



**Bidding Document
for
Procurement of**

**Design, Supply, Erection, Testing & Commissioning
of Upgradation of the Existing 132kV Madunaghat
Substation to 230kV GIS substation on Turnkey
Basis**

(Bid Identification No.: PGCB/DCMPGSP/Madunaghat/SS/03).

Volume 2 of 3 (Part 2)

Employer: Power Grid Company of Bangladesh Limited

Country: The People's Republic of Bangladesh

Project: Dhaka-Chittagong Main Power Grid Strengthening
Project

September 2019

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SECTION 20

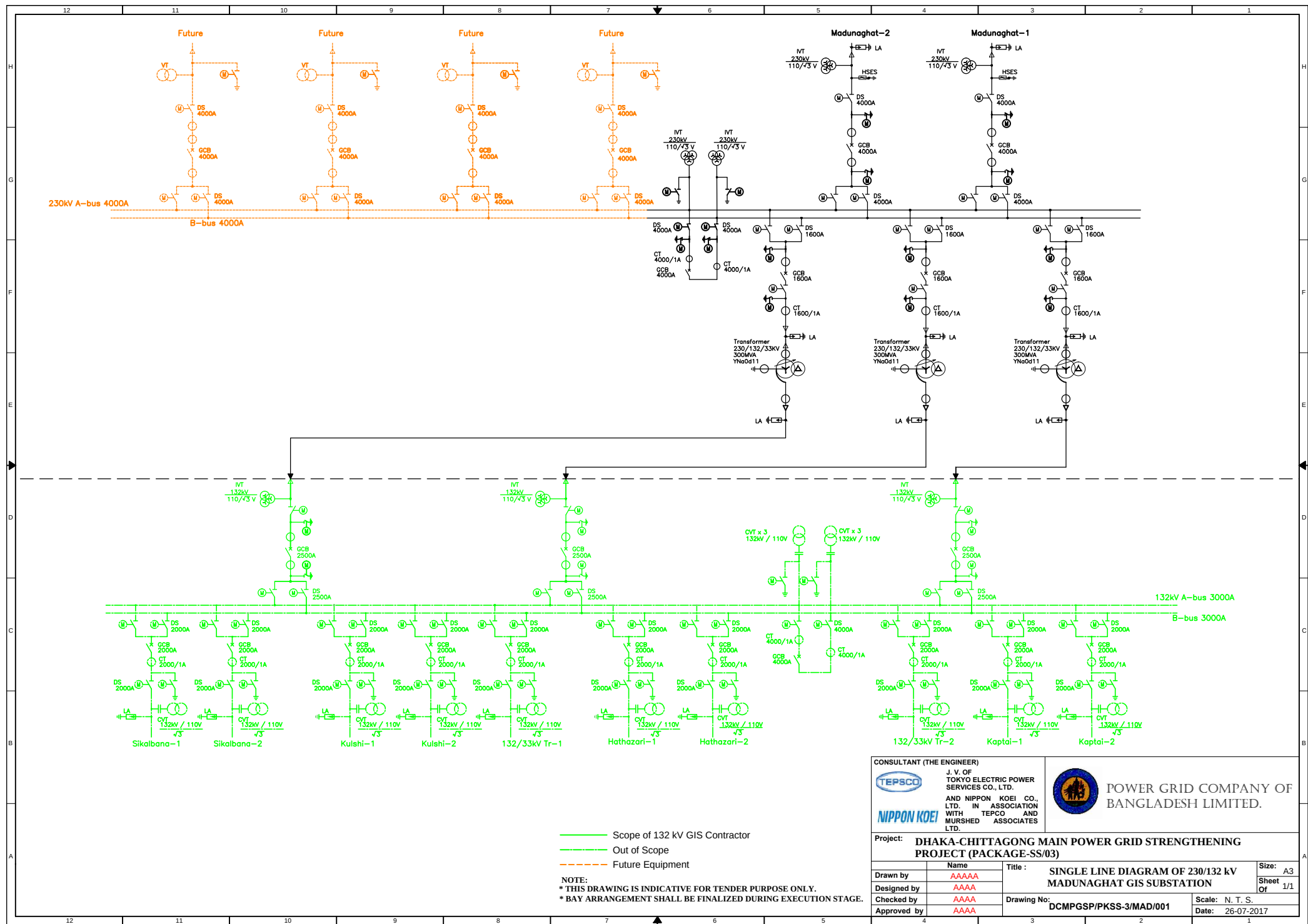
BID DRAWINGS

The following drawings are enclosed for tender purposes.

Drawing Number	Title
DCMPGSP/PKSS-3/MAD/000	SYMBOLS
DCMPGSP/PKSS-3/MAD/001	SINGLE LINE DIAGRAM OF 230/132kV MADUNAGHAT GIS SUBSTATION
DCMPGSP/PKSS-3/MAD/002	GENERAL LAYOUT (PLAN) OF 230/132kV MADUNAGHAT GIS SUBSTATION
DCMPGSP/PKSS-3/MAD/003	230 kV T/L PROTECTION
DCMPGSP/PKSS-3/MAD/004	230 kV BUS PROTECTION
DCMPGSP/PKSS-3/MAD/005	230 kV TRANSFORMER PROTECTION
DCMPGSP/PKSS-3/MAD/006	LV AC DISTRIBUTION SCHEME
DCMPGSP/PKSS-3/MAD/007	110 V DC DISTRIBUTION SCHEME
DCMPGSP/PKSS-3/MAD/008	SUBSTATION AUTOMATION SYSTEM ARCHITECTURE
DCMPGSP/PKSS-3/MAD/009	COMMUNICATION NETWORK SCHEME
DCMPGSP/PKSS-3/MAD/010	230kV SWITCHYARD PANEL ROOM
DCMPGSP/PKSS-3/MAD/011	SWITCHYARD SURFACE



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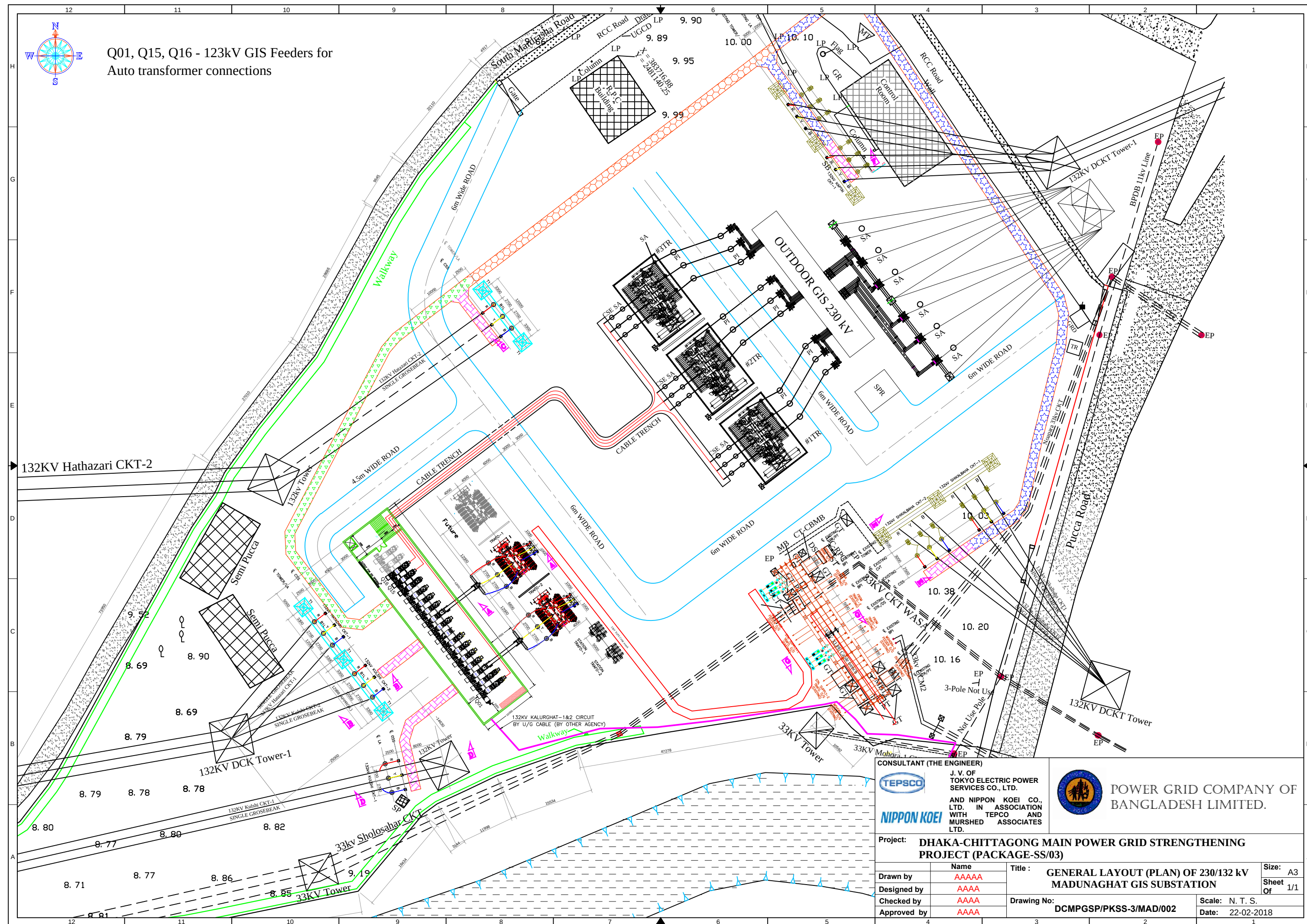
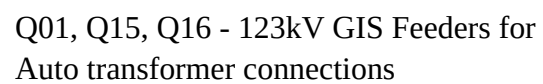
J. V. OF
TEPCO
TOKYO ELECTRIC POWER
SERVICES CO., LTD.
AND NIPPON KOEI CO.,
LTD. IN ASSOCIATION
WITH TEPCO AND
MURSHED ASSOCIATES
LTD.



POWER GRID COMPANY OF
BANGLADESH LIMITED.

Project: **DHAKA-CHITTAGONG MAIN POWER GRID STRENGTHENING
PROJECT (PACKAGE-SS/03)**

Drawn by	AAAAA	Title :	SINGLE LINE DIAGRAM OF 230/132 kV MADUNAGHAT GIS SUBSTATION	Size: A3
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Approved by	AAAA			Date: 26-07-2017



NIPPON KOEI

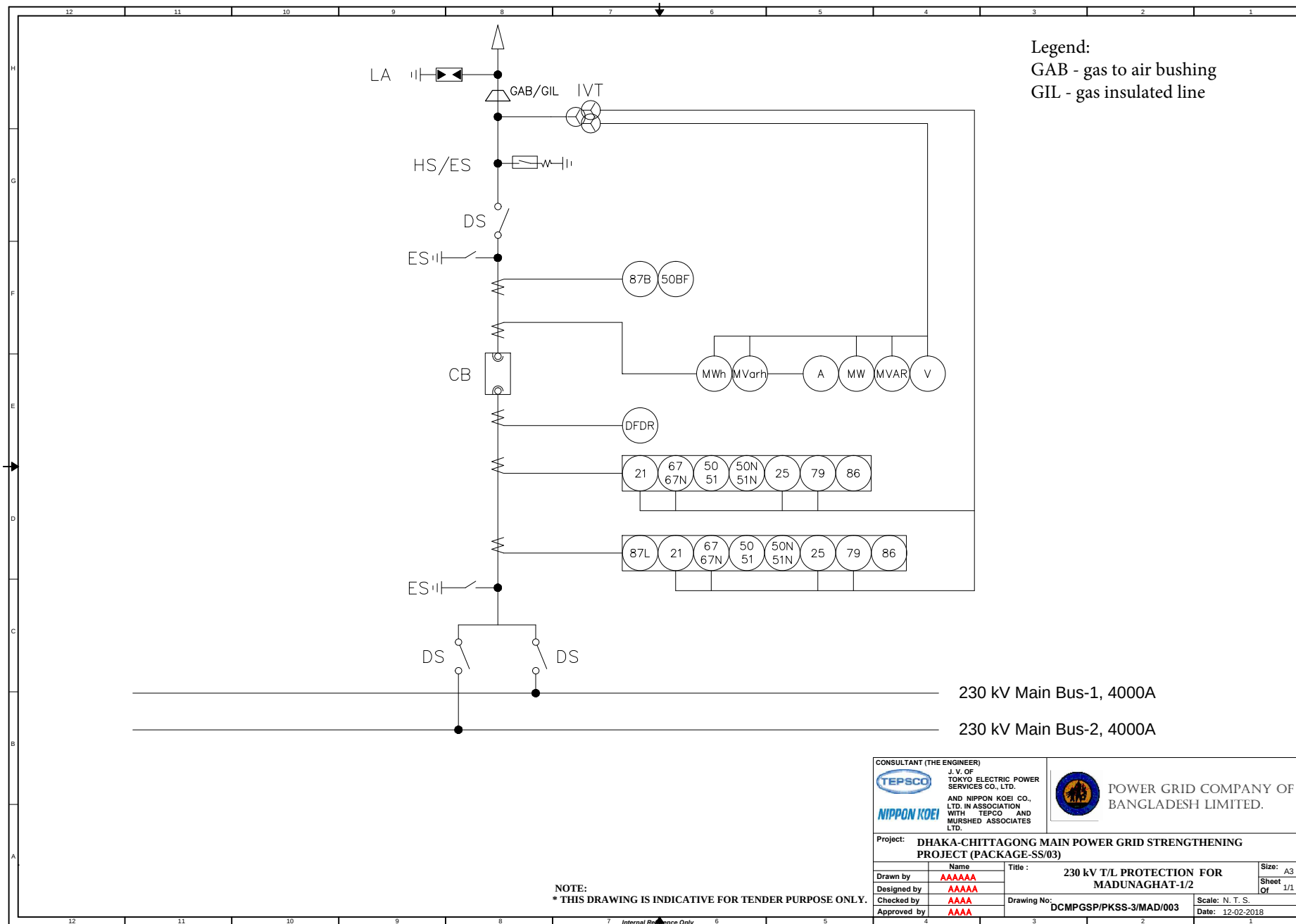
J. V. OF
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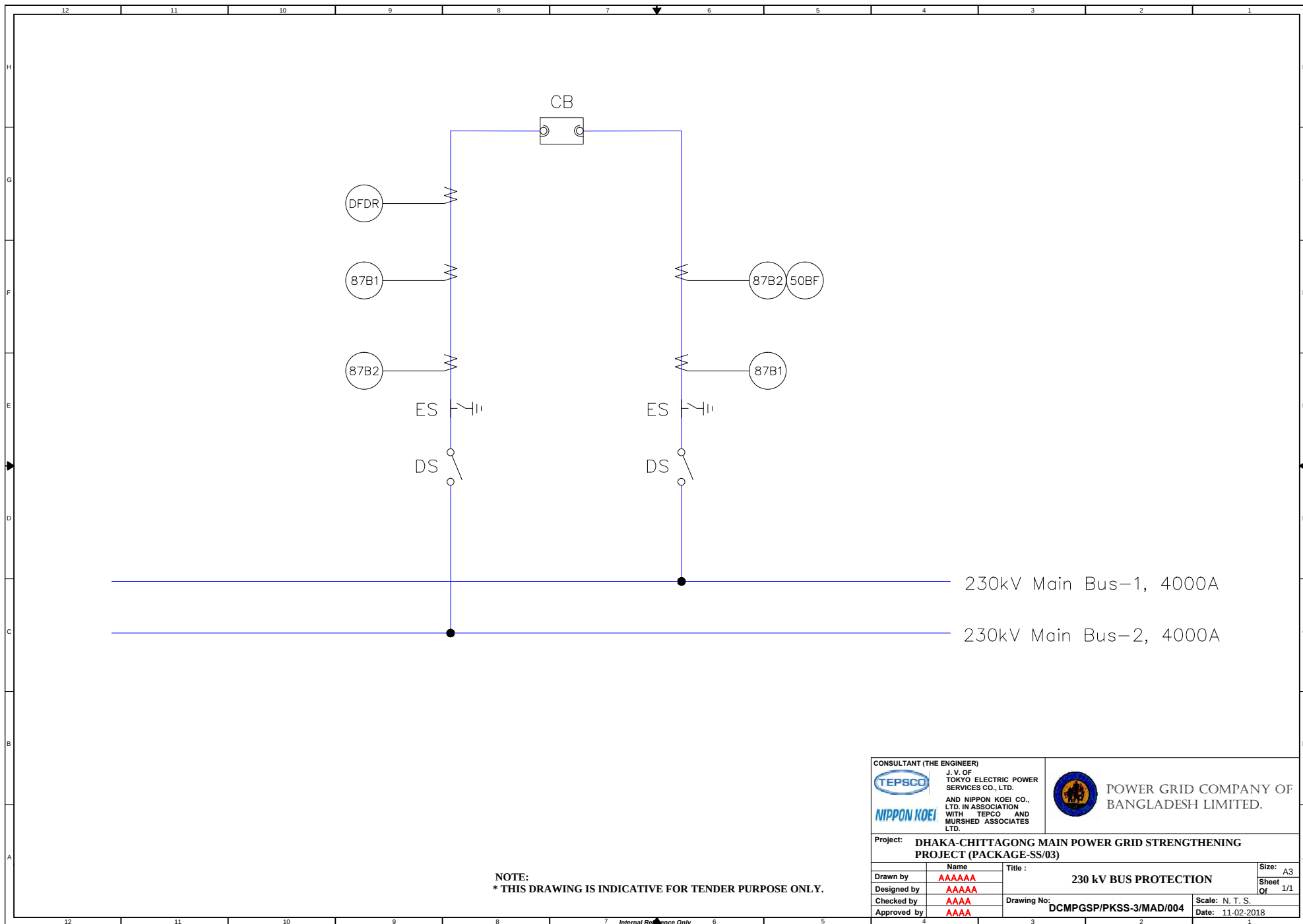
POWER GRID COMPANY OF
BANGLADESH LIMITED.

