

**Operation of Substation design and quality
control of Power Grid Company of Bangladesh
Limited**



**ISO 9001:2008
CERTIFIED**

পাওয়ার গ্রিড কোম্পানী অফ বাংলাদেশ লিঃ
POWER GRID COMPANY OF BANGLADESH LTD.
(An Enterprise of Bangladesh Power Development Board)

Internship Report

On

**Operation of Substation design and quality control of Power Grid
Company of Bangladesh Limited**

(BUS 699: Internship)

**An Internship Report Presented to the BRAC Business School in Partial Fulfillment of the
Requirement for the Degree of Masters of Business Administration.**

Submitted To

S. M Arifuzzaman

MBA program co-ordinator
BRAC Business School
BRAC University

Submitted By

Humayun Rashid

Id No: 13264026

Major: Finance

Program: Masters of Business Administration
BRAC Business School

Date of Submission: June 14, 2016



Inspiring Excellence

LETTER OF TRANSMITTAL

June 14, 2016

Asst. Prof. S.M. Arifuzzaman
MBA Coordinator, BRAC Business School
BRAC University
Mohakhali, Dhaka, Bangladesh

Letter of Transmittal

Dear Sir,

It is my great pleasure to submit the internship report on "Operation of Substation design and quality control of Power Grid Company of Bangladesh Limited" which I have prepared as a partial fulfillment of the course BUS699 practicum.

I made sincere efforts to study related materials, documents, observe operations performed in Substation Design & Quality Control Department and examine relevant records for preparation of the report.

Within the time limit, I have to make this report as comprehensive as possible. But there may be some mistakes due to various limitations. For this reason, I beg your kind consideration in this regard.

Sincerely yours

.....
Humayun Rashid
ID # 13264026

Student Declaration

I, Humayun Rashid, student of Master of Business Administration (MBA), under BRAC Business School (BBS) at BRAC University declaring that this internship report on the topic of “Operation of Substation design and quality control of Power Grid Company of Bangladesh Limited” have only been prepared for the fulfillment of the course of BUS699 Practicum as the partial requirement of the Master of Business Administration (MBA).

I hereby declare that this report has been solely prepared by me and to the best of my knowledge. It contains no materials previously published or written by any other person which have been accepted for the degree at BRAC University or any other educational institution, except the quotations and reference which have been duly acknowledged.

It has not been prepared for any other purpose, reward, or presentation.

.....

Humayun Rashid

Program: MBA

ID # 13264026

Acknowledgement

I would like to convey my sincere gratitude to S.M. Arifuzzaman (Assistant Professor, Coordinator, MBA Program BRAC Business School) for his frank inspiration as well as guidelines in preparing this report. I am also indebted thank to Engr. Noor Jamal, Executive Engineer, Substation Design & Quality Control for his constant guidance and valuable suggestion from time to time.

Finally, I am also indebted to all of my colleagues of the Design & Quality Control department who extended their wholehearted cooperation to me despite their heavy workload during my practical orientation.

I am again expressing my special gratitude to all.

With Warm Thanks,

Humayun Rashid

ID – 13264026

Executive Summary

The purpose of this report to illustrate the operation of Substation Design & Quality Control as an Assistant Engineer of the department as well as to fulfill the partial requirement for MBA degree at BRAC University.

The study is made under the supervision of Assistant Professor S.M. Arifuzzaman, BRAC University.

Power Grid Company of Bangladesh Ltd. (PGCB) was formed under the restructuring process of Power Sector in Bangladesh with the objective of bringing about commercial environment including increase in efficiency, establishment of accountability and dynamism in accomplishing its objectives. PGCB was incorporated in November 1996 with an authorized capital of Tk.10 billion.

It was entrusted with the responsibility to own the national power grid to operate and expand the same with efficiency. Pursuant to Government decision to transfer transmission assets to PGCB from Bangladesh Power Development Board (BPDB) and Dhaka Electric Supply Authority (DESA), PGCB completed taking over of all the transmission assets on 31.12.2002. PGCB expanded its network and capacity many fold and operating those efficiently and effectively.

In the report, I have described the operation of substation design & quality control, my job responsibility, problems that the department is facing currently and finally recommendation.

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CHAPTER 1: INTRODUCTION

1.1 Introduction

Now the world is very much competitive. So everybody has to be expert in his field in both practical knowledge and theoretical knowledge. As BRAC University aims to build future magnate with the theoretical knowledge as well as practical knowledge of economic field of our country, Internship course and its report is a significant aspect in the direction of accomplishing the goal. It is a systematic process for gathering, recording and analyzing of data about the topic that a student goes to learn on the program.

The aim of this internship program is to connect practical knowledge with theoretical aspects. Being a student of MBA, I have completed my internship report from Power Grid Company of Bangladesh Limited (PGCB).

During my internship period, I have tried my best to use the opportunity to enrich my knowledge about my department which is Substation Design and Quality Control and analyzed the way it operates within the organization.

1.2 Origin of the Report

This report is originated as the course requirement for the partial fulfillment of the requirements of internship course of MBA Program at BRAC University. I have been working at Power Grid Company of Bangladesh Limited for the last 3.5 years before starting my internship course. I have been asked to write a report about the role that my department plays within the PGCB.

1.3 Objective of the Report

Primary Objective

The primary objective of this report is to fulfill the partial requirement of MBA degree.

Secondary Objective

- To illustrate the operation of Design & Quality Control.
- To illustrate the role of Substation Design & Quality Control.
- To describe the job responsibility of an Assistant Engineer.
- To provide recommendation to overcome the current problems.

1.4 Methodology of the study

The data needed for conducting the study has been collected from the primary sources as well as secondary sources. In collecting the necessary data, care has been taken so that all the variables that may in some way can't affect the objectives of the study. The information that I used in this study is collected from the following sources:

Primary data sources:

- Personal experience of working here for last 3.5 years.
- Practical desk work
- Face to face conversation with the colleagues.

Secondary data sources:

- PGCB's Website.

1.5 Limitation of the Study

Like every other studies, I too faced some constraints during my internship period which otherwise would have enabled me in making my study more appropriate and logical.

The main limitations are as follows:-

- Most of work in this organization is technical, so explaining it in a simplified form is difficult.
- Most of the published document at PGCB's website is not updated.
- Time Constraint

CHAPTER 2: OVERVIEW OF THE ORGANIZATION

2.1 History of PCGB

Power grid Company of Bangladesh Limited (PGCB) is the only electric power transmission company in Bangladesh and it is one of those utility companies that have been formed during the restructuring of power sector. With an authorized initial capital of 0.10 billion PGCB has been entrusted with the responsibility to own the national power grid to operate and expand the same with efficiency and on 31.12.2002 PGCB has officially completed the taking over process of all the transmission assets from Bangladesh Power Development Board (BPDB) and Dhaka Electric Supply Authority (DESSA).

The company was established under the Company's Act 1994 where 76.25% of the ownership belongs to Bangladesh Power Development Board (BPDB) and the rest 23.75% belongs to general public. Initially, the Board of Directors consisted of nine directors, out of them three were from BPDB, three were from non Government organizations and three were from PGCB. On the 11th October 2006 following directive of Government BPDB reconstituted the Board of Directors of PGCB placing Secretary, Power Division, Ministry of Power, Energy & Mineral Resources as Chairman and Joint Secretary (Admin), Power Division as Director. The Chairman, Power Development Board and all other Directors continued as Directors of the Board. Power grid Company of Bangladesh Limited (PGCB) is listed at both Dhaka Stock Exchange (DSE) and Chittagong Stock Exchange (CSE).

2.2 Prime objective as per memorandum of association

To plan, promote, develop, operate and maintain an integrated and efficient power transmission system network in all its aspects including planning, investigation, research, design and engineering, preparation of preliminary feasibility and detailed project reports, construction operation and maintenance of transmission lines, substations, load despatch centres and communication facilities and appurtenant works, co-ordination of integrated operation of regional, national and international grid systems, providing consultancy services in power systems field, execution of turnkey jobs for other utilities / organisation, wheeling of power, purchase and sale of power.

2.3 Services

Electricity Transmission

The main operating function of PGCB is to transmit energy from BPDB power stations and other generation companies to distribution entities utilizing transmission network. In return PGCB gets its energy wheeling charge from its clients (distribution entities) at the rate fixed by Bangladesh Electricity Regulatory Commission (BERC).

Initially PGCB started with about 1144 circuit km of 230 kV lines, 5255 circuit km of 132 kV lines, 6 nos of 230/132 kV substation and 63 nos of 132/33 kV substations. Transmission lines of the company up to January, 2016 are stood at 220.70 ckt km of 400 kV lines, 3,171.45 circuit km of 230 kV lines, 6,311.63 circuit km of 132 kV lines and 1 nos of 400 kV substations, 1 nos of 400/230kV substation, 19nos of 230/132 kV substation and 90 nos of 132/33 kV substations.

