervisory control , and metering substations typically relay on static and electromechanical devices . Each device makes and loses . Instrumentation transformers , circuit and power framework breakers , tap changers , detaches , and other similar devices can provide procure data . This method has two disadvantages . The first is the cost of each device receiving the Free Power Framework flag , which includes the cost of copper wire loads and labor for this wiring . Furthermore , each device only includes necessary features . Statistics from neighboring organizations .

Micro – based handling technology and fiber – optic – based communication technology have enable highly efficient acquisition and management of electric power system data . Along these lines, microchip – based innovation ushered in a new era of integrated substation assurance and control . This research focuses on the key points and challenges of integrated substations . In addition , relevant testing of Hydro – one communication with integrated substation capacity is shown. The status of the existing substation assurance and control joining system has been clarified.

DEDICATED TO

My Parents and my Teachers

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CHAPTER - 01

INTRODUCTION

1.1 Introduction

It is an excellent opportunity to obtain an entry level position at DPDC . DPDC stands for Dhaka power dispersion organization . It is one of the most important organizations in Bangladesh. Dhaka Power Distribution Company Limited (DPDC) is a public Limited Company that manages the distribution of electricity of Dhaka City Corporation customers. It is part of the power Division of the Ministry of power , Energy , and Mineral Resources of the Government of Bangladesh.
Throughout my internship, I traveled to various locations. Grid substations , SCADA , GIS , Control room , Call center , DPDC Store , DPDC workshop , DPDC library , Metering sector , NOCS are some examples.

1.2 History of Power Distribution in Bangladesh

Electricity was first used in Ahsan Manjil on December 7, 1901
Nawab of Dhaka's residence was then outfitted with a private generator . British citizen Mr Bolton turned on the first electricity in Ahsan Manjil on 7th December of 1901 . The general public began to use power generation in 1930 . When M/S DEVCO, a privately held company developed an electricity distribution system . Until the end of British rule in 1947 , private companies managed Dhaka's power generation and distribution systems . The Government of Pakistan took over the private owned companies in Dhaka in 1957 . They were transferred to the newly formed East Pakistan Water and Power Development Authority (EPWAPDA) in 1959.

After Bangladesh's liberation in 1972 , the Bangladesh Power Development Board (BPDB) took over the power wing of the EPWAPDA. BPDB oversaw Dhaka's power generation and distribution system until 1991. Later in 1990, an autonomous organization known as Dhaka Electric Supply Authority (DESA) was established by an ordinance issued by the president in order to improve consumer services and increase revenue collection by reducing the prevalent high system loss. DESA took over the electricity distribution system in and around Dhaka in October 1991 , but BPDB retained jurisdiction over of power generation.

Later, in 1996 , a subsidiary company called Dhaka Electric Supply Company Limited (DESCO) was formed to take over a few areas of the Dhaka city from DESA . DESCO has been in business since 1998 . DESA's operation were transferred to DPDC later in 2008 . The DPDC covers approximately 350 square kilometers in the southern part of the capital city of Dhaka and adjoining townships of Narayangonj . DESA , the ancestor of DPDC, was established as part of a reform process to ensure better services to the consumers, as well as to develop the power distribution system and reduce system loss . Prior to the established of DESA, the power development board experienced a 45 % of system loss . Following that, DESA was able to reduce it to around 26% . However it had also become a losing concern for a variety of reasons , DPDC was introduced as part of the reform process to replace DESA . In recent years , DPDC has been able to reduce the system loss to a single digit .

In September 2019 , Bangladesh's utility electricity sector had one national grid with a total installed capacity of 21,419 MW . The total installed capacity is 20,000 MW . Bangladesh's energy industry is thriving . Bangladesh has recently begun construction on the 2.4 gigawatt (GW) Rooppur Nuclear Power Plant, which is expected to be operational in 2023 . According to the Bangladesh Power Development Board, 90 percent of the population had access to electricity in July 2018 . However, Bangladesh's per capita energy consumption is considered low . Electricity is now the primary source of power for major of the country's economic activities . Bangladesh's total installed electricity generation capacity (including captive power) was 15,351 MW in January 2017 and 20,000 MW in 2008 .

Rural Electrification Board (REB)

In 1977, Rural Electrification Board was established . In Bangladesh, it implements rural electrification and constructs power lines and substations . Its counterpart, the Bangladesh Power Development Board, is in charge of urban electric distribution . It has captured a portion of the solar energy market .

Dhaka Electric Supply Company Ltd (DESCO)

Dhaka Electric Supply Company Limited, usually known as DESCO was founded in November 1996 under the companies . DESCO provides electricity to the Northern parts of Dhaka city and Tongi Town in the Takeover of the Mirpur area from DESA in 1998 . Gulsan , Banani , Baridhara , and Uttara were acquired in 2003 . Established sales and distribution divisions in 2004 . In 2005 , Inauguration of the prepaid metering system . In 2006 , the company went public . In 2007 , Tongi Pourashava and the distribution license were purchased from BERC.

1.3 Management Of DPDC

In the DPDC board there are 12 members . The Chairman is in 1st position . 10 various members . The 12th member is MD of DPDC .

Managing Director
ED (Admin & HR)
ED (Engg)
ED (Operation)
ED (Finance)
ED (ICT & Procurement)
Total 3577 employees

1.4 Offices / Organizations / Companies under Power Division

1. Bangladesh Energy and Power Research Council (BEPRC)
2. Bangladesh Power Management Institute (BPMI)
3. Sustainable and Renewable Energy Development Authority (SREDA)
4. Office of Chief Electrical Inspector
5. Power Cell
6. Bangladesh Rural Electrification Board (BREB)
7. Bangladesh Power Development Board (BPDB)
8. North West Power Generation Company Ltd (NWPGC)
9. Dhaka Electric Supply Company Ltd (DESCO)
10. Dhaka Power Distribution Company Ltd (DPDC)
11. West Zone Power Distribution Company Ltd (WZPDCO)
12. Northern Electricity Supply Company Ltd (NESCO)
13. Power Grid Company of Bangladesh (PGCB)
14. Ashuganj Power Station Company Ltd (APSCL)
15. B-R Power Gen Ltd
16. Coal Power Generation Company Ltd (CPGCBL)
17. Electricity Generation Company of Bangladesh (EGCB)
18. Rural Power Company Ltd (RPCL)

CHAPTER - 02

BASIC INFORMATION OF DPDC

2.1 About DPDC

Dhaka Power Distribution Company Ltd (DPDC) is Bangladesh's largest power distribution company . Dhaka Power Distribution Company Ltd was established on October 25 , 2005, under the Companies Act of 1994, with a share capital of 10,000 crore divided into ordinary shares of Rs .

On May 14, 2007 , DPDC received permission to conduct commerce and began operation . On July 1, 2008 , the company began commercial operation , taking over all assets and liabilities from DESA . DPDC began operations with 6,55,908 customers and currently has a customer base of 14,52,658

Within the existing legal framework , the Board of Directors is the ultimate authority for the overall management of DPDC . The board is comprised of 12 government- nominated directors . DPDC's strategies functions are managed by a management team led by the Managing Director and five Executive Directors (ED Operation , ED Engg , ED ICT & Procurement , ED Finance , ED Admin & HR) as directed by the Board of Directors.

2.2 Vision

To achieve the country's desired economics , social , and human development through reliable electricity supply in Dhaka city and the Narayanganj area.

2.3 Mission

> Standard quality power distribution through service excellence .
> Power supply tailored to DPDC's geographical needs .
> Ensuring customer satisfaction .
> Developing a new mindset for all employees to fit the corporate culture .
> To achieve self - sufficient and profitability by increasing income and decreasing expenses.