Project:	DHAKA-CHITTAGONG MAIN POWER GRID STRENGTHENING PROJECT (PACKAGE-SS/03)
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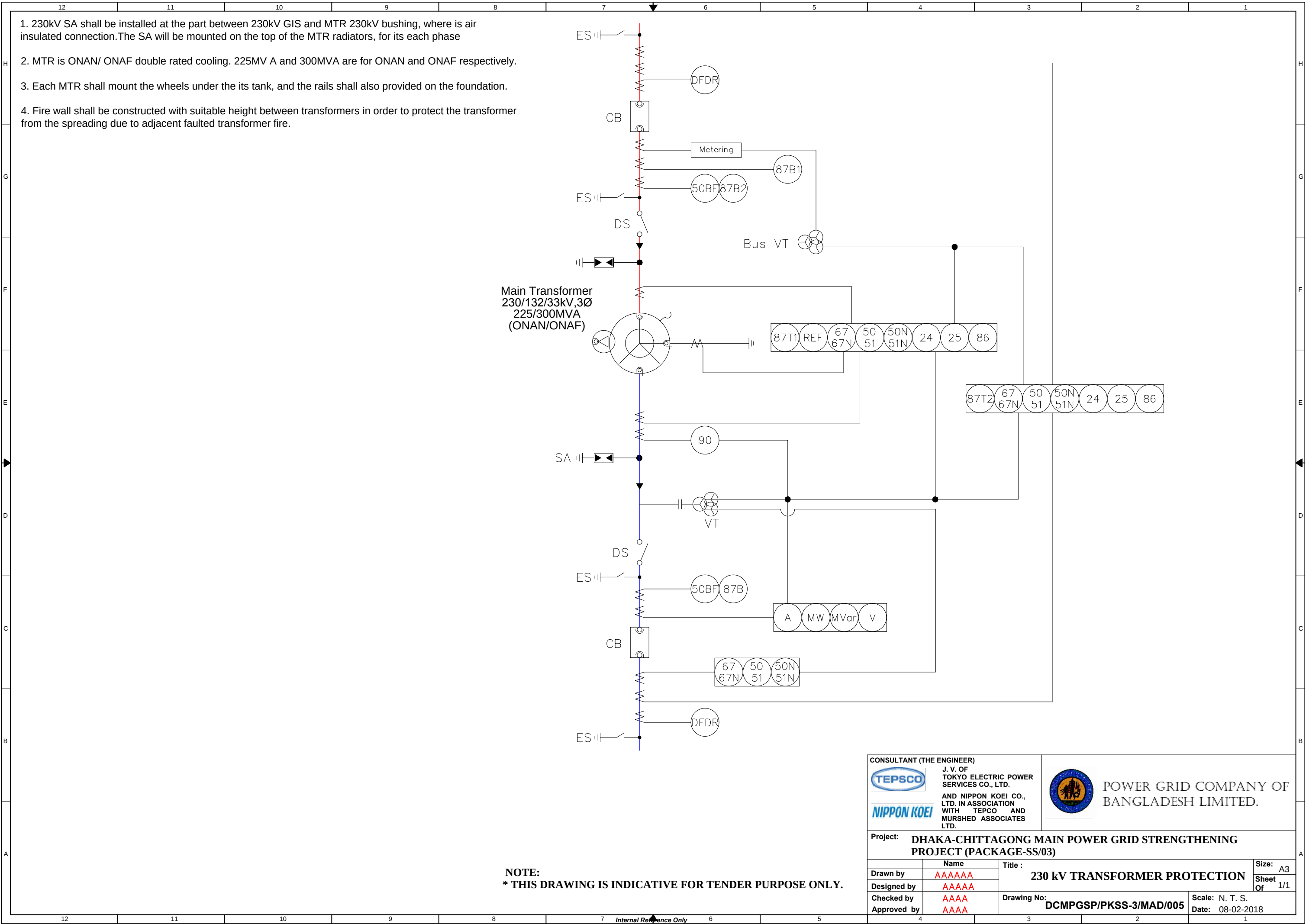
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Checked by	AAAA		Date: 22-02-2018	
Approved by	AAAA			



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Project: DHAKA-CHITTAGONG MAIN POWER GRID STRENGTHENING PROJECT (PACKAGE-SS/03)			
Drawn by Designed by Checked by Approved by	Name AAAAAA AAAAA AAAAA AAAAA	Title : 230 kV T/L PROTECTION FOR MADUNAGHAT-1/2	Size: A3 Sheet Of 1/1
Drawing No: DCMPGSP/PKSS-3/MAD/003		Scale: N.T.S. Date: 12-02-2018	



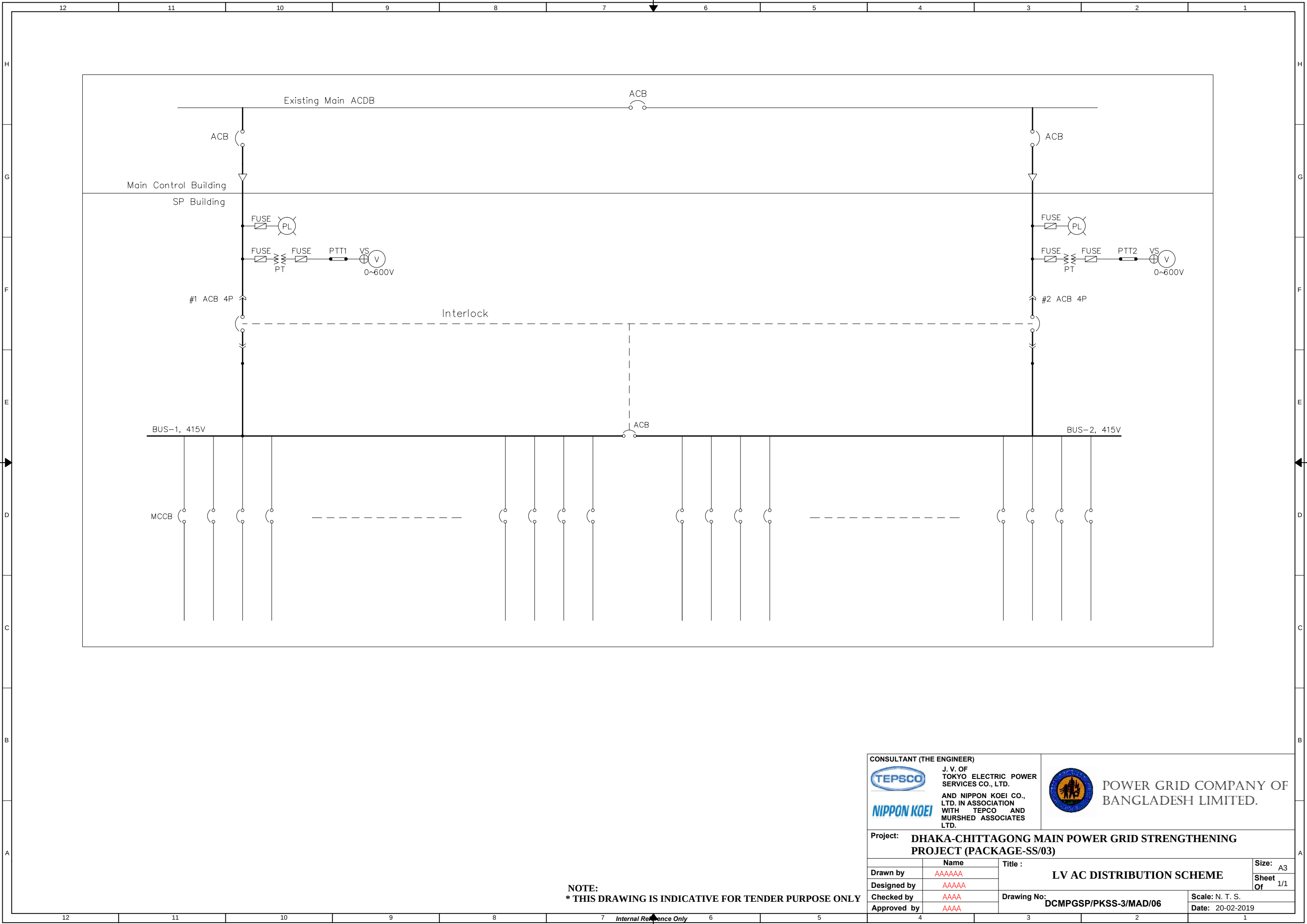
CONSULTANT (THE ENGINEER)  J. V. OF TOKYO ELECTRIC POWER SERVICES CO., LTD.  AND NIPPON KOEI CO., LTD. IN ASSOCIATION WITH TEPSCO AND MURSHED ASSOCIATES LTD.		 POWER GRID COMPANY OF BANGLADESH LIMITED.	
Project: DHAKA-CHITTAGONG MAIN POWER GRID STRENGTHENING PROJECT (PACKAGE-SS/03)			
Drawn by: AAAAAA Designed by: AAAAAA Checked by: AAAAAA Approved by: AAAAAA		Title: 230 kV BUS PROTECTION Drawing No: DCMGPSP/PKSS-3/MAD/004 Scale: N. T. S. Date: 11-02-2018	
		Size: A3 Sheet 1/1 Of	



1. 230kV SA shall be installed at the part between 230kV GIS and MTR 230kV bushing, where is air insulated connection.The SA will be mounted on the top of the MTR radiators, for its each phase
2. MTR is ONAN/ ONAF double rated cooling. 225MV A and 300MVA are for ONAN and ONAF respectively.
3. Each MTR shall mount the wheels under the its tank, and the rails shall also provided on the foundation.
4. Fire wall shall be constructed with suitable height between transformers in order to protect the transformer from the spreading due to adjacent faulted transformer fire.

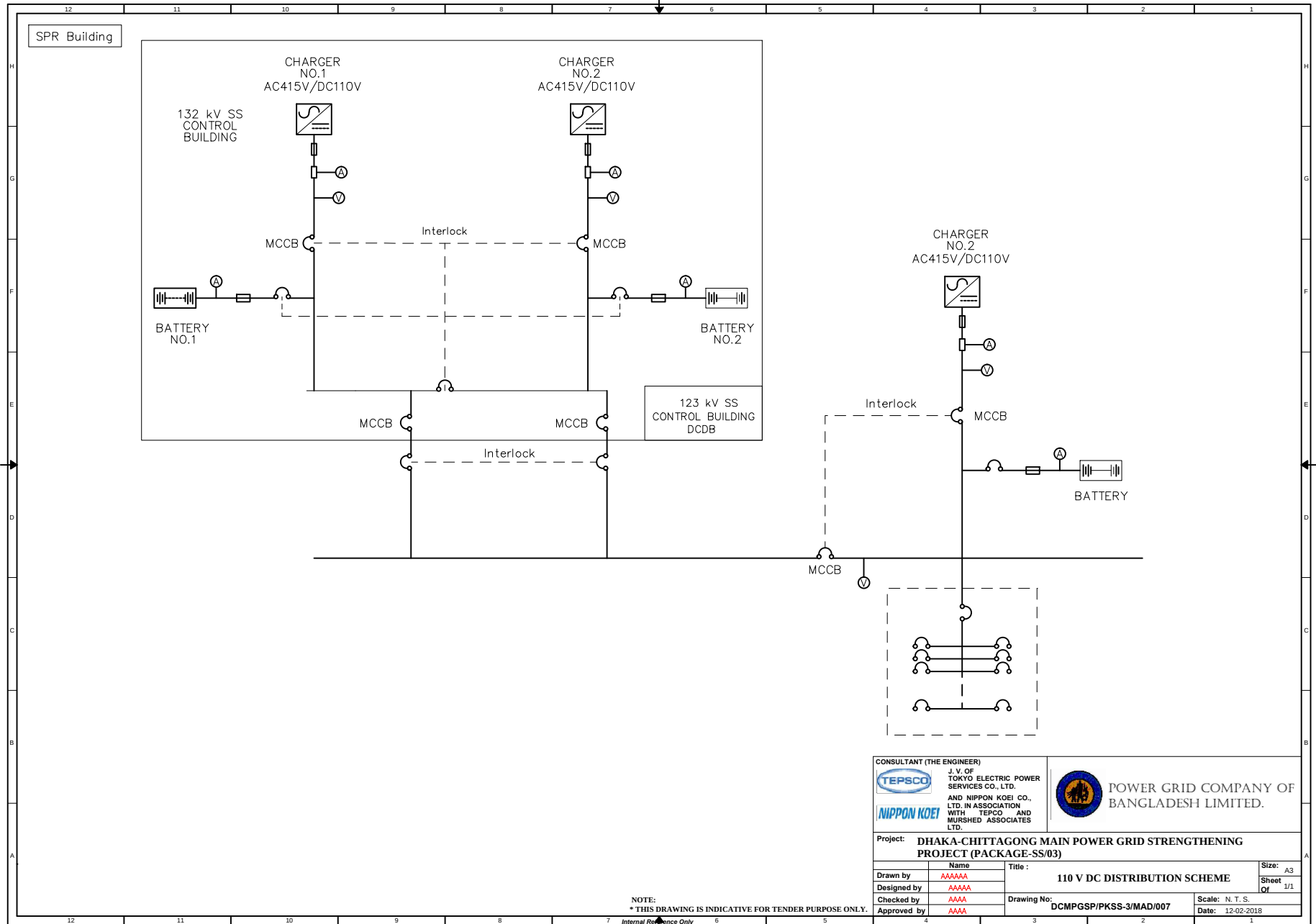
NOTE:
* THIS DRAWING IS INDICATIVE FOR TENDER PURPOSE ONLY.

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Project: DHAKA-CHITTAGONG MAIN POWER GRID STRENGTHENING PROJECT (PACKAGE-SS/03)			
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		Date: 08-02-2018	

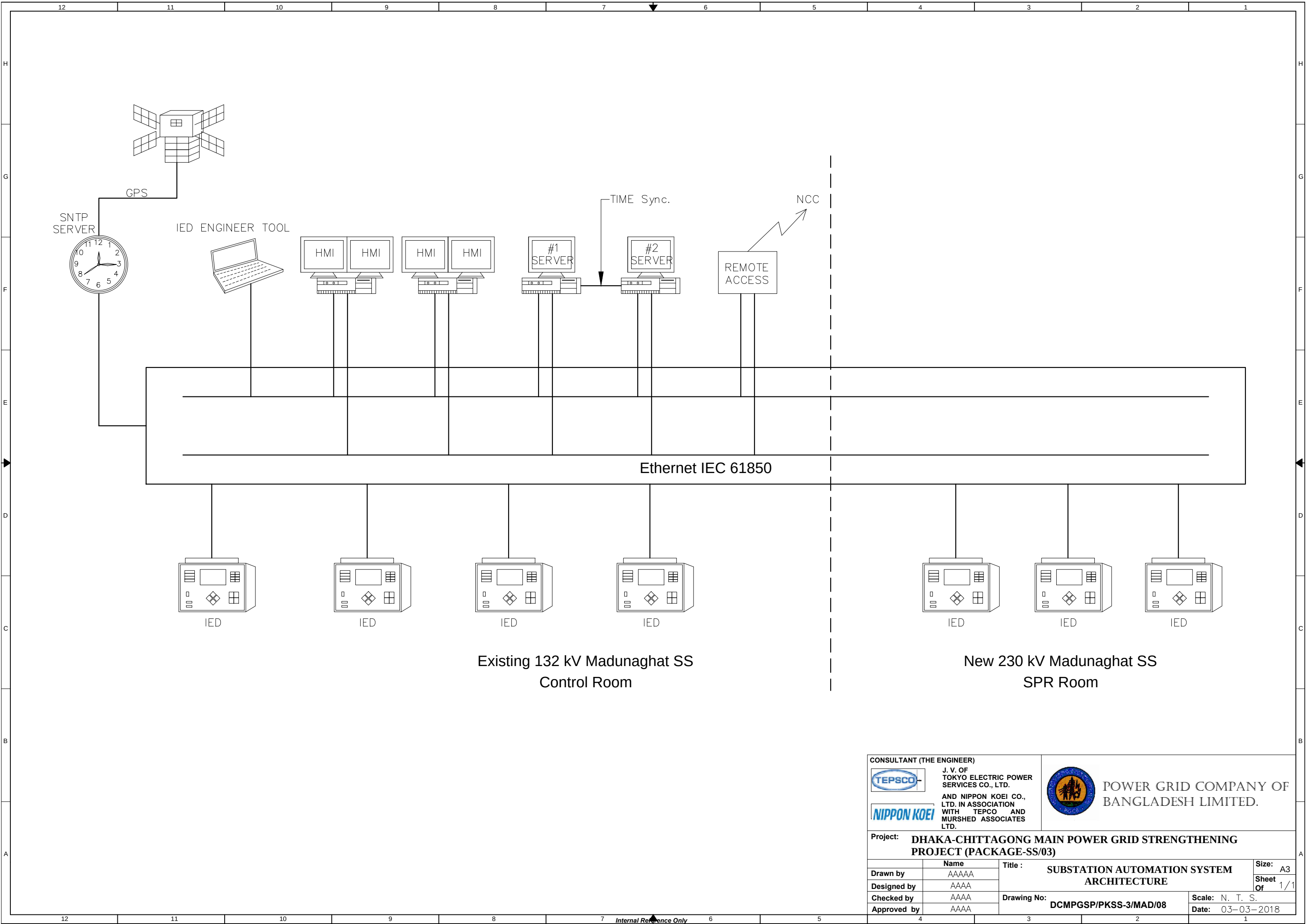


NOTE:
* THIS DRAWING IS INDICATIVE FOR TENDER PURPOSE ONLY

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Project: DHAKA-CHITTAGONG MAIN POWER GRID STRENGTHENING PROJECT (PACKAGE-SS/03)			
Drawn by AAAAAA		Title : LV AC DISTRIBUTION SCHEME	
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Approved by AAAA		Drawing No: DCMPGSP/PKSS-3/MAD/06	
		Scale: N. T. S.	
		Date: 20-02-2019	



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Project: DHAKA-CHITTAGONG MAIN POWER GRID STRENGTHENING PROJECT (PACKAGE-SS/03)			
Name		Title :	Size: A3
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Designed by: AAAAA		Drawing No: DCMGPSP/PKSS-3/MAD/007	
Checked by: AAAAA		Scale: N. T. S.	
Approved by: AAAAA		Date: 12-02-2018	



**TEPSCO**

**NIPPON KOEI**

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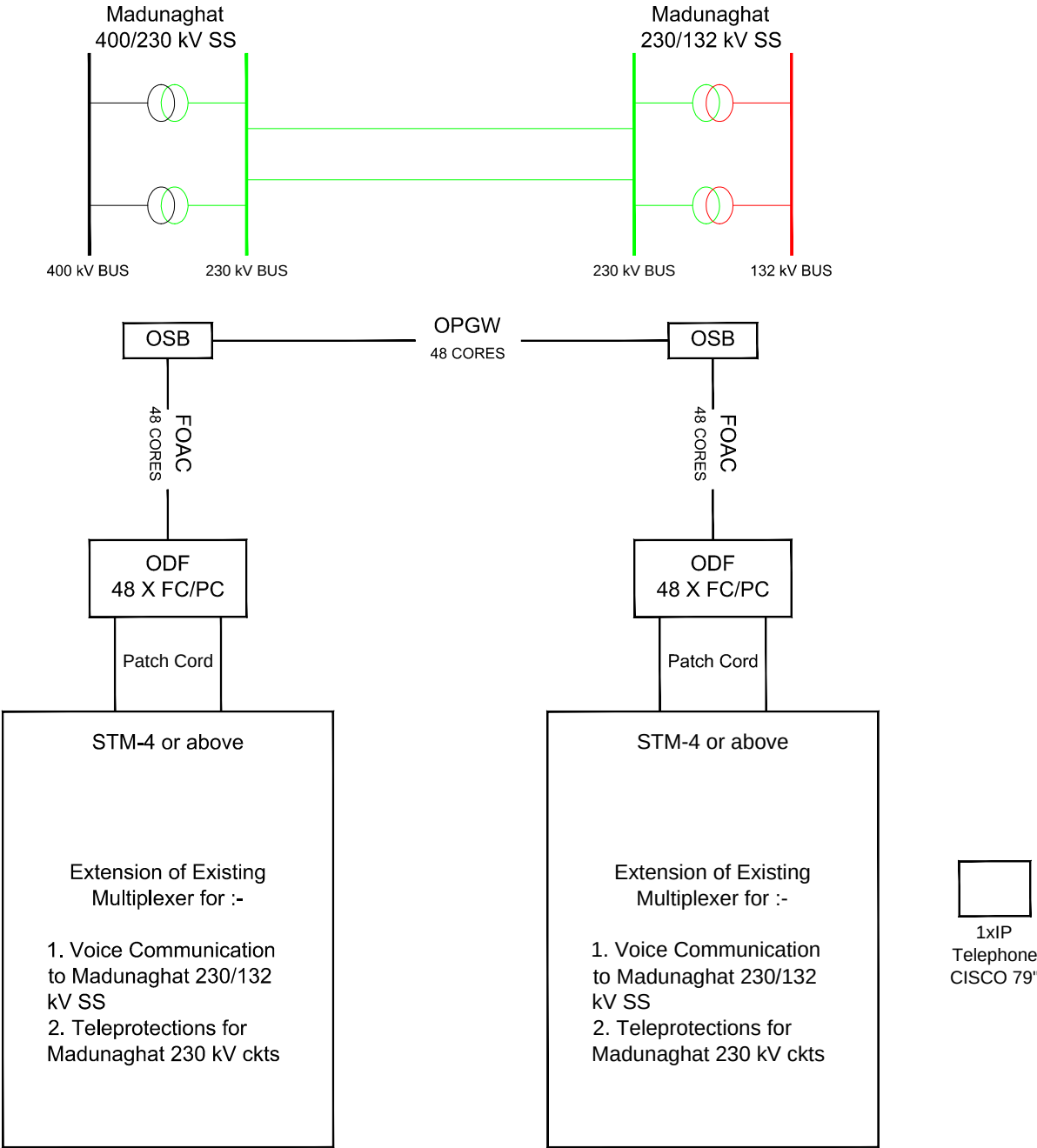


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Project: **DHAKA-CHITTAGONG MAIN POWER GRID STRENGTHENING
PROJECT (PACKAGE-SS/03)**

Drawn by	Name AAAAA	Title : SUBSTATION AUTOMATION SYSTEM ARCHITECTURE	Size: A3
Designed by	AAAA		Sheet Of 1/1
Checked by	AAAA	Drawing No: DCMPGSP/PKSS-3/MAD/08	Scale: N. T. S.
Approved by	AAAA		Date: 03-03-2018

Communication (Primary) Scheme for 400/230 kv to 230/132 kv Madunaghat Sub-station



N.B. : Multiplexer of Madunaghat 230/132 kv will be ABB's equipment
which will be supplied under
Contract :- ICB No. : PSEEIP (TRANCHE-3)/ADB/PGCB/P03/SS

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Project: DHAKA-CHITTAGONG MAIN POWER GRID STRENGTHENING
PROJECT (PACKAGE-SS/03)