Leasing Optical Fiber

PGCB has installed OPGW (Optical Ground Wire) on high voltage transmission line to protect the transmission lines from thundering. This technology of placing optical fiber within the ground wire is being widely used throughout the world at present.

The instant communication between NLDC and different grid substations, power stations are being maintained through PGCB's own telecommunication PLC (Power Line Carrier) system for the purpose of reliable power transmission. Besides voice communication, the above PLC telecommunication system have got the additional facilities of tele-protection for protecting the transmission lines from external faults & tele-metering for instant data transfer and to take necessary actions. Due to the inadequate speed of existing PLC communication equipments, efforts are being taken to improve the telecommunication system of PGCB by installing & using high speed Optical fiber with multiplexers.

The length of the OPGW installed in the transmission line of PGCB till June 2012 is approximately 4300 km and covering the major part of the country. After PGCB's own

communication need, the spare optical fibers are being leased out to local telecom operators to develop national communication infrastructure for their commercial use.

2.4 Mission

Efficient and effective management of national power grid for reliable and quality transmission as well as economic dispatch of electricity throughout the country.

2.5 Vision

Economic upliftment of the country by reaching electricity to all through reliable transmission.

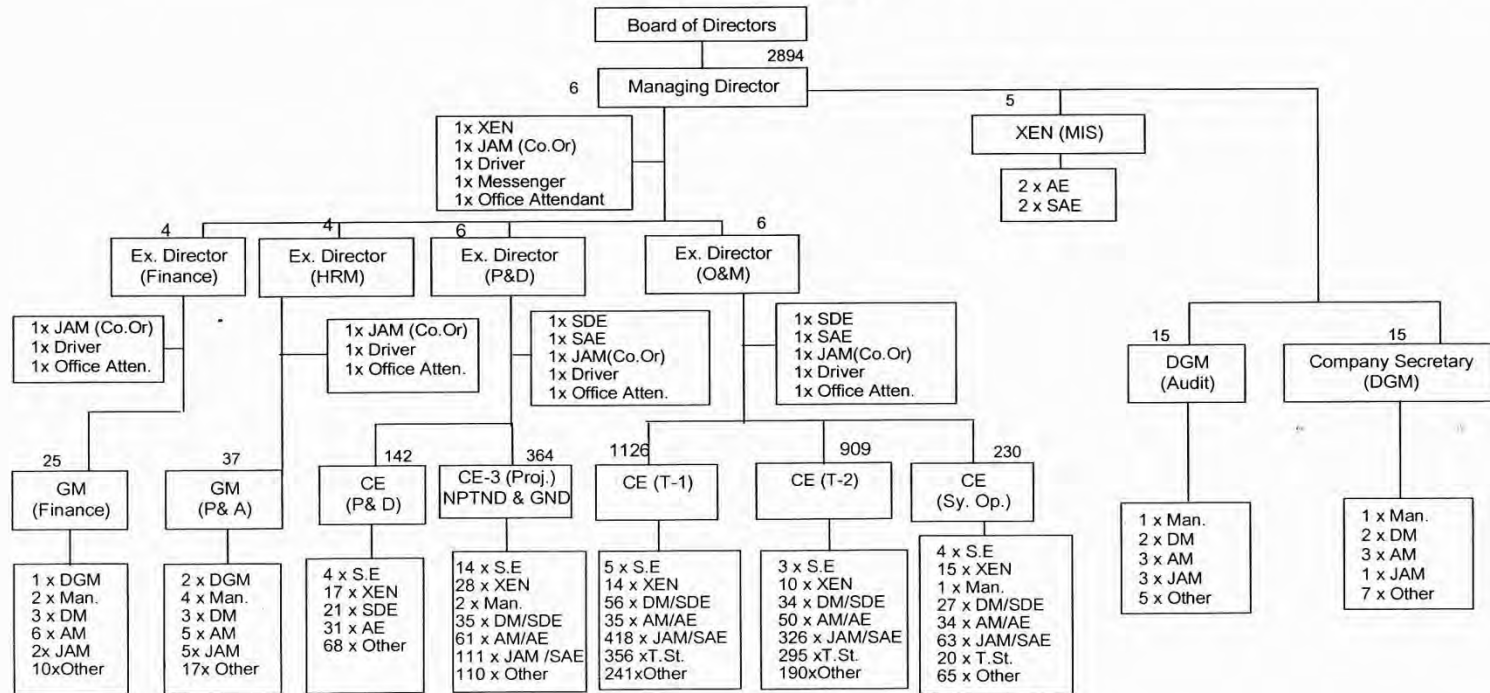
2.6 PGCB at a glance

Corporate Office	Institute of Engineers Bangladesh (IEB) Bhaban (New) 3rd and 4th floor 8/A Ramna, Dhaka - 1000
Year of Incorporation	1996 [C-31820(941)/96]
Status	Public Limited Company
Business	Transmission of Power
Authorized Capital	Tk. 10 Billion
Paid-up Capital	Tk. 4609.13 Million
Turnover (2014-2015)	Tk. 9378.28 Million
Net profit before tax & WPPF (2014-2015)	Tk. 71.63 Million
Present Manpower as on June, 2015	2372 persons
Transmission Line as on: January, 2016	
400kv	220.70 Circuit km
230kv	3171.45 Circuit km
132kv	6311.63 Circuit km
Substation as on: January, 2016	
400kv	1 Nos. 500MW HVDC Back to Back station
400/230kv	1 Nos. 520 MVA
230/132kv	19 Nos. 9375 MVA
132/33kv	90 Nos. 12420.46 MVA
Last Five years achievement	
400kv Substation	1 Nos: 500Mw HVDC Back to Back station
400/230kv Substation	1 Nos. 520 MVA
230/132kv Substation	5 Nos:2700 MVA
132/33kv Substation	12 Nos. 1825 MVA
400kv Transmission Line	220.70 Circuit km
230/132kv Transmission Line	545.55 Circuit km
132/33kv Transmission Line	446.69 Circuit km

2.7 Organization Chart

Quality Management System	POWER GRID COMPANY OF BANGLADESH LTD.			QUALITY FORMS					
	TITLE: Organization Chart								
Document No.:	QD-HRM-01	Revision No.:	00	Effective Date:	01/10/13	Page:	1	of	1

Power Grid Company of Bangladesh Ltd. Organization Chart



* The total number indicates Revenue & Project Setup

Reviewed by : Director (HRM)

Approved by : Managing Director

CHAPTER 3: OPERATION OF SUBSTATION DESIGN & QUALITY CONTROL

3.1 Overview of Design & Quality Control

Design and Quality control is a part of the Planning and Design Division and plays a very important role. This department has been given the authority to facilitate the design approval process of both ongoing and existing substations. Beside these the department is also responsible to prepare tender documents (which includes technical parameters, single line diagram, electrical layout and evaluation & qualification criteria) and evaluation of bid documents submitted against each tender.

Initially the department consisted of 10 to 15 engineers with only one superintending engineer acting as the head of the department. Later as the volume of projects increased the department has been sub-divided into the following three specialized sections:-

- Substation Design
- Civil Design
- Transmission Line Design

Each of these sections has its own superintending engineer acting as their head. A brief job description has already been mentioned above and will be explained further in later sections. However, it shall be noted that out of the three departments Civil Design is not directly involved in the tendering process, instead they assist in preparing drawings, financial estimations and bill of materials that are related to civil engineering.

Fig: - 1 Organogram of Design and Quality Control (2006-2014)

