1. Member List of the Study Team

(1) First Field Survey

Name	Assignment	Organization
Toshiyuki HAYASHI	Team Leader	Japan International Corporation Agency
Gaku SAITO	Vice Team Leader	Japan International Corporation Agency
Yoshiyuki KUDO	Chief Consultant/ Transmission and distribution Planning	Yachiyo Engineering Co., Ltd.
Kenji SAKEMURA	Substation Facilities	Yachiyo Engineering Co., Ltd.
Keiichiro OHASHI	Power Flow Analysis/ Protection Control	Yachiyo Engineering Co., Ltd.
Atsuhito URUNO	Transmission Facilities	Yachiyo Engineering Co., Ltd.
Yasuo HORIGOME	Facility Planning/ Cost Estimation	Yachiyo Engineering Co., Ltd
Kyohei KUROHANE	Construction Planning/ Cost Estimation	Yachiyo Engineering Co., Ltd.
Asami KABASAWA	Social and Environmental Considerations	Yachiyo Engineering Co., Ltd.
Tomoya NAKASHIMA	Substation Facilities Assistant	Yachiyo Engineering Co., Ltd.

(2) Second Field Survey

Name	Assignment	Organization
Toshiyuki HAYASHI	Team Leader	Japan International Corporation Agency
Yoshiyuki KUDO	Chief Consultant/ Transmission and distribution Planning	Yachiyo Engineering Co., Ltd.
Kenji SAKEMURA	Substation Facilities	Yachiyo Engineering Co., Ltd.
Kyohei KUROHANE	Construction Planning/ Cost Estimation	Yachiyo Engineering Co., Ltd.

2. Study Schedule

(1) First Field Study Schedule (March to April in 2015)

No.	Date	Day	Contents of Survey					Accommodation
			Official Members	Consultant Members				
				Chief consultant Group	Substation Group	Transmission Group	Environmental & Social Considerations Group	
1	7 Mar.	Sat.	• Trip {Narita 22:20→Doha 4:35 by QR-807}, Trip {Fukuoka 21:05→Incheon 22:35 by KE-782}					Flight
2	8 Mar.	Sun.	• Trip {Incheon 0:05→Doha 4:15 by QR-859}, Trip {Doha 8:05→Doha 14:30 by QR-1387}					Kigali
3	9 Mar.	Mon.	• 9:00 Courtesy call to JICA Rwanda Office, Explanation and discussion of the schedule of the field survey and project contents • 14:00 Courtesy call to Ministry of Infrastructure and Rwanda Energy Group, Explanation and discussion of the schedule of IC/R, the field survey and project contents					Kigali
4	10 Mar.	Tue.	• Explanation and discussion of the facilities on Rwanda side, the methodology of the site survey, etc. with MoI and REG • Site Survey					Kigali
5	11 Mar.	Wed.	• Submission and discussion of the draft M/D • Explanation of the Grant scheme, obligations of Rwanda side and overall plan, etc. • Visit to the other donors and the relative agencies • JICA Mr. Saito Trip {Narita 22:20→Doha 4:35 by QR-807}		• Meeting with REG • Site survey (Gasogi substation, survey for environmental current situation, etc.)			Kigali
6	12 Mar.	Thu.	• Discussion of the draft M/D • Discussion of and corrections of the draft M/D • JICA Mr. Saito Trip {Doha 8:05→Doha 14:30 by QR-1387}		• Meeting with REG • Site survey (110 kV Transmission Route) • Meeting with Local contractors on topographic & geological investigation • Market survey of equipment and material			Kigali
7	13 Mar.	Fri.	• Signing of the M/D (if possible) • Corrections of the draft M/D (if any)		• Meeting with REG • Signing Meeting with Local contractors on topographic & geological investigation • Confirmation of specifications on existing facilities • Market survey of equipment and material			Kigali
8	14 Mar.	Sat.	• Team discussions, arrangement of collected data					JICA : Flight Kigali
9	15 Mar.	Sun.	• Team discussions, arrangement of collected data					Kigali
10	16 Mar.	Mon.	• Signing of the M/D (MoI and REG) • Report to EoJ and JICA Rwanda office	• Site survey (Ndera substation, Gasogi substation and other substations) • 110kV Transmission line route survey (Ndera substation – Gasogi substation : Approx. 6 km)				Kigali
11	17 Mar.	Tue.	• Trip {Kigali 15:00→Doha 23:15 by QR-1388}	• Site survey (Ndera substation, Gasogi substation and other substations) • 110kV Transmission line route survey (Ndera substation – Gasogi substation : Approx. 6 km)				Kigali
12	18 Mar.	Wed.	• Trip {Doha 1:45→Narita 17:55 by QR-806}	• Site survey (Ndera substation, Gasogi substation and other substations) • 110kV Transmission line route survey (Ndera substation – Gasogi substation : Approx. 6 km)				Kigali
13	19 Mar.	Thu.		• Site survey (Ndera substation, Gasogi substation and other substations) • 110kV Transmission line route survey (Ndera substation – Gasogi substation : Approx. 6 km)				Kigali
14	20 Mar.	Fri.		• Site survey (Ndera substation, Gasogi substation and other substations) • 110kV Transmission line route survey (Ndera substation – Gasogi substation : Approx. 6 km)				Kigali
15	21 Mar.	Sat.		• Team discussions, arrangement of collected data • Trip {Narita 22:20→Doha 4:35 by QR-807} (Ms. Kabasawa)				Kigali
16	22 Mar.	Sun.		• Team discussions, arrangement of collected data • Trip {Incheon 0:05→Doha 4:15 by QR-859} (Ms. Kabasawa)				Kigali

No.	Date	Day	Contents of Survey					Accommodation
			Official Members	Consultant Members				
				Chief consultant Group	Substation Group	Transmission Group	Environmental & Social Considerations Group	
17	23 Mar.	Mon.		• Site survey (Ndera substation, Gasogi substation and other substations) • 110kV Transmission line route survey (Ndera substation – Gasogi substation : Approx. 6 km) • Survey for institutions and organizations, visit to relevant agencies on Environmental & Social Consideration				Kigali
18	24 Mar.	Tue.		• Site survey (Ndera substation, Gasogi substation and other substations) • 110kV Transmission line route survey (Ndera substation – Gasogi substation : Approx. 6 km) • Survey of institutions and organizations, visit to relevant agencies on Environmental & Social Consideration				Kigali
19	25 Mar.	Wed.		• Data Collection of National Development Plan and Socioeconomic conditions • Visit to MoI and survey of power sector structural reform • Survey of power supply and demand (MoI) • Survey of balance of payments and tariff • Survey for institutions and organizations, visit to relevant agencies on Environmental & Social Consideration				Kigali
20	26 Mar.	Thu.		• Preparation of Field Report • Survey Team discussions, arrangement of collected data • Survey for institutions and organizations, visit to relevant agencies on Environmental & Social Consideration				Kigali
21	27 Mar.	Fri.		• Preparation of Field Report • Data collection of Supplementary material, etc. • Market survey of equipment and material, survey of customs clearance • Survey of port and transportation route • Survey for institutions and organizations, visit to relevant agencies on Environmental & Social Consideration				Kigali
22	28 Mar.	Sat.		• Site survey (Supplementary survey)				Kigali
23	29 Mar.	Sun.		• Preparation of Field Report • Collection of supplementary documents and data				Kigali
24	30 Mar.	Mon.		• Preparation of Field Report • Data collection of Supplementary material, etc. • Obtaining the survey report on topographic & geological investigation • Market survey (Local contractor, etc.) • Survey for institutions and organizations, visit to relevant agencies on Environmental & Social Consideration • Trip {Kigali 15:00→Doha 23:15 by QR-1388}(Mr. Ohashi and Mr. Nakashima)				Kigali
25	31 Mar.	Tue.		• Submission, explanation and discussion of Field Report to MoI and REG • Survey for institutions and organizations, visit to relevant agencies on Environmental & Social Consideration • Trip {Doha 1:30→Incheon 16:00 by QR-858}{Incheon 18:35→Fukuoka 19:55 by KE-781}(Mr. Ohashi and Mr. Nakashima)				Kigali
26	1 Apr.	Wed.		• Explanation and discussion of Field Report to MoI and REG • Survey for institutions and organizations, visit to relevant agencies on Environmental & Social Consideration				Kigali
27	2 Apr.	Thu.		• Report to EoJ and JICA Rwanda office • Survey for institutions and organizations, visit to relevant agencies on Environmental & Social Consideration • Trip {Kigali 15:00→Doha 23:15 by QR-1388}				Kigali
28	3 Apr.	Fri.		• Survey for institutions and organizations, visit to relevant agencies on Environmental & Social Consideration • Trip {Doha 1:45→Narita 17:55 by QR-806}, Trip {Doha 1:30→Incheon 16:00 by QR-858}{Incheon 18:35→Fukuoka 19:55 by KE-781}				Kigali

No.	Date	Day	Contents of Survey					Accommodation
			Official Members	Consultant Members				
				Chief consultant Group	Substation Group	Transmission Group	Environmental & Social Considerations Group	
29	4 Apr.	Sat.		• Arrangement of collected data				Kigali
30	5 Apr.	Sun.		• Arrangement of collected data				Kigali
31	6 Apr.	Mon.		• Following up for local consultant on Environmental & Social Consideration, etc.				Kigali
32	7 Apr.	Tue.		• Following up for local consultant on Environmental & Social Consideration, etc.				Kigali
33	8 Apr.	Wed.		• Following up for local consultant on Environmental & Social Consideration, etc.				Kigali
34	9 Apr.	Thu.		• Following up for local consultant on Environmental & Social Consideration, etc.				Kigali
35	10 Apr.	Fri.		• Following up for local consultant on Environmental & Social Consideration, etc.				Kigali
36	11 Apr.	Sat.		• Arrangement of collected data				Kigali
37	12 Apr.	Sun.		• Arrangement of collected data				Kigali
38	13 Apr.	Mon.		• Following up for local consultant on Environmental & Social Consideration, etc.				Kigali
39	14 Apr.	Tue.		• Following up for local consultant on Environmental & Social Consideration, etc.				Kigali
40	15 Apr.	Wed.		• Following up for local consultant on Environmental & Social Consideration, etc.				Kigali
41	16 Apr.	Thu.		• Trip {Kigali 15:00→Doha 23:15 by QR-1388} (Ms. Kabasawa)				Kigali
42	17 Apr.	Fri.		• Trip {Doha 1:45→Narita 17:55 by QR-806} (Ms. Kabasawa)				Kigali

(2) Second Field Study Schedule (November in 2015)

No.	Date	Day	Contents of Survey		Accommodation
			Official Members	Consultant Members (Kudo, Sakemura, Kurohane)	
1	7 Nov.	Sat.	• Trip {Narita 22:20→Doha 4:35 by QR-807}, Trip {Fukuoka 21:05→Incheon 22:35 by KE-782}		Flight
2	8 Nov.	Sun.	• Trip {Incheon 0:05→Doha 4:15 by QR-859}, Trip {Doha 8:05→Doha 14:30 by QR-1387}		Kigali
3	9 Nov.	Mon.	• Courtesy call and explanation of the Preparatory Survey Report to JICA Rwanda Office and EOJ • Courtesy call and submission/explanation of the Preparatory Survey Report to MoI and REG • Confirmation of Environmental & Social Consideration with Rwanda Environment Management Agency (REMA) and MoI		Kigali
4	10 Nov.	Tue.	• Submission/explanation of the Preparatory Survey Report to MoI and REG • Explanation of and discussion on the draft Technical Specifications		Kigali
5	11 Nov.	Wed.	• Submission/explanation of the Preparatory Survey Report to MoI and REG • Explanation of and discussion on the draft Technical Specifications		Kigali
6	12 Nov.	Thu.	• Explanation of and discussion on the draft M/D with MoI and REG • Signing of the M/D		Kigali
7	13 Nov.	Fri.	• Report to JICA Rwanda Office • Trip {Kigali 15:00→Doha 23:15 by QR-1388}		Flight
8	14 Nov.	Sat.	• Trip {Doha 1:45→Narita 17:55 by QR-806}, Trip {Doha 1:30→Incheon 16:00 by QR-858}{Incheon 18:35→Fukuoka 19:55 by KE-781}		-

【Remarks】(Alphabetical order)

EoJ : Embassy of Japan
JICA : Japan International Cooperation Agency
MoI : Ministry of Infrastructure
REMA : Rwanda Environment Management Agency
REG : Rwanda Energy Group

3. List of Parties Concerned in the Recipient Country

Ministry of Infrastructure (MoI)

Mr. Christian Rwakunda	Permanent Secretary
Mr. Robert Nyamrumba	Energy Division Manager
Mr. Peace Kaliisa	Donor Coordinator
Mr. Jerome Nsengyarenje	Senior Engineer

Electrical Development Corporation Limited

Mr. Kamangi Emmanuel	Managing Director
Eng. Ngizwenayo Dieudonne	Director of Energy Planning and Design
Mr. Philbert Kabanda	Environmental Safeguard Specialist
Mr. Richard Sangabo	Social Safeguard Specialist

Electrical Utility Corporation Limited

Eng. William Bihoyiki	Ag. Head of Electricity Transmission Unit
Eng. Lavvy Vincent Mpava	Ag. Director of Electrical Utility
Mr. Butera Laurent	Transmission Engineer
Mr. Simon Ndiramiye	Transmission Engineer
Mr. Kagunge Fredric	Transmission Engineer

Rwanda Environmental Management Authority

Mr. Remy Norbert Duhuze	Director of Environmental Regulation and Pollution Control

Rwanda Development Board

Mr. Gashugi Innocent	Senior Environmental Engineer/Investment Implementation Division

JICA Rwanda Office

Mr. Takahiro Moriya	Chief Representative
Mr. Ryutaro Murotani	Senior Resident Representative
Mr. Naohiro Nozaka	Project Formulation Advisor
Mr. Plaude Nkunzwenimana	Program Officer in Charge of Economic Infrastructure

Minutes of Discussions
of
The Preparatory Survey
on
The Project for Improvement of Substations and Distribution Network Phase 2

In response to the request from the Government of the Republic of Rwanda (hereinafter referred to as "GoR"), the Japan International Cooperation Agency (hereinafter referred to as "JICA"), in consultation with the Government of Japan (hereinafter referred to as "GoJ"), decided to conduct a Preparatory Survey (hereinafter referred to as "the Survey") on The Project for Improvement of Substations and Distribution Network Phase 2 (hereinafter referred to as "the Project").

JICA sent to Rwanda the Preparatory Survey Team (hereinafter referred to as "the Team"), headed by Mr. Toshiyuki HAYASHI, Senior Advisor of JICA. The Team is scheduled to stay in Rwanda from 8th March to 16th April 2015.

The Team held discussions with the officials of Rwanda authorities concerned (hereinafter referred to as "the Rwanda side"). In the course of the discussions, both sides have confirmed the main items described in the sheets attached hereto.

Kigali, Rwanda 20th March, 2015

Mr. Toshiyuki HAYASHI
Team Leader
JICA Senior Advisor,
Japan International Cooperation Agency

Mr. Christian Rwakunda
Permanent Secretary
Ministry of Infrastructure

Mr. Emmanuel Kamanzi
Managing Director
Energy Development Corporation Limited
Rwanda Energy Group

Ms. Odette Mbabazi
Managing Director
Energy Utility Corporation Limited
Rwanda Energy Group

ATTACHMENT

1 Objective of the Project

The objective of the Project is to reinforce power transmission and distribution networks in Kigali.

2 Project Site

The Project sites are located in Kigali as shown in Annex-1.

3 Responsible and Implementing Organizations

The responsible organization is Ministry of Infrastructure (MININFRA).

The implementing organization is Energy Development Corporation Ltd. (EDCL) in collaboration with Energy Utility Corporation Ltd. (EUCL).

The organization structures of MININFRA, EDCL and EUCL are shown in Annex-2, Annex-3 and Annex-4 respectively.

4 Components Requested by the Rwanda side

The main components requested by GoR to GoJ have been confirmed in the Minutes of Discussions signed on 29th August 2014 as attached in Annex-5. During the initial discussion of the Survey, the Rwanda side proposed the revised components for the Project. After a series of discussions, the Rwanda side and the Team have agreed on the main components for the Survey as follows:

(A) Ndera Substation

a. Two sets of 20 MVA 110/15 kV transformers
b. One set of 110 kV switchgear
c. One set of 15kV switchgear
d. One set of control and supervisory facilities

(B) Transmission Line

a. Two circuits of 110 kV transmission lines from the existing line between Birembo and Gasogi substations to Ndera Substation

(C) Distribution Line

a. Two circuits of 15 kV distribution lines from Ndera Substation to existing line between Birembo and Free Zone Phase 1 substations
b. One circuit of 15 kV distribution line from existing Gasogi Substation to Kabuga substation (Ring Main Unit)

(D) Modification of existing Gasogi Substation

a. One set of 15 kV switchgear panel for outgoing feeder to Kabuga

(E) Ring Main Unit

a. Two sets of Ring Main Unit at Kabuga and Murindi.

Based on the result of the Survey, JICA will assess the appropriateness and priority of the above components from the viewpoint of necessity and relevance as Japan's Grant Aid scheme, and will report the findings to the GoJ. The scope of the Project will be confirmed after consultation with the GoJ.

5 Land Preparation for Ndera Substation

During the discussion, the Rwanda side confirmed a heavy fuel oil (HFO) diesel power station will be constructed in the lower side of Ndera Substation. The Rwanda side and the Team have agreed that the land for the substation and the power station will be prepared simultaneously and the earth walls of the prepared land will be properly treated by concrete facing. The Team has confirmed that the necessary land area to construct the substation will be investigated and informed to the Rwanda side during the Survey. The Rwanda side has confirmed that the land preparation will be completed before the start of the civil work for the substation foundation.

6 Japan's Grant Aid Scheme

6.1 Japan's Grant Aid Scheme

The Rwanda side has understood Japan's Grant Aid Scheme explained by the Team as described in Annex-6 and Annex-7.

6.2 Major Undertakings by the Rwanda side

The Rwanda side will take the necessary measures as described in Annex-8 for smooth implementation of the Project.

7 Schedule of the Preparatory Survey

The Team will continue the Survey in Rwanda until 16th April 2015 and report the result to the Government of Japan. Based on the result of the Survey, JICA will prepare the Draft Final Report in English and send a mission around September 2015 to explain and agree on the contents of the Draft Final Report.

8 Environmental and Social Considerations

8.1 The Rwanda side has agreed to conduct the required environmental and social considerations, and obtain approval on environmental clearance as well as other relevant permits/licenses required for the implementation of the Project.

8.2 The Rwanda side has agreed to comply with the JICA Guidelines for Environmental and Social Considerations (hereinafter referred to as "JICA Guidelines") as well as laws and regulations in Rwanda, and was requested to prepare Environmental Checklist and Monitoring Form which are designated by JICA Guidelines for an outline design.

8.3 The Rwanda side has agreed to make necessary arrangements with relevant governmental organizations in order to secure funding for and execution of the above environmental matters in a timely manner as required for smooth execution of the Project.

8.4 The Rwanda side shall secure a necessary budget for environmental assessment and undertake it, and obtain the Environmental Certificate approved by Rwanda Development Board by the end of December 2015.

8.5 Presently, it is expected that the Project may cause a small-scale involuntary resettlement. The Rwanda side has understood that the Team will assist EDCL in identifying project affected people and developing an "Abbreviated Resettlement Action Plan (ARAP)". EDCL shall be responsible for the implementing the ARAP including the payment of compensation by the end of December 2015.

8.6 EDCL shall obtain land use permits and complete land acquisition necessary for the Project by the end of December 2015.

8.7 EDCL shall obtain necessary permits from Municipality by the end of December 2015 to construct new distribution lines within the road reserve.

8.8 Based on the JICA Guidelines, EDCL shall identify stakeholders related to this project and carry out stakeholder consultations during the course of Environmental Impact Assessment study.

8.9 Since an assessment process has not been done yet for this project, the Rwanda side has understood the abbreviated Resettlement Plan (ARAP) might need to be amended based on the results of Environmental Impact Assessment study.

8.10 The Rwanda side has agreed that the compensation will be based on the full replacement cost as much as possible in accordance with the JICA Guidelines.

8.11 The Rwanda side has agreed that the compensation will be based on the full replacement cost as much as possible.

8.12 The Rwanda side has understood that if the Project triggered a large scale involuntary resettlement, the Project will be categorized as Category A instead of B according to the JICA Guidelines. In this case an EIA is required according to the JICA Guidelines, regardless of the requirement by laws and regulations in Rwanda.

9 Other Relevant Issues

9.1 Status of the Survey

The Team explained that the purpose of the Survey is to collect necessary information for evaluating the relevance, appropriateness and urgency of the Project and for analyzing power system in Kigali, and also to identify the issues to be cleared for implementation of the Project. The Rwanda side has agreed to share all necessary information and data with the Team.

9.2 Coordination among relevant Development Partners and agencies

The Team requested the Rwanda side to ensure coordination among relevant development partners and agencies for smooth implementation of the Project and the Rwanda side has agreed to it.

9.3 Counterpart Personnel

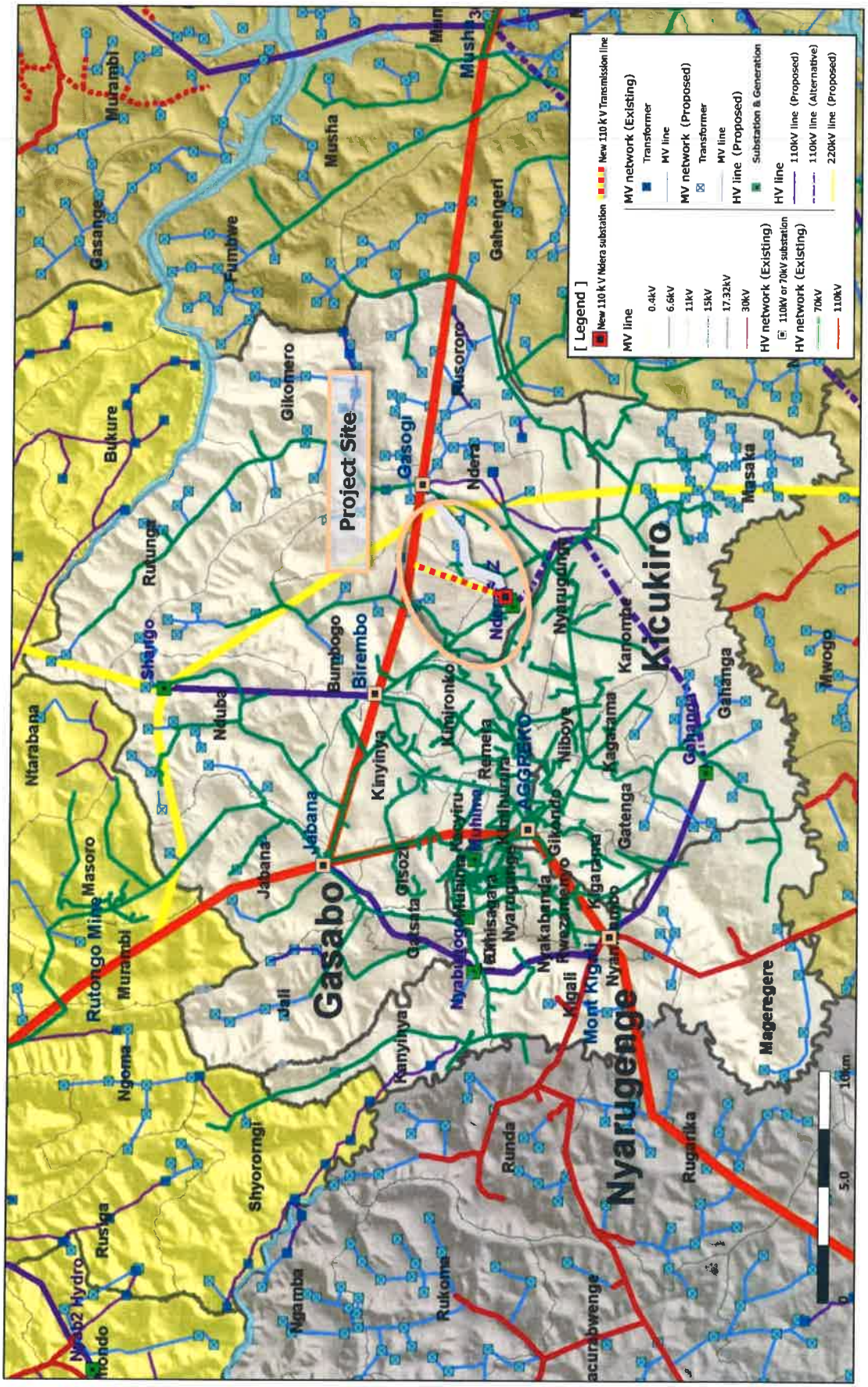
The Team requested the Rwanda side that necessary number of counterpart personnel shall be assigned to the Team and necessary arrangements with related organizations be made during the Survey in Rwanda. The Rwanda side has agreed to it.

(End)

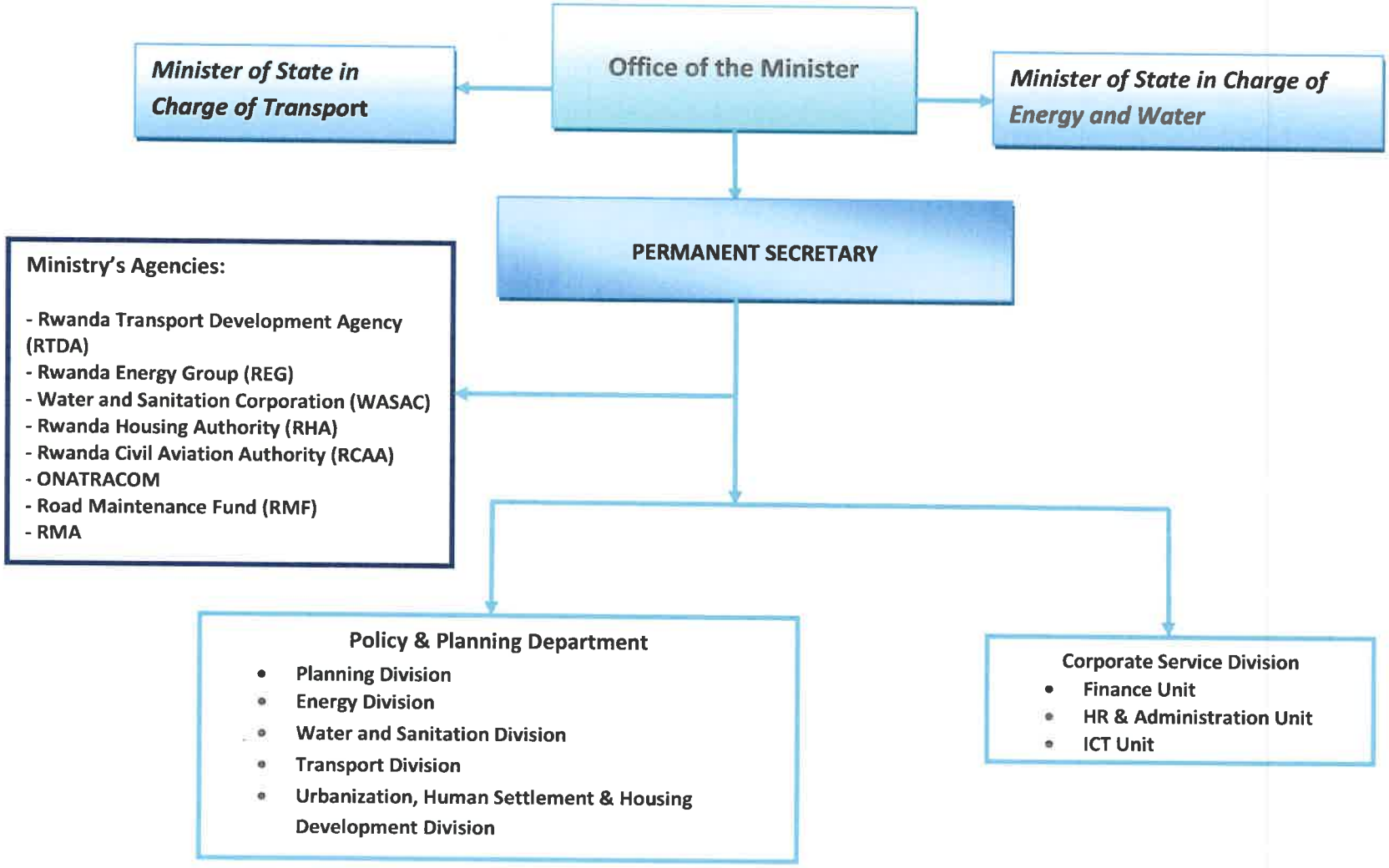
<List of Annexes>

Annex-1. Location of the Project Sites
Annex-2. Organization Structure of Ministry of Infrastructure (MININFRA)
Annex-3. Overall Structure of Rwanda Energy Group and Organization Structure of Energy Development Corporation Ltd. (EDCL)
Annex-4. Organization Structure of Energy Utility Corporation Ltd. (EUCL)
Annex-5. Minutes of Discussions signed on 29th August 2014
Annex-6. Japan's Grant Aid
Annex-7. Flow Chart of Japan's Grant Aid Procedures
Annex-8. Major Undertakings to be taken by Each Government
Annex-9. Tentative schedule of the Project

Location of the Project Sites



Organization Structure of Ministry of Infrastructure (MININFRA)

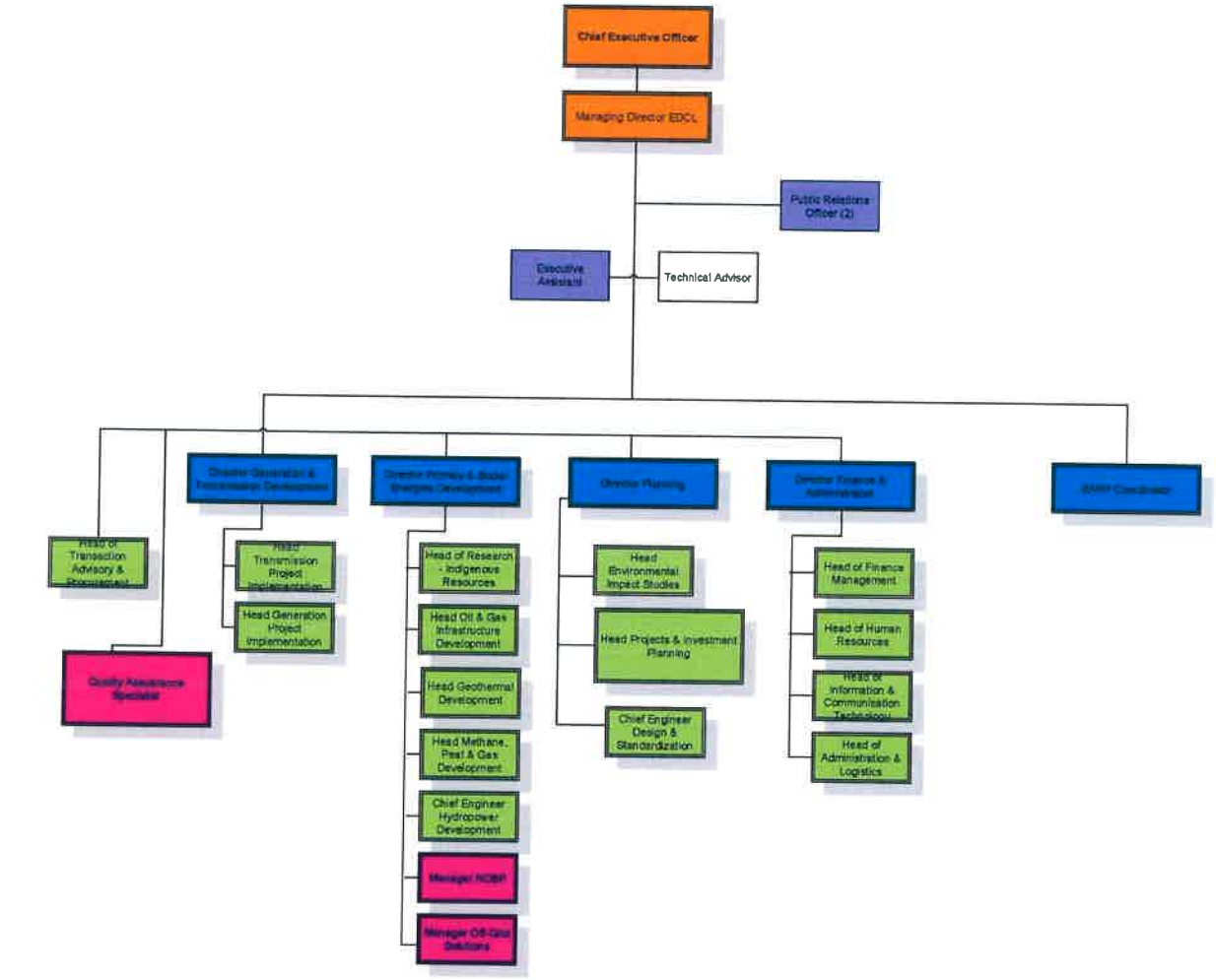


A4-6

Overall Structure of Rwanda Energy Group Ltd.

Organization Structure of Energy Development Corporation ltd.

EDCL Organisation Structure (November 2014) – ***High Level***



KEY

- MD
- Directors
- Senior Manager / Head of Units
- Manager
- Officer
- Support Staff
- Technicians

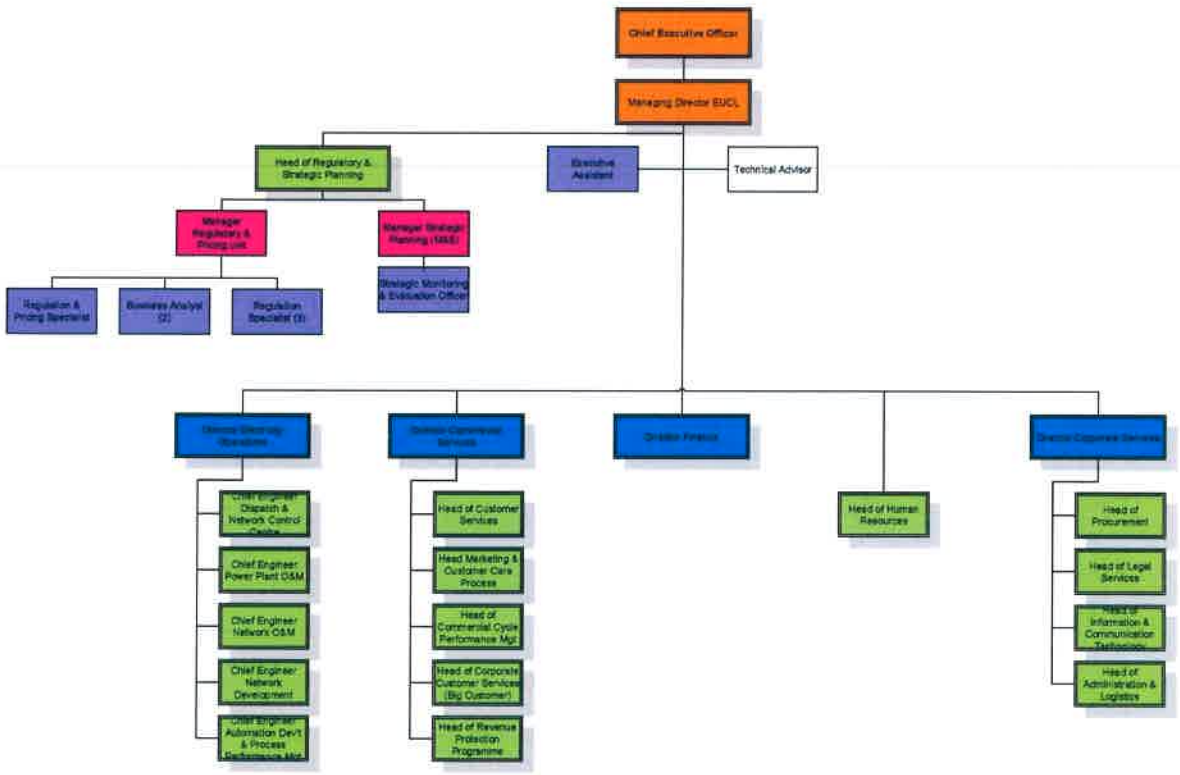
Summary

MD - 1	Manager - 1	Technicians - Nil
Senior Manager / Head of Units - 1	Officer - 3	Support Staff - Nil

Total Staff - 6

Organization Structure of Energy Utility Corporation ltd.

EUCL Organisation Structure (November 2014) – ***MD***



KEY

CEO / MD	Senior Manager / Head of Units	Officer
Directors	Manager	Support Staff

Summary

MD - 1	Senior Manager / Head of Units - 1	Officer - 8
Directors - Nil	Manager - 2	Support Staff - Nil

Total Staff - 12

Annex - 5

Minutes of Discussions on the Project for Improvement of Substations and Distribution Network Phase 2 in the Republic of Rwanda

In response to the request from the Government of the Republic of Rwanda (hereinafter referred to as "Rwanda"), Japan International Cooperation Agency (hereinafter referred to as "JICA"), in consultation with the Government of Japan, decided to conduct a Preparatory Survey (hereinafter referred to as "the Survey") on the Project for Improvement of Substations and Distribution Network Phase 2 (hereinafter referred to as "the Project").

Before conducting the Survey, JICA held discussions about the framework and appropriate components of the Project with the officials of Rwandan authorities concerned (hereinafter referred to as "the Rwandan side"). As a result of the discussions, both sides have confirmed the main items described in the sheets attached hereto.

Kigali, Rwanda
August 29th, 2014

Mr. HAYASHI Toshiyuki
JICA Senior Advisor
Japan International Cooperation Agency

Mr. RWAKUNDA Christian
Permanent Secretary
Ministry of Infrastructure

Mr. MUGIRANEZA Jean Bosco
Chief Executive Officer
Rwanda Energy Group Ltd.

RWANDA ENERGY GROUP LIMITED
CHIEF EXECUTIVE OFFICER

Mrs. MBABAZI Odette
Managing Director
Energy Utility Corporation Ltd.

ATTACHMENT

1. Objective of the Project

The objective of the Project is to reinforce transmission and distribution networks in Kigali.

2. Project Site

The Project sites based on the request from the Rwandan side are located in Kigali as shown in Annex-1.

3. Responsible and Implementing Organizations

(1) The responsible organization is Ministry of Infrastructure (MININFRA).
(2) The implementing organization is Rwanda Energy Group Co. Ltd. (REG) with its subsidiary company the Energy Utility Corporation Ltd. (EUCL).

4. Items Requested by Rwandan side

As a result of the discussions, requested components have been agreed as follows:

- Construction of Ndera primary substation including two sets of 25 MVA transformers (110/15 kV) and 110 kV in-coming transmission line from Gasogi substation to Ndera substation with two ring main units at Murindi and Kicukiro to complete the interconnection of 15 kV between Ndera and Gikondo substations.

JICA will assess the appropriateness and the priority of the requested components from the viewpoint of necessity and relevance as Japan's Grant Aid scheme, and will report the findings to the Government of Japan. The scope of the Project for the further analysis will be confirmed after consultation with the Government of Japan.

5. Japan's Grant Aid Scheme

(1) The Rwandan side has understood Japan's Grant Aid Scheme explained by JICA as described in Annex-2.
(2) The Rwandan side will take the necessary measures, as described in Annex-3, for smooth implementation of the Project.

6. The Preparatory Survey

Based on this Minutes of Discussions, JICA will send the Preparatory Survey Team for Basic Design to Rwanda subject to the approval of the Government of Japan.

7. Other Relevant Issues

(1) Coordination among relevant donors and agencies

JICA requested Rwandan side to ensure coordination among relevant development partners and agencies for smooth implementation of the Project.

(2) Environmental and Social Considerations

a) JICA requested Rwandan side to ensure access to the project site and undertake expropriation if necessary in order to secure the sites.
b) JICA requested Rwandan side to conduct the required environmental studies, and

obtain approval on environmental clearance for implementation of the Project.

c) Rwandan side agreed to comply with JICA Guidelines for Environmental and Social Considerations (hereinafter referred to as "JICA Guidelines") as well as Rwandan laws and regulations.

d) The Rwandan side agreed to make necessary arrangements with governmental organizations concerned in order to secure funding for and execution of the above environmental matters in a schedule as required for smooth execution of the Project.

(3) Counterpart Personnel

The JICA requested Rwandan side that necessary number of counterpart personnel shall be assigned to the preparatory survey team and necessary arrangements with related organizations shall be made in Rwanda. Rwandan side agreed the request.

(4) Operation and maintenance (O&M) of the facilities

As it is quite important that the implementing organization secures proper O&M of the facilities that may be provided under the Japanese Grant Aid Scheme, JICA requested Rwandan side to take the maximum efforts for proper maintenance.

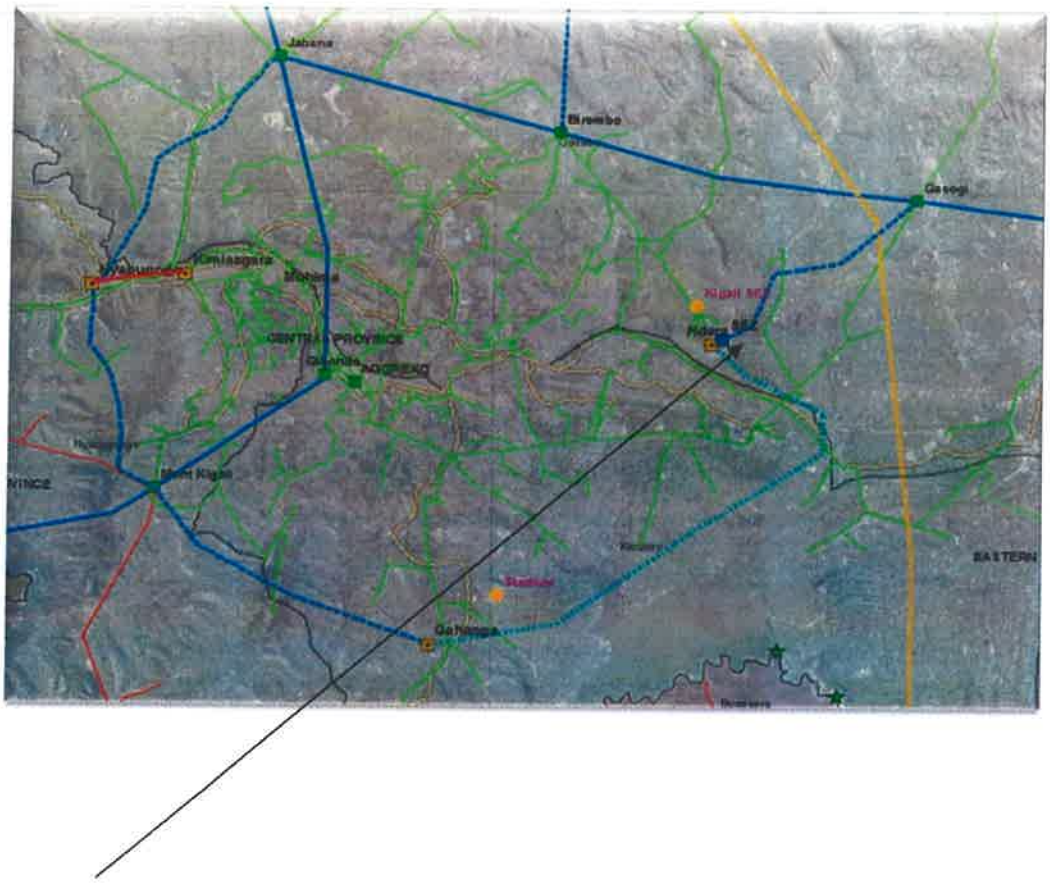
(End)

<List of Annex>

Annex-1	Location of the Requested Project Site
Annex-2	Japan's Grant Aid
Annex-3	Major Undertakings to be taken by Each Government

Annex - 1

LOCATION OF THE REQUESTED PROJECT SITES



Project Site: Ndera, Gasogi and the area between Ndera and Gasogi

JAPAN'S GRANT AID

The Government of Japan (hereinafter referred to as "the GOJ") is implementing the organizational reforms to improve the quality of ODA (Official Development Assistance) operations, and as a part of this realignment, a new JICA law was entered into effect on October 1, 2008. Based on the law and the decision of the Government of Japan (hereinafter referred to as "the GOJ"), JICA has become the executing agency of the Grant Aid for General Projects, for Fisheries and for Cultural Cooperation, etc.

The Grant Aid is non-reimbursable fund to a recipient country to procure the facilities, equipment and services (engineering services and transportation of the products, etc.) for economic and social development of the country under principles in accordance with the relevant laws and regulations of Japan. The Grant Aid is not supplied through the donation of materials as such.

1. Grant Aid Procedures

The Japanese Grant Aid is conducted as follows-

- Preparatory Survey (hereinafter referred to as "the Survey")
  - The Survey conducted by JICA
- Appraisal &Approval
  - Appraisal by The GOJ and JICA, and Approval by the Japanese Cabinet
- Determination of Implementation
  - The Notes exchanged between the GOJ and a recipient country
- Grant Agreement (hereinafter referred to as "the G/A")
  - Agreement concluded between JICA and a recipient country
- Implementation
  - Implementation of the Project on the basis of the G/A

2. Preparatory Survey

(1) Contents of the Survey

The aim of the Survey is to provide a basic document necessary for the appraisal of the Project by JICA and the GOJ. The contents of the Survey are as follows:

- Confirmation of the background, objectives, and benefits of the Project and also institutional capacity of agencies concerned of the recipient country necessary for the implementation of the Project.
- Evaluation of the appropriateness of the Project to be implemented under the Grant Aid Scheme from a technical, financial, social and economic point of view.
- Confirmation of items agreed on by both parties concerning the basic concept of the Project.
- Preparation of a basic design of the Project.
- Estimation of costs of the Project.

The contents of the original request by the recipient country are not necessarily approved in their initial form as the contents of the Grant Aid project. The Basic Design of the Project is confirmed considering the guidelines of the Japan's Grant Aid scheme.

JICA requests the Government of the recipient country to take whatever measures are necessary to ensure its self-reliance in the implementation of the Project. Such measures must be guaranteed even though they may fall outside of the jurisdiction of the organization in the recipient country actually implementing the Project. Therefore, the implementation of the Project is confirmed by all relevant organizations of the recipient country through the Minutes of Discussions.

(2) Selection of Consultants

For smooth implementation of the Survey, JICA uses (a) registered consulting firm(s). JICA selects (a) firm(s) based on proposals submitted by interested firms.

(3) Result of the Survey

The Report on the Survey is reviewed by JICA, and after the appropriateness of the Project is confirmed, JICA recommends the GOJ to appraise the implementation of the Project.

3. Japan's Grant Aid Scheme

(1) The E/N and the G/A

After the Project is approved by the Cabinet of Japan, the Exchange of Notes (hereinafter referred to as "the E/N") will be singed between the GOJ and the Government of the recipient country to make a plead for assistance, which is followed by the conclusion of the G/A between JICA and the Government of the recipient country to define the necessary articles to implement the Project, such as payment conditions, responsibilities of the Government of the recipient country, and procurement conditions.

(2) Selection of Consultants

The consultant firm(s) used for the Survey will be recommended by JICA to the recipient country to also work on the Project's implementation after the E/N and the G/A, in order to maintain technical consistency.

(3) Eligible source country

Under the Japanese Grant Aid, in principle, Japanese products and services including transport or those of the recipient country are to be purchased. When JICA and the Government of the recipient country or its designated authority deem it necessary, the Grant Aid may be used for the purchase of the products or services of a third country. However, the prime contractors, namely, constructing and procurement firms, and the prime consulting firm are limited to "Japanese nationals".

(4) Necessity of "Verification"

The Government of the recipient country or its designated authority will conclude contracts denominated in Japanese yen with Japanese nationals. Those contracts shall be verified by JICA. This "Verification" is deemed necessary to secure accountability to Japanese taxpayers.

(5) Major undertakings to be taken by the Government of the Recipient Country

In the implementation of the Grant Aid Project, the recipient country is required to undertake such necessary measures as Annex-3.

(6) "Proper Use"

The Government of the recipient country is required to maintain and use the facilities constructed and the equipment purchased under the Grant Aid properly and effectively and to assign staff necessary for this operation and maintenance as well as to bear all the expenses other than those covered by the Grant Aid.

(7) "Export and Re-export"

The products purchased under the Grant Aid should not be exported or re-exported from the recipient country.

(8) Banking Arrangements (B/A)

a) The Government of the recipient country or its designated authority should open

an account in the name of the Government of the recipient country in a bank in Japan (hereinafter referred to as "the Bank"). JICA will execute the Grant Aid by making payments in Japanese yen to cover the obligations incurred by the Government of the recipient country or its designated authority under the Verified Contracts.

b) The payments will be made when payment requests are presented by the Bank to JICA under an Authorization to Pay (A/P) issued by the Government of the recipient country or its designated authority.

(9) Authorization to Pay (A/P)

The Government of the recipient country should bear an advising commission of an Authorization to Pay and payment commissions to the Bank.

(10) Social and Environmental Considerations

A recipient country must ensure the social and environmental considerations for the Project and must follow the environmental regulation of the recipient country and JICA socio-environmental guideline.

(End)

Annex-3

Major Undertakings to be taken by Each Government

No.	Items	To be covered by Grant Aid	To be covered by Recipient Side
1	to secure lots of land necessary for the implementation of the Project and to clear the sites		●
2	To construct the following facilities		
	1) The building	●	
	2) The gates and fences in and around the site		●
	3) The parking lot	●	
	4) The road within the site	●	
	5) The road outside the site (including Access road)		●
3	To provide facilities for distribution of electricity, water supply and drainage and other incidental facilities necessary for the implementation of the Project outside the sites		
	1)Electricity		
	a. The distributing power line to the site		●
	b. The drop wiring and internal wiring within the site	●	
	c. The main circuit breaker and transformer	●	
	2) Water Supply		
	a. The city water distribution main to the site		●
	b. The supply system within the site (receiving and elevated tanks)	●	
	3) Drainage		
	a. The city drainage main (for storm sewer and others to the site)		●
	b. The drainage system (for toilet sewer, common waste, storm drainage and others) within the site	●	
	4) Gas Supply		
	a. The city gas main to the site		●
	b. The gas supply system within the site	●	
	5) Telephone System		
	a. The telephone trunk line to the main distribution frame/panel (MDF) of the building		●
	b. The MDF and the extension after the frame/panel	●	
	6) Furniture and Equipment		
	a. General furniture		●
	b. Project equipment	●	
4	To ensure prompt unloading and customs clearance of the products at ports of disembarkation in the recipient country and to assist internal transportation of the products		
	1) Marine (Air) transportation of the Products from Japan to the recipient country	●	
	2) Tax exemption and custom clearance of the Products at the port of disembarkation		●
	3) Internal transportation from the port of disembarkation to the project site	●	
5	To ensure that customs duties, internal taxes and other fiscal levies which may be imposed in the recipient country with respect to the purchase of the products and the services be exempted		●
6	To accord Japanese nationals whose services may be required in connection with the supply of the products and the services such facilities as may be necessary for their entry into the recipient country and stay therein for the performance of their work		●
7	To ensure that the Facilities and the products be maintained and used properly and effectively for the implementation of the Project		●
8	To bear all the expenses, other than those covered by the Grant, necessary for the implementation of the Project		●
9	To bear the following commissions paid to the Japanese bank for banking services based upon the B/A		
	1) Advising commission of A/P		●
	2) Payment commission		●
10	To give due environmental and social consideration in the implementation of the Project.		●

JAPAN'S GRANT AID

The Government of Japan (hereinafter referred to as "the GOJ") is implementing the organizational reforms to improve the quality of ODA operations, and as a part of this realignment, a new JICA law was entered into effect on October 1, 2008. Based on the law and the decision of the Government of Japan (hereinafter referred to as "the GOJ"), JICA has become the executing agency of the Grant Aid for General Projects, for Fisheries and for Cultural Cooperation, etc.

The Grant Aid is non-reimbursable fund to a recipient country to procure the facilities, equipment and services (engineering services and transportation of the products, etc.) for economic and social development of the country under principles in accordance with the relevant laws and regulations of Japan. The Grant Aid is not supplied through the donation of materials as such.

1. Grant Aid Procedures

The Japanese Grant Aid is conducted as follows-

- Preparatory Survey (hereinafter referred to as "the Survey")
  - The Survey conducted by JICA
- Appraisal &Approval
  - Appraisal by The GOJ and JICA, and Approval by the Japanese Cabinet
- Determination of Implementation
  - The Notes exchanged between the GOJ and a recipient country
- Grant Agreement (hereinafter referred to as "the G/A")
  - Agreement concluded between JICA and a recipient country
- Implementation
  - Implementation of the Project on the basis of the G/A

2. Preparatory Survey

(1) Contents of the Survey

The aim of the Survey is to provide a basic document necessary for the appraisal of the Project by JICA and the GOJ. The contents of the Survey are as follows:

- Confirmation of the background, objectives, and benefits of the Project and also institutional capacity of agencies concerned of the recipient country necessary for the implementation of the Project.
- Evaluation of the appropriateness of the Project to be implemented under the Grant Aid Scheme from a technical, financial, social and economic point of view.
- Confirmation of items agreed on by both parties concerning the basic concept of the Project.
- Preparation of a basic design of the Project.
- Estimation of costs of the Project.

The contents of the original request by the recipient country are not necessarily approved in their initial form as the contents of the Grant Aid project. The Basic Design of the Project is confirmed considering the guidelines of the Japan's Grant Aid scheme.

JICA requests the Government of the recipient country to take whatever measures are necessary to ensure its self-reliance in the implementation of the Project. Such measures must be guaranteed even though they may fall outside of the jurisdiction of the organization in the recipient country actually implementing the Project. Therefore, the implementation of the Project is confirmed by all relevant organizations of the recipient country through the Minutes of Discussions.

(2) Selection of Consultants

For smooth implementation of the Survey, JICA uses (a) registered consulting firm(s). JICA selects (a) firm(s) based on proposals submitted by interested firms.

(3) Result of the Survey

The Report on the Survey is reviewed by JICA, and after the appropriateness of the Project is confirmed, JICA recommends the GOJ to appraise the implementation of the Project.

3. Japan's Grant Aid Scheme

(1) The E/N and the G/A

After the Project is approved by the Cabinet of Japan, the Exchange of Notes (hereinafter referred to as "the E/N") will be singed between the GOJ and the Government of the recipient country to make a plead for assistance, which is followed by the conclusion of the G/A between JICA and the Government of the recipient country to define the necessary articles to implement the Project, such as payment conditions, responsibilities of the Government of the recipient country, and procurement conditions.

(2) Selection of Consultants

The consultant firm(s) used for the Survey will be recommended by JICA to the recipient country to also work on the Project's implementation after the E/N and the G/A, in order to maintain technical consistency.

(3) Eligible source country

Under the Japanese Grant Aid, in principle, Japanese products and services including transport or those of the recipient country are to be purchased. When JICA and the Government of the recipient country or its designated authority deem it necessary, the Grant Aid may be used for the purchase of the products or services of a third country. However, the prime contractors, namely, constructing and procurement firms, and the prime consulting firm are limited to "Japanese nationals".

(4) Necessity of "Verification"

The Government of the recipient country or its designated authority will conclude contracts denominated in Japanese yen with Japanese nationals. Those contracts shall be verified by JICA. This "Verification" is deemed necessary to secure accountability to Japanese taxpayers.

(5) Major undertakings to be taken by the Government of the Recipient Country

In the implementation of the Grant Aid Project, the recipient country is required to undertake such necessary measures as Annex-5.

(6) "Proper Use"

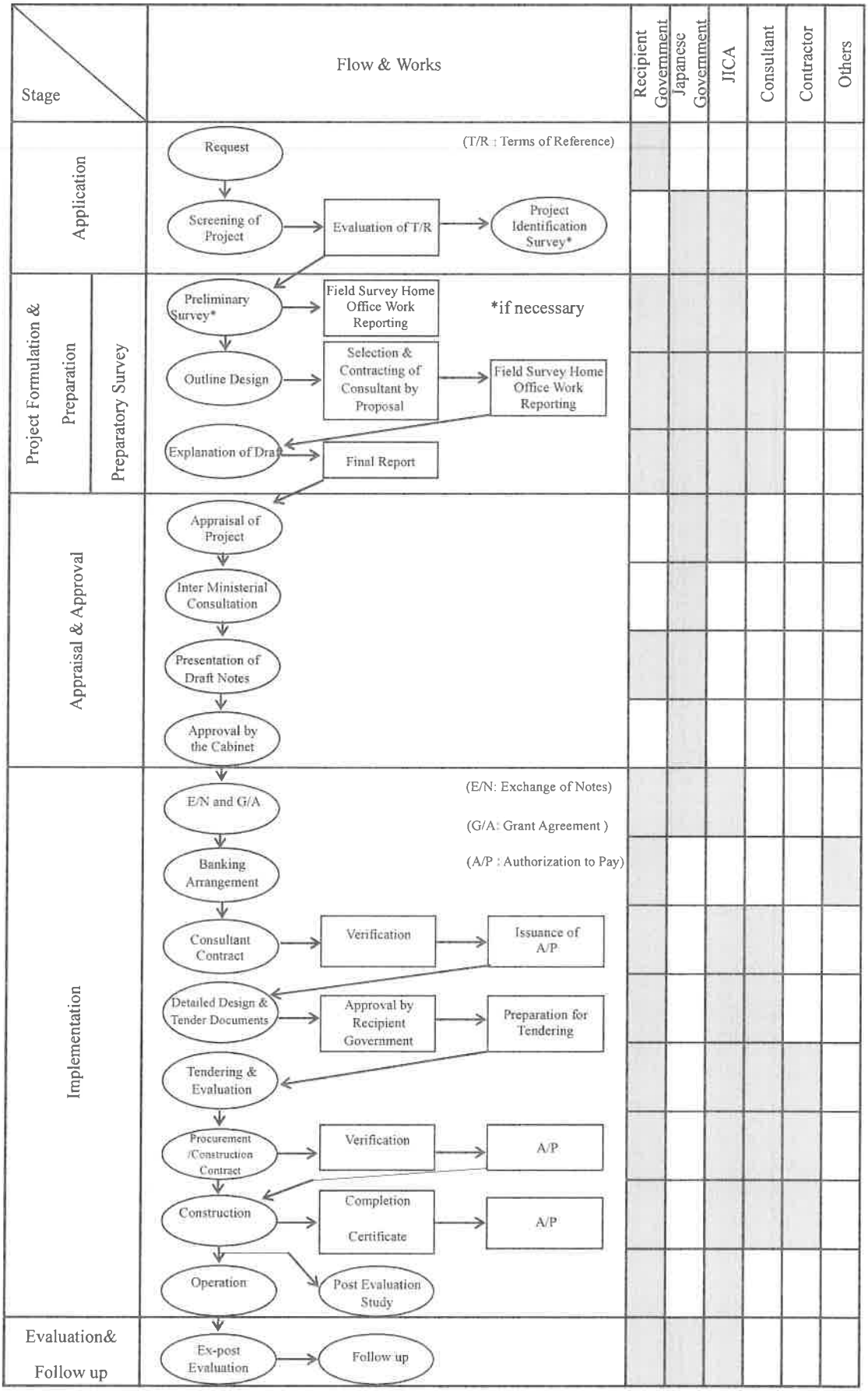
The Government of the recipient country is required to maintain and use the facilities constructed and the equipment purchased under the Grant Aid properly and effectively and to assign staff necessary for this operation and maintenance as well as to bear all the expenses other than those covered by the Grant Aid.