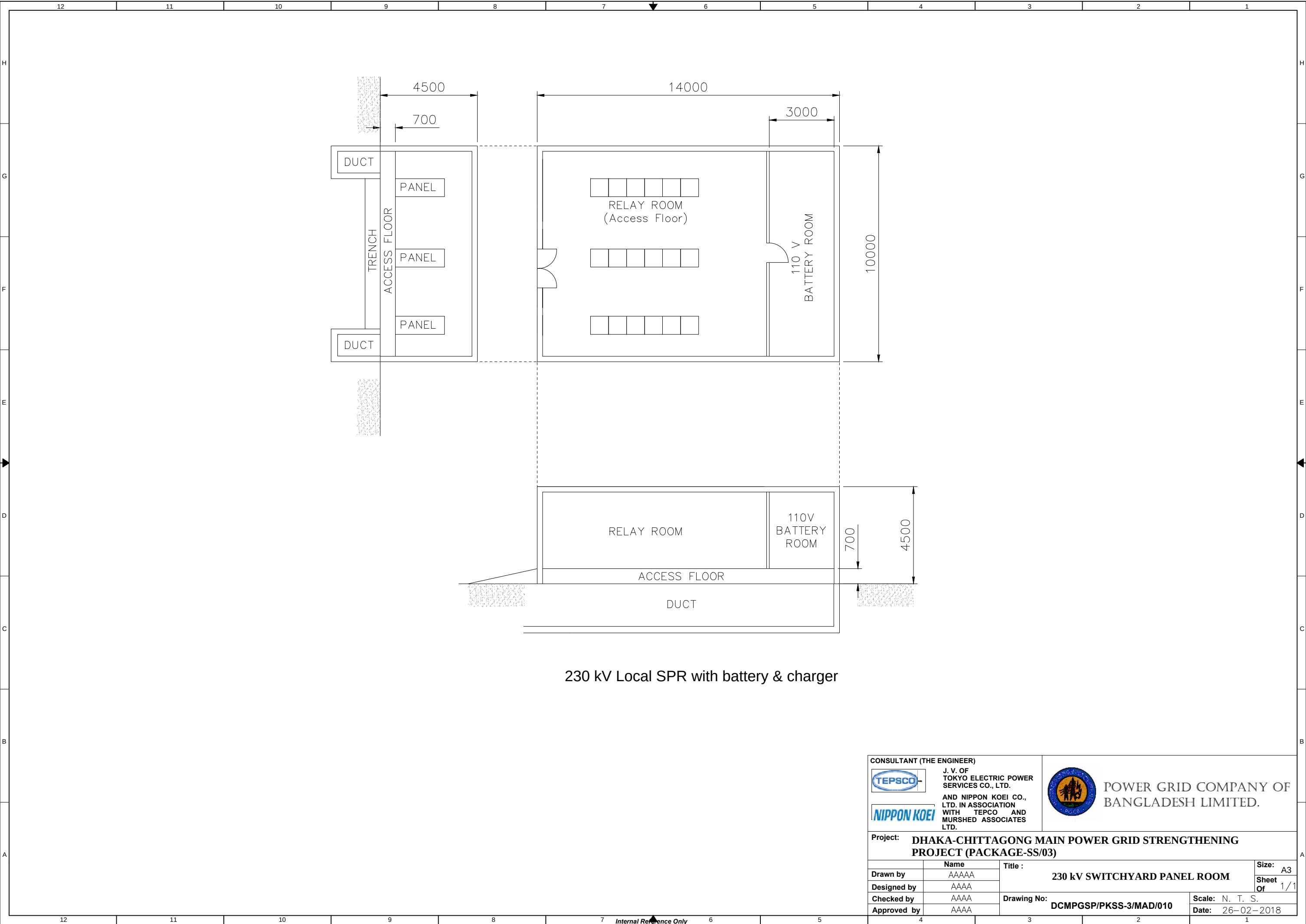
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Approved by	AAAA		Date: 01-03-2018

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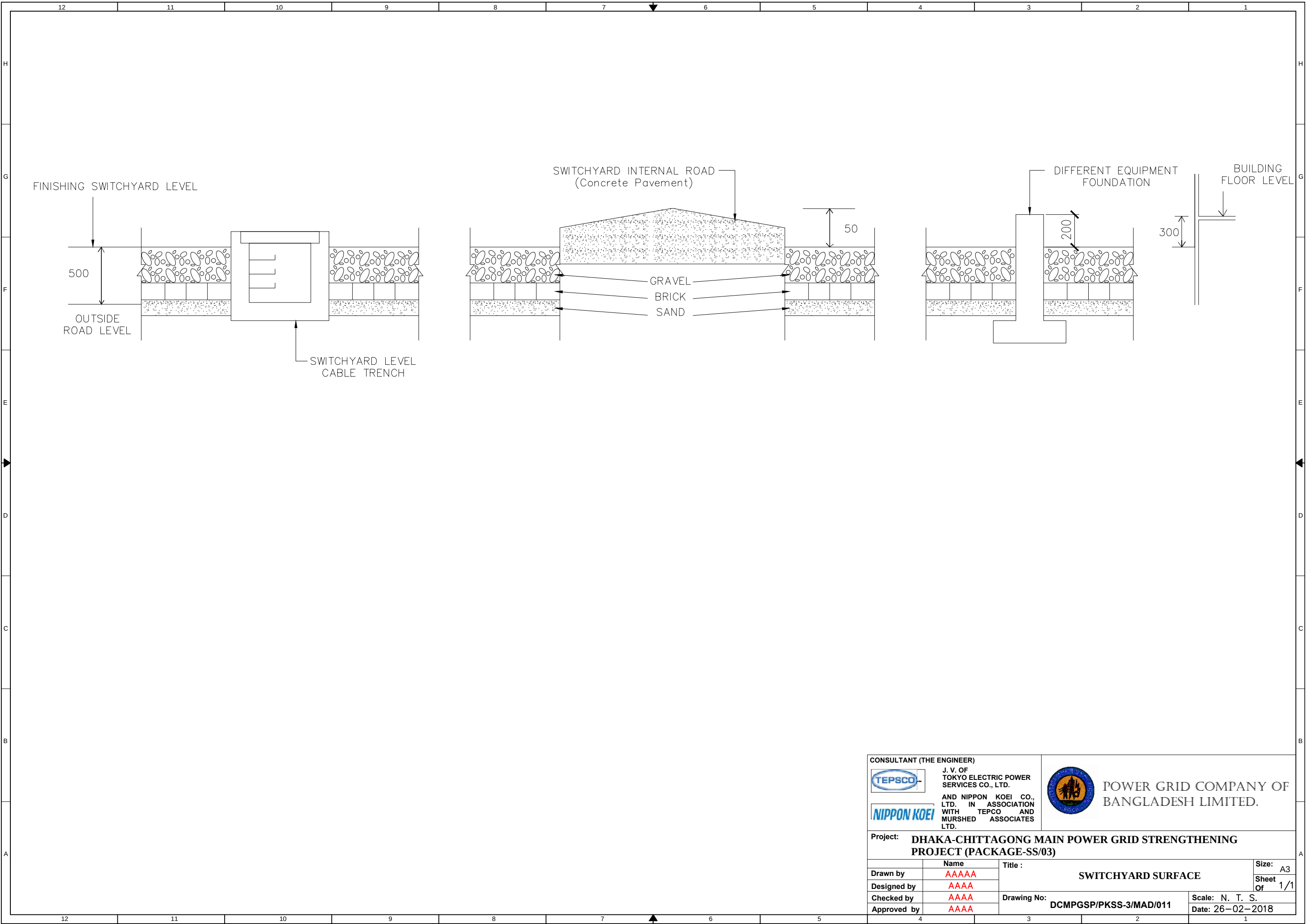
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Project: DHAKA-CHITTAGONG MAIN POWER GRID STRENGTHENING PROJECT (PACKAGE-SS/03)			
Drawn by	Name AAAAA	Title : 230 kV SWITCHYARD PANEL ROOM	Size: A3
Designed by	AAAA		Sheet Of 1/1
Checked by	AAAA	Drawing No: DCMPGSP/PKSS-3/MAD/010	Scale: N. T. S.
Approved by	AAAA		Date: 26-02-2018





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BANGLADESH LIMITED.

Project: **DHAKA-CHITTAGONG MAIN POWER GRID STRENGTHENING
PROJECT (PACKAGE-SS/03)**

Drawn by	Name AAAAA	Title : SWITCHYARD SURFACE	Size: A3
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Approved by	AAAA		Date: 26-02-2018

SECTION 21
REFERENCE DATA**TABLE OF CONTENTS**

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21.2	Transformer Barge Stowage Plan.....	2
21.3	Reference Drawings for Civil Works	2

SECTION 21

REFERENCE DATA

21.1 Report on Study of Method to Transport Heavy Loads (400kV Transformers) in Bangladesh

See Annex 21-1.

21.2 Transformer Barge Stowage Plan

See Annex 21-2.

21.3 Reference Drawings for Civil Works

See Annex 21-3.

Annex 21-1:
Report on Study of Method to Transport Heavy Loads (400kV Transformers) in Bangladesh

Report on Study
of Method to Transport Heavy Loads
(400kV Transformers) in Bangladesh

January 2015

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5.	Local Laws and Remarks on Transportation	13
6.	Rough Estimate of Transportation Costs	13

Attachments:

BARGE STOWAGE PLAN	HJ-DWG-20A4680W-01-0
RORO PLAN	HJ-DWG-20A4680W-02-0
TRANSPORTATION PLAN	HJ-DWG-20A4680W-03-0

1. Purpose of the Study

A study of possible ways of safely transporting heavy objects to the substations in Bangladesh was conducted based on a request received to consider methods of transporting heavy objects (400kV transformers), the specifications attached to the request (August 11, 2014), and a request to change the contents of the request (October 30, 2014).

2. Equipment to be Moved

400-/230kV Transformer

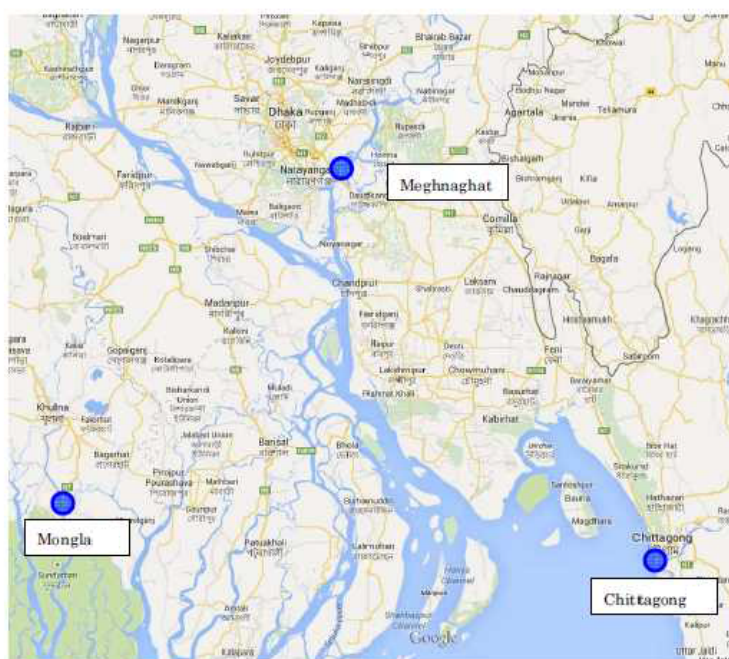
Dimension: 10.8 m wide x 4.10 m deep x 4.60 m high Weight: 207 tons

3. Contents of the Study

A. Meghnaghat Substation

(1) Methods expected to be used for transportation to the substation

The object will be transported by barge from the main vessel at Chittagong Port or Mongla Port, and by river to a temporary pier near the Meghnaghat Substation. According to the information received from an experienced shipper, river transportation to the candidate temporary pier is feasible. Oil tankers and other barges have transported goods on the river. Roll-off work will be conducted from the barge to the candidate temporary pier, and trailer transportation will be used to the proposed construction site.



(2) Candidate pier construction site and inland transportation



1) The south side of the proposed substation construction site (existing pier)

The temporary pier could not be examined because it is located at an already constructed power station site, but the data gathered at the time of another project and provided by the local partner was confirmed. The distance from the water to the jetty was 3.6 m (September 2014). The work will be difficult without cargo handling equipment such as a crane. This pier is therefore not suitable for roll off work. The water depth is not confirmed. The transportation route from the pier has not been studied. (See photo of expected transportation route below.)



2) North-west side of the proposed substation construction site (recommended by TEPCO)

This point is a suitable location due to its proximity to the candidate substation site, but the elevation is 6 meters or more from the river to and the site of the substation. A slope is needed to move heavy objects up the height by a trailer, and it can be assumed that extensive civil engineering work would be required. As culvert is installed for drainage. The route and strength of the culvert will have to be studied before deciding to use it as a route for moving heavy loads. (See photos of expected transportation route below.)



- 3) East side of Meghan Bridge (recommended by Nippon Express)
 Temporary piers have been built at this point in the past. It currently is used as a site for unloading river sand. The transportation route is along an ordinary road and the Dhaka-Chittagong Highway. This proposed route is considered optimal even though aerial wires would have to be raised, it would pass through a highway gate, and lane dividing blocks would have to be moved. The transportation distance is 3.5 km. (See photos of expected transportation route below.)



Proposed temporary pier



Hinterland



Ordinary road



Highway Route 1



Right-turn from the highway.
Separation blocks need to be removed.



Right-turn in front of the existing power
station. Gate width is 8m.



Left turn. Remove inner wire netting.
(To be confirmed.)



Near proposed SS construction site. Road
width is 5.5 m.

(3) Proposal

- 1) The proposed pier is not suitable for roll-off pier due to the height of the temporary pier.
- 2) A slope of about 100m is needed to overcome the difference of elevation. Considering the restoration, it is not appropriate due to the extensive civil engineering that would be required.
- 3) While the transportation route passes through an ordinary highway, handling at the temporary pier, and the ordinary road and the highway have been used for this kind of transport. The transportation in question is considered possible.

As described above, we recommend 3).

B. Madunaghat Substation

(1) Expected transportation method to the substation

The object will be transshipped to a barge at Chittagong Port, and transported by river to the temporary pier near the Madunaghat Substation. Roll-off will be conducted at the temporary pier on the Route 163, and the object will be transported by trailer from the temporary pier to the proposed construction site. This time, we examined the candidate temporary pier site on the Halda River (west of R163) and the existing pier on the Karnaphuli River (east of R163).

(2) Candidate sites for temporary pier



1) Candidate temporary pier site on Halda River

The distance from the temporary pier to the site is 6.1 km. The proposed construction site is used to dispose of river sand, and it would be relatively easy to build a connecting road.



Candidate site for temporary pier



Candidate site for connecting road

2) Candidate temporary pier site on Karnaphuli River (existing pier)

The distance from the temporary pier to the site is 11.3 km. The pier has a cargo-handling facility, with a sign indicating it has the capacity to move 200 tons, but it has been not used for

eight years or more. Inquiries must be made to the owner about the possibility of using it. The weight of the transformer exceeds the indicated cargo-handling capacity, which means that weight reduction and cargo-handling method must be considered in detail if it will be used.



Whole-view of the cargo-handling facility
(route width is 5400mm).



Hooking capacity (200 tons/30 tons)

(3) River transportation from Chittagong Port to the candidate site for temporary pier
Upper obstacles and water depths are as shown below for barge transportation via the Karnaphuli River from Chittagong Port.

	1) Candidate site on Halda River	2) Candidate site on Karnaphuli River
Karnaphuli 3 rd Bridge	13 m clearance	
Kalurghat Karnaphuli Bridge	7.6 m clearance (raised about 2.0 m in rainy season)	
Water depth of Halda River Confluence	Water depth of 18 m or more	
In front of Halda Bridge	High-voltage cable at 8.2 m high	
Halda Bridge	8 m clearance	
Candidate Pier on Halda River	Water depth of 8 m or more	
Gudawn Karnaphuli Bridge		9 m clearance

The lowest bridge clearance seen in the study is 7.6 meters. The high-voltage wire is 8.2 meters high, but it will be 6.2 meters if the separation is 2 meters. In the rainy season, a rise in the water level of about 1.5 to 2.0 meters is expected, and a jack-down of the entire cargo and shutting off power to the high-voltage cable should be considered.

(4) Inland transportation from the candidate temporary pier

1) Temporary pier on Halda River

- Upper obstacles: Power cables and communication lines exist at various points. These can be avoided by raising them. Community gates (bamboo) would have to be temporarily removed. In-depth discussion with the community is needed in advance. Trees may be obstacles at several points, and explanation and approval of the community as indicated above, and a report to the road administrator are needed.



Cable conditions



Trees



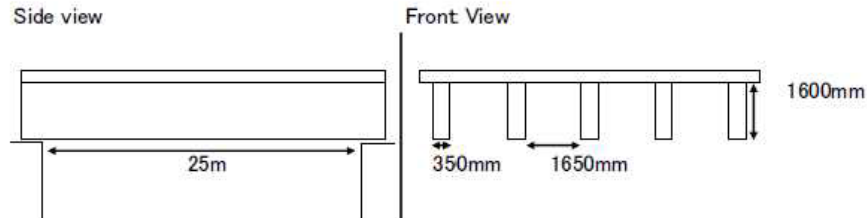
Community gate (5.8 m high)

- Road width: A new connecting road near the temporary pier and an intersection in front of the candidate substation site are to be considered, but other roads can be used due to a road width of 6 meters or more.
- Bridges, etc.: On the transportation route to the proposed site, there are 1 bridge and 7 culverts.

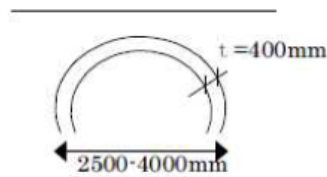
Bridge conditions:

Name : Abdul Kader Bridge
Type : Concrete beam bridge
Length : 25 m





Culvert conditions
 Diameter : 2500 – 4000 mm
 Thickness : 400 mm



It is thought that the Abdul Kader Bridge can be reinforced by the over-bridge method, and it is thought that culverts are can be reinforced by placing iron plates on them corresponding to the depth of earth covering.

- Areas with shops: One built-up shopping area exists on the route. In daytime, many cars, three-wheel auto rickshaws and pedestrians use the road, and negotiation with and gaining the approval of the community is needed. A prior report to the road administrator is necessary, and traffic control would be needed on the day of the proposed transportation.



Shopping area where traffic control would be needed.

- Road works: Water supply tubes are being placed beside the road in parallel with the transportation route. Future road work is unknown at this time for the transportation route in question. It must be surveyed again at the time of transportation. If any work is expected, discussions on the content of the work and measures that would be needed to protect it would have to be discussed with the related parties.



At the time of survey, water supply tubing work by JICA was being conducted at various places.

- Road surface course: The road is paved with asphalt for the entire route, but there are rutting and cracks in various parts of it. When transporting heavy loads, road surface conditions must be confirmed and photos must be taken to confirm that heavy objects have not injured road surface.



Example of road damage. Similar cracks are seen at various places.

2) Jetty of Karnaphuli River

- Upper obstacles: (1) Power cables and communication lines exist in various places just like they are along the route. They can be avoided by raising them up during transportation. Any community gate (bamboo) must be temporarily removed. Prior discussion in depth with the community is needed. There are many places where trees become obstacles, and explanation to and approval of the community in advance is needed as well. A report to the road administrator is needed, too.



Cable conditions



Trees



Community gate (5.8 m high)

- Road width: The future road from the intersection in front of the proposed substation site to the destination is subject to future examination, but other roads are six meters wide or more and transportation is possible.
- Bridges, etc.: There are five culverts and three bridges on the route to the proposed site. One of the bridges is made of brick piers. Its strength was unknown at the time of the study.



Culvert conditions





Bridge conditions: The piers are made of bricks.



Bridge conditions: Concrete arch.

- Shopping area: There is one shopping area. In the daytime, many cars, three-wheel vehicles and pedestrians use the road, and prior negotiations with and approval of the community are needed. A report to the road administrator is needed, and traffic control must be conducted on the day of transportation.



Crowded shopping area.



Traffic control will be needed.

- Road works, etc.: Roadside water supply piping work is ongoing along the transportation route. It is not known at this time whether or not any road construction work is being planned. The situation must be clarified when the stage of planning transportation is reached. If any work is expected, the work content and measures to deal with it properly must be discussed with the related parties.



JICA work on water supply piping was being done at the time of the survey.

- Road surface course: All routes are paved with asphalt, but ruts and cracks exist on various parts of the road. Road surface conditions must be confirmed and photos should be taken before transportation of heavy loads is undertaken, and it must be confirmed that transportation of heavy objects has not damaged it.



Cracks and other asphalt damage are seen at various locations along the road.

(5) Proposals

- 1) The distance from the candidate temporary pier to the proposed substation construction site is shorter than the distance involved in proposal 2. There is one bridge on this road, but it appears that it would be possible to use the bridge if over-bridge construction method is used to strengthen it.
- 2) It is unknown whether or not the existing cargo-handling facility can be used. The capacity is insufficient as well. Assumed roll-off work would not be appropriate due to the elevation of the pier above the water. The distance of 11.3 km from the pier to the proposed substation construction site is longer than that of Proposal 1). There are two market areas along the way, and traffic control will be more difficult.

Therefore, the company recommends Proposal 1) above. Construction of a temporary pier should be done in the dry season when the water level is low, and it is desirable that transportation take place in the wet season when the water level is high.

4. Loading chart/work chart

See the attachments below.

- | | |
|------------------------|---------------------------|
| 1) BARGE STOWAGE PLAN | -----HJ-DWG-20A4680W-01-0 |
| 2) RORO PLAN | -----HJ-DWG-20A4680W-02-0 |
| 3) TRANSPORTATION PLAN | -----HJ-DWG-20A4680W-03-0 |

5. Local laws and remarks on transportation

The BRTA Section of the Ministry of Communication provides for rules on axle weight of transportation vehicles for domestic transportation in Bangladesh in No. RRD/BRTA/Overload-38/96 (P-1)-653. The maximum allowable load per axle is 10.0 tons, and an allowable axle weight is defined for each type of vehicle. As there is no provision covering multi-axle trailers to be used this time. The proposed vehicle is based on 10.0 tons per axle.