2.4 DPDC profile

Administrative

SL no	Subject	Details
1	Company Name	Dhaka Power Distribution Company Limited
2	Registered Office	Biddyut Bhavan , 1 Abdul Gani Road , Dhaka - 1000
3	Headquarter	Biddyut Bhavan , Abdul Gani Road , Dhaka - 1000
4	Incorporation	25 October , 2005
5	Commercial Operation	1st July , 2008
6	Authorized Capital	10,000 crores
7	Administrative Ministry	Ministry of Power , Energy and Mineral Resources
8	Department	Department of Electricity
9	Managing Director	Engineer Bikash Dewan

Operational and Commercial (Financial Year 2019 - 2020)

SL no	Details	Amount
1	Total Volume	250 square km
2	Total Transmission and Distribution Lines	5741.16 Km
3	132 KV Transmission Line	204.06 Km
4	33 KV Distribution Line	480.82 Km
5	0.4 KV 11 KV 11 / 0.4 KV line	5045.98 Km
6	Number of substations	73
7	To Distribute	20270
8	Power at 33/11 KV level	3654 MVA
9	System Loss	6.58 %
10	Number of Consumers	14,52,658 (February , 2021)

2.5 DPDC system loss

System loss of DPDC is 18.18 % in FY 2008 - 2009 , 11.68 % in FY 2010 - 2011 , 10.51 % in FY 2011 - 2012 , 9.56 % in FY 2012 - 2013 , 9.46 % in FY 2013 - 2014 , 9.41 % in FY 2014 - 2015 . Also in the last financial year 2015 - 2016 system loss at 132 KV level is 118 % and at 33 KV level is 8.67 % , In 2016 - 2017 financial system loss is 8.40 % , In 2017 - 2018 financial system loss is 7.49 % , In 2018 - 2019 financial system loss is 7.29 % , and in 2019 - 2020 financial system loss was 6.58 %