(7) "Export and Re-export"

The products purchased under the Grant Aid should not be exported or re-exported from the recipient country.

(8) Banking Arrangements (B/A)

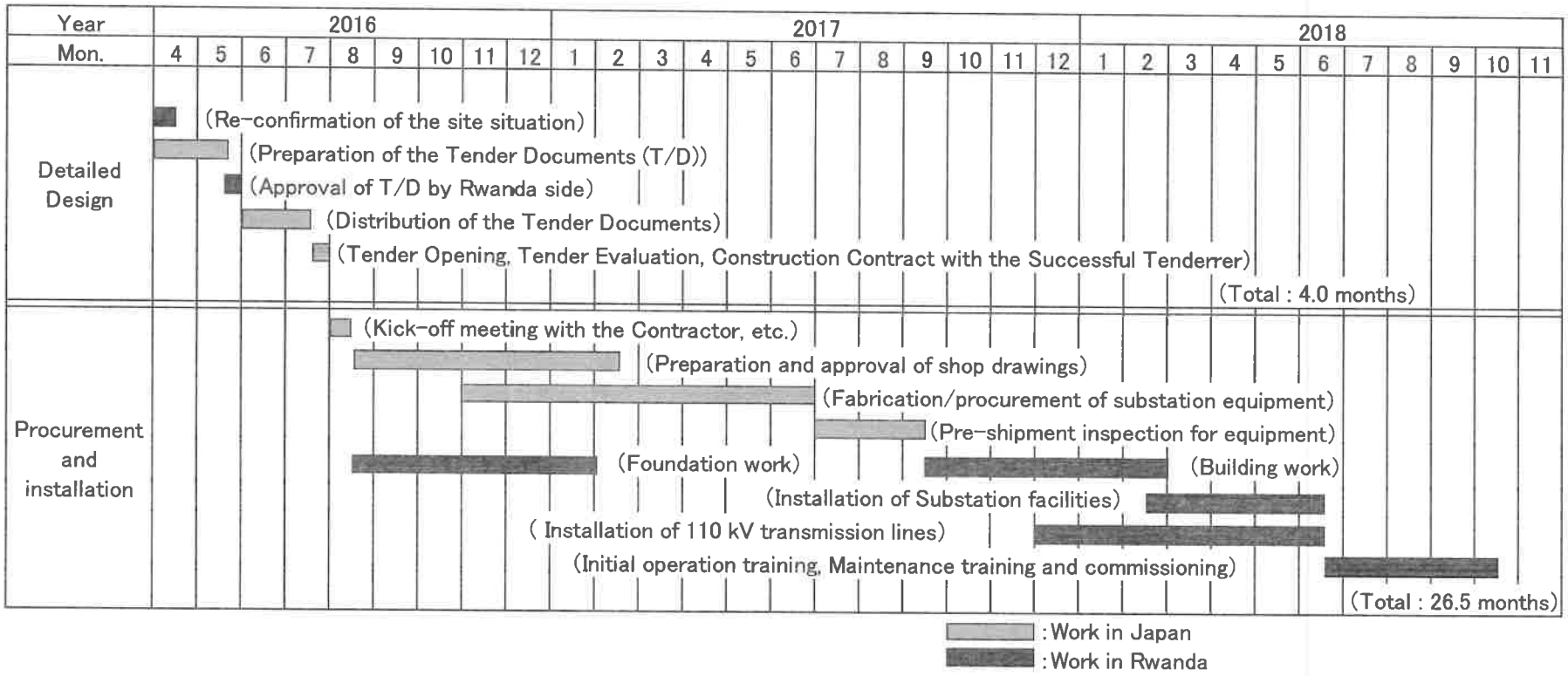
Flow Chart of Japan's Grant Aid Procedures



Major Undertakings to be taken by Each Government

No.	Items	To be covered by Grant Aid	To be covered by Recipient Side
1	to secure lots of land necessary for the implementation of the Project and to clear the sites;		●
2	To construct the following facilities		
	1) The building	●	
	2) The gates and fences in and around the site		●
	3) The parking lot	●	
	4) The road within the site	●	
	5) The road outside the site (including Access road)		●
3	To provide facilities for distribution of electricity, water supply and drainage and other incidental facilities necessary for the implementation of the Project outside the sites		
	1)Electricity		
	a. The distributing power line to the site		●
	b. The drop wiring and internal wiring within the site	●	
	c. The main circuit breaker and transformer	●	
	2) Water Supply		
	a. The city water distribution main to the site		●
	b. The supply system within the site (receiving and elevated tanks)	●	
	3) Drainage		
	a. The city drainage main (for storm sewer and others to the site)		●
	b. The drainage system (for toilet sewer, common waste, storm drainage and others) within the site	●	
	4) Gas Supply		
	a. The city gas main to the site		●
	b. The gas supply system within the site	●	
	5) Telephone System		
	a. The telephone trunk line to the main distribution frame/panel (MDF) of the building		●
	b. The MDF and the extension after the frame/panel	●	
	6) Furniture and Equipment		
	a. General furniture		●
	b. Project equipment	●	
4	To ensure prompt unloading and customs clearance of the products at ports of disembarkation in the recipient country and to assist internal transportation of the products		
	1) Marine (Air) transportation of the Products from Japan to the recipient country	●	
	2) Tax exemption and custom clearance of the Products at the port of disembarkation		●
	3) Internal transportation from the port of disembarkation to the project site	●	
5	To ensure that customs duties, internal taxes and other fiscal levies which may be imposed in the recipient country with respect to the purchase of the products and the services be exempted		●
6	To accord Japanese nationals whose services may be required in connection with the supply of the products and the services such facilities as may be necessary for their entry into the recipient country and stay therein for the performance of their work		●
7	To ensure that the Facilities and the products be maintained and used properly and effectively for the implementation of the Project		●
8	To bear all the expenses, other than those covered by the Grant, necessary for the implementation of the Project		●
9	To bear the following commissions paid to the Japanese bank for banking services based upon the B/A		
	1) Advising commission of A/P		●
	2) Payment commission		●
10	To give due environmental and social consideration in the implementation of the Project.		●

Tentative schedule of the Project



Minutes of Discussions
of
The Preparatory Survey
on
The Project for Improvement of Substations
and Distribution Network Phase 2
(Explanation on Draft Preparatory Survey Report)

On the basis of the discussions and field survey in the Republic of Rwanda from 8th March to 16th April 2015, and the subsequent technical examination of the results in Japan, the Japan International Cooperation Agency (hereinafter referred to as "JICA") prepared a draft Preparatory Survey Report on the Project for Improvement of Substations and Distribution Network Phase 2 (hereinafter referred to as "the Draft Report").

In order to explain the Draft Report and to consult with the concerned officials of the Government of Rwanda on its contents, JICA sent to Rwanda the Preparatory Survey Team for the explanation of the Draft Report (hereinafter referred to as "the Team"), headed by Mr. Toshiyuki HAYASHI, JICA Senior Advisor, and is scheduled to stay in the country from 8th to 13th November, 2015.

As the result of the discussions, both sides confirmed the main items described in the attached sheets.

Kigali, November 12th, 2015

Mr. Toshiyuki HAYASHI
Team Leader
JICA Senior Advisor,
Japan International Cooperation Agency

Mr. Christian RWAKUNDA
Permanent Secretary
Ministry of Infrastructure

Mr. Emmanuel KAMANZI
Managing Director
Energy Development Corporation Limited
Rwanda Energy Group

Ms. Odette MBABAZI
Managing Director
Energy Utility Corporation Limited
Rwanda Energy Group

ATTACHMENT

1 Objective of the Project

The objective of the Project is to improve stability and efficiency of power supply through strengthening substations, transmission lines and distribution lines, thereby contributing to economic growth of Rwanda.

2 Title of the Preparatory Survey

Both sides have confirmed the title of the Preparatory Survey as "the Preparatory Survey for the Project for Improvement of Substations and Distribution Network Phase 2".

3 Project Site

Both sides have confirmed that the sites of the Project are in Kigali City, and are shown in Annex 1.

4 Line Organization and Executing Agency

Both sides have confirmed the Line Organization and Executing Agency as follows:

4.1 The Line Organization is the Ministry of Infrastructure (hereinafter referred to as "MININFRA"), which would be the organization to supervise the Executing Agency.

4.2 The Executing Agency is Energy Development Corporation Limited (hereinafter referred to as "EDCL") in collaboration with Energy Utility Corporation Limited (hereinafter referred to as "EUCL"). The Executing Agency shall coordinate with all the relevant agencies, and ensure that the necessary undertakings are taken by the relevant agencies properly and on time for the smooth implementation of the Project. The organization charts of MININFRA, EDCL and EUCL are shown in Annex 2.

5 Contents of the Draft Report

After the explanation of the contents of the Draft Report by the Team, MININFRA, EDCL and EUCL (hereinafter referred to as " Rwanda side") have agreed in principle to its contents.

6 Cost Estimation (exclusive taxes)

Both sides have confirmed that the Project cost estimation described in the Draft Report was provisional and would be examined further by the Government of Japan for its final approval. Present cost estimation is shown in Annex 3.

7 Confidentiality of the Cost Estimation and Specifications

Both sides have confirmed that the Project cost estimation and technical specifications in the Draft Report should never be duplicated or disclosed to any third parties until all the contracts of the Project are concluded.

8 Japanese Grant Scheme

Rwanda side understands the Japanese Grant Scheme and its procedures as described in Annex 4 (Japanese Grant), Annex 5 (Flow Chart of Japanese Grant Procedures) and Annex 6 (Financial Flow of Japanese Grant), and the necessary measures to be taken by the Government of Rwanda.

9 Project Implementation Schedule

The Team explained to Rwanda side that the expected implementation schedule is as attached in Annex 7. The project completion is planned in 2018.

10 Expected outcomes and Indicators

Both sides have agreed that the key indicators for expected outcomes are as follows. Rwanda side has responsibility to monitor the progress of the indicators and achieve the target in year 2021.

10.1 Quantitative Description

Outcome Indicator	Base line in January 2015	Target in 2021	
		Without the Project	With the Project
Annual electric energy at sending end of Ndera substation (GWh)	N.A	N.A	65
Load factor of transformer in Gikondo Substation (%)	59	63 – 90	53 - 76
Power loss of transmission system in Kigali network (kW)	467	3,937	3,225

10.2 Narative Description

Power demand in Kigali area in base line period in January 2015 was 57 MW. The demand forecast at low case is 111 MW and high case is 158 MW in 2021 according to the "Final Report of the Project for Preparation of Electricity Development Plan for Sustainable Geothermal Energy Development in Rwanda March 2015 (Master Plan)." This project will enable EUCL to meet the demand increase in 2021 forecasted in the Master Plan; thus, increase the revenue from electricity sales for EUCL. As demand increases almost three times more than the base line period, power loss also increases as it is shown in Quantitative Description above. However, because of this project, power loss will be reduced by 712 kW.

11 Major Undertakings to be taken by Recipient Government

Both sides have confirmed that the Major Undertakings to be taken by Recipient Government are described in Annex 8. Rwanda side has assured to take the necessary measures and coordination including allocation of the necessary budget which is preconditions of the implementation of the Project. It has been further agreed that the costs are indicative, i.e. at Outline Design level. More accurate costs will be calculated at the Detailed Design stage. Contents of Annex 3 (Project Cost Estimation) will be updated as the Detailed Design progresses, and will finally be attached to the signed Grant Agreement.

12 Monitoring during the Implementation

The Project will be monitored every month by the executing agency by using the Project Monitoring Report (PMR) attached in Annex 9.

13 Ex-Post Evaluation

JICA will conduct ex-post evaluation three (3) years after the project completion with respect to five evaluation criteria (Relevance, Effectiveness, Efficiency, Impact, Sustainability) of the Project. The result of the evaluation will be publicized. Rwanda side will be required to provide necessary support for the evaluation.

14 Schedule of the Study

JICA will compile the Final Report of the Preparatory Survey in accordance with the confirmed items and send it to Rwanda side around March 2016.

15 Environmental and Social Consideration

15.1 Environmental Guidelines and Environmental Category

The JICA mission explained that 'JICA Guidelines for Environmental and Social Considerations (April 2010)' (hereinafter referred to as 'the Guidelines') is applicable for the Project. The Project is categorized as B because the Project is neither located in a sensitive area, nor has its sensitive characteristics, further nor falls into sensitive sectors under the Guidelines, and its potential adverse impacts on the environment are not likely to be significant.

15.2 Environmental Checklist

The environmental and social considerations including major impacts and mitigation measures for the Project are summarized in the Environmental Checklist attached as Annex 10. Both sides have confirmed that in case of major modification of the content of the Environmental Checklist, EDCL shall submit the modified version to JICA in a timely manner.

15.3 Environmental Issues

15.3.1 Environmental Impact Assessment (EIA)

Both sides have confirmed that the EIA report was approved by Rwanda Development Board in August 2015. Rwanda side has agreed on JICA's disclosure of provided EIA report on its website.

15.3.2 Environmental Management Plan and Environmental Monitoring Plan

Both sides have confirmed Environmental Management Plan (EMP) and Environmental Monitoring Plan (EMoP) of the Project are shown as Annex 11. Both sides have agreed that environmental mitigation measures and monitoring shall be conducted based on the EMP and EMoP, which may be updated during the detailed design stage.

15.4 Social Environment

15.4.1 Land Acquisition and Resettlement

Both sides have confirmed that the14,539.2m^2 of land would be acquired, 59 Households / 191 people would be affected, and 3 Households / 19 people would be relocated due to the implementation of the Project. Such land acquisition and resettlement shall be implemented based on the (Abbreviated) Resettlement Action Plan (RAP) prepared in line with JICA Guidelines, and the RAP was authorized by Rwanda side in August 2015.

15.5 Environmental and Social Monitoring

15.5.1 Environmental Monitoring

Both sides have agreed that EDCL will submit the results of environmental monitoring to JICA by using the monitoring form attached as Annex 11.

15.5.2 Social Monitoring

Both sides have confirmed that EDCL will implement social monitoring about land acquisition and resettlement proposed in the RAP. Rwanda side and the JICA mission have agreed that EDCL will submit results of social monitoring to JICA by using the monitoring form attached as Annex 12.

15.5.3 Information Disclosure of Monitoring Results

Both sides confirmed that Rwanda side will disclose results of environmental and social monitoring to local stakeholders in their field offices.

Rwanda side has agreed that JICA will disclose the results of the environmental and social monitoring submitted by EDCL using the monitoring forms attached in Annex 11 and Annex 12 on its website.

16 Other Relevant Issues

16.1 Project Owner and Supervision

Both sides have confirmed that EDCL is the project owner and responsible for the construction supervision. Both sides have also confirmed that EDCL and EUCL will utilize this project for the capacity development of their engineers, so that they would be able to increase their practical experience for future projects.

16.2 Operation and Maintenance of the Facilities

The Team explained the importance of operation and maintenance of the facilities constructed by the Project considering that proper asset management impacts greatly on life-span of the facilities and its maintenance cost. EUCL shall secure enough staff and budgets necessary for appropriate operation and maintenance of the facilities.

16.3 Cooperation among Relevant Organizations

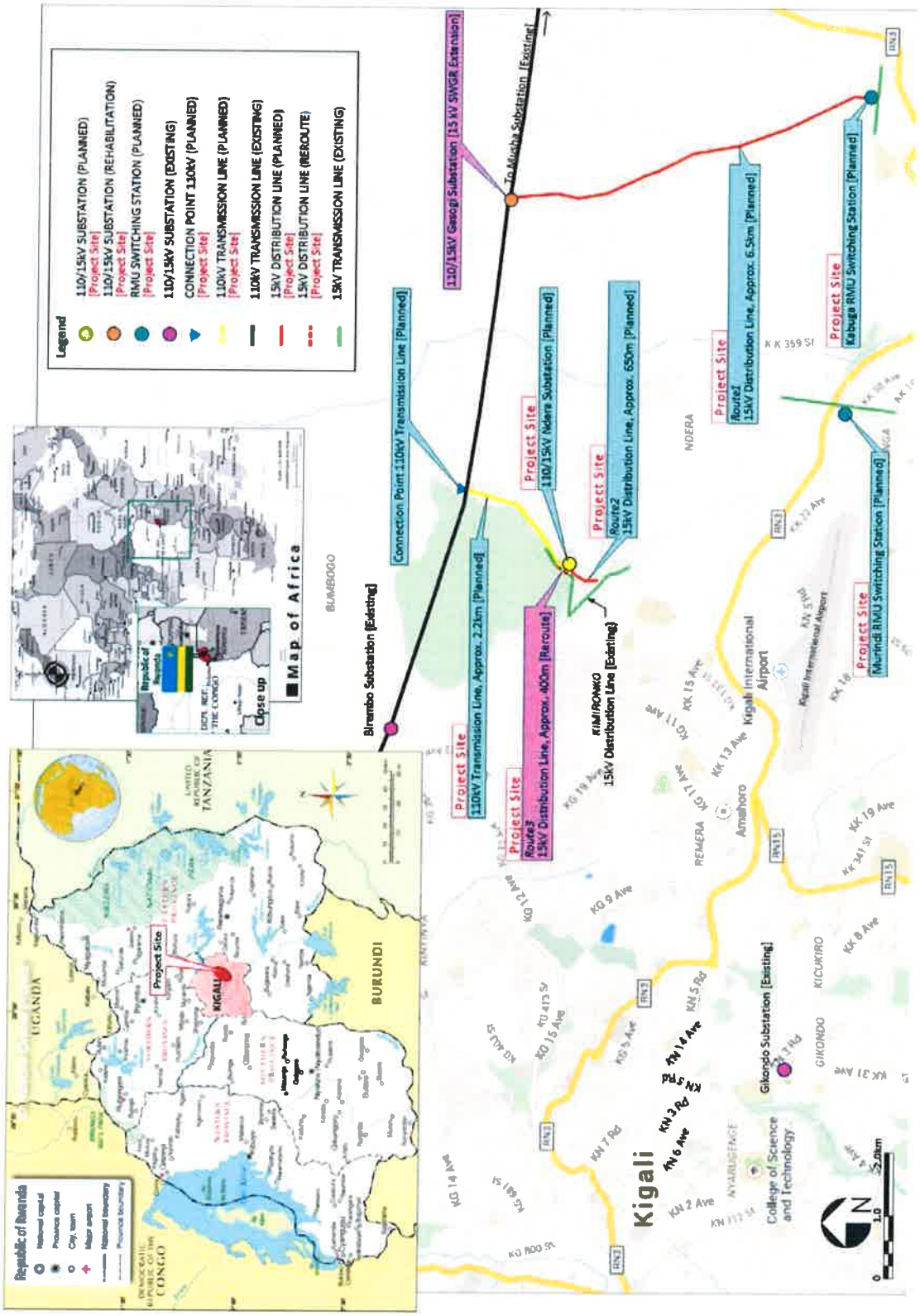
The Team requested Rwanda side to ensure coordination among relevant development partners and agencies for the smooth implementation of the Project. The Rwanda side has agreed to it.

16.4 Disclosure of Information

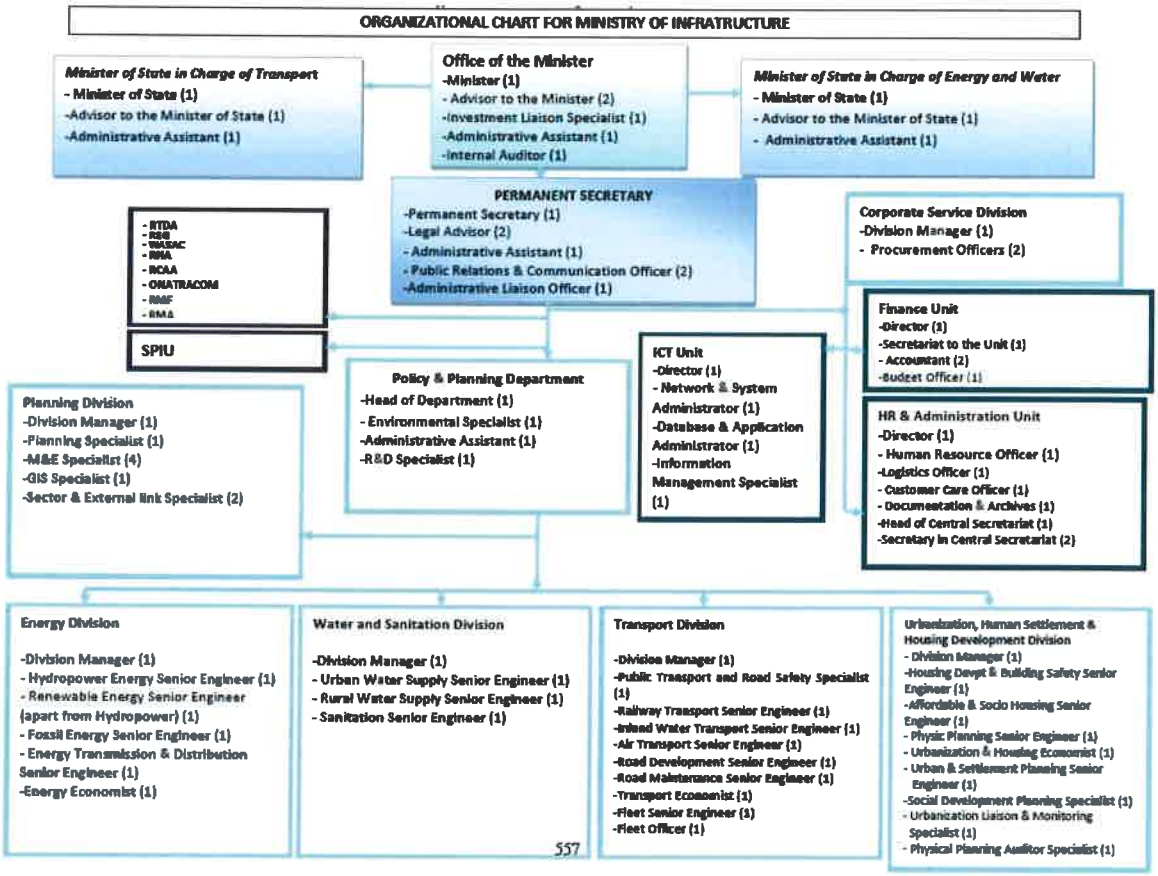
Both sides have confirmed that the study results excluding the Project cost will be disclosed to the public after completion of the Preparatory Survey. All the study results including the project cost will be disclosed to the public after all the contracts for the Project are concluded.

Annex 1

Project Site

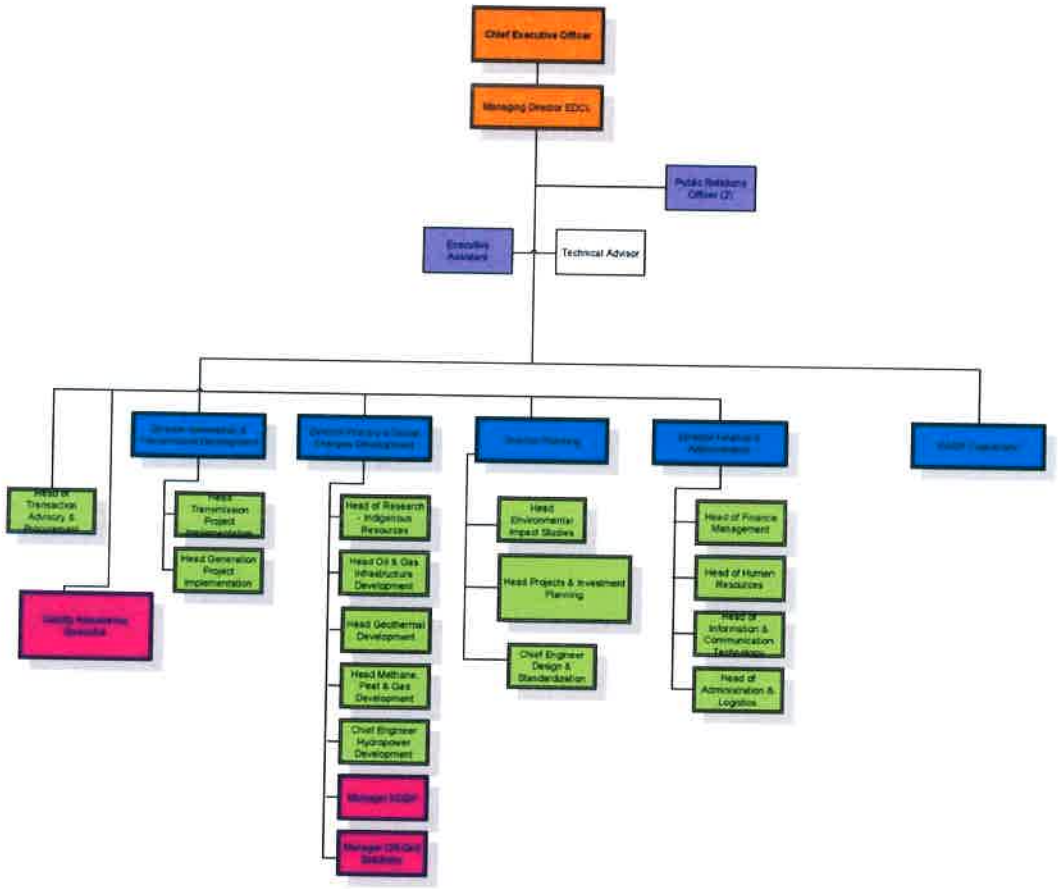


Organization Chart of MININFRA



Organization Chart of EDCL

EDCL Organisation Structure (November 2014) – ***High Level***



KEY

- MD
- Directors
- Senior Manager / Head of Units
- Manager
- Officer
- Support Staff
- Technicians

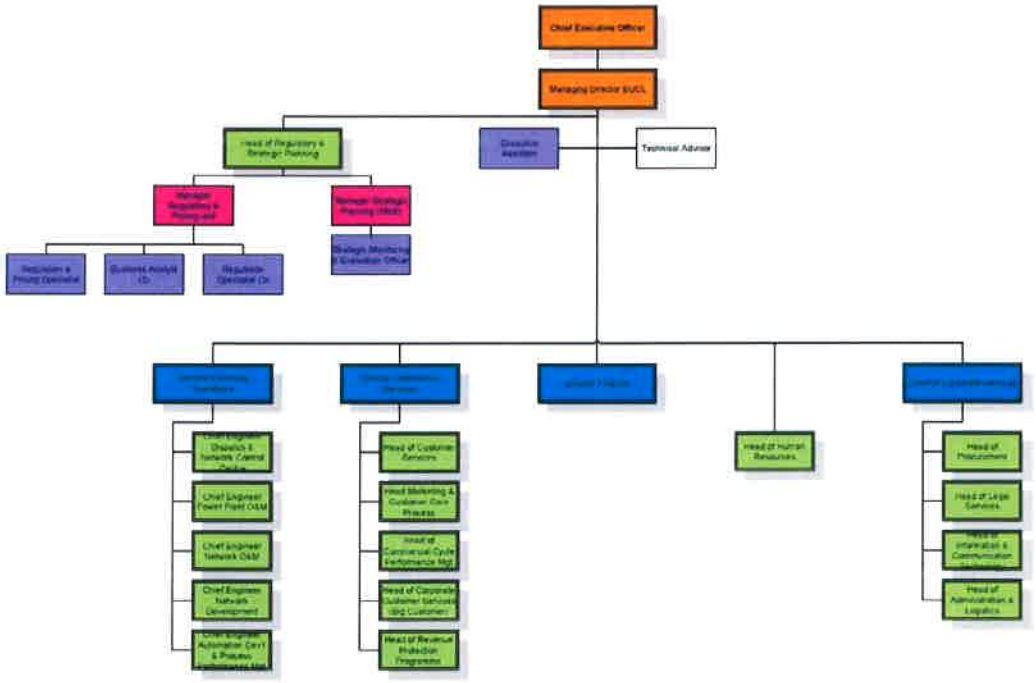
Summary

MD - 1	Manager - 1	Technicians - Nil
Senior Manager / Head of Units - 1	Officer - 3	Support Staff - Nil

Total Staff - 6

Organization Chart of EUCL

EUCL Organisation Structure (November 2014) – *MD*



KEY

CEO / MD
Directors
Senior Manager / Head of Units
Manager
Officer
Support Staff

Summary

MD - 1	Senior Manager / Head of Units - 1	Officer - 6
Directors - Nil	Manager - 2	Support Staff - Nil

Total Staff - 12

This page is closed due to the confidentiality.

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Japanese Grant

The Japanese Grant (hereinafter referred to as the "Grant") is non-reimbursable fund provided to a recipient country to procure the facilities, equipment and services (engineering services and transportation of the products, etc.) for its economic and social development in accordance with the relevant laws and regulations of Japan. The Grant is not supplied through the donation of materials as such.

Based on a JICA law which was entered into effect on October 1, 2008 and the decision of the GOJ, JICA has become the executing agency of the Japanese Grant for Projects for construction of facilities, purchase of equipment, etc.

1 Grant Procedures

The Grant is supplied through following procedures:

1.1 Preparatory Survey

The Survey conducted by JICA

1.2 Appraisal &Approval

Appraisal by the GOJ and JICA, and Approval by the Japanese Cabinet

1.3 Authority for Determining Implementation

The Notes exchanged between the GOJ and a recipient country

1.4 Grant Agreement (hereinafter referred to as "the G/A")

Agreement concluded between JICA and a recipient country

1.5 Implementation

Implementation of the Project on the basis of the G/A

2 Preparatory Survey

2.1 Contents of the Survey

The aim of the preparatory Survey is to provide a basic document necessary for the appraisal of the Project made by the GOJ and JICA. The contents of the Survey are as follows:

a. Confirmation of the background, objectives, and benefits of the Project and also institutional capacity of relevant agencies of the recipient country necessary for the implementation of the Project.
b. Evaluation of the appropriateness of the Project to be implemented under the Grant Scheme from a technical, financial, social and economic point of view.
c. Confirmation of items agreed between both parties concerning the basic concept of the Project.
d. Preparation of an outline design of the Project.
e. Estimation of costs of the Project.

The contents of the original request by the recipient country are not necessarily approved in their initial form as the contents of the Grant project. The Outline Design of the Project is confirmed based on the guidelines of the Japanese Grant scheme.

JICA requests the Government of the recipient country to take whatever measures necessary to achieve its self-reliance in the implementation of the Project. Such measures must be guaranteed even though they may fall outside of the jurisdiction of the organization of the recipient country which actually implements the Project. Therefore, the implementation of the Project is confirmed

by all relevant organizations of the recipient country based on the Minutes of Discussions.

2.2 Selection of Consultants

For smooth implementation of the Survey, JICA employs (a) consulting firm(s). JICA selects (a) firm(s) based on proposals submitted by interested firms.

2.3 Result of the Survey

JICA reviews the Report on the results of the Survey and recommends the GOJ to appraise the implementation of the Project after confirming the appropriateness of the Project.

3 Japanese Grant Scheme

3.1 The E/N and the G/A

After the Project is approved by the Cabinet of Japan, the Exchange of Notes(hereinafter referred to as "the E/N") will be signed between the GOJ and the Government of the recipient country to make a pledge for assistance, which is followed by the conclusion of the G/A between JICA and the Government of the recipient country to define the necessary articles, in accordance with the E/N, to implement the Project, such as payment conditions, responsibilities of the Government of the recipient country, and procurement conditions.

3.2 Selection of Consultants

In order to maintain technical consistency, the consulting firm(s) which conducted the Survey will be recommended by JICA to the recipient country to continue to work on the Project's implementation after the E/N and G/A.

3.3 Eligible source country

Under the Grant, in principle, Japanese products and services including transport or those of the recipient country are to be purchased. The Grant may be used for the purchase of the products or services of a third country, if necessary, taking into account the quality, competitiveness and economic rationality of products and services necessary for achieving the objective of the Project. However, the prime contractors, namely, constructing and procurement firms, and the prime consulting firm are limited to "Japanese nationals", in principle.

3.4 Necessity of "Verification"

The Government of the recipient country or its designated authority will conclude contracts denominated in Japanese yen with Japanese nationals, in principle. Those contracts shall be verified by JICA. This "Verification" is deemed necessary to fulfill accountability to Japanese taxpayers.

3.5 Major undertakings to be taken by the Government of the Recipient Country

In the implementation of the Grant Project, the recipient country is required to undertake such necessary measures. The Japanese Government requests the Government of the recipient country to exempt all customs duties, internal taxes and other fiscal levies such as VAT, commercial tax, income tax, corporate tax, resident tax, fuel tax, but not limited, which may be imposed in the recipient country with respect to the supply of the products and services under the verified contract, since the Grant fund comes from the Japanese taxpayers.

3.6 "Proper Use"

The Government of the recipient country is required to maintain and use properly and effectively the facilities constructed and the equipment purchased under the Grant, to assign staff necessary for this operation and maintenance and to bear all the expenses other than those covered by the Grant.

3.7 "Export and Re-export"

The products purchased under the Grant should not be exported or re-exported from the recipient country.

3.8 Banking Arrangements (B/A)

The Government of the recipient country or its designated authority should open an account under the name of the Government of the recipient country in a bank in Japan (hereinafter referred to as "the Bank"), in principle. JICA will execute the Grant by making payments in Japanese yen to cover the obligations incurred by the Government of the recipient country or its designated authority under the Verified Contracts.

The payments will be made when payment requests are presented by the Bank to JICA under an Authorization to Pay (A/P) issued by the Government of the recipient country or its designated authority.

3.9 Authorization to Pay (A/P)

The Government of the recipient country should bear an advising commission of an Authorization to Pay and payment commissions paid to the Bank.

3.10 Environmental and Social Considerations

The Government of the recipient country must carefully consider environmental and social impacts by the Project and must comply with the environmental regulations of the recipient country and JICA Guidelines for Environmental and Social Consideration (April, 2010) .

3.11 Monitoring

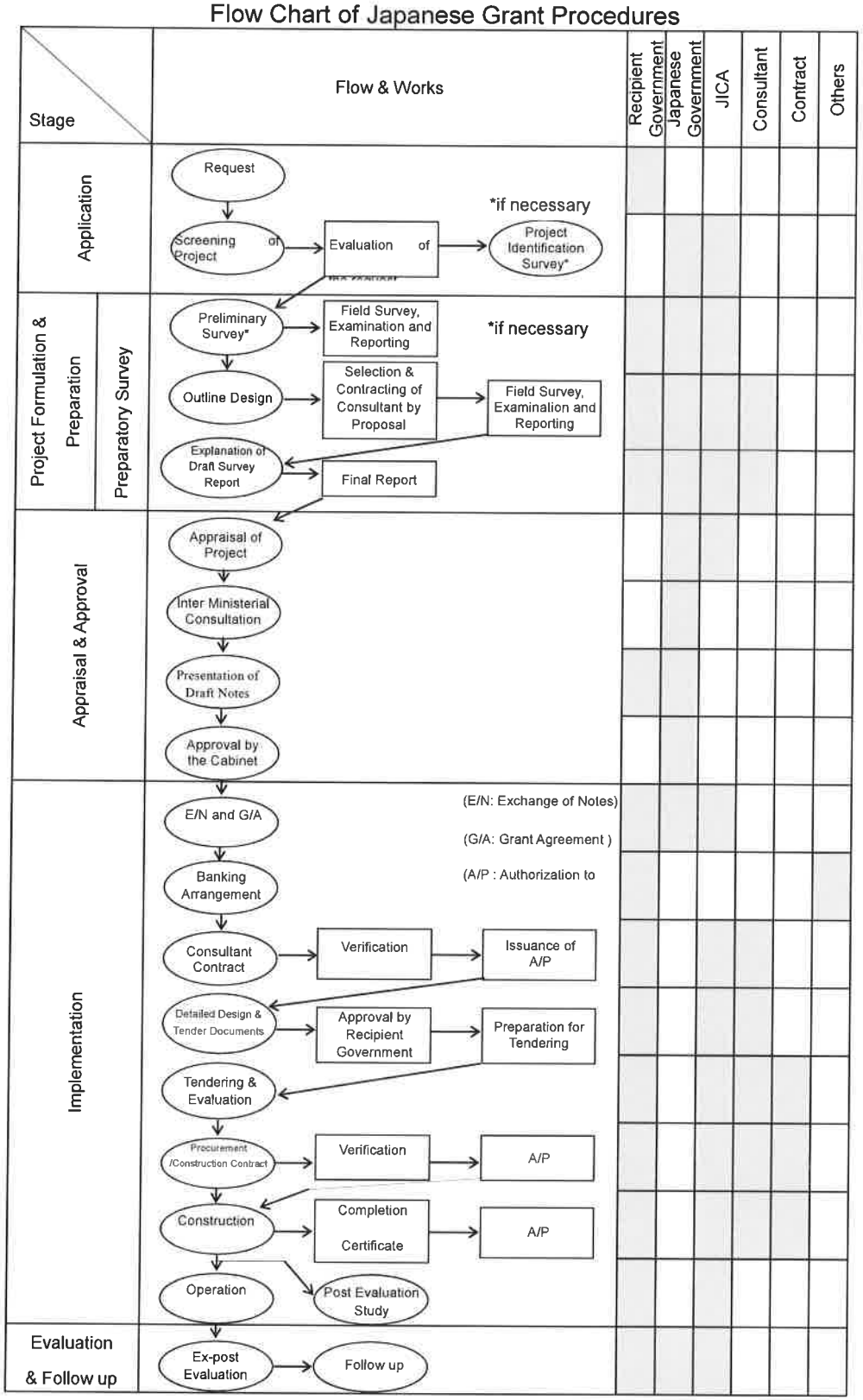
The Government of the recipient country must take their initiative to carefully monitor the progress of the Project in order to ensure its smooth implementation as part of their responsibility in the G/A, and must regularly report to JICA about its status by using the Project Monitoring Report (PMR).

3.12 Safety Measures

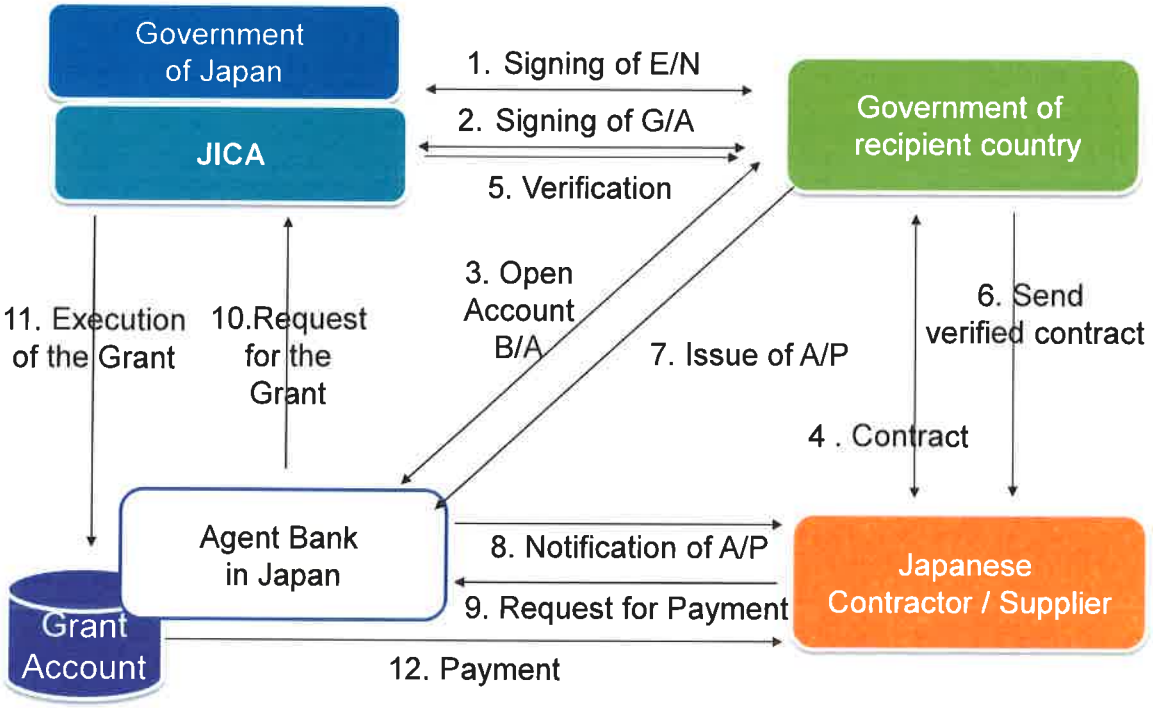
The Government of the recipient country must ensure that the safety is highly observed during the implementation of the Project.

Annex 5

Flow Chart of Japanese Grant Procedures

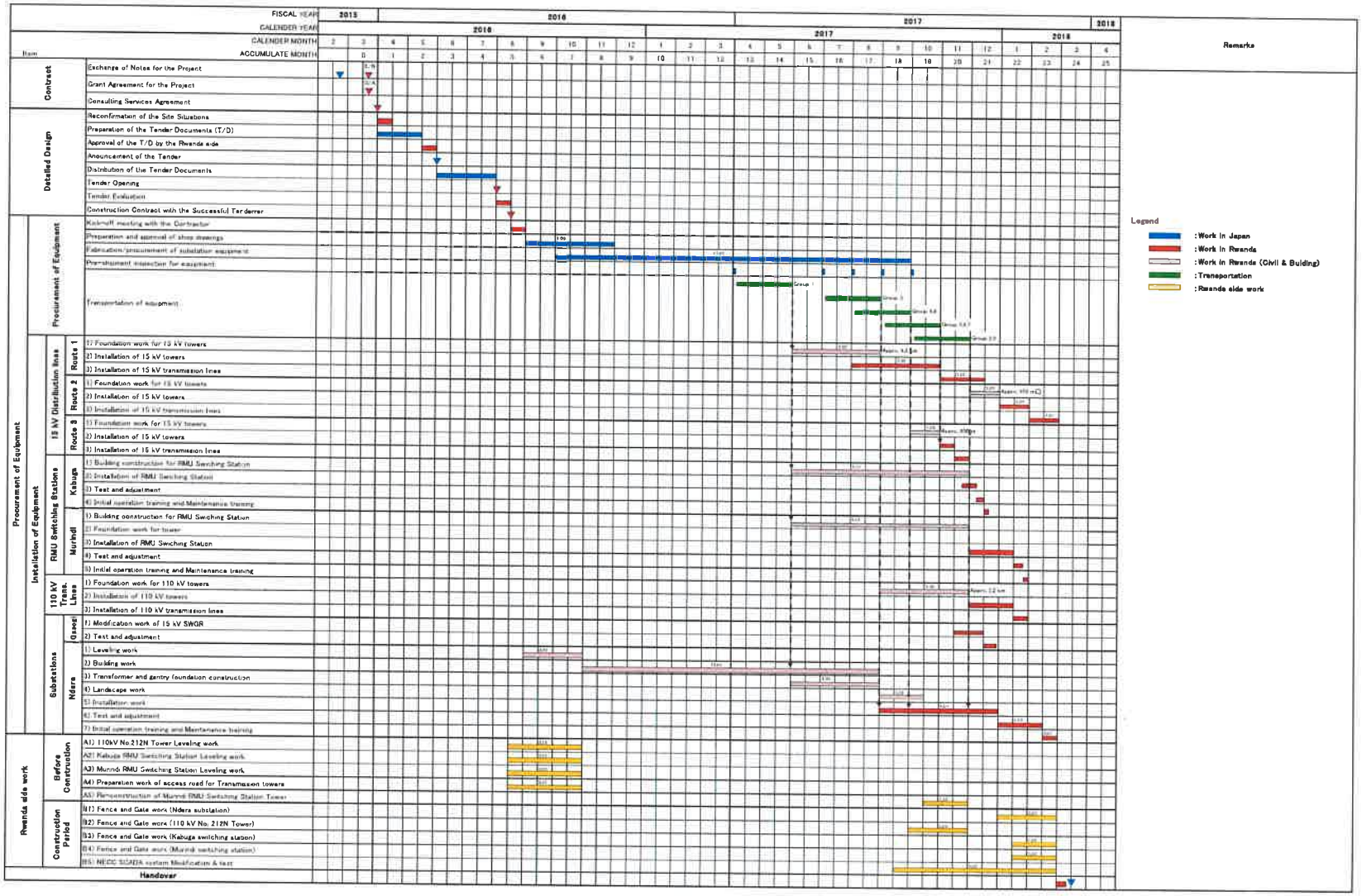


Financial Flow of Japanese Grant



Annex 7

Project Implementation Schedule



Annex 8

Major Undertakings to be taken by Recipient Government

1. Before the Tender

No	Items	Deadline	In charge	Cost (million USD)	Ref.
1	To open Bank Account (Banking Arrangement: B/A)	within 1 month after G/A	MINECOFIN	-	
2	To implement RAP	Before December 2015	EDCL	0.2	
3	To secure the following lands (1) For Ndera Substation (2) For Murindi RMU Switching Station (3) For Kabuga RMU Switching Station (4) For 110kV Transmission Line (2.2km) (5) For 110kV Connection Area (50mx50m) (6) For 15kV Distribution Line –Route 1 (6.5km) (7) For 15kV Distribution Line – Route 2 (650m) (8) For 15kV Distribution Line – Route 3 (400m) (9) For access road for constructing transmission and distribution lines	before notice of the tender document (T/D)	REG/ EDCL	1.0	
4	To obtain permission from related authorities such as road, water, air-port, etc., for construction of 110kV transmission and 15kV distribution lines	before notice of T/D	REG/ EDCL	-	
5	To clear, level and reclaim for Murindi RMU switching station	before notice of T/D	REG/ EDCL	-	

2. During the Project Implementation

No	Items	Deadline	In charge	Cost	Ref.
1	To bear the following commissions to a bank of Japan for the banking services based upon the B/A				
	1) Advising commission of A/P	every payment	EDCL	-	
	2) Payment commission for A/P	during the Project	EDCL	-	
2	To ensure prompt unloading and customs clearance of the products at the port of disembarkation in recipient country and assist internal transportation of the products (1) Tax exemption and customs clearance of the products at the port of disembarkation	during the Project	EDCL	-	
3	To accord Japanese nationals whose services may be requires in connection with the supply of the products and services such facilities as may be necessary for their entry into the recipient country and stay therein for the performance of their work	during the Project	EDCL	-	
4	To ensure that customs duties, internal taxes and other fiscal levies which may be imposed in the recipient country with respect to the purchase of the Products and the Services to be exempted	during the Project	EDCL	-	
5	To bear all the expenses, other than those to be borne by the Grant Aid, necessary for construction of the facilities as well as for the transportation and installation of the equipment	during the Project	EDCL	-	

No	Items	Deadline	In charge	Cost	Ref.
6	To construct for the project sites the following facilities (1) Gate and fences for Ndera S/S, Murindi & Kabuga RMU stations and 110kV connection area (2) The road outside the site, if necessary (3) Guard house, if necessary	during the Project	EDCL/ EUCL	-	
7	To prepare following incidental work for the New substation and RMU stations (1) Electricity: the distribution power line to the site (2) Water: the city water distribution main to the site	during the Project	EDCL/ EUCL	-	
8	To prepare measures necessary to obtain the following permits: - Permits for installation work - Permits to access to restricted areas	during the Project	EDCL	-	
9	To Secure temporary storage yard for materials and equipment	during the Project	EDCL	0.04	
10	To Secure access roads, wayleaves and usage permissions for construction of 110kV transmission and 15kV distribution lines	during the Project	EDCL	-	
11	To transfer existing underground cables and pipes, and obtain acquisition of related permits (electricity, telephone, water, sewerage, etc.)	during the Project	EDCL/ EUCL	-	
12	To obtain acquisition of permits for trans-road work	during the Project	EDCL	-	
13	To provide the places to dispose of surplus soil and waste water	during the Project	EDCL	-	
14	To dismantle the existing towers for 15 kV distribution nearby Ndera substation and existing 110kV T/L tower No. 212	during the Project	EDCL/ EUCL	0.003	
15	To expand the 15kV switchgear room and cable trench in existing Gasogi substation	during the Project	EDCL/ EUCL	-	
16	To modify communication facility at existing Gasogi substation for new optical fibre cables from Kabuga RMU switching station	during the Project	EDCL/ EUCL	-	
17	To extend and connect optical fibre cable to Murindi RMU switching station from existing SCADA network for new entry	during the Project	EDCL/ EUCL	0.27	
18	To modify SCADA system and Optical Network Management System in NECC (in Gikondo S/S) to accommodate the three new stations	during the Project	EDCL/ EUCL	0.55	
19	To procure and install LV power cable from distribution panel in each RMU switching stations to surrounding consumers	during the Project	EDCL/ EUCL	-	
20	To Secure the safety of persons concerned with the works under the Rwanda side at the project sites	during the Project	EDCL/ EUCL	-	
21	To do temporary dead-line work during the work (Response to and compensation for users of electricity in relation to outages inevitable for the work)	during the Project	EDCL/ EUCL	-	
22	Announcement of outage plans to users of electricity during the work	during the Project	EDCL/ EUCL	-	
23	To clear and level for 110kV connection area	during the Project	EDCL/ EUCL	-	
24	To monitor and supervise the implementation of Environmental Management Plan (EMP) and mitigation measures prepared through the environmental assessment and monitor environmental and social impacts caused by the	during the Project	EDCL	-	

No	Items	Deadline	In charge	Cost	Ref.
	Project with an adaptive management approach				
25	To provide general furniture for three new stations	Upon the completion of the facilities	EUCL	-	

3. After the Project

No	Items	Deadline	In charge	Cost	Ref.
1	To monitor environmental and social impacts during the operation with an adaptive management approach	After completion of the construction	EUCL	-	

*; The cost estimates are provisional. This is subject to the approval of the Government of Japan.

Project Monitoring Report
on
Project Name
Grant Agreement No. XXXXXXX

20XX, Month

Organization Information

Authority (Signer of the G/A)	_____ Person in Charge _____ (Division) _____ Contacts Address: _____ Phone/FAX: _____ Email: _____
Executing Agency	_____ Person in Charge _____ (Division) _____ Contacts Address: _____ Phone/FAX: _____ Email: _____
Line Agency	_____ Person in Charge _____ (Division) _____ Contacts Address: _____ Phone/FAX: _____ Email: _____

Outline of Grant Agreement:

Source of Finance	Government of Japan: Not exceeding JPY _____ mil. Government of (_____): _____
Project Title	
E/N	Signed date: Duration:
G/A	Signed date: Duration:

1: Project Description

1-1 Project Objective

1-2 Necessity and Priority of the Project

- Consistency with development policy, sector plan, national/regional development plans and demand of target group and the recipient country.

1-3 Effectiveness and the indicators

- Effectiveness by the project

Quantitative Effect (Operation and Effect indicators)		
Indicators	Original (Yr)	Target (Yr)
Qualitative Effect		

2: Project Implementation

2-1 Project Scope

Table 2-1-1a: Comparison of Original and Actual Location

Location	**Original:** *(M/D)* **Attachment(s):Map**	**Actual:** *(PMR)* **Attachment(s):Map**

Table 2-1-1b: Comparison of Original and Actual Scope

Items	Original	Actual
(M/D) 'Soft component' shall be included in 'Items'.	*(M/D)*	*(PMR)* Please state not only th e most updated schedul e but also other past re visions chronologically. All change of design shal l be recorded regardless of its degree.

2-1-2 Reason(s) for the modification if there have been any.

(PMR)

2-2 Implementation Schedule
2-2-1 Implementation Schedule

Table 2-2-1: Comparison of Original and Actual Schedule

Items	Original		Actual
	DOD	G/A	
【M/D】 'Soft component' shall be stated in the column of 'Items'. Project Completion Date*	*(M/D)*		*(PMR)* As of (Date of Revision) Please state not only the most updated schedule but also other past revisions chronologically.

*Project Completion was defined as _____ at the time of G/A.

2-2-2 Reasons for any changes of the schedule, and their effects on the project.

2-3 Undertakings by each Government
2-3-1 Major Undertakings
See Attachment 2.

2-3-2 Activities
See Attachment 3.

2-3-3 Report on RD
See Attachment 4.

2-4 Project Cost
2-4-1 Project Cost

Table 2-4-1a Comparison of Original and Actual Cost by the Government of Japan
(Confidential until the Tender)

Items			Cost (Million Yen)	
	Original	Actual	Original	Actual
Construction Facilities (or Equipment)	'Soft component' shall be included in 'Items'.			Please state not only the most updated schedule but also other past revisions chronologically.
Consulting Services	- Detailed design -Procurement Management -Construction Supervision			
Total				

Note: 1) Date of estimation:
2) Exchange rate: 1 US Dollar = Yen

Table 2-4-1b Comparison of Original and Actual Cost by the Government of XX

Items			Cost (Million USD)	
	Original	Actual	Original	Actual
				Please state not only the most updated schedule but also other past revisions chronologically.
Total				

Note: 1) Date of estimation:
2) Exchange rate: 1 US Dollar = (local currency)

2-4-2 Reason(s) for the wide gap between the original and actual, if there have been any, the remedies you have taken, and their results.

(PMR)

2-5 Organizations for Implementation

2-5-1 Executing Agency:

- Organization's role, financial position, capacity, cost recovery etc,
- Organization Chart including the unit in charge of the implementation and number of employees.

Original: *(M/D)*

Actual, if changed: *(PMR)*

2-6 Environmental and Social Impacts

- The results of environmental monitoring as attached in Attachment 5 in accordance with Schedule 4 of the Grant Agreement.
- The results of social monitoring as attached in Attachment 5 in accordance with Schedule 4 of the Grant Agreement.
- Information on the disclosed results of environmental and social monitoring to local stakeholders, whenever applicable.

3: Operation and Maintenance (O&M)

3-1 O&M and Management

- Organization chart of O&M
- Operational and maintenance system (structure and the number ,qualification and skill of staff or other conditions necessary to maintain the outputs and benefits of the project soundly, such as manuals, facilities and equipment for maintenance, and spare part stocks etc)

Original: *(M/D)*
Actual: *(PMR)*

3-2 O&M Cost and Budget

- The actual annual O&M cost for the duration of the project up to today, as well as the annual O&M budget.

Original: *(M/D)*

4: Precautions (Risk Management)

- Risks and issues, if any, which may affect the project implementation, outcome, sustainability and planned countermeasures to be adapted are below.

Original Issues and Countermeasure(s): *(M/D)*	
Potential Project Risks	Assessment
1.	Probability: H/M/L
(Description of Risk)	Impact: H/M/L
	Analysis of Probability and Impact:

	Mitigation Measures:
	Action during the Implementation:
	Contingency Plan (if applicable):
2.	Probability: H/M/L
(Description of Risk)	Impact: H/M/L
	Analysis of Probability and Impact:
	Mitigation Measures:
	Action during the Implementation:
	Contingency Plan (if applicable):
3.	Probability: H/M/L
(Description of Risk)	Impact: H/M/L
	Analysis of Probability and Impact:
	Mitigation Measures:
	Action during the Implementation:
	Contingency Plan (if applicable):
Actual issues and Countermeasure(s)	
(PMR)	

5: Evaluation at Project Completion and Monitoring Plan

5-1 Overall evaluation

Please describe your overall evaluation on the project.

5-2 Lessons Learnt and Recommendations

Please raise any lessons learned from the project experience, which might be valuable for the future assistance or similar type of projects, as well as any recommendations, which might be beneficial for better realization of the project effect, impact and

assurance of sustainability.

5-3 Monitoring Plan for the Indicators for Post-Evaluation

Please describe monitoring methods, section(s)/department(s) in charge of monitoring, frequency, the term to monitor the indicators stipulated in 1-3.

Attachment

1. Project Location Map
2. Undertakings to be taken by each Government
3. Monthly Report
4. Report on RD
5. Environmental Monitoring Form / Social Monitoring Form
6. Monitoring sheet on price of specified materials (Quarterly)
7. Report on Proportion of Procurement (Recipient Country, Japan and Third Countries) (Final Report Only)

Monitoring sheet on price of specified materials

1. Initial Conditions (Confirmed)

	Items of Specified Materials	Initial Volume A	Initial Unit Price (¥) B	Initial total Price C=A×B	1% of Contract Price D	Condition of payment	
						Price (Decreased) E=C−D	Price (Increased) F=C+D
1	Item 1	●●t	●	●	●	●	●
2	Item 2	●●t	●	●	●		
3	Item 3						
4	Item 4						
5	Item 5						

2. Monitoring of the Unit Price of Specified Materials

(1) Method of Monitoring : ●●

(2) Result of the Monitoring Survey on Unit Price for each specified materials

	Items of Specified Materials	1st ●month, 2015	2nd ●month, 2015	3rd ●month, 2015	4th	5th	6th
1	Item 1						
2	Item 2						
3	Item 3						
4	Item 4						
5	Item 5						

(3) Summary of Discussion with Contractor (if necessary)

-
-
-

Report on Proportion of Procurement (Recipient Country, Japan and Third Countries)
(Actual Expenditure by Construction and Equipment each)

	Domestic Procurement (Recipient Country) A	Foreign Procurement (Japan) B	Foreign Procurement (Third Countries) C	Total D
Construction Cost	(A/D%)	(B/D%)	(C/D%)	
Direct Construction Cost	(A/D%)	(B/D%)	(C/D%)	
others	(A/D%)	(B/D%)	(C/D%)	
Equipment Cost	(A/D%)	(B/D%)	(C/D%)	
Design and Supervision Cost	(A/D%)	(B/D%)	(C/D%)	
Total	(A/D%)	(B/D%)	(C/D%)	

Environmental Check List

Category	Environmental Item	Main Check Items	Yes: Y No: N	Confirmation of Environmental Considerations (Reasons, Mitigation Measures)
1 Permits and Explanation	(1) EIA and Environmental Permits	(a) Have EIA reports been already prepared in official process? (b) Have EIA reports been approved by authorities of the host country's government? (c) Have EIA reports been unconditionally approved? If conditions are imposed on the approval of EIA reports, are the conditions satisfied? (d) In addition to the above approvals, have other required environmental permits been obtained from the appropriate regulatory authorities of the host country's government?	(a) Y (b) (c) (d)	(a)-(c) The EIA report has been already approved on 25 Aug. 2015. Conditions are general issues concerning the construction works and they are already addressed in the EIA report with mitigation measures and monitoring plan. (d) No additional approval is required.
	(2) Explanation to the Local Stakeholders	(a) Have contents of the project and the potential impacts been adequately explained to the Local stakeholders based on appropriate procedures, including information disclosure? Is understanding obtained from the Local stakeholders? (b) Have the comment from the stakeholders (such as local residents) been reflected to the project design?	(a)Y (b) Y	(a)Stakeholder meetings are held at least twice at Sector level during EIA/ARAP study. PAPs who could not attend the meetings were contacted individually. For absent PAPs, EDCL continues to attempt to contact with them. (b)Main comments raised during meetings are concerning compensation for loss and employment opportunities during construction, and they are addressed in ARAP.
	(3) Examination of Alternatives	(a) Have alternative plans of the project been examined with social and environmental considerations?	(a) Y	(a) Alternative plans, including no-project option are examined. Different routes for transmission lines and distribution lines, and locations of the Ndera substation and two RMUs were examined. There is no major difference in terms of impacts on natural environment among alternatives; however, the present project is most preferable in terms of lower impacts on social and economic aspects.
2 Pollution Control	(1) Water Quality	(a) Is there any possibility that soil runoff from the bare lands resulting from earthmoving activities, such as cutting and filling will cause water quality degradation in downstream water areas? If the water quality degradation is anticipated, are adequate measures considered?	(a) N	(a) There are no rivers or water areas around the project sites.
3 Natural Environment	(1) Protected Areas	(a) Is the project site located in protected areas designated by the country's laws or international treaties and conventions? Is there a possibility that the project will affect the protected areas?	(a)N	(a) The Project site is within Kigali City and there is no protected area nearby. The Project will not affect the protected area.
	(2) Ecosystem	(a) Does the project site encompass primeval forests, tropical rain forests, ecologically valuable habitats (e.g., coral reefs, mangroves, or tidal flats)? (b) Does the project site encompass the protected habitats of endangered species	(a)N (b)N (c) N (d)N (e)N (f)N	(a) There is no forested area near the project site. (b) There is no protected habitat of endangered species. (c) No significant ecological impact is anticipated.