Total transportation weight: 268.50 tons =

207.0t (cargo weight) + 49.0t (vehicle weight) + 6.0t (power pack weight) - 6.0t (load dispersion beam)

Axles of the vehicle: 15 axle x 2 axles

Tons per axle: 8.95 t/axle

< 10.0 t/axle OK

For the transportation, discussions will be conducted with the local police, and requests will be submitted for police escorts during the transportation. The local administration has verbally approved the transportation subject to the agreement with the local community. However, no document has been issued. It is important to avoid any trouble with the community along the way.

6. Rough estimate of transportation cost

Rough estimation of temporary pier construction, transportation and obstacle removal are as indicated below. Barge and transportation vehicles are assumed on the basis of temporary imports from Singapore.

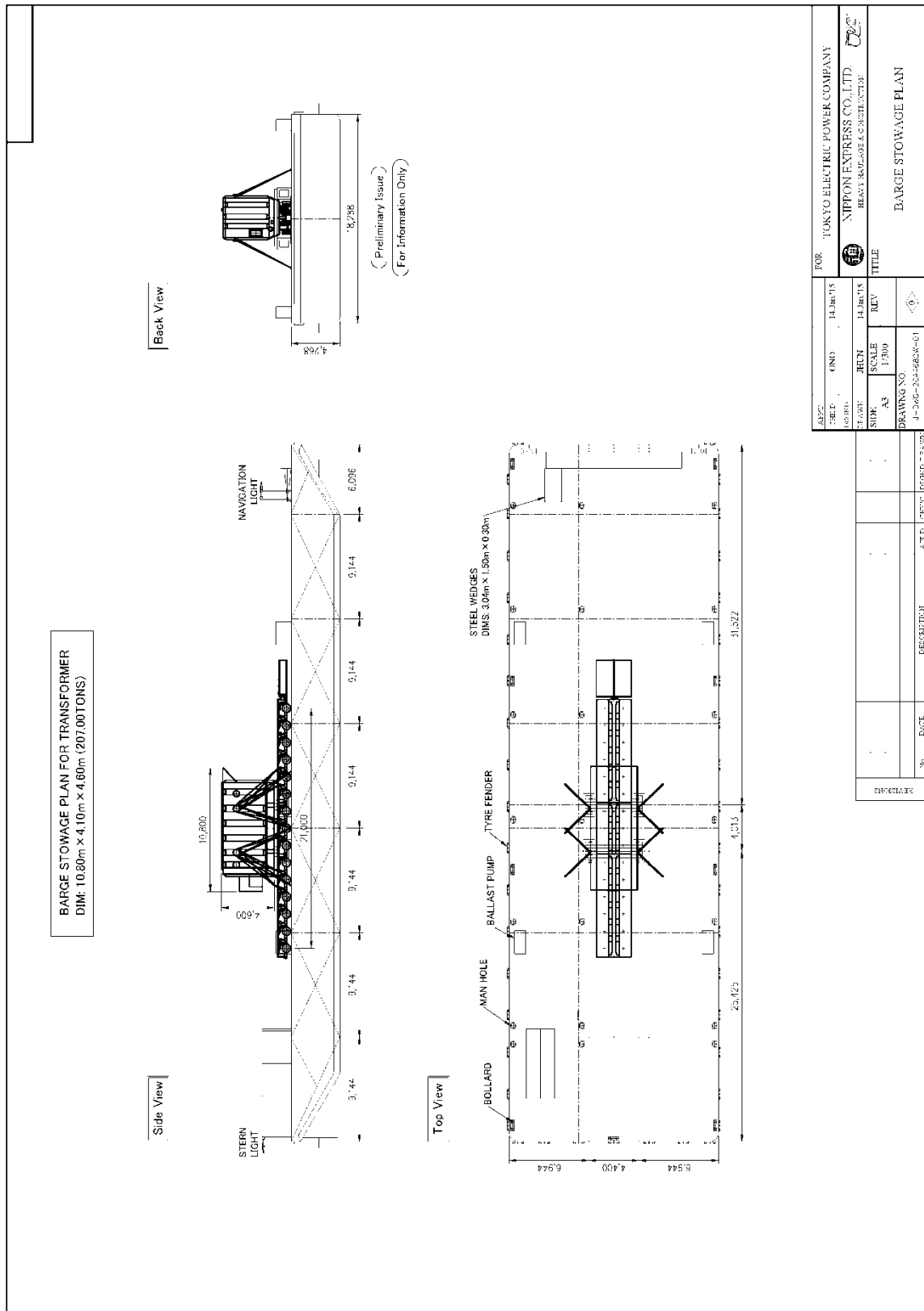
Case 1. Both projects in 30 days

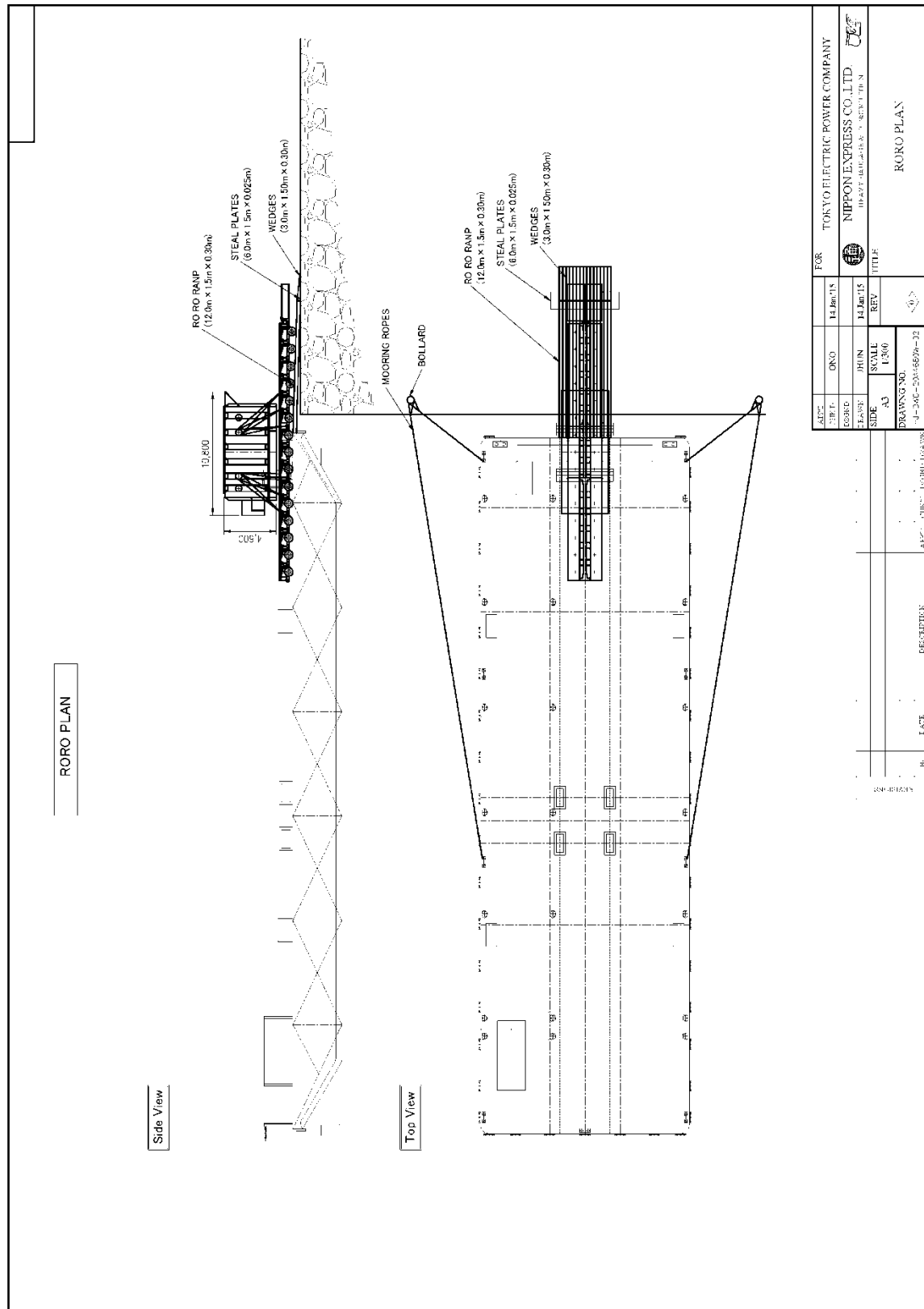
	Meghnaghat Substation	Madunaghat Substation	Total
Sea and land transportation	US\$611,927.54		US\$611,927.54
Jetty construction	US\$105,841.64	US\$105,841.64	US\$211,683.29
Removal obstacle	US\$40,708.32	US\$126,195.81	US\$166,904.13
Total	US\$758,477.51	US\$232,037.45	US\$990,514.96

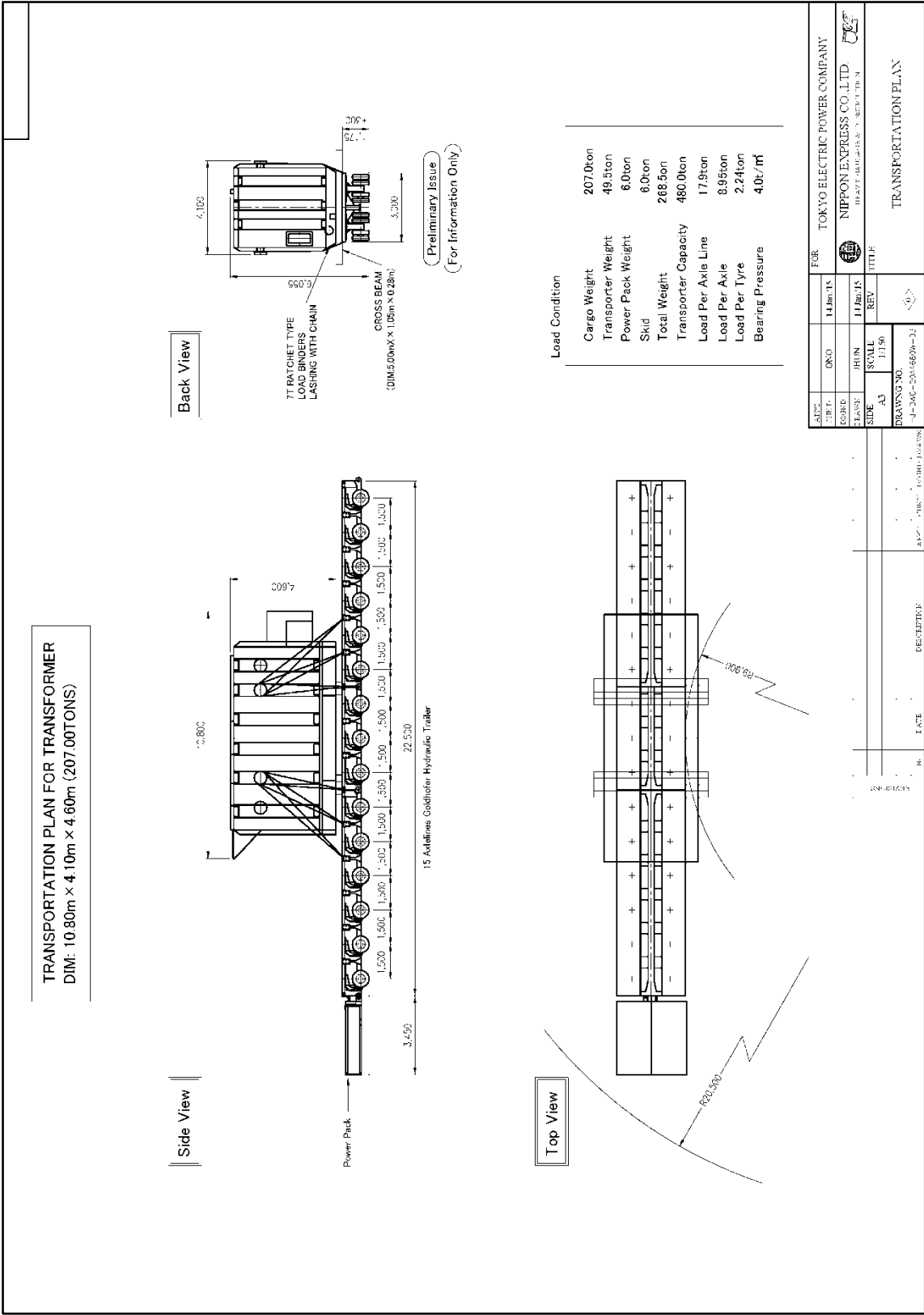
Case 2. Based on separate schedule (interval of 30 days or more)

	Meghnaghat Sub Station	Madunaghat Substation	Total
Sea and land transportation	US\$611,927.54	US\$611,927.54	US\$1,223,855.08
Jetty construction	US\$105,841.64	US\$105,841.64	US\$211,683.29
Removal of obstacles	US\$40,708.32	US\$126,195.81	US\$166,904.13
Total	US\$758,477.51	US\$843,964.99	US\$1,602,442.50

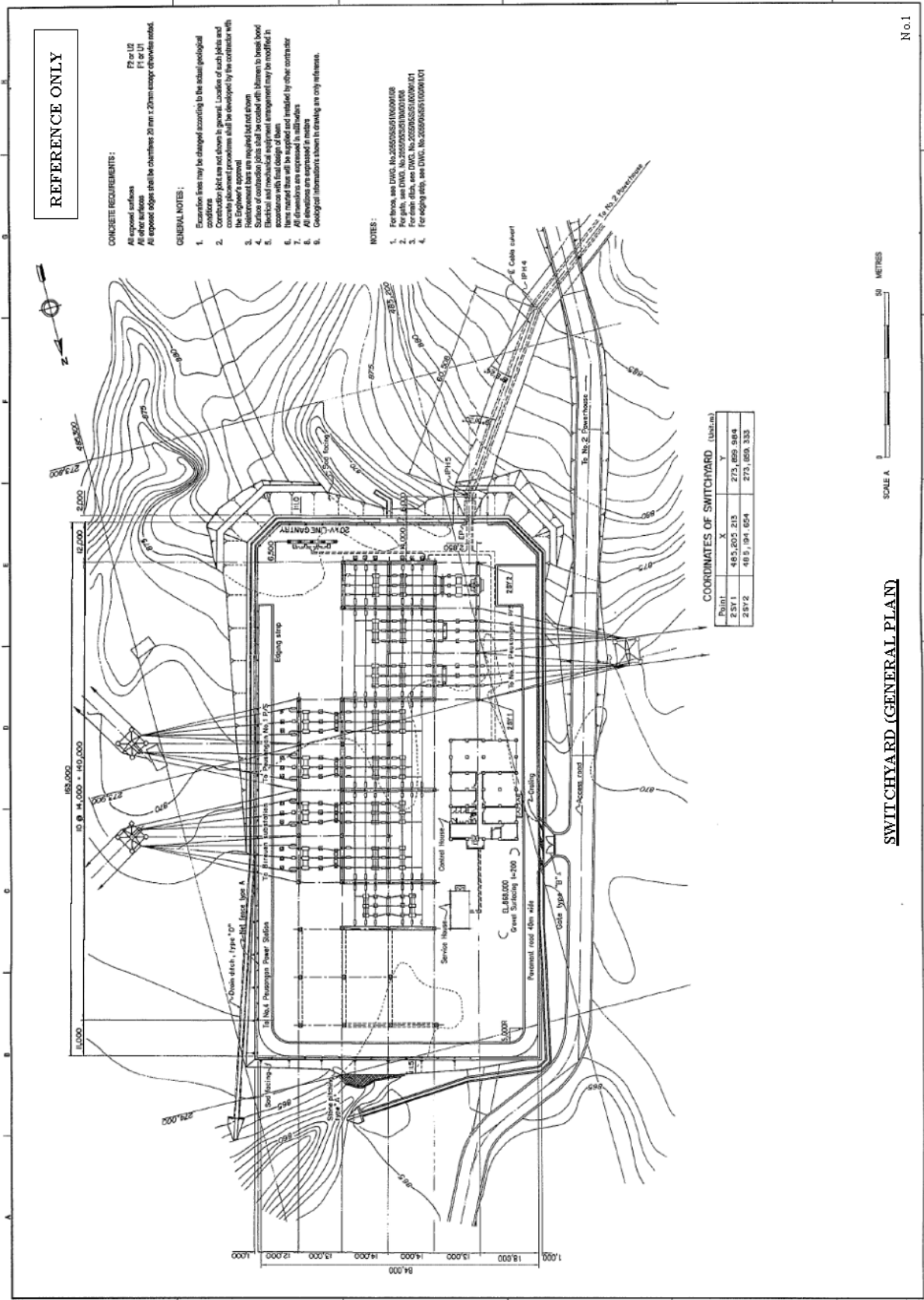
Annex 21-2:
Transformer Barge Stowage Plan