2.6 Organogram of DPDC

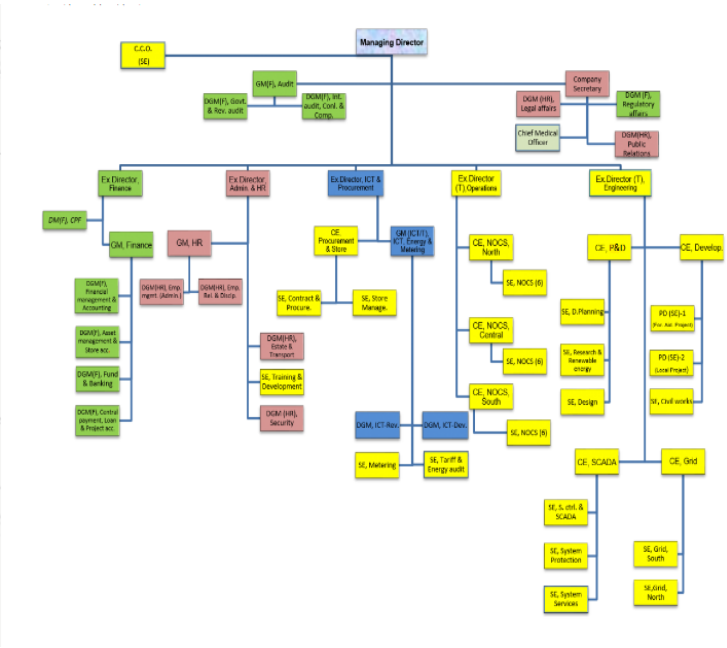


Figure 2.6.1 Organogram of DPDC

2.7 Circle wise DPDC area map

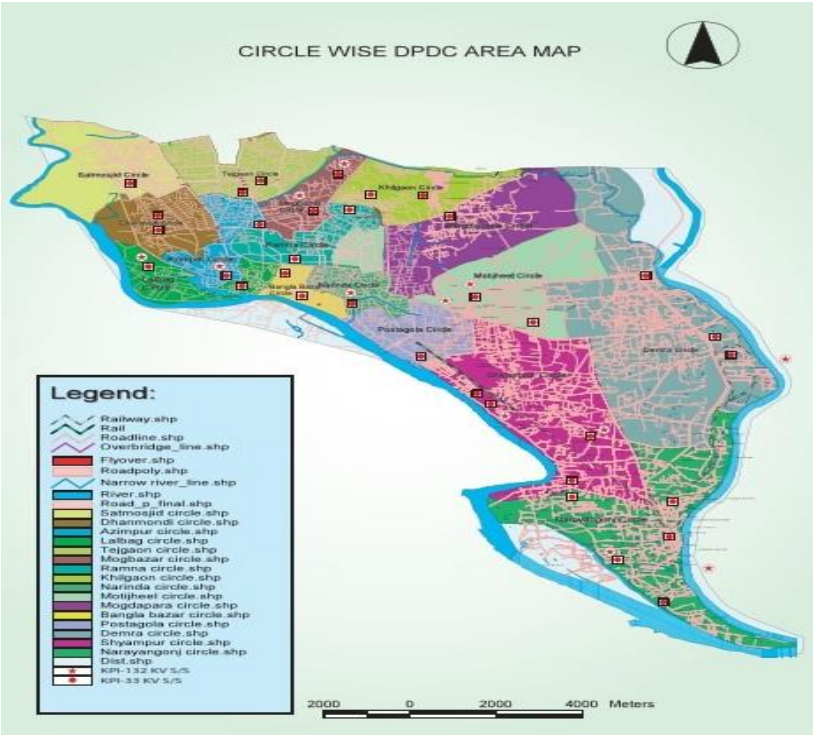


Figure 2.7.1 Circle wise DPDC area map

2.8 GIS based DPDC area map

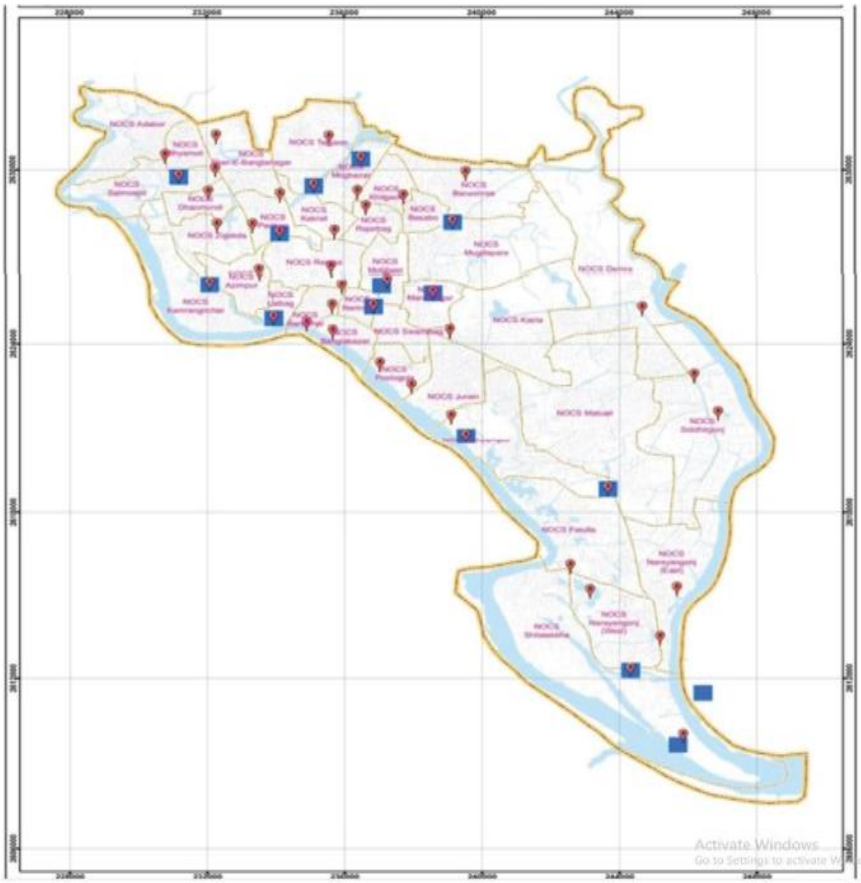


Figure 2.8.1 GIS based DPDC area map

CHAPTER - 03

POWER DISTRIBUTION SYSTEM IN DPDC

3.1 Power Distribution System

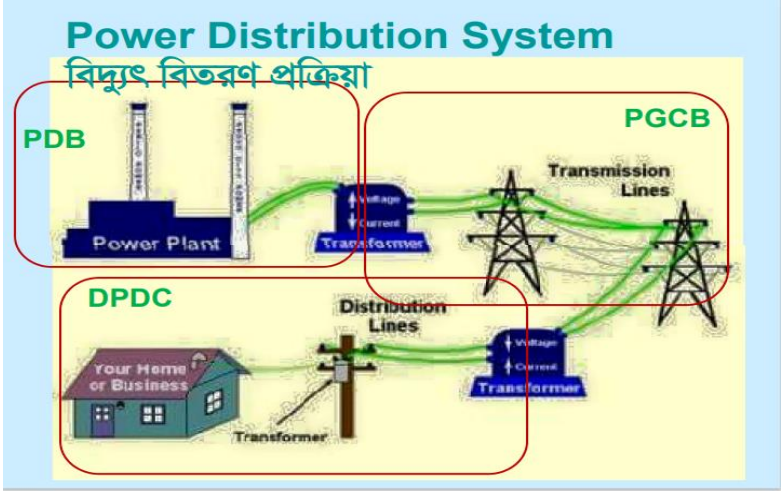


Figure 3.1.1 Power Distribution System

3.2 33/11 KV Substation

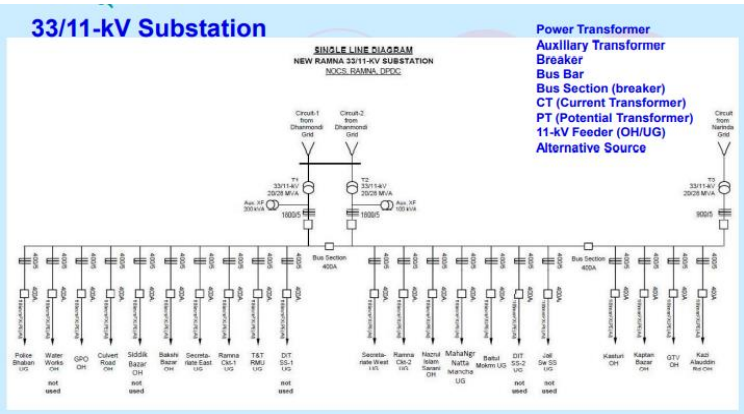


Figure 3.2.1 33/11 KV Substation

3.3 11 KV Switching Station

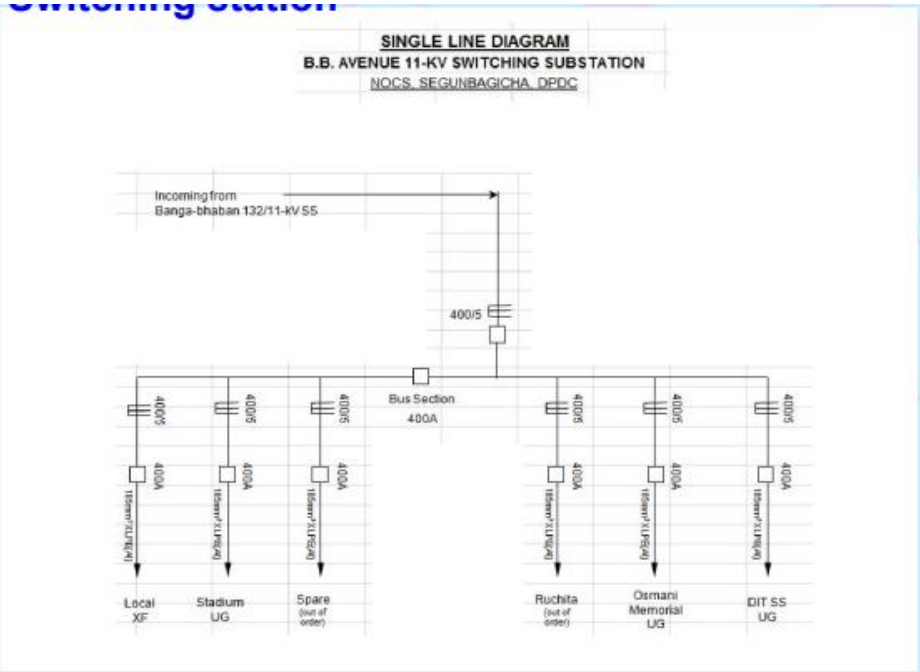


Figure 3.3.1 11 KV Switching Station

3.4 11 KV Bus Bar

Figure 3.4.1 11 KV Bus Bar

3.5 11 KV Underground Network

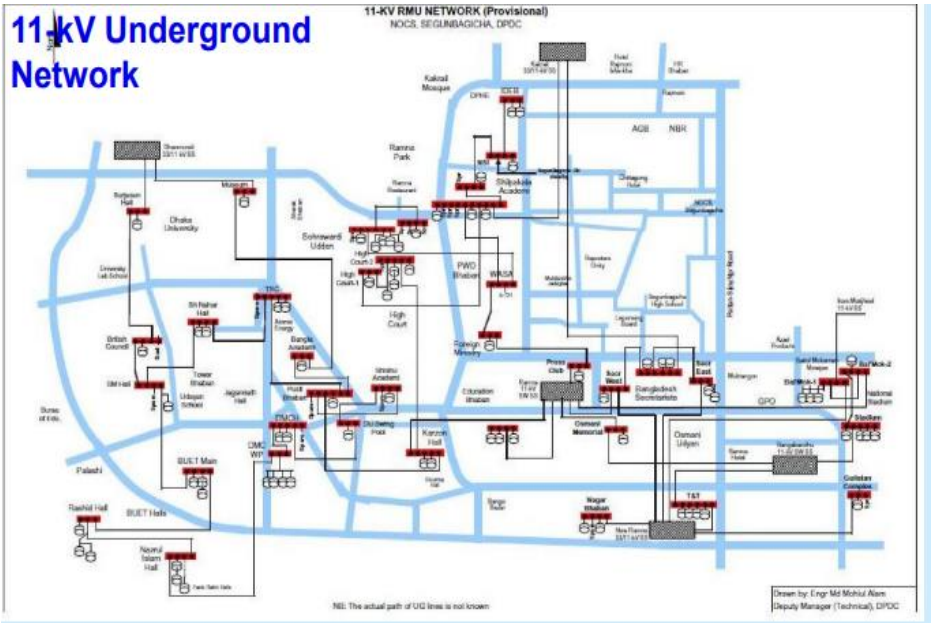


Figure 3.5.1 11 KV Underground Network

3.6 11 KV RMU (Ring Main Unit)

Figure 3.6.1 11 KV RMU (Ring Main Unit)

3.7 11 kv Overhead Feeder

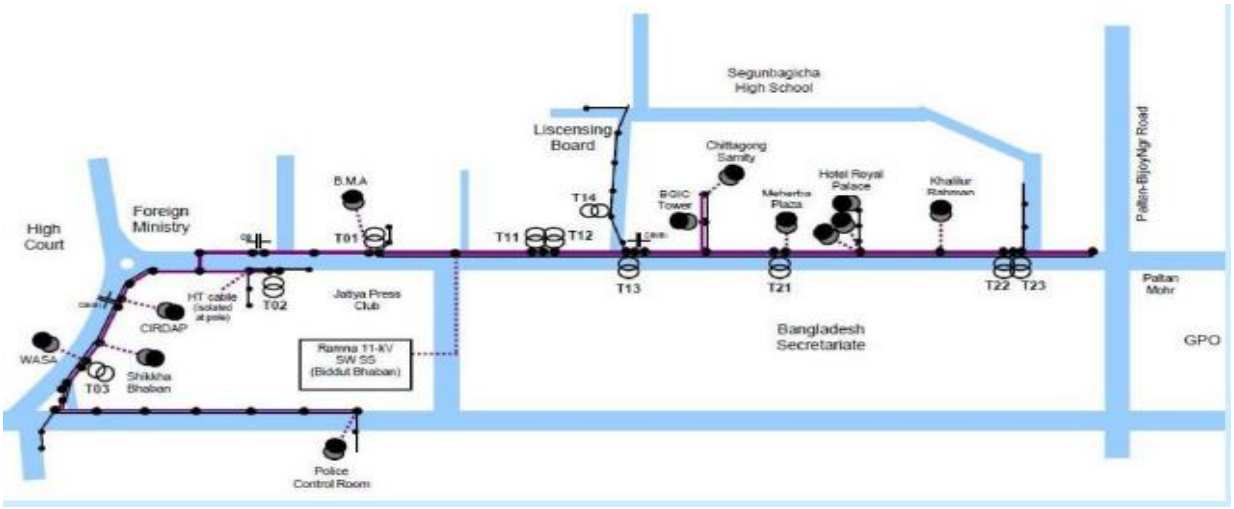


Figure 3.7.1 11 KV Overhead Feeder

3.8 11 KV/ LT Line

Figure 3.8.1 11 KV/ LT Line

3.9 11 KV/ LT Line with Jumper

Figure 3.9.1 11 KV/ LT Line with Jumper

3.10 Distribution Transformer

Figure 3.10.1 Distribution Transformer

3.11 Cable Connection in Substation Breaker

Figure 3.11.1 Cable Connection in Substation Breaker

3.12 Underground Cable

Figure 3.12.1 Underground Cable

3.13 Cross - Sectional view of Power Cable

Figure 3.13.1 Cross - Sectional view of Power Cable

3.14 Various Cables

		
600 V Single Conductor Wire	Control & Tray Cable	Instrumentation & Thermocouple Wire
		
Medium Voltage Power Cable	Armored Cable & Continuously Welded Sheath	Portable Cable

