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

On

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

(BUS 699: Internship)


Submitted To

S. M Arifuzzaman
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Submitted By

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Id No: 13264026
Major: Finance

Program: Masters of Business Administration
BRAC Business School

Date of Submission: June 14, 2016
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 is 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

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

<table>
<thead>
<tr>
<th>Corporate Office</th>
<th>Institute of Engineers Bangladesh (IEB) Bhaban (New) 3rd and 4th floor 8/A Ramna, Dhaka - 1000</th>
</tr>
</thead>
<tbody>
<tr>
<td>Year of Incorporation</td>
<td>1996 [C-31820(941)/96]</td>
</tr>
<tr>
<td>Status</td>
<td>Public Limited Company</td>
</tr>
<tr>
<td>Business</td>
<td>Transmission of Power</td>
</tr>
<tr>
<td>Authorized Capital</td>
<td>Tk. 10 Billion</td>
</tr>
<tr>
<td>Paid-up Capital</td>
<td>Tk. 4609.13 Million</td>
</tr>
<tr>
<td>Turnover (2014-2015)</td>
<td>Tk. 9378.28 Million</td>
</tr>
<tr>
<td>Net profit before tax &amp; WPPF (2014-2015)</td>
<td>Tk. 71.63 Million</td>
</tr>
<tr>
<td>Present Manpower as on June, 2015</td>
<td>2372 persons</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Transmission Line as on: January, 2016</th>
</tr>
</thead>
<tbody>
<tr>
<td>400kv</td>
</tr>
<tr>
<td>230kv</td>
</tr>
<tr>
<td>132kv</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Substation as on: January, 2016</th>
</tr>
</thead>
<tbody>
<tr>
<td>400kv</td>
</tr>
<tr>
<td>400/230kv</td>
</tr>
<tr>
<td>230/132kv</td>
</tr>
<tr>
<td>132/33kv</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Last Five years achievement</th>
</tr>
</thead>
<tbody>
<tr>
<td>400kv Substation</td>
</tr>
<tr>
<td>400/230kv Substation</td>
</tr>
<tr>
<td>230/132kv Substation</td>
</tr>
<tr>
<td>132/33kv Substation</td>
</tr>
<tr>
<td>400kv Transmission Line</td>
</tr>
<tr>
<td>230/132kv Transmission Line</td>
</tr>
<tr>
<td>132/33kv Transmission Line</td>
</tr>
</tbody>
</table>
2.7 Organization Chart
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)*
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.

Methods to procure goods & related services, works & related physical services

- OTM (Open Tendering Method)
- LTM (Limited Tendering Method)
- TSTM (Two Stage Tendering Method)
- OSTETM (One Stage Two Envelope Tendering Method)
- RFQM (Request for Quotation Method)
- DPM (Direct Procurement Method)
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**

<table>
<thead>
<tr>
<th>No.</th>
<th>Factor/Sub-Factor</th>
<th>Requirement</th>
<th>Compliance Requirements</th>
<th>Joint Venture (existing or intended)</th>
<th>Submission Requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Single Entity</td>
<td>All Parties Combined</td>
<td>Each Member</td>
</tr>
<tr>
<td>2.3</td>
<td>Financial</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Performance</td>
<td></td>
<td></td>
<td>Must meet requirement</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.5</td>
<td>Average</td>
<td>Minimum</td>
<td>Must meet requirement</td>
<td>Must meet requirement</td>
<td>Must meet</td>
</tr>
<tr>
<td></td>
<td>Annual</td>
<td>average</td>
<td>requirement</td>
<td>requirement</td>
<td>requirement</td>
</tr>
<tr>
<td></td>
<td>Turnover</td>
<td>annual</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>turnover</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Fig-4:- Experience Criteria in EQC**

<table>
<thead>
<tr>
<th>No.</th>
<th>Factor/Sub-Factor</th>
<th>Requirement</th>
<th>Compliance Requirements</th>
<th>Joint Venture (existing or intended)</th>
<th>Submission Requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Single Entity</td>
<td>All Parties Combined</td>
<td>Each Member</td>
</tr>
<tr>
<td>2.4</td>
<td>Experience</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Must meet requirement</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Must meet requirement</td>
<td>N/A</td>
</tr>
</tbody>
</table>

- **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

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

- **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 combine 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 with tender notice (also known Invitation for Bids). The tender notice is also published through print media (two Bangla newspapers and two English newspapers). 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.
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**

1. **Preliminary Examination (pass-or-fail)**
   - Evaluation of documents and information submitted.
     - Letter of Technical Bid;
     - Written confirmation of authorization to commit the Bidder;
     - Bid Security; and
     - Eligibility
   - Selection of bids to be evaluated in the next stage.

2. **Qualification Evaluation (pass-or-fail)**
   - Evaluation of manufacturer’s qualification of major items

3. **Clarification to Potential Bidders**
   - Issue of clarifications
   - Review of clarification answers

4. **Determination of Bids to be Further 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
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.

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**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: PROBLEMS, 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.

![Image of an Assistant Engineer's desk](image)

*Fig 15:* This is the desk of an Assistant Engineer showing how a cube is being flooded with files
To make things worse each assistant engineer is responsible to look after at least three projects in parallel. As a result most 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 PGC B 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 as issue in Bangla and forward it to other department. Now when a file is marked to particular department, there is 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.
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

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