Category	Environmental Item	Main Check Items	Yes: Y No: N	Confirmation of Environmental Considerations (Reasons, Mitigation Measures)
		designated by the country's laws or international treaties and conventions? (c) If significant ecological impacts are anticipated, are adequate protection measures taken to reduce the impacts on the ecosystem? (d) Are adequate measures taken to prevent disruption of migration routes and habitat fragmentation of wildlife and livestock? (e) Is there any possibility that the project will cause the negative impacts, such as destruction of forest, poaching, desertification, reduction in wetland areas, and disturbance of ecosystem due to introduction of exotic (non-native invasive) species and pests? Are adequate measures for preventing such impacts considered? (f) In cases where the project site is located in undeveloped areas, is there any possibility that the new development will result in extensive loss of natural environments?		(d) No significant impacts are expected on habitat fragmentation and migration routes. (e) There is no such possibility as there is no important ecosystem near the project site. The project will not introduce non-native invasive species or pests. (f)The project site is within Kigali city, which is already developed.
3 Natural Environment	(3) Topography and Geology	(a) Is there any soft ground on the route of power transmission and distribution lines that may cause slope failures or landslides? Are adequate measures considered to prevent slope failures or landslides, where needed? (b) Is there any possibility that civil works, such as cutting and filling will cause slope failures or landslides? Are adequate measures considered to prevent slope failures or landslides? (c) Is there a possibility that soil runoff will result from cut and fill areas, waste soil disposal sites, and borrow sites? Are adequate measures taken to prevent soil runoff?	(a)N (b)Y (c)Y	(a)The study confirmed that there was hard soil at 2m below the surface. For the structure bases, the top soft soil will be removed and the hard soil will be directly used as bases. .(b)-(c)The site for Ndera Substation requires land preparation, by cutting soil from the north side and filling to the south side of the land. The slope is gentle and will not cause landslides. To avoid soil runoff, the rain gutter will be created the top and bottom of the slope. There will be no soil waste to cause soil run off.
4 Social Environment	(1) Resettlement	(a) Is involuntary resettlement caused by project implementation? If involuntary resettlement is caused, are efforts made to minimize the impacts caused by the resettlement? (b) Is adequate explanation on compensation and resettlement assistance given to affected people prior to resettlement? (c) Is the resettlement plan, including compensation with full replacement costs, restoration of livelihoods and living standards developed based on socioeconomic studies on resettlement? (d) Are the compensations going to be paid prior to the resettlement? (e) Are the compensation policies prepared in document? (f) Does the resettlement plan pay particular attention to vulnerable groups or people,	(a) Y (b) Y (c) Y (d) Y (e) Y (f) Y (g) Y (h) Y (i) Y (j) Y	(a) A small scale resettlement (59PAHs with 191PAPs) due to the loss of land, structures, crops and trees is triggered. Only 3 households need to relocate. To minimize the impact, the project site selection avoids areas with many houses and the smaller bases for towers are selected. (b) Stakeholder meetings as well as individual consultations were held to explain project brief and locations, calculation method for compensations/restoration measure (priority employment of PAPs) in local language and they will be continued during implementation. (c)Census survey and inventory of assets to be lost is conducted on all PAPs. The resettlement plan is including

Category	Environmental Item	Main Check Items	Yes: Y No: N	Confirmation of Environmental Considerations (Reasons, Mitigation Measures)
		including women, children, the elderly, and people below the poverty line, ethnic minorities, and indigenous peoples? (g) Are agreements with the affected people obtained prior to resettlement? (h) Is the organizational framework established to properly implement resettlement? Are the capacity and budget secured to implement the plan? (i) Are any plans developed to monitor the impacts of resettlement? (j) Is the grievance redress mechanism established?		compensation with full replacement costs, restoration of livelihoods and living standards by temporary employment considering the suspension of agricultural activities during the construction. (d) The compensation will be paid prior to the resettlement. It is also stipulated in the laws of Rwanda. (e) An Abbreviated Resettlement Action Plan was prepared in accordance with JICA Guidelines and World Bank safeguard policies. (f) The PAHs of this project does not include the households headed by the vulnerable groups. Female household heads are simply the owners of assets and they are not widows or single mothers. For the employment during construction, female PAPs will be provided with equal opportunities. (g) As of now, there are 4 absent PAPs who lives away and have not been contacted and 8 PAPs who have not reached consensus. Efforts will be continuously made to contact or build consensus before implementation of resettlement. Failing, the process will be carried out in accordance with the law of Rwanda. However the grievance redress mechanism will remain in case these PAPs have complaints. (h) The organizational framework was established and EDCL will play the major role for implementation. EDCL has experience in implementing other RAPs and is responsible for securing the fund. (i) Monitoring is carried out monthly. The plan is included in ARAP. (j) The Grievance redress mechanism is established based on locally practiced conflict resolution method at community level and legal practice.
	(2) Living and Livelihood	(a) Is there a possibility that the project will adversely affect the living conditions of inhabitants? Are adequate measures considered to reduce the impacts, if necessary? (b) Is there a possibility that diseases, including infectious diseases, such as HIV will be brought due to immigration of workers associated with the project? Are adequate considerations given to public health, if necessary?	(a) Y (b) Y (c)Y (d)Y	(a) A small scale resettlement is triggered. An ARAP was prepared and any loss will be compensated at full replacement cost (b) Since all labors will be employed locally within Kigali, no immigration of workers is expected. (c) There is no radio interference anticipated due to the low voltage and distance. (d)The compensation will be given in accordance with ARAP and the

Category	Environmental Item	Main Check Items	Yes: Y No: N	Confirmation of Environmental Considerations (Reasons, Mitigation Measures)
		(c) Is there any possibility that installation of structures, such as power line towers will cause radio interference? If any significant radio interference is anticipated, are adequate measures considered? (d) Are the compensations for transmission wires given in accordance with the domestic law?		domestic law.
4 Social Environment	(3) Heritage	(a) Is there a possibility that the project will damage the local archeological, historical, cultural, and religious heritage? Are adequate measures considered to protect these sites in accordance with the country's laws?	(a)N	(a)There is no such possibility as there is no heritage site.
	(4) Landscape	(a) Is there a possibility that the project will adversely affect the local landscape? Are necessary measures taken?	(a)N	(a)The project will not affect the landscape. The area around the project site is already developed.
	(5) Ethnic Minorities and Indigenous Peoples	(a) Are considerations given to reduce impacts on the culture and lifestyle of ethnic minorities and indigenous peoples? (b) Are all of the rights of ethnic minorities and indigenous peoples in relation to land and resources respected?	(a)N/A (b)N/A	(a)There are no ethnic minorities and indigenous people affected by the project. (b)There are no ethnic minorities and indigenous people affected by the project.
	(6) Working Conditions	(a) Is the project proponent not violating any laws and ordinances associated with the working conditions of the country which the project proponent should observe in the project? (b) Are tangible safety considerations in place for individuals involved in the project, such as the installation of safety equipment which prevents industrial accidents, and management of hazardous materials? (c) Are intangible measures being planned and implemented for individuals involved in the project, such as the establishment of a safety and health program, and safety training (including traffic safety and public health) for workers etc.? (d) Are appropriate measures taken to ensure that security guards involved in the project not to violate safety of other individuals involved, or local residents?	(a) N (b) Y (c)Y (d)Y	(a) -(d)The project proponent observes all laws and ordinances associated with working conditions of the country. EDCL has the document called "Environmental and Social Requirements for Tender" and the contractor is required to observe safety and hazard management as well as health and well-being of workers and local communities described in the document.
5 Others	(1) Impacts during Construction	(a) Are adequate measures considered to reduce impacts during construction (e.g., noise, vibrations, turbid water, dust, exhaust gases, and wastes)? (b) If construction activities adversely affect the natural environment (ecosystem), are adequate measures considered to reduce impacts? (c) If construction activities adversely affect the social environment, are adequate measures considered to reduce impacts?	(a)Y (b)Y (c)Y	(a) EDCL's "Environmental and Social Requirements for Tender" covers requirements to reduce impacts during construction. (b) The project site is within Kigali City hence construction activities are not going to affect the natural environment. (c)Construction activities may disturb the traffic around the site. EDCL requires the contractor to control traffic with collaboration with local police and

Category	Environmental Item	Main Check Items	Yes: Y No: N	Confirmation of Environmental Considerations (Reasons, Mitigation Measures)
				mitigation measures will be included in Environmental Management Plan.
	(2) Monitoring	(a) Does the proponent develop and implement monitoring program for the environmental items that are considered to have potential impacts? (b) What are the items, methods and frequencies of the monitoring program? (c) Does the proponent establish an adequate monitoring framework (organization, personnel, equipment, and adequate budget to sustain the monitoring framework)? (d) Are any regulatory requirements pertaining to the monitoring report system identified, such as the format and frequency of reports from the proponent to the regulatory authorities?	(a)Y (b)Y (c)Y (d)Y	(a)-(d) For the items with impacts, EDCL (planning and construction phases) and EUCL (operation phase) will be monitoring. Monitoring plan and responsible organizations are included in the EIA report. RDB notified the frequency of monitoring report.
6 Note	Reference to Checklist of Other Sectors	(a) Where necessary, pertinent items described in the Road checklist should also be checked (e.g., projects including installation of electric transmission lines and/or electric distribution facilities).	(a)N/A	(a)There is no additional Environmental Items that may be affected.
	Note on Using Environmental Checklist	(a) If necessary, the impacts to transboundary or global issues should be confirmed, (e.g., the project includes factors that may cause problems, such as transboundary waste treatment, acid rain, destruction of the ozone layer, or global warming).	(a)N/A	(a)The impacts of this Project are limited to its immediate vicinity and most of them are related to construction activities. There is no such impact to trans boundary or global issues.

Environmental Management Plan/Environmental Monitoring Plan

Environmental Management Plan

No.	Item	Impact	Mitigation Measures	Implementation/Responsible Body	Cost (USD)
	Planning Phase				
1	Involuntary Resettlement	Loss of assets, income and livelihood due to resettlement (including temporary ones)	• In accordance with JICA guidelines and WB OP4.12, An Abbreviated Resettlement Action Plan(ARAP) will be prepared based on the consensus with project affected people, compensation at full replacement cost and support and will be implemented.	EDCL Relevant Sectors	251, 878USD
	Construction Phase				
1	Economic activities, living and livelihood	Impacts on living and livelihood due to resettlement (including temporary ones)	• Same as above • PAPs will have priority for the project related employment opportunities.	Same as above	N/A
2	Land Use and Utilization of local resources	Limited access to agricultural land due to land acquisition.	• Presentation of a clear construction work schedule and smooth implementation • Sharing and coordinating a work plan with residents and communities	Contractor	N/A
3	Existing social infrastructure and services	Impacts on traffic during construction works Power Cut during construction works	• By announcing construction plans to nearby residents and collaborating with local police, enforcement of traffic safety and mitigation of traffic congestion • Preparation of power cut plan and sharing the plan with affected communities	EDCL Contractor	N/A
4	Occupational health hazards	Health and safety of construction workers	• EUCL will confirm environmental and social safety management plan proposed by contractor at tendering. Based on this plan, the contractor will carry out safety and management tasks and avoid and mitigate risks of accidents. • Based on laboring laws, the contractor must provide protective gear to workers, ensure them to wear them and provide safe working environment. • Construction site (especially the storage site) will be fenced, lighted and guarded by security guards to prevent intruders and theft	EDCL Contractor	Include in construction costs
5	Air Pollution	Air pollution by heavy machineries during leveling and construction works	• Minimize number of deliveries through timely scheduling. • Only contract automobiles with vehicle inspection certification, which are expected to have less exhaust emissions.	Contractor	N/A

No.	Item	Impact	Mitigation Measures	Implementation/Responsible Body	Cost (USD)
6	Soil Pollution	Spillage of insulating oil from transformer	• Insulating oil as well as transformers will be set in the metal box. To prevent spillage, oil dike will be set under the transformers and filled with stone chips. • Protection of exposed ground with vegetation and rain drainage, etc.to prevent run-off	Contractor	Include in construction costs
7	Waste	Dismantling of the existing tower under the responsibility of the implementing agency Waste during construction	• EUCL will recycle any materials saved from dismantling the existing towers and unrecyclable materials will be properly hand over to waste Management Company. • Regular disposal of solid waste to Nduba damp site or have a contract with a RURA registered waste disposal company to dispose it of	Contractor	included in construction costs
8	Noise/Vibration	Noise during leveling and construction	• Controlling operation time to reduce impact by noise as much as possible. Use of proper automobile with inspection certificate	Contractor	N/A
9	Odor	Odors from waste and toilets	• Regular disposal of solid waste to Nduba damp site or have a contract with a RURA registered waste disposal company to dispose it off. • Mobile toilets installed on site with a person in-charge of ensuring proper hygiene of these toilets	Contractor	included in construction costs
10	Accidents	Accidents involving workers and residents	• Same as for occupational health hazards • When wiring or removing power lines, fall prevention net will be used.	Contractor	included in construction costs
11	Protected Plant	Cutting 2 trees of a protected species	• Vegetation clearance should be limited within ROW. • Plantation of the species removed.	EDCL	3USD/ suppling
	Operation Phase				
1	Soil pollution	Spillage of insulating oil from transformers	• Insulating oil as well as transformers will be set in the metal box. To prevent spillage, oil dike will be set under the transformers and filled with stone chips.	EUCL	included in construction costs
2	Electrocution	Electrocution caused by contacting with wire or tower	• Based on IEC Standards, proper insulator set is connected to each voltage. • Tower will be equipped with metals to prevent climbing and signboard indicating high voltage. Residents nearby will be informed about prevention of electrocution. • Ground wires with enough capacity will be set. • EUCL operatives will check house wiring carefully	EUCL Contractor	included in construction costs

No.	Item	Impact	Mitigation Measures	Implementation/Responsible Body	Cost (USD)
3	Fire	Fire risks caused by broken insulators	• Ground wires with enough capacity will be set.	EUCL Contractor	included in construction costs

Monitoring Plan

No		Item	Methods	Frequency	Responsible body
	Planning Phase				
1	Involuntary Resettlement/Land acquisition	Compensation payment to bank accounts of PAPs	Counting the number of payment transaction to PAPs	Monthly until completion of land acquisition	EDCL
	Construction Phase				
1	Land Use and Utilization of local resources	Work schedule and progress	Work schedule	Monthly during construction	Contractor/ EDCL
2	Existing social infrastructure and services	Rewiring of the existing line Power cut	Confirming work plan Confirming a power cut plan	During rewiring works During construction	Contractor/ EDCL
3	Occupational health hazards	Workers with protective gear Reports on accidents	Site inspection Confirming the reports	Daily during construction	Contractor/ EDCL
4	Security at construction sites	Security guards Fence Lighting at night	Site inspection	Daily during construction	Contractor
5	Protected Plant	Adherence to ROW Plantation of protected specie	Checking on no vegetation clearance outside of ROW. Confirming the number of trees planted and growth.	Monthly	Contractor/ EDCL
6	Air pollution	Inspection certification of vehicle and heavy machineries	Site inspection	Daily during construction phase	Contractor/Sector Infrastructure Department
7	Soil Pollution	PAHs, BTEX,	Soil sampling at the Ndera substation (GC/MS methods)	3 times, before, during and after construction	Contractor
8	Waste	Waste management	Site inspection	Daily during construction phase	EDCL/Sector Infrastructure Department
9	Noise/vibration	Inspection certification of vehicle and heavy machineries	Site inspection	Daily during construction phase	Contractor/Sector Infrastructure Department
10	Odor	Waste management	Site inspection	Daily during construction phase	Contractor/Sector Infrastructure

					Department
11	Temporary Toilets	Management of temporary toilets	Site inspection	Daily during construction phase	EDCL/Contractor
	Operation Phase				
1	Electrocution	Climbing prevention measure at towers	Site inspection	At commission and regular maintenance	EUCL/Sector Infrastructure Department
2	Soil Pollution	PAHs , BTEX	Soil sampling at the Ndera substation (GC/MS methods)	Annually	EUCL
3	Fire risks	Fire prevention measures	Site inspection	At commission and regular maintenance	EUCL/Sector Infrastructure Department

Annex 12

Environmental and Social Monitoring Form

Below are drafts of monitoring forms based on the EMP and for resettlement and land acquisition.

Environmental Management

Construction Phase

	Monitoring Item	Parameters to be monitored	Monitoring result and reports made during this period	Measures to be taken	Frequency
1	Land use & Utilization of local resources	Construction Duration			Before construction commencement and quarterly during construction phase
2	Existing social infrastructure and services	Existing line re-routed			During construction of Route 3
3	Occupation health hazards	Workers with protective gear Records of accidents			Monthly
4	Security in the project area	Hoarding fence, light and security guards			Throughout the construction phase
5	Protected flora species	• ROW width dimensions • Number of Umuco trees offset in tree nursery			Throughout the construction phase
6	Air pollution	Automobiles with inspection certificates			Throughout the construction phase
7	Soil degradation/pollution	Soil parameters; PAHs, BTEX,			Before construction, mid-term of construction and end of construction
8	Solid Waste	Solid waste on site			Throughout the construction phase
9	Noise/Vibration	Automobiles with inspection certificates			Throughout the construction phase
10	Odor	Solid waste on site			Throughout the construction phase
11	Poor sanitation	Clean mobile toilets on site			Throughout the construction phase

Operation Phase

	Monitoring Item	Parameters to be monitored	Monitoring result/reports made during this period	Measures to be taken	Frequency
1	Human electrocution	Towers with proposed mitigation precautionary measures installed			At commissioning of the construction completion
2	Soil degradation/pollution	Soil parameters; PAHs and BTEX			Annually
3	Fire risk	Towers with proposed mitigation precautionary measures installed			At construction completion. Also inspection throughout operation as part of Operation and Maintenance.

Resettlement and Land Acquisition

Monitoring on land acquisition and resettlement will be conducted monthly by EDCL.

Activities	Expected Date Completion	Responsible Organization.
Approval of ARAP		EDCL
Processing Compensation Fund	31 Oct 2015	EDCL/ MINECOFIN

Progress of Compensation Payment and Land Acquisition

Components	Planned Total	Unit	Monthly Progress			Progress in %		Expected Date Completion	Responsible Organization.
			Sept 2015	Oct 2015	Nov 2015	Till the last month	Up to the month		
Compensation Payment									
Ndera Substation area	20	HH						30 Nov 2015	EDCL/ MINECOFIN
15kV DL Gasogi-Kabuga	38	HH						30 Nov 2015	EDCL/ MINECOFIN
Murindi RMU	1	HH						30 Nov 2015	EDCL/ MINECOFIN
Total	59	HH						30 Nov 2015	EDCL/ MINECOFIN
Land Acquisition									
Ndera Substation area	11,462.48	m^2						30 Nov 2015	EDCL/Sector Leader
15kV DL Gasogi-Kabuga	2105.72	m^2						30 Nov 2015	EDCL/Sector Leader
Murindi RMU	971	m^2						30 Nov 2015	EDCL/Sector Leader
Total	14,539.2	m^2						30 Nov 2015	EDCL/Sector Leader

Note: The figures in this table include the PAPs without consensus and absent

Progress of Consensus with PAPs absent and without consensus

Type of PAPs	Number	Unit	Monthly Progress							Expected Date Completion	Responsible Organization.
			Sept 2015	Oct 2015	Nov 2015	Dec 2015	Jan 2016	Feb 2016	Mar 2016		
Absent	4	HH									EDCL
Without Consensus	8	HH									EDCL
Total	12	HH									EDCL

Remarks on Progress with PAPs absent and without consensus

No.	Name of PAP	Status/Progress in this month	Action Plan for the next month
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			
11			
12			

6. Drawings

Substation and RMU Switching station Facilities

DWG No.	Title
SS-01	Ndera Substation Single Line Diagram
SS-02	Kabuga RMU Switching Station Single Line Diagram
SS-03	Murindi RMU Switching Station Single Line Diagram
SS-04-1	Ndera Substation Control System Diagram
SS-04-2	RMU Switching Stations Control System Diagram
SS-04-3	Communication System Diagram for Gasogi Substation and Kabuga RMU Switching Station
SS-05	Gasogi Substation Single Line Diagram
SS-06-1	Ndera Substation Arrangement Drawing (Plan) of 110 kV Switchyard
SS-06-2	Ndera Substation Arrangement Drawing (Section) of 110 kV Switchyard
SS-07	Ndera Substation Arrangement Drawing of Equipment in Control Building
SS-08	Murindi RMU Switching Station Arrangement Drawing of Equipment
SS-09	Kabuga RMU Switching Station Arrangement Drawing of Equipment
SS-11	Ndera Substation Arrangement Drawing of Cable Trays (Basement Floor)

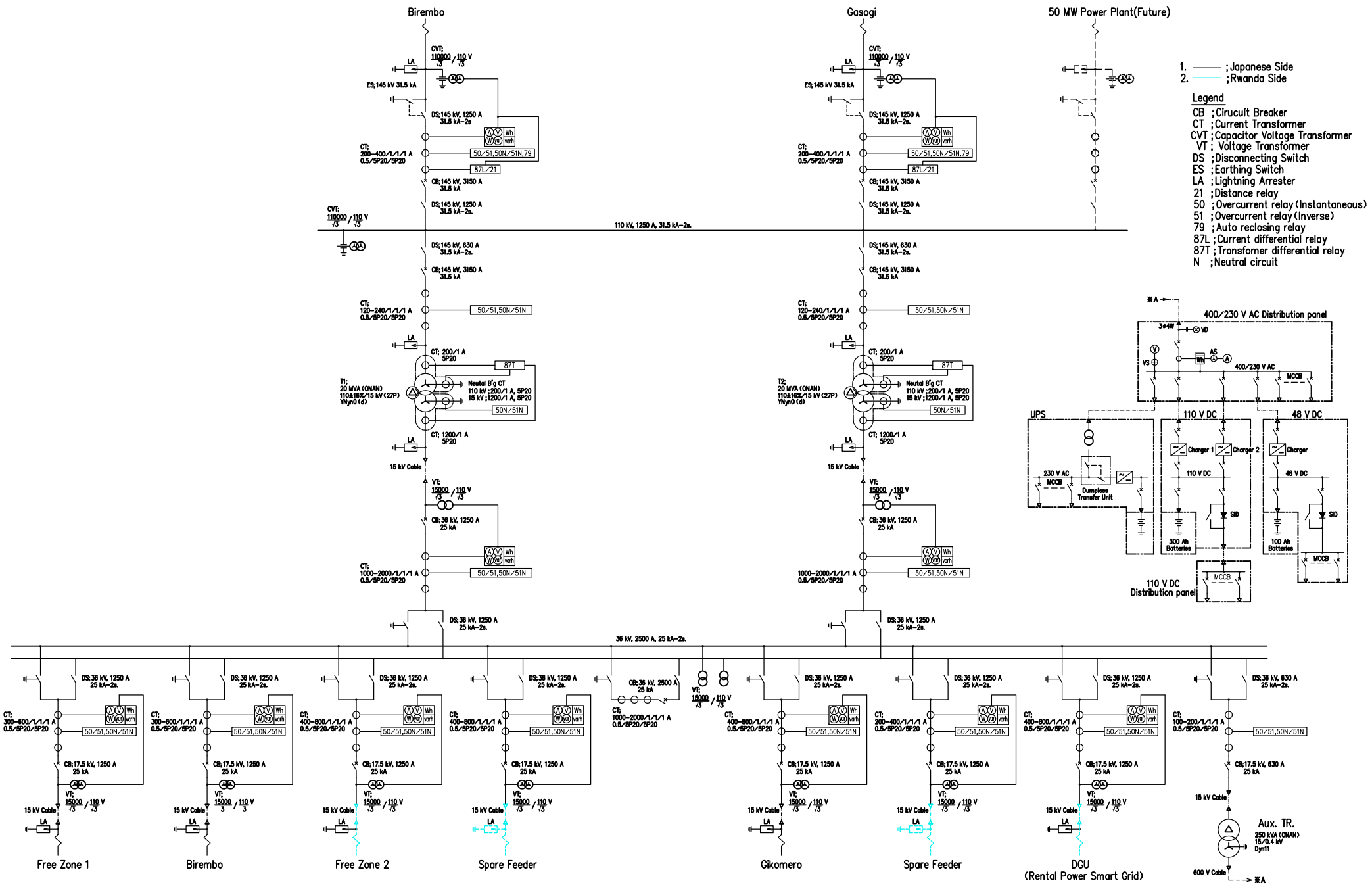
Architect Facilities

DWG No.	Title
A-01	Ndera Substation Building Site Layout
A-02	Ndera Substation Building Finishing Schedule
A-03	Ndera Substation Building Basement Floor Plan
A-04	Ndera Substation Building Ground Floor Plan
A-05	Ndera Substation Building Roof Plan 1
A-06	Ndera Substation Building Roof Plan 2
A-07	Ndera Substation Building Elevation 1
A-08	Ndera Substation Building Elevation 2
A-09	Ndera Substation Building Section 1
A-10	Ndera Substation Building Section 2
A-11	Kabuga Switching Station Site Plan
A-12	Murindi Switching Station Site Plan
A-13	Kabuga (Murindi) Switching Station Finishing Schedule
A-14	Kabuga (Murindi) Switching Station Plan
A-15	Kabuga (Murindi) Switching Station Elevation
A-16	Kabuga (Murindi) Switching Station Section

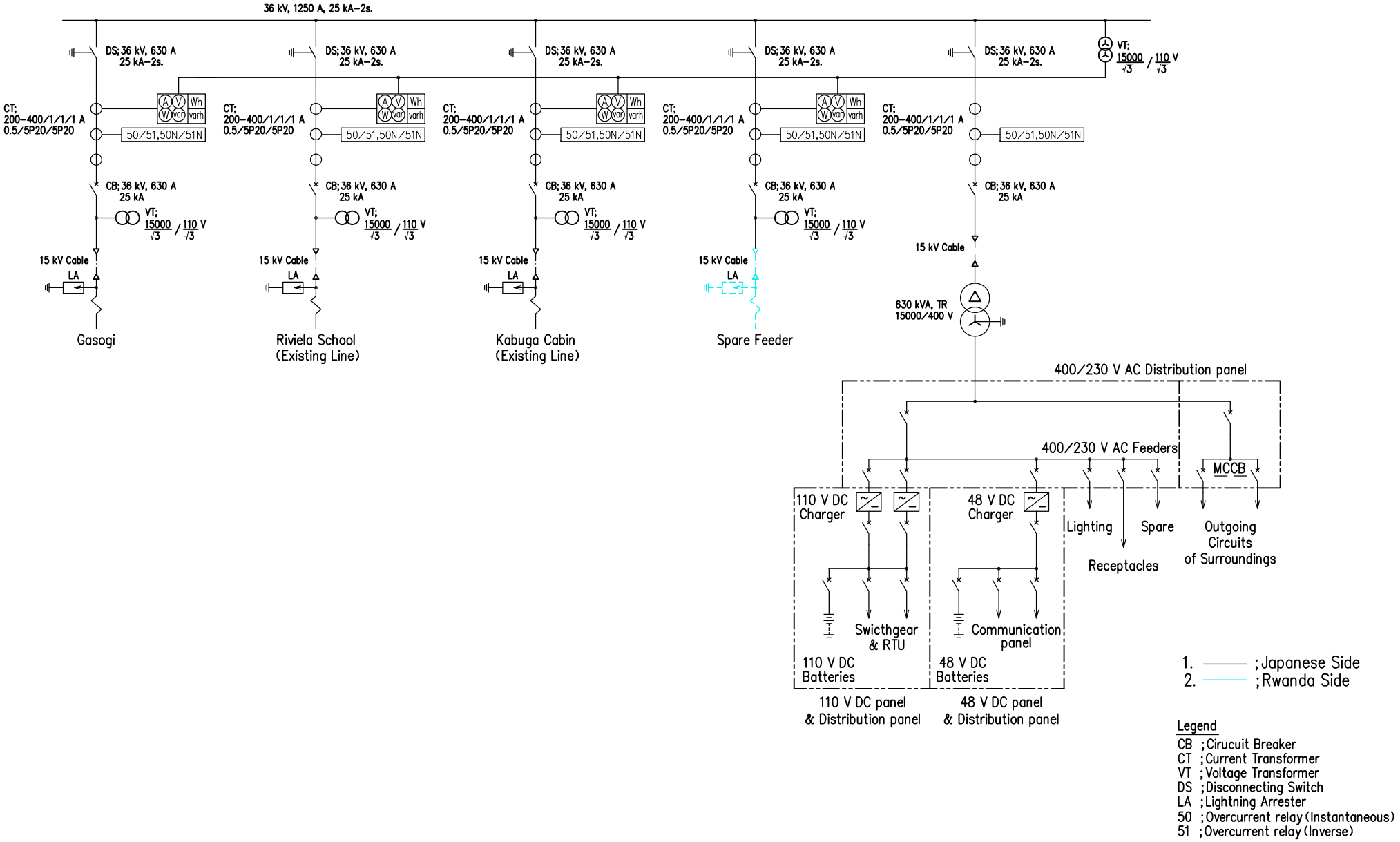
Transmission and Distribution Line Facilities

DWG No.	Title
GG-01	Transmission and Distribution Site Map（Overall）
GG-02	Transmission and Distribution Network Diagram (only Planned Area)
GG-11	110kVTransmission Line Route（Tower 212⇔Ndera S/S：Approx. 2.2km）
GG-12	Branch Point of 110kV Transmission Line (Plan) (Scale: 1/500)
GG-13	Branch Point of 110kV Transmission Line（Section）
GG-14	Gantry Tower for110kVBranch Point
GG-21	15kV Distribution Line Route（Route-1: Gasogi S/S to Kabuga RMU SS）
GG-22	Site Layout of Kabuga RMU Switching Station
GG-31	15kV Distribution Line Route (Route-2:　Ndera S/S to Birembo/Free Zone-1)
GG-32	15kV Distribution Line Cable Route (Route-2)
GG-41	15kV Distribution Line Route (Route-3: Rubungo to Gosha District)
GG-51	Site Layout of Murindi RMU Switching Station
LP-01	110kV Transmission Line; Line Profile (1 / 2) (Branch Point to Ndera S/S)
LP-02	110kV Transmission Line; Line Profile (2 / 2) (Branch Point to Ndera S/S)
LP-11	15kVDistribution Line; Route-1, Line Profile (1 / 4) (Gasogi S/S—Kabuga RMU SS)
LP-12	15kVDistribution Line; Route-1, Line Profile (2 / 4) (Gasogi S/S—Kabuga RMU SS)
LP-13	15kVDistribution Line; Route-1, Line Profile (3 / 4) (Gasogi S/S—Kabuga RMU SS)
LP-14	15kVDistribution Line; Route-1, Line Profile (4 / 4) (Gasogi S/S—Kabuga RMU SS)
LP-21	15kV Distribution Line; Route-2, Line Profile (1 / 1) (Ndera S/S—Birembo SS/Free Zone PH1)
LP-31	15kVDistribution Line; Route-3, Line Profile (1 / 1) (Rubungo SS—Gosha District)
TL-S1	110kV Tower Skelton, Type: 110-A2
TL-S2	110kV Tower Skelton, Type: 110-B2
TL-S3	110kV Tower Skelton, Type: 110-C2
TL-S4	110kV Tower Skelton, Type: 110-D2
TL-S5	110kV Tower Skelton, Type: 110-E1
TL-S6	110kV Tower Foundation（1/2）
TL-S7	110kV Tower Foundation（2/2）
DL-S1	15kV Tower Skelton, Type: 15-TA1
DL-S2	15kV Tower Skelton, Type: 15-TB1
DL-S3	15kV Tower Skelton, Type: 15-TD1
DL-S4	15kV Tower Skelton, Type: 15-TB2

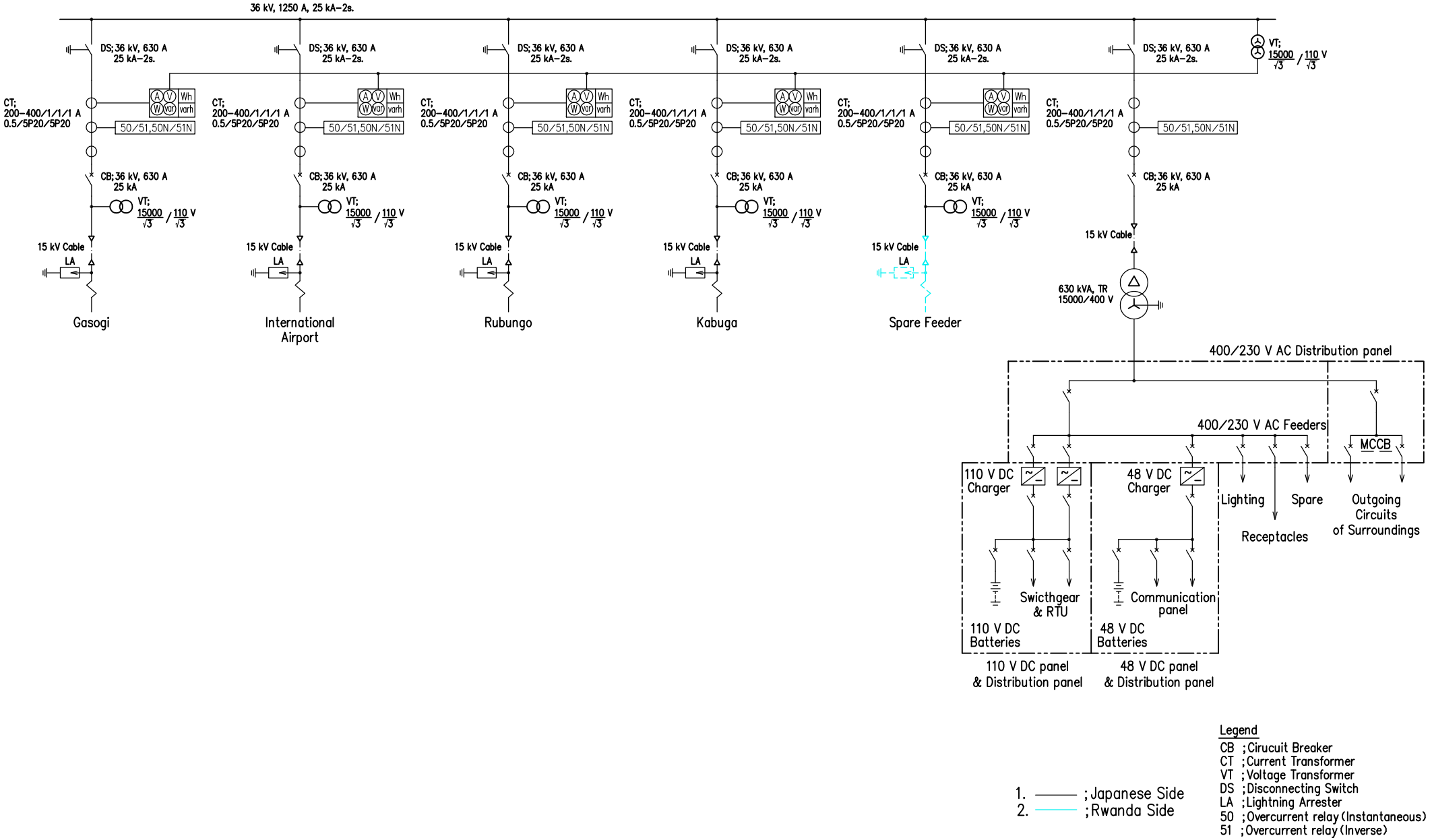
DWG No.	Title
DL-S5	15kV Tower Skelton, Type: 15-TD2
DL-S6	15kV Tower Skelton, Type: 15-PA1
DL-S7	15kV Tower Foundation (1/2)
DL-S8	15kV Tower Foundation (2/2)



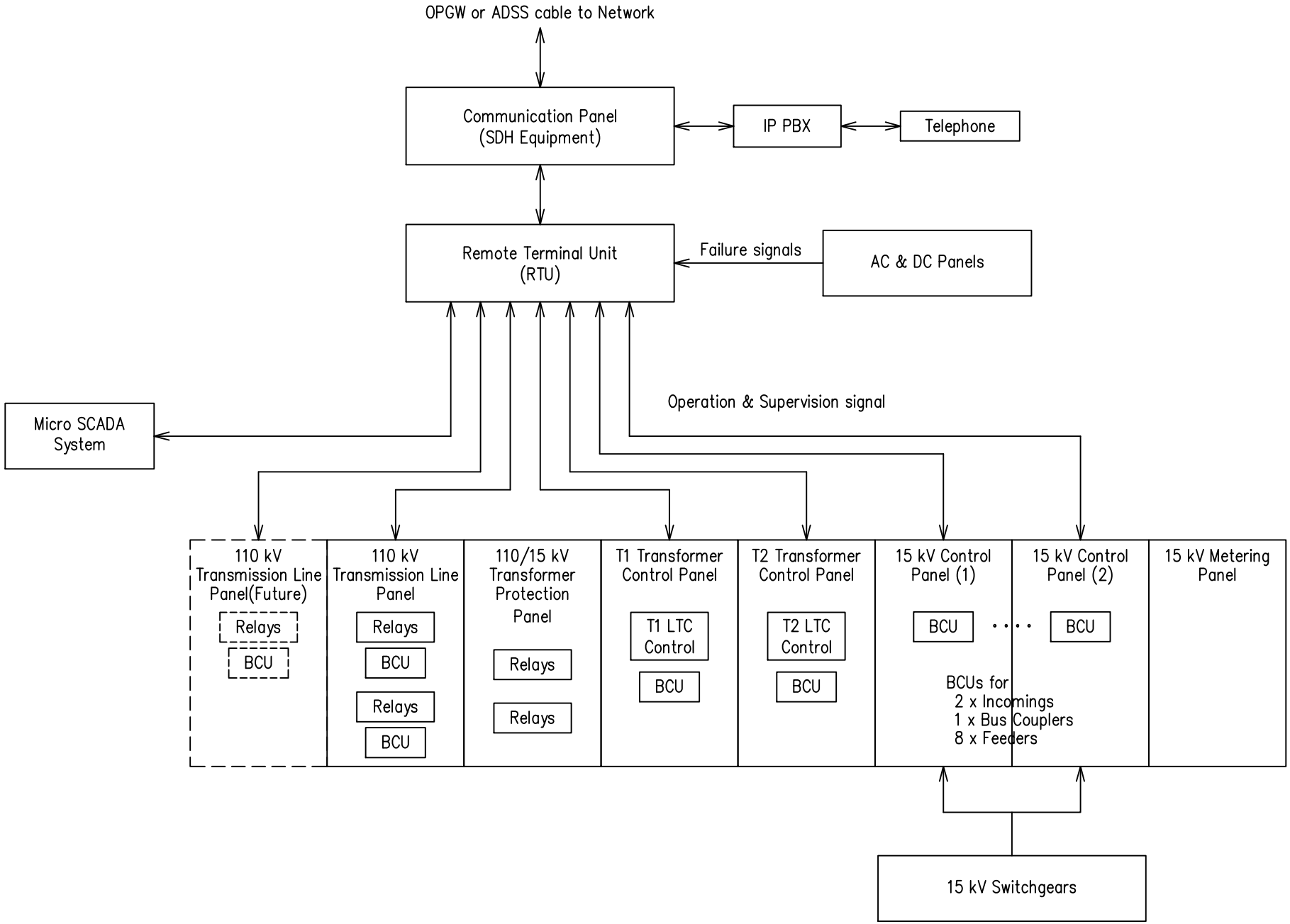
DWG No. SS-01 Ndara Substation Single Line Diagram



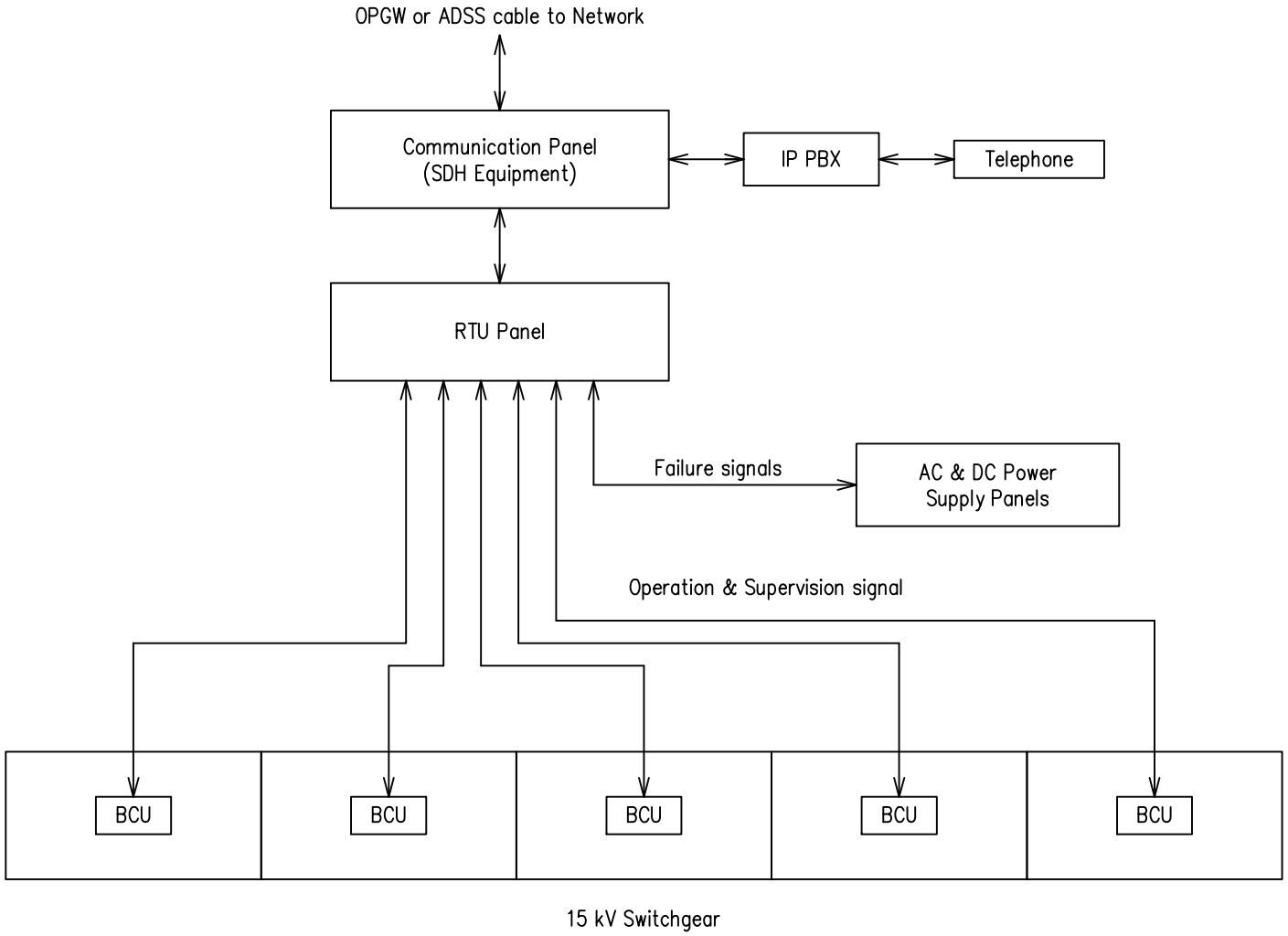
DWG No. SS-02 Kabuga RMU Switching Station Single Line Diagram



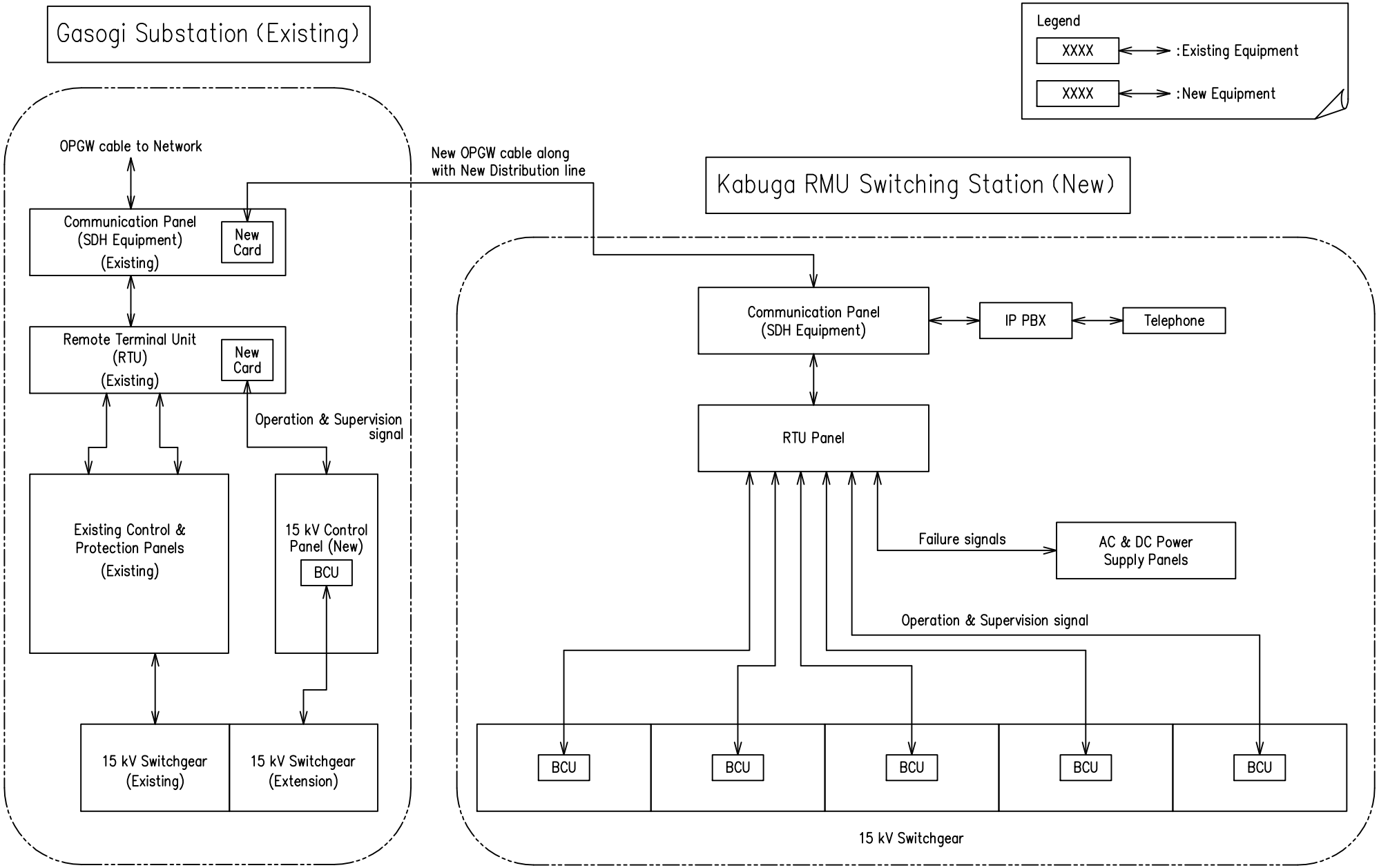
DWG No. SS-03 Murindi RMU Switching Station Single Line Diagram



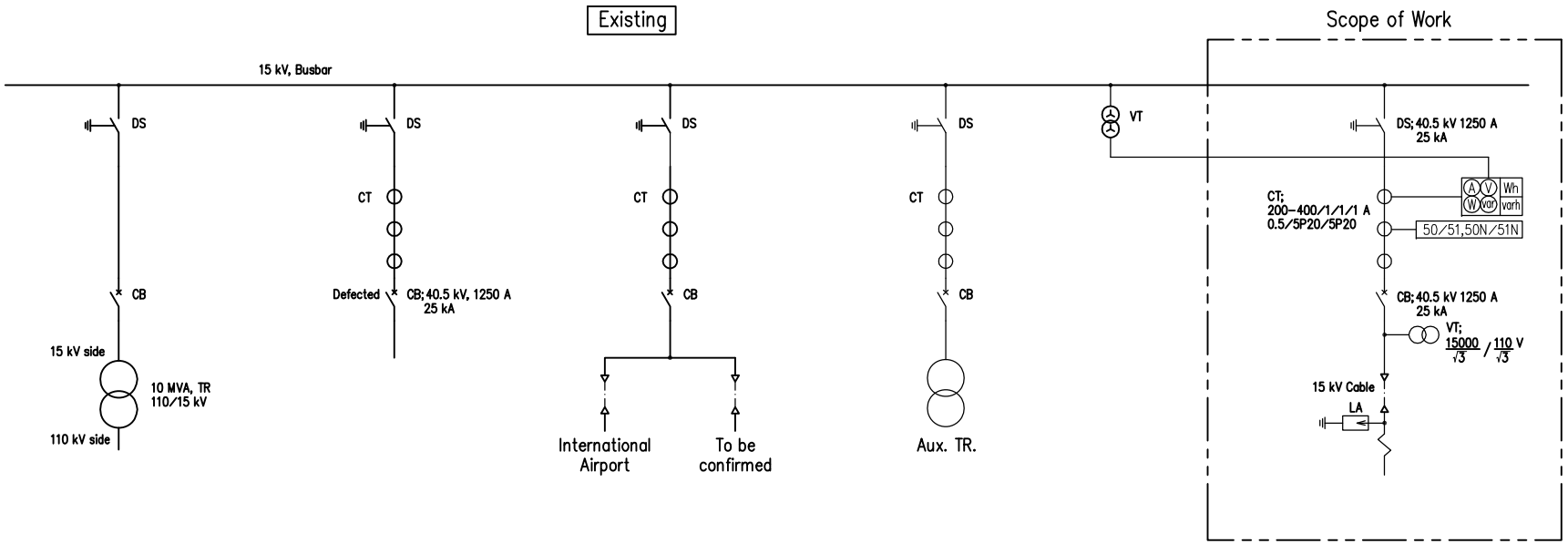
DWG No. SS-04-1 Ndera Substation Control System Diagram



DWG No. SS-04-2 RMU Switching Stations Control System Diagram

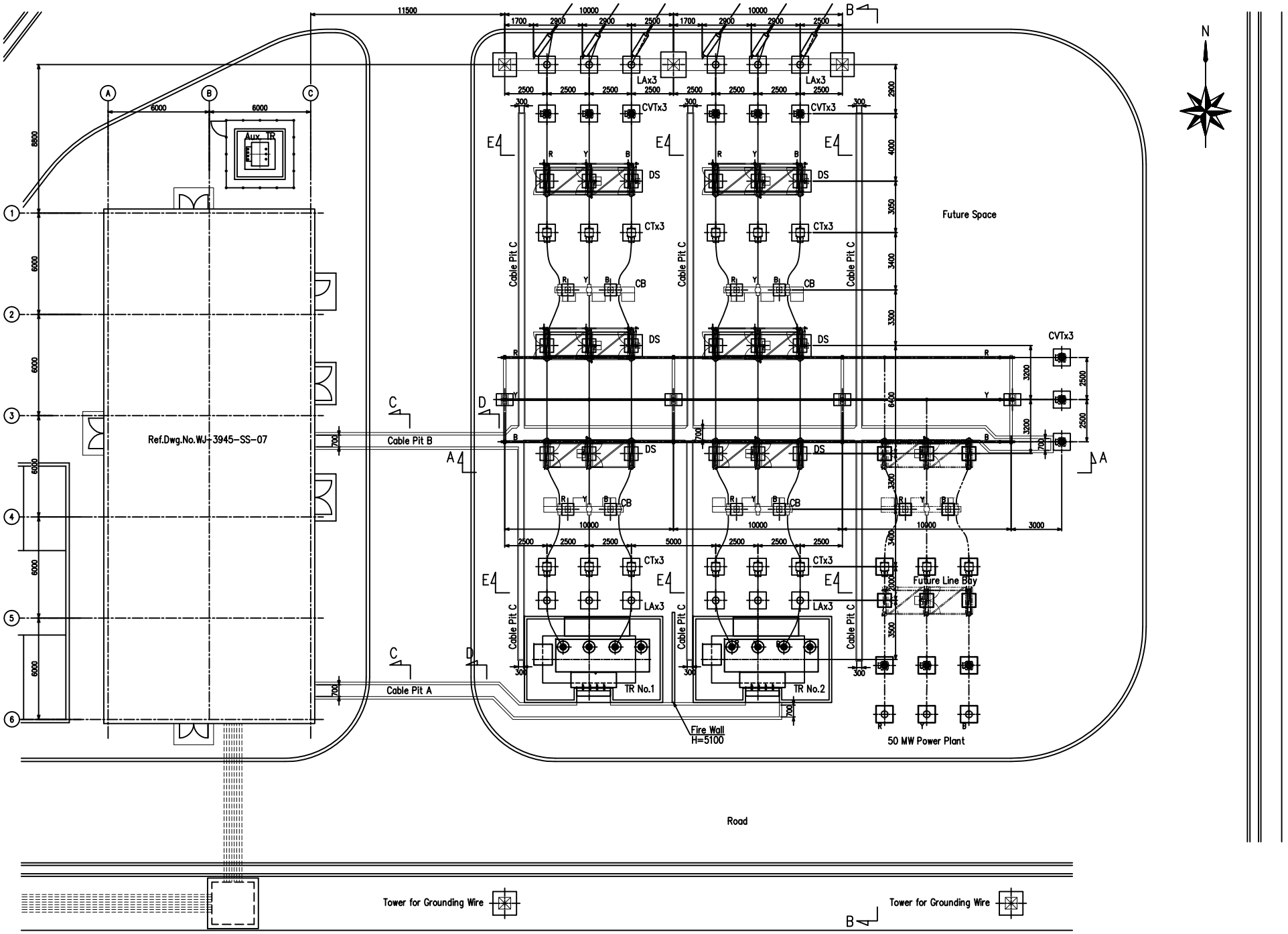


DWG No. SS-04-3 Communication System Diagram for Gasogi Substation and Kabuga RMU Swiching Station

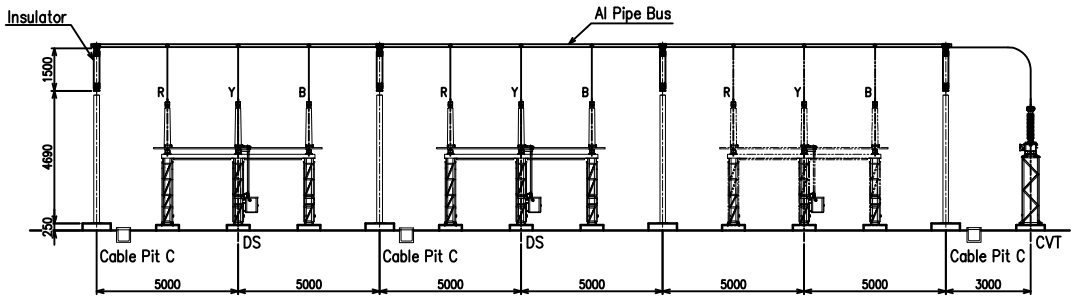


Legend
CB ; Cirucuit Breaker
CT ; Current Transformer
VT ; Voltage Transformer
DS ; Disconnecting Switch
LA ; Lightning Arrester
50 ; Overcurrent relay (Instantaneous)
51 ; Overcurrent relay (Inverse)

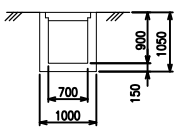
DWG No. SS-05 Gasogi Substation Single Line Diagram



DWG No. SS-06-1 Ndera Substation Arrangement Drawing（Plan）of 110 kV Switchyard



Section A–A
(S=1/100)



Section C~
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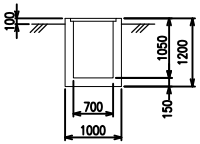
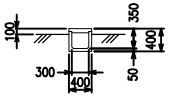


Section D~
(S=1/50)



Section E~
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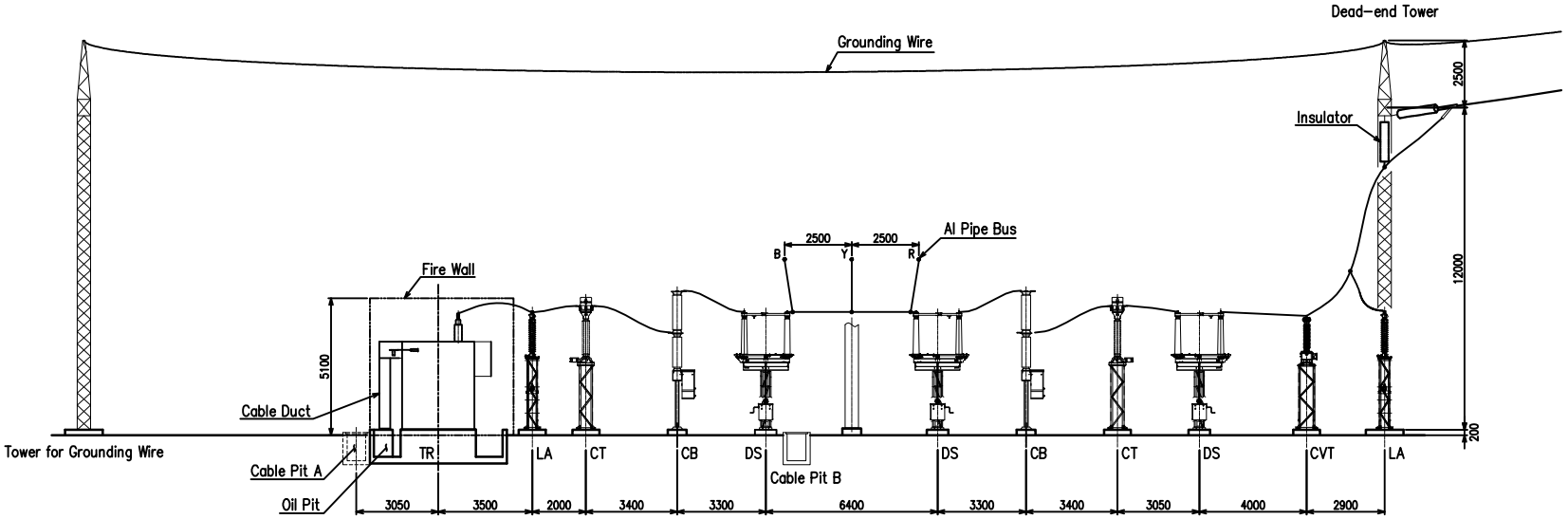
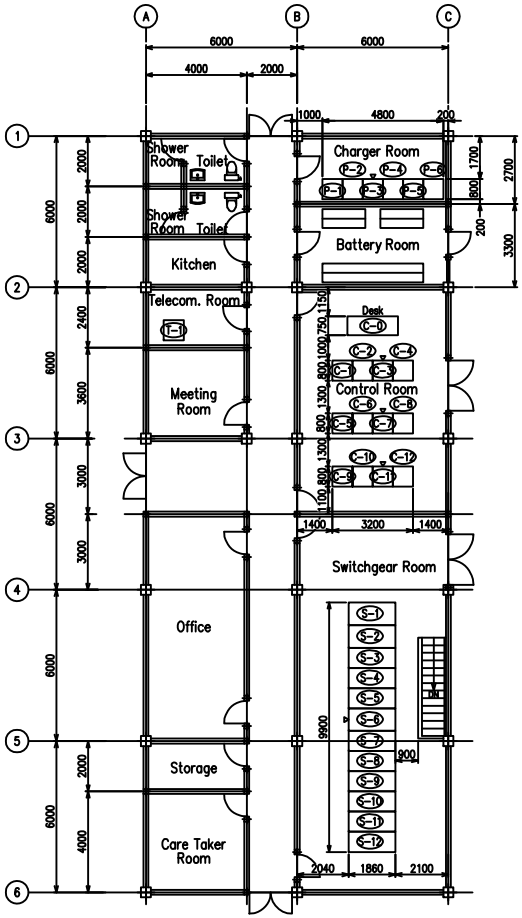