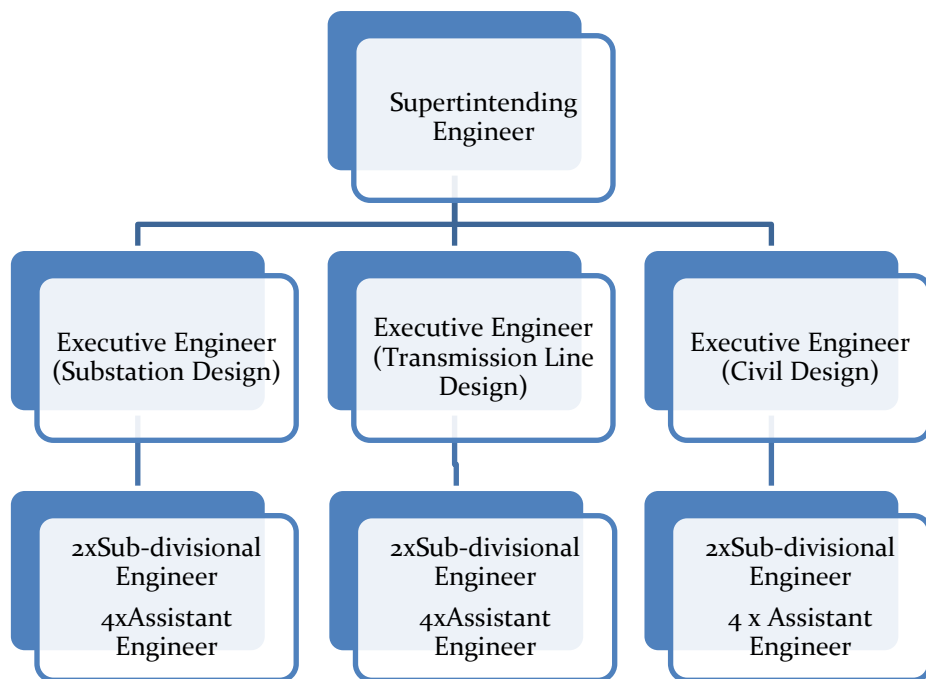
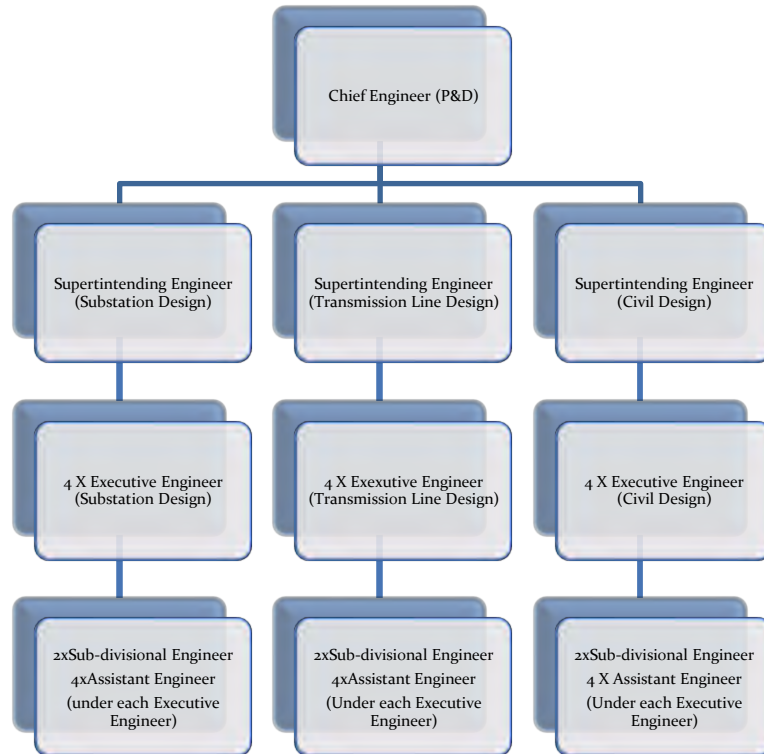
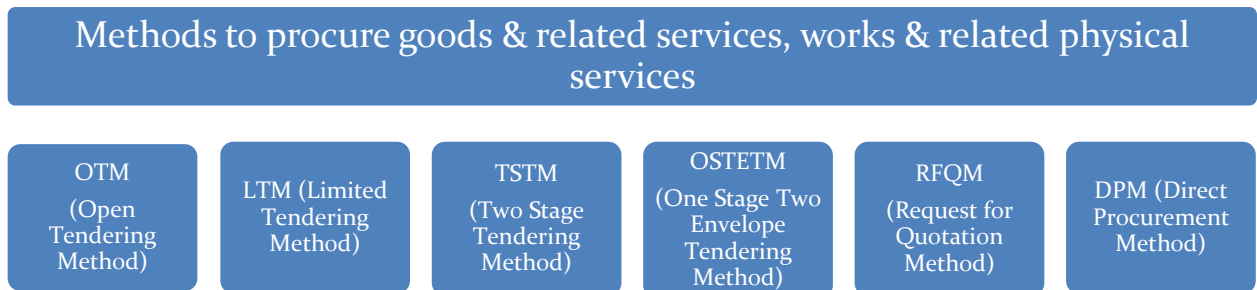


Fig: - 2 Organogram of Design and Quality Control (2014 onwards)



3.2 Operation of Substation Design & Quality Control

Since, I work for Substation Design and Quality Control (SSD & QC) so in this section I will provide a detail description of the responsibilities of this department. As mentioned above one of the major responsibilities of SSD & QC is to facilitate tendering process. Now in general tendering process is usually handled by the procurement department through which any organization can procure goods, works and services. However, there are methods to complete the procurement process. The whole tendering process starts with selecting one of these following methods depending on the size and complexity of the project.



Now PGCB does have a specialized procurement department but projects that are larger in volumes and more complex to handle are usually taken care of by Design & Quality control. These complex projects are referred to as Turnkey Projects which usually follow the TSTM (Two stage tendering method) or OSTETM (One stage two envelope tendering method) to complete the procurement procedure. Turnkey project is a contract under which a firm agrees to fully design, construct and equip a manufacturing/ business/ service facility and turn the project over to the purchaser when it is ready for operation. These projects are usually funded by ADB (Asian Development Bank), World Bank, JICA (Japan International Cooperation Agency), GoB's (Government of Bangladesh) own fund etc.

In two stage tendering method the technical bid and price bid submitted by the bidder are opened in two different stages. Firstly, the technical bid are opened in front of the bidders and then after the evaluation of the technical bids, only the technically responsive bidders' financial bids are opened for evaluation. On the other hand in case of one stage two envelope tendering method both the technical and financial bids are opened on the same day.

After having decided the method that is to be followed the next task is to prepare the tender documents. Now a typical tender document may be sub-divided into the following major sections:-

- **Instruction to Bidders (ITB):-** A set of generalized rules that the bidder must follow if they want to participate in the bidding process along with all the relevant information for Bidders on:-
 - How to prepare the bidding documents.
 - The last date and time of Bid submission.
 - The time of Bid opening.
 - Procedures on how the contract will be awarded.
 - Criteria to determine the lowest evaluated responsive bid.

This section of the contract document is always kept unedited and none of the clauses of this section can be deleted or modified under any circumstances. However, we are allowed to add tender specific information against each clause if required at the bid data sheet.

- **Tender data sheet/Bid data sheet: -** Bid data sheet summarizes all information to be provided to the bidder. It contains the information and provisions that are specific to a particular tendering process. To facilitate the preparation of bid data sheet, its clauses are numbered with the same numbers as those corresponding to ITB.
- **Evaluation and Qualification Criteria (EQC):-** This section thoroughly describes the qualification requirement (non performance of other contracts, financial situation, experience & manufacturer or third party subcontractor requirement).

Here is a sample of EQC (Fig-3) showing the financial criteria that needs to be fulfilled for a JICA funded project.

Fig-3:- Financial Criteria in EQC

Eligibility and Qualification Criteria			Compliance Requirements			Documentation	
No.	Factor/ Sub-Factor	Requirement	Single Entity	Joint Venture (existing or intended)			Submission Requirements
				All Parties Combined	Each Member	One Member	
2.3 Financial Situation							
2.3.1	Financial Performance	The audited balance sheets or, if not required by the law of the Bidder's country, other financial statements acceptable to the Employer, for the last five (5) years shall be submitted and must demonstrate the current soundness of the Bidder's financial position and its prospective long term profitability. As the minimum requirement, a Bidder's net worth calculated as the difference between total assets and total liabilities should be positive.	Must meet requirement	N/A	Must meet requirement	N/A	Form FIN – 1 with attachments
2.3.2	Average Annual Turnover	Minimum average annual turnover of 29 million USD, calculated as total certified payments received for Contracts in progress and/or completed, within the last five (5) years.	Must meet requirement	Must meet requirement	Must meet twenty five percent (25%) of the requirement	Must meet forty percent (40%) of the requirement	Form FIN – 2

Fig-4:- Experience Criteria in EQC

Eligibility and Qualification Criteria			Compliance Requirements			Documentation	
No.	Factor/ Sub-Factor	Requirement	Single Entity	Joint Venture (existing or intended)			Submission Requirements
				All Parties Combined	Each Member	One Member	
2.4 Experience							
2.4.1	General Experience	Bidders must have experience under contracts in the role of prime contractor (single entity or JV member), Subcontractor, or management contractor ^(b) for at least the period starting 1 st January 2006.	Must meet requirement	N/A	Must meet requirement	N/A	Form EXP - 1
2.4.2	Specific Experience	At least three (3) similar ^(a) contracts specified below have been completed as a prime contractor (single entity or JV member) between 1 st January 2006 and the Bid submission deadline.	Must meet requirement	Must meet requirements ^(a)	N/A	N/A	Form EXP - 2(a)

- **Price Schedule:** - It is basically a form for the bidders where they put their quoted price against each designated item. A sample of the price schedule is given below