Figure 3.14.1 Various Cables

3.15 Various Wires

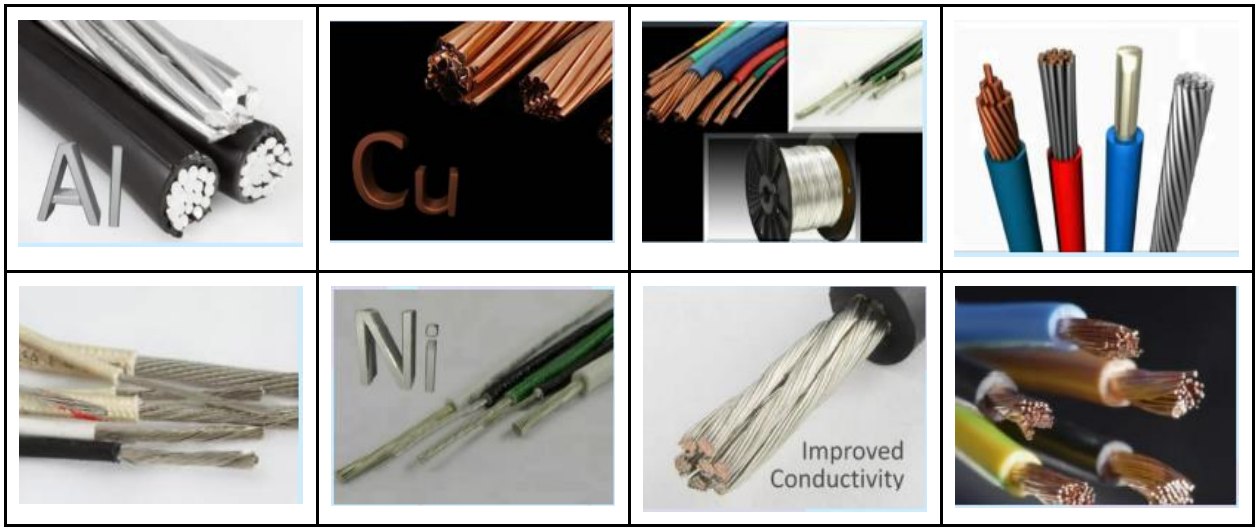


Figure 3.15.1 Various Wires

3.16 Height of Poles

LT Line (400/ 230 V)	9 - 10 meter
11 KV Line	11 - 12 meter
33 KV Line	12 - 15 meter

3.17 Wire Size

15 - amps	14 - gauge (3 . 24 mm^2)
20 - amps	12 - gauge (5 . 48 mm^2)
30 - amps	10 - gauge (8 . 30 mm^2)