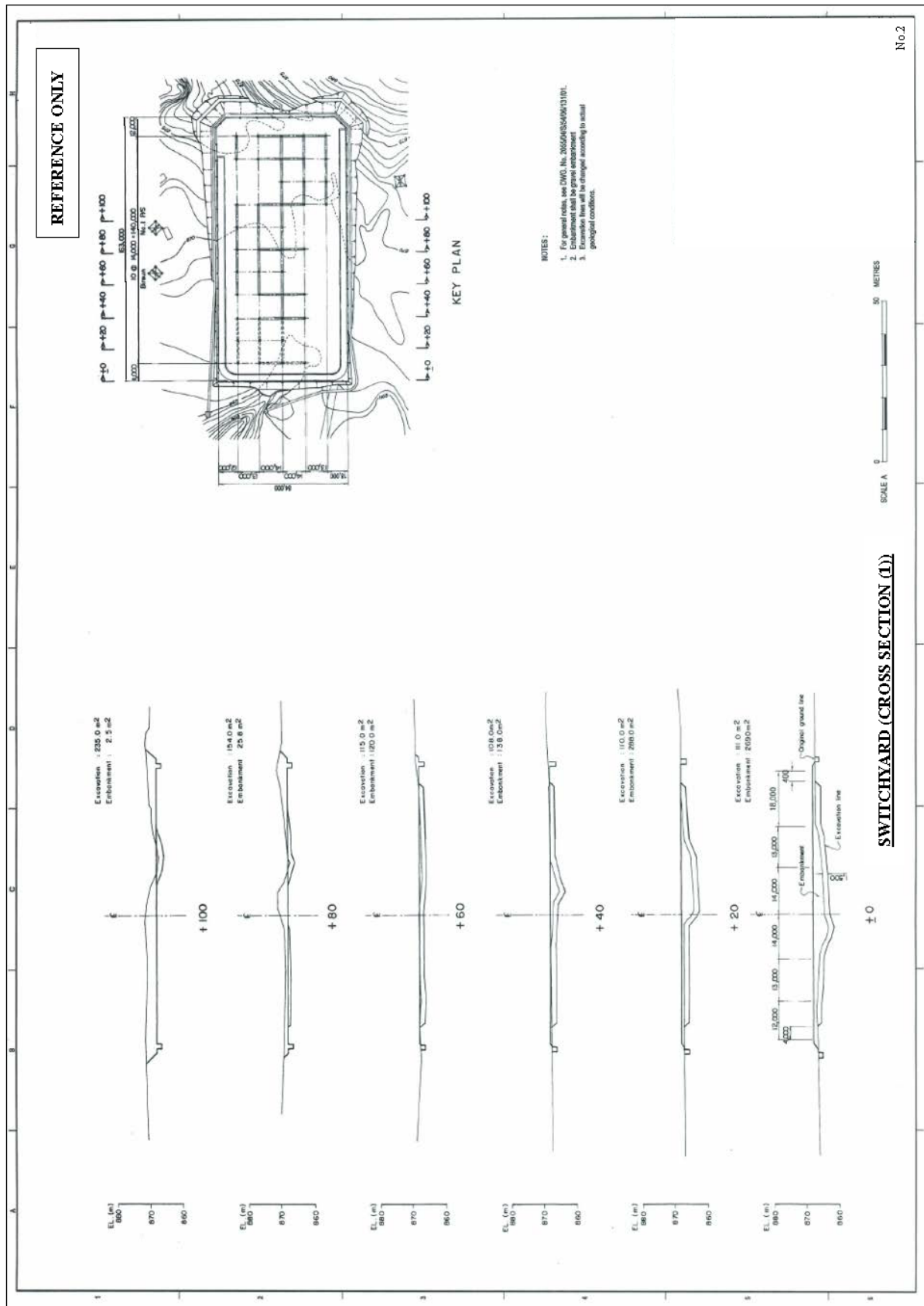


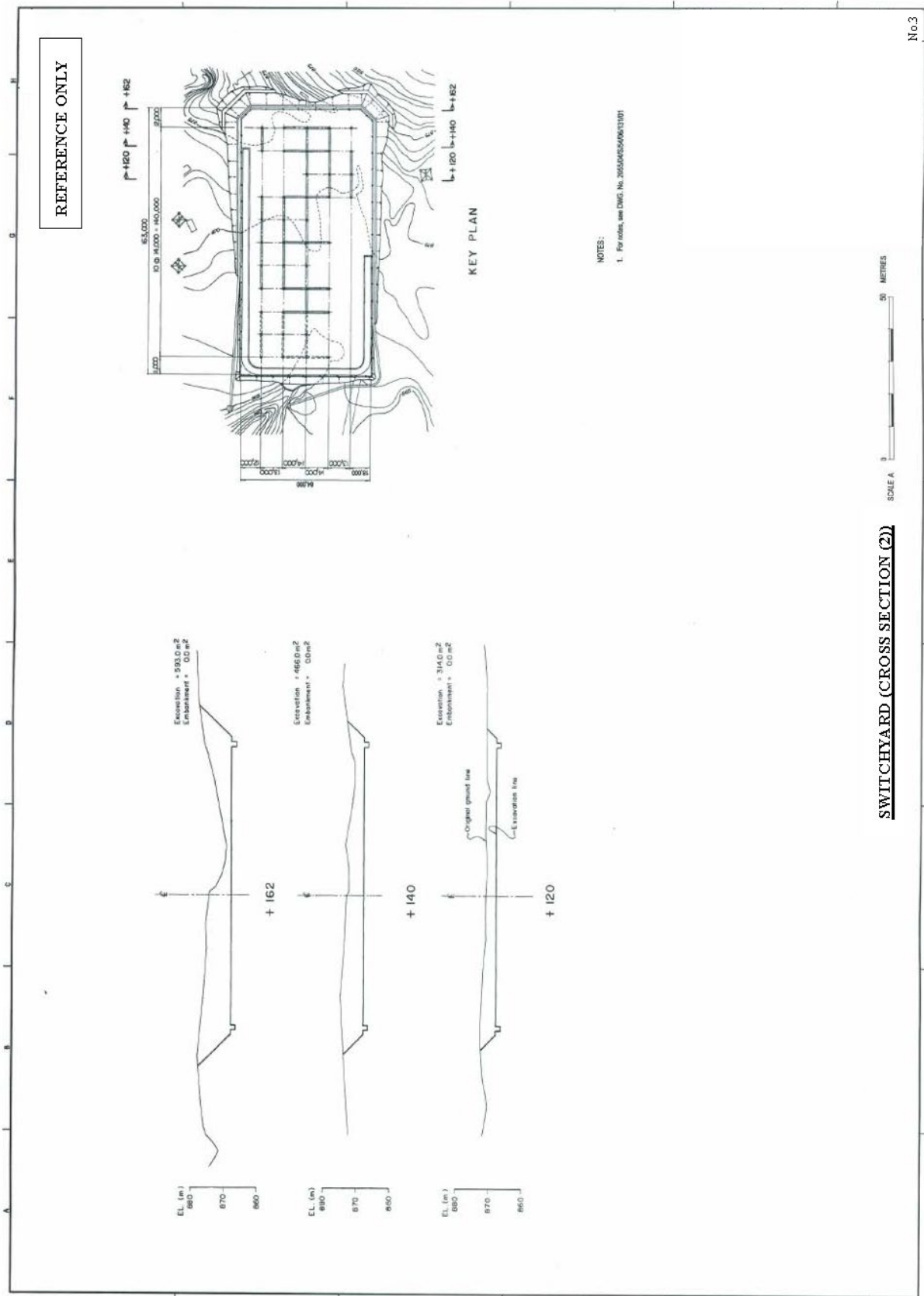




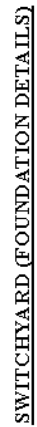
Annex 21-3:
Reference Drawings for Civil Works

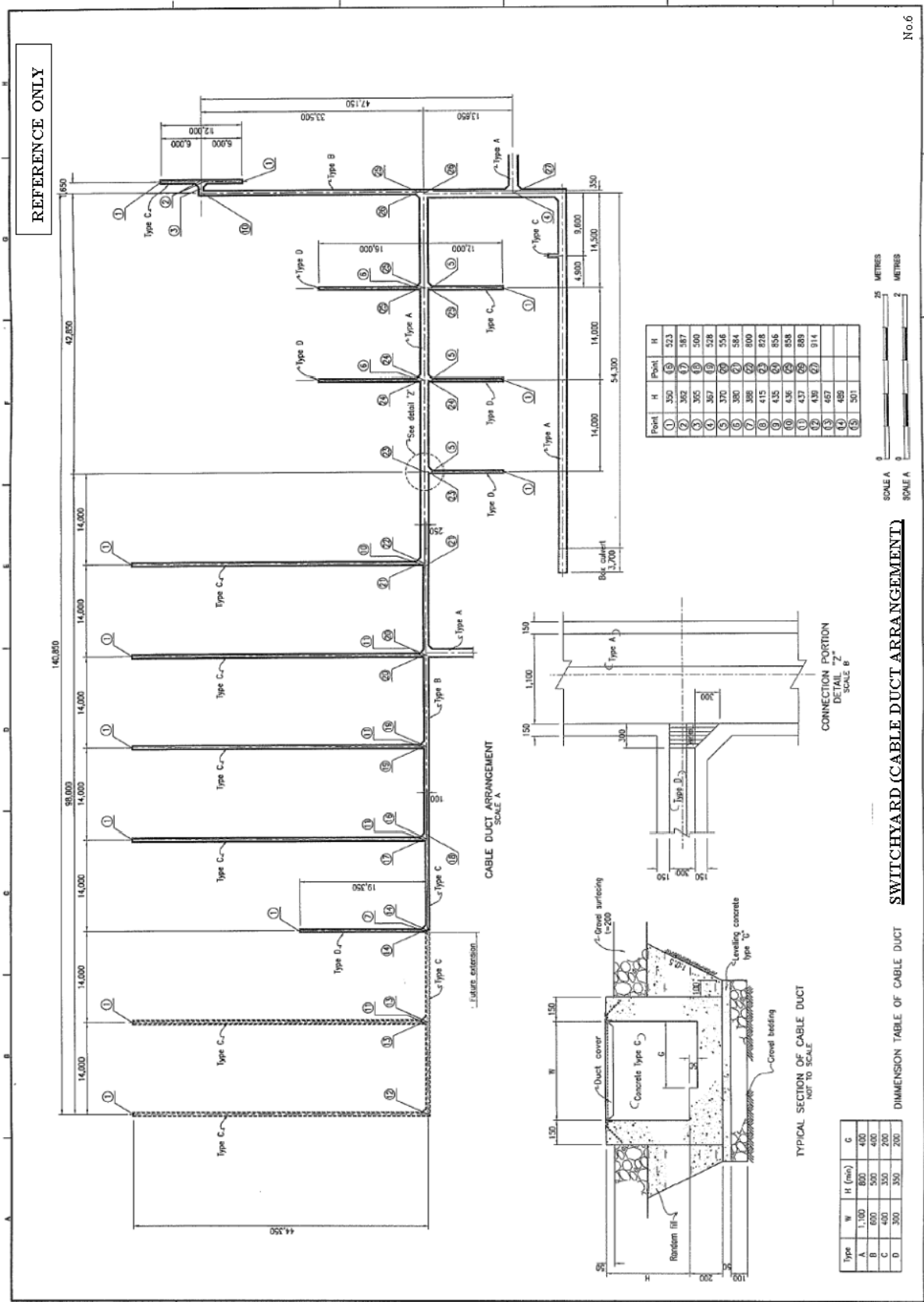


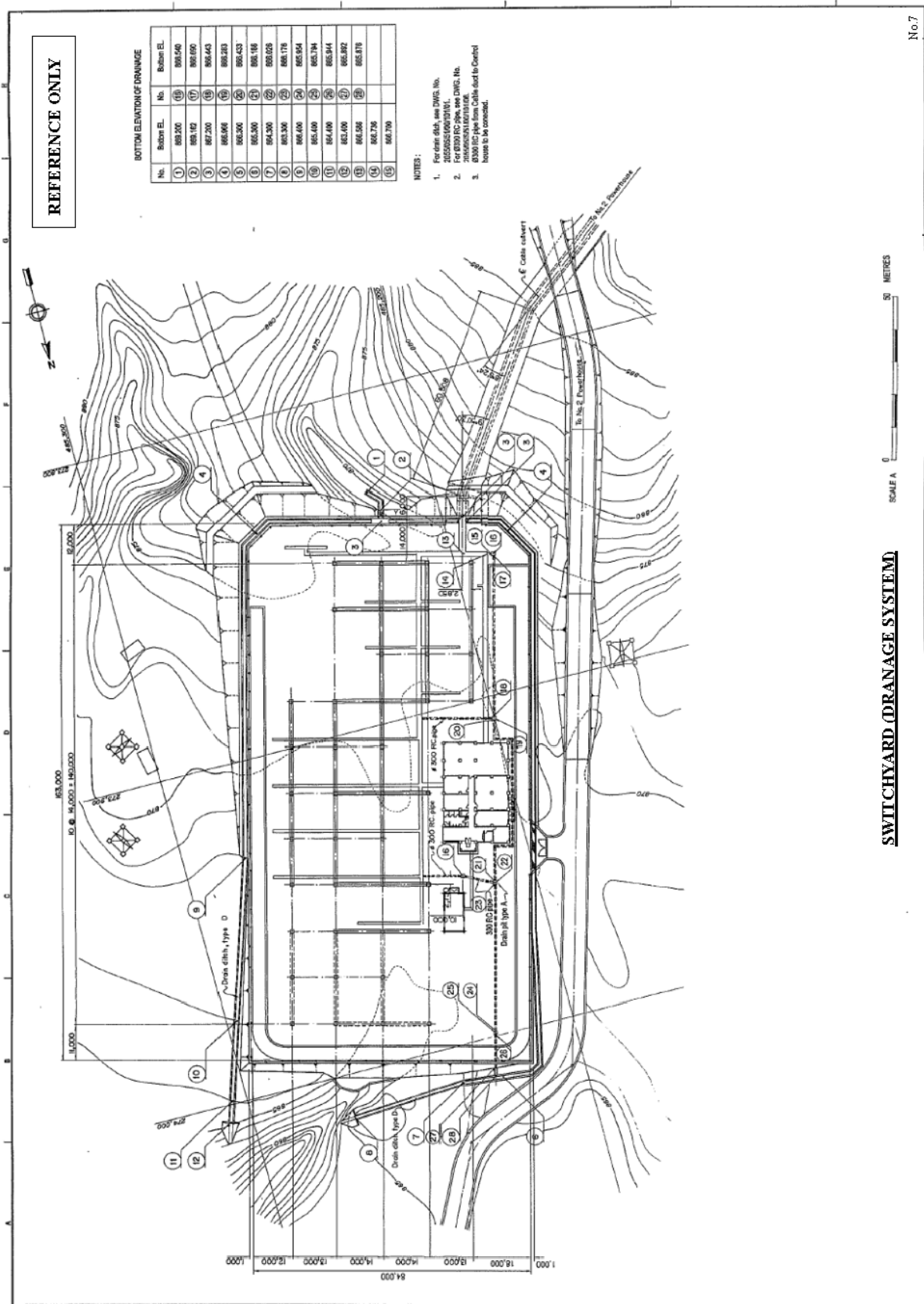












Section 22

Environmental Management Plan

The Contractor is requested to manage environmental and social impacts anticipated to occur during construction period, monitor environmental and social indicators and develop relevant documents / reports for Package SS-3 based on Annex 22-1 Environmental Management Plan.

Annex 22-1: Environmental Management Plan

**Dhaka-Chittagong Main Power Grid Strengthening
(Matarbari-Madunaghat-Meghnaghat) Project**

Environment Management Plan

(L/A No. BD-P81)

March 2018

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ABBREVIATIONS

APLALC	Action Plan for Land Acquisition and Livelihood Compensation
BFD	Bangladesh Forest Department
DOE	Department of Environment
ECA	Ecologically Critical Area
ECA	Environment Conservation Act
ECC	Environmental Clearance Certificate
ECR	Environment Conservation Rules
EIA	Environmental Impact Assessment
EMP	Environmental Management Plan
EMoP	Environmental Monitoring Plan
GIIP	Good International Industry Practice
GOB	Government of Bangladesh
IEE	Initial Environmental Examinations
IFC	International Finance Corporation
JICA	Japan International Cooperation Agency
kV	Kilo Volt
MEA	Multilateral Environmental Agreement
ODA	Overseas Development Assistance
PGCB	Power Grid Company of Bangladesh
PIU	Project Implementation Unit
SCC	Site Clearance Certificate
TEPSCO	Tokyo Electric Power Services Co. Ltd.
T/L	Transmission Line
TOR	Terms of Reference
UNCED	United Nations Conference on Environment and Development
WHO	World Health Organization

1. INTRODUCTION

1.1 Background

Given a steep increase in the power demand in Bangladesh, the planned outage is executed constantly due to a large fluctuation in voltage and frequency since the capacity of electric power supply does not meet the demand. High economic growth of recent years is expected to keep boosting the peak power demand up to 33,708MW by 2030 at the rate of 8.5% per annum.

Approximately 70% of electricity in the country is generated by gas-fired thermal power plants using domestic natural gas. There is however a need to diversify the energy sources because of the growing demand for domestic gas and the elevated risk of running out of it shortly. Against this backdrop, the Government of Bangladesh (GOB) formulated the Power System Master Plan (PSMP) 2010, according to which the Government is planning to develop the deep-sea port to import natural gas, coal and other fuels and construct power plants using these imported sources of energy in the Chittagong Division. While the power generation capacity in the division is expected to continue to expand in years to come, the country is facing urgent needs to increase and enhance the power transmission capacity with high voltage from the Chittagong Division to the Dhaka Metropolitan Area for securing a stable supply of high-quality electricity is a key to sustainable economic development in Bangladesh.

1.2 Project Objectives

The GOB has concluded a loan agreement with the Japan International Cooperation Agency (JICA) to receive an ODA loan as much as JPY 43,769 million to finance the Dhaka-Chittagong Main Power Grid Strengthening Project, the main objectives of which are to create facilities to transmit power from upcoming Matarbari 1200 MW Coal-based Power Plant and to enhance the power transmission capability between Chittagong and Dhaka, thereby to meet the growing demand for power in Bangladesh.

1.3 Project Description

By constructing high-voltage main power lines between Dhaka and Chittagong, this project aims to ensure a stable supply of electricity in Bangladesh, thereby contributing to its economic growth and mitigation of climate change. The project comprises of the following components;

- Construction of 400kV transmission lines from Dhaka Division to Matarbari Ultra Super Critical Coal-fired Power plant
- Construction of new 400kV/230kV substations and expansion of a 230kV/132kV substation
- Consulting Services (basic design, bid documents preparation, bid evaluation, approval of design, specifications and drawings, construction supervision and certification of EPC contractors' works, facilitation of implementation of environmental management plan, environmental monitoring plan, technical knowledge transfer, documentation, etc.)

The executing agency of the project is the Power Grid Company of Bangladesh Limited (PGCB). A Project Implementation Unit (PIU) is established at the PGCB and the contract of the project consultancy services has been awarded and work commenced in November 2016.

The project will be implemented in five main contracts namely, Package 1 (TL-1): 400kV Meghnaghat – Madunaghat T/L, 230 kV LILO at Madunaghat SS from 230 kV Hathazari - Sikalbaha T/L, and 230 kV Madunaghat -Old Madunaghat T/L (turnkey basis), Package 2 (TL-2): 400kV Madunaghat – Matarbari T/L (turnkey basis), Package 3 (SS-1): 400/230kV Meghnaghat AIS SS (turnkey basis), 230kV LILO at Madunaghat SS from 230kV Hathazari – Sikalbaha T/L, Package 4 (SS-2): 400/230kV Madunaghat GIS SS (turnkey basis), and Package 5 (SS-3): Upgradation of the existing 132kV Madunaghat SS to 230kV (turnkey basis). All construction and installation works are scheduled to be commenced in January 2018 and the target date for their completion is October 2020.

According to *the Bangladesh Environment Conservation Rules (ECR) 1997*, 400kV transmission line project falls under the ‘Red’ category, so far as environmental impact is concerned. An Initial Environment Examination (IEE) followed by Environmental Impact Assessment (EIA) including Environmental Management Plan (EMP) are required for their installations in order to obtain an environmental clearance from the Department of Environment (DOE). PGCB obtained a site clearance from the DOE for exemption of IEE and approval of TOR for EIA during the preliminary studies in 2014 as well as an environmental clearance in 2015.

JICA, the funding agency of the project, identified the proposed project activities as Category B according to *the JICA Guidelines for Environmental and Social Considerations (April 2010)* in terms of its sectors, characteristics and areas, stating that the project is not likely to have significant adverse impact on the environment. The anticipated impacts are site-specific; few, if any, of them are irreversible; in most cases, they can be mitigated more readily than Category A projects. Responsibilities of the project proponents include the planning and monitoring of necessary environmental and social considerations activities.

1.4 Rationale of Environmental Management Plan

The project’s EMP has been prepared to take mitigation measures and conduct monitoring during pre-construction, construction and operation periods to eliminate adverse environmental and social impacts, offset them, or reduce them to acceptable levels. The plan also includes the actions needed to implement these measures.

The main objectives of the EMP shall be;

- Achieve a safe and healthy environment for workers and the public, during construction by mitigating adverse environmental impacts and risk minimization through planning and implementation of specific safeguards
- Comply with Bangladesh’s national environmental policies, regulations, standards and guidelines in all activities associated with the work including all supporting activities
- Meet with the environmental and social safeguard requirements of *the JICA Guidelines for Environmental and Social Considerations (April 2010)*
- Provide an integrated and consistent approach to the environmental management of the design, construction and maintenance phases



- Set the environmental responsibilities of those involved throughout the various stages of the project and enhance good management practices and commitment to environmental issues
- Incorporate mitigation measures to minimize disturbance of the natural environment; prevent or minimize all forms of pollution; adopt best practices to prevent or minimize adverse environmental impacts; develop waste management practices based on prevention, minimization, recycling, treatment or disposal of wastes
- Include monitoring and reporting of environmental performance and mechanism of addressing non-compliances and public complaints if any
- Facilitate the best practice environmental management of the project

1.5 Structure of Environmental Management Plan

This EMP has been structured with the aim of providing information regarding the environmental management of the project. The plan is divided into six chapters;

Chapter 1: Introduction:

A brief introduction of the project including the background, project objectives, project description, and rationale of the environmental management plan

Chapter 2: Environmental Legislations and Requirements:

A description of national legal and administrative framework and JICA's environmental management requirements in implementation of the project

Chapter 3: Implementation Arrangements:

A description of implementation mechanism of the EMP and training requirements

Chapter 4: Environmental Impacts and Mitigation (Package TL-2 and SS-3):

A description of anticipated environmental impacts caused by the proposed project activities in the area covered under the Package TL-2 and SS-3, and their mitigation measures that is under the contractual obligations of contractors during the contract period

Chapter 5: Environmental Monitoring Plan (Package TL-2 and SS-3):

An Environmental Monitoring Plan describing monitoring to be conducted to ensure the implementation of each mitigatory measure with identifying monitoring parameters, frequencies and agencies responsible for implementation and monitoring in the area covered under the Package TL-2 and SS-3 that is under the contractual obligations of contractors during the contract period

Chapter 6: Documentation and Reporting (Package TL-2 and SS-3):

Monitoring formats usable under the contractual obligations by contractors during the contract period in the area covered under the Package TL-2 and SS-3

2. POLICY, LEGAL AND ADMINISTRATIVE FRAMEWORK

According to the national environmental legislation of Bangladesh, all development projects are governed by legal and institutional requirements. As such, assessment of relevant legal provisions, policies, strategies and institutional issues are very important for any project proponent or developer before execution of a program or plan. Project proponents must be well aware of these requirements and comply with the provisions as applicable and necessary. The activities of the power sector projects of the Bangladesh Government fall under the 'Red' category according to *the ECR 1997* and therefore, need to conduct IEE and EIA studies to obtain site and environmental clearance from the DOE before initiating development projects.

2.1 Provision under National Law and By-laws

2.1.1 Provisions under the Environmental Legislations

National laws, by-laws and official resolutions relevant to the installation of high-voltage transmission lines and construction of substations, their operation and maintenance activities, and other associated works have been identified. Under the national legal framework the proposed intervention needs to comply with the environmental legislations of the land and needs to fulfill the requirements that *the Bangladesh Environment Conservation Act (ECA) 1995* is the key legislation in relation to environment protection in Bangladesh. This Act is promulgated for environment conservation, standards, development, pollution control, and abatement. It has repealed *the Environment Pollution Control Ordinance of 1977*. The Act has been amended in 2000, 2002, 2007 and 2010.

The main objectives of the ECA 1995 are:

- Conservation and improvement of the environment; and
 - Control and mitigation of pollution of the environment.
- The main strategies of the Act can be summarized as:
- Declaration of ecologically critical areas and restriction on the operations and processes, which can or cannot be carried/initiated in the ecologically critical areas;
 - Regulations in respect of vehicles emitting smoke harmful for the environment;
 - Environmental clearance;
 - Regulation of the industries and other development activities' discharge permits;
 - Promulgation of standards for quality of air, water, noise and soil for different areas for different purposes;
 - Promulgation of a standard limit for discharging and emitting waste; and
 - Formulation and declaration of environmental guidelines.