Schedules of Rates and Prices

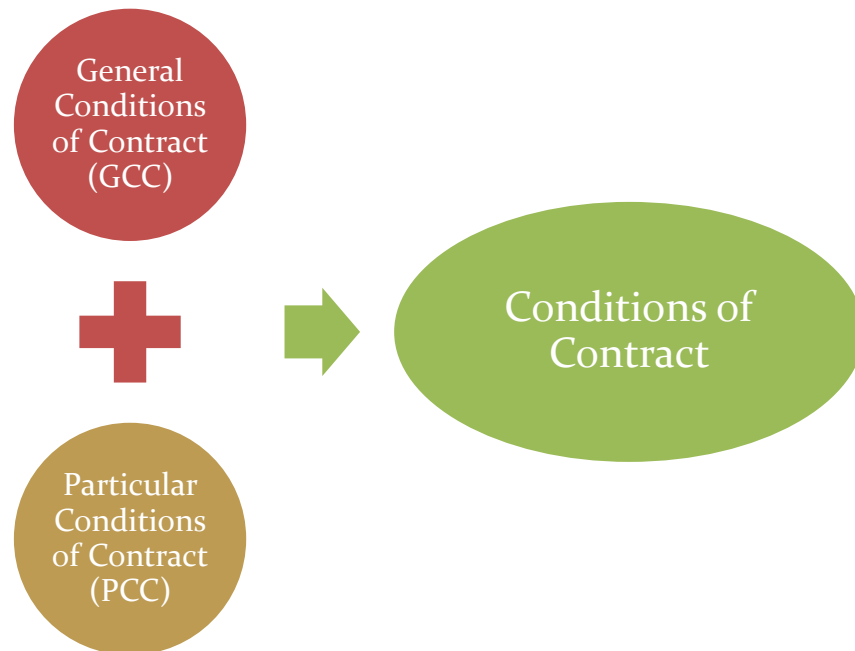
Schedule No. 1. Plant and Mandatory Spare Parts Supplied from Abroad

Item	Description	Code ¹	Qty. (1)		Unit Price ²		Total Price ² (1) x (3)
					(2)	CIP (3)	
1	Shariatpur New Substation						
1A	145kV Outdoor Switchgear (AIS) and Associating Equipment						
1A1	Circuit Breaker, SF6, 1250A, live tank, single pole operating for line bays		2	Sets			
1A2	Disconnecter with earthswitch, 1250A, for line bays		2	Sets			
1A3	Disconnecter without earthswitch, 1250A, for line bays		4	Sets			
1A4	Circuit Breaker, SF6, 1250A, live tank, gang operating for Transformer bay		2	Sets			
1A5	Disconnecter with earthswitch, 1250A, for Transformer bays		2	Sets			
1A6	Disconnecter without earthswitch, 1250A, for Transformer bays		4	Sets			
1A7	Circuit Breaker, SF6, 3000A, live tank, gang operating for bus-coupler bays		1	Set			
1A8	Disconnecter without earthswitch, 3000A, for buscoupler bays		2	Sets			
1A9	Single phase surge arrester, 120kV, 10kA Discharge Current Class III gapless metaloxide		12	Nos			
1A10	Single phase current transformer, 5-core, for line bays		6	Nos			
1A11	Nil		Nil	set			
1A12	Single phase current transformer, 4-core, for transformer bays		6	Nos			
1A13	Nil		Nil	set			
1A14	Single phase current transformer, 2-core, for bustie bay		3	Nos			
1A15	Single phase current transformer, 2-core, for bustie bay		3	Nos			
1A16	Single phase Inductive Voltage Transformer(IVT)		18	Nos			
1A17	Flexible Conductor, clamps & connectors for busbar, Jackbus, Jumper & equipment						
	i) _Flexible Conductor for jackbus, jumper, equipment connections		1	Lot			
	ii) _Flexible Conductor for main bus		1	Lot			
	iii) _Clamps & Connectors		1	Lot			
1A18	Insulator & Fittings						
	i) _Insulator		1	Lot			
	ii) _Fittings		1	Lot			
1A19	Steel structures & cable tray						
	i) _Gantry Column including nut&bolts		1	Lot			
	ii) _Gantry beam including nut&bolts		1	Lot			
	iii) _Equipment support structures including nut&bolts		1	Lot			
	iv) _Cable tray including fitting, fixing accessories		1	Lot			
	Sub-Total of A.						

- **General Conditions of Contract:-** This section contains all the general conditions related to contracts. These conditions are applicable after signing the contract. Since, it is

general by nature we are not allowed to edit this section. However, we have the freedom to edit, replace or delete any clause at Particular Conditions of Contracts (PCC) section depending on specific contract requirements.

- **Particular Conditions of Contract (PCC):-** Similar to BDS, this section contains information and provisions that are specific to a particular tendering and contracting process. PCC clauses are also numbered with the same numbers as those corresponding to GCC clauses. GCC and PCC combined must contain all the information and no clause shall be left blank unless otherwise it is mentioned as “not applicable”.



- **Drawings:** - Lastly we provide drawings related to the project in order to illustrate the scope of work for the bidders.

After the completion of tender preparation, the tender is then uploaded to PGCB website along tender notice (also known Invitation for Bids). The tender notice is also published through print media (two bangla news papers and two english news papers). This tender notice is issued by the Company Secretary after it is being approved by the Managing Director. A typical tender notice contains the following key information:-

- The name of the project.
- The name of the organization responsible for funding the project.
- The price of the tender documents.
- The last date and time of submission of the bidding document along with the amount of Bid Security.

Fig 6 :- Tender documents uploaded at PGCB website

The screenshot shows the website of the Power Grid Company of Bangladesh Ltd. (PGCB). The header includes the company logo and name in Bengali and English. The main content area displays a tender notice for the project: "DESIGN, SUPPLY, ERECTION, TESTING & COMMISSIONING OF MADUNAGHAT – KALURGHAT 132KV DOUBLE CIRCUIT UNDERGROUND TRANSMISSION LINE AND RE-CONDUCTORING OF EXISTING COMILLA (S) – CHANDPUR 132KV DOUBLE CIRCUIT OVERHEAD TRANSMISSION LINE ON TURNKEY BASIS". The notice includes details such as the bid number (PSEEIP/TRANCHE-3)/ADB/PGCB/ P03/TL, submission date (21-06-16), opening date (21-06-16), and tender type (Transmission). It also lists the contact person (Md. Ashraf Hossain) and the company secretary (PGCB, Dhaka). There are sections for "TENDER NOTICE" and "BID DOCUMENTS" with links to download the documents.

Fig 7:- Invitation for Bids

The screenshot shows an "INVITATION FOR BIDS" document. The title is "DESIGN, SUPPLY, ERECTION, TESTING & COMMISSIONING OF MADUNAGHAT – KALURGHAT 132KV DOUBLE CIRCUIT UNDERGROUND TRANSMISSION LINE AND RE-CONDUCTORING OF EXISTING COMILLA (S) – CHANDPUR 132KV DOUBLE CIRCUIT OVERHEAD TRANSMISSION LINE ON TURNKEY BASIS". The document provides the following details:

- Date: 17 April 2016
- PGCB Memo No: 01/PGCB/Sec(TLD&OC)/2016/ 2195
- Loan No. 3350-BAN: Power System Expansion and Efficiency Improvement Investment Program (PSEIP) of Tranche-3
- Contract No. PSEEIP/TRANCHE-3)/ADB/PGCB/ P03/TL
- Deadline for Submission of Bids: 07 June 2016

 The document contains several numbered points:

- The People's Republic of Bangladesh has received a loan from the Asian Development Bank (ADB) towards the cost of Power System Expansion and Efficiency Improvement Investment Program (PSEIP) of Tranche-3. Power Grid Company of Bangladesh Limited (PGCB), one of the implementing agencies of the project, intends to apply part of the proceeds towards payments under the contracts for procurement of Package-3: Lot-2: Design, Supply, Erection, Testing & Commissioning of Madunaghat-Kalurghat 132KV Double Circuit Underground Transmission Line and Re-conductoring of Existing Comilla(S)- Chandpur 132KV Double Circuit Overhead Transmission Line on Turnkey Basis.
- The Power Grid Company of Bangladesh Limited (PGCB), (the Employer) invites sealed bids from eligible bidders for the Design, Supply, Erection, Testing & Commissioning of Madunaghat-Kalurghat 132KV Double Circuit Underground Transmission Line and Re-conductoring of Existing Comilla(S)-Chandpur 132KV Double Circuit Overhead Transmission Line on Turnkey Basis (hereinafter referred to as the Works). Details of the scope of the Works are specified in the bidding document.
- International Competitive Bidding (ICB) will be conducted in accordance with ADB's Single-Stage Two-Envelope bidding procedure and is open to all bidders from eligible source countries.
- The Works under the contract shall be completed within Five hundred forty (540) days from the effective date.
- The qualification criteria of the bidders are specified in the bidding document. The bidders are advised to inspect the bidding document by visiting the PGCB website <http://www.pgcb.org.bd> or PGCB Head Office for further details.
- Bidders may obtain further information from and inspect and acquire the bidding documents at the Company Secretary, Power Grid Company of Bangladesh Ltd. (PGCB), The Institute of Engineers Bangladesh (IES) Shaban (3rd and 4th Floor), S/A, Ramna, Dhaka-1000, Bangladesh; Tel: +88 02 9533063, +88 02 959514, 9556054; Fax: +88 02 95 62 382; Email: enppgb@gmail.com
- For participating in this ICB, eligible bidders shall have to purchase complete set of bidding documents on submission of a written application to the Company Secretary, PGCB at the above address and upon payment of a non-refundable fee of US\$ 200.00 (United States Dollar Two hundred only) or Tk. 15,000.00 (Taka Fifteen thousand only) in the form of Pay Order/ Demand Draft in favour of the Power Grid Company of Bangladesh Limited. The Bidding Document may be sent through a courier for an additional fee of 20 Tk. 1000.00 (local delivery) or US\$ 120.00 (International delivery) in the form of Pay Order/ Demand Draft in favour of Power Grid Company of Bangladesh Limited.
- Bids must be delivered to the address mentioned above in item 5 on or before 11:00 Hours Local Time (GMT+6 hours) on 07 June 2016 together with a Bid Security of US\$ 250,000.00 (United States Dollars Two hundred fifty thousand only), or an equivalent amount in freely convertible currency.
- The technical bids will be opened at 11:00 Hours Local Time (GMT+6 hours) on 07 June 2016 at the same address mentioned in item 5 in the presence of Bidders' representatives who choose to attend.
- When comparing bids, ADB's Domestic Preference Scheme will be applied in accordance with the provisions stipulated in the Bidding Document.
- PGCB will not be responsible for any costs or expenses incurred by bidders in connection with the preparation or delivery of bids including costs and expenses related to visits to the sites of installation of the Works.