3.18 Overhead Single Phase Service Connection

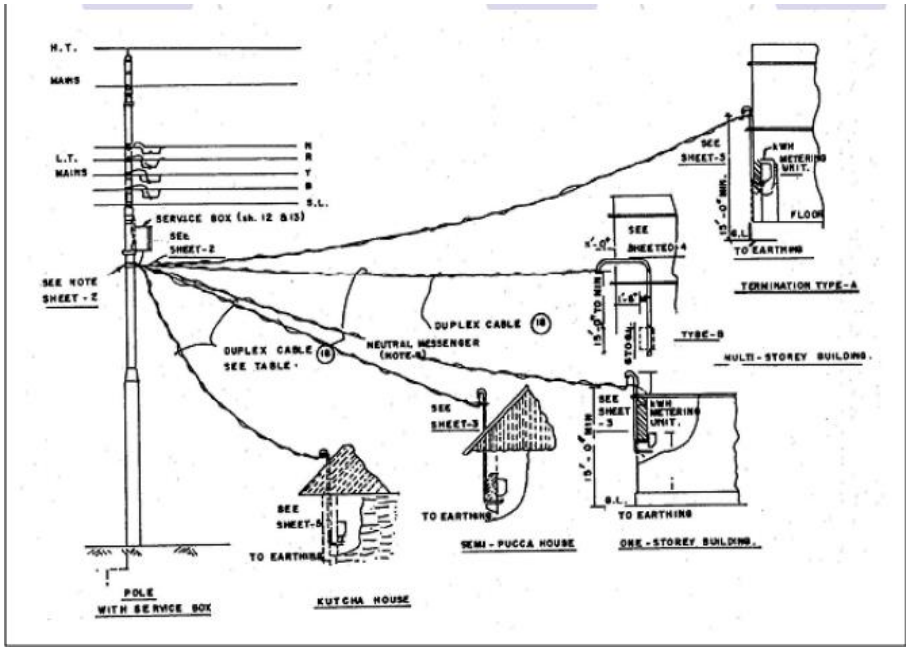


Figure 3.18.1 Overhead Single Phase Service Connection

3.19 Overhead Three Phase Service Connection

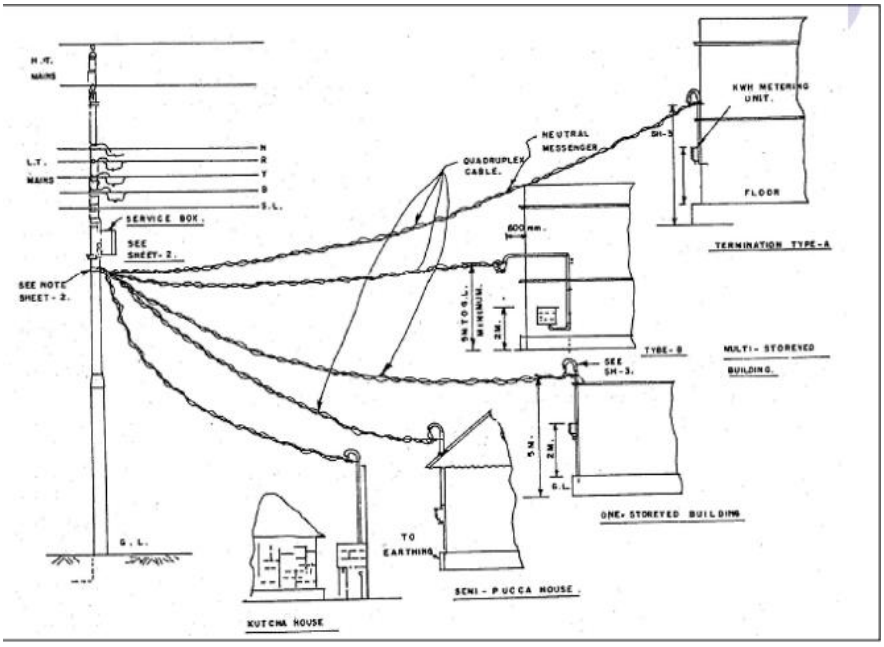


Figure 3.19.1 Overhead Three Phase Service Connection

3.20 HT Service Connection

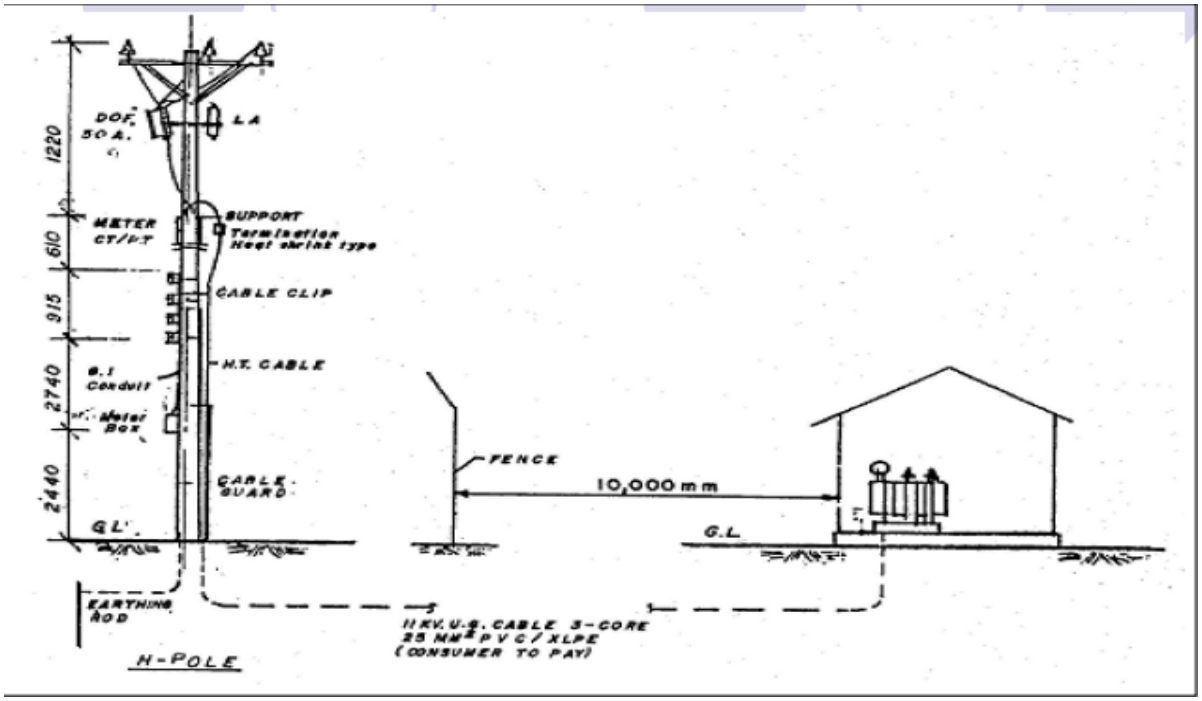


Figure 3.20.1 HT Service Connection

CHAPTER – 04

TRANSFORMER

4.1 About Transformer

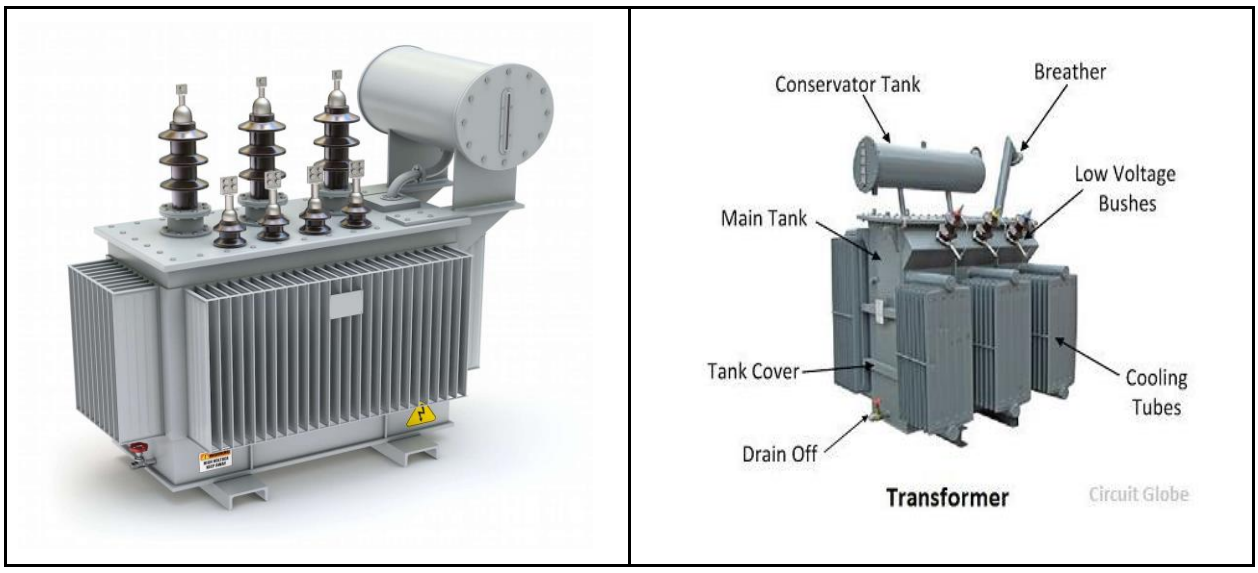


Figure 4.1.1 Transformer

The term ‘’ transformer ‘’ is derived from the English word ‘’ transform ‘’ which means to convert . A transformer is a stationary device that changes the magnetic field while maintaining the frequency constant to step down and step up the voltage (V) of an alternating current supply . The transformer has two coils , one for the primary coil and one for the secondary coil . These coils determine the output voltage .

Electrical power is typically generated at 11 KV . AC power is transmitted over long distance at very high voltages, such as 220 KV or 440 KV, for economical reasons . As a result, a step – up transformer is used at the generating stations .

For safety reasons , the voltage is stepped down to different levels by step down transformers at various substations to feed the power to the various locations, and thus the power is utilized at 400 / 230 kV.

4.2 Various Types of Transformer

According to based on Voltage Level

> Step up

> Step down

According to based on Core Construction

> Core type

> Shell type

> Spiral core type

According to based on Measuring Instrument

> Current Transformer (CT)

> Potential Transformer (PT)

According to based on Set up

> Indoor Type

> Outdoor Type

> Pole Mounted

> Pad Mounted

According to based on Phase

> Single phase

> Three phase

According to based on Uses

> Power Transformer

> Distribution Transformer

> Auto Transformer

4.3 Standard Transformer Sizes

Phase	Voltage Level	Capacity
Single Phase	11 / 0.23 KV	10 , 15 , 25 , 50 , 75 , 100 KVA
Three Phase	11 / 0.4 KV	100 , 200 , 250 KVA
Three Phase	33 / 11 KV	2.5 , 5 , 10 , 20 MVA
		

4.4 Equipment of Transformer

Core :

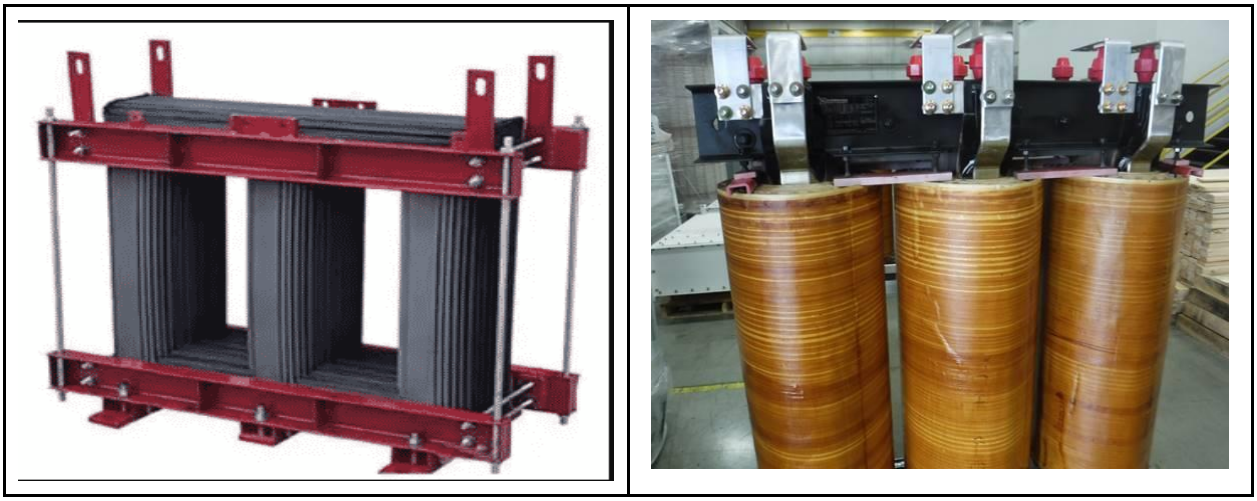


Figure 4.4.1 Transformer Core

A transformer core is a device that uses electromagnetic induction to transfer power from one source to another . It offers mechanical support to the winding . This creates a low reluctance closed ferromagnetic path to the Magnetic flux. Reduce the losses caused by flux leakage as well.

Breather :

Figure 4.4.2 Transformer Breather

The breather is a steel shaped bottle tube which is attached to one side of Conservator to allow air to pass through the Calcium Chloride and Silica gel from the conservator and fill it to absorb the moisture contained within .

Bushing :

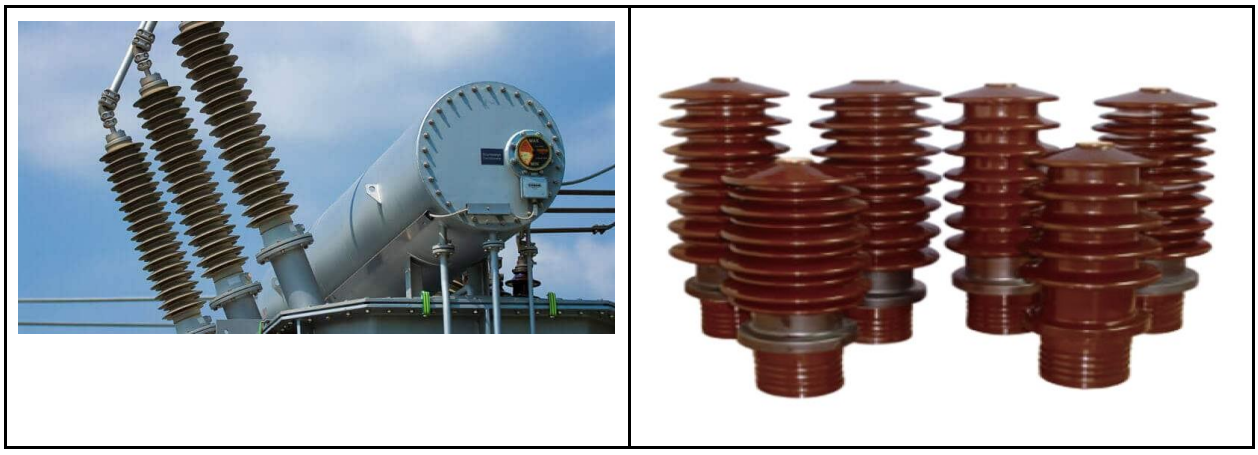


Figure 4.4.3 Transformer Bushing

A bushing is a type of Hollow insulator that is used in power devices to allow a conductive wire to easily enter a conductive surface , without making any electrical contact . Typically, it is created with the aid of porcelain . It can also be made of other types of insulating materials .