Section B–B
(S=1/100)

DWG No. SS-06-2 Ndera Substation Arrangement Drawing（Section）of 110 kV Switchyard



Charger Room

No.	Panel Name
P-1	AC Distribution panel
P-2	Uninterruptible Power Supply panel
P-3	110 V DC Charger panel
P-4	110 V DC Distribution panel
P-5	48 V DC Charger panel
P-6	48 V DC Distribution panel

Control Room

No.	Panel Name
C-0	Micro SCADA on the Desk
C-1	15 kV Control panel (2)
C-2	15 kV Control panel (1)
C-3	T2 Transformer Control panel
C-4	T1 Transformer Control panel
C-5	Future Space
C-6	110/15 kV Transfofmer Protection panel
C-7	110 kV Transmission Line panel
C-8	110 kV Transmission Line panel (Future)
C-9	Future Space
C-10	Remote Terminal Unit
C-11	Future Space
C-12	Future Space

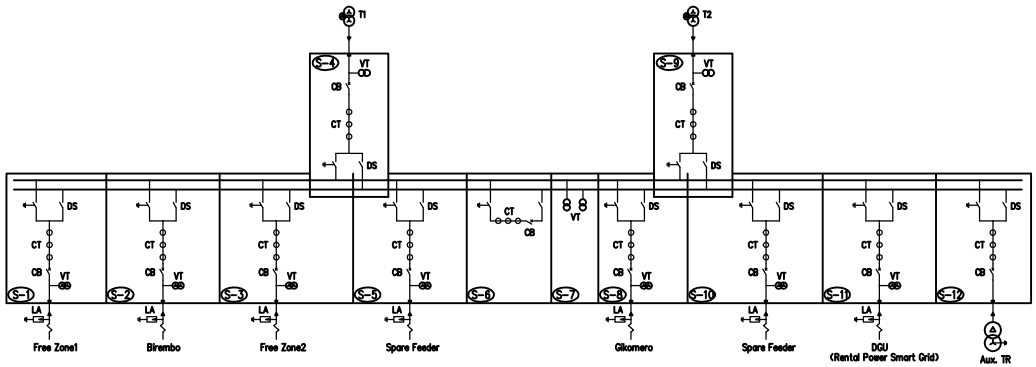
Switchgear Room

No.	Panel Name
S-1	Free Zone 1
S-2	Birembo
S-3	Free Zone 2
S-4	20 MVA Transformer T1
S-5	Spare Feeder
S-6	Bus Coupler
S-7	Busbar VT
S-8	Gikomero
S-9	20 MVA Transformer T2
S-10	Spare Feeder
S-11	DGU (Rental Power Smart Grid)
S-12	Auxiliary Transformer

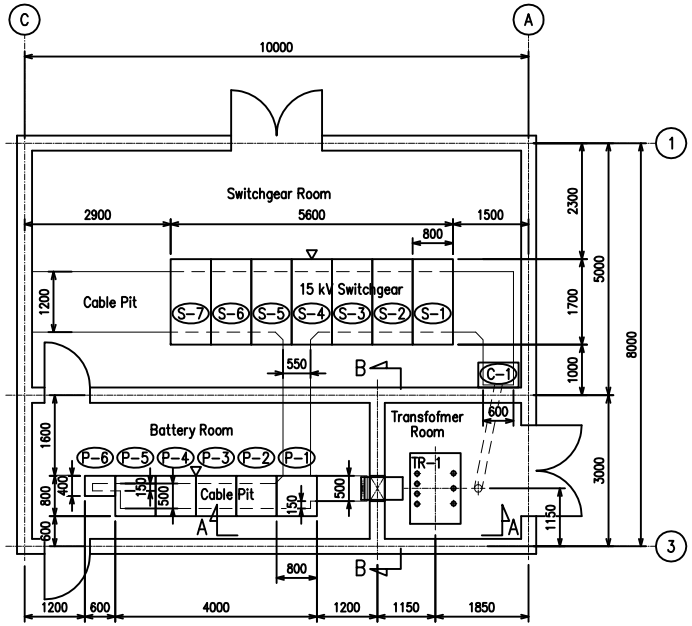
Telecommunication Room

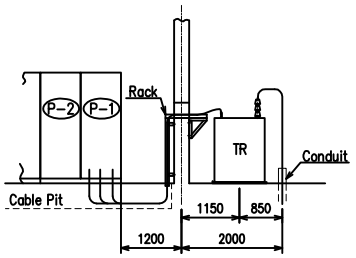
No.	Panel Name
T-1	Multiplexer

Single Line Diagram of 15 kV Switchgear

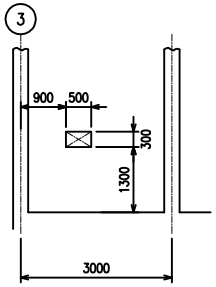


DWG No. SS-07 Ndera Substation Arrangement Drawing of Equipment in Control Building





Section A-A



Section B-B

Battery Room

No.	Panel Name
P-1	AC Distribution panel (1)
P-2	AC Distribution panel (2)
P-3	110 V DC Charger panel
P-4	110 V DC Distribution panel
P-5	48 V DC Charger & Distribution panel
P-6	Multiplexer

Switchgear Room

No.	Panel Name
C-1	Remote Terminal Unit

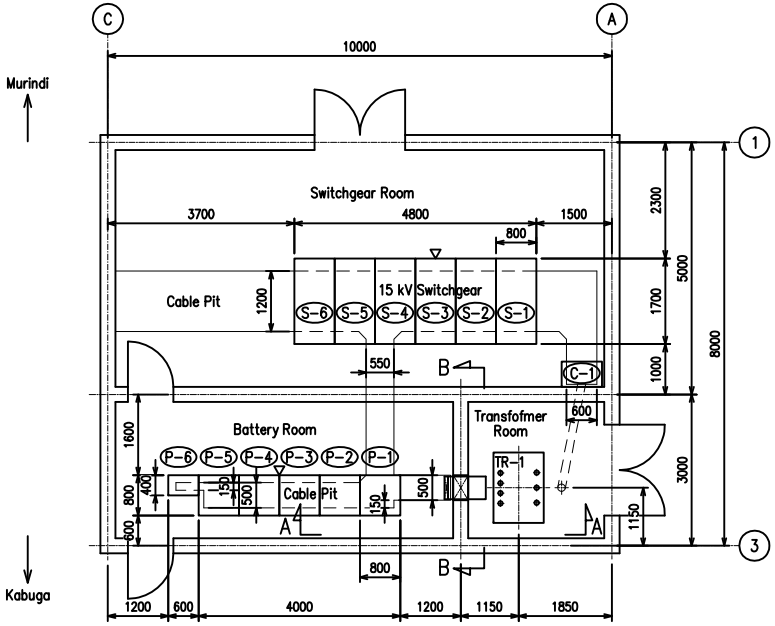
Switchgear Room

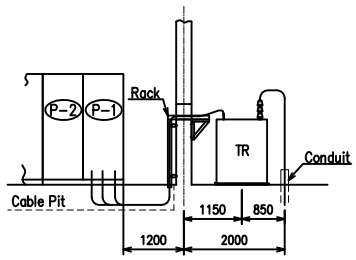
S-1	Gasogi
S-2	International Airport
S-3	Rubungo
S-4	Kabuga
S-5	Spare Feeder
S-6	630 kVA Transformer
S-7	Busbar VT

Transformer Room

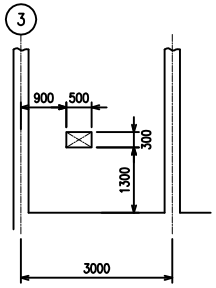
No.	Panel Name
TR-1	630 kVA Transformer

DWG No. SS-08 Murindi RMU Switching Station Arrangement Drawing of Equipment





Section A–A



Section B–B

Battery Room

No.	Panel Name
P–1	AC Distribution panel (1)
P–2	AC Distribution panel (2)
P–3	110 V DC Charger panel
P–4	110 V DC Distribution panel
P–5	48 V DC Charger & Distribution panel
P–6	Multiplexer

Switchgear Room

No.	Panel Name
C–1	Remote Terminal Unit

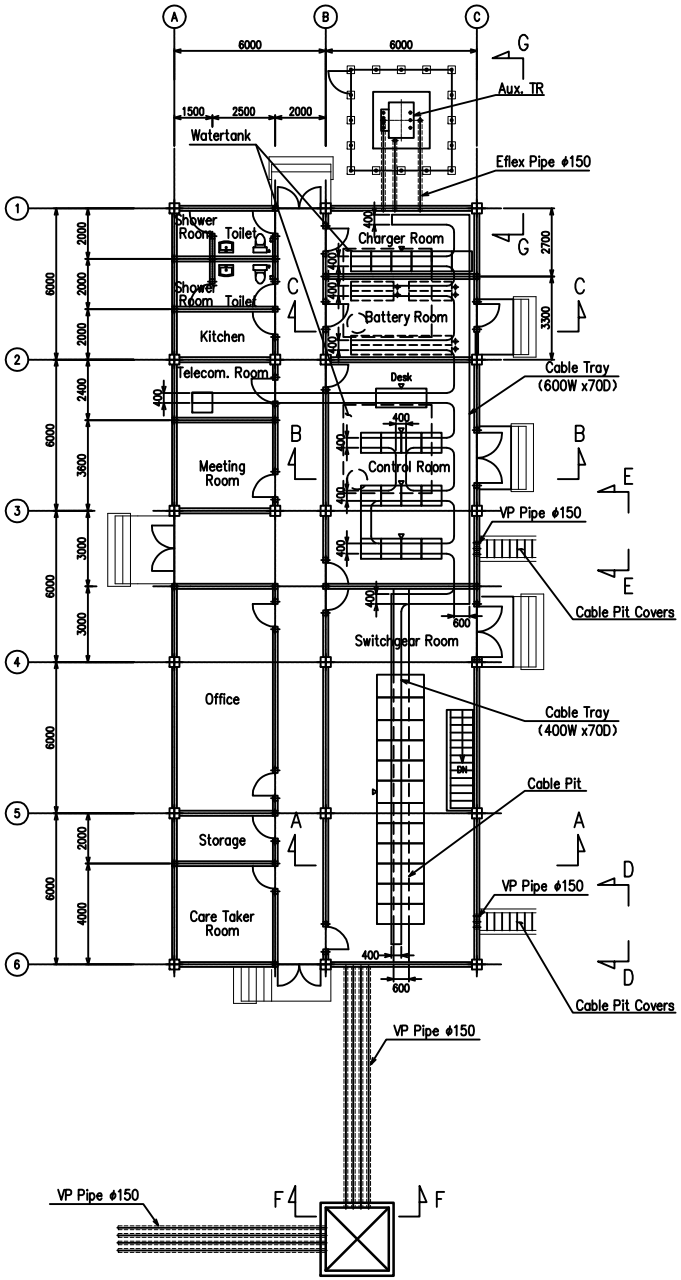
Switchgear Room

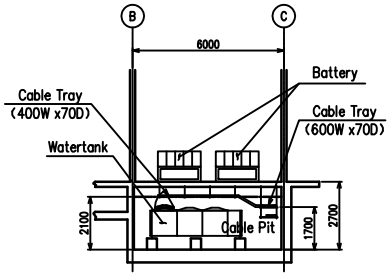
S–1	S–1 Gasogi
S–2	S–2 Riviela School
S–3	S–3 Kabuga Cabin
S–4	S–4 Spare Feeder
S–5	S–5 630 kVA Transformer
S–6	S–6 Busbar VT

Transformer Room

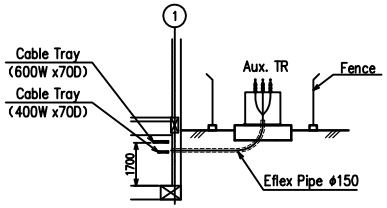
No.	Panel Name
TR–1	630 kVA Transformer

DWG No. SS-09 Kabuga RMU Switching Station Arrangement Drawing of Equipment

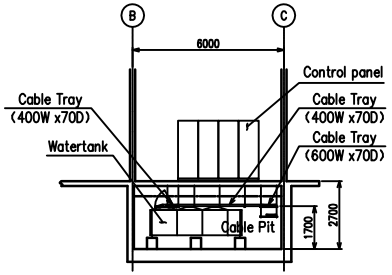




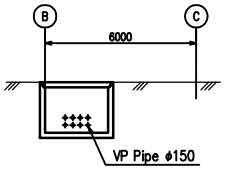
Section C–C



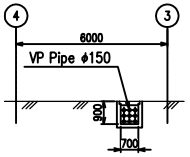
Section G–G



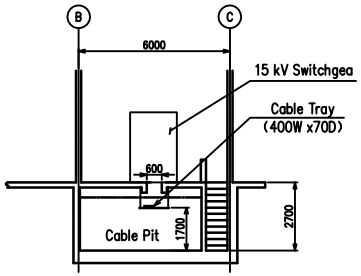
Section B–B



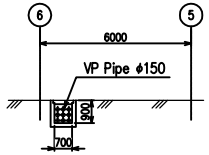
Section F–F



Section E–E



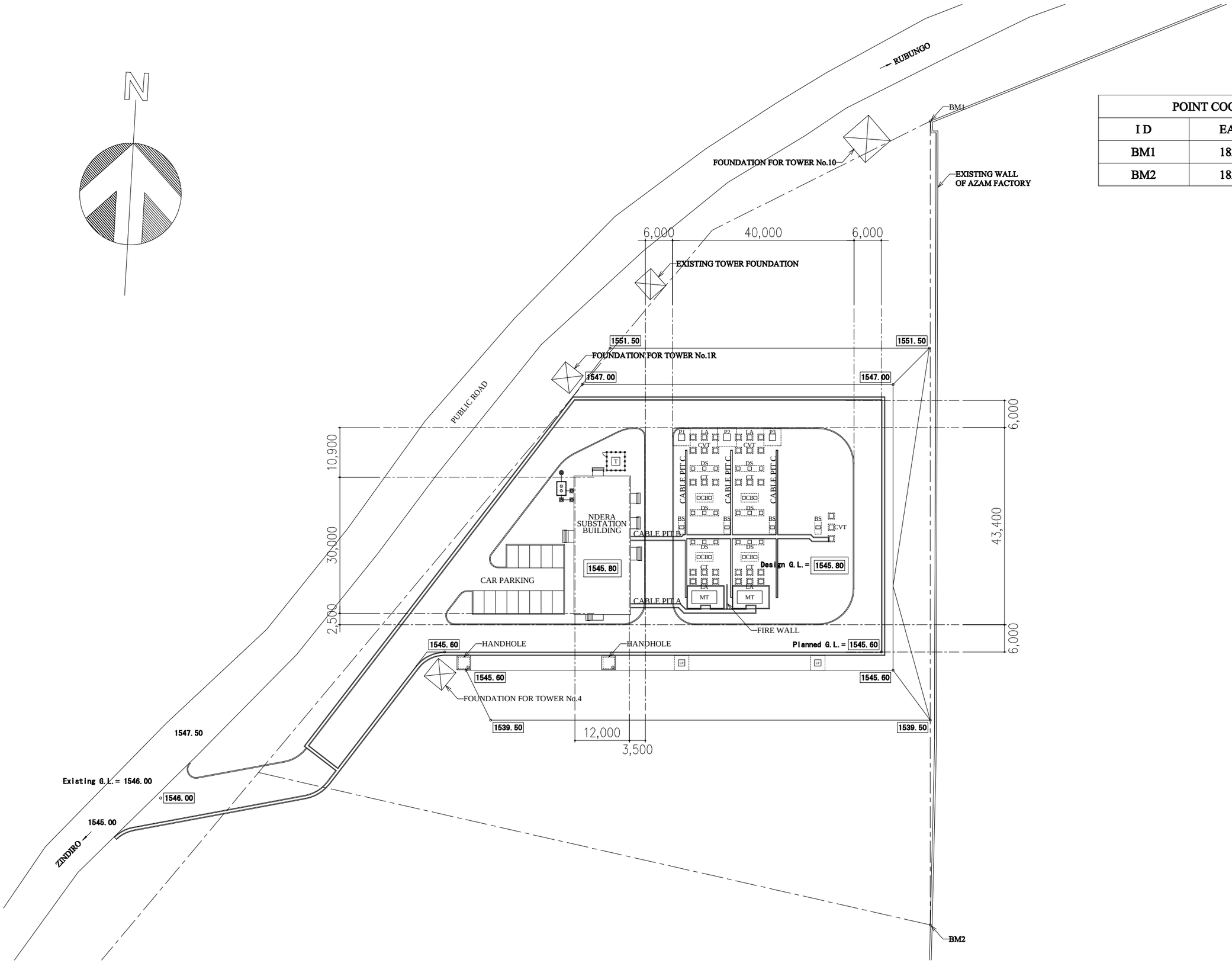
Section A–A



Section D–D

DWG No. SS-011 Ndera Substation Arrangement Drawing of Cable Trays（Basement Floor）

POINT COORDINATES		
I D	EAST	NORTH
BM1	182949.67	9786332.31
BM2	182959.89	9786155.62



DWG No. A-01: Ndera Substation Building Site Layout

GENERAL

BUILDING AREA	427.50 m2
TOTAL FLOOR AREA	602.19 m2
STRUCTURE	REINFORCED CONCRETE

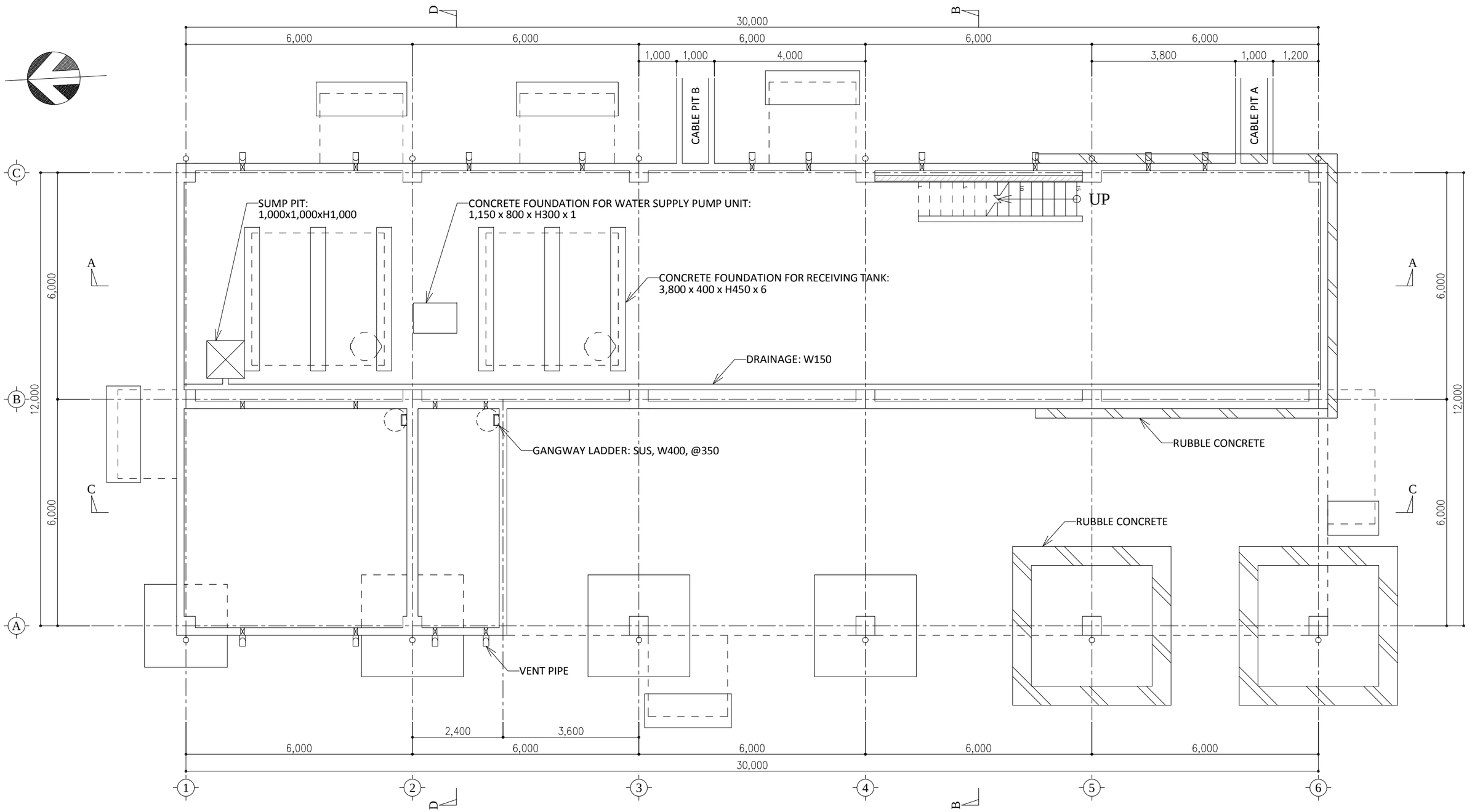
EXTERIOR FINISHING SCHEDULE

LOCATION	SPECIFICATION
COLUMN	FINISH (A.E.P) ON REINFORCED CONCRETE WITH MORTAR STEEL TROWEL 30mm THK
BEAM	PAINT FINISH (A.E.P) ON REINFORCED CONCRETE WITH MORTAR STEEL TROWEL 30mm THK
WALL	PAINT FINISH (A.E.P) ON 150mm THK CONCRETE BLOCK WITH MORTAR STEEL TROWEL 30mm THK
ROOF	CONCRETE STEEL TROWEL ON COVER CONCRETE WITH WELDED WIRE MESH THERMAL INSULATION: EXTRUDED POLYETHYLENE FORM 50mm THK ASPHALT MEMBRANE WATER PROOFING OR EQUIVALENT COATS OF HOT BITUMEN ON REINFORCED CONCRETE SLAB
FLOOR	CERAMIC TILE (300x300mm, NON SLIP) ON REINFORCED CONCRETE

INTERIOR FINISHING SCHEDULE (NDERA SUBSTATION BUILDING)

ROOM NAME	FLOOR	BASEBOARD	WALL	CEILING	REMARKS
BF Basement	NON-SLIP PAINTING FINISH ON CONCRETE		EXPOSED CONCRETE (WITH REPAIR)	EXPOSED CONCRETE (WITH REPAIR)	
BF Pit	CONCRETE STEEL TROWEL		DITTO	DITTO	
GF Switchgear Room	PORCELAIN TILE 300 X 300 ON MORTAR STEEL TROWEL	PAINT FINISH(A.E.P) MORTAR FINISH H=100	PAINT FINISH(A.E.P) MORTAR STEEL TROWEL 20mm THK ON 150mm THK CONCRETE BLOCK	PAINT FINISH (A.E.P) EXPOSED CONCRETE (WITH REPAIR)	FIRE EXTINGUISHER 1 SET, NAME PLATE
GF Control Room	DITTO	DITTO	DITTO	DITTO	AIR CONDITIONING, NAME PLATE FIRE EXTINGUISHER 1 SET
GF Battery Room	DITTO	DITTO	DITTO	DITTO	FIRE EXTINGUISHER 1 SET, NAME PLATE
GF Charger Room	DITTO	DITTO	DITTO	DITTO	AIR CONDITIONING, NAME PLATE FIRE EXTINGUISHER 1 SET WASH BASE, MIRROR, WATER FAUCET
GF Telecom Room	DITTO	DITTO	DITTO	MAKEUP PLASTER BOARD 9.5mm THK LIGHT IRON SUSPENDED FRAME	AIR CONDITIONING, NAME PLATE FIRE EXTINGUISHER 1 SET
GF Office	DITTO	DITTO	DITTO	DITTO	NAME PLATE
GF Meeting	DITTO	DITTO	DITTO	DITTO	NAME PLATE
GF Care Taker Room	DITTO	DITTO	DITTO	DITTO	NAME PLATE
GF Kitchen	DITTO	DITTO	DITTO	DITTO	EXHAUST FAN WITH HOOD, NAME PLATE FIRE EXTINGUISHER 1 SET SINK 1 SET, NAME PLATE
GF Toilet, Shower Room	DITTO		PORCELAIN TILE 100 X 100 ON MORTAR STEEL TROWEL ON 150, 100mm THK CONCRETE BLOCK	DITTO	EXHAUST FAN WITH HOOD, NAME PLATE TOILET PAPER HOLDER, WASH BASE MIRROR, WATER FAUCET
GF Storage	DITTO	PAINT FINISH(A.E.P) MORTAR FINISH H=100	PAINT FINISH(A.E.P) MORTAR STEEL TROWEL 20mm THK ON 150mm THK CONCRETE BLOCK	EXPOSED CONCRETE (WITH REPAIR)	NAME PLATE
GF Corridor	DITTO	DITTO	DITTO	MAKEUP PLASTER BOARD 9.5mm THK LIGHT IRON SUSPENDED FRAME	FIRE EXTINGUISHER 2 SETS

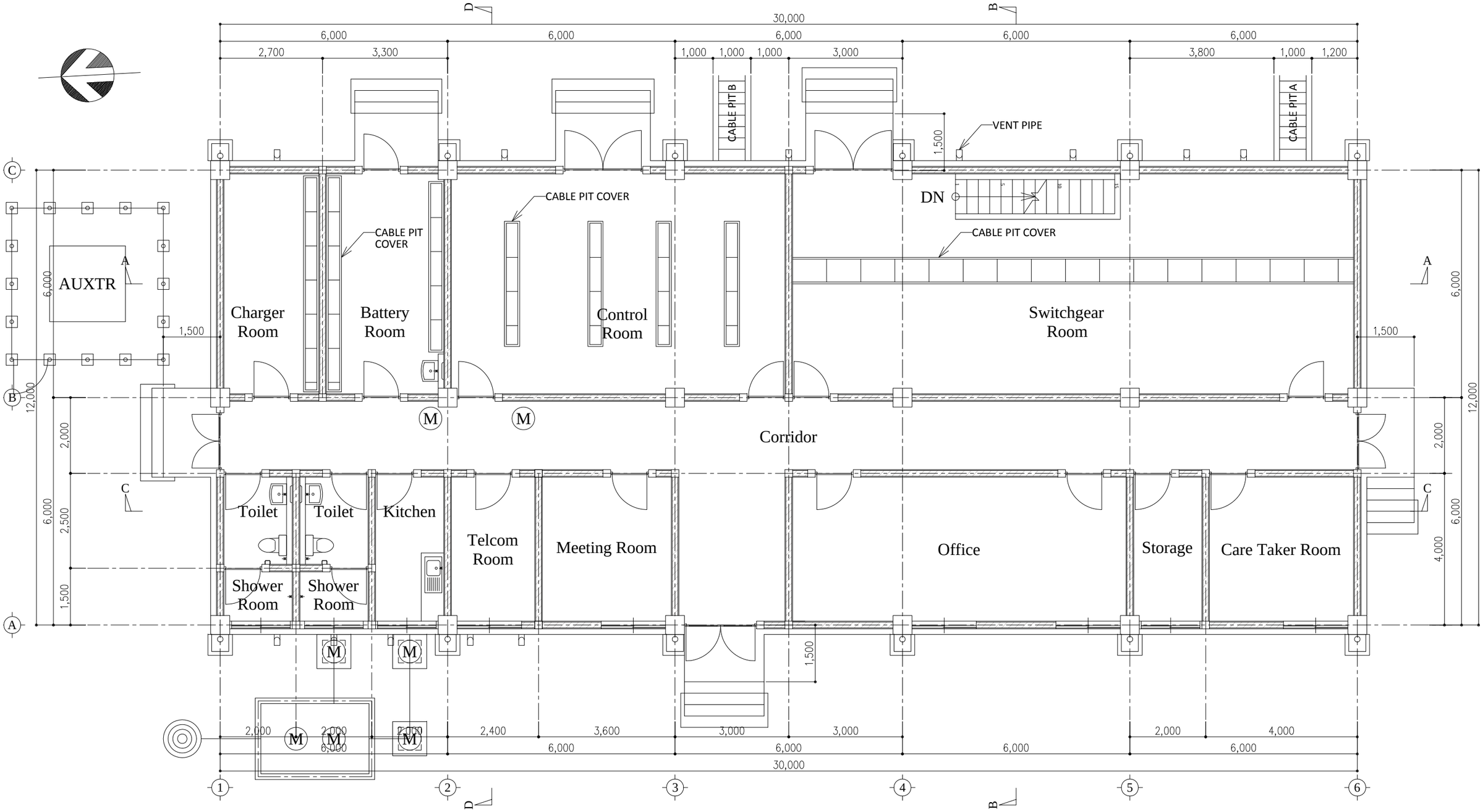
DWG No. A-02: Ndera Substation Building Finishing Schedule



GENERAL NOTES

1) CONCRETE BLOCK t=150

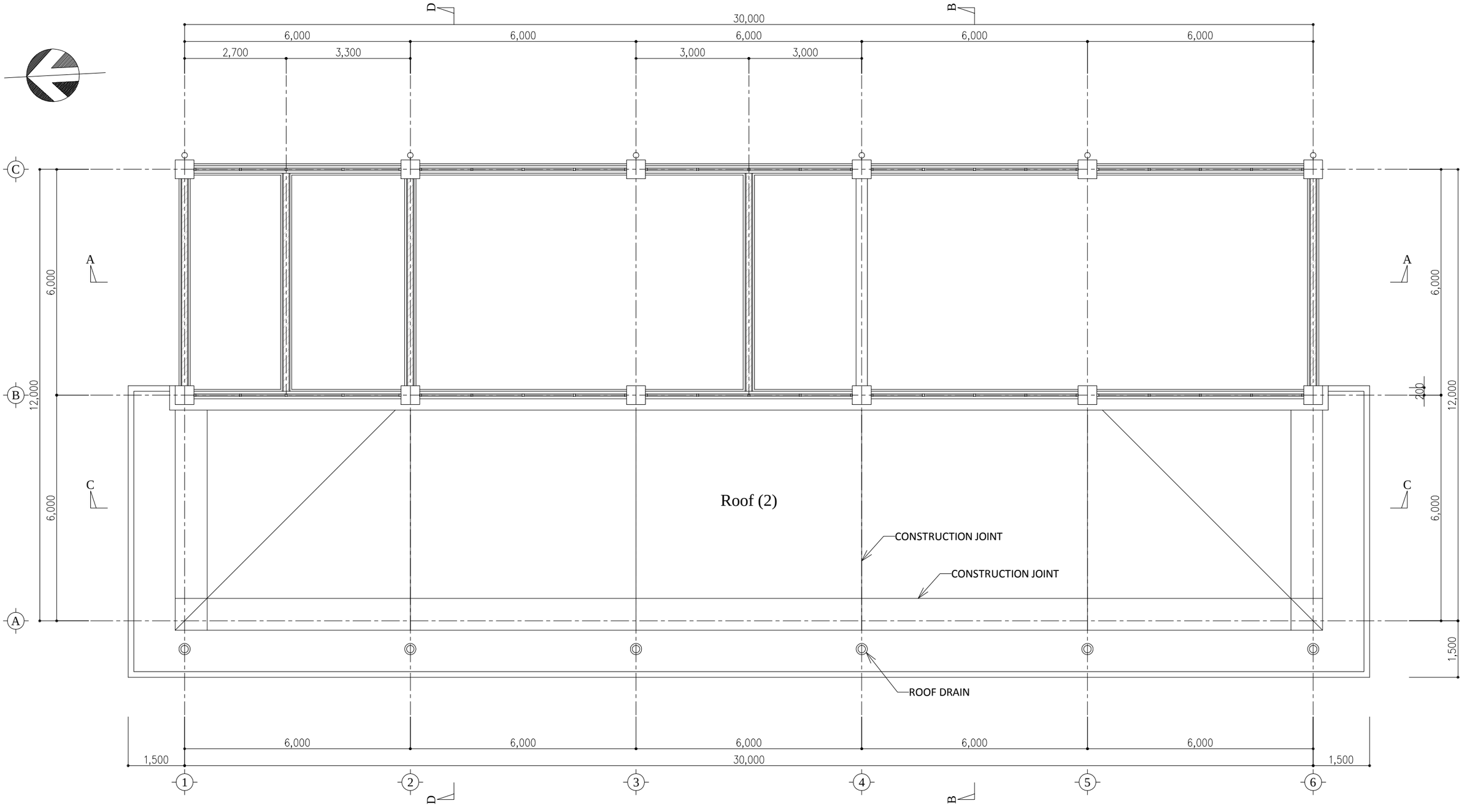
DWG No. A-03: Ndera Substation Building Basement Floor Plan



GENERAL NOTES

1) CONCRETE BLOCK t=150
2) (M) MANHOLE

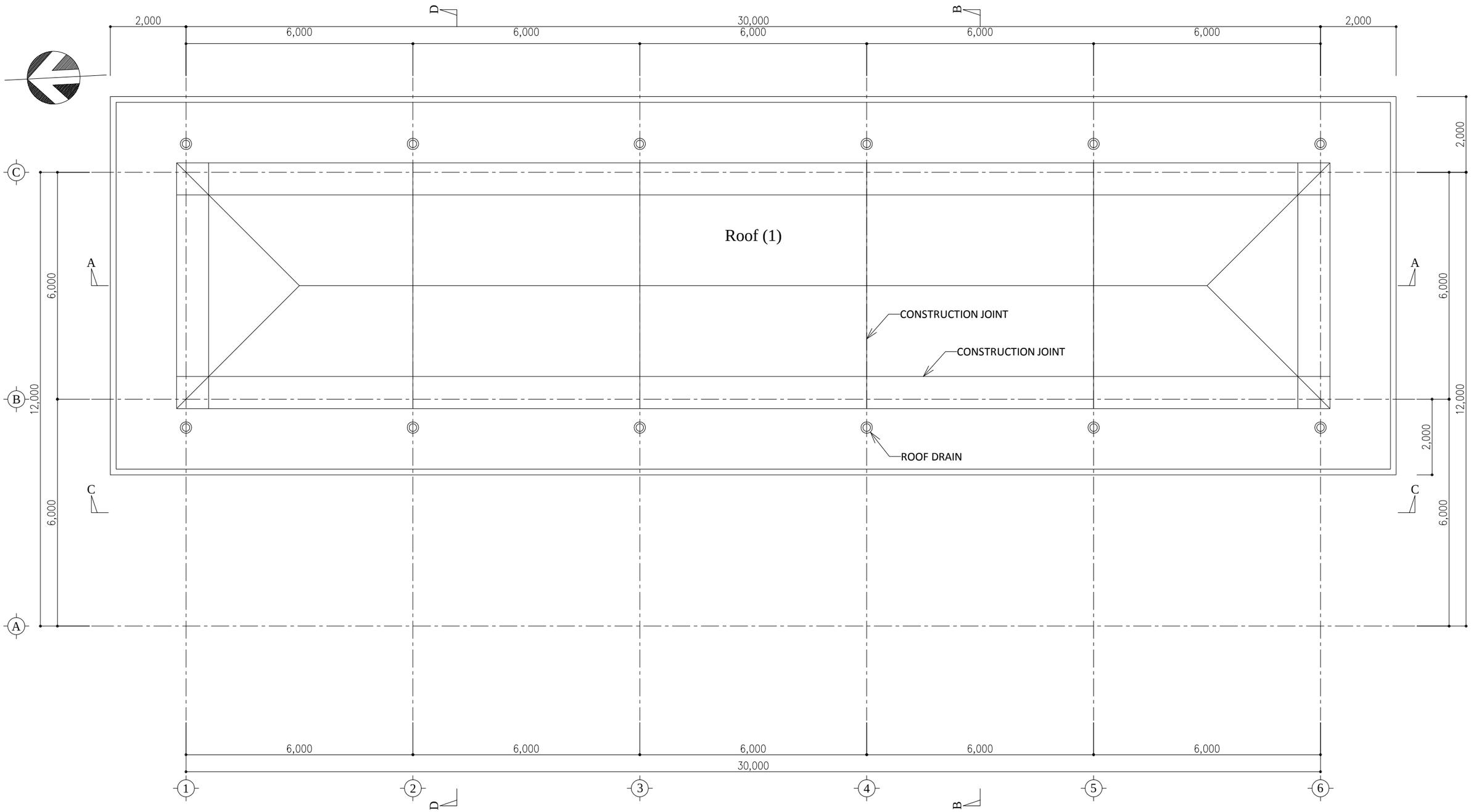
DWG No. A-04: Ndera Substation Building Ground Floor Plan



GENERAL NOTES

1) CONCRETE BLOCK t=150

DWG No. A-05: Ndera Substation Building Roof Plan 1



GENERAL NOTES

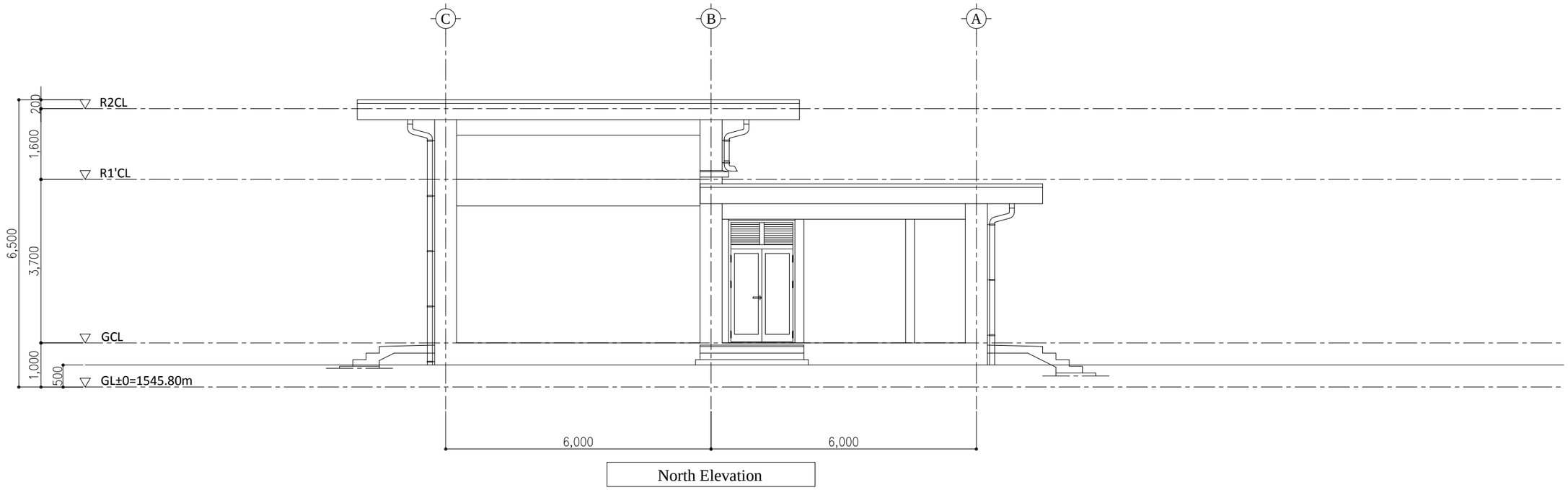
1) CONCRETE BLOCK t=150

DWG No. A-06: Ndera Substation Building Roof Plan 2

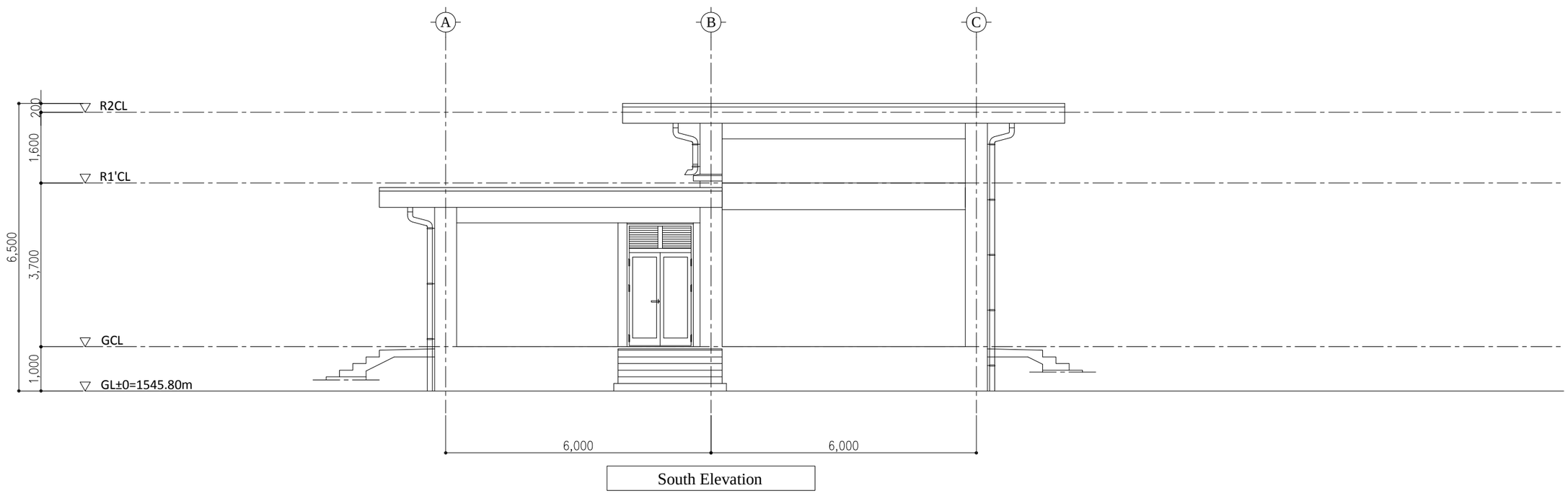
West Elevation

East Elevation

DWG No. A-07: Ndera Substation Building Elevation 1

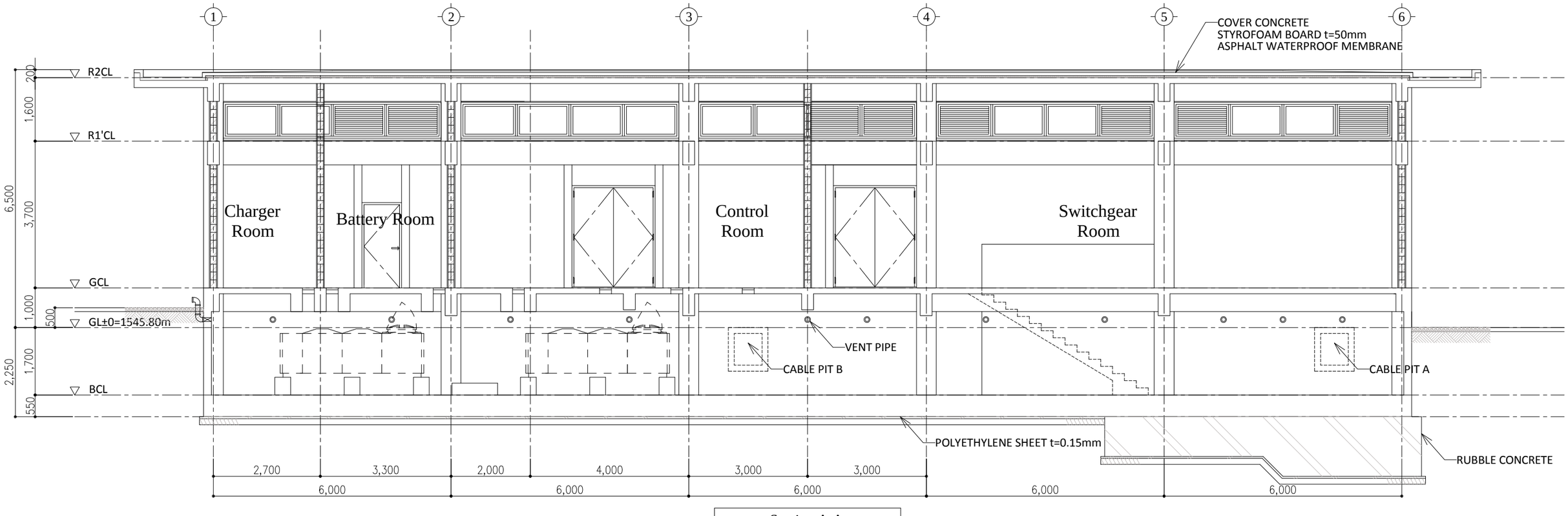


North Elevation

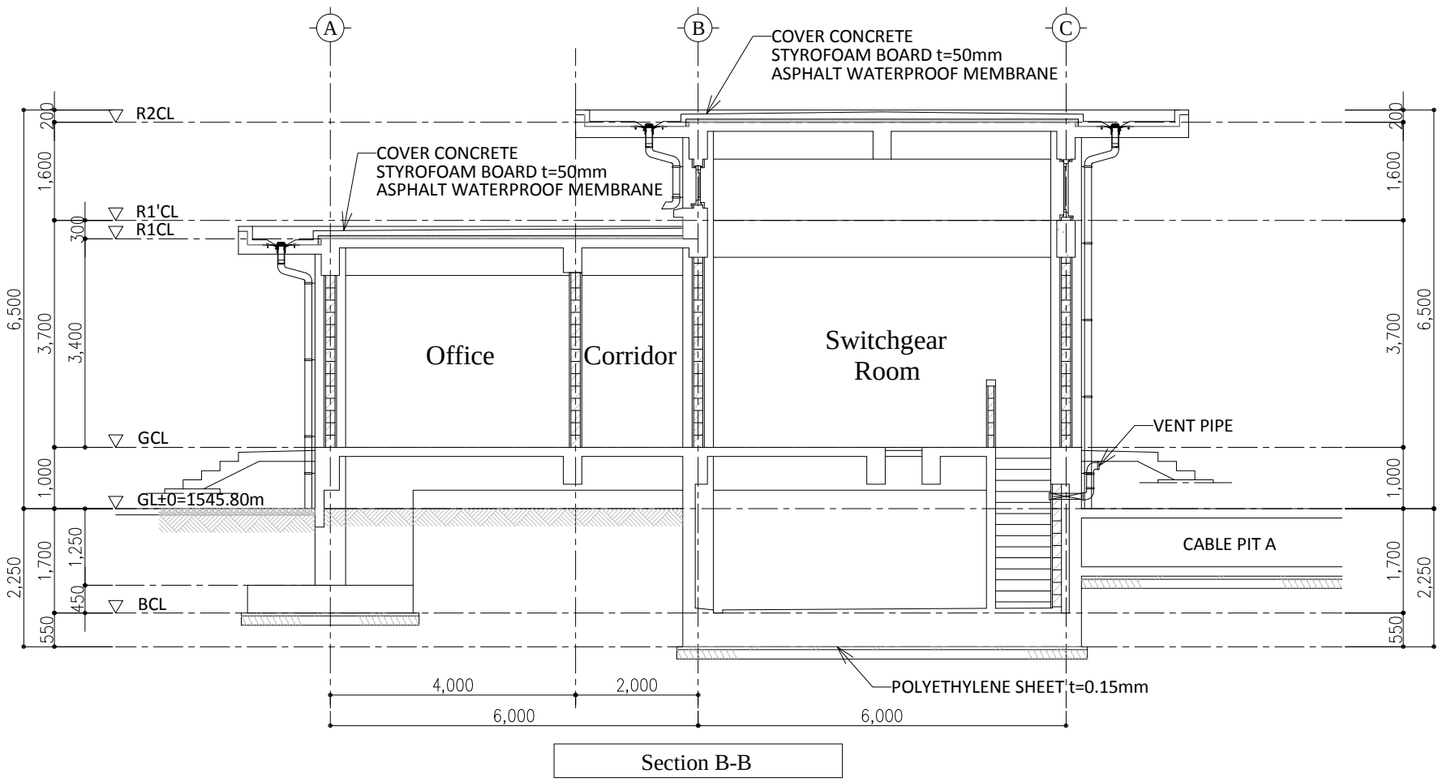


South Elevation

DWG No. A-08: Ndera Substation Building Elevation 2



Section A-A

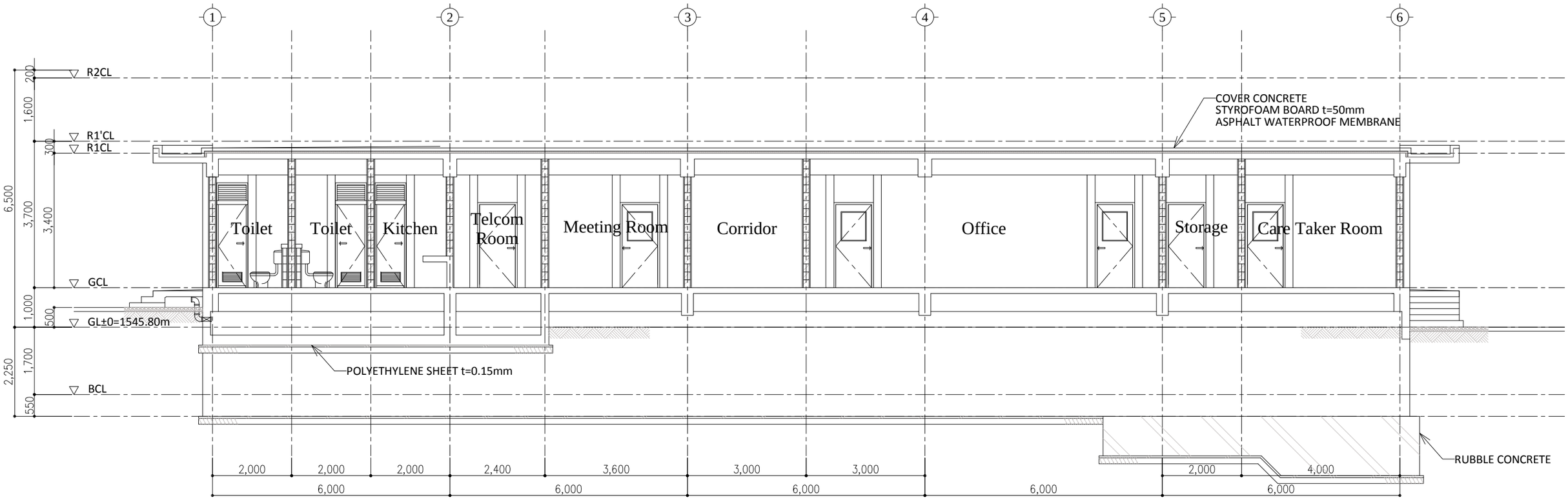


Section B-B

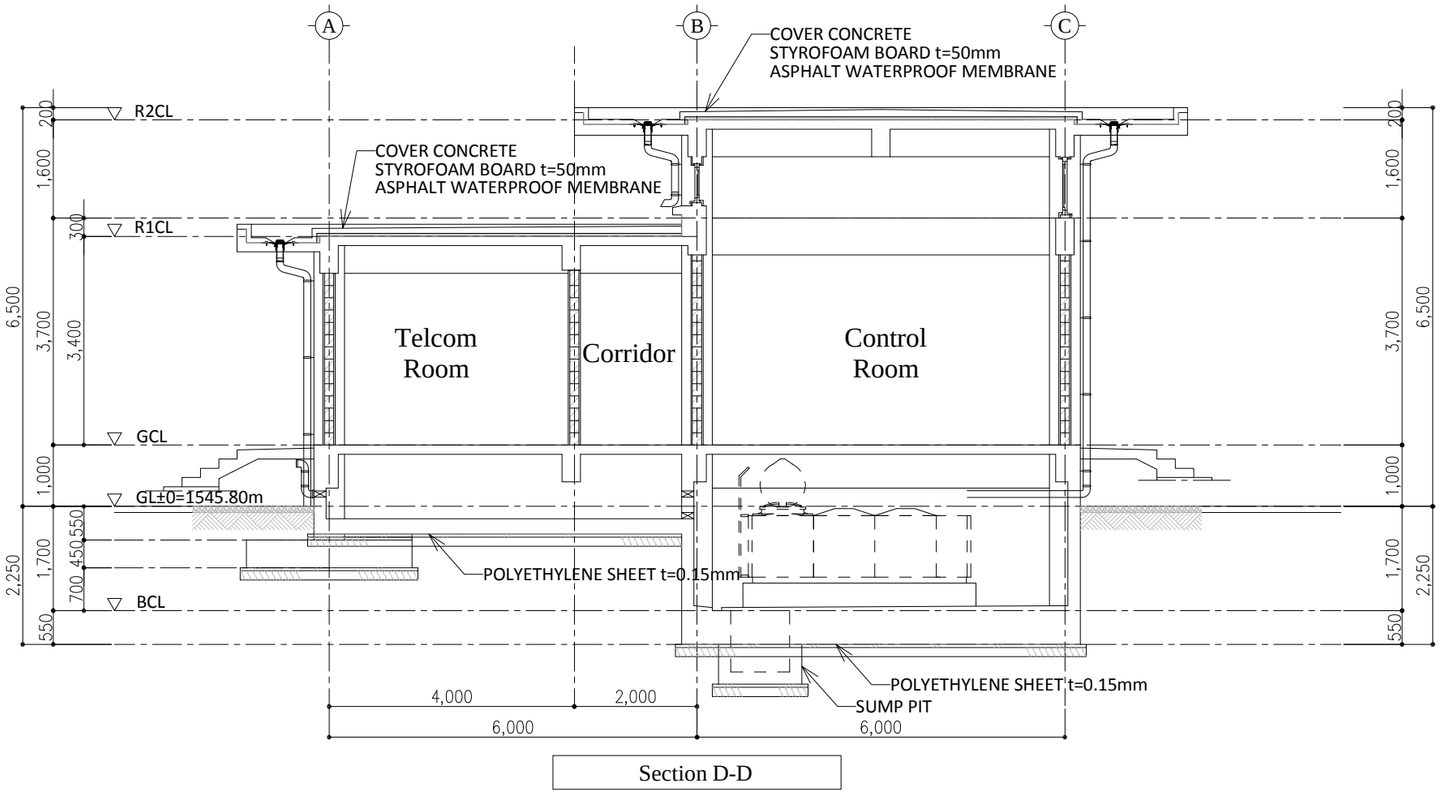
GENERAL NOTES

1) CONCRETE BLOCK t=150

DWG No. A-09: Ndera Substation Building Section 1



Section C-C

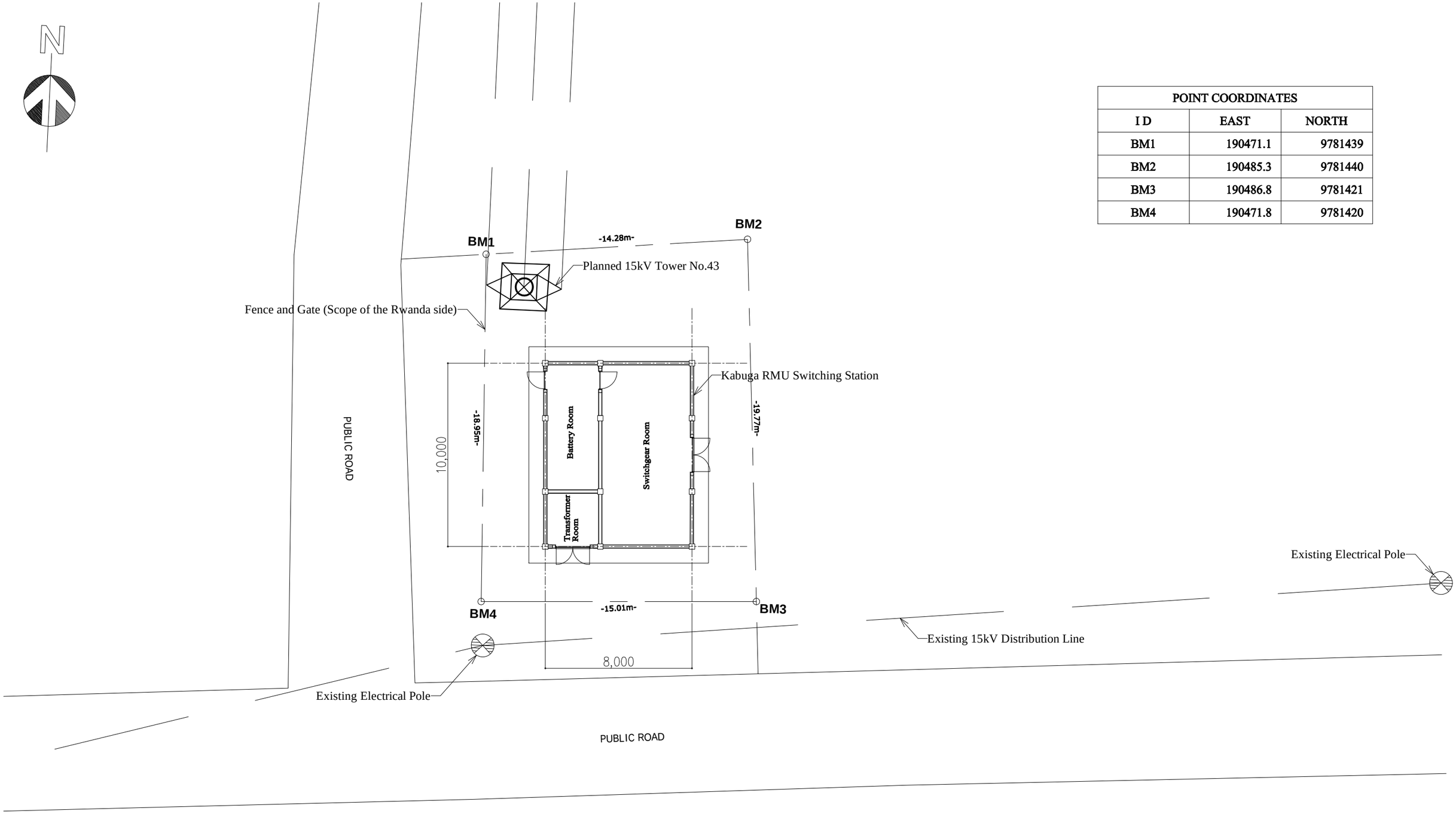


Section D-D

GENERAL NOTES

1) CONCRETE BLOCK t=150

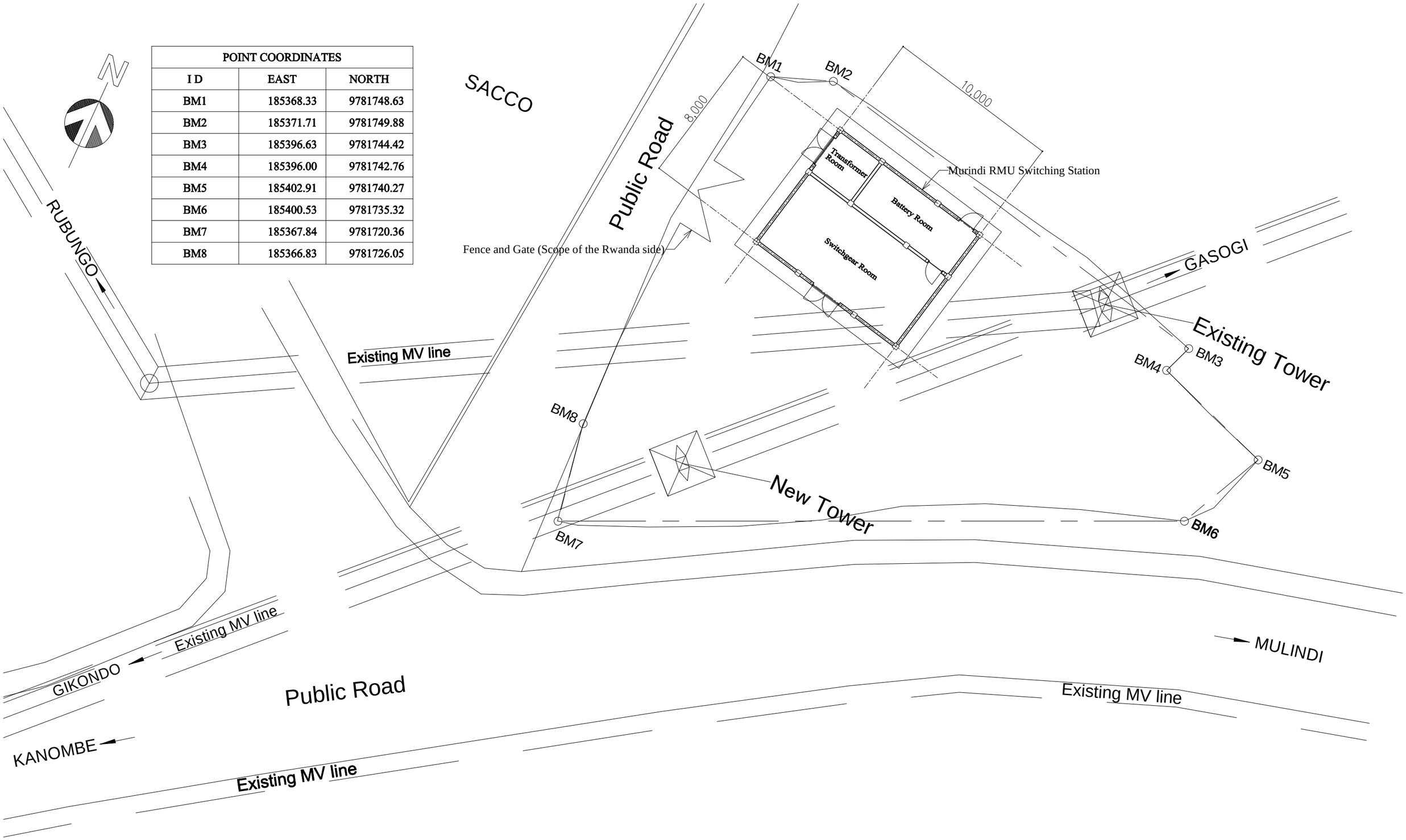
DWG No. A-10: Ndera Substation Building Section 2