 The document is signed by Md. Ashraf Hossain, Company Secretary.

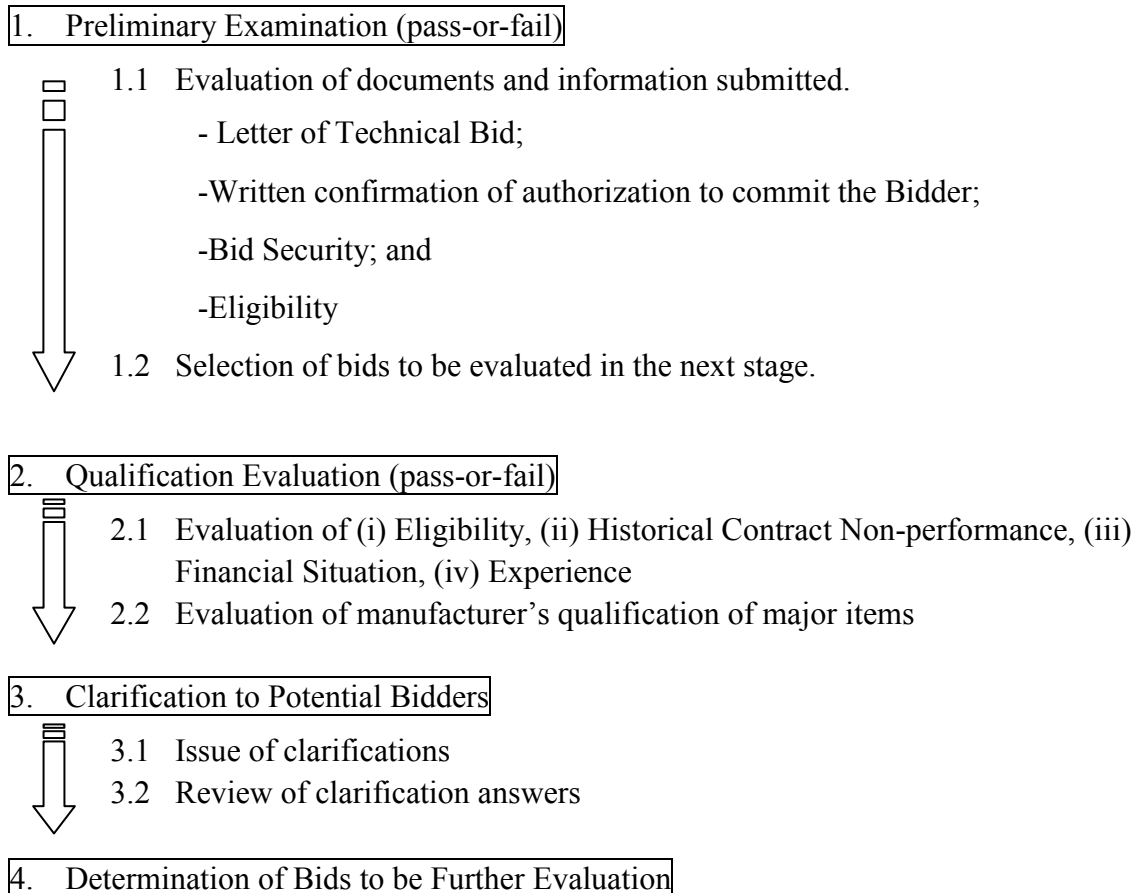
All the bidders are requested to submit their bids (one original and two copies) along with their financial proposal (also one original and two copies) in a separate packet. Depending on the type of methods the bids are opened accordingly in front of the bidders by the Opening Committee. Opening Committee is only responsible to open the bids. As PGCB's practice the committee consists of five members from different departments within PGCB which are as follows:-

- Deputy General Manager – Audit
- Deputy General Manager - Finance (also a member of Technical Evaluation Committee)
- Project Director of the concern project.
- Superintending Engineer Procurement.
- Superintending Engineer Design & Quality Control.

We start evaluating the bids on the very next after opening of the bids. Normally it takes a minimum of two to three weeks to evaluate the bids depending on the number of bidders. But at the same time we have to keep in mind that contract signing must be completed within 180 days from the date of opening as the bid will be valid within that period.

The outlines of evaluation of technical bids are indicated in the flow diagram as below.

Procedure of Technical Evaluation



After the successful completion of the technical evaluation a TEC meeting is called by the project director to discuss the outcome of the technical evaluation and finalize the evaluation report. The financial proposal of the technically responsive bidders are opened and evaluated for arithmetic corrections. In the end the lowest financially evaluated bidder is awarded with the contract. After approval from the board we issue Notification of Award (NOA) to the lowest evaluated bidder. After unconditional acceptance of the notification of award from the bidder side we finally proceed with the contract signing.

Till now I have explained how design & quality control department carry out the tendering process. The second vital job is to facilitate the design approval process. Every turnkey projects

in PGCB as soon as it hits the execution stage all documents related to the project such as drawing, calculation etc have to go through the design and quality control department for approval. Even during project execution if there is a slight deviation (for example change in quantity of certain equipment or change in country of origin of a certain equipment etc) from the contract document, Design & QC is bound to investigate the matter first and provide initial approval. It shall be noted here whenever there is a slight change in contract, it means the contract requires an amendment which must be approved by the highest authority i.e. PGCB Board after the initial clearance from Design & QC.

At beginning of the construction of a substation the primary drawings that are needed to be approved are single line diagram and electrical layout of the substation.

In electrical power system a single line diagram is referred to as a simplified notation of a three phase system. With the single line diagram of a substation we determine the current rating of different equipment, current rating of bus bars and the bus arrangement. Different equipment are represented by different symbols with their respective current.

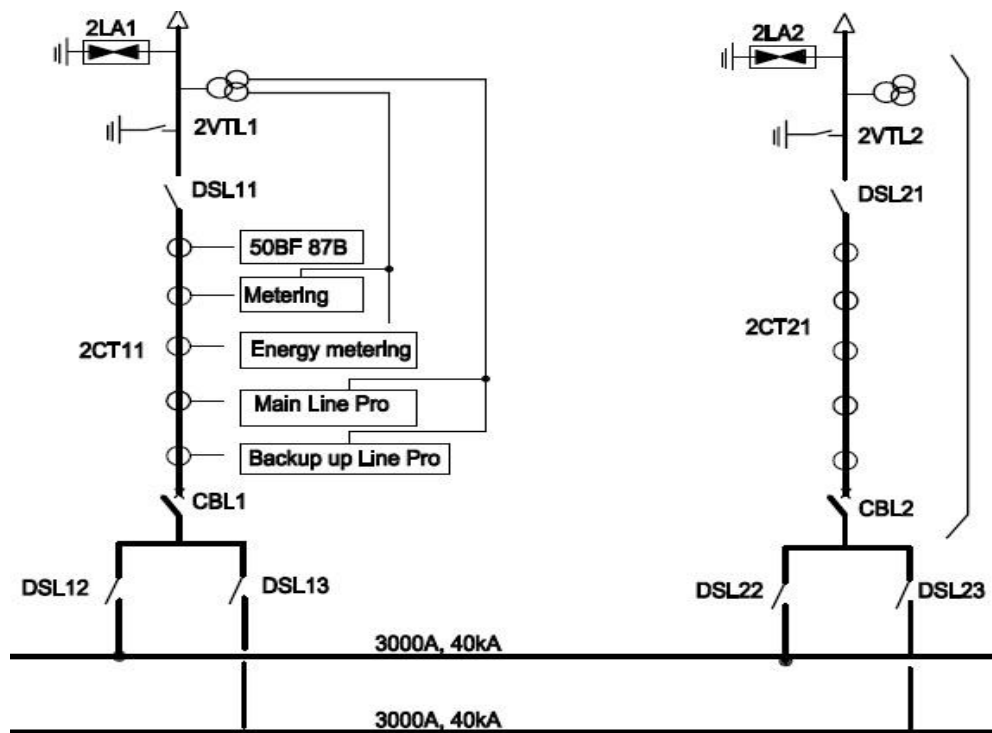


Fig 8:- This is a typical single line diagram showing two line bays and 3000A double busbar arrangement.