Before any new project/development interventions by the government or by non-governmental agencies can go ahead, as stipulated under *the ECR 1997*, the project promoter must obtain an environmental clearance certificate (ECC) from the Director General of the DOE. An appeal procedure does exist for those promoters who fail to obtain clearance. Failure to comply with any part of this Act may result in punishment of

imprisonment or fine or both. The DOE executes the Act under the leadership of the Director General.

The ECA 1995 ascertains responsibility for compensation in cases of damage to ecosystems, provides punitive measures both for fines and imprisonment, and fixes authority on cognizance of offences. It elaborates on the restriction on polluting automobiles, restriction on the sale and production of environmentally harmful items like polythene bags, assistance from law enforcement agencies for environmental actions, break-up of punitive measures, and authority to try environmental cases.

The ECR 1997 is the first set of rules, promulgated under *the ECA 1995*. There have been three amendments to this set of rules - February and August 2002 and April 2003. *The ECR 1997* provides categorization of industries and projects and identifies types of environmental assessments needed against respective categories of industries or projects. These rules set (i) the National Environmental Quality Standards for ambient air, various types of water, industrial effluent, emission, noise, vehicular exhaust etc., (ii) the requirement for and procedures to obtain environmental clearance, and (iii) the requirement for IEE and EIA's according to the categories of industrial and other development interventions. The Rules are not explicit for various oil and gas exploration interventions. Rather, this is covered under the broader heading of "exploration, extraction and distribution of mineral resources" under the 'Red' category projects.

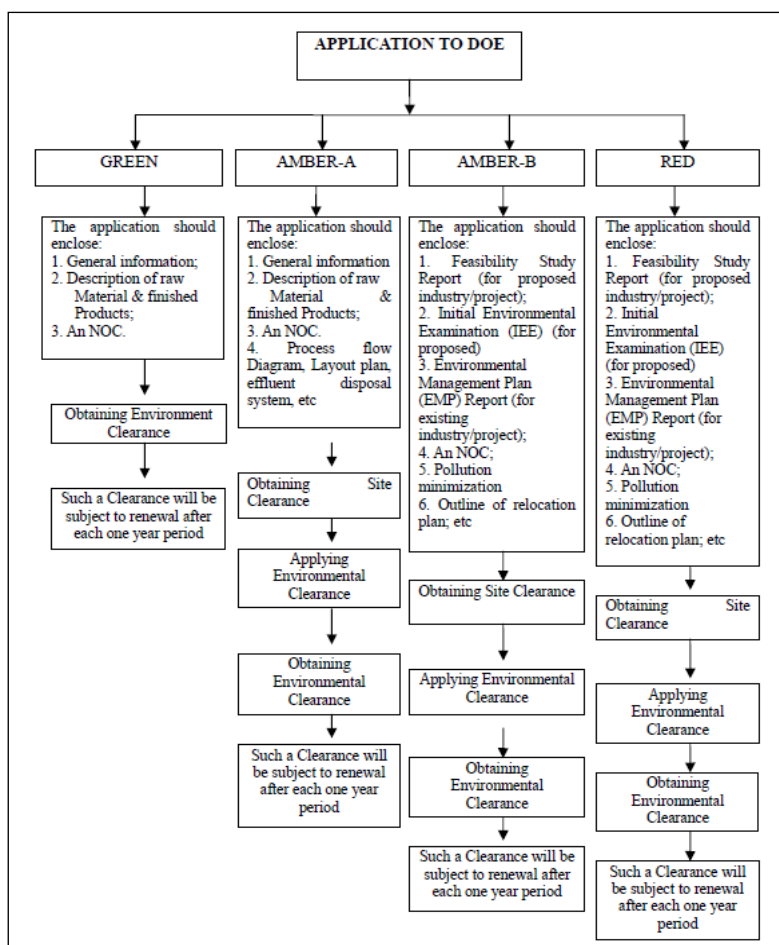
The proposed project, according to the DOE, is considered under the 'Red' category of *the ECR 1997* (Item 64: water, power and gas distribution line laying / relaying / extension).

2.1.2 Compliance with DOE's EIA Guidelines

The DOE issued the EIA Guidelines for Industries in December 1997 and addresses the IEE and EIA for several industrial sectors and activities. Each project proponent must conduct an IEE or EIA and is expected to consult and follow the EIA Guidelines.

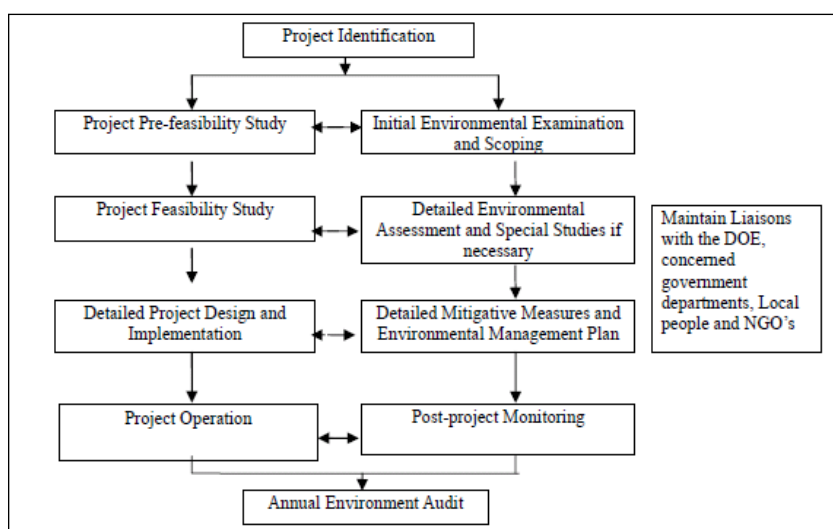
The project activities fall under the 'Red' category according to the ECR 1997, it was mandatory to carry out EIA including EMP for getting an ECC from the DOE. Under the EIA study, the provisions of the environment legislations and the EIA Guidelines were painstakingly reviewed.

The DOE has introduced an application procedure for obtaining SCC and ECC. Figure 222-1 shows the application procedure of all four categories, and Figure 222-2 shows the process of obtaining clearances from the DOE.



(Source: EIA Process, EIA Guideline for Industries, Department of Environment, Dhaka, 1997. pp.7)

Figure 222-1: Flow Chart of EIA/IEE Process



(Source: EIA Process, EIA Guideline for Industries, Department of Environment, 1997. pp.8)

Figure 222-2: Process of Obtaining Clearance Certificate from DOE

2.1.3 Compliance under the National Laws

Wildlife (protection and safety) Act 2012

The Wildlife (protection and safety) Act 2012, passed in the Parliament on 8th July, 2012. Under this act, the hunting, trapping, killing of wildlife are strictly prohibited. After the establishment of this Act, a board will be formed with the concerned members recommended by the Government. There are certain provisions kept in this Act, e.g., entrance, management, rules and regulation of the protected area, and etc. If any person without license performs any kind of trade, he will be jailed for at least a year.

The Forest Act, 1927 and Amendment Act 2000

The Forest Act of 1927 provides for reserving forests over which the government has an acquired property right. This Act has made many types of unauthorized uses or destruction of forest produce punishable. The Government may assign any village community its right to or over any land, which has constituted a reserved forest.

According to the Act the GOB may prohibit certain activities in the declared reserved forest area such as any intervention kindles, keeps or carries any fire; trespasses or pastures cattle, or permits cattle to trespass; causes any damage by negligence in felling any tree or cutting or dragging any timber; etc.

As a reserved forest exists near the proposed route of the 400kV transmission line, the proposed project is required to comply with this requirement of legislation. Its rules and regulations under the Act was reviewed during EIA study to find that the proposed activities of the project would not violate any provisions of it.

The Supplementary Rules of 1959 empowered the concerned governmental bodies to restrict totally and for a specified period, the shooting, hunting or catching of various birds, animals and reptiles in the controlled and vested forests. *The Private Forest Ordinance of 1959* provides for the conservation of private forests and for the forestation, in certain cases, of wastelands in Bangladesh.

The Penal Code, 1860

The Penal Code of 1860 has some valid provisions related to pollution management, environment protection and protection of health and safety. Some of these are: Section 277: Falling Water or Public Spring or Reservoir; Section 278: Making Atmosphere Noxious to Health; Section 284: Negligent Conduct with Respect to Poisonous Substance; Section 285: Negligent Conduct with Respect to Fire or Combustible Matter; and Section 286: Negligent Conduct with Respect to Explosive Substance.

The Acquisition and Requisition of Immovable Property Ordinance (1982)

This Ordinance has replaced the Land Acquisition Act of 1894 and the East Bengal (Emergency) Requisition of Property Act of 1948. The Ordinance governs acquisition and requisition by the government of immovable property for any public purpose or in the public interest. It may be noted that contrary to the previous Acts (i.e. Act XIII of 1948), this Ordinance deals only with immovable property.



The Ordinance has well-defined procedures regarding payment of compensation for an acquired piece of land. If, for example, the land is used for rice growing, then an amount equivalent to approximately 1.5 times the market value of a given variety of rice (e.g., paddy) that is currently being (or could be) produced annually is fixed as a yearly lease value. In case of outright purchase (carried out on a 99-year lease), the compensation-value of acquired land varies widely according to the locality, soil fertility, and access to transportation and related infrastructure factors. The current compensation and resettlement provisions are however inadequate both in terms of timing of payments and quantum. The procedures involved are cumbersome and time consuming and often causes hindrance to the smooth execution of the project. Legal provisions covering adequate compensation to the project affected persons, particularly disadvantaged groups such as women and squatters and such other vulnerable groups are yet to be framed.

Civil Aviation Ordinance 1960 and Civil Aviation Rules, 1984

The Civil Aviation Ordinance 1960 was made to make better provisions for the control of manufacture, possessions, use, operation, sale, import and export of aircraft, the control and regulation of air transport services, and the control and development of aerodromes in the country. It repealed the Aircraft Act, 1934 (XXII of 1934).

Present legal regulatory framework for civil aviation activities in Bangladesh is the Civil Aviation Rules 1984 and the Air Navigation Orders issued by the Chairman under this rule.

All civil aviation activities in Bangladesh are regulated by the Civil Aviation Rules 1984 which was made and promulgated by the Government in exercise of the powers conferred by sections 4,5,7 and 8 of the Civil Aviation Ordinance 1960 (XXXII of 1960), section 10 of the Aircraft (Removal of Danger to Safety) Ordinance 1965 (XII of 1965), section 4 of the Telegraph Act, 1885 (XIII of 1885) and in suppression of the Aircraft Rules 1937 and the Airport Obstruction Clearance Rules 1981. This set of rules elaborately dealt with personnel (pilot, flight engineer, air traffic controller, aircraft maintenance engineer etc.) licensing, airworthiness requirements, operation of aircraft, rules of the air, air transport services; construction height of the surrounding infrastructure etc. Most of today's operational responsibilities and functions of the Civil Aviation Authority (CAAB) are defined and formulated in these Rules.

2.2 Environmental Standard

Details of the environmental standards applicable in Bangladesh are described in the Environmental Conservation Rules of 1997. Regulated Areas spread to all industries, and regulated items are air quality, water quality (surface water, drinking water), noise (boundary, source), emissions from motor vehicles or ships, odor, sewage discharge, waste from industrial units and industrial effluents or emissions. Project proponents must be compliant with the Bangladesh National Environmental Quality Standards with which industrial effluent is set.

Items and standards which are related to the installation of transmission lines and construction of substations are listed below.

2.2.1 Ambient Air

The following table shows the air quality standards of Bangladesh. Air quality standards adhere to WHO Guidelines are also mentioned there.

Table 22-1: Standards for Air Quality

No	Parameter	Concentration ($\mu\text{g}/\text{m}^3$)		Exposure Time
		ECR	IFC Guidelines (General 2007)	
a	Carbon Monoxide (CO)	10000	-	8 hours
		40000	-	1 hour
b	Lead (Pb)	500	-	1 year
c	Nitrogen Dioxide (NO_2)	100	40	1 year
		-	200	1 hour
d	Suspended Particulate Matter (SPM)	200	-	8 hours
e	Particulate Matter $10\mu\text{m}$ (PM_{10})	50	20	1 year
		150	50	24 hours
f	Particulate Matter $2.5\mu\text{m}$ ($\text{PM}_{2.5}$)	15	10	1 year
		65	25	24 hours
g	Ozone	235	-	1 hour
		157	160	8 hours
h	Sulfur Dioxide (SO_2)	80	-	1 year
		365	125	24 hours

(Source: Bangladesh Gazette July 19, 2005 and IFC Environmental Health and Safety Guidelines 2007)
 Note: Air quality standards of IFC Guidelines are quoted from WHO Guidelines.

2.2.2 Water Quality

The table below shows the water quality standard for inland surface water in Bangladesh.

Table 222-2: Standard for Water Quality (Inland Surface Water)

No	Best Practice based classification	pH	BOD mg/l	Dissolved Oxygen (DO), mg/l	Total Coliform Bacteria number/100
a	Source of drinking water for supply only after disinfecting	6.5-8.5	2 or less	6 or above	50 or less
b	Water usable for recreational activity	6.5-8.5	3 or less	5 or above	200 or less
c	Source of drinking water for supply after conventional treatment	6.5-8.5	6 or less	6 or above	5,000 or less
d	Water usable for fisheries	6.5-8.5	6 or less	5 or above	---
e	Water usable by various process and cooling industries	6.5-8.5	10 or less	5 or above	5,000 or less
f	Water usable for irrigation	6.5-8.5	10 or less	5 or above	5,000 or less

(Source: The Environmental Conservation Rules, 1997)

2.2.3 Noise



For noise, a standard limit is set for each zone class category in Bangladesh. The following table shows the noise standard in the country and international standard as defined by the IFC.

Table 222-3: Standards for Sound

No	Zone Class	Limits in dBa (ECR)		Limits in dBa (IFC)	
		Day	Night	Day	Night
a	Silent Zone	45	35	55	45
b	Residential Zone	50	40		
c	Mixed Zone (this area is used for a combination of residential, commercial and industrial purposes)	60	50	70	70
d	Commercial Zone	70	60		
e	Industrial Zone	75	70		

(Source: The Environmental Conservation Rules, 1997 and IFC Environmental Health and Safety Guidelines 2007)

2.3 International Legal Obligations

Bangladesh is signatory to a number of Multilateral Environmental Agreements (MEAs) and also some bilateral instruments. Some of them are very important in context of environmental protection. The legal obligations and provisions of MEAs related to the proposed project interventions have been reviewed.

Bangladesh has already accessed to, ratified or signed a number of important MEAs related to environment protection and conservation of natural resources which shall have to be complied with during implementation of the project. The pertinent ones of these are highlighted below:

Rio Declaration

The United Nations Conference on Environment and Development (UNCED) adopted the global action program for sustainable development called 'Rio Declaration' and 'Agenda 21' in 1992. The Principle 4 of the Rio Declaration, to which Bangladesh is a signatory along with a total of 178 countries, states as, "In order to achieve sustainable development, environmental protection should constitute an integral part of the development process and cannot be considered in isolation from it".

Convention on Biological Diversity (1992)

The Convention on Biological Diversity, Rio de Janeiro, 1992 was adopted on 5 June 1992 and entered into force on 29 December, 1993. Bangladesh ratified the Convention on 20 March, 1994. The Contracting Parties of the Convention have committed to:

- Introducing appropriate procedures requiring environmental impact assessments of its proposed projects that are likely to have significant adverse effects on biodiversity, with a view to avoiding or minimizing such effects, and where appropriate allow for public participation in such procedures; and
 - Introducing appropriate arrangements to ensure that environmental consequences of its programs and policies, that are likely to have significant adverse impacts on biodiversity, are duly taken into account.
- Obligation has been placed on the State parties to provide for environmental impact assessments of projects that are likely to have significant adverse effects on biological diversity (art. 4).

Convention on Wetlands of International Importance Especially as Waterfowl Habitat, Ramsar (1971)

This convention is also known as the Ramsar Convention. It was adopted on 2 February, 1971 and entered into force on 21 December, 1975. Bangladesh has ratified the Convention on 20 April, 2002. This provides a framework for national action and international cooperation for the conservation and wise use of wetlands and their resources. There are 127 Parties with 1085 wetland sites designated as 'Wetlands of International Importance'. This is an intergovernmental treaty, which provides the framework for international co-operation for the conservation of wetlands habitats. Obligations for Contracting Parties include the designation of wetlands to the "List of Wetlands of International Importance", the provision of wetland considerations within their national land use planning, and the creation of Natural Reserves. Part of Sundarbans Reserved Forest (located in the Southwest of the country) is one of the Ramsar Site.

2.4 Development Agency's Guidelines

The project will follow the JICA Guidelines for Environment and Social Considerations and the Environmental, Health, and Safety Guidelines of the International Finance Corporation.

JICA Environment and Social Consideration Guideline (April 2010)

JICA, which is responsible for ODA, plays a key role in contributing to sustainable development in developing countries. The inclusion of environmental and social costs in development costs and the social and institutional framework that makes such inclusion possible are crucial for sustainable development. Internalization and an institutional framework are requirements for measures regarding environmental and social considerations, and JICA is required to have suitable consideration for environmental and social impacts.

The objectives of the guidelines are to encourage project proponents and other relevant stakeholders to have appropriate consideration for environmental and social impacts, as well as to ensure that JICA's support for and examination of environmental and social considerations are conducted accordingly. The guidelines outline JICA's responsibilities and procedures, along with its requirements for project proponents etc., in order to facilitate the achievement of these objectives. In doing so, JICA endeavours to ensure transparency, predictability, and accountability in its support for and examination of environmental and social considerations.

IFC / EHS Guidelines

The EHS Guidelines are technical reference documents with general and industry-specific examples of Good International Industry Practice (GIIP), as defined in IFC's Performance Standard 3 on Pollution Prevention and Abatement.

3. IMPLEMENTATION ARRANGEMENTS

3.1 Implementation Structure

This plan has been prepared to provide planning level strategies for the tendering process of project construction. Along with EIA report approved by the DOE, this EMP will remain as the main source document for all environmental issues relating to the project during its design, construction, operation and maintenance stages. An extracted version of this EMP shall be provided in the tender process for the EPC contracts of substations and transmission lines, to allow the prospective contractors to incorporate the works involved in providing each mitigation measure into their physical and financial planning.

Parties who will be awarded the contracts are required to produce their own EMPs, i.e., **EMP during the contract period** describing how they will address each issue as part of their responsibilities by providing details of proposed approaches, equipment, manpower, etc. Thus the project EMP is the cornerstone of environmental management throughout project implementation, and is the definitive guide to all potential impacts, and the required mitigation and monitoring.

The PGCB is the Executing Agency of the project, and a Project Implementation Unit (PIU), headed by a Project Director (PD) established at PGCB will work on coordination and execution of the tender process, construction and commissioning activities. The PD will report directly to the Power Division. The PIU has appointed TEPSCO-Nippon Koei as the engineering design and supervising consultant. The project will be implemented based on five packages for construction and installation of substations and transmission lines. The PGCB will appoint successful contractors who will be answerable to both PGCB and the Consultant.

At the construction stage, the PIU shall take care for all construction activities with the Consultant, and encourage the contractors to fully understand the necessary mitigation measures and to implement them. During the construction activity, in which a large inflow of workers and vehicles is predicted, the PD shall encourage the surrounding community to understand the content and schedule of the construction activity and mitigation measures, and obtain local people's opinions and change the mitigation measures as appropriate. The contractors shall hold explanation sessions with the local people and report to the PGCB and the Consultant on the implementation status of environmental management and monitoring.

Figure 222-3 describes the environmental management and monitoring implementation structure with the reporting flow during the construction phase.

Figure 222-3: Environmental Management and Monitoring Implementation Structure during Construction Phase

Responsibilities of each institution and procedures are defined as follows for successful implementation of the EMP.

PGCB, through the Project Director and the staff, will bear full responsibility as the Executing Agency of the project, for ensuring that the project complies with national laws and regulations, the JICA Guidelines, and best environmental practices and for meeting the mitigation and monitoring requirements during pre-construction, construction and operation periods.

The direct responsibility of implementing, provisions in this EMP will lie with the PD and will play a coordinating role and conduct training and awareness raising in public relations in the process as well.