POINT COORDINATES		
I D	EAST	NORTH
BM1	190471.1	9781439
BM2	190485.3	9781440
BM3	190486.8	9781421
BM4	190471.8	9781420

DWG No. A-11: Kabuga RMU Switching Station Site Plan

POINT COORDINATES		
I D	EAST	NORTH
BM1	185368.33	9781748.63
BM2	185371.71	9781749.88
BM3	185396.63	9781744.42
BM4	185396.00	9781742.76
BM5	185402.91	9781740.27
BM6	185400.53	9781735.32
BM7	185367.84	9781720.36
BM8	185366.83	9781726.05



DWG No. A-12: Murindi RMU Switching Station Site Plan

GENERAL

BUILDING AREA	80.00 m2
TOTAL FLOOR AREA	80.00 m2
STRUCTURE	REINFORCED CONCRETE

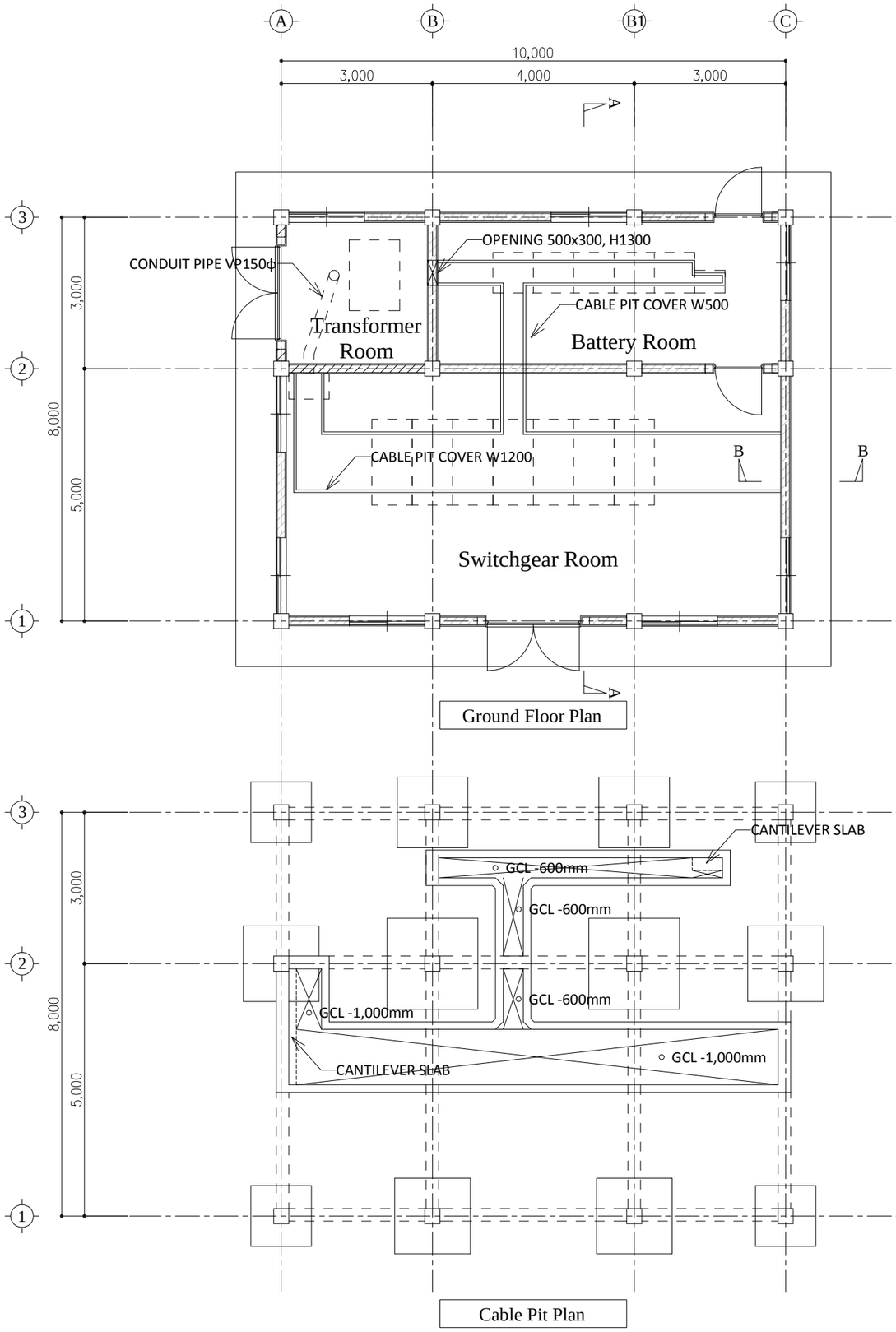
EXTERIOR FINISHING SCHEDULE

LOCATION	SPECIFICATION
COLUMN	FINISH (A.E.P) ON REINFORCED CONCRETE WITH MORTAR STEEL TROWEL 30mm THK
BEAM	PAINT FINISH (A.E.P) ON REINFORCED CONCRETE WITH MORTAR STEEL TROWEL 30mm THK
WALL	PAINT FINISH (A.E.P) ON 150mm THK CONCRETE BLOCK WITH MORTAR STEEL TROWEL 30mm THK
ROOF	CONCRETE STEEL TROWEL ON COVER CONCRETE WITH WELDED WIRE MESH THERMAL INSULATION: EXTRUDED POLYETHYLENE FORM 50mm THK ASPHALT MEMBRANE WATER PROOFING OR EQUIVALENT COATS OF HOT BITUMEN ON REINFORCED CONCRETE SLAB
FLOOR	CERAMIC TILE (300x300mm, NON SLIP) ON REINFORCED CONCRETE
PLINTH PROTECTION	CERAMIC TILE (300x300mm, NON SLIP) ON REINFORCED CONCRETE

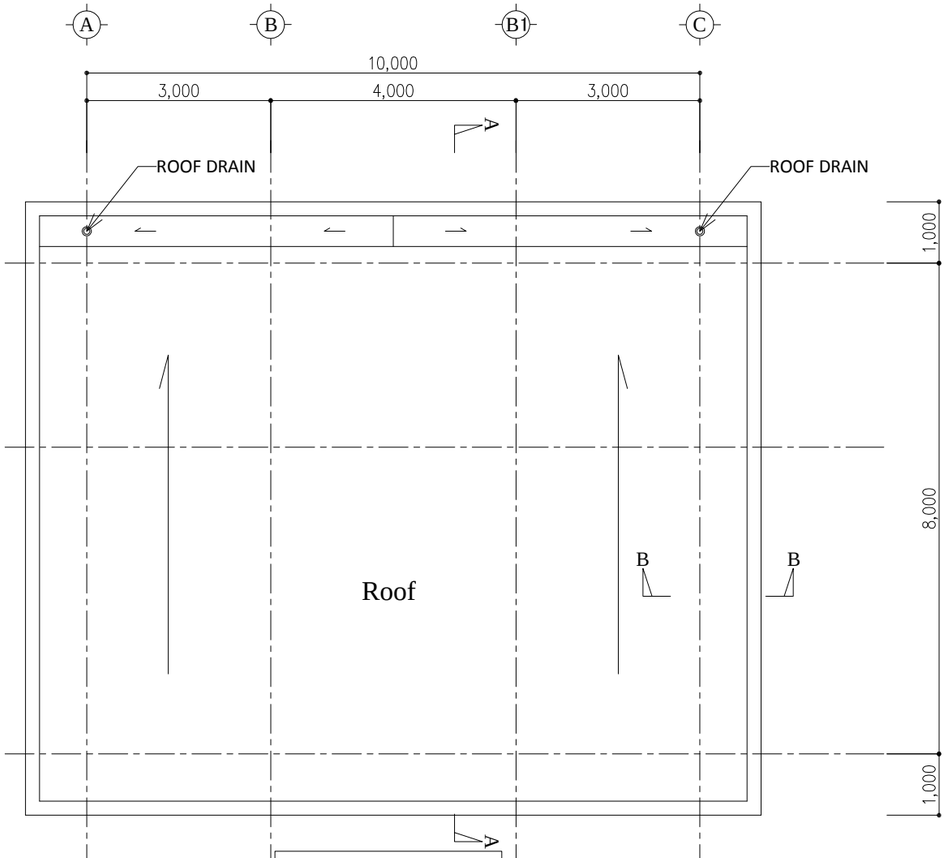
INTERIOR FINISHING SCHEDULE (KABUGA, MURINDI SWITCHING STATION)

ROOM NAME	FLOOR	BASEBOARD	WALL	CEILING	REMARKS
Switchgear Room	PORCELAIN TILE 300 X 300 ON MORTAR STEEL TROWEL	PAINT FINISH(A.E.P) MORTAR FINISH H=100	PAINT FINISH(A.E.P) MORTAR STEEL TROWEL 20mm THK ON 150mm THK CONCRETE BLOCK	PAINT FINISH (A.E.P) EXPOSED CONCRETE (WITH REPAIR)	EXHAUST FAN WITH HOOD, NAME PLATE FIRE EXTINGUISHER 1 SET NAME PLATE
Battery Room	DITTO	DITTO	DITTO	DITTO	EXHAUST FAN WITH HOOD, NAME PLATE FIRE EXTINGUISHER 1 SET NAME PLATE
Transformer Room	NON-SLIP PAINTING FINISH ON CONCRETE	DITTO	DITTO	DITTO	EXHAUST FAN WITH HOOD, NAME PLATE FIRE EXTINGUISHER 1 SET NAME PLATE
					AIR CONDITIONING, NAME PLATE FIRE EXTINGUISHER 1 SET

DWG No. A-13: Kabuga (Murindi) RMU Switching Station Finishing Schedule



Ground Floor Plan



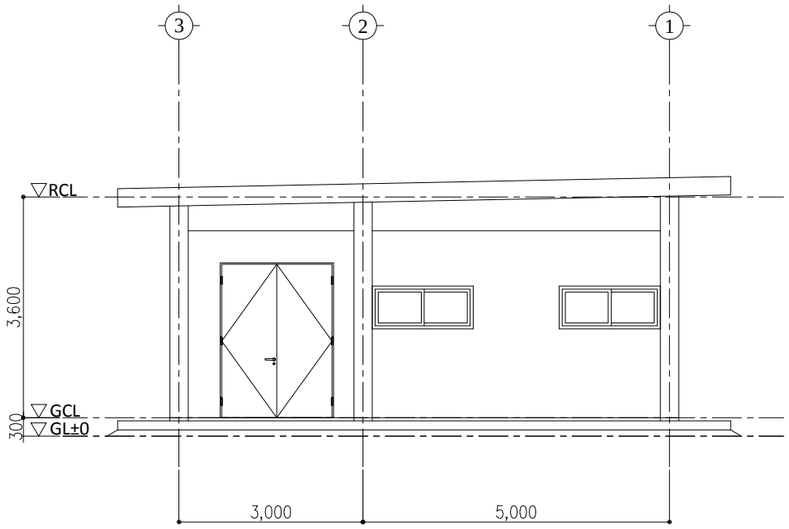
Roof Plan

Cable Pit Plan

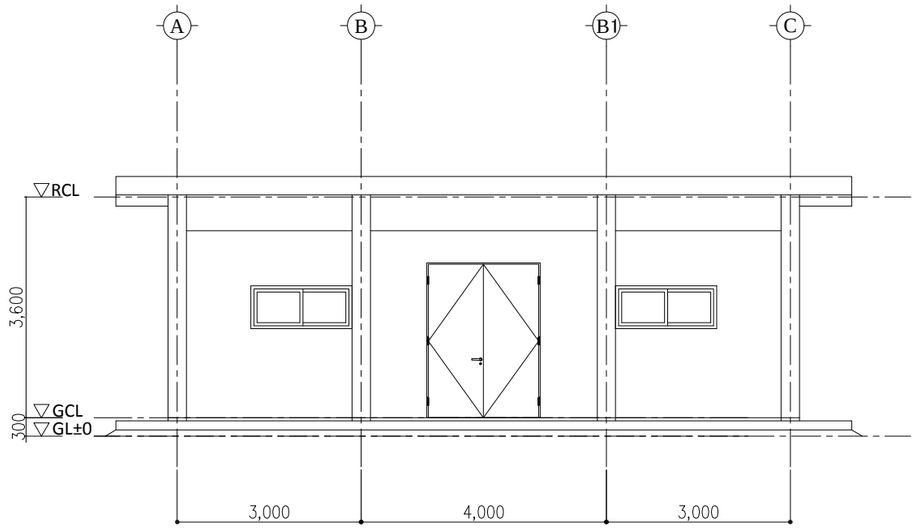
GENERAL NOTES

1) CONCRETE BLOCK t=150

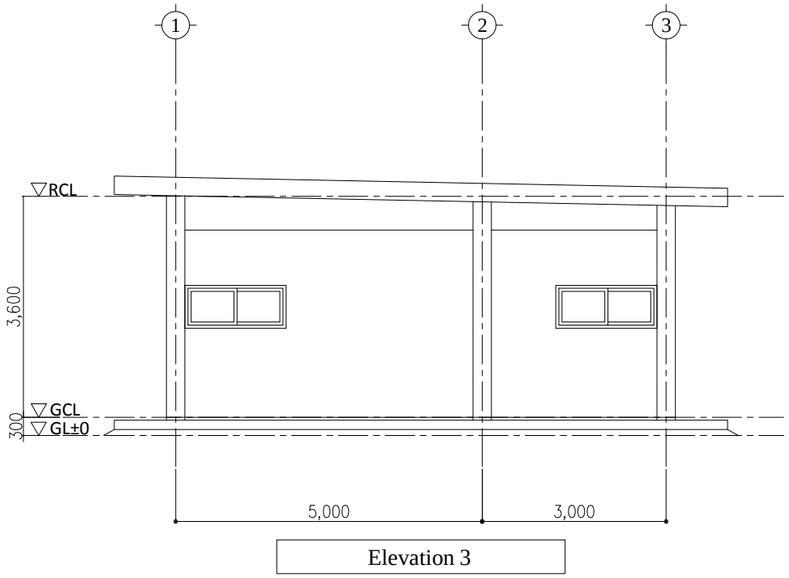
DWG No. A-14: Kabuga (Murindi) RMU Switching Station Plan



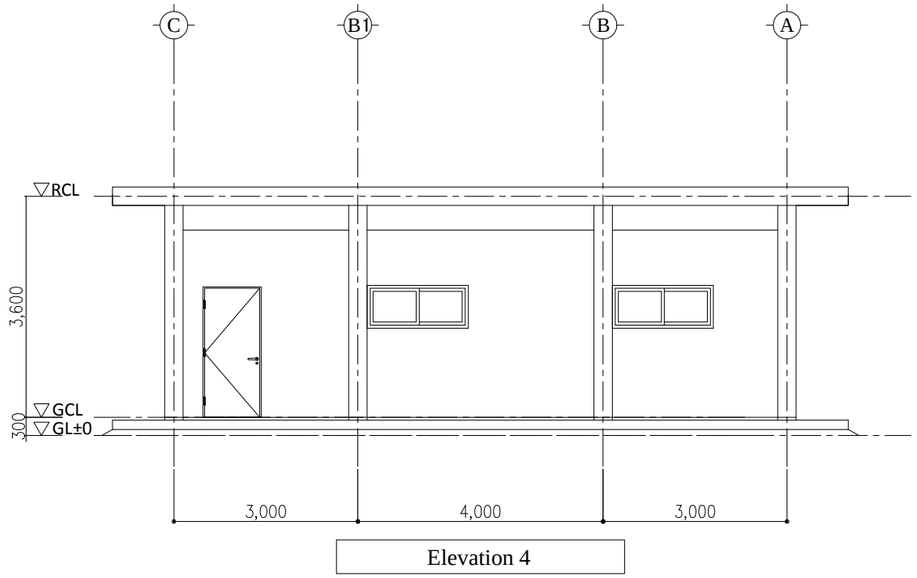
Elevation 1



Elevation 2

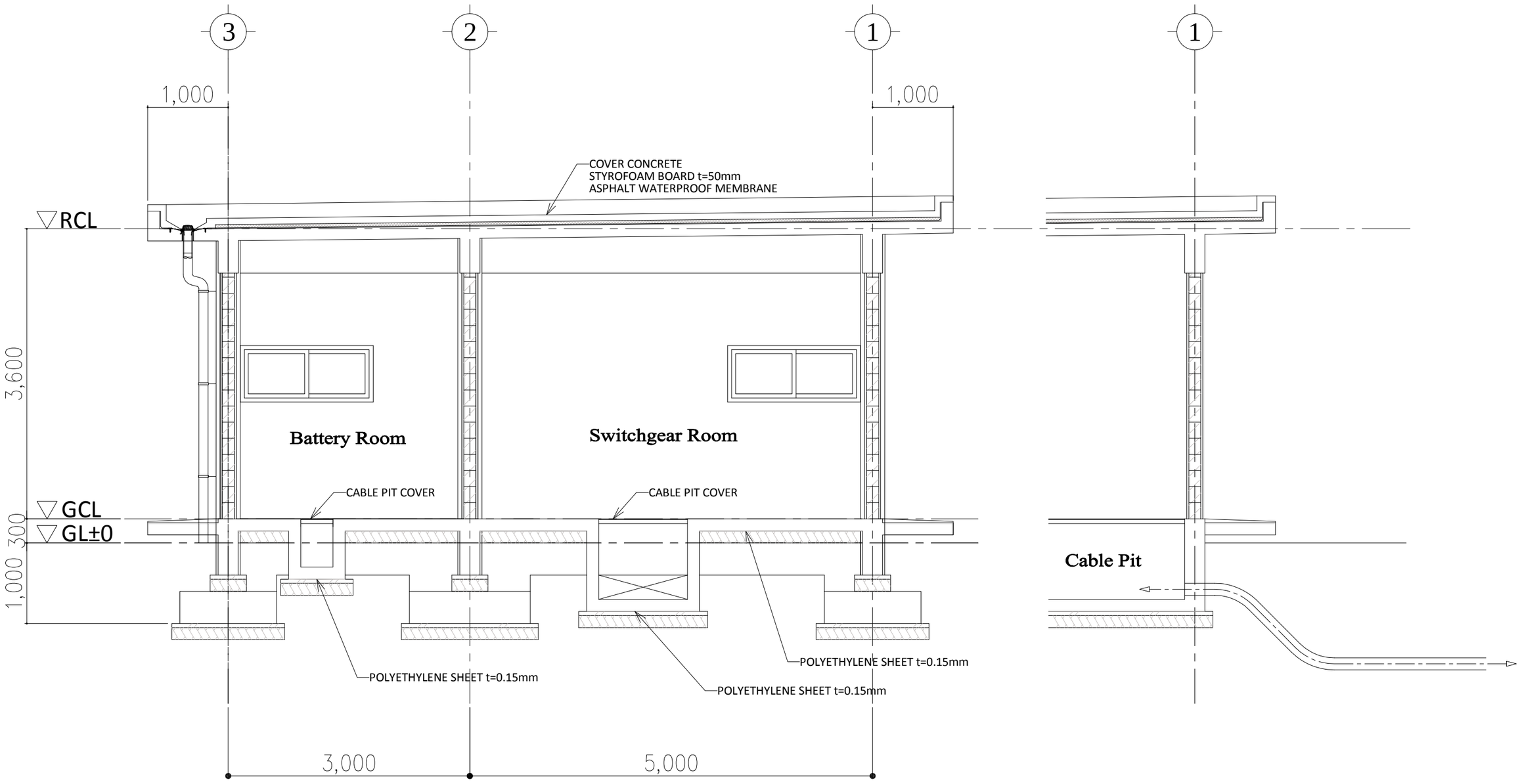


Elevation 3



Elevation 4

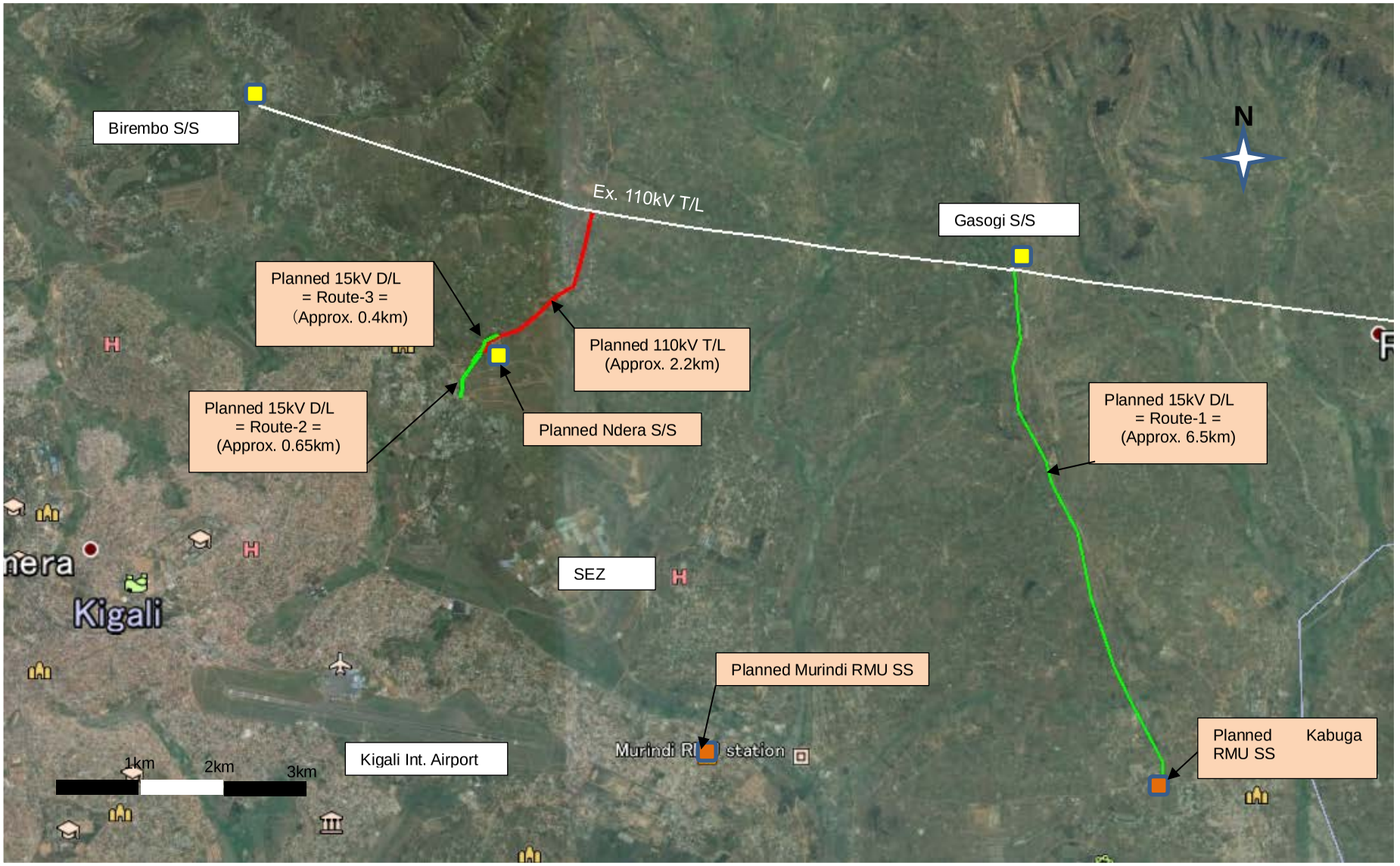
DWG No. A-15: Kabuga (Murindi) RMU Switching Station Elevation



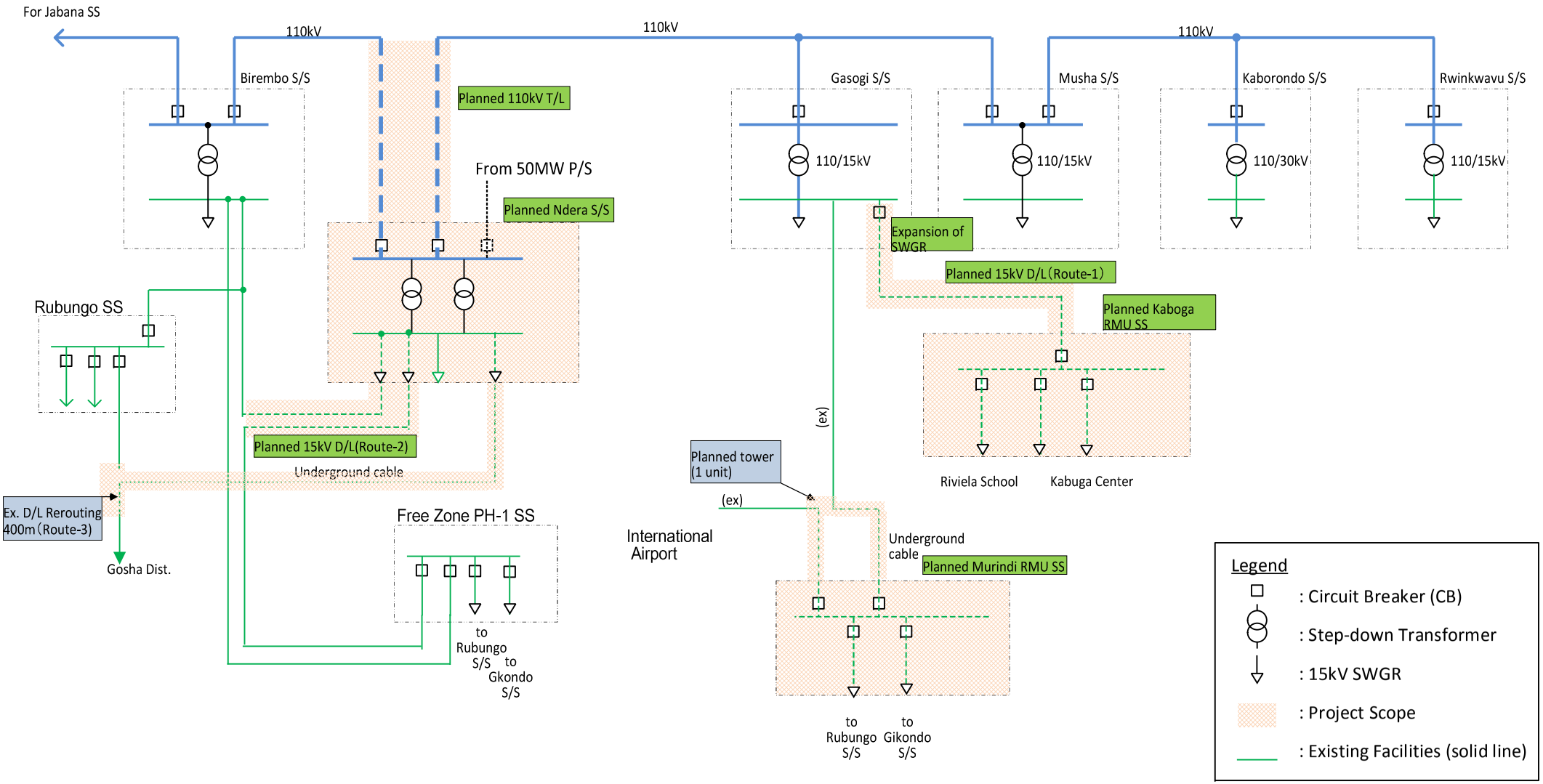
Section A-A

Section B-B

DWG No. A-16: Kabuga (Murindi) RMU Switching Station Section



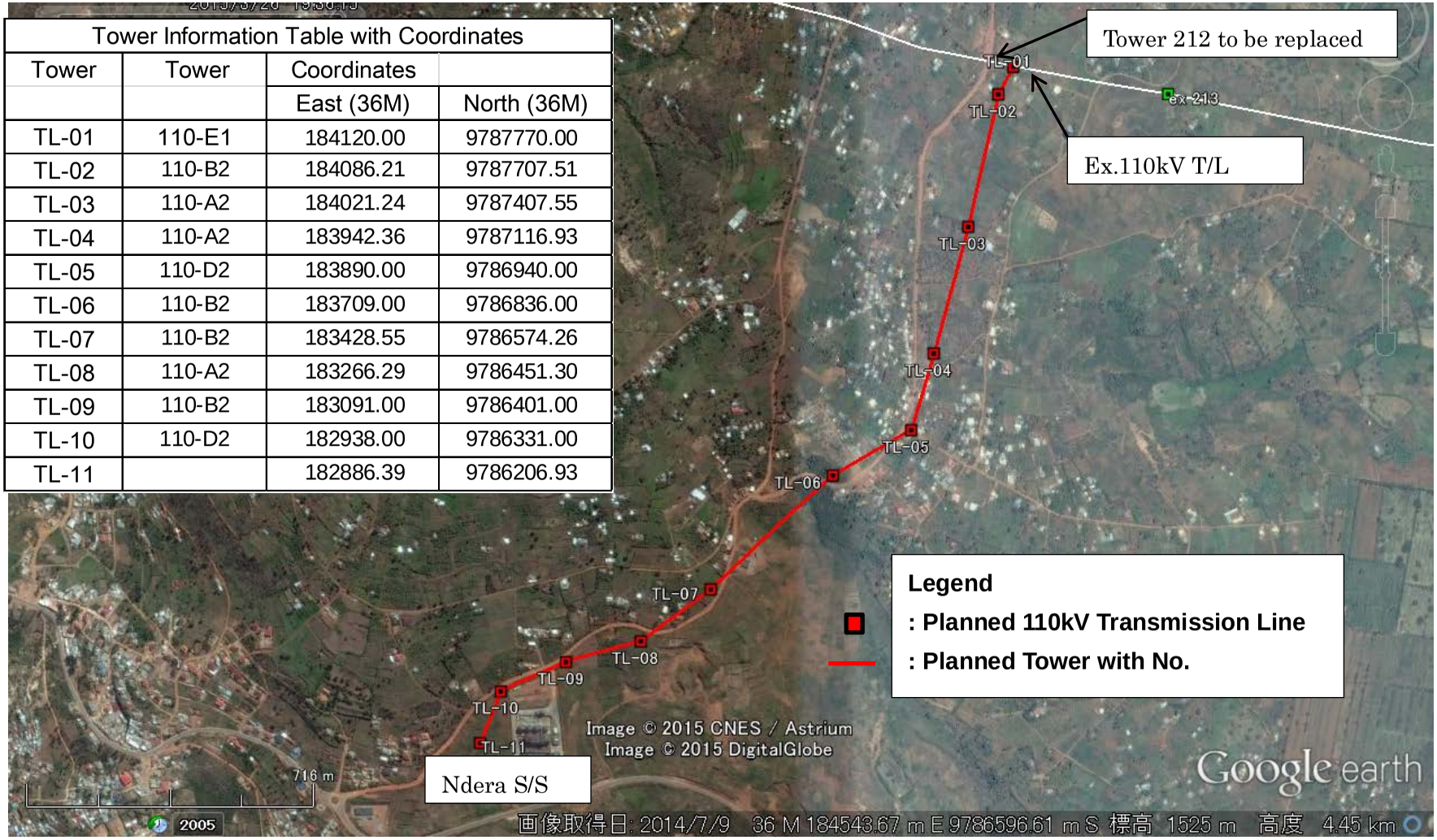
DWG No. GG-01: Transmission and Distribution Site Map (Overall)



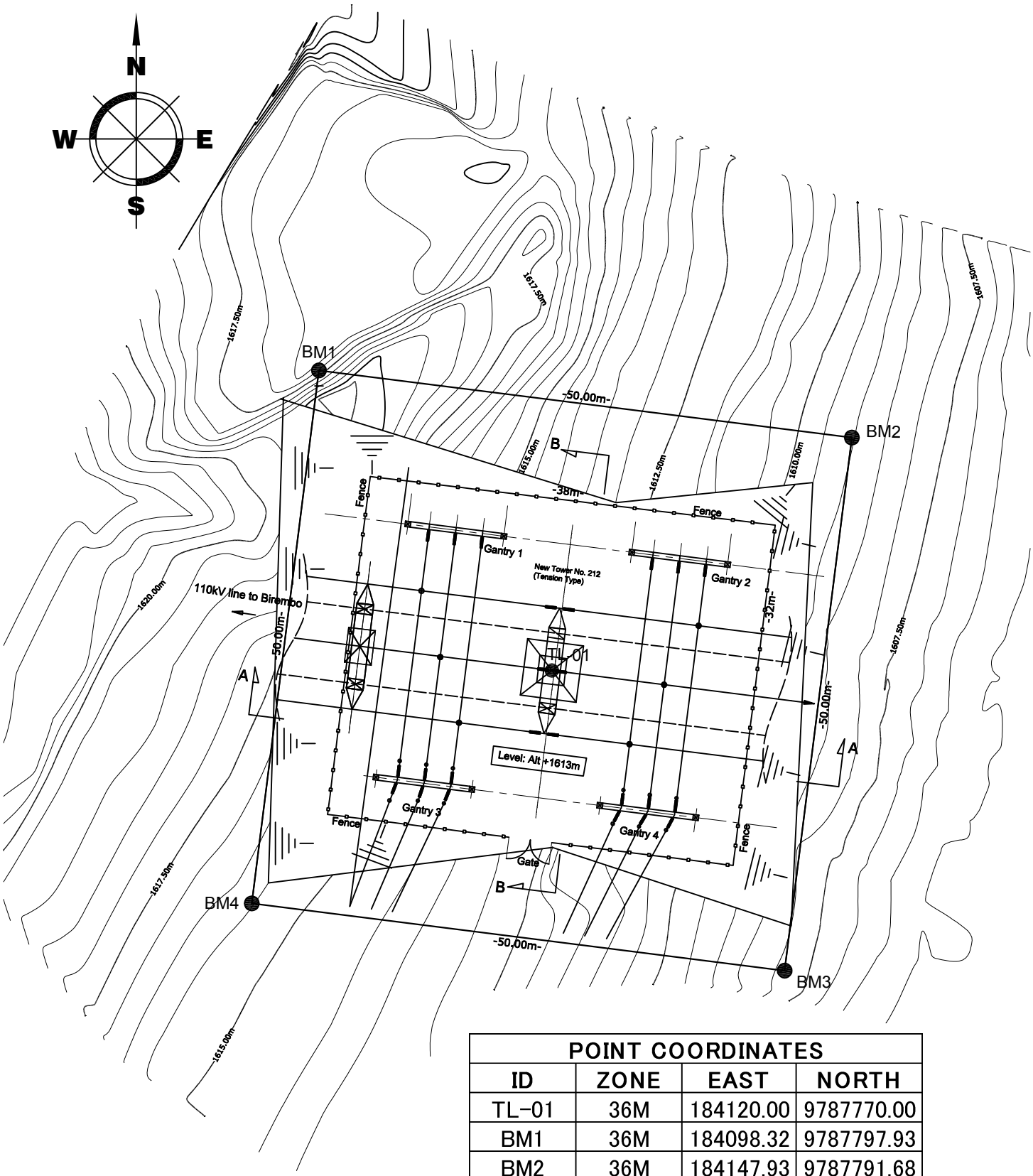
DWG No. GG-02: Transmission and Distribution Network (Only Planned Area)

19th March 2015

Tower Information Table with Coordinates			
Tower	Tower	Coordinates	
		East (36M)	North (36M)
TL-01	110-E1	184120.00	9787770.00
TL-02	110-B2	184086.21	9787707.51
TL-03	110-A2	184021.24	9787407.55
TL-04	110-A2	183942.36	9787116.93
TL-05	110-D2	183890.00	9786940.00
TL-06	110-B2	183709.00	9786836.00
TL-07	110-B2	183428.55	9786574.26
TL-08	110-A2	183266.29	9786451.30
TL-09	110-B2	183091.00	9786401.00
TL-10	110-D2	182938.00	9786331.00
TL-11		182886.39	9786206.93



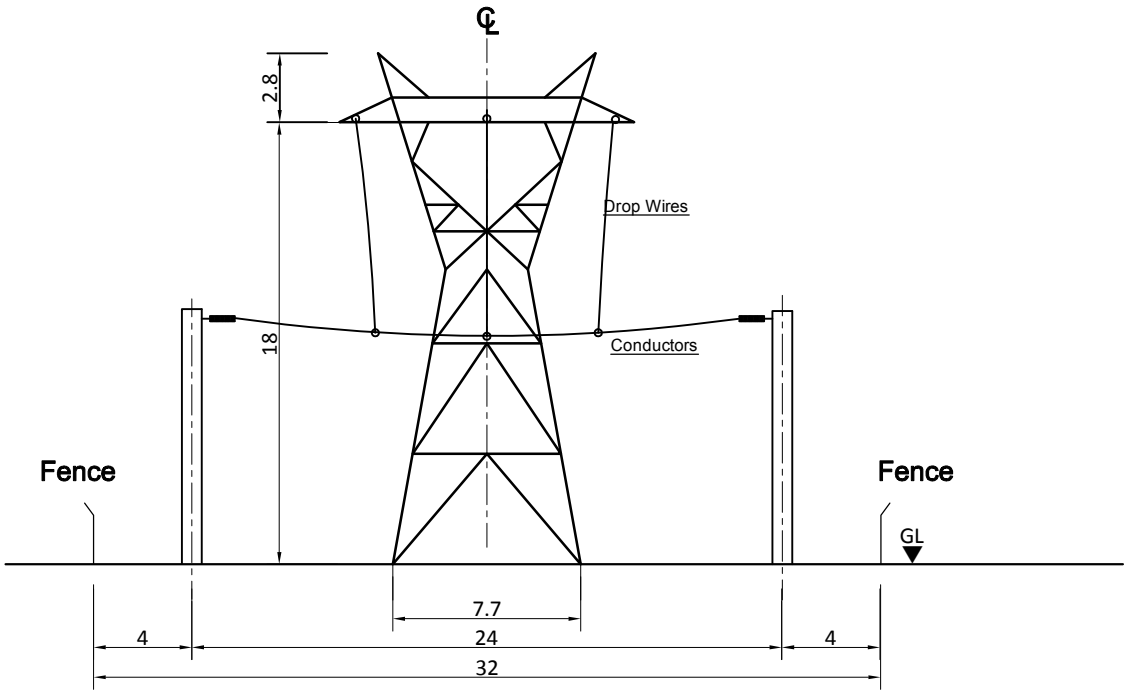
DWG No. GG-11: 110kV Transmission Line　Route（Tower 212—Ndera S/S：Approx. 2.2 km）



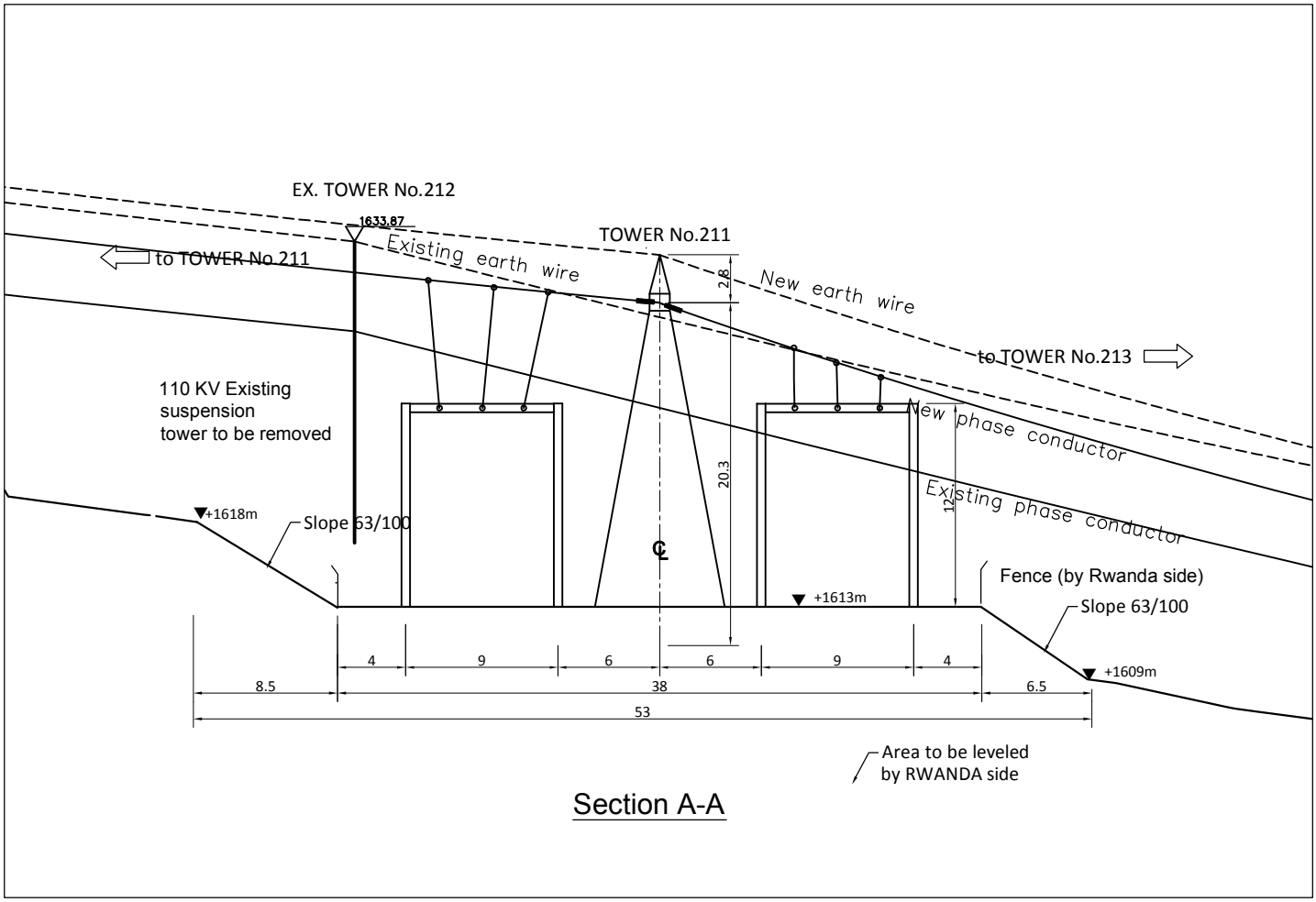
POINT COORDINATES			
ID	ZONE	EAST	NORTH
TL-01	36M	184120.00	9787770.00
BM1	36M	184098.32	9787797.93
BM2	36M	184147.93	9787791.68
BM3	36M	184141.67	9787742.07
BM4	36M	184092.07	9787748.32

Remarks:
1. Gate and Fence shall be installed by Rwandan side.
2. Site Leveling work shall be done by Rwandan side.

DWG No. GG-12: Branch Point of 110kV Transmission Line Plan（Scale: 1/500)



Section B-B

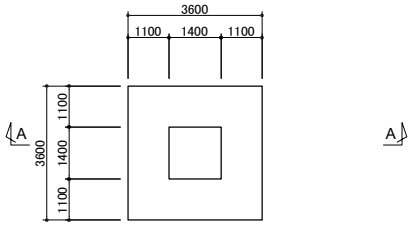


Section A-A

DWG No. GG-13: Branch Point of 110kV Transmission Line（Section）

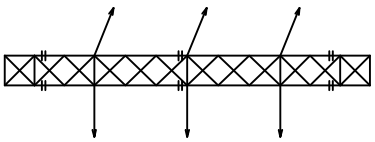
DESIGN CONDITION TABLE				
DESCRIPTION		UNIT	DESIGN VALUE	
VOLTAGE		kV	110	
CIRCUIT		cct	1	
TYPE TOWER		—	GANTRY	
WIND LOAD SPAN		m	40	
WEIGHT LOAD SPAN		m	40	
LINE ANGLE		Degree	0-22	
VERTICAL ANGLE		tan α	-0.2	
CONDUCTOR	CODE	—	ACSR 240/40 (DIN)	
	NUMBERS	—	(ONE) 1	
	DIAMETER	mm	21.8	
	UNIT MASS	kg/m	0.989	
	UNIT TENSION	N/wire	Gantry side 4,900 (500 kgf/wire)	
			To tower side 6,860 (700 kgf/wire)	
GROUND WIRE	CODE	—	OPGW 97/48	
	NUMBERS	—	(ONE) 1	
	DIAMETER	mm	16.0	
	UNIT MASS	kg/m	0.604	
	UNIT TENSION	N/wire	2,940 (300 kgf/wire)	
INSULATOR	KIND	—	250mm Suspension Type	Cylindrical Post Insulator
		Numbers	9 × 1 (Single Tension)	C6 - 650 - A
	WEIGHT	kg/set	180	70
	WIND	N/set	488 (49.8 kgf/set)	203 (20.7 kgf/set)
WIND PRESS	TOWER	Pa	1,214 (123.8 kgf/㎡)	
	CONDUCTOR	Pa	552 (56.3 kgf/㎡)	
	GROUND WIRE	Pa	552 (56.3 kgf/㎡)	

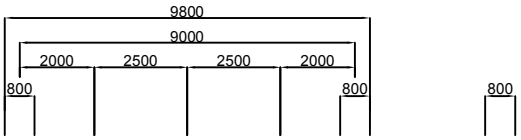
P1, 2 n=8
(COMMON GANTRY 1 ~ GANTRY 4)

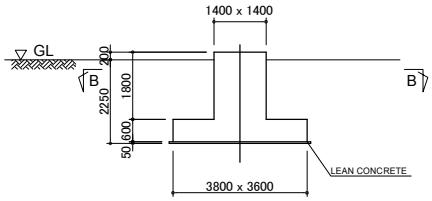


PLAN

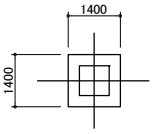
Planar view



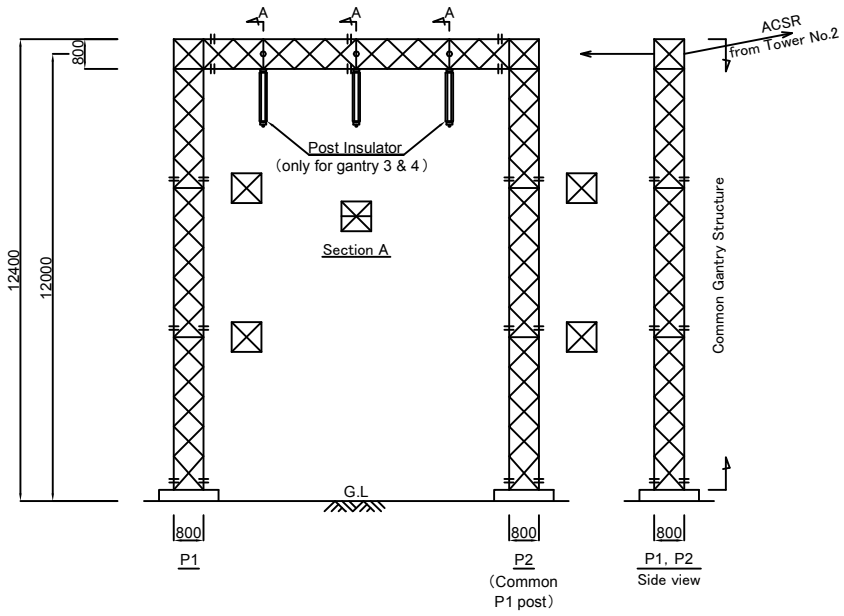




SECTION A - A

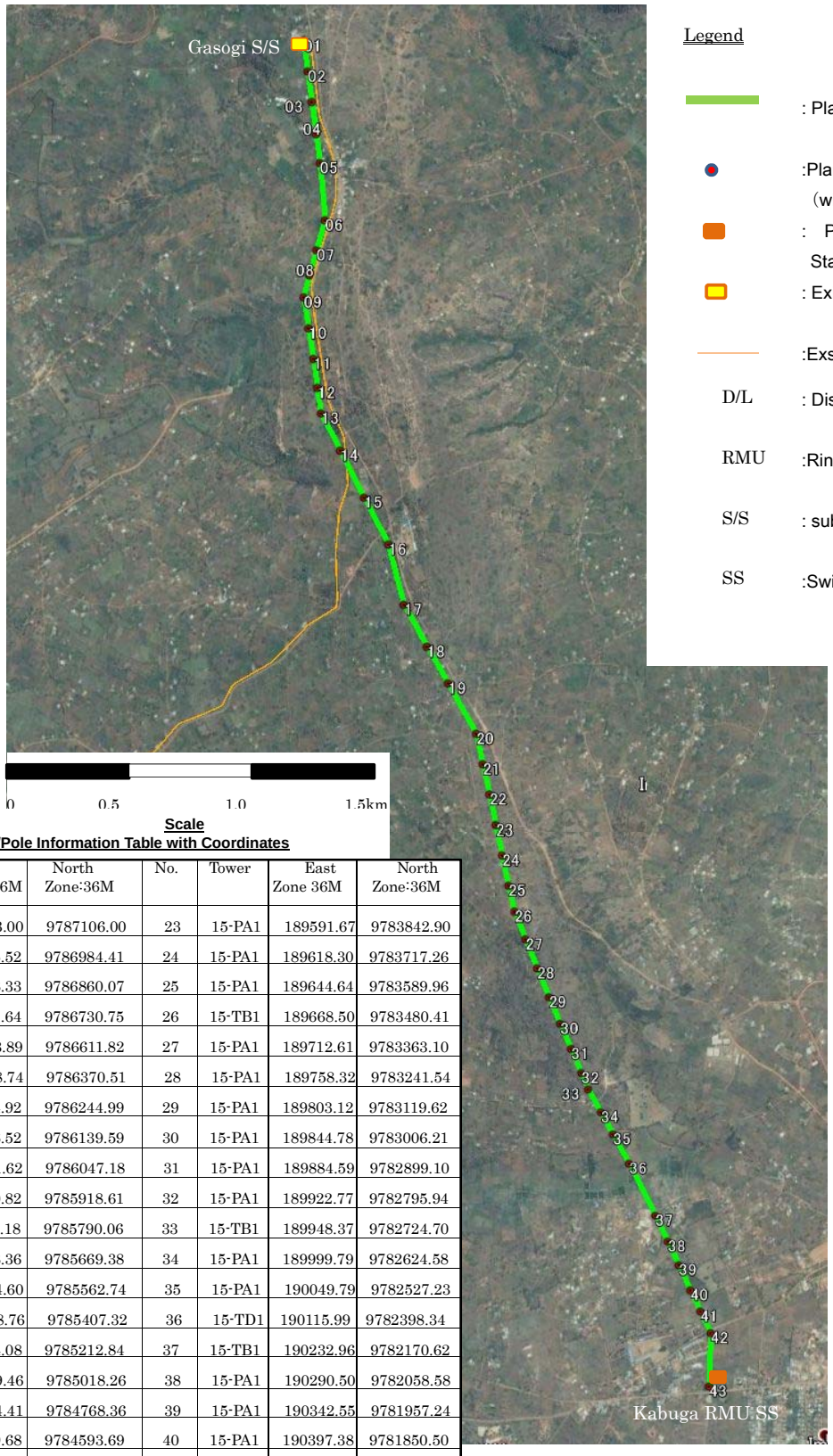


SECTION B - B



FOUNDATION PLAN FOR GANTRY STRUCTURE

DWG No. GG-14:Gantry Tower for 110kV Branch Point

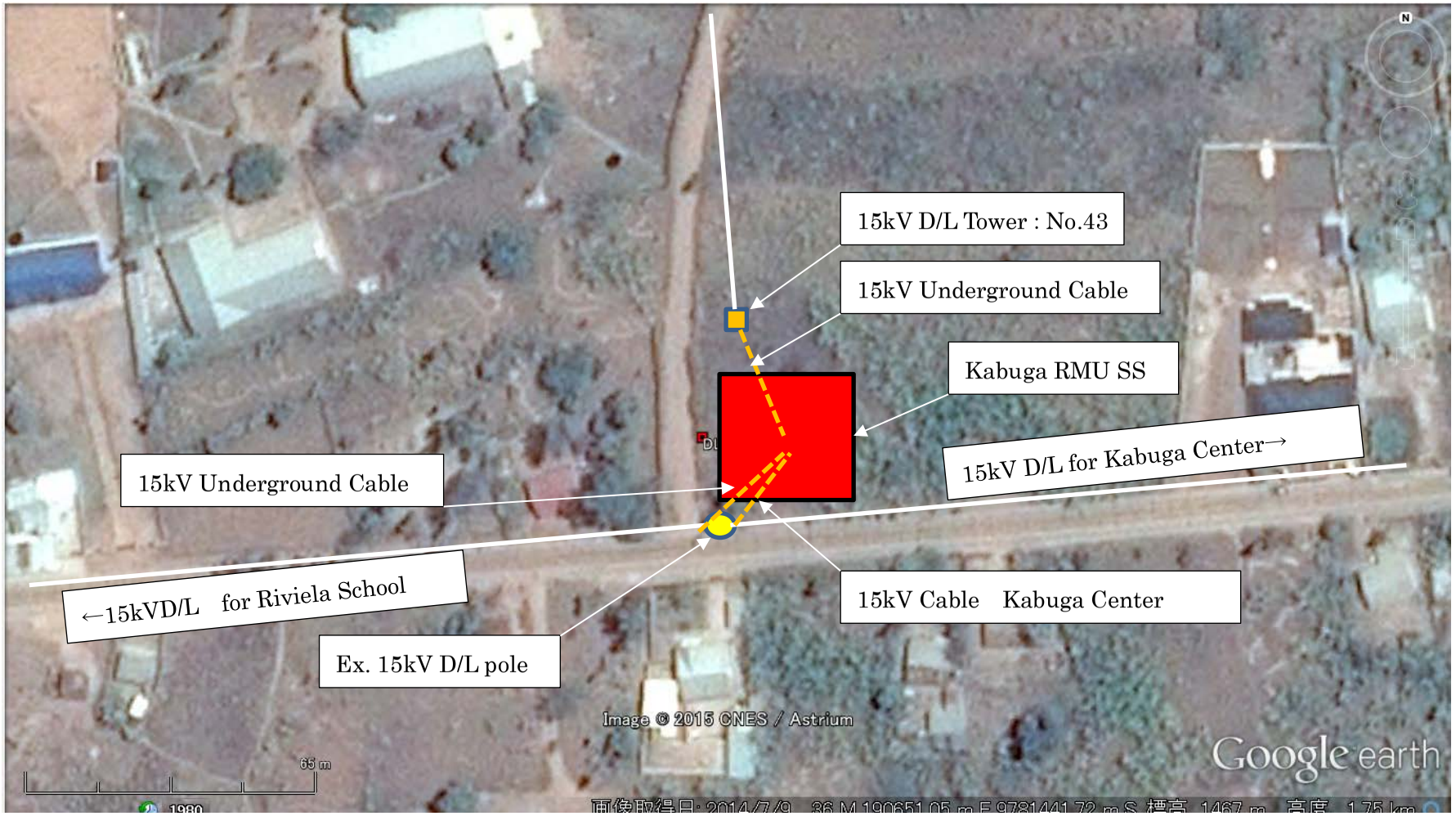


Scale

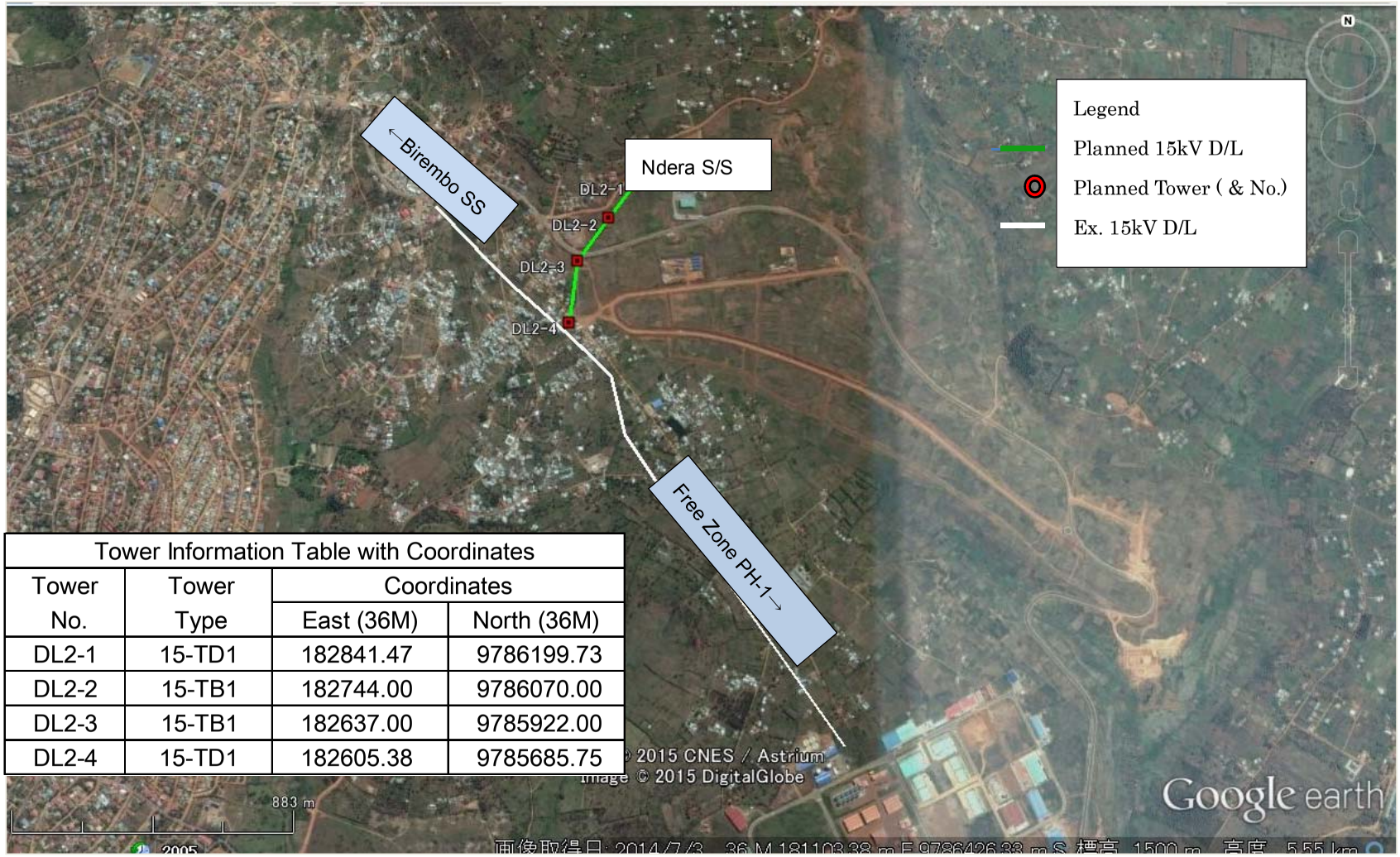
Tower/Pole Information Table with Coordinates