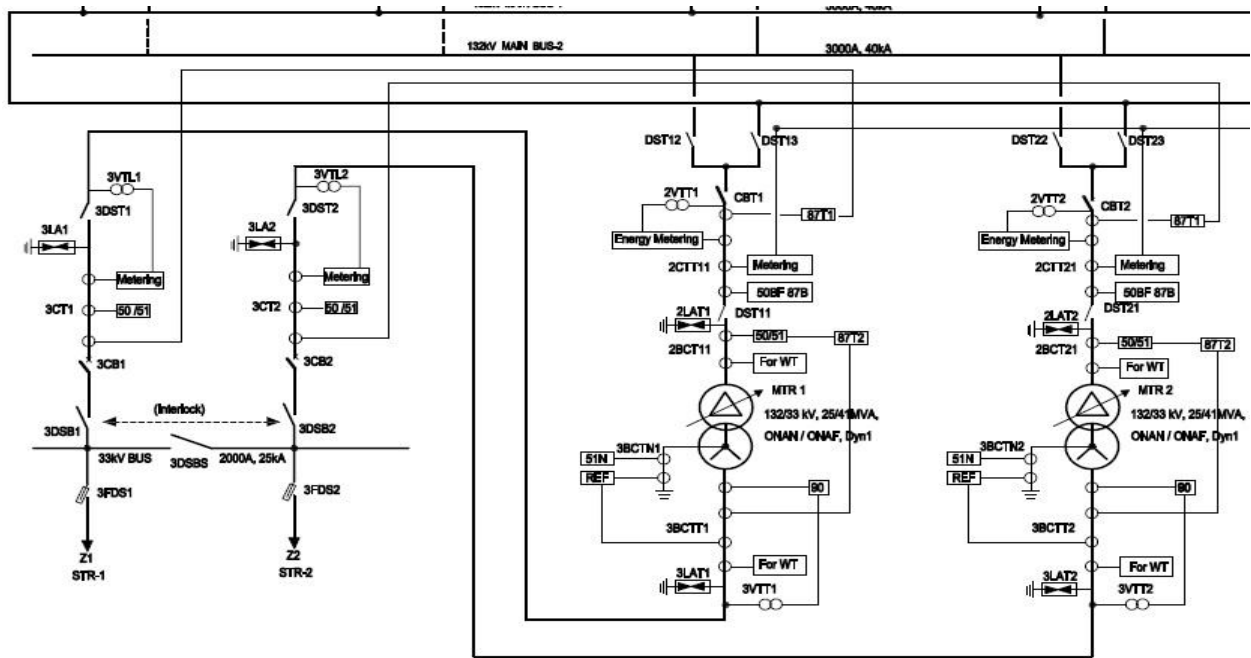


Fig 9:- This is a typical single line diagram showing two transformer bays along with 33kV switchgears and 3000A double busbar arrangement.

Electrical layout is used to determine the orientation of different equipment, internal roads, control houses etc with respect to the physical condition of the site. Sometimes we take the help of Google Earth to extract the exact physical condition of the site to finalize the layout.

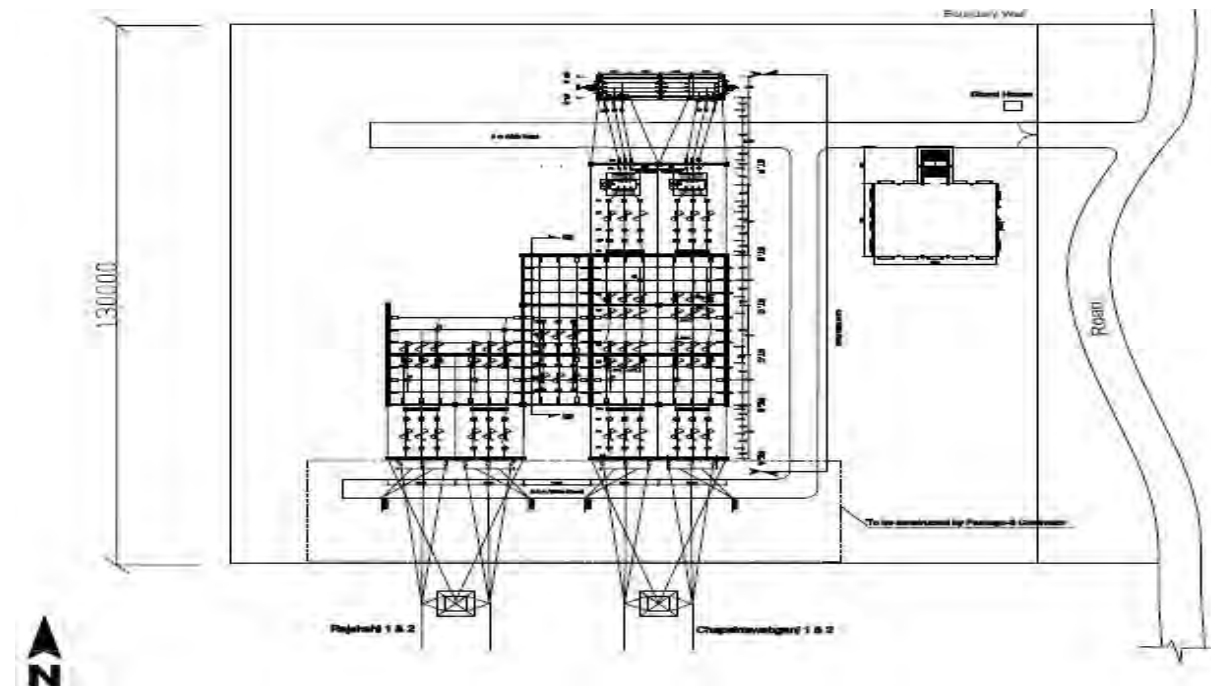


Fig 10:- This is a typical electrical layout of 132/33kV substation at Rajshahi.

Except for the above two drawings, there are other important drawings and document that need to be approved like general arrangement drawing of equipment, current transformer & voltage transformer sizing calculation, guaranteed technical particulars etc. All these documents are checked with respect to the contract document, IEC (International Electrotechnical Commission) and IEEE (Institute of Electrical and Electronics Engineers) standards.

Founded in 1906, the IEC (International Electrotechnical Commission) is the world’s leading organization for the preparation and publication of International Standards for all electrical, electronic and related technologies. These are known collectively as “electrotechnology”.

The Institute of Electrical and Electronics Engineers is a professional association with its corporate office in New York City and its operations center in Piscataway, New Jersey. It was formed in 1963 from the amalgamation of the American Institute of Electrical Engineers and the Institute of Radio Engineers. Today, it is the world's largest association of technical professionals with more than 400,000 members in chapters around the world. Its objectives are the educational and technical advancement of electrical and electronic engineering, telecommunications, computer engineering and allied disciplines.