Buchholz Relay :

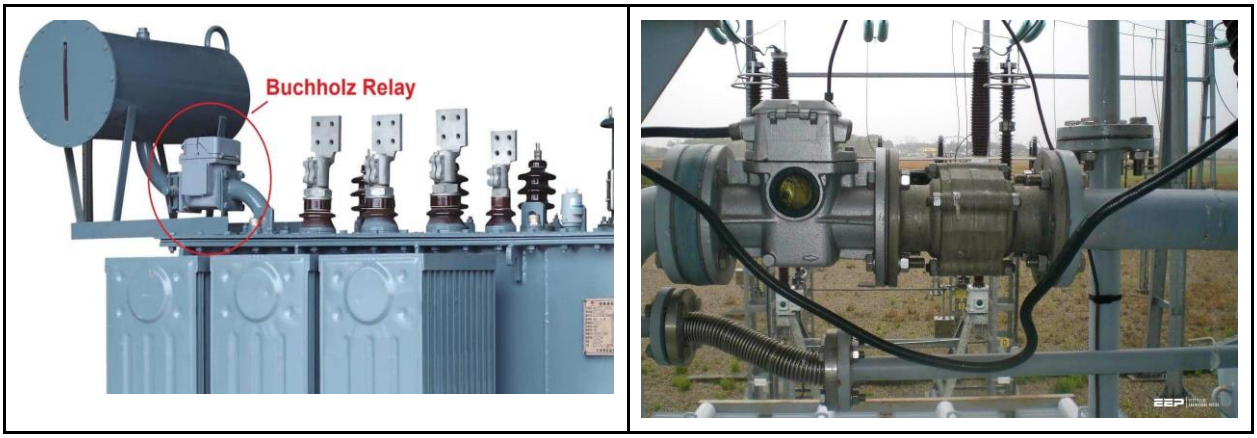


Figure 4.4.4 Buchholz Relay

Buchholz relays are safety devices used in electrical power transmission and distribution. They are mounted on some oil - filled power transformers and reactors that have an external overhead oil reservoir known as a Conservator .

Winding:

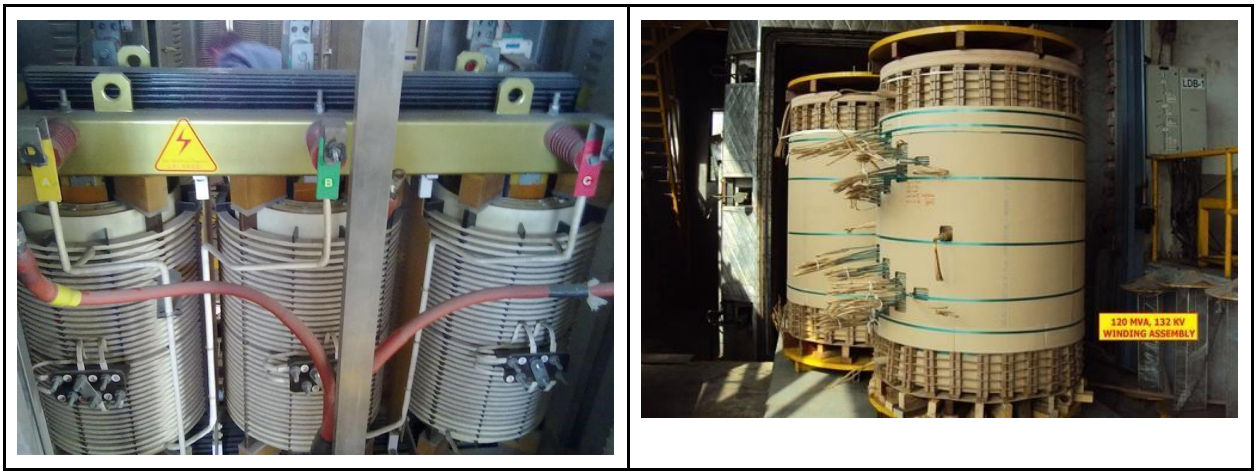


Figure 4.4.5 Transformer Winding

In a transformer there are two types of windings , Primary winding and another one is secondary winding . The primary winding draws energy from the main source , and the secondary winding transmits it to the load . It has the ability to increase or decrease the Voltage or Current level.

Conservator Tank :

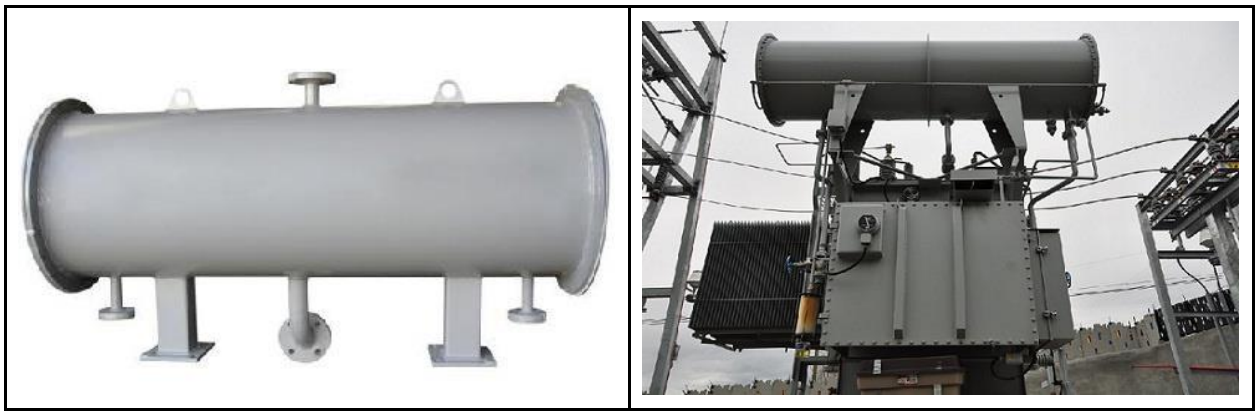


Figure 4.4.6 Conservator Tank

A conservator tank is a Cylindrical tank mounted on the roof of a transformer's main tank . It is used to allow enough space for the oil in the transformer to spread after heating **.**

Radiator :

Figure 4.4.7 Transformer Radiator

The transformer's radiator accelerates the cooling rate of the transformer . It is essential for increasing loading capacity of an electrical transformer . This is the primary function of the power transformer's radiator .

Horn Gap :


Figure 4.4.8 Horn Gap

When the High Tension voltage rises for any reason, such as a lightning arrestor, the excess voltage flows through it and into the ground . The horn gap in the High Tension bushing then resembles a horn . This is the primay function of the horn gap .

Tap Changer :


Figure 4.4.9 Tap Changer

A tap changer's primary function is to regulate the output voltage of a transformer . The tap changer accomplishes this by changing the number of turns in one ratio winding , thereby changing the transformer's turn ratio .

Name Plate :

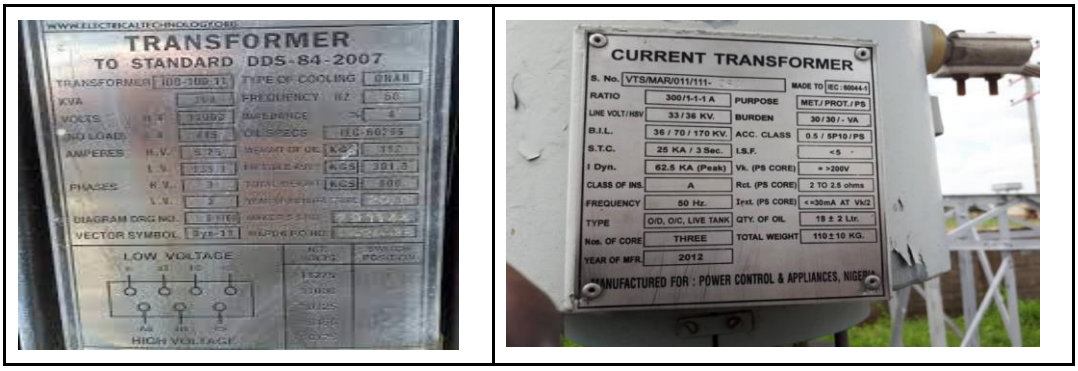


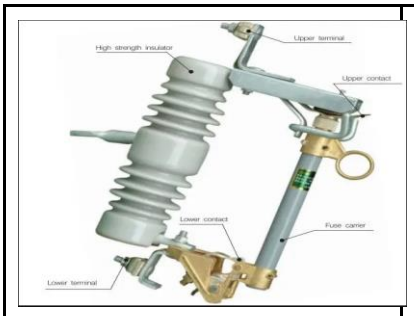
Figure 4.4.10 Name Plate'

The nameplate of a transformer contains the transformer's KVA rating , Voltage rating , Frequency , Number of phases , Temperature , name of manufacture , year of manufacture , and so on.