No.	Tower	East Zone:36M	North Zone:36M	No.	Tower	East Zone 36M	North Zone:36M
01	15-TD1	188793.00	9787106.00	23	15-PA1	189591.67	9783842.90
02	15-PA1	188805.52	9786984.41	24	15-PA1	189618.30	9783717.26
03	15-PA1	188818.33	9786860.07	25	15-PA1	189644.64	9783589.96
04	15-PA1	188831.64	9786730.75	26	15-TB1	189668.50	9783480.41
05	15-TB1	188843.89	9786611.82	27	15-PA1	189712.61	9783363.10
06	15-TD1	188868.74	9786370.51	28	15-PA1	189758.32	9783241.54
07	15-PA1	188834.92	9786244.99	29	15-PA1	189803.12	9783119.62
08	15-PA1	188806.52	9786139.59	30	15-PA1	189844.78	9783006.21
09	15-TB1	188781.62	9786047.18	31	15-PA1	189884.59	9782899.10
10	15-PA1	188800.82	9785918.61	32	15-PA1	189922.77	9782795.94
11	15-PA1	188820.18	9785790.06	33	15-TB1	189948.37	9782724.70
12	15-PA1	188838.36	9785669.38	34	15-PA1	189999.79	9782624.58
13	15-TD1	188854.60	9785562.74	35	15-PA1	190049.79	9782527.23
14	15-TD1	188938.76	9785407.32	36	15-TD1	190115.99	9782398.34
15	15-TA1	189044.08	9785212.84	37	15-TB1	190232.96	9782170.62
16	15-TD1	189149.46	9785018.26	38	15-PA1	190290.50	9782058.58
17	15-TD1	189214.41	9784768.36	39	15-PA1	190342.55	9781957.24
18	15-TA1	189309.68	9784593.69	40	15-PA1	190397.38	9781850.50
19	15-TA1	189394.47	9784438.23	41	15-PA1	190443.64	9781760.42
20	15-TD1	189510.64	9784225.24	42	15-TD1	190490.69	9781663.83
21	15-PA1	189537.77	9784097.22	43	15-TD1	190485.25	9781439.01
22	15-TD1	189564.72	9783970.08				

DWG No. GG-21: 15KV Distribution Line Route (Route-1 ： Gasogi S/S-Kabuga RMU SS)



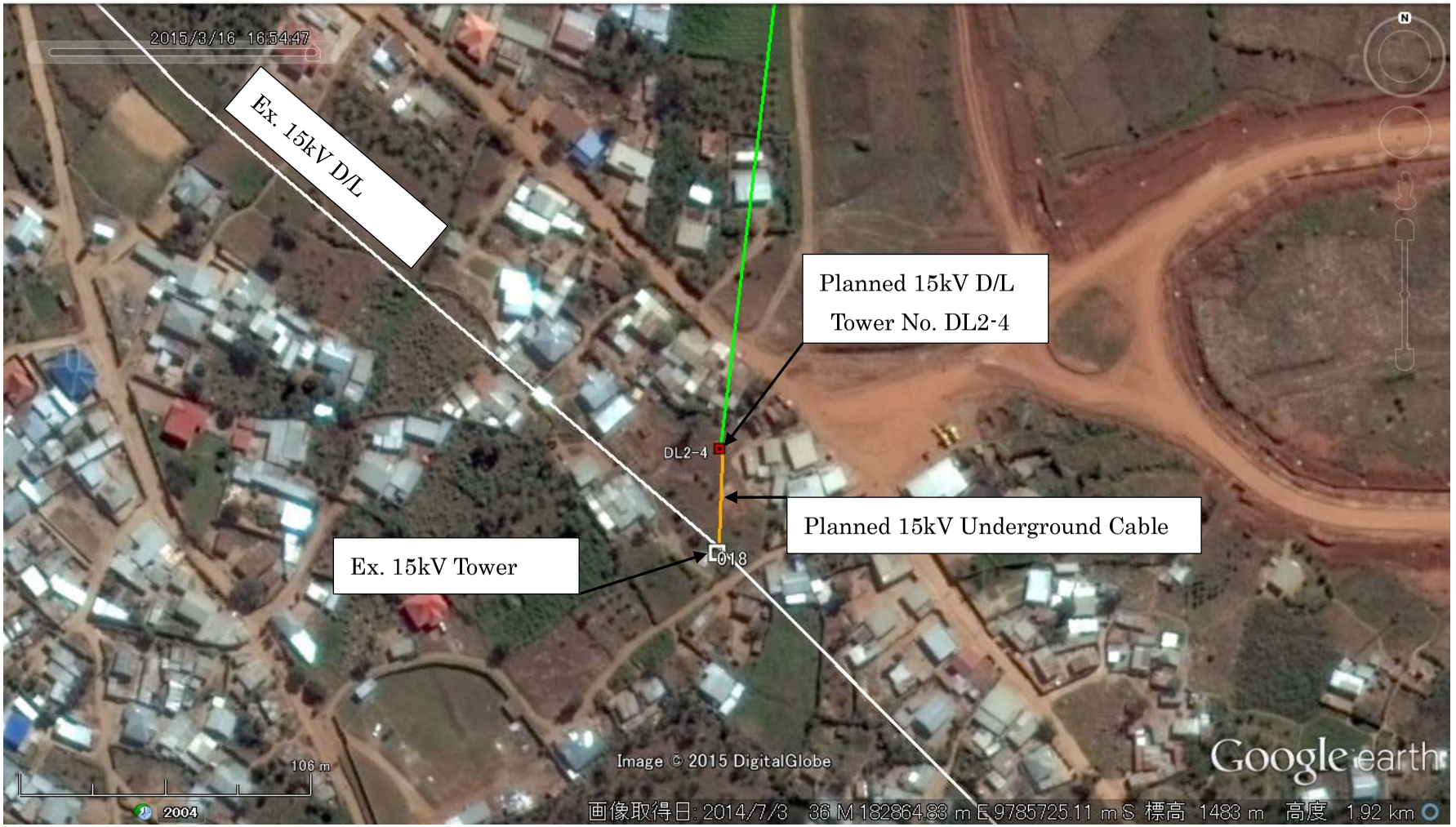
DWG No. GG-22: Site Layout of Kabuga RMU Switching Station



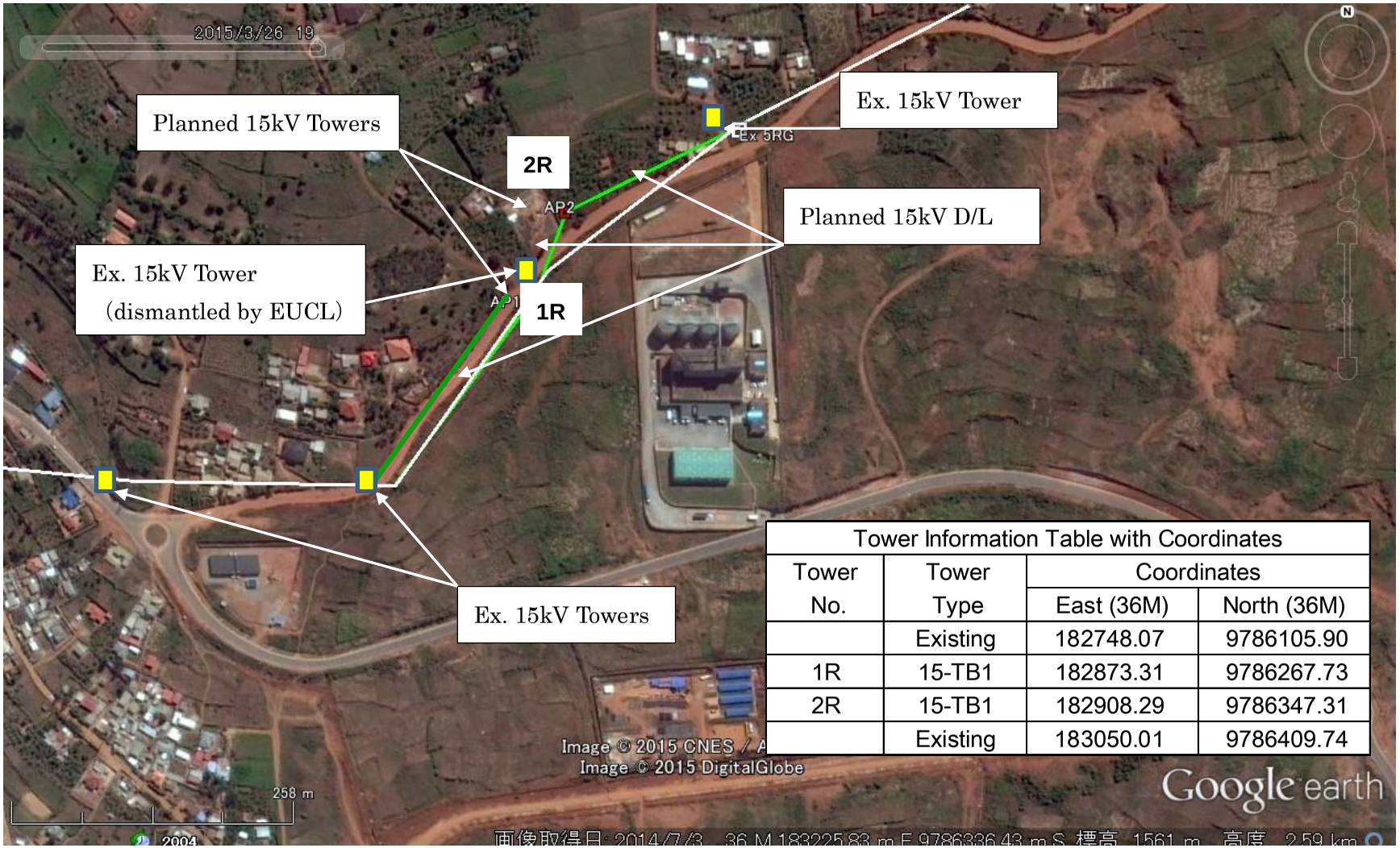
Tower Information Table with Coordinates

Tower No.	Tower Type	Coordinates	
		East (36M)	North (36M)
DL2-1	15-TD1	182841.47	9786199.73
DL2-2	15-TB1	182744.00	9786070.00
DL2-3	15-TB1	182637.00	9785922.00
DL2-4	15-TD1	182605.38	9785685.75

GG-31: 15kV Distribution Line Route (Route-2: Ndera S/S to Birembo/Free Zone PH-1)

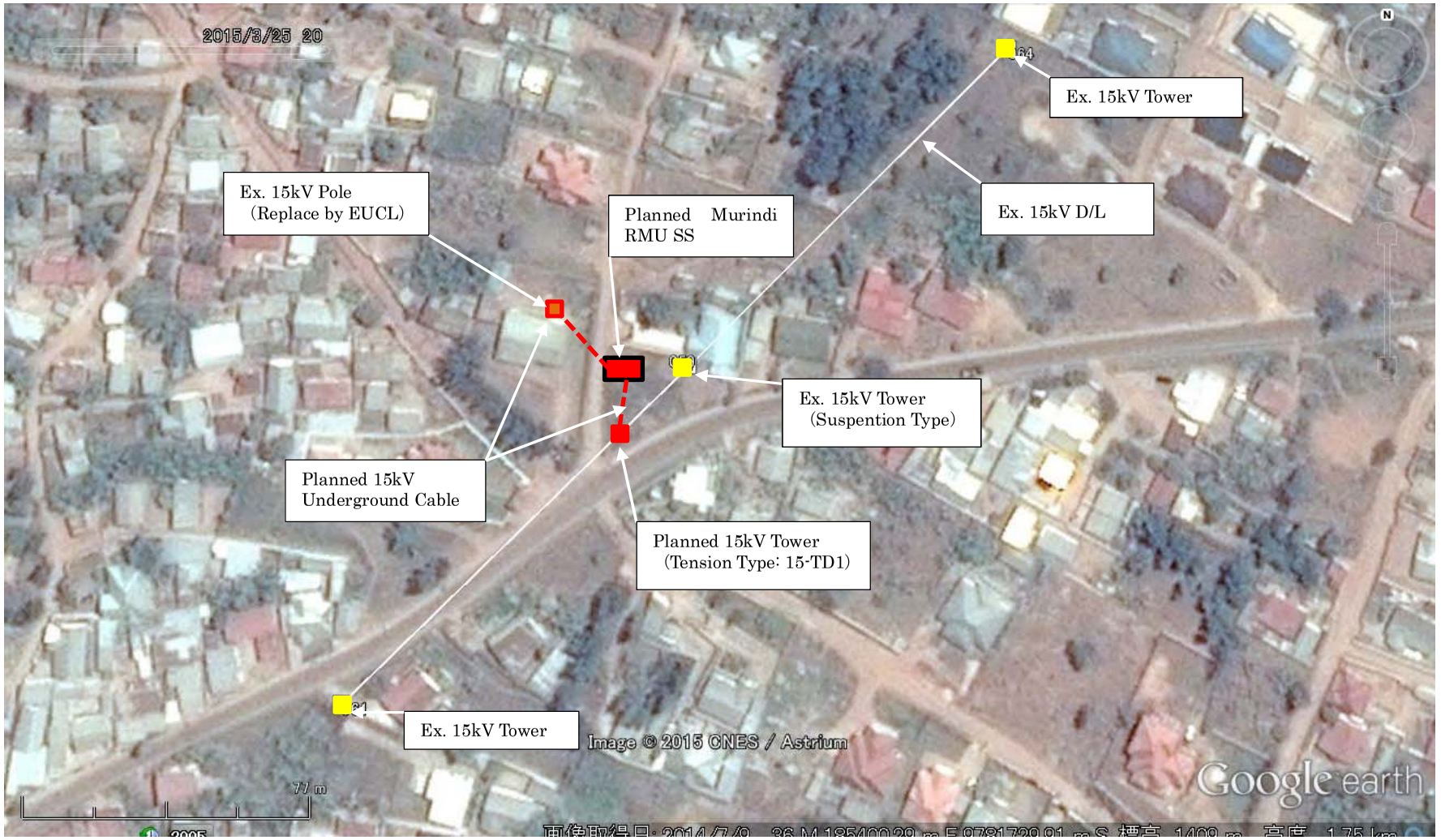


DWG No. GG-32: 15kV Distribution Line Cable Route (Route-2)

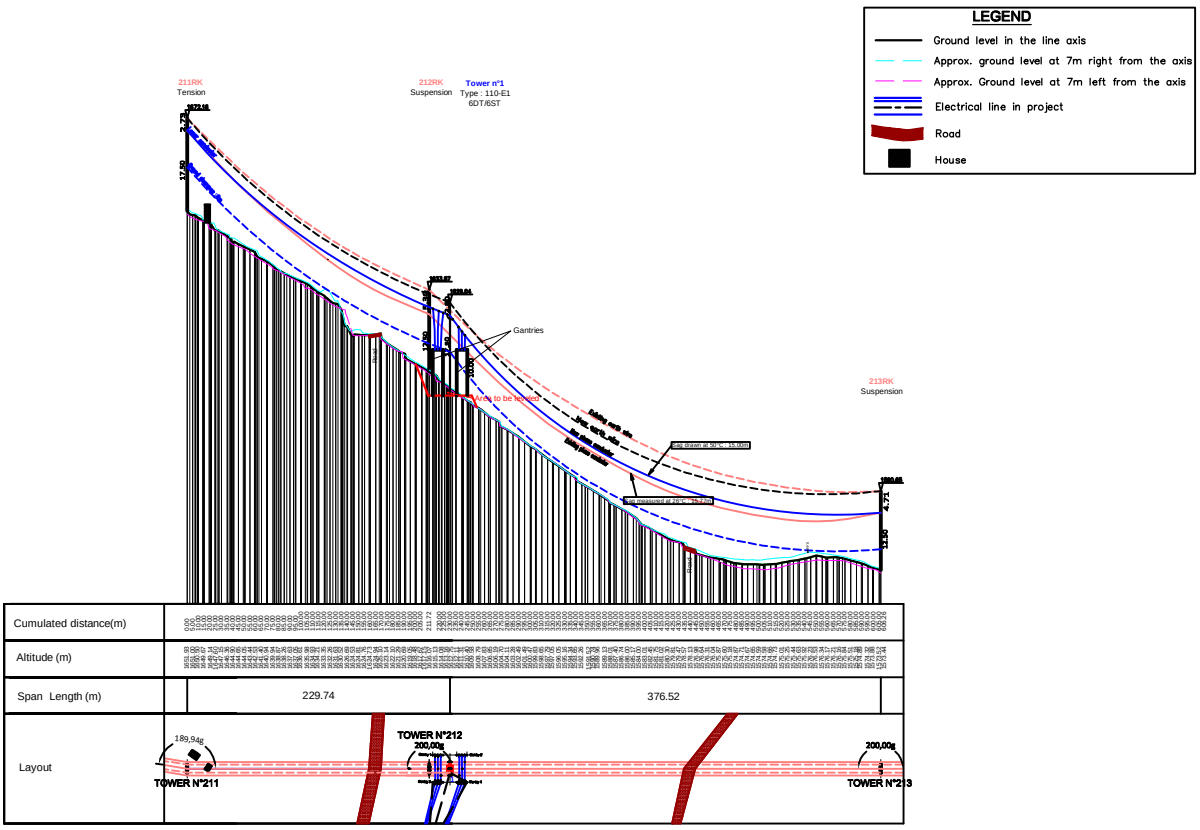


Tower Information Table with Coordinates			
Tower No.	Tower Type	Coordinates	
		East (36M)	North (36M)
	Existing	182748.07	9786105.90
1R	15-TB1	182873.31	9786267.73
2R	15-TB1	182908.29	9786347.31
	Existing	183050.01	9786409.74

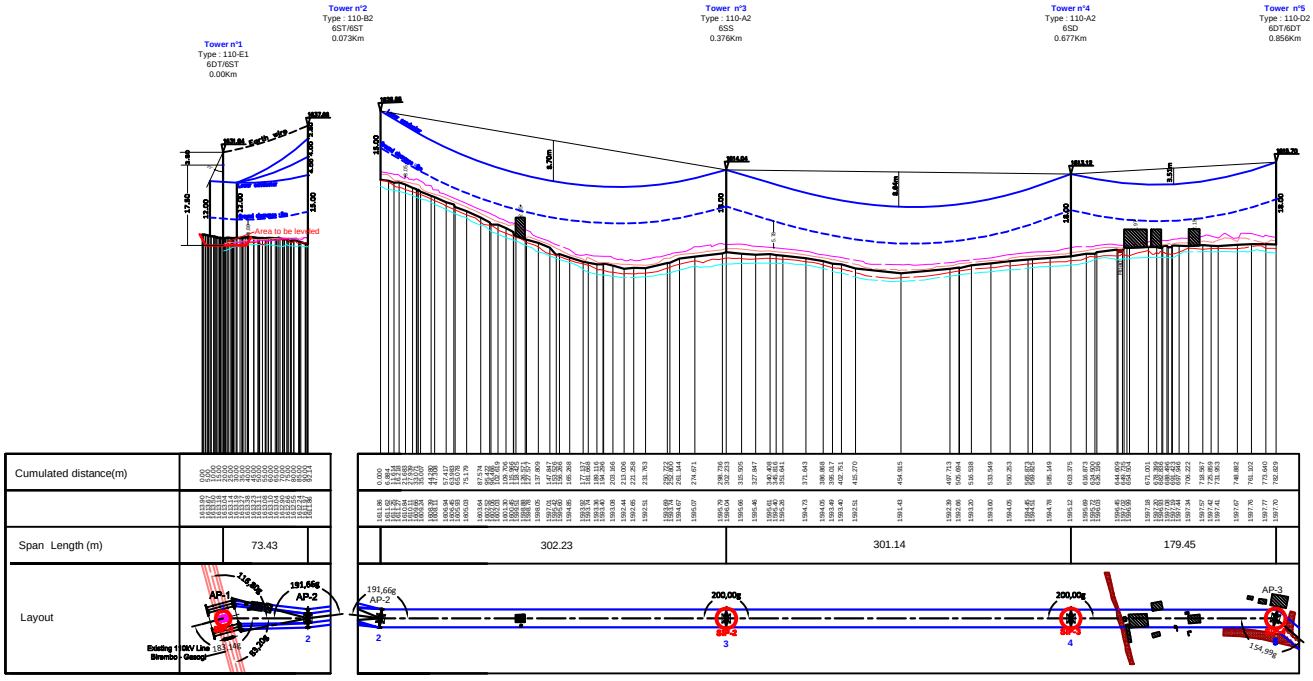
DWG No. GG-41: 15kV Distribution Line Route (Route-3: Rubungo to Gosha District)



DWG No. GG-51: Site Layout of Murindi RMU Switching Station

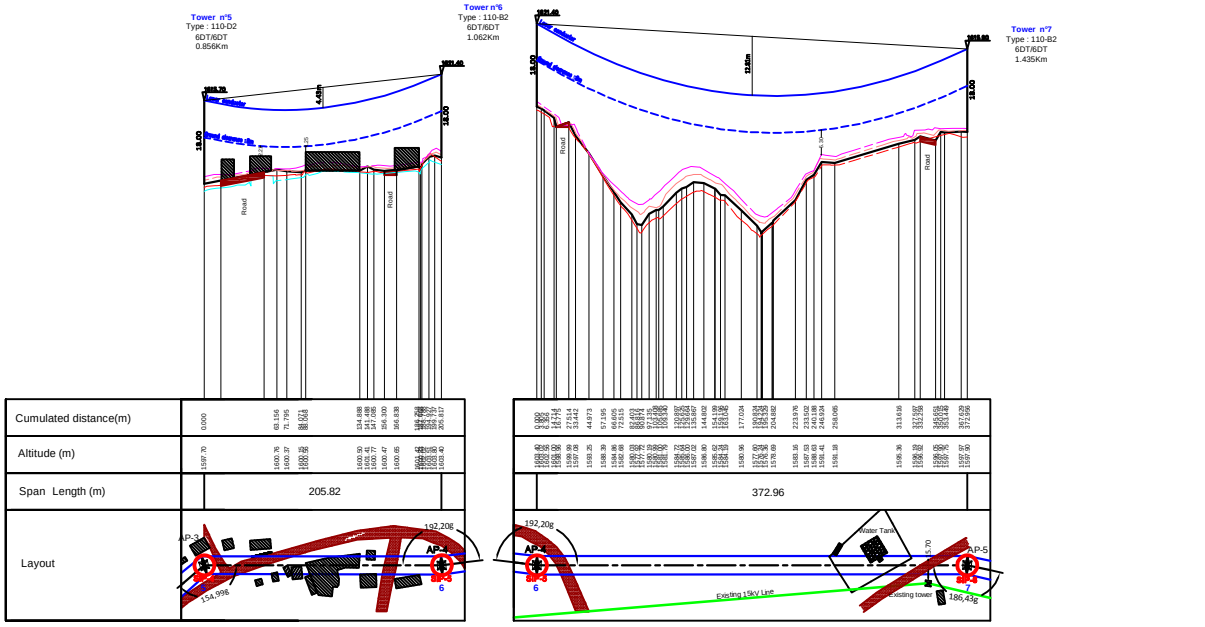


Existing Tower No. 211 to 213

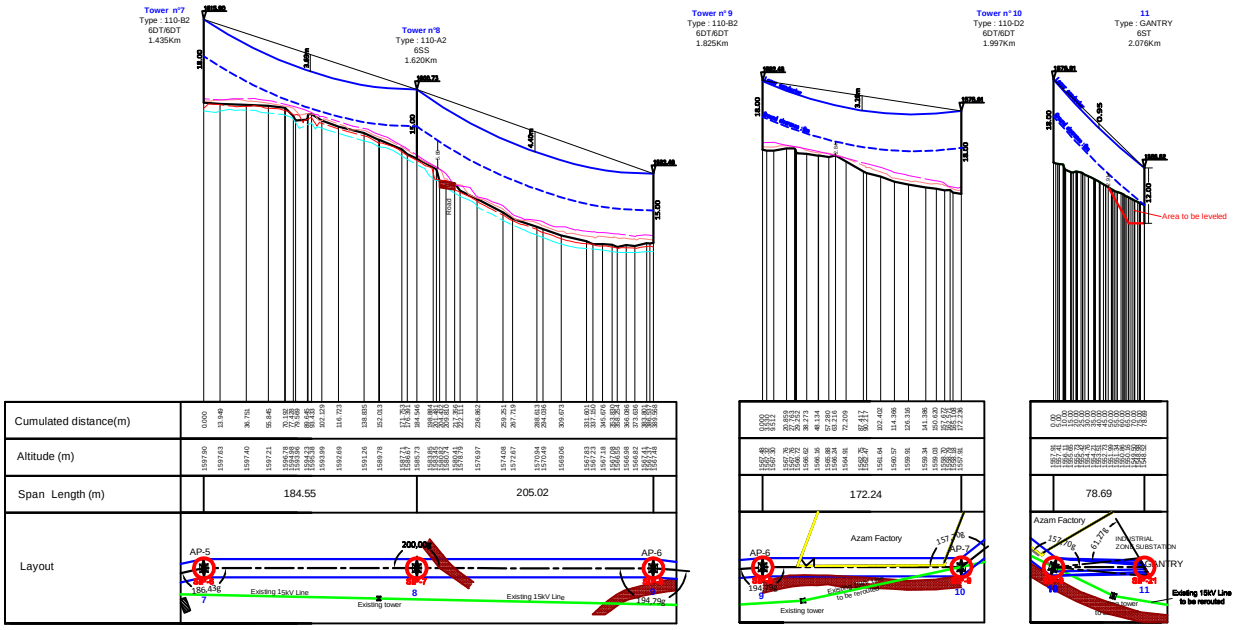


Tower No. 1 to 5

DWG No. LP-01: 110kV Transmission Line; Line Profile (1 / 2)
(Branch Point to Ndera S/S)

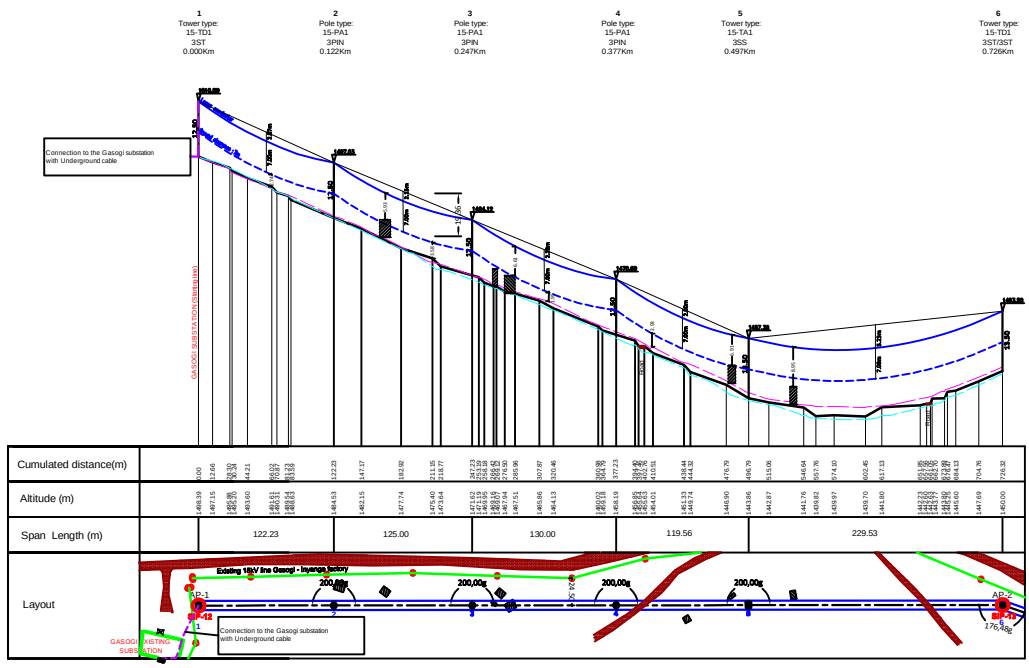


Tower No. 5 to 7

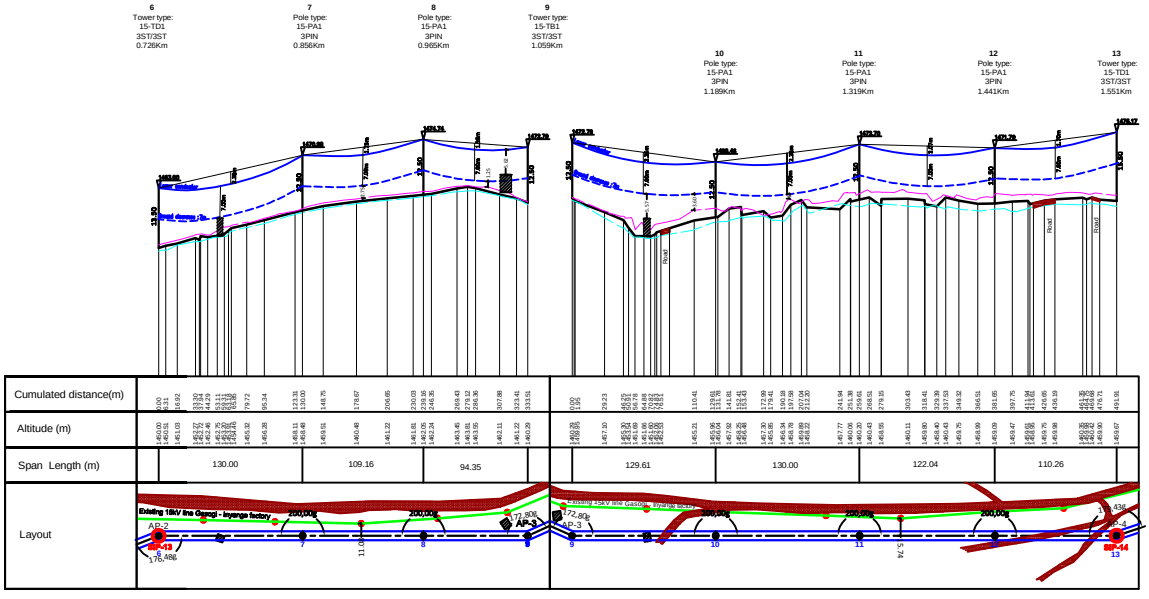


Tower No. 7 to 11

DWG No. LP-02: 110kV Transmission Line; Line Profile (2 / 2)
(Branch Point to Ndera S/S)

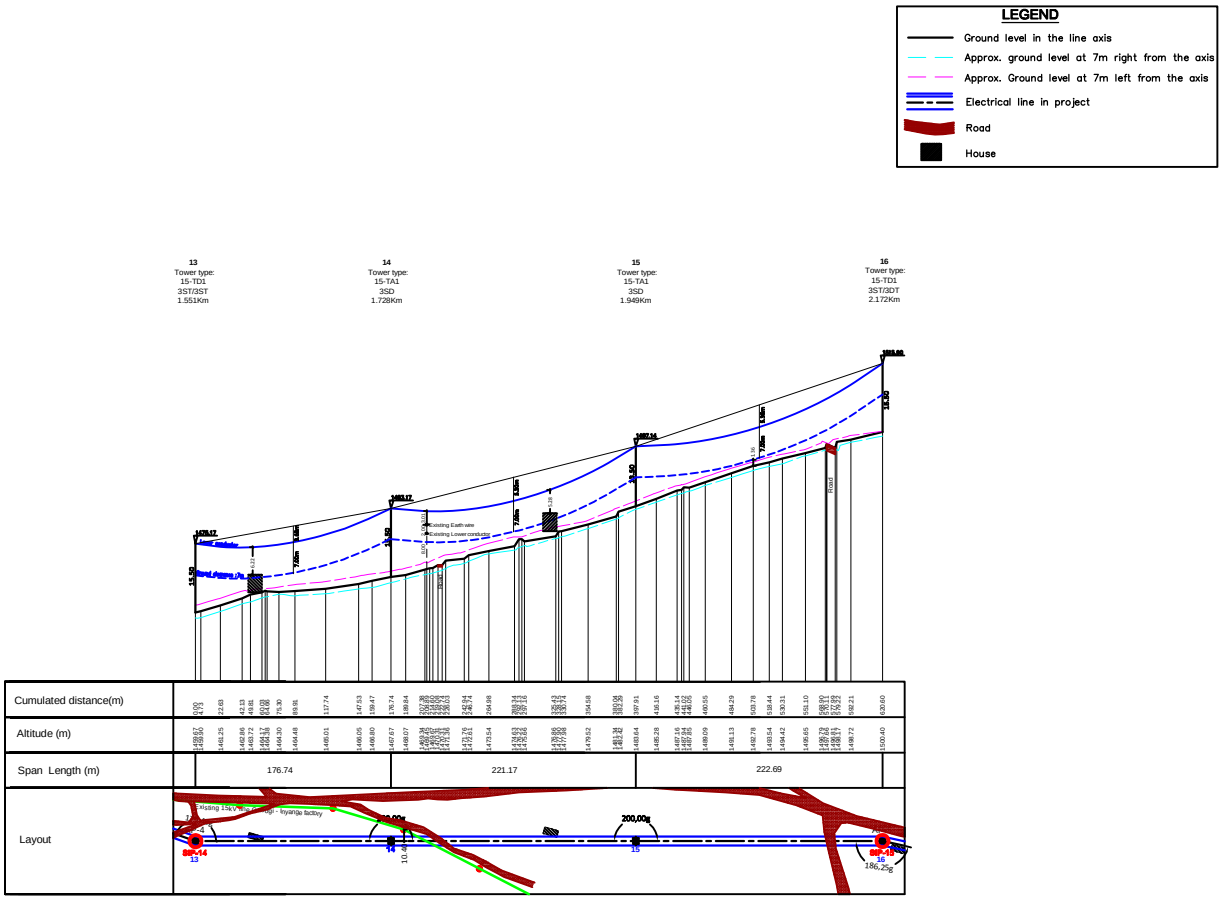


Tower / Pole No. 1 to 6

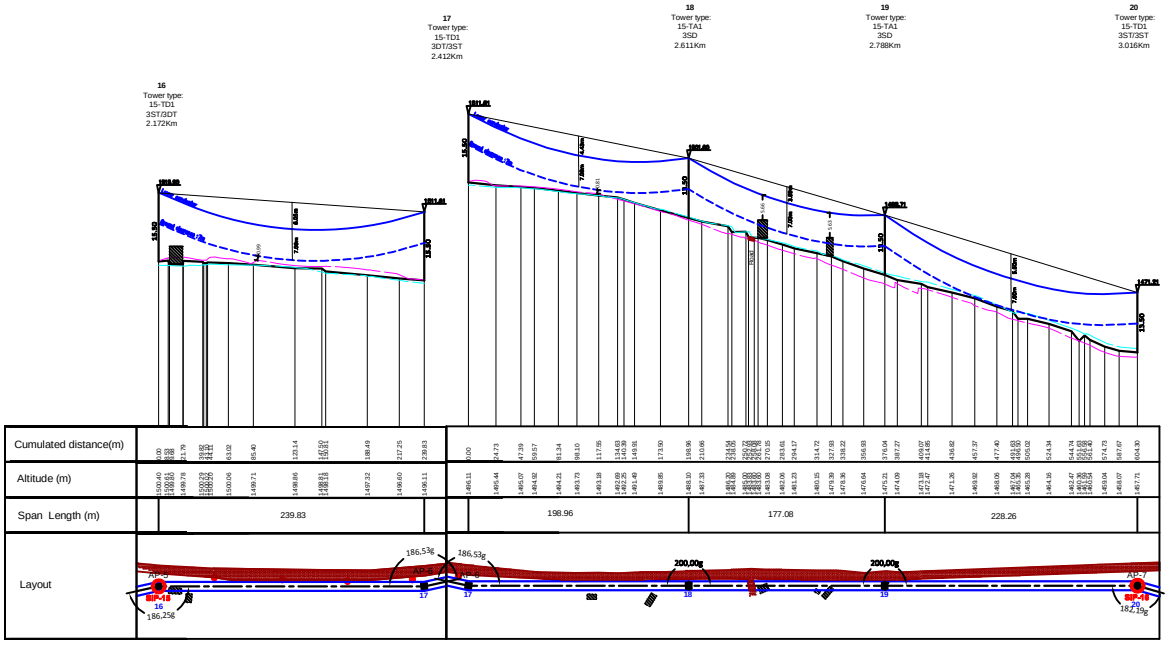


Tower / Pole No. 6 to 13

DWG No. LP-11: 15kVDistribution Line; Route-1, Line Profile (1 / 4)
(Gasogi S/S—Kabuga RMU SS)

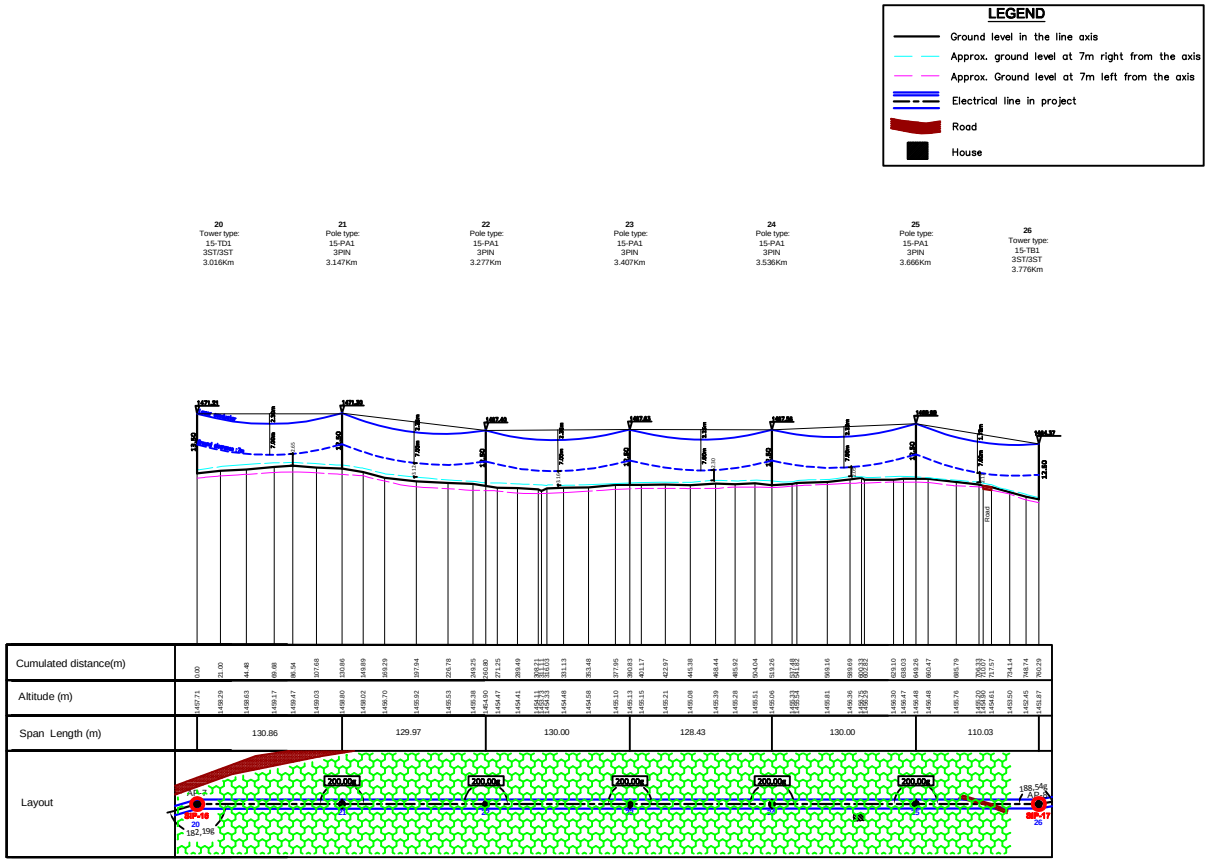


Tower / Pole No. 13 to 16

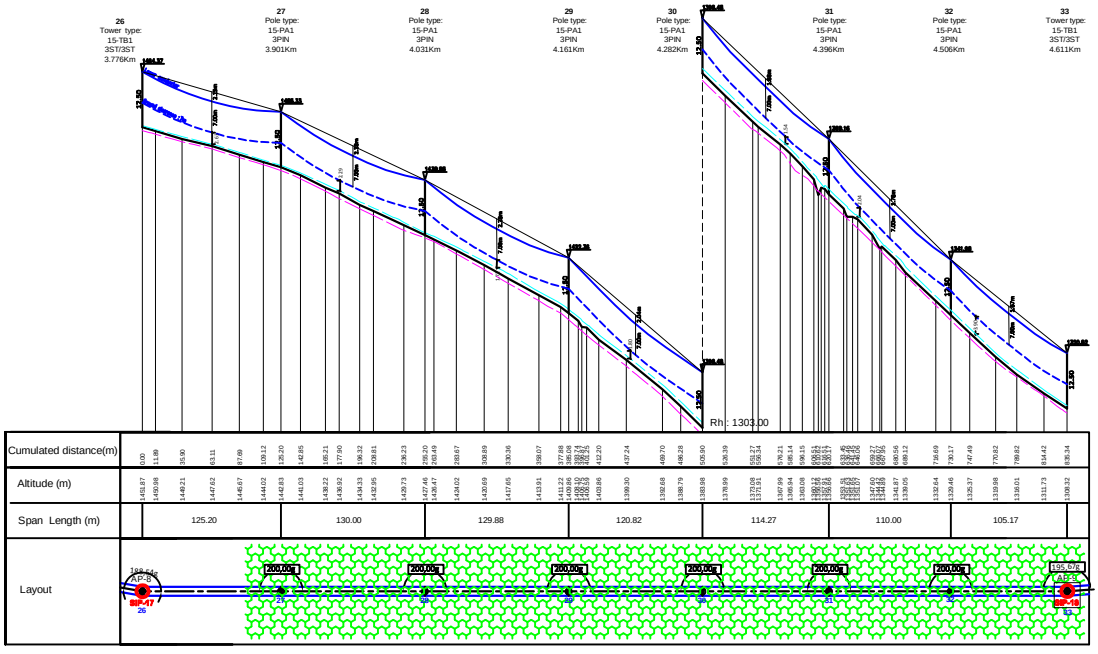


Tower / Pole No. 16 to 20

DWG No. LP-12: 15kVDistribution Line; Route-1, Line Profile (2 / 4)
(Gasogi S/S—Kabuga RMU SS)

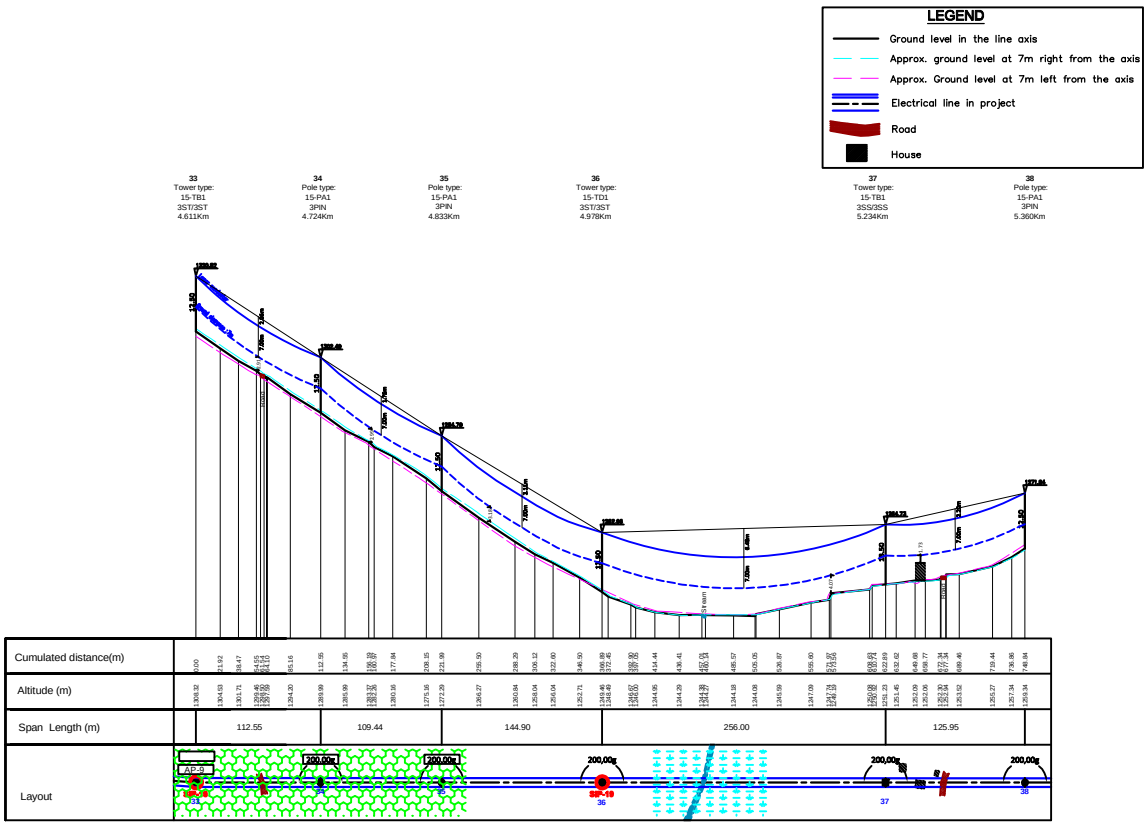


Tower / Pole No. 20 to 26

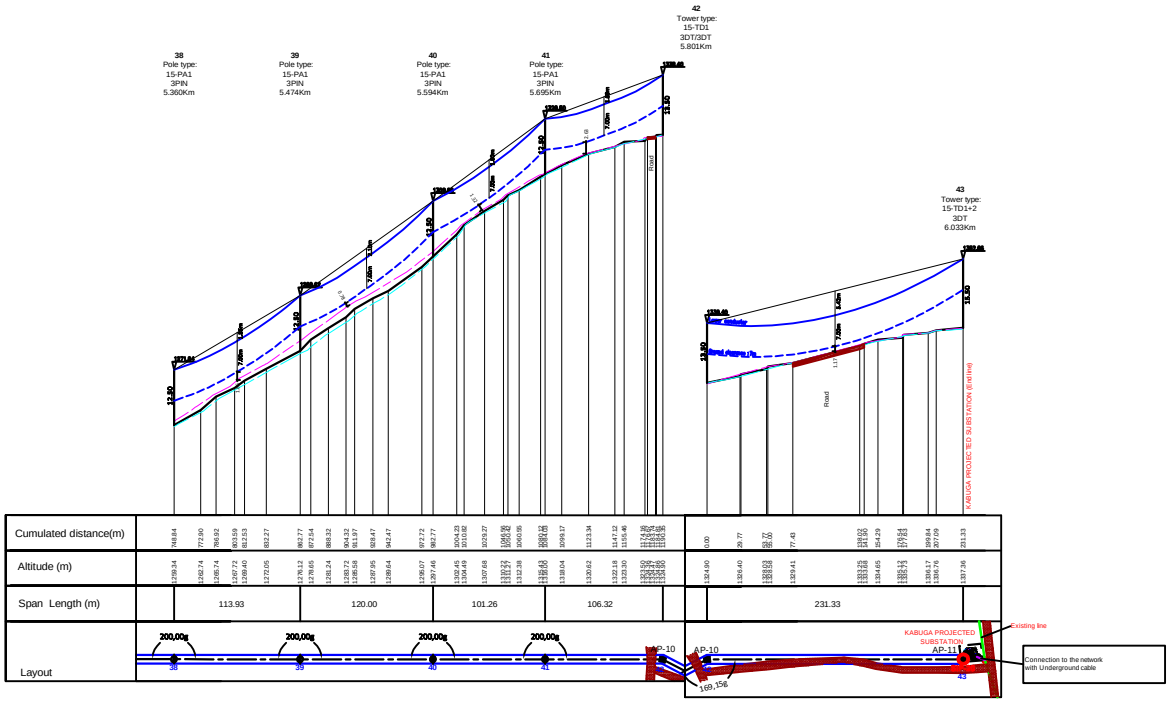


Tower / Pole No. 26 to 33

DWG No. LP-13: 15kVDistribution Line; Route-1, Line Profile (3 / 4)
(Gasogi S/S—Kabuga RMU SS)

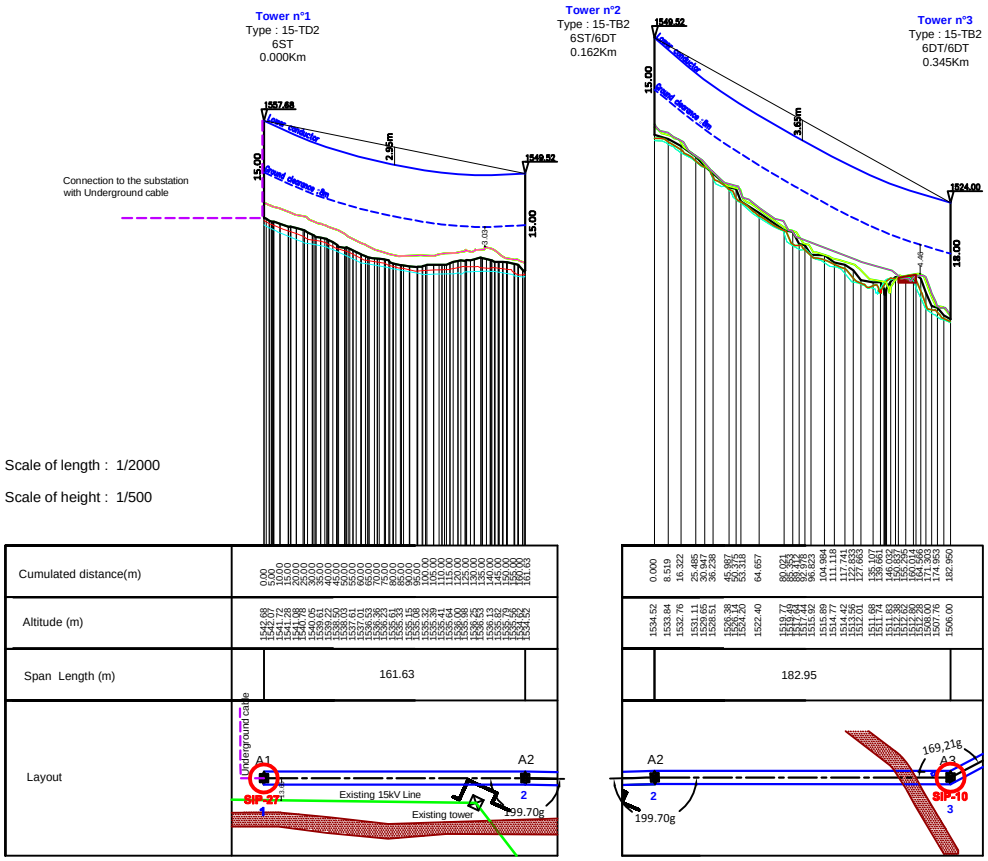


Tower / Pole No. 33 to 38

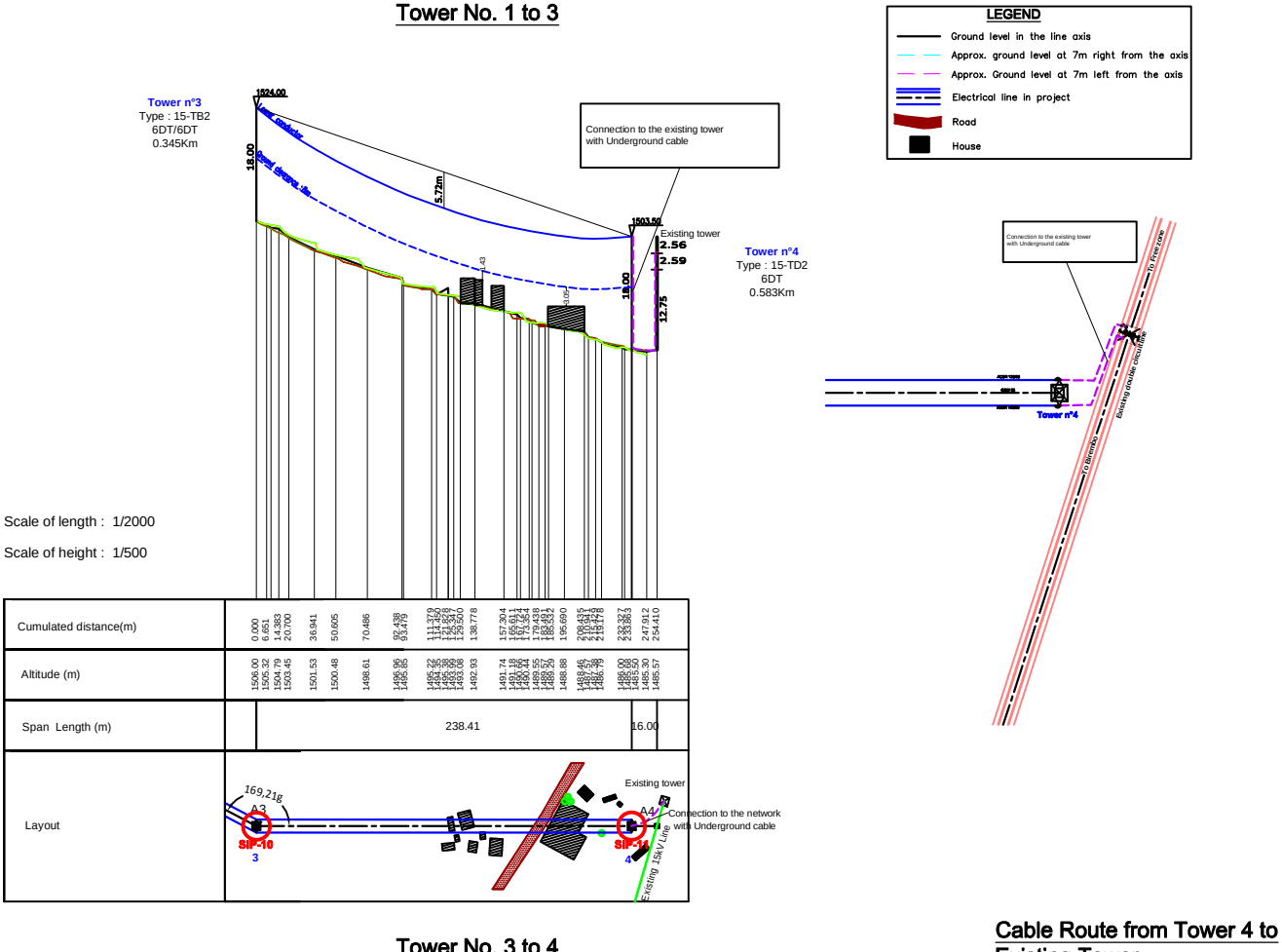


Tower / Pole No. 38 to 43

DWG No. LP-14: 15kVDistribution Line; Route-1, Line Profile (4 / 4)
(Gasogi S/S—Kabuga RMU SS)



Tower No. 1 to 3



Tower No. 3 to 4

Cable Route from Tower 4 to Existing Tower

DWG No. LP-21: 15kV Distribution Line; Route-2, Line Profile (1 / 1)
(Ndera S/S—Birembo SS/Free Zone PH1)

LEGEND

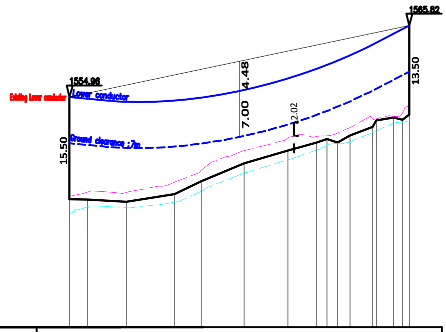
- Ground level in the line axis
- Approx. ground level at 7m right from the axis
- Approx. Ground level at 7m left from the axis
- Electrical line in project
- Road
- House

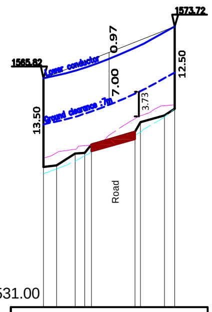
Tower n°1R is direct connected to the substation with underground cable