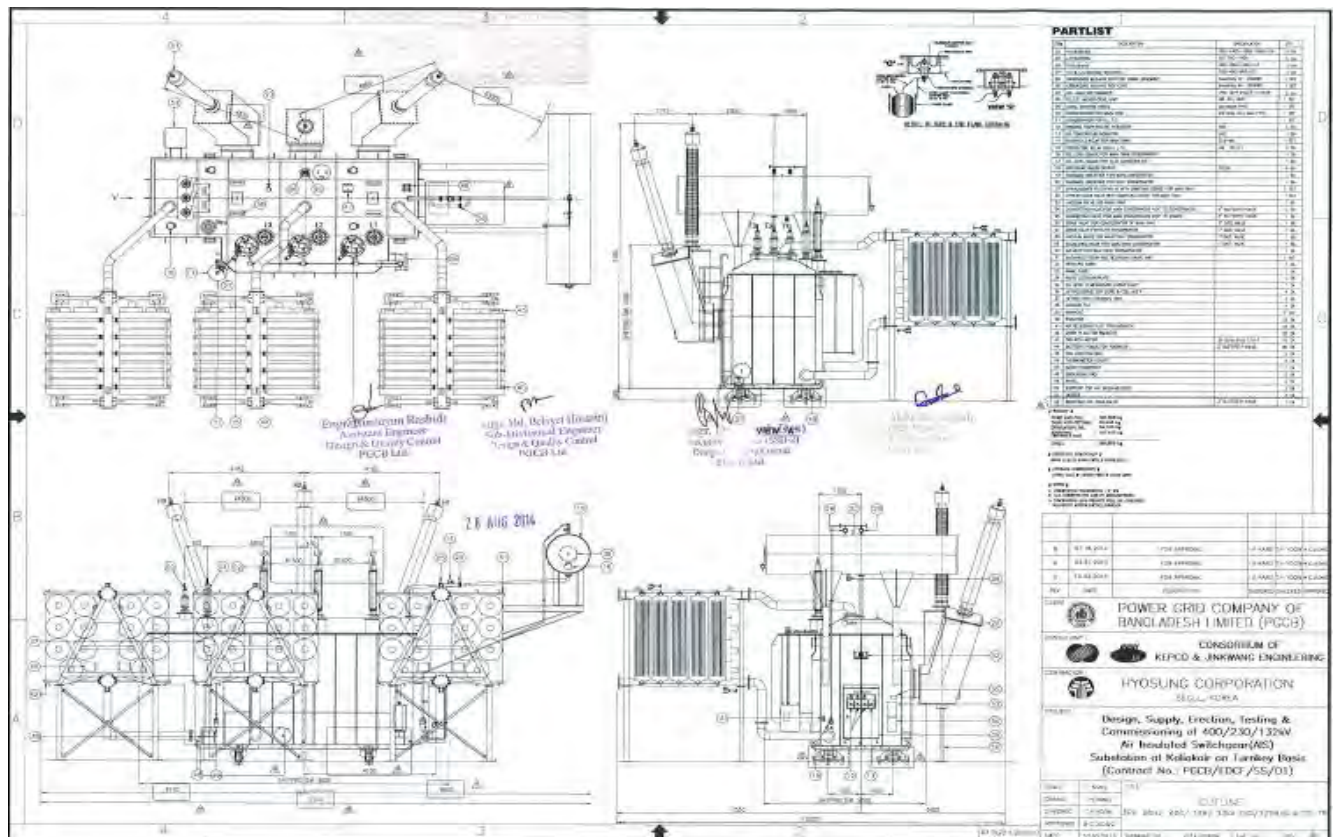


Fig 11:- This is an approved general arrangement drawing of a 400/132/33kV, 325MVA transformer



Fig:- 12 IEC standard for power cables



Fig 13:- IEC standard for line traps

3.3 My Job Responsibility

I work as an Assistant Engineer in this department for the last four years. My job responsibility is pretty much the same as I explained so far. Assistant Engineer is the junior most position in this department so most of the files are marked to the Assistant Engineers for initial checking. In case of tender management, I prepare the technical specifications, single line diagrams, electrical layout, protection single line diagram etc using AUTO CAD software for tender purpose. Before finalizing everything of course I have to sit with my reporting officer (Executive Engineer) to cross check the things I have prepared. I also assist in preparing the price schedules and sometimes make estimation for construction of new substation. After finalizing the tender documents I send the soft copies to our ICT department requesting them to upload the files at our website. I provide assistance to the company secretary and public relation officer in preparing the invitation of bids for print media publication.

I am also responsible in evaluating the technical and financial bids of different projects. Though I am not a member of Technical Evaluation Committee but being an assistant engineer it falls under my responsibility to check all the bids and present the status in front of the TEC members during a TEC meeting. Once an evaluation report is finalized and signed by the TEC members, the report needs to be placed in front of PGCB board members for final approval. To present it to

the board I need to prepare a board paper (in Bangla) along with a power point presentation. After approval from the Board, I prepare the notification of award which is issued by our Superintending Engineer.

In the execution part I am responsible in checking the single line diagram, electrical layout, DC single line diagram, AC single line diagram, equipment general arrangement drawings, guaranteed technical particulars etc. As mentioned above I take the help of the Contract Document and IEC standards. I am also responsible for checking various calculations related to a substation such as earthing calculation, direct stroke lightning calculation, main bus sizing calculation etc. After checking the documents I report back to my Executive Engineer about status and if the documents are good to be approved or require resubmission we notify this to the contractor with forwarding letter which is issued by the Superintending Engineer.

Apart from the above I also provide technical solutions to the problems arising in existing substation.

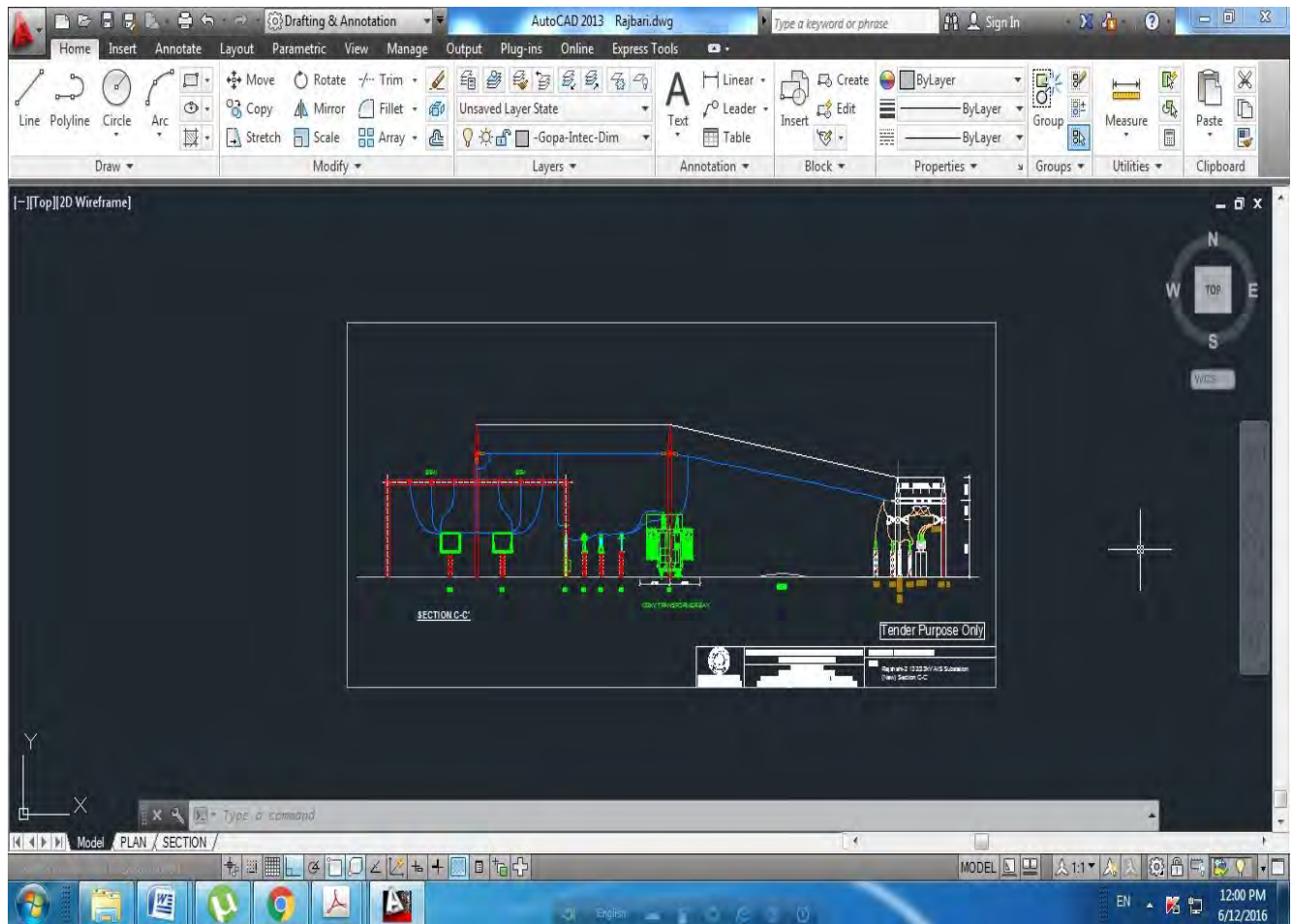


Fig 14:- This is an Auto Cad software window that we use to draw different drawings.

Besides the desk job we get to enjoy some outdoor activities as well. After any equipment gets approval from the design, the contractor sends a copy of the approved document to the respective manufacturer and advises them to start manufacturing. After manufacturing, two officials from PGCB will be nominated to visit the manufacturer's factory and perform Factory Acceptance Test (FAT). During FAT a series of routine tests will be performed as per acceptable standards on a sample of the equipment in presence of PGCB officials.

After completion of FAT the contractor will submit the test reports to design requesting a dispatch clearance. My job is to check the test reports as per IEC standards and advise the Project Director to issue the dispatch clearance with a condition that after completion of shipment at site the contract must arrange a Post Landing Inspection (PLI).

Post Landing Inspection (PLI) is lead by a committee of three members where one member must be from Design & QC. During PLI, we count the number of boxes shipped with the shipping documents, open some of the random boxes and cross check the status of the equipment with the approved document.