3.2.2 Consultants' Responsibilities

- Update EMP as appropriate, including an environmental monitoring plan (EMoP), by reflecting the conditions stated in the ECC issued by the DOE, and incorporate necessary technical specifications with design and contract documents;
- Define environmental conservation measures and identify contractors' responsibilities as explained in the EIA/IEE and EMP during the preparation of bidding documents;
- Revise / update the Action Plan for Land Acquisition and Livelihood Compensation (APLALC) and associated social assessment report (as required for only TL-2 in this package) in accordance with the agreed framework, monitor the procedures for timely acquisition / requisition of ROW (permanent and temporary), and disbursement of compensation to the affected people, and ensure their awareness on the grievance redress procedure;
- Assist PGCB in dissemination and explanation of the confirmed and identified environmental and social issues to the public including holding public consultations as required;
- Assist PGCB to review contractors' environmental and social programs in accordance with EIA/IEE, EMP and JICA Guidelines, and to draw recommendations to PGCB regarding any necessary amendments for its approval;
- Supervise EMP implementation and undertake monitoring to ensure that the project activities are implemented in accordance with the EMP and the conditions stated in the ECC;
- Monitor the effectiveness of EMP and negative impacts on the environment caused by the construction works, such as disturbance to migrant birds;
- Assist PGCB in the capacity building of their staff on environmental management through on-the-job trainings on environmental assessment techniques, mitigation measure planning, supervision and monitoring and reporting;
- Prepare quarterly environmental monitoring reports presenting the environmental impacts and implementation of environmental mitigation measures during the construction stage;
- Prepare monthly reports in which the progress of acquisition / requisition of land and compensation payment is monitored;
- Prepare an environmental and social safeguard evaluation report at the end of the consulting service presenting the implementation results of the EMP, EMoP and social safeguard action plan.

3.2.3 Contractors' Responsibilities

- Develop an **EMP during contract period** (hereinafter mentioned as "EMP (C)") based on the guidelines provided in tender documents following the award of the contract;
- Supervise/ monitor/ review the construction activities in regular basis and ensure that recommended environmental and social measures in **the EMP (C)**; regulations and the approvals are met on site.
- Appoint an Environmental Representative to implement and monitor the environmental obligations and provide guidance where necessary;

- Ensure that the communication channels within the organizational structure are properly established to facilitate the flow of information, guidelines and directives to construction staff;
- Ensure construction staff is adequately trained and informed to carry out the responsibilities of **the EMP (C)**;
- Ensure that the Construction Engineers, Planners, and Field Level Supervisors abide by the guidelines and directions stipulated by **the EMP (C)**;
- Ensure that adequate resources are made available to carry out Environmental Representative's functions properly;

The responsibility of implementing regular environmental safeguards and mitigation measures mentioned in **the EMP (C)** rests with the construction crew. The environmental responsibilities entrusted to construction team members shall be included in their job descriptions and spelt out in **the EMP (C)**.

3.2.4 Training of Personnel

In order to achieve the project's environmental management targets, every person involved in the project must be aware of their role and responsibilities. All personnel involved in the project must undertake an environmental training. The training will include but not be limited to:

- Environmental legislations in Bangladesh
- Environmental standards and guidelines (Air, Noise, Water, etc.)
- JICA's requirements on environmental and social management
- General environmental responsibilities of project staff
- Site and project specific requirements such as minimizing nuisance to the public, minimizing soil, water, air and noise pollution, solid waste management practices etc.
- Dissemination of extra information as required during the course of the construction works

Prior to commencement of construction works, the contractors will have to provide briefing to all the construction crew and sub-contractors on environmental management requirements and how they are to be implemented. The contractors shall display printed instructions on implementation of **the EMP (C)** measures and displayed in all work sites and site offices as appropriate.

4. ENVIRONMENTAL IMPACTS AND MITIGATION (PACKAGE SS-3)

With respect to the Package SS-3, it has been revealed that most of the adverse impacts could be minimized or eliminated by adopting standard mitigation measures.

4.1 Outline of Anticipated Environmental Impact in Package SS-3

The Package SS-3 includes demolition of the existing 132kV AIS SS facilities and removal of all the debris from their dismantling works including the existing foundation, and replacement of the existing 132kV AIS SS with the proposed 230 kV GIS SS. All the works will be completed within the site, which is owned by PGCB, so that there will be no land acquisition or resettlement.

Environmental mitigation measures shall be required for noise, water contamination, soil contamination and etc. caused by demolition of the existing AIS SS facilities and removal of debris during the pre-construction period, and laying pile foundations for new 230kV GIS SS and construction of their building and equipment during the construction phase. In operation phase, on the other hand, most of the construction phase impacts will not occur and the impacts will be restricted only to the operation and maintenance of the project.

4.2 Mitigation Measures

An Environmental Management – Mitigation Matrix has been prepared and it identifies anticipated impacts and mitigation measures with respect to all the stages of project life: (i) pre-construction, (ii) construction, and (iii) operation. The environmental impact – mitigation matrix is given in Table 222-4.

Table 222-4: Environmental Impact - Mitigation Matrix

No	Impact Item	package	Anticipated Impact	Mitigation Measures (Management Efforts)	Implementation Responsibility (Management Institution)
1. Pre-construction phase					
a.	Preparation for acquisition / requisition of land	TL-2 (Not Used)	- Loss of land at tower bases (permanent)	- Tower locations shall be explored in non-residential areas - Land acquisition for the tower bases shall be conducted on the basis of compensation at replacement cost	Offices of Deputy Commissioner PGCB
b.	Notification of ROW	TL-2 (Not Used)	- Loss of standing crops - Loss of trees - Livelihood means (temporary)	- Temporary block out during construction period will occur for safety and security - Standing crops and trees shall be compensated at market prices - Compensation should be conducted in compliance with relevant laws and regulations	Offices of Deputy Commissioner PGCB
c.	Air Pollution (demolition and removal work)	SS-3	1) Dust in substation site resulting from demolition works of the existing buildings 2) Exhaust gas from construction machinery and vehicles used for carrying debris and other wastes 3) Air pollution arising from incineration of construction materials and waste	1) Dust prevention - Watering access roads and construction site (especially in the dry season) - Enclosure around buildings to be demolished - Using cover sheet on trucks for the transportation of soil 2) Gas emission prevention - Periodic maintenance and management of all construction machinery and vehicles 3) Waste management - Prohibit open burning and illegal dumping	Implementation: Contractor Supervision: PGCB and the Consultant
d.	Water Pollution (demolition and removal work)	SS-3	1) Run off water from demolition work area 2) Domestic wastewater of workers 3) Spillage due to inattention and deliberate dumping of wastes	1) Run off water - Covering demolition site to minimize rainwater mixed with demolition wastes. Settling tank for excessive construction sludge & waste water - Spillage oil should be trapped in construction area for treatment - Install proper drainage for water treatment 2) Domestic wastewater - Install wastewater treatment facility for workers, such as septic tanks	Implementation: Contractor Supervision: PGCB and the Consultant

No	Impact Item	package	Anticipated Impact	Mitigation Measures (Management Efforts)	Implementation Responsibility (Management Institution)
				3) Waste management - Ban on illegal dumping of wastes	
e.	Waste (demolition and removal work)	SS-3	1) Construction wastes from demolition work 2) Domestic waste from workers 3) Hazardous demolition waste such as dry batteries and asbestos, etc.	1), 2) Construction and domestic wastes - Conduct separate waste collection and promote recycling and reuse - Appropriate disposal of non-recyclable waste according to rules 3) Hazardous waste - Hazardous waste should be treated under the related regulations	Implementation: Contractor Supervision: PGCB and the Consultant
f.	Soil Pollution (demolition and removal work)	SS-3	1) Run off water from demolition work area 2) Domestic wastewater of workers 3) Spillage due to inattention and deliberate dumping of wastes	1) Run off water - Spillage oil should be trapped in construction area for treatment - Install proper drainage for water treatment to prevent soil pollution 2) Domestic wastewater - Install wastewater treatment facility for workers, such as septic tanks to prevent soil pollution 3) Waste management - Ban on illegal dumping of wastes to prevent soil pollution	Implementation: Contractor Supervision: PGCB and the Consultant
g.	Noise and vibration (demolition and removal work)	SS-3	1) Noise and vibration by machinery used in demolition works 2) Noise by vehicles used for removing debris and other wastes, and moving workers	1) Construction machinery - Optimizing demolition work schedule - Perform demolition work during daytime, especially piling work - Using low-noise/ low vibration equipment, as much as possible 2) Mobilization - Limit truck speed, especially around residential areas	Implementation: Contractor Supervision: PGCB and the Consultant
h.	Working Environment (including Occupational Safety)	SS-3	Labor accidents during demolition and removal of existing facility	- Prepare a manual for labor accident prevention including safety education and training - Provide workers with appropriate protective equipment - Use facilities and equipment that protects against	Implementation: Contractor Supervision: PGCB and the Consultant

No	Impact Item	package	Anticipated Impact	Mitigation Measures (Management Efforts)	Implementation Responsibility (Management Institution)
				electric shocks	
2. Construction Period					
a.	Air Quality	TL-2 SS-3	1) Dust resulting from pile foundation work and construction work of SS facility. 2) Exhaust gas from construction machinery and vehicles used for mobilization of equipment 3) Air pollution arising from incineration of construction materials and waste	1) Dust prevention - Watering access roads and construction site, especially in the dry season - Using cover sheet on trucks for the transportation of soil 2) Gas emission prevention - Periodic maintenance and management of all construction machinery and vehicles 3) Waste management - Prohibit open burning and illegal dumping	Implementation: Contractor Supervision: PGCB and the Consultant
b.	Water Quality	TL-2 SS-3	1) Run off water from construction area 2) Domestic wastewater of workers 3) Inappropriate disposal of waste	1) Run off water - Transmission line route was selected avoiding any steep sloped areas - Preventing soil loss by stabilizing any slopes of the construction area with concrete, as necessary based on geological survey 2) Domestic wastewater - Install wastewater treatment facility for workers, such as septic tanks 3) Waste management - Prohibit illegal waste disposal	Implementation: Contractor Supervision: PGCB and the Consultant
c.	Waste	TL-2 SS-3	1) Construction waste from foundation and construction works 2) Domestic waste from workers 3) Hazardous waste such as dry batteries, etc.	1), 2) Construction and domestic waste - Conduct separate waste collection and promote recycling and reuse - Appropriate disposal of non-recyclable waste according to rules 3) Hazardous waste - Hazardous waste should be treated under the related regulations	Implementation: Contractor Supervision: PGCB and the Consultant

No	Impact Item	package	Anticipated Impact	Mitigation Measures (Management Efforts)	Implementation Responsibility (Management Institution)
d.	Soil	SS-3	1) Run off water from construction area 2) Domestic wastewater of workers 3) Spillage oil from construction machinery and vehicles used for construction equipment, and transformers	1) Run off water - Spillage oil should be trapped in construction area for treatment - Install proper drainage for water treatment to prevent soil pollution 2) Domestic wastewater - Install wastewater treatment facility for workers, such as septic tanks to prevent soil pollution 3) Waste management - Ban on illegal dumping of wastes to prevent soil pollution	Implementation: Contractor Supervision: PGCB and the Consultant
e.	Noise and Vibration	TL-2 SS-3	1) Noise and vibration caused by construction machinery 2) Noise caused by vehicles used for mobilization of equipment and workers	1) Construction machinery - Optimizing construction schedule - Perform construction work during daytime, especially piling work - Using low-noise/ low vibration equipment, as much as possible 2) Mobilization - Limit truck speed, especially around residential areas	Implementation: Contractor Supervision: PGCB and the Consultant
f.	Offensive Odors	SS-3	- Domestic wastewater of workers	- Install wastewater treatment facility for workers, such as septic tanks to prevent odors	Implementation: Contractor Supervision: PGCB and the Consultant
g.	Disturbance to the Poor, Deterioration of Local Economy, Land Use and Utilization of Local Resources	TL-2 (Not Used)	- Temporary loss of farmlands, being kept out of construction zones - deterioration of the poor's living standard due to the temporary loss of job in ROW	- Employ as many local residents as possible - Use the services and products offered by the local community	Implementation: Contractor Supervision: PGCB and the Consultant
h.	Infectious Diseases	TL-2 SS-3	- Temporary influx of migrant labor during construction may increase risk of infection - deterioration of labor health	- Establish health center and implementation of periodic health check-ups - Education and training on workers' health care	Implementation: Contractor Supervision:

No	Impact Item	package	Anticipated Impact	Mitigation Measures (Management Efforts)	Implementation Responsibility (Management Institution)
			- Spreads of infectious diseases		PGCB and the Consultant
i.	Work Conditions (including work safety)	TL-2 SS-3	- Handling heavy loads - Working at heights - Electric shocks	- Prepare a manual for labor accident prevention including safety education and training - Provide workers with appropriate protective equipment - Inspect and ensure that any lifting devices, such as cranes, are appropriate for expected loads - Keep lifting devices well maintained and perform maintenance checks as appropriate - Use facilities and equipment that protect against electric shocks	Implementation: Contractor Supervision: PGCB and the Consultant
j.	ROW	TL-2 (Not Used)	- Loss of standing crops - Loss of trees - Livelihood means (temporary)	- Temporary block out during construction period will occur for safety and security - Standing crops and trees shall be compensated at market prices - Compensation should be conducted in compliance with relevant laws and regulations	Implementation: Offices of Deputy Commissioner Contractor Supervision: PGCB and the Consultant
k.	Accidents	TL-2 SS-3	- Land traffic accidents - Possible access restriction and traffic increase	- Prior public notice of demolition work and its schedule - Land traffic accidents - Observation of traffic regulations, installation of traffic signs and education on safe driving - Training safe operation of vehicles	Implementation: Contractor Supervision: PGCB and the Consultant
3. Operation Phase					
a.	Work Conditions (including work safety), and Accidents	TL-2 SS-3	- Maintenance work - Working at heights - Electric shocks - Traffic accidents	- Prepare a manual for labor accident prevention including safety education and training - Provide workers with appropriate protective equipment - Use facilities and equipment that protect against electric shocks	PGCB

5. ENVIRONMENTAL MONITORING PLAN (PACKAGE SS-3)

The Environmental Monitoring Plan (EMoP) is an essential part of the environmental management process of the proposed project. The EMoP is developed under the EMP framework which identifies the project's environmental risks and impacts, describes the mitigation measures and proposes an implementation mechanism with allocating responsibilities for all related actions in pre-construction, construction and operation periods. The EMP provides the overall structure to deliver the mitigation and the EMoP, then provides the mechanism to ensure that (a) whether the mitigation was implemented and (b) whether the mitigation was sufficient and effective.

5.1 Importance of the Environmental Monitoring

In general terms, environmental monitoring involves a systematic collection and analysis of social and environmental mitigation / compliance related information as the project progresses. It is aimed at improving the efficiency and effectiveness of a project. Monitoring is based on the targets set and activities planned during the planning phases of a project. It helps to keep the work on track, and can let the project management know when performance is not up to the expected standards. The EMoP enables to determine whether the project is meeting the set environmental standards and whether the resources available are sufficient and are being well used, whether the capacity is sufficient and appropriate, and whether the progress envisages the environmental mitigation efforts to achieve the expected outputs.

The importance of Environmental Monitoring is emphasized in *the JICA Guidelines for Environmental and Social Considerations (April 2010)*. According to JICA, a project whose environmental category is A, B, or FI requires monitoring of its environmental management process. The project proponent will report the monitoring results to JICA using methods and formats agreed by both sides. The reporting period should cover the implementation phase including the preparatory stage (i.e., from the day of signing the implementation agreement to completion) as well as the operational phase. The reporting period after completion is basically two years for an ODA loan Project.

5.2 Objectives of the Environmental Monitoring Plan

The main objectives and purposes of the Environmental Monitoring Plan are to:

- ensure regulatory requirements are met;
- check that impacts do not exceed project standards and other environmental standards described in the EMP;



- verify that mitigation measures are effective and implemented in the manner described in the EMP;
- Assess the adequacy of environmental monitoring such as selected monitoring locations, schedules, monitoring methods, as well as required supervision, and to suggest improvements, if appropriate, based on the results;
- Set up an effective environmental monitoring mechanism; identifying key players and their roles in implementing the EMoP; suggest reporting system and provide report / record formats

5.3 Monitoring Approach

5.3.1 General Approach

The general approach to environmental monitoring is to check the compliance of the applicable laws, regulations and standards and to compare the pre-, during and post-project situations and measuring relevant environmental impacts against baseline conditions. Baseline data establishes a reference basis for managing environmental impacts throughout the life of the project. The monitoring process will therefore be introduced to check progress and the resultant effects on the environment as the project activities proceeds.

PGCB, as the executing agency, will carry out monitoring activities in accordance with the approved EIA and ECC. The Consultant and contractors, pursuant to their contractual obligations, undertake part of inspections, monitoring and reporting during the contract period. The following types of inspections and monitoring will be employed.

- Inspections planned and conducted on a regular basis to ensure that mitigation measures and commitments are properly maintained and implemented, and the specific management procedures, if any, are being following.
- Receptor monitoring undertaken to verify predictions made in the EMP and to confirm that the activities at the site are not resulting in an unacceptable deterioration of environment.
- Compliance monitoring involving periodic sampling or continuous recording of specific environmental quality indicators or discharge levels to ensure compliance of discharges and emissions with project standards.

The contractors shall undertake the necessary monitoring measures for short- and long-term basis. However, during monitoring, close links should be maintained with other relevant stakeholder agencies such as the DOE, the Bangladesh Forest Department (BFD), and Deputy Commissioner's Offices of the concerned districts. Much of the work during the construction stage can form part of the contractor's routine inspection activities that will be included in the construction contract. The planned mitigation measures indicated in EMP's **Table 222-4** should, therefore, be included on the list of contractual items. These should be planned and checked against their effectiveness in reducing the negative impacts / or enhancing the benefits.

5.3.2 Monitoring Locations

Contractors will carry out regular readings and assessments on construction site of TL-2 and SS-3, which shall be filled in the agreed forms and submit to the PIU.

Along with those on construction sites of TL-2 and SS-3, the contractors will also maintain and submit monitoring results of parameters at two monitoring points; St.6 and St.7, to the Consultant as well as PGCB during contract period as their contractual obligation. The two sites where parameters shall be monitored under the Package TL-2 and SS-3 are shown in the table below. Each station is where the natural environmental survey was carried out and parameters were measured twice in rainy and dry seasons of 2014: at the beginning of July and early November.

Table 22-5: Outline of Monitoring Points (Not Used)

Monitoring Point		Package	Place			Remarks
No.	Name		Upazila	District	Division	
St. 6	Burumchhara (River's Surroundings)	TL-2	Anowara	Chittagong	Chittagong	Figure 222-4
St. 7	Burumchhara (River's Surroundings)	TL-2	Banshkali	Chittagong	Chittagong	Figure 222-5

(Source: the Consultant)

Burumchhara (Anowara Upazila, Chittagong) lies next to the Sangu River where paddy fields are spread, adjacent to which there is a small forest. Some reptiles, amphibians, and waterfowls such as shore birds are habiting. There are a few houses near the planned line route.

To the East of Anowara PP (Banshkali Upazila), some reptiles, amphibians, and waterfowls such as shore birds are habiting. And there are a few houses near the planned transmission line route.





(Source: the Consultant)

Figure 222-4: Burumchhara (Surrounding of the River)



(Source: the Consultant)

Figure 222-5: East of Anowara PP

5.4 Environmental Monitoring Plan

In accordance with the anticipated impacts and mitigation measures described in the above **Table 222-4**, the Environment Monitoring Matrix in **Table 222-6** below shows a whole picture of monitoring implementation during pre-construction, construction and operation stages. It describes monitoring parameters / indicators, methods, locations, duration and frequency, and monitoring responsibilities in order to check progress and the resulting effects on the environment throughout the project life. Contractor's monitoring responsibility will be through the construction stage.

One important aspect of monitoring is to assess the effectiveness of the mitigation measures suggested, where they are found lacking, appropriate new actions to mitigate any adverse effects should be undertaken. It requires measurements of selected environmental parameters at identified monitoring points and a summary of the measurement schedule proposed is given in **Table 222-7**.