Existing Tower n°3
0.000km

1R
Tower type:
15-TD1
3DT/3DT
0.207Km

2R
Pole type:
15-PA1
3DT/3DT
0.286Km

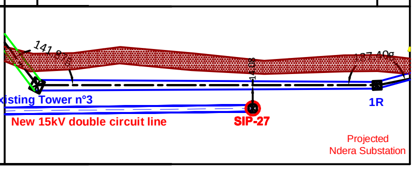


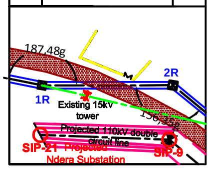


Scale of length : 1/2000

Scale of height : 1/500

Rh : 1531.00

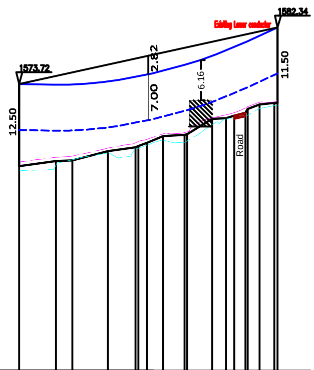
Cumulated distance(m)	0.00	11.04	34.60	64.09	80.11	106.34	132.88	150.40	156.75	163.23	170.72	184.64	186.75	197.25	202.76	206.67
Altitude (m)	1539.46	1539.42	1539.04	1540.23	1542.19	1544.90	1546.83	1548.05	1548.62	1548.09	1549.11	1550.46	1551.43	1551.87	1551.52	1552.32
Span Length (m)	206.67															
Layout																

Cumulated distance(m)	0.00	7.92	19.29	24.97	29.22	55.56	58.98	73.52	79.81
Altitude (m)	1552.32	1552.61	1554.39	1554.50	1555.77	1557.69	1559.18	1560.19	1561.22
Span Length (m)	79.81								
Layout									

Existing Tower to Tower No. 2R

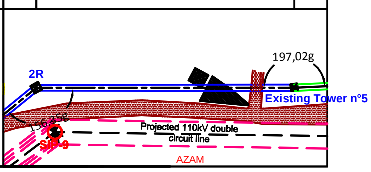
2R
Pole type:
15-PA1
3DT/3DT
0.286Km

Existing Tower n°5
0.444km



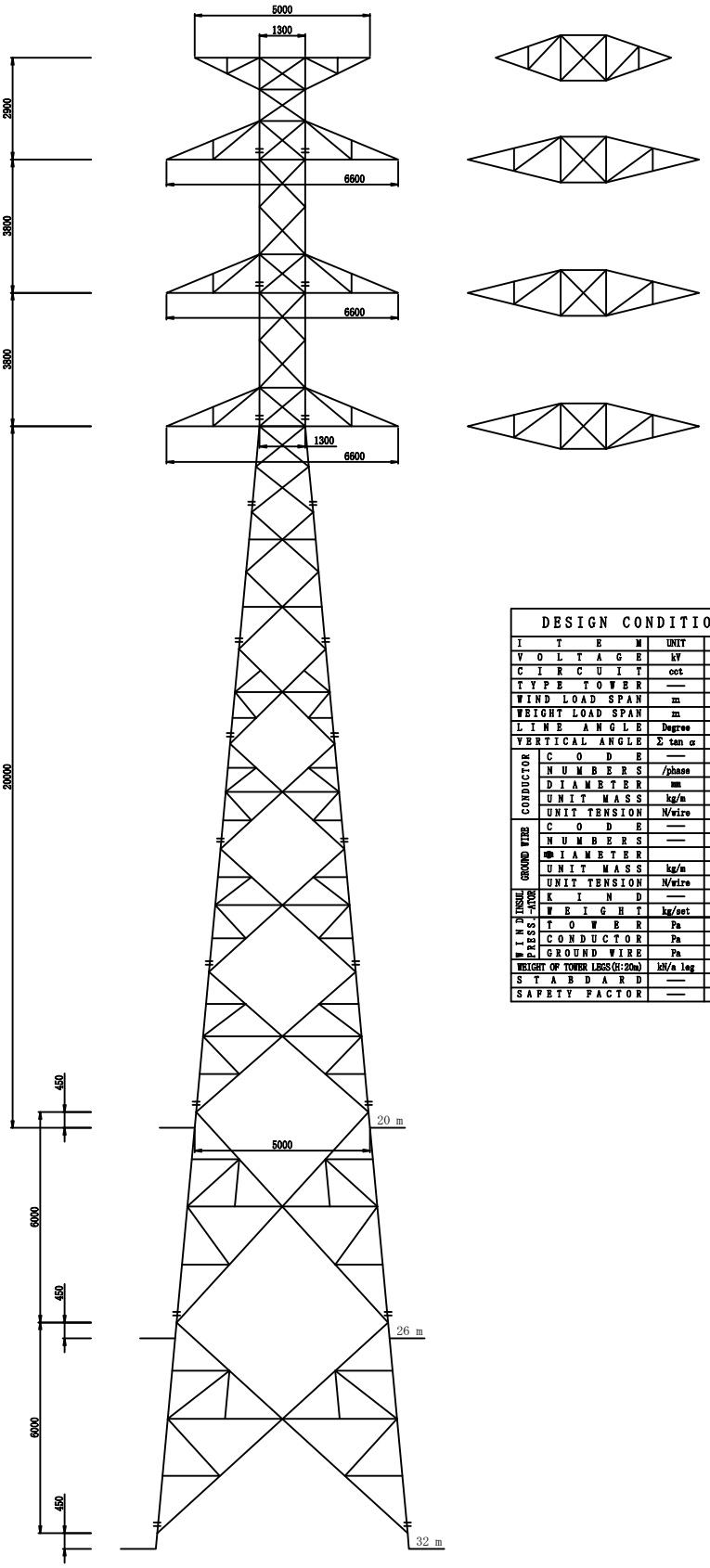
Scale of length : 1/2000

Scale of height : 1/500

Cumulated distance(m)	0.00	22.36	32.46	54.02	70.65	72.47	77.67	87.55	100.59	101.99	117.25	125.56	130.78	137.45	138.99	146.19	155.11	157.05
Altitude (m)	1561.22	1562.00	1562.09	1563.51	1564.05	1564.26	1564.76	1565.80	1565.97	1566.08	1568.39	1568.48	1568.91	1569.35	1569.92	1570.61	1570.82	1570.84
Span Length (m)	157.05																	
Layout																		

Tower No. 2R to Existing Tower

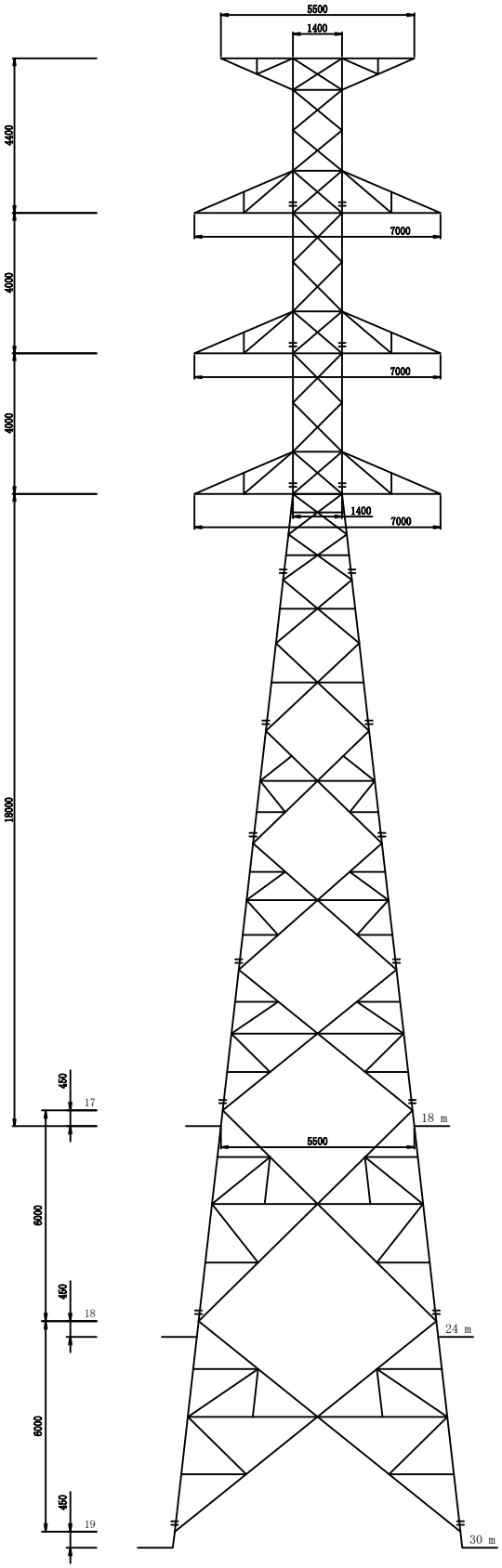
DWG No. LP-31: 15kVDistribution Line; Route-3, Line Profile (1 / 1) (Rubungo SS— Gosha District)

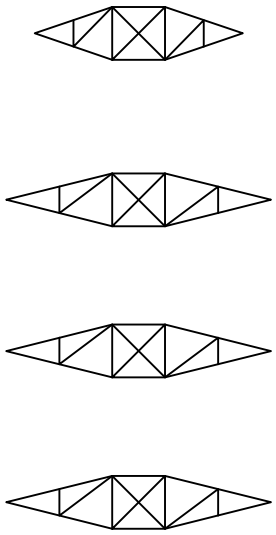


DESIGN CONDITION TABLE			
ITEM		UNIT	DESIGN
VOLTAGE		kV	110
CIRCUIT		cct	2
TYPE TOWER		—	110-A2
WIND LOAD SPAN		m	350
WEIGHT LOAD SPAN		m	450
LINE ANGLE		Degree	3
VERTICAL ANGLE		Σ tan α	0.15
CONDUCTOR	CODE	—	ACSR 240/40
	NUMBERS	/phase	1
	DIAMETER	mm	21.8
	UNIT MASS	kg/m	0.969
	UNIT TENSION	N/wire	26,478
GROUND WIRE	CODE	—	OPGW 97mm2
	NUMBERS	—	1
	DIAMETER		16
	UNIT MASS	kg/m	0.604
	UNIT TENSION	N/wire	20594
INSUL ATOR	KIND	—	250mm x 2sets Suspension
	WEIGHT	kg/set	120
WIND PRESS.	TOWER	Pa	1599
	CONDUCTOR	Pa	552
	GROUND WIRE	Pa	552
WEIGHT OF TOWER LEGS(H:20m)		kN/a leg	10.7
STABDARD		—	JEC 127
SAFETY FACTOR		—	Body: 1.0,Arm: 1.2

Scale: 1/200

DWG No. TL-S1: 110kV Tower Skeleton, Type: 110-A2

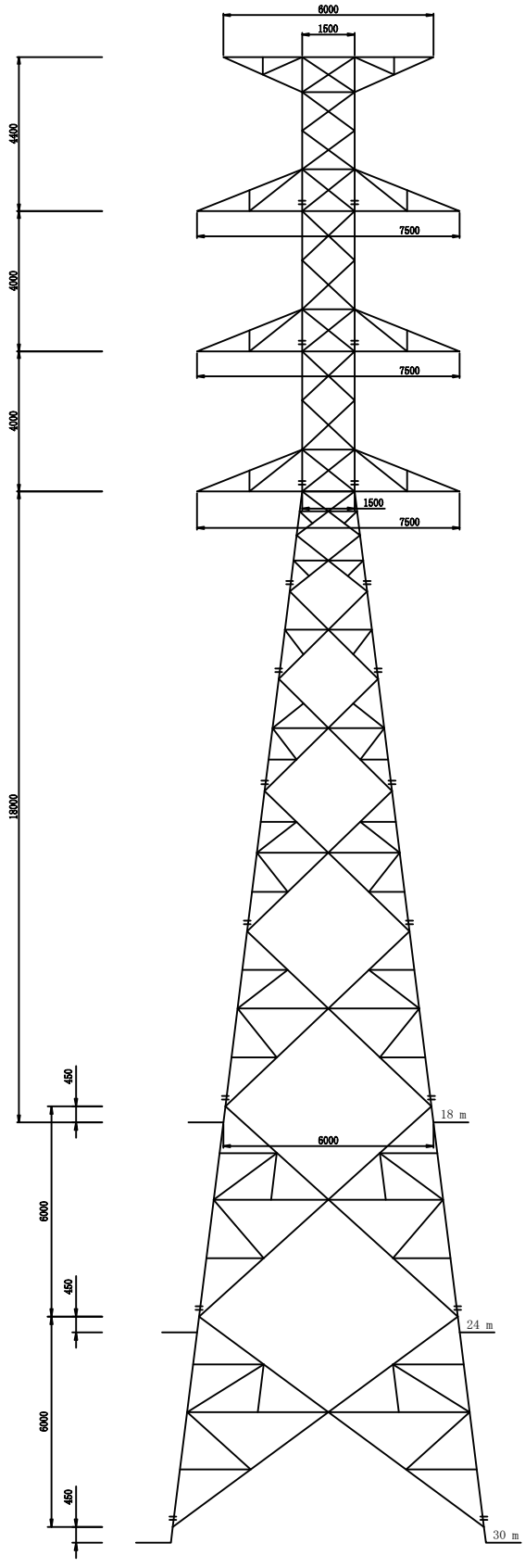


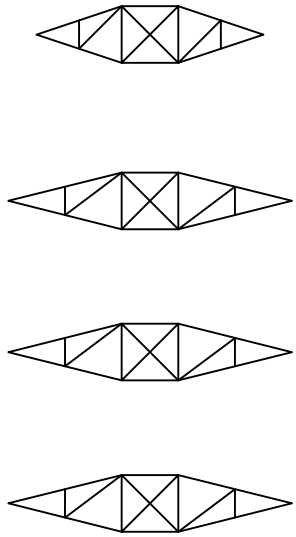


DESIGN CONDITION TABLE			
ITEM		UNIT	DESIGN
VOLTAGE		kV	110
CIRCUIT		cct	2
TYPE TOWER		—	110-B2
WIND LOAD SPAN		m	350
WEIGHT LOAD SPAN		m	450
LINE ANGLE		Degree	15
VERTICAL ANGLE		Σ tan α	0.15
CONDUCTOR	CODE	—	ACSR 240/40
	NUMBERS	/phase	1
	DIAMETER	mm	21.8
	UNIT MASS	kg/m	0.989
	UNIT TENSION	N/wire	26,478
GROUND WIRE	CODE	—	OPGW 97mm2
	NUMBERS	—	1
	DIAMETER	mm	16
	UNIT MASS	kg/m	0.604
	UNIT TENSION	N/wire	20694
INSULATOR	KIND	—	250mm x 2sets Suspension
	WEIGHT	kg/set	360
WIND PRESS.	TOWER	Pa	1599
	CONDUCTOR	Pa	552
	GROUND WIRE	Pa	552
WEIGHT OF TOWER LEGS		kN/a leg	10.7
STANDARD		—	JEC 127
SAFETY FACTOR		—	Body: 1.0, Arm: 1.2

Scale: 1/200

DWG No. TL-S2: 110kV Tower Skeleton, Type: 110-B2

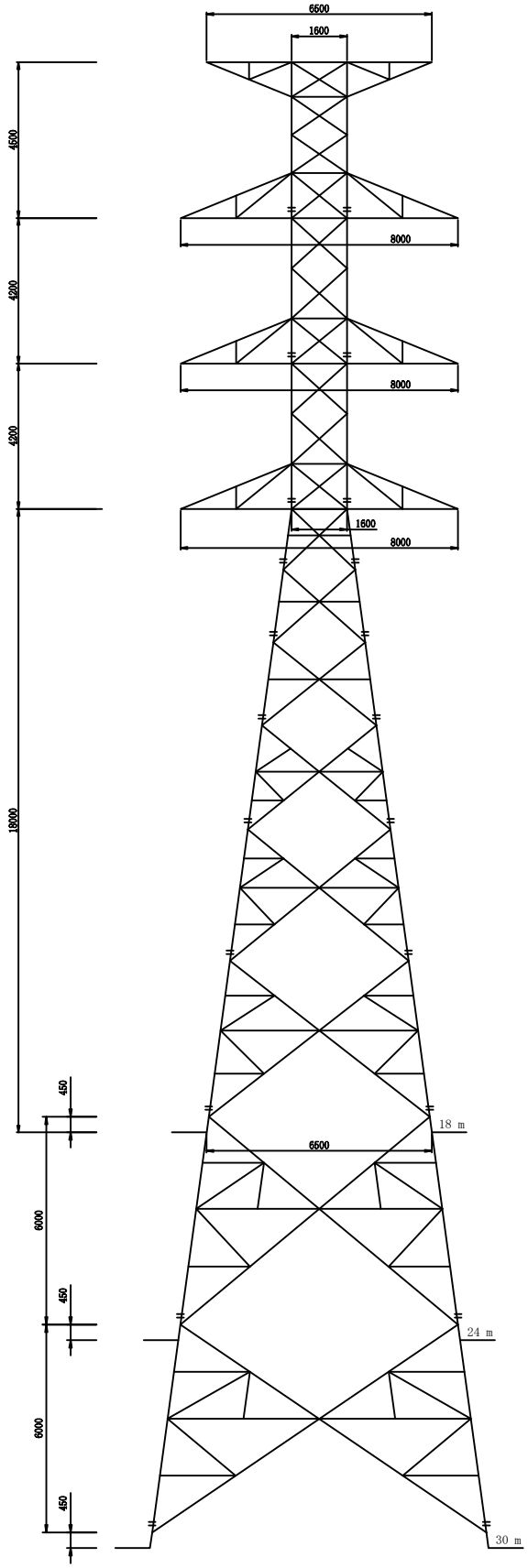


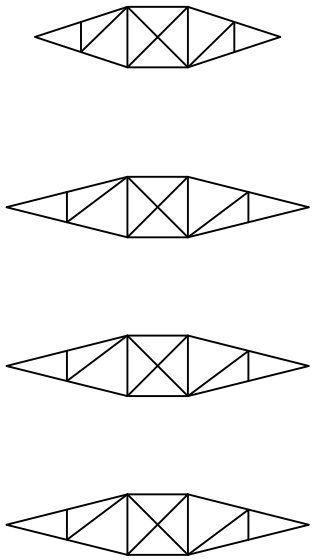


DESIGN CONDITION TABLE			
ITEM		UNIT	DESIGN
VOLTAGE		kV	110
CIRCUIT		cct	2
TYPE TOWER		—	110-C2
WIND LOAD SPAN		m	350
WEIGHT LOAD SPAN		m	450
LINE ANGLE		Degree	30
VERTICAL ANGLE		Σ tan α	0.15
CONDUCTOR	CODE	—	ACSR 240/40
	NUMBERS	/phase	1
	DIAMETER	mm	21.8
	UNIT MASS	kg/m	0.989
	UNIT TENSION	N/wire	26,478
GROUND WIRE	CODE	—	OPGW 97mm2
	NUMBERS	—	1
	DIAMETER	mm	16
	UNIT MASS	kg/m	0.604
	UNIT TENSION	N/wire	20694
INSUL. ASSEMBLY	KIND	—	250mm x 2sets Suspension
	WEIGHT	kg/set	360
DESIGN PRESS. FOR	TOWER	Pa	1599
	CONDUCTOR	Pa	552
	GROUND WIRE	Pa	552
WEIGHT OF TOWER LEGS		kN/a leg	10.7
STABDARD		—	JEC 127
SAFETY FACTOR		—	Body: 1.0, Arm: 1.2

Scale: 1/200

DWG No. TL-S3: 110kV Tower Skeleton, Type: 110-C2

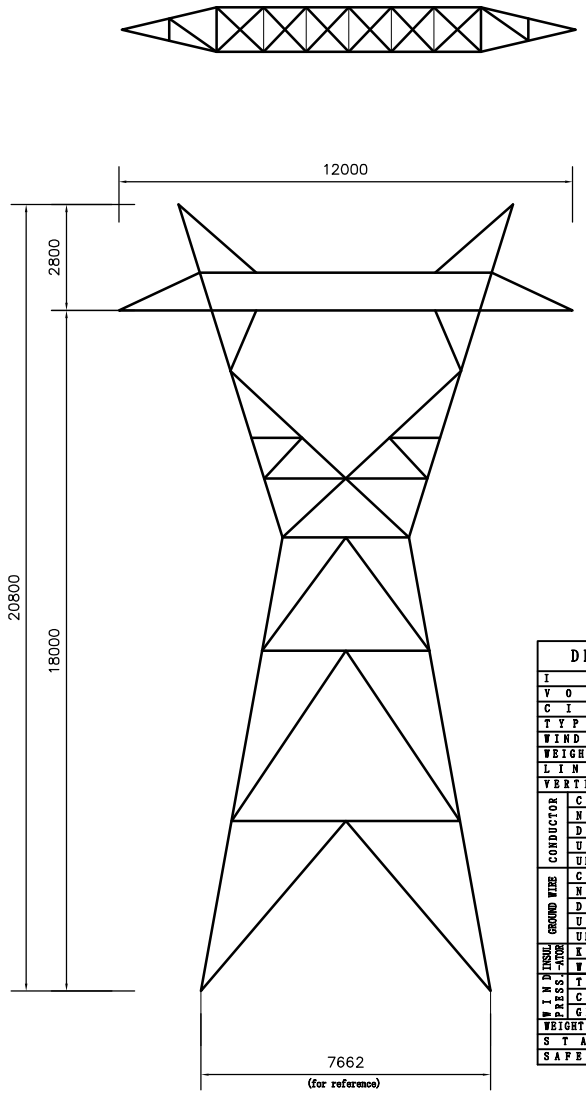




DESIGN CONDITION TABLE				
ITEM		UNIT	DESIGN	DESIGN
VOLTAGE		kV	110	110
CIRCUIT		cct	2	2
TYPE TOWER		——	110-D2	110-D2
WIND LOAD SPAN		m	50	300
WEIGHT LOAD SPAN		m	50	400
LINE ANGLE		Degree	30	0
VERTICAL ANGLE		Σ tan α	0.15	0.15
CONDUCTOR	CODE	——	ACSR 240/40	ACSR 240/40
	NUMBERS	/phase	1	1
	DIAMETER	mm	21.8	21.8
	UNIT MASS	kg/m	0.989	0.989
	UNIT TENSION	N/wire	9807	26478
GROUND WIRE	CODE	——	OPGW 97mm2	OPGW 97mm2
	NUMBERS	——	1	1
	DIAMETER	mm	16	16
	UNIT MASS	kg/m	0.604	0.604
	UNIT TENSION	N/wire	6875	20594
INSULATOR	KIND	——	250mm x 2sets Suspension	250mm x 2sets Suspension
	WEIGHT	kg/set	360	360
WIND PRESS.	TOWER	Pa	1599	1599
	CONDUCTOR	Pa	552	552
	GROUND WIRE	Pa	552	552
WEIGHT OF TOWER LEGS		kN/a leg	——	27.3
STABDARD		——	JBC 127	JBC 127
SAFETY FACTOR		——	Body: 1.0,Arm: 1.2	Body: 1.0, Arm: 1.2

Scale: 1/200

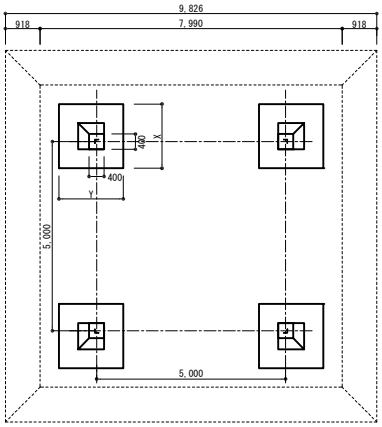
DWG No. TL-S4: 110kV Tower Skeleton, Type: 110-D2



DESIGN CONDITION TABLE			
ITEM		UNIT	DESIGN
VOLTAGE		kV	110
CIRCUIT		cct	1
TYPE TOWER		——	110-E1
WIND LOAD SPAN		m	see line profile drawing
WEIGHT LOAD SPAN		m	see line profile drawing
LINE ANGLE		Degree	3
VERTICAL ANGLE		Σ tan α	0.15
CONDUCTOR	CODE	——	ACSR 240/40
	NUMBERS	/phase	1
	DIAMETER	mm	21.8
	UNIT MASS	kg/m	0.989
	UNIT TENSION	N/wire	26,478
GROUND WIRE	CODE	——	OPGW 97mm2
	NUMBERS	——	1
	DIAMETER	mm	16
	UNIT MASS	kg/m	0.604
	UNIT TENSION	N/wire	20694
INSUL-ATOR	KIND	——	250mm x 2sets Suspension
	WEIGHT	kg/set	360
WIND PRESS.	TOWER	Pa	1599
	CONDUCTOR	Pa	552
	GROUND WIRE	Pa	552
WEIGHT OF TOWER LEGS		kN/a leg	——
STABDARD		——	JEC 127 or equivalent
SAFETY FACTOR		——	Body: 1.0, Arm: 1.2

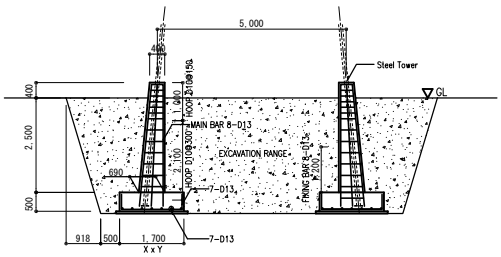
Scale: 1/200

DWG No. TL-S5: 110kV Tower Skeleton, Type: 110-E1



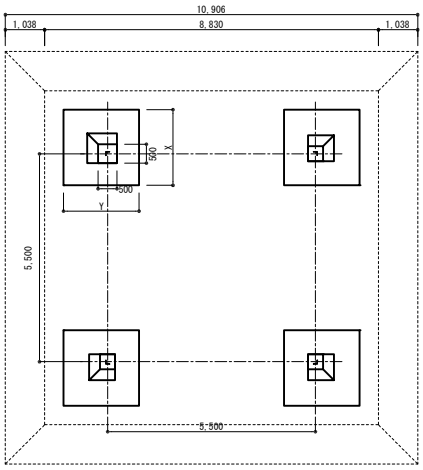
PLAN

Land Size to be secured: 10m x 10m



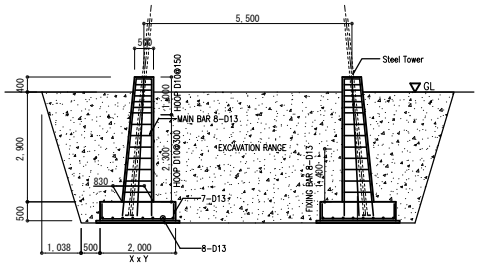
SECTION

FOUNDATION PLAN FOR TOWER TYPE: 110-A2 (SCALE 1/200)



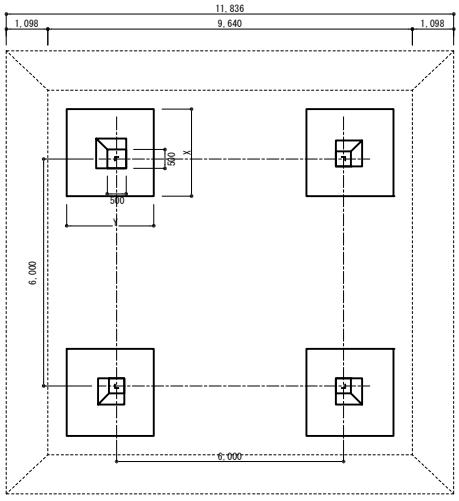
PLAN

Land Size to be secured: 11m x 11m



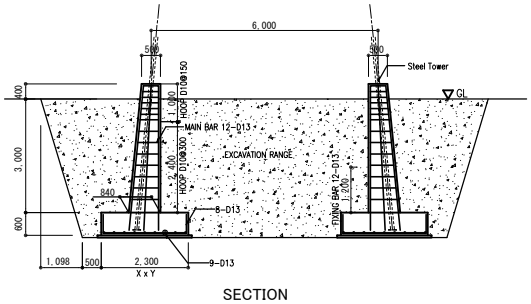
SECTION

FOUNDATION PLAN FOR TOWER TYPE: 110-B2 (SCALE 1/200)



PLAN

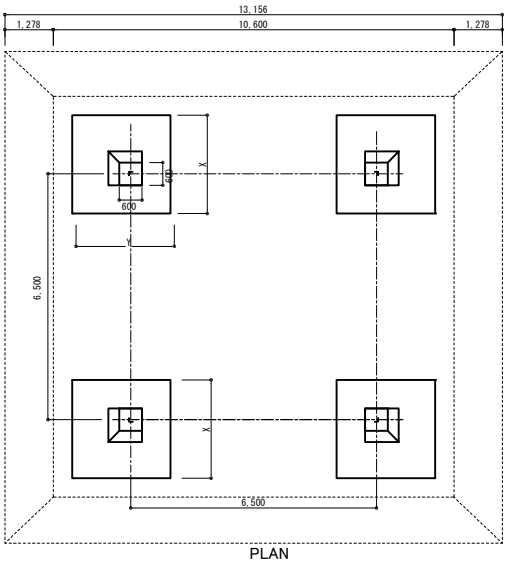
Land Size to be secured: 12m x 12m



SECTION

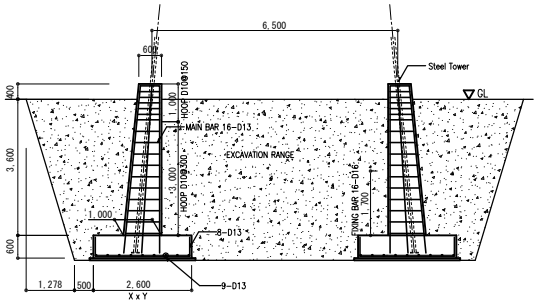
FOUNDATION PLAN FOR TOWER TYPE: 110-C2 (SCALE 1/200)

DWG No. TL-S6: 110kV Tower Foundation Plan (1/2)



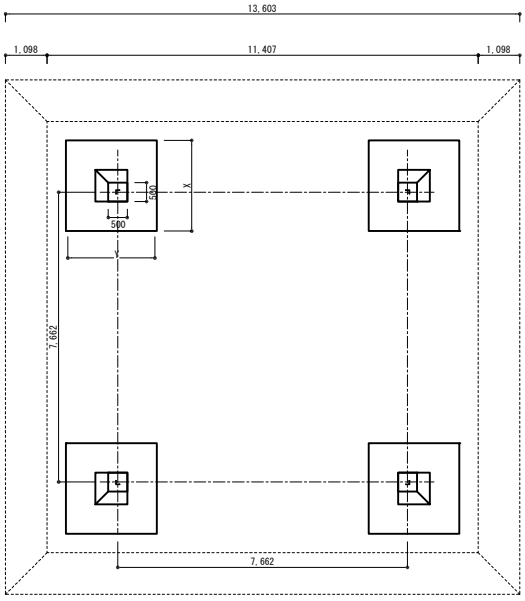
PLAN

Land Size to be secured: 14m x 14m



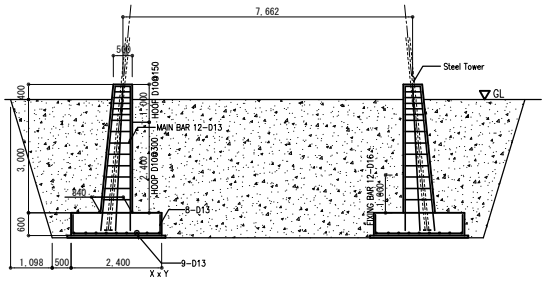
SECTION

FOUNDATION PLAN FOR TOWER TYPE: 110-D2 (SCALE 1/200)



PLAN

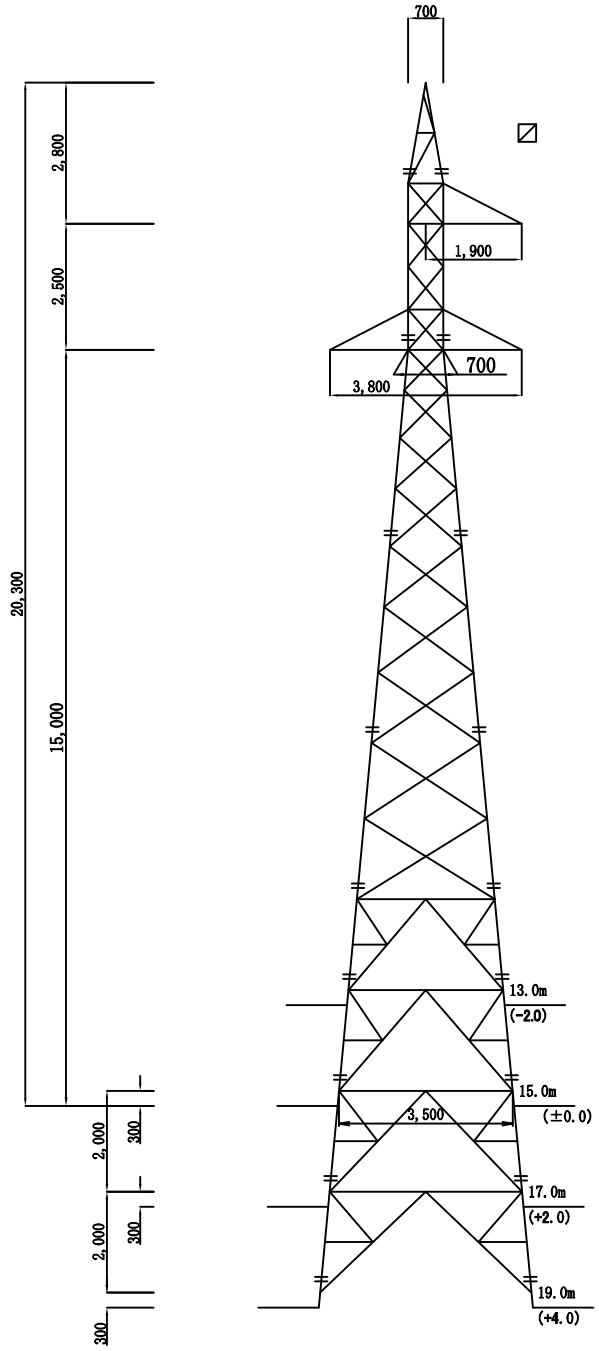
Land Size to be secured: 14m x 14m



SECTION

FOUNDATION PLAN FOR TOWER TYPE: 110-E1 (SCALE 1/200)

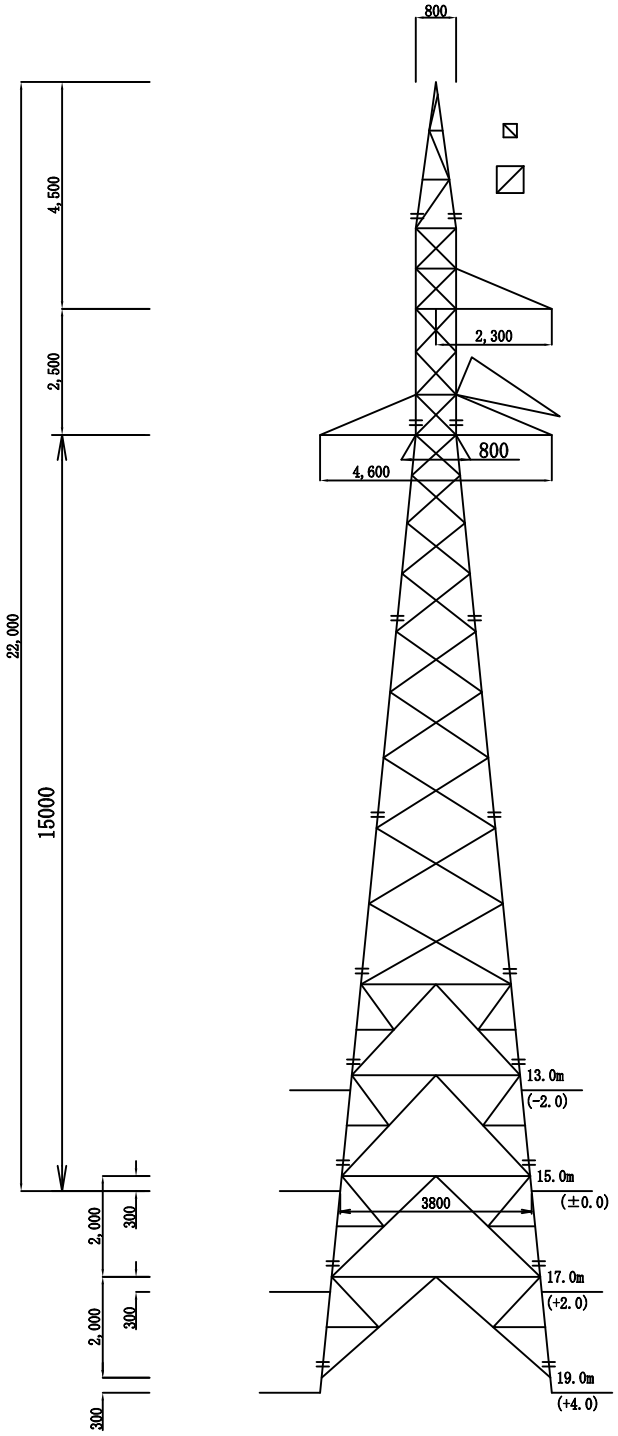
DWG No. TL-S7: 110kV Tower Foundation Plan(2/2)



DESIGN CONDITION TABLE			
ITEM		UNIT	DESIGN
VOLTAGE		kV	15(30)
CIRCUIT		cct	1
TYPE TOWER		——	15-TA1
WIND LOAD SPAN		m	250
WEIGHT LOAD SPAN		m	350
LINE ANGLE		Degree	3
VERTICAL ANGLE		Σ tan α	0.15
CONDUCTOR	CODE	——	ACSR 120/20
	NUMBERS	/phase	1
	DIAMETER	mm	15.5
	UNIT MASS	kg/m	0.496
	UNIT TENSION	N/wire	15,690
GROUND WIRE	CODE	——	OPGW ACS46mm2-3.9
	NUMBERS	——	1
	DIAMETER	mm	9.6
	UNIT MASS	kg/m	0.352
	UNIT TENSION	N/wire	11,770
INSUL-ATOR	KIND	——	250mm x 2sets Suspension
	WEIGHT	kg/set	120
WIND PRESS.	TOWER	Pa	1599
	CONDUCTOR	Pa	552
	GROUND WIRE	Pa	552
WEIGHT OF TOWER LEGS		kN/a leg	6.38
STABDARD		——	JEC 127
SAFETY FACTOR		——	Body: 1.0, Arm: 1.2

Scale: 1/150

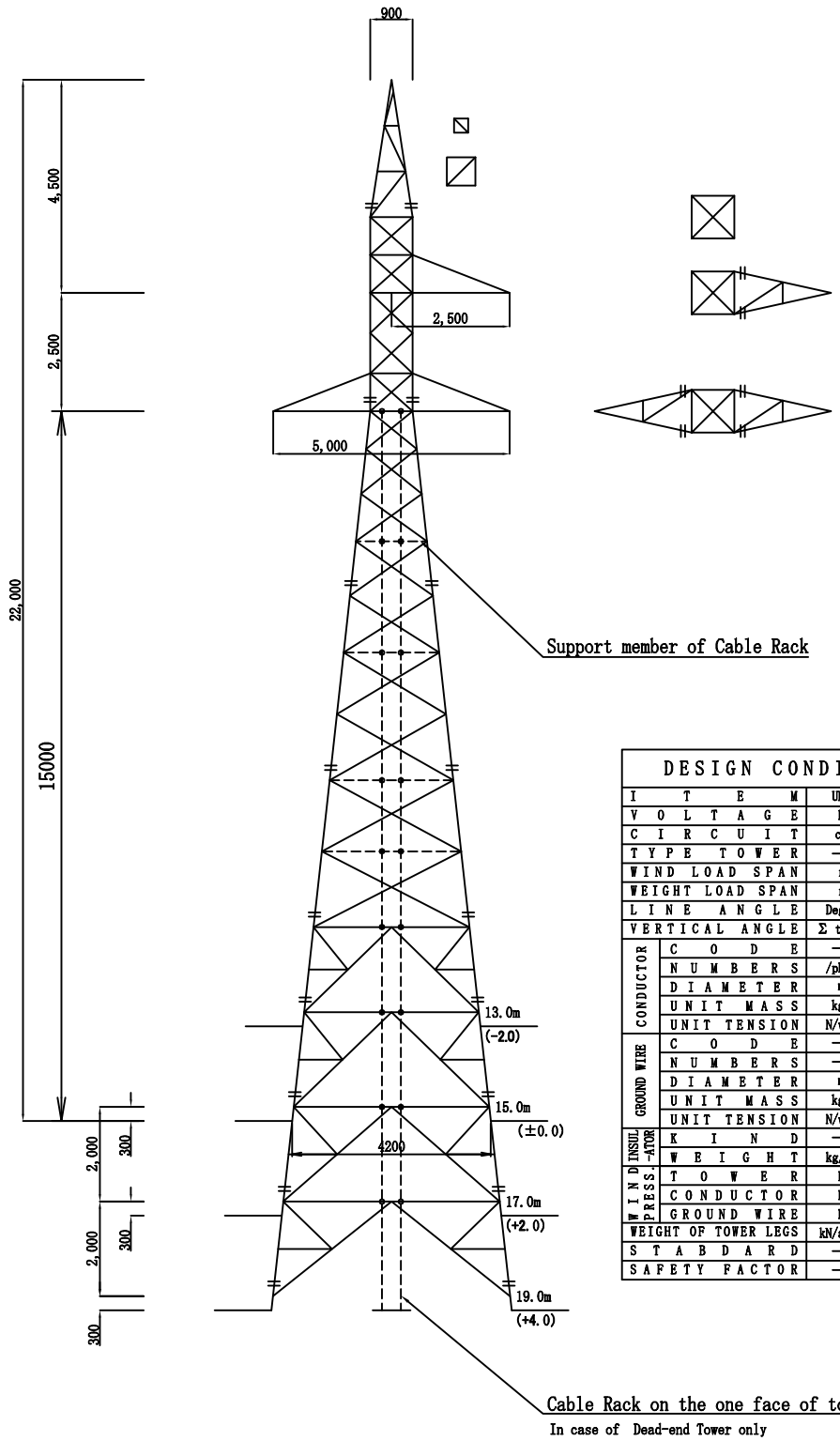
DWG No. DL-S1: 15kV Tower Skeleton, Type: 15-TA1



DESIGN CONDITION TABLE			
ITEM		UNIT	DESIGN
VOLTAGE		kV	15(30)
CIRCUIT		cct	1
TYPE TOWER		——	15-TB1
WIND LOAD SPAN		m	250
WEIGHT LOAD SPAN		m	350
LINE ANGLE		Degree	30
VERTICAL ANGLE		Σ tan α	0.15
CONDUCTOR	CODE	——	ACSR 120/20
	NUMBERS	/phase	1
	DIAMETER	mm	15.5
	UNIT MASS	kg/m	0.496
	UNIT TENSION	N/wire	15,690
GROUND WIRE	CODE	——	OPGW ACS46mm2-3.9
	NUMBERS	——	1
	DIAMETER	mm	9.6
	UNIT MASS	kg/m	0.352
	UNIT TENSION	N/wire	11,770
INSUL-ATOR	KIND	——	250mm x 2sets Suspension
	WEIGHT	kg/set	210
WIND PRESS.	TOWER	Pa	1599
	CONDUCTOR	Pa	552
	GROUND WIRE	Pa	552
WEIGHT OF TOWER LEGS		kN/a leg	8.28
STABDARD		——	JEC 127
SAFETY FACTOR		——	Body: 1.0, Arm: 1.2

Scale: 1/150

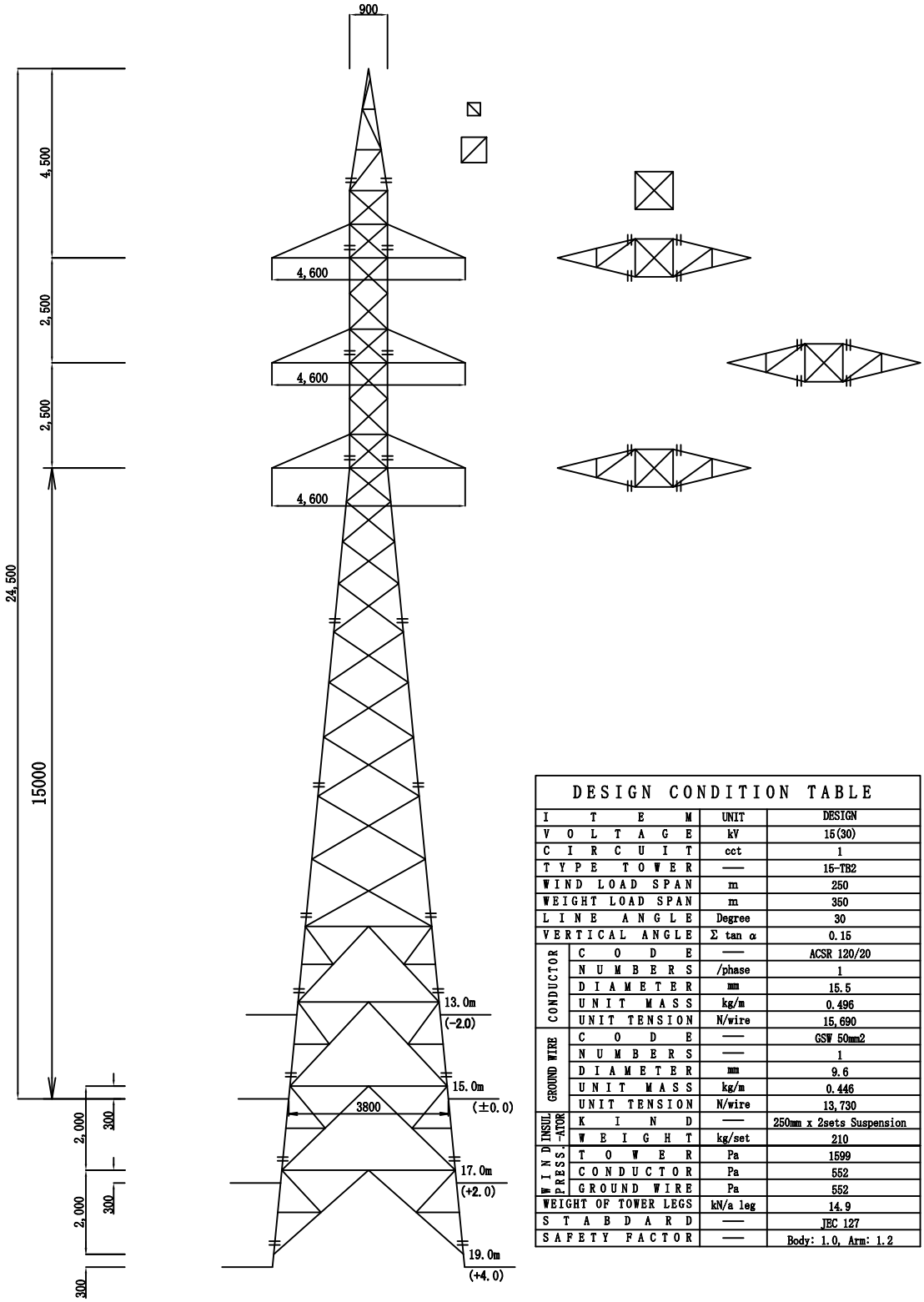
DWG No. DL-S2: 15kV Tower Skeleton, Type: 15-TB1



DESIGN CONDITION TABLE			
ITEM		UNIT	DESIGN
VOLTAGE		kV	15(30)
CIRCUIT		cct	1
TYPE TOWER		——	15-TD1
WIND LOAD SPAN		m	Dead End: 125, Angle: 250
WEIGHT LOAD SPAN		m	Dead End: 175, Angle: 50
LINE ANGLE		Degree	50
VERTICAL ANGLE		Σ tan α	0.15
CONDUCTOR	CODE	——	ACSR 120/20
	NUMBERS	/phase	1
	DIAMETER	mm	15.5
	UNIT MASS	kg/m	0.496
	UNIT TENSION	N/wire	15,690
GROUND WIRE	CODE	——	OPGW ACS46mm2-3.9
	NUMBERS	——	1
	DIAMETER	mm	9.6
	UNIT MASS	kg/m	0.352
	UNIT TENSION	N/wire	11,770
INSUL-ATOR	KIND	——	250mm x 2sets Suspension
	WEIGHT	kg/set	210
WIND PRESS.	TOWER	Pa	1599
	CONDUCTOR	Pa	552
	GROUND WIRE	Pa	552
WEIGHT OF TOWER LEGS		kN/a leg	8.28
STABDARD		——	JEC 127
SAFETY FACTOR		——	Body: 1.0, Arm: 1.2

Scale: 1/150

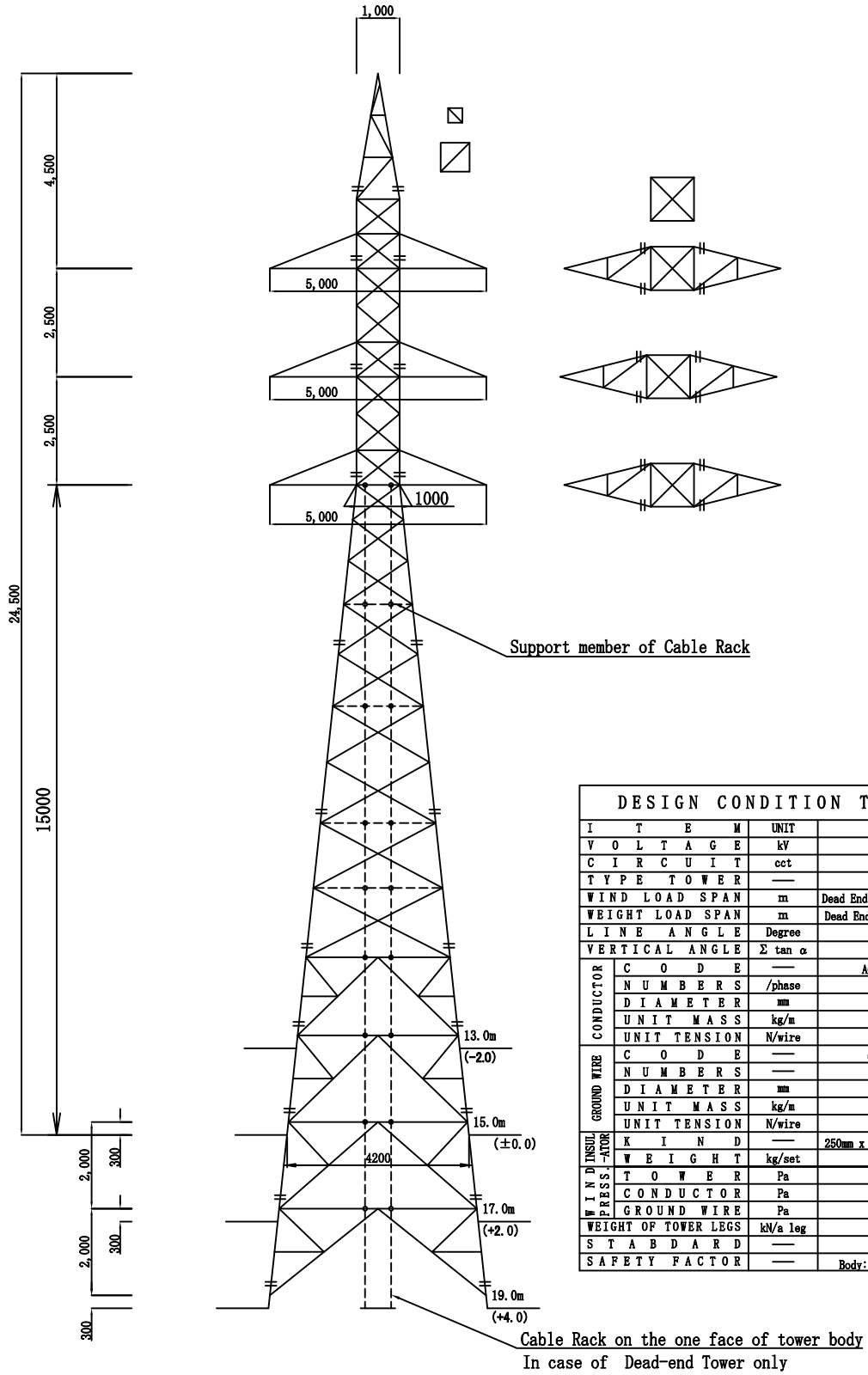
DWG No. DL-S3: 15kV Tower Skeleton, Type: 15-TD1



DESIGN CONDITION TABLE			
ITEM		UNIT	DESIGN
VOLTAGE		kV	15(30)
CIRCUIT		cct	1
TYPE TOWER		—	15-TB2
WIND LOAD SPAN		m	250
WEIGHT LOAD SPAN		m	350
LINE ANGLE		Degree	30
VERTICAL ANGLE		Σ tan α	0.15
CONDUCTOR	CODE	—	ACSR 120/20
	NUMBERS	/phase	1
	DIAMETER	mm	15.5
	UNIT MASS	kg/m	0.496
	UNIT TENSION	N/wire	15,690
GROUND WIRE	CODE	—	GSW 50mm2
	NUMBERS	—	1
	DIAMETER	mm	9.6
	UNIT MASS	kg/m	0.446
	UNIT TENSION	N/wire	13,730
INSUL-ATOR	KIND	—	250mm x 2sets Suspension
	WEIGHT	kg/set	210
WIND PRESS.	TOWER	Pa	1599
	CONDUCTOR	Pa	552
	GROUND WIRE	Pa	552
WEIGHT OF TOWER LEGS		kN/a leg	14.9
STABDARD		—	IEC 127
SAFETY FACTOR		—	Body: 1.0, Arm: 1.2

Scale: 1/150

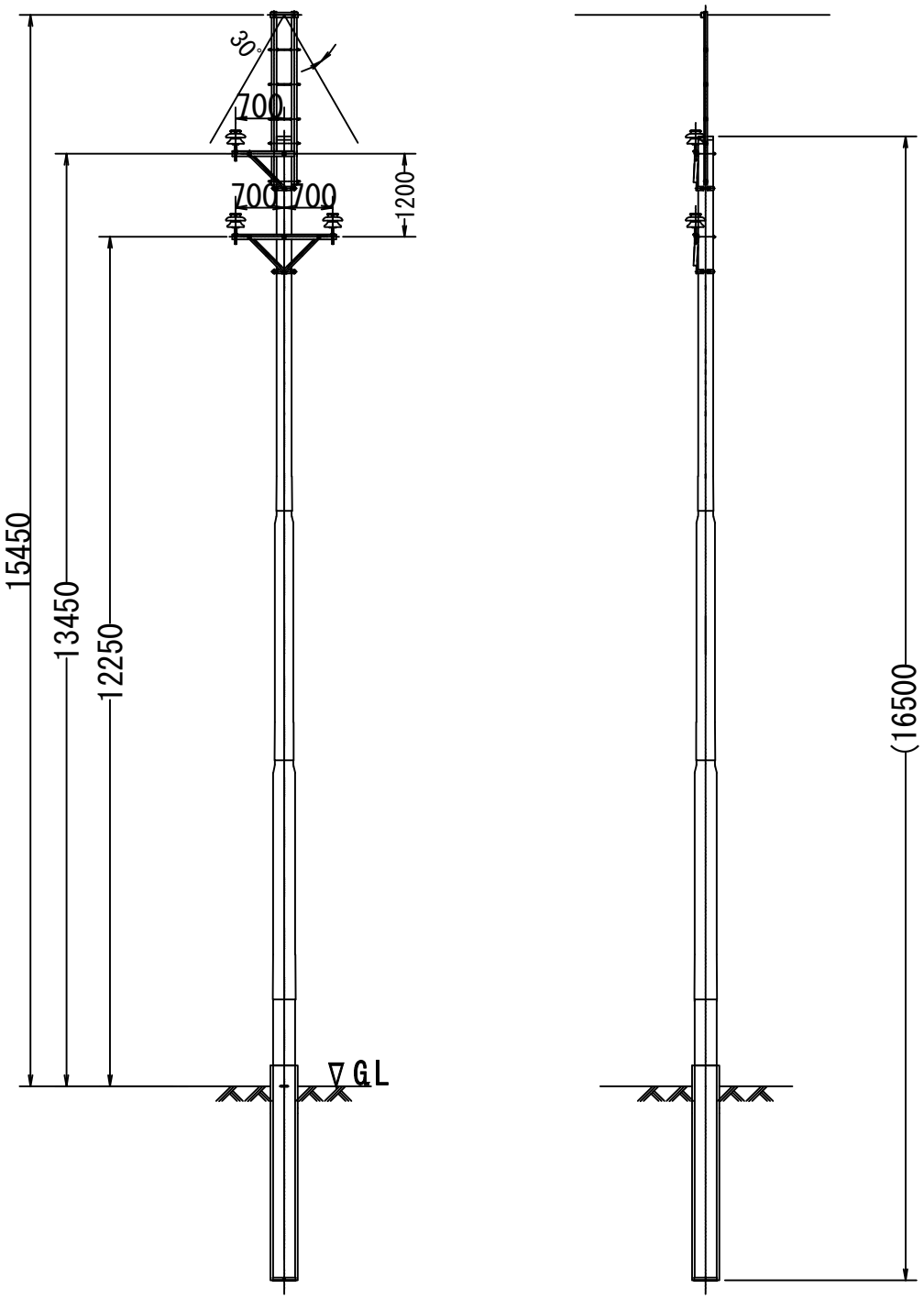
DWG No. DL-S4: 15kV Tower Skeleton, Type: 15-TB2



DESIGN CONDITION TABLE			
ITEM		UNIT	DESIGN
VOLTAGE		kV	15(30)
CIRCUIT		cct	2
TYPE TOWER		—	15-TD2
WIND LOAD SPAN		m	Dead End: 125, Angle: 250
WEIGHT LOAD SPAN		m	Dead End: 175, Angle: 50
LINE ANGLE		Degree	50
VERTICAL ANGLE		Σ tan α	0.15
CONDUCTOR	CODE	—	ACSR 120/20
	NUMBERS	/phase	1
	DIAMETER	mm	15.5
	UNIT MASS	kg/m	0.496
	UNIT TENSION	N/wire	15,690
GROUND WIRE	CODE	—	GSW 55mm2
	NUMBERS	—	1
	DIAMETER	mm	9.6
	UNIT MASS	kg/m	0.446
	UNIT TENSION	N/wire	13,730
INSUL-ATOR	KIND	—	250mm x 2sets Suspension
	WEIGHT	kg/set	210
WIND PRESS.	TOWER	Pa	1599
	CONDUCTOR	Pa	552
	GROUND WIRE	Pa	552
WEIGHT OF TOWER LEGS		kN/a leg	14.7
STABDARD		—	IEC 127
SAFETY FACTOR		—	Body: 1.0, Arm: 1.2

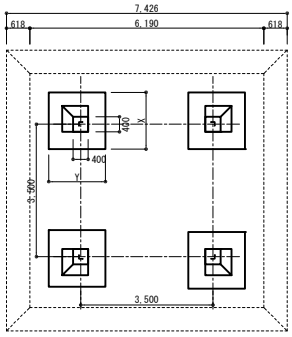
Scale: 1/150

DWG No. DL-S5: 15kV Tower Skeleton, Type: 15-TD2



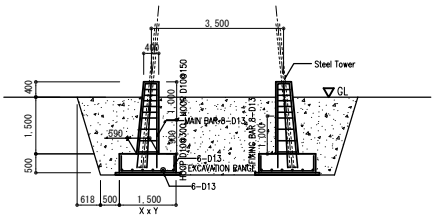
Scale: 1/100

DWG No. DL-S6: 15kV Tower Skeleton, Type: 15-PA1



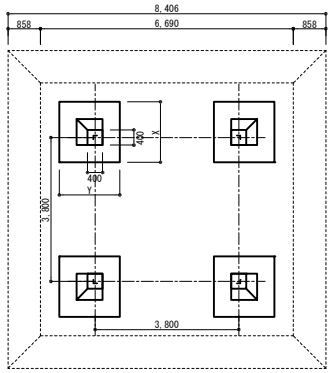
PLAN

Land Size to be secured: 8m x 8m



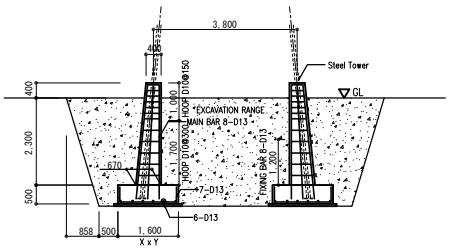
SECTION

FOUNDATION PLAN FOR TOWER TYPE: 15-TA1 (SCALE 1/200)



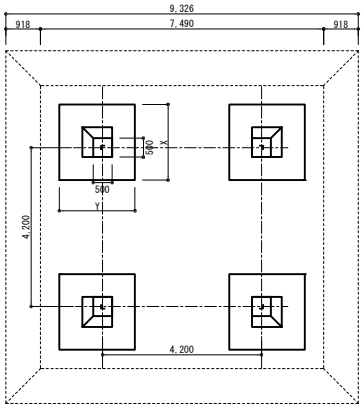
PLAN

Land Size to be secured: 9m x 9m



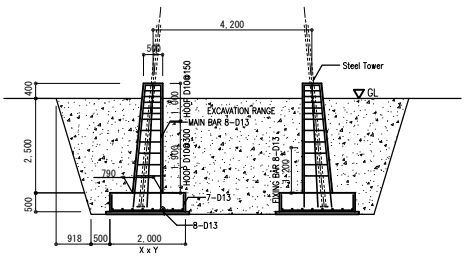
SECTION

FOUNDATION PLAN FOR TOWER TYPE: 15-TB1 (SCALE 1/200)



PLAN

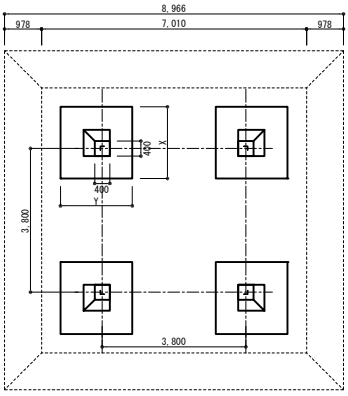
Land Size to be secured: 10m x 10m



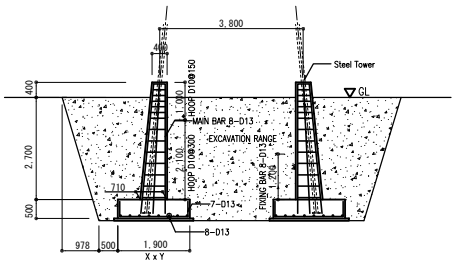
SECTION

FOUNDATION PLAN FOR TOWER TYPE: 15-TD1 (SCALE 1/200)

DWG No. DL-S7: 15kV Tower Foundation Plan (1/2)

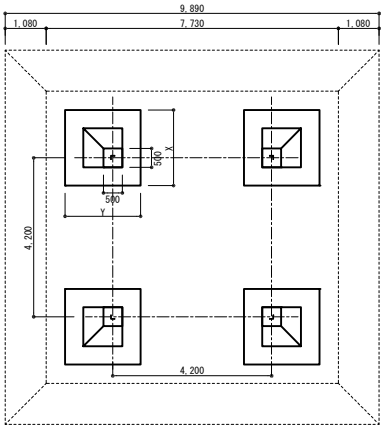


Land Size to be secured: 9m x 9m

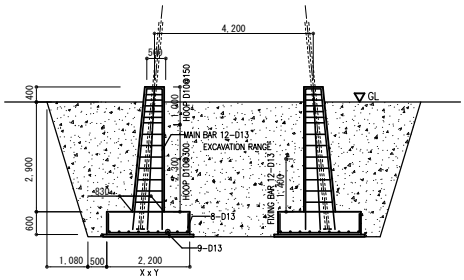


PLAN SECTION

FOUNDATION PLAN FOR TOWER TYPE: 15-TB2 (SCALE 1/200)



Land Size to be secured: 10m x 10m



PLAN SECTION

FOUNDATION PLAN FOR TOWER TYPE: 15-TD2 (SCALE 1/200)

PREPARATORY SURVEY
ON
IMPROVEMENT OF SUBSTATIONS AND DISTRIBUTION NETWORK PHASE 2
IN
THE REPUBLIC OF RWANDA

FIELD REPORT

2nd APRIL 2015

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Implementing Agency for the Project

Confirmed and Agreed by:

Eng. William BIHOYIKI
Ag. Head of Electricity Transmission Unit
Energy Utility Corporation Limited
Rwanda Energy Group
Relevant organization for the Project

JICA PREPARATORY SURVEY TEAM

Yachiyo Engineering Co.,Ltd.