4.5 Transformer Protection

Transformer Protection needed for
> Stresses , which generated by the supply voltage
> Stresses due to the load
> Internal Faults in transformer
> Thundering

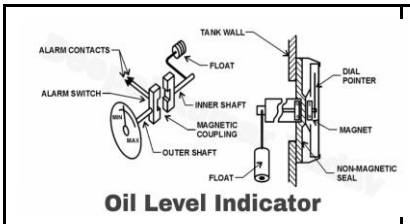
Means of Transformer Protection



Fuse

MCB

MCCB



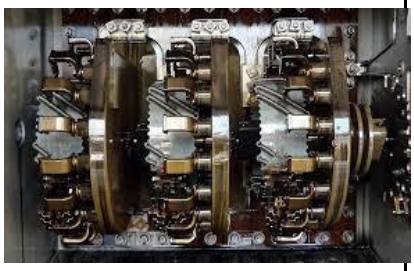
Oil Level Indicator

Silica Gel

Horn Gap

Temperature Meter

Lightning Arrester



Tap Changer

Figure 4.5.1 Transformer Protection

4.6 Transformer Earthing

Figure 4.6.1 Transformer Earthing

An earthing transformer is a three - phase transformer which is connected to the power system to provide a neutral connection for earthing , either directly or through impedance.

Earthing depth = 20 feet , 40 feet , 80 feet

Standard depth = 100 feet

Resistance = Less than 1 ohm

Usually GI wire is used

Pipes can be used

4.7 Transformer Testing

Figure 4.7.1 Transformer Testing

Transformer is needed for ,
> Is the insulation of each phase correct ?
> Is there a phase of earth or not ?
> Is the coil cut in any phase or none ?

Transformer Testing Equipment:

Megger (Digital / Analog)

AVO (Digital / Analog)

Figure 4.7.2 Transformer Testing Equipment

Testing

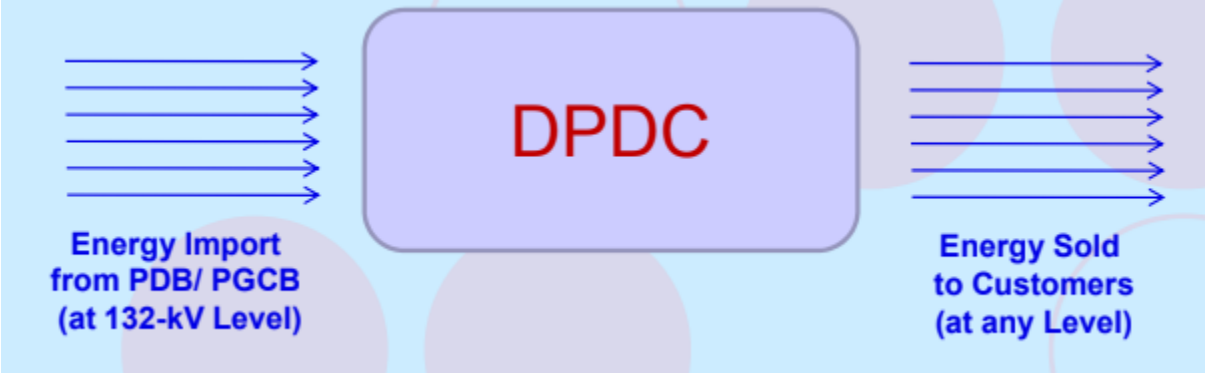
Material	Test	Which is measured	With which is expressed	Comment
Megger	Insulation Test	Resistance	Mega Ohm	Large Scale
AVO	Continuity Test	Resistance	Ohm	Small Scale

Materials	Measurement Point	Received Resistance (Standard)	Review	Comment
Megger	R - Y Y - B B - R HT - LT HT - G LT - G	= 0 (Zero) Ohm = 0 (Zero) Ohm = 0 (Zero) Ohm Infinity Infinity Infinity	If the reading is high, be suspicious If there is a chance , the reading will be close to zero	Isolate from have to do before measuring the transformer supply and load
AVO	R - Y Y - B B - R	12 Ohm 12 Ohm 12 Ohm	Cut the coil, go to one, and the reading will double	

CHAPTER - 05

THE TREND OF SYSTEM LOSS IN DPDC

5.1 System Loss in DPDC



Energy Loss = Energy Import - Energy Sold

System Loss (%) = (Energy Loss / Energy Import) * 100%

Average System Loss :

NOCS	Import Unit mKWh	Sold Unit mKWh	System Loss (%)
Tejgaon	27.86	24.38	12.48
Kakrail	19.94	18.98	4.84
Tejgaon Circle	47.80	43.36	9.29

System Loss in 33- KV Level:

Month August-2020
Date:29.09.2020

33-kV Level

NOCS	IMPORT	SOLD	SYSTEM LOSS(%)
Tejgaon	27805091	25107055	9.70
Kakrail	21443185	20614201	3.87
Moghbazar	17391677	16308733	6.23
Khilgaon	13197262	12039301	8.77
Satmosjid	16634027	15495432	6.84
Sherebangla nagar	18750946	17289454	7.79
Dhanmondi	20596604	19756957	4.08
Jhigatala	23083976	22258914	3.57
Azimpur	16366386	15759311	3.71
Paribagh	28939235	27879795	3.66
Shyamoli	15577113	14320864	8.06
Adabor	26561308	24124605	9.17

NOCS	IMPORT	SOLD	SYSTEM LOSS(%)
Lalbagh	26946145	25846644	4.08
Kamrangirchar	32726989	31793137	2.85
Ramna	20024459	19590198	2.17
Rajarbagh	15580942	14596959	6.32
Bashabo	13128952	12405453	5.51
Bonossri	18492062	17989988	2.72
Molijheel	19563995	19286726	1.42
Mughdapara	15744312	13218943	16.04
Banglabazar	14420462	13160131	8.74
Bongshal	17081715	16792396	1.69
Narinda	12915415	11719808	9.26
Swamibagh	13256059	11542169	12.93

NOCS	IMPORT	SOLD	SYSTEM LOSS(%)
Kazla	29192485	28666718	1.80
Maniknagar	18761618	18083441	3.61
Shyampur	60513812	58841569	2.76
Matuail	18361395	16535426	9.94
Postogola	14624569	14223509	2.74
Jurain	27544877	26682190	3.13
Narayangonj-West	26783532	24109956	9.98
Narayangonj-East	29041989	27303429	5.99
Damra	18747169	16155338	13.83
Siddhirgonj	39940176	36986584	7.40
Fatulla	30381631	27430167	9.71
Shitalokko	40214403	37975423	5.57

Source : DPDC annual report

Total Import = 820335974
Total Sold = 771890924
System Loss = 5.91%

132 KV Import	824550260
33 KV import of DPDC	820335974
Difference between 132 KV import & 33 KV import of DPDC in %	0.511
DPDC Sold Units	771890924
System Loss at 132 KV Level	6.39

DPDC : 2008 - 2021

At 132 - KV Level

2008 - 2009	18.18 %
2019 - 2020	6.58 %
2020 - 2021	6.53 %

Target 2021- 2022 7.15 &
Target 2022- 2023 7.10 %
Target 2023 - 2024 7.05 %

DPDC System Loss

	132-kV Level	33-kV Level	
2007-2008	---	20.06 %	DESA
2008-2009	18.18 %	16.89 %	DPDC
2009-2010	13.09 %	12.43 %	
2010-2011	11.68 %	11.14 %	
2011-2012	10.51 %	9.87 %	
2012-2013	9.56 %	9.04 %	
2013-2014	9.46 %	8.97 %	
2014-2015	9.41 %	8.91 %	
2015-2016	9.18 %	8.67 %	
2016-2017	8.40 %	8.14 %	
2017-2018	7.41 %	6.97 %	
2018-2019	7.29 %	6.61 %	
2019-2020	6.58 %	6.02 %	Target: 7.48 % (132-kV)
2020-2021	6.53 %	6.12 %	Target: 7.20 % (132-kV)

Demra System Loss

33-kV Level
28.74 %
17.87 %
14.61 %
13.99 %
11.93 %
11.24 %
10.77 %
11.10 %
11.87 %
10.84 %
9.86 %
10.53 %
11.20 %

Month	132-kV Level	33-kV Level	
Jul'2008	22.89 %	21.71 %	DPDC starts
Aug'2008	20.73 %	19.20 %	
Sep'2008	22.01 %	20.59 %	
Oct'2008	17.77 %	16.36 %	
Nov'2008	19.63 %	18.10 %	
Dec'2008	15.37 %	14.26 %	
Jul'2019	8.35 %	7.76 %	after 11 years
Aug'2019	6.19 %	5.55 %	
Sep'2019	5.63 %	4.99 %	
Oct'2019	7.31 %	6.68 %	
Nov'2019	4.56 %	3.91 %	
Dec'2019	4.15 %	3.43 %	

Source : DPDC Annual Report

5.2 System Loss of Power Division

The System loss (Distribution) comes down to 8.48% this year (2020 - 2021) as against 8.73% in previous year.