Table 222-6: Environmental Monitoring Matrix

No	Potential Impact	App.	Monitored Parameter	Method of Collecting and Analyzing Data	Location	Duration and Frequency	Responsibility
1. Pre-construction phase							
a.	Preparation for acquisition / requisition of land	TL-2 (Not Used)	- Electricity Act 1910	- Monitor the progress of Government procedure for acquisition / requisition of land for construction work	- Areas to be acquired for the tower bases	- Quarterly during the official process	PGCB
b.	Notification of ROW	TL-2 (Not Used)	- Electricity Act 1910 - JICA Guidelines for Environmental and Social Considerations (April 2010)	- Monitor the progress of Government procedure for general notification of ROW.	- ROW	- Quarterly during the official process	PGCB
c.	Air Pollution (demolition and removal work)	SS-3	PM10 Ambient Air Quality Standard SO2, NO2	Collecting samples and analyzing at a lab.	- Demolition and removal site	1. Once before demolition work 2. Every month for the first two months 3. Adjusted frequency based on the 1&2 results for proper monitoring	Implementation: Contractor Supervision: PGCB and the Consultant
d.	Water Pollution (demolition and removal work)	SS-3	PH, Oil, Wastewater standards	Collecting samples and analyzing at a lab	- Demolition and removal site	1. Once before demolition work 2. Every month for the first two months 3. Adjusted frequency based on the 1&2	Implementation: Contractor Supervision: PGCB and the Consultant

No	Potential Impact	App.	Monitored Parameter	Method of Collecting and Analyzing Data	Location	Duration and Frequency	Responsibility
						results for proper monitoring	
e.	Waste (demolition and removal work)	SS-3	- Waste Management Rules	- Record of kinds and quantity of waste, and the disposal method	- Demolition and removal site - Labor dormitory	- Continuous records	Implementation: Contractor Supervision: PGCB and the Consultant
f.	Soil Pollution (demolition and removal work)	SS-3	Soil Quality standard	Collecting samples and analyzing at a lab	- Demolition and removal site	1. Once before demolition work 2. Once after the completion of demolition and removal work	Implementation: Contractor Supervision: PGCB and the Consultant
g.	Noise and vibration (demolition and removal work)	SS-3	Noise level standards	Measurement using noise level meter	- Demolition and removal site	1. Once before demolition work 2. Every month for the first two months 3. Adjusted frequency based on the 1&2 results for proper monitoring	Implementation: Contractor Supervision: PGCB and the Consultant
h.	Working Environment (including Occupational Safety)	SS-3	- Handling heavy loads - Electric shocks	- Record of accidents	- PGCB office	- Once a year	Implementation: Contractor Supervision: PGCB and the Consultant
2. Construction Period							
a.	Air Quality	TL-2 (Not Used)	PM10 Ambient Air Quality Standard	Collecting samples and analyzing at a lab.	- Two monitoring points (St. 6 & 7)	- At the beginning of the contract (Baseline measurement)	Implementation: Contractor

No	Potential Impact	App.	Monitored Parameter	Method of Collecting and Analyzing Data	Location	Duration and Frequency	Responsibility
		SS-3	SO ₂ , NO ₂		- Construction site	- Once every three months	Supervision: PGCB and the Consultant
b.	Water Quality	TL-2 (Not Used)	pH, BOD, SS, Oil, Coliforms Wastewater standards Ambient water quality standards	Collecting samples and analyzing at a lab	- One point foreside of the drain outlet. - Three points: one at construction site and two in the surroundings - Two monitoring points (St. 6 & 7)	- At the beginning of the contract (Baseline measurement) - Once every three months	Implementation: Contractor Supervision: PGCB and the Consultant
		SS-3	pH, Oil, Coliforms Wastewater standards Ambient water quality standards		- Two points at Construction site (one between the control room and construction site, another between construction site and pond)		
c.	Waste	TL-2 SS-3	- Waste Management Rules	- Record of kinds and quantity of waste, and the disposal method	- Construction sites	- Continuous records	Implementation: Contractor Supervision: PGCB and the Consultant
d.	Soil Pollution	SS-3	Soil Quality standard	Collecting samples and analyzing at a lab	- Two points at Construction site (one between the control room and construction site, another	Once before construction work	Implementation: Contractor Supervision: PGCB and the Consultant

No	Potential Impact	App.	Monitored Parameter	Method of Collecting and Analyzing Data	Location	Duration and Frequency	Responsibility
					between construction site and pond)		
e.	Noise and Vibration	TL-2 (Not Used) SS-3	Noise level standards	Measurement using noise level meter	- Three points: one at construction site and another two in the surroundings - Two monitoring points (St. 6 & 7)	1.Once before construction work 2.Once every three months	Implementation: Contractor Supervision: PGCB and the Consultant
f.	Offensive Odors	SS-3	-Waste Management rule	Spot visiting and interviewing with local residents	- Surrounding area of the construction site (at residential area)	Continuous records	Implementation: Contractor Supervision: PGCB and the Consultant
g.	Disturbance to the Poor Deterioration of Local Economy Land Use and Utilization of Local Resources	TL-2 (Not Used)		- Interviewing people living near the line route	- Villages along the transmission line route - Affected people	- Simultaneously	Implementation: Contractor Supervision: PGCB and the Consultant
h.	Infectious Diseases	TL-2 SS-3	- health condition	- Health check-ups	- Contractor's office	- Once a year	Implementation: Contractor Supervision: PGCB and the Consultant
i.	Work Conditions (including work safety)	TL-2 SS-3	- Handling heavy loads - Working at heights - Electric shocks	- Record of accidents	- Contractor's office	- Once a year	Implementation: Contractor Supervision: PGCB and the Consultant
j.	ROW	TL-2	- Electricity Act	- Monitor the payment of	- ROW	- Simultaneously	Implementation:

No	Potential Impact	App.	Monitored Parameter	Method of Collecting and Analyzing Data	Location	Duration and Frequency	Responsibility
		(Not Used)	1910 - JICA Guidelines for Environmental and Social Considerations (2010)	ROW Compensation through the contractor for the entitled people.			Contractor Supervision: PGCB and the Consultant
k.	Accidents	TL-2 SS-3	- Land traffic accidents	- Record of accidents	- Contractor's office	- Once a year	Implementation: Contractor Supervision: PGCB and the Consultant
3. Operation Phase							
a.	Work Conditions (including work safety), Accidents	TL-2 SS-3	- Handling heavy loads - Working at heights - Electric shocks - No. of accidents	- Record of accidents	- PGCB office - On-site	- Once a year	PGCB

Table 222-7: Environmental Measurements Schedule

Aspect	Parameter	Method	Stage	Frequency	Responsibility	Location
Air quality	SO ₂ , NO ₂ , PM ₁₀	Spectrometric method; High volume sampling and Gravimetric analysis	At the commencement of construction	Once (Baseline measurement)	Contractor / PGCB	St.6 and St. 7
			Construction	Once every three months	Contractor / PGCB	St.6 and St. 7
Water Quality	pH, BOD, SS, Oil and grease, coliforms	Portable water quality Meter, Spectrometric method	At the commencement of construction	Once (Baseline measurement)	Contractor / PGCB	St.6 and St. 7 Construction sites of TL-2 and SS-3
			Construction	Once every three months	Contractor / PGCB	St.6 and St. 7 Construction sites of TL-2 and SS-3
Noise level	Day and Night time Noise level (dB)	Portable noise meter (range 0-120 dB(A))	At the commencement of construction	Once (Baseline measurement)	Contractor / PGCB	St.6 and St. 7 Construction sites of TL-2 and SS-3
			Construction	Once every three months	Contractor / PGCB	St.6 and St. 7 Construction sites of TL-2 and SS-3

6. DOCUMENTATION AND REPORTING (PACKAGE SS-3)

6.1 Environmental Performance and Compliance

The Consultant will collect all the environmental parameters as frequent as required in the EMoP, and submit them quarterly in monitoring and implementation reports (that contain executive summary, introduction, activities during the reporting period, environmental impact monitoring & mitigation measures, environmental measurements, public complaints (if any), and conclusion & recommendation) to PD of PIU who shall initiate follow-up actions with supervision of PGCB and Power Division.

Monitoring results will be presented in regular reports and reviewed. The results of the inspection and monitoring activities will be reported on a weekly / monthly / quarterly and yearly basis, or as required. The EMoP and parameters will be reviewed periodically and, if necessary, will be modified to include any additional parameters necessary to ensure good environmental and social performance. Similarly, the monitoring methods and frequencies will also be subjected to periodic review.

A mid-term review of environmental issues scheduled at once in three months and shall be conducted by the PGCB and the Consultant. This will have the objective of reviewing environmental monitoring and management activities as well as making recommendations for long-term environmental monitoring requirements. The PIU will also report the monitoring results to JICA using methods and formats at particular frequency agreed by both sides.

The draft monitoring formats for each environmental parameter are given in the following pages.

Monitoring form for Package SS-3

The following items should be monitored at the site of 230kV Madunaghat SS periodically during pre-construction and construction phase.

1. Pre-Construction phase (demolition work for existing buildings, distribution line switching and land leveling)
- 1) Air quality (for demolition work)

(Date)

(Parameter: SO₂, NO₂, and PM₁₀, Unit µg/m³)

Parameter	Ave. time	Site		Ambient air quality standards	Remarks
		St.6	St.7		
SO ₂	(1hr)			350 (1hr)	
	(24hr)			125 (24hr)	
NO ₂	(1hr)			200 (1hr)	
	(24hr)			100 (24hr)	
PM ₁₀	(24hr)			150 (24hr)	

(Meteorological Condition)

Location (Date)	Time		Temperature (°C)		Moisture (%)	Wind	
			Dry	Wet		Direction	Speed
	AM	:					m/sec
	PM	:					m/sec
	AM						
	PM						

- 2) Water quality (Discharge wastewater) (for demolition work)

At two points One point foreside of the drain outlet, and another at pond behind the demolition site within the SS boundary)

(Date)

Parameter	Unit	Result	Wastewater discharge standards			Remarks (Measurements method)
			Inland surface water	Public sewerage system connected to treatment at second stage	Irrigated land	
Temperature	°C		-	-	-	
pH	-		6-9	6-9	6-9	
BOD	mg/L		50	250	100	
SS	mg/L		150	500	200	
Oil & grease	mg/L		10	20	10	
Total fecal coliform	MPN / 100ml		-	-	-	

Note: please duplicate the table to record monitoring results at all the site points.

3) Waste (for demolition work)

(Frequency) Continuously

(Unit: ton/gm)

Month	Sample Date	Kinds of Waste (Quality)		Rate of recycling/Reuse (%)		Remarks
		Industrial	Domestic	Industrial	Domestic	
		(A)	(B)	(A)	(B)	

4) Soil conditions (for demolition work)

Location	Date	Pollutant detected	Measures	Remarks

5) Noise (for demolition work)

(Date)

(Unit: dBA)

Location	Result	Noise standards					Remarks
		A	B	C	D	E	
		Day (6AM-9PM): 45	Day: 50	Day: 60	Day: 70	Day: 70	
		Night (9PM-6AM): 35	Night: 40	Night: 50	Night: 60	Night: 70	

Notes: Category of areas is as follows: A: Silent zone, B: Residential area, C: Mixed area (mainly residential area, and also simultaneously used for commercial and industrial purposes), D: Commercial area, E: Industrial area.

(Meteorological Condition)

Location (Date)	Time		Temperature (°C)		Moisture (%)	Wind	
			Dry	Wet		Direction	Speed
	AM	:					m/sec
	PM	:					m/sec
	AM	:					m/sec
	PM	:					m/sec

6) Work Environment

(Frequency) Once a year

- Monitor the records of labor accidents

2. Construction phase

1) Air quality

(Date)

(Parameter: SO₂, NO₂, and PM₁₀, Unit µg/m³)

Parameter	Ave. time	Site		Ambient air quality standards	Remarks
		St.6	St.7		
SO ₂	(1hr)			350 (1hr)	
	(24hr)			125 (24hr)	
NO ₂	(1hr)			200 (1hr)	
	(24hr)			100 (24hr)	
PM ₁₀	(24hr)			150 (24hr)	

(Meteorological Condition)

Location (Date)	Time		Temperature (°C)		Moisture (%)	Wind	
			Dry	Wet		Direction	Speed
	AM	:					m/sec
	PM	:					m/sec
	AM						
	PM						

2) Water quality (Discharge wastewater)

At two points One point foreside of the drain outlet, and another at pond behind the construction site within the SS boundary)

(Date)

Parameter	Unit	Result	Wastewater discharge standards			Remarks (Measurements method)
			Inland surface water	Public sewerage system connected to treatment at second stage	Irrigated land	
Temperature	°C		-	-	-	
pH	-		6-9	6-9	6-9	
BOD	mg/L		50	250	100	
SS	mg/L		150	500	200	
Oil & grease	mg/L		10	20	10	
Total fecal coliform	MPN / 100ml		-	-	-	

Note: please duplicate the table to record monitoring results at all the site points.

3) Waste

(Unit: ton/gm)

Month	Sample Date	Kinds of Waste (Quality)		Rate of recycling/Reuse (%)		Remarks
		Industrial	Domestic	Industrial	Domestic	
		(A)	(B)	(A)	(B)	

4) Soil

Location	Date	Pollutant detected	Measures	Remarks

5) Noise

(Date)

(Unit: dBA)

Location	Result	Noise standards					Remarks
		A	B	C	D	E	
		Day (6AM-9PM): 45	Day: 50	Day: 60	Day: 70	Day: 70	
		Night (9PM-6AM): 35	Night: 40	Night: 50	Night: 60	Night: 70	

Notes: Category of areas is as follows: A: Silent zone, B: Residential area, C: Mixed area (mainly residential area, and also simultaneously used for commercial and industrial purposes), D: Commercial area, E: Industrial area.

(Meteorological Condition)

Location (Date)	Time		Temperature (°C)		Moisture (%)	Wind	
			Dry	Wet		Direction	Speed
	AM	:					m/sec
	PM	:					m/sec
	AM	:					m/sec
	PM	:					m/sec

6) Offensive Odors

Location	Date	Odors detected	Measures	Remarks

7) Infectious diseases (once a year)

- Monitor the health record through medical check-ups

8) Work Environment (once a year)

- Monitor the record of accidents

9) Accidents (once a year)

- Monitor the record of accidents

6.2 Ad-hoc Environmental Incidents

Environmental incident reports are to be completed and forwarded to the Consultant by contractors for all environmental incidents regardless of the magnitude of impact. The suggested environmental incidents record format is given in **Table 222-8**.

Table 222-8: Ad-hoc Environmental Incidents Record Format

Date and time	Environmental Incident	Location	Action Taken	Person Responsible

6.3 Complaints Register

Contractors shall maintain a register of complaints made by the public at their site offices. An extract of this registry for each month will be provided to the PIU by monthly basis. The suggested complaints register format is given in **Table 222-9**.

Table 222-9: Sample Complains Registry

Date and time	Complaint	Name and Contact Details	Action Taken	Date of Action Taken	Person Responsible

23-1

SECTION 23

SECURITY MODULE

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SECTION 23

SECURITY MODULE

23.1 General

- a. The Employer and the Contractor shall review together from time to time compliance with Security Plan in consultation with relevant security agencies.
In case Contractor judges that the security measures taken by the Employer under the Employer's scope is insufficient considering current security measures, the situation of Contractor's site work, the number of staffs/workers of the Contractor at site and the possible change of threat level, the Contractor shall be entitled to request the Employer to enhance the degree of the security measures under the Employer's scope at any time. Such Contractor's request shall be associated with a sound reason and shall be reflected in Security Plan.
- b. The Employer will arrange for:
 - (i) The construction of a temporary site perimeter security fence;
 - (ii) The Construction of Watch towers with security alarms and searchlights near the temporary jetty access point; and

The Employer shall use his best endeavors to complete the installation/ construction of the above, as soon as practicable.
- c. As per Sub-Clause 10.8 of the Particular Conditions, the Employer shall be responsible for ensuring the security outside the site perimeter against the external attacks such as the act of rebellion and terrorism, on a 24 hour, seven day per week basis, in accordance with the Security Plan agreed by the Employer and the Contractor.
- d. The Employer shall provide:
 - (i) Security for the Contractor's foreign staff travelling outside the project area on project business (e.g. travelling between the Cox's Bazar Airport/Seaport, the Chittagong Airport/Seaport and the site, from site to attend local meetings) as appropriate.
 - (ii) Security to ensure the safety of transport of goods and materials travelling to and from the site by land and sea, as appropriate.
 - (iii) A helipad for the emergency evacuation of project staff.
 - (iv) Support for the Contractor's personnel to evacuate including coordination with relevant authorities, as much as possible, in case if the Contractor cannot reasonably arrange the evacuation measures.
 - (v) Proper Security Officer who shall be a counterpart of the Security Officer arranged by the Contractor.
- e. The Contractor shall be responsible for:
 - (i) The ongoing maintenance of the above mentioned temporary site perimeter security fence, watch towers, security alarms, searchlights and lighting, constructed/installed by the Employer under (b) above (including the payment of electricity bills);
 - (ii) The construction and maintenance of additional watch towers with security alarms and searchlights adjacent to the temporary site perimeter security fence;
 - (iii) The relocation of watch towers, searchlights, alarms and lighting as necessary during the course of the Project as appropriate. The Contractor shall be required to shift them to locations as instructed by the Engineer once the perimeter security fence has been constructed by the Contractor.

- (iv) The connection of the security lighting, watch towers and associated equipment (including that provided by the Employer) to a redundant power supply.

Payment for the above items shall be claimed and made through the amount allocated in the Provisional Sum.

- f. The Site Security Plan shall establish details of the Contractor's overall responsibilities for security services. The plan shall cover the requirements for all work areas, including, but not limited to, storage areas and facilities and areas in existing, previously constructed, and new construction area. It shall also include the security plan for the site accommodation for the Employer, the Engineer and the Contractor.

The Contractor's proposals shall include:

- (i) The plan of Security Command and Control Centre (SCCC) and supply and maintenance of the security control system. The SCCC shall be designed and constructed following consultation with all relevant security agencies and will be used as the central point to control and coordinate the activities and responses of all of the security groups. The plan of SCCC shall include the communication plan among all the security groups. The Employer shall assist the Contractor for obtaining necessary license for radio communications.
- (ii) The security control system which shall consist of sufficient equipment (including CCTV, lighting, alarms and communications equipment) and personnel to prevent unauthorized access twenty-four (24) hours per day, seven (7) days per week and which can ensure the safety and security of persons and property on the Site. In particular it shall provide coverage of all entry points to the site, accommodation, office and storage areas (including those provided for the Engineer and the Employer) and any areas agreed by the Employer / Engineer to be judged as "at risk" areas. It shall include the installation of alarms with triggering points installed at police camp, Ansar barracks etc.
- (iii) The relocation of the sand road (also to be used for community road), watch towers, searchlights, alarms and lighting as necessary during the course of the Project as appropriate. The Contractor shall be required to shift them to locations as instructed by the Engineer once the perimeter security fence specified under Sub-Clause 1004.02 of the Specification has been constructed by the Contractor.
- (iv) An identification badge / card system within the site perimeter until the Taking-Over Certificate is issued. Each person employed within the site perimeter shall be issued an identification badge/card and shall be registered by the Contractor through the access control system. The Contractor shall furnish badges/cards for all personnel, including the Employer's and the Engineer's Personnel. In addition to personnel identification, all licensed construction vehicles shall be checked and registered with the access control system and shall be marked with a suitable identification sticker. Likewise, the licensed vehicles of construction personnel authorized to bring their vehicles on the Site shall be registered with the access control system and shall be marked with a suitable identification sticker.
- g. The Contractor shall be responsible for all materials and equipment in his custody or placed in construction by him within the site perimeter. Security methods within the site perimeter (such as construction of secondary fencing and gates if any, etc.), shall be

employed as necessary to ensure the protection of all materials, equipment, and construction work from theft, vandalism, fire, and all other damage and loss.

- h. The Contractor shall:
 - (i) Employ a suitably experienced and qualified full-time Security Officer at the site during the project phase. The Security Officer's duties shall include:
 - Gather general intelligence.
 - Coordinate security.
 - Establish a threat monitoring system & procedures.
 - Establish an emergency response team.
 - Conduct security drills and regular security briefings.
 - (ii) Enforce travel advisory and restrictions on movement of personnel, vehicle and material for the Contractor and Subcontractors as per threat levels.
 - (iii) Conduct criminal verification checks on all local contract workers for the Contractor and Subcontractors before they are employed at the site.
 - (iv) Conduct pre-deployment security awareness briefings for all staff of the Contractor and Subcontractors before they are deployed to the project site.
 - (v) Ensure all drivers for the Contractor and Subcontractors are trained in defensive driving and administering first aid.
 - (vi) Ensure that all the Contractor's land based project vehicles and all vehicles provided under this Contract are fitted with GPS tracking, first-aid kit and mobile phone communications so that their location can be monitored from and they be able to communicate with the SCCC.
- i. The Contractor shall cooperate with the Employer regarding all security measures instituted at the Site.
- j. The Contractor shall prohibit the commission of any and all illegal and nuisance activities in the Site or upon the land of the Employer or adjacent residents. Any Contractor's Personnel found to have violated this provision shall be subject to immediate dismissal.
- k. All construction personnel and vehicular traffic shall enter and leave the Site through the designed construction entrance gate. Unauthorized personnel will not be permitted on the Site. Removal of materials or equipment from the project site shall require permission from the Contractor and the Engineer. The guard on duty at the gatehouse shall check the ingress and egress of construction personnel and traffic. When the guard is not on duty at the gatehouse, the gate shall be closed and locked.
- l. Security Module payments shall be:
 - (i) claimed and made through the amount allocated in Schedule No. 5: Security Module Provisional Sum; and
 - (ii) limited to the items of work listed/ described in Schedule No. 5: Security Module Provisional Sum.

All costs and expenses for execution of any other item of work of the Contractor's scope shall be included in rates and/or prices in Schedules No. 1 to 4 of Price Schedules.

23.2 Temporary Fence and Gate

The Contractor shall erect an unclimbable fence of chain link wire netting which is higher than 2.4 meters, surrounding the Work Area. Gates in the fence shall be adequate to maintain the security of the area and shall be subject to the approval of the

Engineer.

In case if this temporary boundary fence overlaps with the site perimeter fence (constructed by the Employer), the Contractor may be able to utilize those overlapping parts of that perimeter fence, with some modifications where necessary, for the completion of it (the temporary boundary fence), subject to the Engineer's approval.

The temporary boundary fence, upon its completion shall be considered as perimeter security fence (in place of perimeter security fence constructed by the Employer) for the purpose of the security module and plan; and the site perimeter is denoted by its fence line.

Upon completion of the Works, The Contractor shall remove all temporary fences and gates and reinstate the ground surface appropriately.”