CHAPTER 4: PROMLEMS, RECOMMENDATION AND CONCLUSION

4.1 Problems

I mentioned earlier that Design and Quality Control department is one of the vital departments of PGCB. It manages the highest volume of work compare to other departments as it is connected to all the running and upcoming projects. Despite all the high volume of work in terms of man power this department is lagging way behind. Currently Substation design has four (4) executive engineers, one (1) sub-divisional engineer and six (6) assistant engineers these numbers do not even fulfill the requirement of current set up considering we have sixteen projects running and many more in the pipeline.

Then there is no proper sitting arrangement for the engineers. After every tender submission a huge number of files will arrive which are very confidential and must be kept under the custody of the assigned department but we don't have adequate space to preserve them. Most of the assistant engineers share a table which their colleagues and some of them don't have computers to work.



Fig 15:- This is the desk of an Assistant Engineer showing how a cube is being flooded with files



Fig 16:- This room belongs to an Executive Engineer, the files and the boxes arrived recently due to tender opening.

To make things worse each assistant engineer is responsible to look after at least three projects in parallel. As a result most of us fail to meet the deadlines especially when we are evaluating bids which eventually affects the KPI (key performance indicator) of the whole department. Even though we addressed this to our management several times but the procedure of approving a new setup is very long.

This brings us to our next problem which is the internal communication problem. All the government owned organization and autonomous body like PGCB follow this unique way to communicate with other departments which is in the form of note sheets. Note sheets are written in blue colored papers where a department will address an issue in Bangla and forward it to other department. Now when a file is marked to particular department, there is a tendency that this particular file will travel to the junior most officers for comment crossing every desk within the hierarchy of that department i.e. from Superintending Engineer to Assistant Engineer.

পাওয়ার গ্রীড কোম্পানী অব বাংলাদেশ লিমিঃ (পিজিসিবি)

সিদ্ধি: ২/১৩/১০১৩/১০১: তারিখ: 28/11/2011 এর আওতাধীন নির্মাণের কারিগরীর ৪০০/১০০/১০১ কেবি উপকরণ নির্মাণ কাজে প্রকল্পের M/s Hyosung কর্তৃক সরবরাহকৃত 400KV, 25MVAR, Shunt Reactor ও এর Insulation Oil এবং Steel Structure এর Post Landing Inspection (PLI) রিপোর্ট অনুমোদন রপদে।

১) নিম্নের বর্ণিত উপকরণ নির্মাণ কাজের প্রকল্পের M/s HYOSUNG Corporation, Korea কর্তৃক Korea হতে বিদ্যুৎ সরবরাহ/স্থাপনা সংক্রান্ত কাজের ক্ষেত্রে যা বিদ্যমান Hyosung এর কারিগরীর উপকরণের প্রকল্পে বর্ণিত ও সরবরাহ করা হবে।

Item No	Description of Materials	Qty.	Packaging Description	Country of Origin	CIF Value
3A	Works and Equipment for Shunt Reactor Installation as specified in Section 16 of the Technical Specification				
3A.1	400KV, 25MVAR (25MVA) Three phase outdoor type Shunt Reactor	2 Nos	Total 120 packages Gross Weight 264,349.5 KG	China	USD 1,334,494.00
					৳ 65,00,00,000.00

১) পত্র ২২/১৩/১০১৩/১০১: অধিবেশন নির্মাণের ডিম্যান্ড নং ১০১, গ্রেড উপকরণ ও সরঞ্জাম সরবরাহের লাইসেন্স নং ১০১/১৩/১০১/১০১ এর আওতাধীন নির্মাণের উপকরণের অন্তর্ভুক্ত উপকরণ-১ এর বর্ণিত উপকরণ সরবরাহের পরিকল্পনা করা হবে। এর পরিচালনা/নিয়ন্ত্রণের দায়িত্বভার Invoiced Packing List (বিলি সনাক্ত) অনুসারে, আমদানিকৃত ২টি 400KV, 25MVAR 3p Shunt Reactor এবং Insulation Oil রাখা যাবে।

২) নির্মাণের Post Landing Inspection (PLI) অর্থাৎ Approved Design Drawing অনুসারে Shunt Reactor এর Dimension verification বা Visual Inspection সম্পন্ন করা হবে, যাকে মাসামাল সনাক্ত করার পরিকল্পনা করা হবে। তবে, নির্মাণের প্রকল্পের ডিম্যান্ড (অংশ সংযুক্ত) ও সরবরাহকৃত ২টি Shunt Reactor এর সংশ্লিষ্ট Name Plate Data (বিলি সনাক্ত) এর নিম্নোক্ত শর্তাবলি পরিমিত করা হবে।

১) Weight:

Sl. No	Particulars	Serial Number	Description	Name Plate Data		Difference	
				Approved (kg)	PLI Observation (kg)	kg	%
	Cone & Coil			30,000	31,000	1000	+3.33%
	Tank & Filling	H180342.0064		23,500	19,000	-4,500	-19.15%
	Insulation Oil	H180342.0065		25,800	22,980	-2,820	-11.32%
	Total Weight			79,300	73,180	-6,120	-7.72%

২) Winding Resistance & Reactance

Equipment Name	Serial Number	Particulars	Name Plate Data	
			Approved	PLI Observation
H180342.0064		Winding Resistance (75°C)	14.0 Ω/Phase	14.20 Ω/Phase
		Reactance (at 25 MVAR)	5.400 Ω	5.650 Ω
H180342.0065		Winding Resistance (75°C)	14.0 Ω/Phase	14.13 Ω/Phase
		Reactance (at 25 MVAR)	5.400 Ω	5.550 Ω

৩) উপকরণ, Oil, অনুমোদিত ডিম্যান্ডের Dimension verify after detail design এর উপস্থাপনা (৩%)

- 2 -

১) PLI এর পরে উপস্থিত M/s Hyosung এর প্রকল্পের কারিগরী, 7" height of Shunt Reactor to 10" height to Tower Dimensioned as per the Technical Specification. The weight mentioned in Technical Specification is 79,300 kg. The weight mentioned in Technical Specification is 73,180 kg. The weight mentioned in Technical Specification is 79,300 kg. The weight mentioned in Technical Specification is 73,180 kg.

২) Approved Design Drawing অনুসারে, সরবরাহকৃত Steel Structure (for Shunt Reactor) ও winding reaction of Core Tower), Anchor Bolt এর Shunt Reactor এর parts এর Visual Inspection সম্পন্ন করা হবে, যাকে মাসামাল সনাক্ত করার পরিকল্পনা করা হবে। তবে, নির্মাণের প্রকল্পের ডিম্যান্ড (অংশ সংযুক্ত) ও সরবরাহকৃত ২টি Shunt Reactor এর সংশ্লিষ্ট Name Plate Data (বিলি সনাক্ত) এর নিম্নোক্ত শর্তাবলি পরিমিত করা হবে।

৩) উপকরণ, সরবরাহকৃত উপকরণের ডিম্যান্ড নং ১০১/১৩/১০১/১০১ এর আওতাধীন নির্মাণের উপকরণের অন্তর্ভুক্ত উপকরণ-১ এর বর্ণিত উপকরণ সরবরাহের পরিকল্পনা করা হবে। এর পরিচালনা/নিয়ন্ত্রণের দায়িত্বভার Invoiced Packing List (বিলি সনাক্ত) অনুসারে, আমদানিকৃত ২টি 400KV, 25MVAR 3p Shunt Reactor এবং Insulation Oil রাখা যাবে।

৪) নির্মাণের Post Landing Inspection (PLI) অর্থাৎ Approved Design Drawing অনুসারে Shunt Reactor এর Dimension verification বা Visual Inspection সম্পন্ন করা হবে, যাকে মাসামাল সনাক্ত করার পরিকল্পনা করা হবে। তবে, নির্মাণের প্রকল্পের ডিম্যান্ড (অংশ সংযুক্ত) ও সরবরাহকৃত ২টি Shunt Reactor এর সংশ্লিষ্ট Name Plate Data (বিলি সনাক্ত) এর নিম্নোক্ত শর্তাবলি পরিমিত করা হবে।

৫) Weight:

৬) Winding Resistance & Reactance

Handwritten signature and stamp of the project department.

Fig 17: - Note sheets initiated by the project department.

4.2 Recommendation and Conclusion

We expect that the management will look into the above issue more seriously. Design department requires more office space and more man power. The engineers working here are very cable and require more training. The internal training of PGCB is very poor and need lots of improvement. Most of the foreign trainings are attended by board members (most of them are non-technical) which is a complete misuse of power as these trainings are meant for Engineers only. As a result the development of Engineers is very slow. Developing the current engineer base will eventually reduce PGCB's dependency on foreign consultants and this will save lot of money for PGCB in the long run.

PGCB has its own email server but it is way too primitive and not reliable. As a result most of the officers rather use their own personal email for official purpose. I will definitely recommend the management to update the email server and motivate officials to use email as the form of communication instead of note sheets.

CHAPTER 5: BIBLIOGRAPHY

5.1 Bibliography

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- Power Grid Company of Bangladesh Limited (PGCB) website.
- PGCB archive.
- From Job experience.