FY	BPDB	REB	DPDC	DESCO	WZPDCO	NESCO	DISTRI-BUTION	TRANS-MISSION	TRANSMISSION & DISTRIBUTION
2020-21	**8.50%**	**9.67%**	**6.53%**	**5.58%**	**7.88%**	**10.49%**	**8.48%**	**3.05%**	**11.11%**
2019-20	8.99%	9.90%	6.67%	6.32%	8.27%	10.62%	8.73%	2.91%	11.23%
2018-19	9.12%	10.87%	7.37%	7.11%	8.83%	10.52%	9.35%	3.10%	11.96%
2017-18	9.89%	11.06%	7.49%	7.14%	9.24%	11.32%	9.60%	2.75%	11.87%
2016-17	10.92%	11.38%	8.48%	7.24%	9.57%	11.06%	9.98%	2.67%	12.19%

Source : DPDC annual report

5.3 Reasons of System Loss

> Technical
> Non - Technical

Technical Loss:

> Line Loss
> Transformer Loss

Technical Loss Comprises of ,

> Loss in Transformer
> Loss in Conductor
> Loss in Joints
> Loss in Other parts

Non - technical Loss:

> Faults in Meter
> Power Rigging

5.4 How to Control System Loss

Technical Loss Control	Non - Technical Loss Control
> Technical Work	> Technical Work > Non - Technical Work

Technical works for Technical Loss control :

> 11 KV Overhead feeder splitting / capacity argumentation
> Sub - standard service cables , lines and to provide uninterrupted power to customers and reduce system losses, take the following steps to standardize connectivity.
> Load balancing of transformer
> Twisted connections of the line are connected by crimped , mid - span joints
> The connection on the HT and LT sides of the distribution transformer are made through sockets and crimps to do
> Each 11 KV feeder covers 11 KV line , 0.4 KV line , distribution transformer , consumer 100% complains of all activities including service , DOF , lightning arrester , earthing .

Non - Technical works for Non- Technical Loss control :

> Replacing analog meters with installation of digital meters
> Determining the CT ratio according to the load of the MT customer
> Enhancing installation of mother meters and single points meters
> Ensuring standard meter testing system for 36 NOCS offices
> Ensuring MT meter inspection / testing activities by Metering Department
> Continuation of MT customer conversion process
> Ensuring 100% accuracy of incoming meters of all feeders.

Technical works for Non- Technical Loss control :

> All LT meters installed in various parts of the building should be conveniently located on the ground floor to facilities easy reading
> Ensuring 100% sealing of meters and proper record keeping
> Ensuring correct billing of temporary connections in accordance with policy
> Ensuring billing in accordance with correct meter reading and placement and recording of meter reading cards
> Regularly recording the date and time of feeder - wise load transfers in 33 / 11 KV sub - stations and 11 KV switching stations .
> Confirmation of new connection bill payment for the following month.

5.5 Discussion

> Trend of system loss is positive
> There are some saturation level
> Technical loss must be determined
> 1% system loss costs TK. 80 crore
> Attempt to eliminate calculation errors

CHAPTER - 06

VISITING AREAS

6.1 Dhanmondi Sub-Station

Figure 6.1.1 Dhanmondi Sub-Station

6.2 SCADA (Supervisory Control And Data Acquisition)

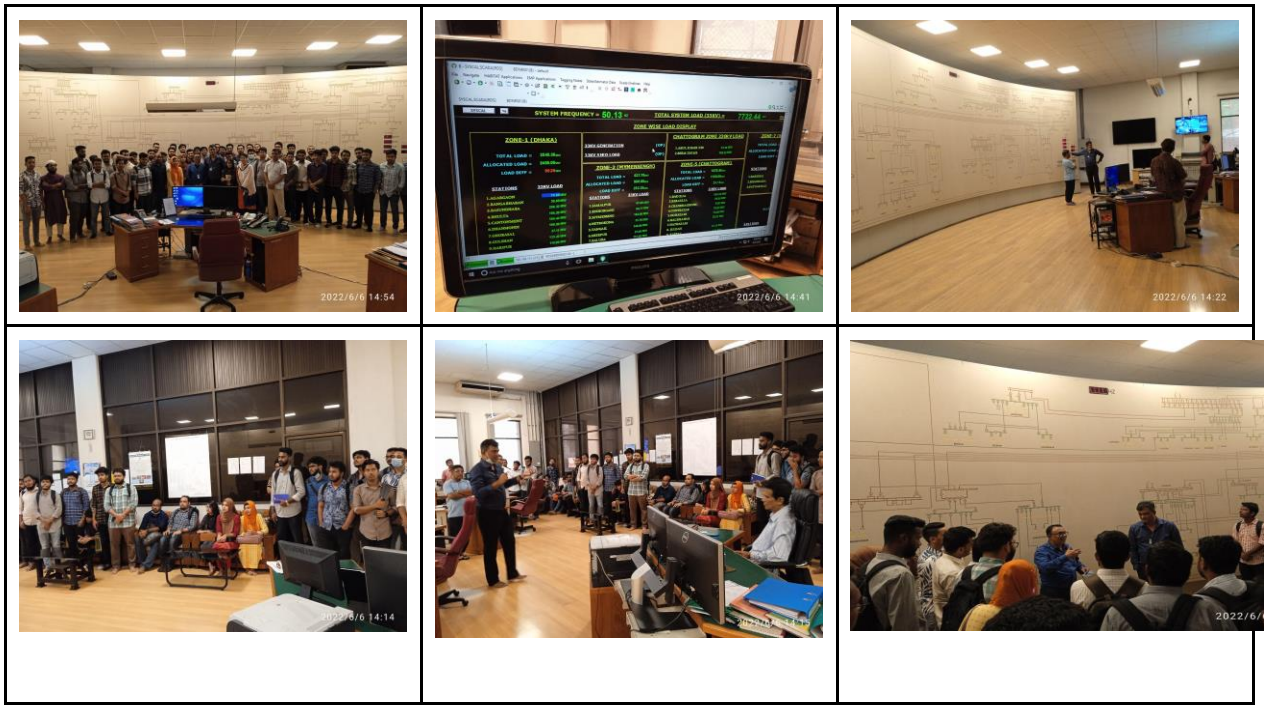


Figure 6.2.1 SCADA

6.3 Grid Sub-Station

Figure 6.3.1 Grid Sub-Station

6.4 DPDC Workshop

Figure 6.4.1 DPDC Workshop

6.5 NOCS (Network Operation & Customer Service) Poribag

Figure 6.5.1 NOCS Poribag

6.6 NOCS (Network Operation & Customer Service) Hatirpul

Figure 6.6.1 NOCS Hatirpul

6.7 DPDC Library

Figure 6.7.1 DPDC Library

CHAPTER - 07

CONCLUSION & DISCUSSION

7.1 Conclusion

During my internship at DPDC , I experienced some extraordinary days. DPDC is my state's most practical electricity sector organization . DPDC has provided me with real - world experience in electricity distribution. It gave me the opportunity to practically apply my hypothetical knowledge . This experience will be extremely beneficial to me in the future . I've met numerous authorities people of DPDC including SE (Superintending Engineer) , XEN (Executive Engineer), AE (Assistant Engineer). They have been extremely helpful to me during my internship.

7.2 Discussion

DPDC taught me with invaluable skills for understanding substation equipment . It provides me with a pleasurable experience . I learned practical information during my internship at DPDC. I learned about the transmission and distribution systems, as well the operational and control of breakers . The most important thing is that I learned about professional life , time management , and how much they are obedient with their work. This will be beneficial in my work field . Overall, my internship at DPDC was a great experience.

REFERENCES

1. https://en.wikipedia.org/wiki/Transformer
2. https://electrical-engineering-portal.com/equipment-distribution-substation
3. https://electricalgang.com/ct-pt-transformer/
4. https://www.electrical4u.com/protection-system-in-power-system/
5. http://www.electricalunits.com/earthing-transformer-or-neutral-grounding-transformer/
6. https://elearn.daffodilvarsity.edu.bd/pluginfile.php/1338758/mod_resource/content/2/Book-Mehta.pdf
7. https://en.wikipedia.org/wiki/Relay
8. https://dpdc.gov.bd/site/page/816191d7-0196-4e00-aa59-4e3cf6a400a4/-
9. https://en.wikipedia.org/wiki/Dhaka_Power_Distribution_Company
10. https://dpdc.gov.bd/site/page/00beca42-bc18-4bb9-960e-a5ad8132815a/-