Contents

[Attachment]

1. Outline of the Project

1.1 Background of the Project

In response to the request from the Government of the Republic of Rwanda (Rwanda), the Japan International Cooperation Agency (JICA), in consultation with the Government of Japan, decided to conduct a Preparatory Survey (the Survey) on the Project for Improvement of Substations and Distribution Network Phase 2 (the Project).

JICA sent to Rwanda the Preparatory Survey Team (the Team) headed by Mr. Toshiyuki Hayashi, Senior Advisor, JICA, to conduct the first field survey and the Team is scheduled to stay in the country from 8th March to 16th April, 2015.

The Team continued discussions with the concerned officials of Rwanda and the field survey in Rwanda.

EDCL, EUCL and the Team had series of technical discussions to form mutual understandings about the contents, scope, preconditions for the Outline Design, basic specifications, general layouts, and so on of the Project in the first field survey. EDCL, EUCL and the Team agreed to record the following issues described on this Field Report as a conclusion of the discussions.

Components of the Project will be further examined and may be modified through the consultation with the Japanese Ministry of Foreign Affairs and JICA headquarters. It is important for the Rwanda side to understand that the Preparatory Survey is not a commitment for the future implementation of the Project.

Particularly, in consideration of the schedule and procedures of Japan's Grant Aid projects, the Team explained that the outline design, planning of the implementation schedule, the cost estimation and so on of the Project will be carried out in accordance with the mutual understandings made on this field report immediately after the first field survey. EDCL and EUCL expressed understanding about the schedule and procedures of Japan's Grant Aid projects. EDCL and EUCL agreed for the Team to progress the further study, the outline design, planning of the implementation schedule, the cost estimation and so on of the Project in accordance with the mutual understandings made on this field report immediately after the first field survey.

1.2 Framework for the Project

The framework for the Project is shown as follows.

(1) The responsible ministry is Ministry of Infrastructure (MININFRA).
(2) The implementing agency is Energy Development Corporation Limited (EDCL).
(3) The relevant organization is Energy Utility Corporation Limited (EUCL).

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1.3 The Scope of the Japanese side

The Scope of the Japanese side is shown in Table 1.3-1 and DWG. No. GA-01.

Two (2) sets of 110/15 kV transformers (20 MVA, Outdoor type) shall be installed as the scope of the Japanese side.

Table 1.3-1 Outline of the Final Components

Components	Capacity
Procurement and Installation Work	
1. **Ndera substation**	
(a) 20 MVA 110/15 kV transformers	2 units
(b) 110 kV switchgear	1 set
(c) 15kV switchgear	1 set
(d) Control and supervisory facilities	1 set
2. **Transmission Line**	
(a) Two circuits of 110 kV transmission lines from the existing line between Birembo and Gasogi substations to Ndera Substation	Approx. 2.2 km
3. **Distribution Line**	
(a) Two circuits of 15 kV distribution lines from Ndera Substation to existing line between Birembo and Free Zone Phase 1 substations	Approx. 650 m
(b) One circuit of 15 kV distribution line from existing Gasogi Substation to Kabuga Ring Main Unit (RMU) Switching Station	Approx. 6.5 km
4. **Modification of existing Gasogi Substation**	
(a) 15 kV switchgear panel for outgoing feeder to Kabuga RMU Switching Station	1 set
5. **RMU Switching Stations**	
(a) RMU Switching Stations at Kabuga and Murindi.	2 sets
Procurement Work	
6. **Maintenance Tools for the Equipment of the Project**	1 lot
7. **Spare Parts for the Equipment of the Project**	1 lot
Construction Work	
8. **Foundation for the Equipment of the Project (Transformers, Towers for 110 kV Transmission Line, etc.)**	1 lot
9. **Building of the Project (Ndera substation, Kabuga and Murindi RMU Switching Stations)**	3 building

[Remark] Quantities shall be examined in the outline design.

1.4 Obligations/Undertakings of the Rwanda side for the Project

Preconditions

① The Rwanda side has agreed to conduct the environmental and social considerations required by JICA Guidelines for Environmental and Social Considerations (2010). An Abbreviated Resettlement Action Plan (ARAP) must be prepared and the land acquisition should be completed by December 2015. An approval on environmental clearance, such as EIA Certificate of Authorization as well as other relevant permits/licenses required for the implementation of the Project must be obtained in a timely manner to meet the Project schedule. An Environmental Management Plan (EMP), monitoring plan and impact mitigation measures must be prepared during an environmental assessment.

Necessary Inputs by the Rwanda side

Prior to the Commencement of the Construction Work

② To do land preparation work and leveling work before commencement of installation work by the Japanese side (refer to 2.1.7 and 2.2.2). Necessary lands are as follows;
(1) Ndera Substation
(2) 110kV connection area near tower No. 212: approx. 32 m x 38 m minimum
(3) 110kV transmission line; approx. 2.2 km
(4) 15kV distribution line for Route-1: approx. 6.5 km, refer to DWG No. DL-11
(5) 15kV distribution line for Route-2: approx. 650 m, refer to DWG No. DL-21
(6) 15kV distribution line for Route-3 approx. 200 m, refer to DWG No. DL-31
(7) Kabuga RMU switching station: 20 m x 15 m
(8) Murindi RMU switching station: 20 m x 15 m
(9) Necessary access road for constructing all transmission and distribution lines

③ To obtain permission from related authorities for 110 kV transmission lines and 15 kV distribution lines to go across the roads before commencement of installation work by the Japanese side.

④ To resettle occupants in accordance with the resettlement plan prepared at the stage of the survey in smooth manner, if necessary.

During the Construction Work

⑤ To schedule both power and communication network shutdown required for construction works of the Project, and carry out in timely manner. The Rwanda side shall also manage any issue concerning the shutdown including related procedures, and compensation to and grievances from customers.

⑥ To modify the NECC SCADA system and the Optical Network Management System to accommodate the new three stations so called Ndera substation and Kabuga & Murindi switching stations. This modification includes the additional network connection measures of the Multiplexer/SDH panel in Gasogi substation for the connection of new optic fiber cable from Kabuga switching station.

⑦ To procure and construct the communication cable (optic fiber cable) from Multiplexer/SDH panel in Murindi switching station to the existing communication network of distribution lines.

⑧ To provide the setting list of protection relays related to the Project for coordination of setting values with new relays to be supplied under the Project. The setting value change at the substations where the transmission lines connected from Ndera substation shall be conducted by the Rwanda side including necessary tests and thier records shall be presented to Japan side.

⑨ To extend 15 kV switching room with cable trench to accommodate one additional 15 kV feeder panel supplied by the Japanese side.

⑩ To secure a temporary storage yard of approximately 5,000 m^2 near the Project site during the construction period of the Project.

⑪ To implement Environmental Management Plan and mitigation measures prepared through the environmental assessment and monitor environmental and social impacts caused by the Project with an adaptive management approach.

⑫ To construct fence and gate for 110 kV connection site, refer to DWG No. TL-05.

⑬ To construct fences and gates at the project sites in accordance with the layout and arrangement of the equipment and facilities of the Project.

⑭ To dismantle the existing towers in order to implement the Project.

After the Commencement of Operation

⑮ To monitor environmental and social impacts during the operation with an adaptive management approach.

2. Technical requirements confirmed in the first field survey

2.1 Technical requirements for the Substation of the Project

2.1.1 General requirement

(a) General Design Condition

Table 2.1.1-1 Basic Conditions for the Facility Design of the Project

Items		Values
Altitude		~~Over 1,000 m upto~~ 2,000 m
Ambient Temperature	Maximum	40 ~~38~~ Degrees Centigrade
	Minimum	5 ~~13~~ Degrees Centigrade
	Mean	20 ~~22~~ Degrees Centigrade
Maximum Wind Velocity		30 m/s
Annual Rain Fall		1,450 1,128 mm/year
Seismic Force		Horizontal 0.10 G
Soil Bearing Capacity		~~40~~ 25 t/m^2 (now on survey)

(b) System voltage

- 110 kV : 110 kV ± 10% (99.0 - 110 - 121.0 kV)
- 15 kV : 15 kV ± 10% (13.5 - 15 – 16.5 kV)

(c) Frequency

50 Hz ± 0.5 Hz (49.5 - 50 – 50.5 Hz)

(d) Short circuit current

According to our approximate system analysis, the following short circuit current is considered.

- 110 kV : 31.5 kA or more
- 15 kV : 25 kA or more

(e) Grounding system

- 110 kV : Solid grounding
- 15 kV : Solid grounding

(f) Pollution level for Insulator

Light (IEC-60815)

(g) Applicable Codes and Standards

As a rule, the transmission and substation system equipment shall be designed in accordance with IEC and IEC compatible standards. (JEC and so on)

2.1.2 Technical requirements for Ndera Substation

The following basic concept is applied for Ndera Substation.

- 110 kV double circuit transmission lines are connected to the substation, one is from Birembo and the other is from Gasogi substations.
- Two sets of 20 MVA transformer (T1 & T2) will be installed and parallel operation of two transformers will be conducted.
- Indoor type 15 kV switchgear with double busbar system will be installed in the new control building.
- Entire earthing system in the substation will be considered.
- One set of control and supervisory equipment will be installed.

Please refer "Single Line Diagram for Ndera Substation (Preliminary)".

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Table 2.1.2-1 Equipment to be provided for Ndera Substation

No.	Equipment	Q'ty	Unit	Major Specifications
1. Ndera Substation				
(1)	110 kV Switchgear	1	lot	- 2 sets of 110 kV Feeder bay 145 kV*, 31.5 kA or more 1 set (for three phases) comprising of;- • Disconnecting Switch (DS) • Circuit Breaker (CB) • Current Transformer (CT) • DS with Earthing Switch (ES) • Voltage Transformer (VT) • Lightning Arrester (LA) - 2 sets of 110/15 kV Transformer bay 145 kV*, 31.5 kA or more 1 set (for three phases) comprising of;- • Disconnecting Switch (DS) • Circuit Breaker (CB) • Current Transformer (CT) • Lightning Arrester (LA) - 3 phases of 110 kV VT for 110 kV Busbars Note*; Taking into consideration of altitude of the site (approximately 1,500 m), the rated voltage of 110 kV system shall be 145 kV.
(2)	20 MVA, 110/15 kV Transformer	2 27 27steps	sets	- 2 x 20 MVA Transformers with OLTC - Primary: 110 kV+/- 16% -27T - Secondary: 15 kV - Parallel operation of the two transformers is considered.
(3)	250 kVA, 15/0.4 kV Auxiliary transformer 14	1	set	- 1 x 100 kVA Transformer with NLTC - Primary: 15 kV+/- 2.5%, +/- 5.0% - Secondary: 400-230 V, Three phase, four wires The capacity will be confirmed considering the auxiliary loads in the whole substation.
(4)	Indoor type 15 kV GIS Switchgear with double busbars	1	lot	- 2 sets of 110/15 kV transformer bays 36 kV*, 1,250 A, 25 kA or more - 1 set of 15 kV coupler bay 36 kV*, 2,500 A, 25 kA or more - 8 sets of feeder bays 36 kV*, 800 A, 25 kA Note*; The rated voltage of 15 kV system shall be 36 kV, since the distribution voltage of the whole country is 30 kV, while that in Kigali city is 15 kV.
(5)	110 kV busbar	1	lot	Aluminum tubes for three phase busbars Note; The conductor fittings on the busbars for future 50 MW power plant bay will be provided.
(6)	Gantry towers	1	lot	- Dead-end gantry towers for 2 circuits of 110 kV transmission lines
(7)	Insulators	1	lot	- Support insulators for 110 kV busbar and transmission line wires at gantry towers
(8)	110 kV conductors and fittings	1	lot	- 2 sets for 110 kV transmission line bays - 2 sets for 110/15 kV transformer bays

No.	Equipment	Q'ty	Unit	Major Specifications
				- 1 set for 110 kV busbars
(9)	Towers for Grounding wires	1	lot	- 2 sets of towers for grounding wires
(10)	110 kV Control and Protection Panel for Transmission Line	1	lot	The panel includes the following devices for two (2) circuits;- - Bay control units (ABB REF670 or equivalent) - Protection relays (Areva P545 or equivalent)
(11)	110/15 kV Transformer Control Panels	2	sets	The panel includes;- - On-load tap changer control - Bay control unit (ABB RET670 or equivalent)
(12)	110/15 kV Transformer Protection Panel	1	lot	The panel includes the following devices for two (2) transformers;- - Transformer differential protection relays - Protection relays for neutral circuits
(13)	15 kV Control Panel	1	lot	The panel(s) includes Bay control units for all 15 kV feeders, including Incoming and Bus coupler bays.
(14)	AC Distribution Panel	1	lot	- MCCBs for 400/230 V AC, three phase, four wires
(15)	DC Distribution Panels	1	lot	- MCCBs for 110 V DC - MCCBs for 48 V DC The MCCBs may be installed in Charger panels.
(16)	Battery and Charger Panel	1	lot	- 110 V DC Batteries and Charger - 48 V DC Batteries and Charger
(17)	Uninterruptible Power Supply	1	set	- Input voltage: 400/230 V AC, three or single phase - Output voltage: 230 V AC, single phase The back-up time is at least 1 hour.
(18)	Micro SCADA system	1	lot	- Server and Client (Work Station HMI) with Bay Control Unit (BCU) system for controlling and supervising of the substation - Remote Terminal Unit (RTU) for communication with the existing National Electricity Control Center (NECC) SCADA system (ABB RTU560 or equivalent)
(19)	Communication System	1	lot	The communication system includes;- - SDH multiplexer panel (including ECI BG-20 or equivalent) - IP PBX equipment with telephone sets - Cables including optical fiber cables for the substation inside
(20)	15 kV power cables	1	lot	15 kV power cables and necessary accessories for connection - 15 kV cables between 110/15 kV transformers and 15 kV switchgear (incoming circuits) - 15 kV cables between 15 kV switchgear panels and first 15 kV distribution tower(s) and/or pole(s)
(21)	Low voltage power and control cables	1	lot	- Necessary low voltage power and control cables and necessary accessories for connection
(22)	Earthing system in the substation	1	lot	- Earthing conductors and accessories - Overhead grounding wires for new 110 kV switchgear and transformer area

2.1.3 Technical requirements for 15 kV RMU Switching Stations

The 15 kV RMU Switching Stations will be installed at "Kabuga" and "Murindi" area.

The Switching Stations are received power from the major substations by 15 kV and distribute the power to the other Switching Stations, and transform the voltage to 400 V AC to the surroundings. Table 2.1.2-2 shows the equipment list for each 15 kV RMU Switching Station.

Table 2.1.3-1 Equipment List for each Switching Station at Kabuga and Murindi

No.	Equipment	Q'ty	Unit	Major Specification
(1)	Indoor type 15 kV GIS Switchgear	5	panel	- 36 kV, 1,250 A, 25 kA or more - 4 x Feeder panels - 1 x 15/0.4 kV Transformer feeder panel
(2)	630 kVA Transformer	1	set	- 630 kVA (ONAN) - 15,000±2.5%, ±5.0% / 400-230 V
(3)	AC Distribution panel	1	set	- MCCBs for 400/230 V AC, three phase, four wires
(4)	110 & 48V DC Battery and Charger	1	lot	- MCCBs for 110 V DC - MCCBs for 48 V DC The MCCBs will be installed in each Charger panel.
(5)	Remote Terminal Unit (RTU)	1	lot	- RTU for communication with the existing National Electricity Control Center (NECC) SCADA system (ABB RTU560 or equivalent)
(6)	Communication System	1	lot	The communication system includes;- - SDH multiplexer panel (including ECI BG-20 or equivalent) - IP PBX equipment with telephone set - Cables including optical fiber cables for the substation inside
(7)	15 kV power cables	1	lot	- Between 15 kV Switchgear and 630 kVA Transformer. - 15 kV cables between 15 kV switchgear panels and first 15 kV distribution tower(s) and/or pole(s)
(8)	Low voltage power and control cables	1	lot	Cables and necessary accessories for connection
(9)	Earthing system	1	lot	Earthing conductors and accessories

2.1.4 Technical requirements for 15kV Switchgear Modification of Gasogi Substation

In order to connect an additional distribution line to Kabuga RMU switching station, one additional 15 kV feeder bay has to be extended. The existing 15 kV Switchgear room with cable trench will be extended by the Rwanda side to accommodate one extended switchgear panel supplied by Japanese side.

Table 2.1.3-1 Equipment List for Gasogi Substation

No.	Equipment	Q'ty	Unit	Major Specifications
(1)	Indoor type 15 kV GIS Switchgear feeder panel for extension	1	set	- 15 kV GIS Switchgear feeder panel Type: ZX1.5 (ABB) - 40.5 kV, 1250 A, 25 kA

2.1.5 Technical requirements for the facilities of Ndera Substation

(1) Design Conditions for the Substation Facilities

The design conditions for the substation Facilities are shown in the above mentioned Table 2.1.1-1.

(2) Requirements for the Substation Facilities

Design Ground Level would be set on 1546.5m from sea level. Necessary land preparation including Access Road, Earth wall, Land Leveling, Boundary Fence would be constructed by the Rwanda side. But Pavement of the approach road, Ditch of site rain drainage, Control Building, Cable Pit, TR Foundations, Fire Wall, Gantry Foundations, Bus Structure Foundations and other Equipment Foundations would be constructed by Japanese side.

outdoor lighting
water supply from utility

1) Outline of Control Building

The Outline of Control Building is shown in Table 2.1.5-1 (See DWG A-05, 06, 07, 08).

Ground Floor Level should be +1.0m from Design Ground Level to secure the height of Cable Pit.

Table 2.1.5-1 Outline of the Control Building

Items	Contents	Details
Structure	Reinforced Concrete Ralumen Structure	
Height of story	2 stories BFL-GFL=2.65 m GFL-IFL=3.5 m, 5.1m	BF: Cable Pit with Water Tank (10ton)×2 GF: Control Room, Switchgear Room, Entrance, Office, Meeting Room, Battery Room, Charger Room, Telecom Room, On Duty Room, Toilet, Shower, Kitchen, Corridor, Stair Case
Total Floor Area	Approx. 540 m^2	BF:180m2 GF:360m2
Building Area	Approx. 360 m^2	-
Exterior	Wall Finishing	Concrete with Urethane Exterior Paint Concrete Louver with Urethane Exterior Paint
	Roof Finishing	Concrete Plate t=80 with wire-mesh @200 Urethane joint @2000 each, Insulation t=50 Asphalt Membrane 3 Layer Water Proofing
Interior	Wall Finishing	Paint on Mortar iron trowel
	Floor Finishing	Ceramic Tile 300*300
	Ceiling	LGS Ceiling with Gypsum Board t=12 Paint Finish

roof = like Musha S/S

The outline of major architectural equipment is as following,

a) Electrical work: Lighting system, Socket system, Exterior Lighting system
b) Plumbing work: Water supply, Water tank (10ton 2 units), Septic tank and Soak Pit
c) Mechanical Work: Air-condition (Control Room, Charger Room, Telecom Room)

2) Foundation of 110/15 kV 20MVA Transformers

The Outline of the Foundation of 110/15 kV transformers is shown in Table 2.1.5-2 (See DWG A-05). Ground Floor Level should be +0.2 m from Design Ground Level.

Table 2.1.5-2 Outline of the Foundations of 110/15 kV transformers

Items	Contents	Details
Structure	Reinforced Concrete Mat Foundation	-
Height of story	1 story	GF: 2 units of 20 MVA transformer [Note] For the equipment to avoid submerging to water on heavy rainy days, the floor level of the foundations shall be 0.5 m raised from the Design Ground Level. Fire Wall: Concrete wall H=5.1 m, L=6.0 m, t=250 Total number 1 Oil pit: Around Transformer Foundation D=1.5 m covered with Gravel, overflow piping connected to the oil-water separator set west-beside the foundation Cable Culvert 700mm*1000mm

3) Foundations of Electrical Equipment

The Outline of the foundations of Electrical Equipment, Gantry, CB, DS and others is shown in Table 2.1.5-3 (See DWG A-02 and A-03).

Table 2.1.5-3 Outline of the Foundations of Electrical Equipment

Items	Contents	Details
Structure	Reinforced Concrete Foundation	-
Height of story	0 story	[Note] to avoid submerging to water on heavy rainy days, the floor level of the foundations shall be 0.2 m- raised from the ground level.

4) Cable Pit

The Outline of the Cable Culvert is shown in Table 2.1.5-4 (See DWG A-05).

Table 2.1.5-4 Outline of the Cable Pit

Items	Details
Cable Pit from 20 MVA transformers to Control Building	Reinforced Concrete Box with Concrete Cover t=50mm, t=150mm Length around 30m (W=0.7 m, D=1.0m)

Cable Pit is for smooth installation and maintenance from each transformer to Control Building.

2.1.6 Technical requirements for the facilities of RMU Switching Stations

(1) Design Conditions for RMU Switching Stations Facilities

The design conditions for the Ring Main Unit Facilities are shown in the Table 2.1.2-1. same as Substation Facilities.

(2) Requirements for the RMU Switching Stations Facilities

Necessary land development including Access Road, Earth wall, Land Leveling, Boundary Fence would be constructed by Rwandan side. But Pavement of the approach road, Ditch of site rain drainage, Power Supply Building, equipment Foundations would be constructed by the Japanese side.

1) Outline of RMU Switching Stations Buildings

The Outline of RMU Switching Stations Buildings is shown in Table 2.1.6-1 (See DWG A-03 and A-04).

Table 2.1.6-1 Outline of RMU Switching Stations Station Building

Items	Contents	Details
Structure	Reinforced Concrete Wall Structure	
Height of story	1 stories GFL-1FL=4.0 m	GF: Switchgear Room, Battery Room, AUX Transformer Room
Total Floor Area	Approx. 80 m^2	-
Building Area	Approx. 80 m^2	-
Exterior	Wall Finishing	Concrete with Urethane Exterior Paint
	Roof Finishing	Concrete Plate t=80,wire-mesh @200 Urethane joint @2000 each, Insulation t=50 Asphalt Membrane 3 Layer Water Proofing
Interior	Wall Finishing	Paint on Mortar iron trowel
	Floor Finishing	Ceramic Tile 300*300
	Ceiling	Exposed Concrete Paint Finishing

2.1.7 Preparation Work to be done by the Rwanda Side

Before commencement of construction work to be done by the Japanese side, following works should be completed by the Rwanda Side.

(1) Land Preparation Work at the site of Ndera Substation

1) Requirements of Land Preparation Work at the site of Ndera Substation

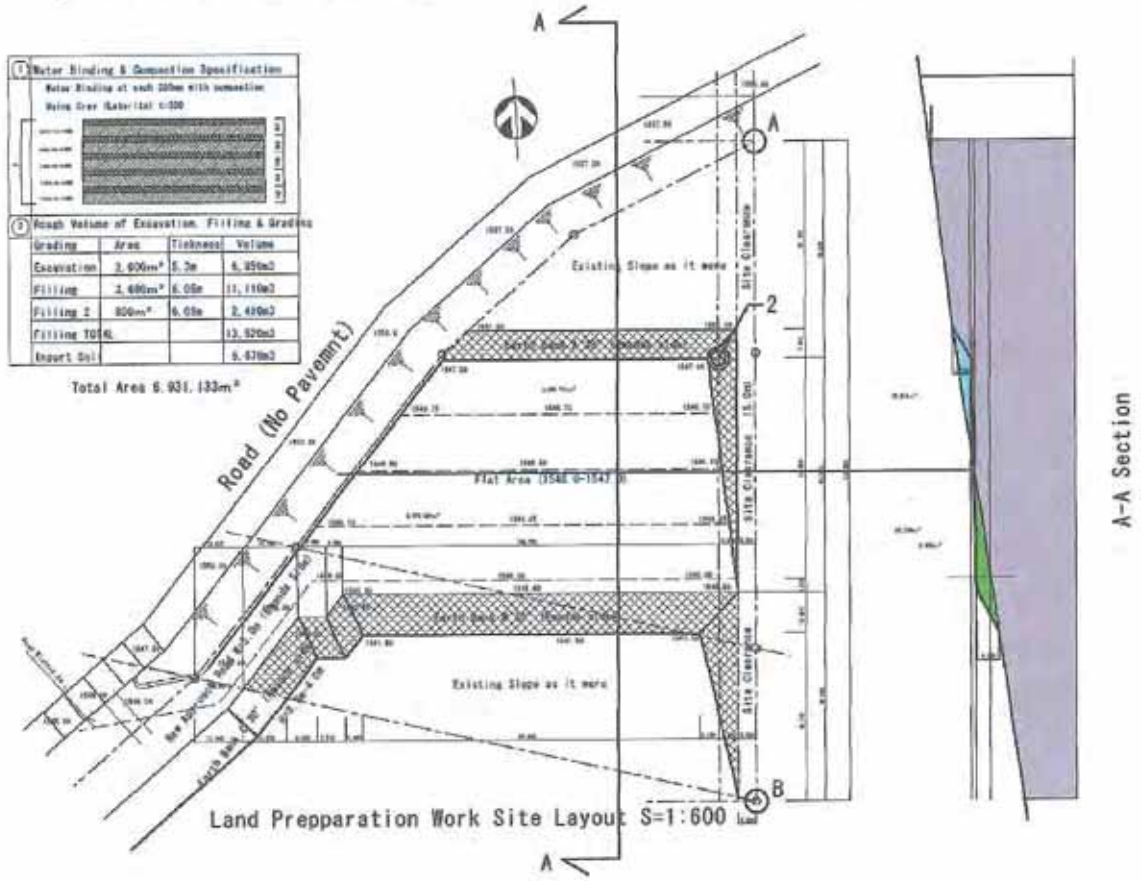


Figure 2.1.7-1 Land Preparation Work Site Layout

According to the Drawing as shown in Figure 2.1.7-1, land preparation work should be done.

Upper part of the site it should be excavated down to the level of 1,546.5 m from see level with bank (30 degree slope). Roughly estimated volume of the excavated soil would be 6,850 m^3.

Lower part of the site it should be land filling with excavated soil and import soil with bank (30 degree slope). Roughly estimated total volume of land filling soil would be 13,520 m^3.

And approach road (W=5.0 m) should be prepared.

At the area of land filling, water binding would be required at each 30 cm with compaction by tamper.

Estimated construction schedule would be from 6 months to 7 months.

Excavation soil Volume: 7,000 m^3

Filling Soil Volume: 13,600 m^3 (Import soil Volume: Cray 6,600 m^3)

Grading Area: 6,560 m^2

(2) Land Preparation Work at the sites of RMU Switching Station

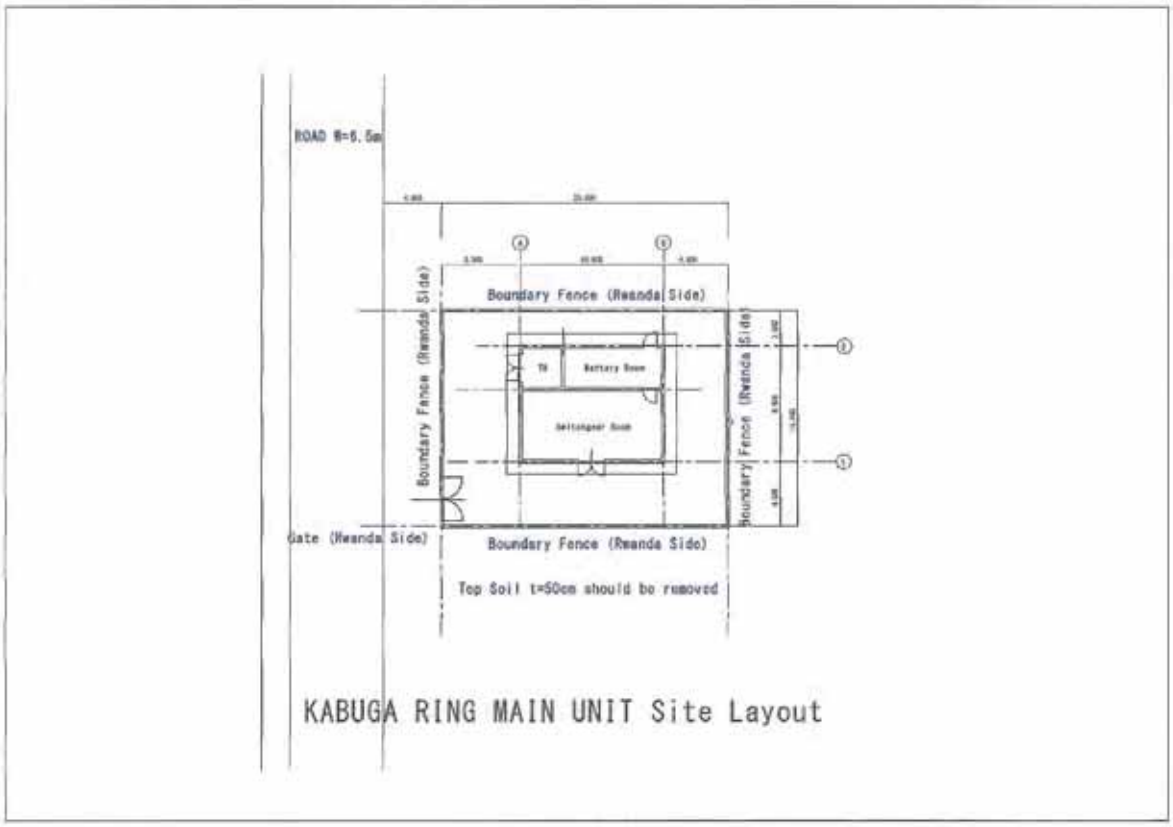


Figure 2.1.7-2 Land Preparation Work Site Layout at Kabuga RMU Switching Station

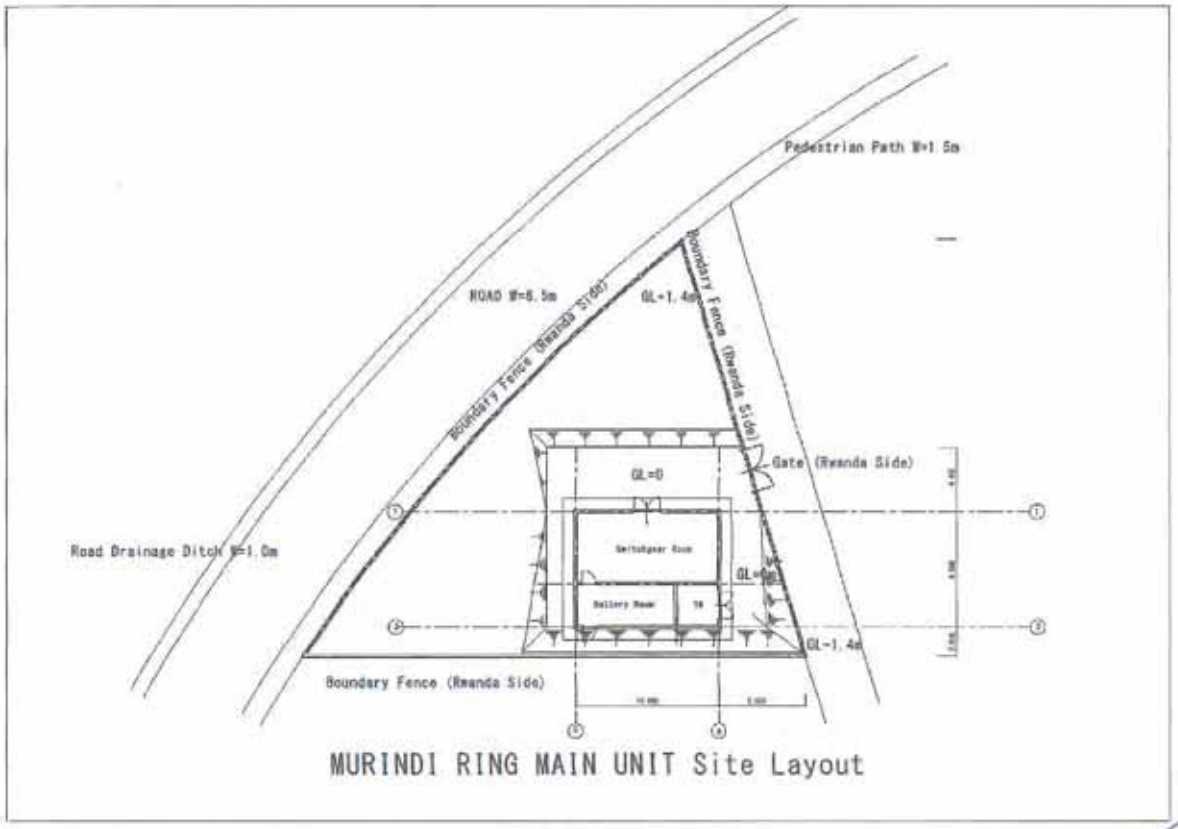


Figure 2.1.7-3 Land Preparation Work at Murindi RMU Switching Station

There are two sites of RMU Switching Stations. Topographie Survey has not yet completed.
Proposed site area in Kabuga RMU Switching Station will be 15m in width and 20 m in length as shown in Figure 2.1.7-2 Land Preparation Work at Kabuga RMU Switching Station. Total site area is 300 m^2.

The site is almost flat but top soil of this site is very week, so 30 cm of this top soil should be removed and new cray should be refilled of the same volume. Therefore total volume of land preparation work would be as follows,

Kabuga RMU Swiching Station Site

Excavation and dumping soil Volume: 300 $m^2 \times 0.3$ m = 90 m3
Filling Soil Volume: 90 m^3 (Import soil: Cray)
Grading Area: 300 m^2

Proposed site area in Murindi RMU Switching Station will be as shown in Figure 2.1.7-3 Land Preparation Work at Murindi RMU Switching Station. Total site area is around 530 m^2.
Terrain of this site is down slope from the road border line down to the bottom border line around 2.8 m. So in the middle part of down slope, flat area will be required. The size of the required flat area is 13 m in width and 15 m in length, total flat area is around 200 m^2. Half of this area will be excavated and using excavated soil another half of this area will be landfilling and make it flat area. Top soil of this site is very week, so 30 cm of this top soil should be removed and new cray should be refilled of the same volume. Therefore total volume of land preparation work would be as follows,

Murindi RMU Swiching Station Site

Excavation and dumping soil Volume: 200 $m^2 \times 0.3$ m = 60 m^3
Filling Soil Volume: 46 m^3 (Import soil: Cray)
Grading Area: 200 m^2

(3) Land Preparation Work at the site of 110 kV Transmission Line

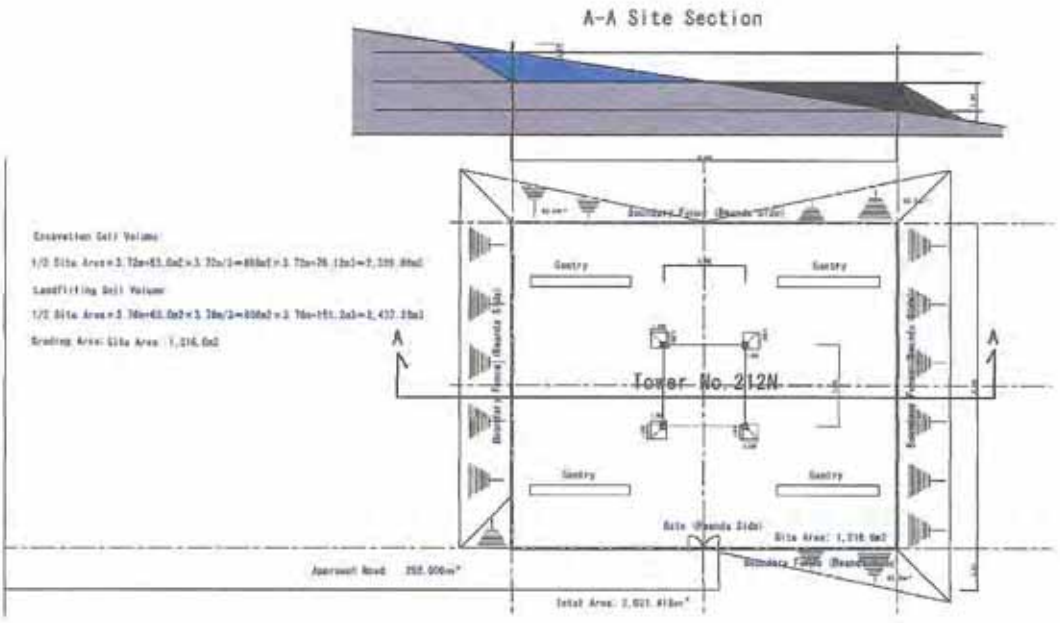


Figure 2.1.7-4 Land Preparation Work at Gantry Tower 110 kV

Proposed site area in 110 kV Gantry Tower No. 222N will be as shown in Figure 2.1.7-4 Land Preparation Work at Gantry Tower 110 kV. Total site area is around 2,030 m^2.

Terrain of this site is down slope from the road border line down to the bottom border line. So in the middle part of down slope, flat area will be required. The size of the required flat area is 38 m in width and 32 m in length, total flat area is around 1,216 m^2. Half of this area will be excavated and using excavated soil another half of this area will be landfilling and make it flat area. Therefore total volume of land preparation work would be as follows,

Murindi RMU Switching Station Site

Excavation soil Volume: 2,340 m^3

Filling Soil Volume: 3,440 m^3

Import soil: Cray: 100 m^3

Grading Area: 1,216 m^2

2.2 Technical requirement for Transmission and Distribution Lines

2.2.1 Technical requirement for Transmission and Distribution Lines

(1) Scope of Work

Project scope of work for transmission and distribution lines shows on DWG No. GA-01 attached hereafter is as follows;

① 110 kV Transmission Line:

New Ndera substation will be energized from existing 110 kV transmission line between Birembo and Musha substations. The tower of No. 212 on the transmission line shall be

re-built with tension type tower form suspension type tower, and then the new tension type tower will be split two way, one is for Birembo substation and another one is for Musha substation via Gosogi substation, refer to attached drawing No. GA-03. The new tension tower named "Tower No. 212N" will be connected to new 110 kV transmission line with double circuits up to Ndera substation line length is approx. 2.2 km, the transmission line route shown on drawing No TL-01 attached.

② 15 kV Distribution Line: Route-1

15 kV distribution line: Route-1with single circuit from Gasogi substation to Kabuga RMU switching station shown on DWG No. DL-11 will be constructed, the line length is approx. 6.0 km. Support of the 15kV distribution line is tower and steel pole types, refer to DWG No. DL12. The 15 kV distribution line shall be considered to be used for 30 kV distribution line.

③ 15 kV Distribution Line: Route-2

15 kV distribution line: Route-2 with double circuits from Ndera substation to existing 15 kV distribution line between Birembo substation and free zone PH-1 RMU station shall be constructed. The line length is approx. 600 m. Conductor configuration is vertical layout with lattice type tower, refer to DWG No. DL-22 attached. This 15 kV Distribution line shall also be used for 30 kV distribution line.

④ 15 kV Distribution Line: Route-3

There was an existing steel tower for 15 kV distribution line from Berimbo substation to Gishaka area, the tower has been located on planned 110 kV transmission line at approaching to new Ndera substation. Therefore, concerned two (2) existing towers of the 15 kV distribution line shall be diverted as shown on DWG No. DL-31 attached. The line configuration is triangle layout shown on DWG No. DL22 attached. This 15 kV Distribution line shall also be used for with 30 kV distribution line.

⑤ Kabuga RMU Swiching Station:

Kabuga RMU switching station will connect 15 kV distribution line: Route-2 above item ③, from Gasogi substation. Outgoing feeders will be comected to existing distribution lines located near the station.

⑥ Murindi RMU Swiching Station

Incoming feeders are connected from existing 15 kV distribution line. The existing tower to be connected to the RMU Swiching Station is suspension type tower; therefore the tower should be needed to re-build to tension type tower. Outgoing feeder will be connected to existing distribution lines located near the station, refer to DWG No. RM-11 attached.

(2) Design Conditions for 110 kV Transmission (T/L) and 15 kV Distribution Lines (D/L)

Natural Conditions and Electrical Conditions are shown in Table 2.2.1-1 and Table 2.2.1-2, respectively.

Table 2.2.1-1 Natural Conditions

Items	Design Values
Altitude	Over 1000m upto 2000m
Conductor temperature	-
Minimum temperature	5 degree C
Everyday temperature	25 degree C
Maximum temperature	80 degree C
Sag calculation to determin steel tower height	50 degree C
Wind speed	30 m/s
Wind load on conductors	56.3 kg/ m^2
Wind load on steel tower	163.1 kg/ m^2
Soil bearing capacity	40 ton/m^2 (now on survey)

Table 2.2.1-2 Electrical Conditions

Items	Design Value
Standard Span Length	350m for 110kV T/L, 250m for 15kV D/L
Wind Span	350m for 110kV T/L, 250m for 15kV D/L
Weight Span	450m for 110kV T/L, 350m for 15kV D/L
Vertical Component	15% of Max Working Tension for 110kV T/L
Right of Way (ROW)	- 110kV T/L: 15m width (7.5m +7.5m) - 15kV D/L for double circuits: 10m width (5m +5m) - 15kV D/L for Single circuit: 6m width (3m +3m)
Height of conductor (See Note 1)	
General area (m)	7 m
Waterway (m)	10 m
Road crossing (m)	8 m
Shield angle for Lightning	30 degree
Minimum nominal specific creepage distance	16 mm/kV
Equivalent salt deposit density	0.063 mg/cm^2

Note:

a) As EUCL's concept, facility for15kV distribution line shall be designed usable for 30kV distribution line.

b) To decide standard tower height, conductor height of 8 meters shall be employed.

(3) Requirements for 110 kV Transmission and Distribution Lines

Specifications for 110 kV Transmission and Distribution Lines are shown as follows.

Table 2.2.1-3 Specifications for 110kV Transmission Line

No.	Items	Specifications	
1)	Line Structure	Type:	Steel lattice type tower
		Configuration of tower:	Dual circuits, vertical layout (See DWG. No. TL-03)
		Type of tower:	Suspension type (110A2: Angle: 3 degree), Tension type (110B2: Angle: 15 degree), Tension type (110C2: Angle 30 degree) Termination tower (Angle: 60 degree or dead-end)
		Safety factor:	1.0 for main body 1.2 for arms
2)	Overhead Line (Conductor)	Type: ACSR Size 240/40 DIN	
3)	Insulator	Standards:	IEC60383-1 or equivalent
		Size:	254 mm suspension insulators
		Creepage distance:	292 mm
		Material:	Porcelain
		Color:	Brown

No.	Items	Specifications
		Ball and socket coupling: 16mm Number of insulators: 9 pcs/phase
4)	Shield Wire and Optical Fiber Cable	Type: OPGW x 2 Number of Optic Fiber Core: 24 cores Shielding angle: less than 30 degree.

Table 2.2.1-4 Specifications for 15kV Distribution Line: Route-1

No.	Items	Specifications
1)	Line Structure	Type: Steel lattice type tower and Steel Pole Configuration of tower: Single circuit, triangle layout for tower and horizontal layout for steel pole, See DWG. No. T-03
2)	Overhead Line (Conductor)	Type: ACSR Size 120/20, DIN
3)	Insulator for Tower	Specification : Same as 110kV Transmission Line but electromechanical Failing Load is 70kN Number of insulators: three (3) units/string to be confirmed
	Insulator for Pole	Type: Pin type on cross arm
4)	Shield Wire	Type: OPGW Number of Optic Fiber Core: 24 cores Shielding angle: less than 30 degree.

Table 2.2.1-5 Specifications for 15kV Distribution Line: Route-2

No.	Items	Specifications
1)	Line Structure	Type: Steel lattice type tower Configuration of tower: Double circuit, vertical layout See DWG. No. T-03
2)	Overhead Line (Conductor)	Type: ACSR Size 120/20, DIN 48204 /4-1974
3)	Insulator for Tower	Specification: Same as 110kV Transmission Line but electromechanical Failing Load is 70kN Number of insulators shall be three (3) units/string to be confirmed
4)	Shield Wire	Type: G655 or equivalent The shielding angle: less than 30 degree.

Table 2.2.1-6 Specifications for 15kV Distribution Line: Route-3

No.	Items	Specifications
1)	Line Structure	Type: Steel lattice type tower Configuration of tower: Single circuit, See DWG. No. T-03
2)	Overhead Line (Conductor)	Type: ACSR Size 120/20, DIN 48204 /4-1974
3)	Insulator for Tower	Specification: Same as 110kV Transmission Line Number of insulators shall be three (3) units/string to be confirmed
4)	Shield Wire	Type: G655 or equivalent The shielding angle: less than 30 degree.

Table 2.2.1-7 Specifications for Power Cable of 15kV Distribution Lines

No.	Items	Specifications
1)	Type	15kV or 30kV, XLPE insulation, PVC sheath, tape armor, copper conductor
2)	Standard	IEC 60502
3)	Size	50mm2, 70mm2, 95mm2, 120mm2, up to 240mm2

(4) Work Demarcation for Transmission Line, Distribution Line and Ring Main Unit

Work Demarcation for Transmission Line, Distribution Line and Ring Main Unit is shown in Attachment-2.

2.2.2 Technical requirements for the Foundation of Transmission and Distribution Lines

(1) Design Conditions for the Facilities

The design conditions for Facilities of the RMU Switching Stations are shown in the Table 2.1.1-1 same as Substation Facilities.

(2) Requirements for the Facilities

Necessary land development including Access Road, Earth wall, Land Leveling, Boundary Fence would be constructed by the Rwanda side.

1) Foundations for Towers of 110 kV Transmission lines

The Outline of the foundations for Towers 110 kV Transmission Lines is shown in Table 2.2.2-1.

Table 2.2.2-1 Outline of the Foundations of 110 kV Transmission Line Tower

Items	Contents	Details
Structure	Reinforced Concrete Foundation (Pad & Chimney Type)	Tower H (Now on study)

2) Foundations for Towers of 15 kV Distribution lines

The Outline of the foundations for Towers 15 kV Distribution Lines is shown in Table 2.2.2-2.

Table 2.2.2-2 Outline of the Foundations of 15 kV Distribution Line Tower

Items	Contents	Details
Structure	Reinforced Concrete Foundation	Tower H (Now on study)

2.3 Environmental and Social Consideration

JICA Study Team will hire a local consultant to assist EDCL in preparation of an Abbreviated Resettlement Action Plan and obtaining the necessary clearance and relevant permits/licenses. EDCL should work in collaboration with the local consultant and facilitate him in accessing necessary data and information to carry out his tasks.

JICA Study Team and EDCL visited Rwandan Environment Management Authority (REMA) and Rwanda Development Board (RDB) to confirm a procedure to obtain an EIA Certificate. It is imperative that EDCL submit a Project Brief to RDB so that RDB can determine whether the Project requires a full EIA or not. Presently EDCL is aiming to submit a Project Brief to RDB by 2 April 2015 and Screening result from RDB is expected by 15 April 2015.

In accordance with the Screening result from RDB, a further environmental study or a full EIA study will be carried out.

EDCL has already started process of acquiring land and resettlement for some of the components. EDCL must apply the above ARAP retrospectively as much as possible to the land acquisition and resettlement that have been already in process.

For the smooth implementation of the project, it is targeted that EDCL completes land acquisition by December 2015. ARAP should be finalized and authorized (or at least acknowledged) by Ministry of Finance by June 2015.

The table below is a schedule for each action to be taken for obtaining an EIA Certificate and preparation of ARAP. In order to complete the land acquisition by December 2015, implementation of the ARAP should start from July 2015. Each action and its schedule for implementation of ARAP will be confirmed with the person in charge of land acquisition at EDCL in the first week of April 2015 and this schedule will be revised and shared among relevant members.

Table 2.3-1 Schedule of Environmental Assessment and Preparation of ARAP

	Action	Actor	Expected Time Period/Target Date	2015 Mar	Apr	May	Jun	Dec
Environmental Assessment	Submission of Project Brief to RDB for Screening	EDCL/JICA ST/Local Consultant(JICA)	02 April 2015		▲			
	Issue of Screening result	RDB	Within 15days after submission of Project Brief		▲			
	Further Environmental study (e.g. a full EIA study), (if required by Screening Result)	EDCL/Local Consultant(JICA)						
	Issue of EIA Certificate	RDB	Issue date is depending Screening Result		▲			
Preparation of ARAP	Mobilization of Local Consultant	JICA/Local Consultant(JICA)			▲			
	ARAP Study	EDCL/Local Consultant(JICA)						
	Submission of ARAP to Min of Finance	EDCL					▲	
	Approval (or acknowledgment) of ARAP	Min of Finance.						
	Submission of ARAP to JICA	EDCL/Local Consultant(JICA)					▲	
Implementation of ARAP	Completion of Land Acquisition	EDCL	December 2015					▲

2.4 Procurement Plan of Spare Parts and Maintenance Tools

Capability of sustainable operation and maintenance for the equipment of the Project by the Recipient is one of conditions for the Japan's Grant Aid. The Rwanda side shall keep operation and maintenance for the equipment of the Project properly by himself, including procurement of spare parts. On the other hand, the warranty period for the Project is 1 year after insurance of the completion certificate in case of the Japan's Grant Aid. To secure operation and maintenance for the equipment of the Project for the warranty period, the Spare parts required for the period shall be provided as the scope of the Japanese.

Possession of maintenance tools for proper operation and maintenance for the equipment of the Project by the Recipient is one of conditions for the Japan's Grant Aid. However, the special tools required for operation and maintenance of the equipment of the Project shall be provided as the scope of the Japanese.

Spare parts and maintenance tools listed in Table 2.4-1 and Table 2.4-2 are recommended to be procured. More detailed parts, tools, test equipment and the quantity will be explained with the Draft Final Report.

Table 2.4-1 Recommended Spare Part List

Legend; pc: piece, ea.: each,
N.A.: Not applicable

Name of Spare Parts	Quantity		
	Ndera	Kabuga	Murindi
1. 110 kV Switchgear equipment			
1.1 Circuit Breaker			
(1) Closing coil	1 pc	N.A.	N.A.
(2) Tripping coil	1 pc	N.A.	N.A.
1.2 Disconnecting Switch (DS)			
(1) Fixed and moving contact (3 phase set for DS)	1 set	N.A.	N.A.
(2) Fixed and moving contact (3 phase set for Earthing switch)	1 set	N.A.	N.A.
1.3 Transformer			
1.3.1 110/15 kV Transformer			
(1) Gasket (complete set)	1 set	N.A.	N.A.
(2) Buchholz relay set	1 set	N.A.	N.A.
(3) Oil temperature indicator (main tank and conservator)	1 pc ea.	N.A.	N.A.
(4) Oil level indicators (main tank and conservator)	1 pc ea.	N.A.	N.A.
(5) Silica gel for Breathers	200%	N.A.	N.A.
1.3.2 15/0.4 kV Transformer			
(1) Oil temperature indicator	1 pc	1 pc	1 pc
(2) Silica gel for Breathers	200%	200%	200%

Name of Spare Parts	Quantity		
	Ndera	Kabuga	Murindi
2. 15 kV Switchgear equipment			
(1) Closing coil	1 pc	1 pc	1 pc
(2) Tripping coil	1 pc	1 pc	1 pc
(3) Vacuum bulbs complete with necessary accessories for replacement (for three phase)	1 set ea.	1 set ea.	1 set ea.
(4) Isolating main terminals (completed one pole)	1 set ea.	1 set ea.	1 set ea.
(7) Fuse (each type)	100%	100%	100%
(8) Meter (each type)	1 pc ea.	1 pc ea.	1 pc ea.
(9) Auxiliary relay (each type)	1 pc ea.	1 pc ea.	1 pc ea.
(10) Necessary accessories for 15 kV cable	1 set	1 set	1 set
3. Control and Protection			
(1) Protection relay (each type)	1 pc ea.	N.A.	N.A.
(2) Bay control unit	1 pc ea.	1 pc ea.	1 pc ea.
(3) Fuse (each type)	100%	100%	100%
(4) Meter (each type)	1 pc ea.	1 pc ea.	1 pc ea.
(5) Auxiliary relay (each type)	1 pc ea.	1 pc ea.	1 pc ea.
(6) Control and selector switch, if any (each type)	1 pc ea.	1 pc ea.	1 pc ea.
4. Station LV Power Supply Equipment			
4.1 AC Distribution Board			
(1) MCCB (each type)	1 pc ea.	1 pc ea.	1 pc ea.
(2) Indicating lamp, if any (each type)	100%	100%	100%
(3) Fuse (each type)	100%	100%	100%
(4) Meter (each type)	1 pc ea.	1 pc ea.	1 pc ea.
4.2 DC Distribution Board			
(1) MCCB (each type)			
(2) Indicating lamp, if any (each type)	100%	100%	100%
(3) Fuse (each type)	100%	100%	100%
(4) Meter (each type)	1 pc ea.	1 pc ea.	1 pc ea.
4.3 Battery and Charger			
(1) Battery	2 cells ea.	2 cells ea.	2 cells ea.
(2) Electrolyte (20 letter/tank)	1 tank	1 tank	1 tank
(3) Control Card and diode module	1 pc ea.	1 pc ea.	1 pc ea.
(4) Indicating lamp, if any (each type)	100%	100%	100%
(5) Fuse (each type)	100%	100%	100%
(6) Meter (each type)	1 pc ea.	1 pc ea.	1 pc ea.
5. Communication			
(1) RTU card	1 pc ea.	1 pc ea.	1 pc ea.

2.5 On-the-Job Training (OJT)

On-the-job training (OJT) will be carried out during the construction period. Through the OJT, maintenance and operation staff of the Rwanda side will be able to experience practical and advanced skill from Manufacturer's engineers. Contents of OJT are suggested as follows.

- Operation and maintenance on 110 kV and 15 kV substation equipment
- Protection relay setting
- Fault analysis and operation record management
- Deterioration diagnosis of insulation oil
- Purification processing insulation oil

3. Tentative Implementation Schedule of the Project

The tentative implementation schedule is shown as Attachment-3. In case that the Project is adapted by the Japanese Government, the Project will proceed as follows in the earliest scenario. The installation work of the Project will start in October, 2016. It is important for both sides to understand that the Preparatory Survey is not a commitment for the future implementation of the Project.

- The Exchange of Notes between the Rwanda and Japanese Government will be signed in March, 2016.
- The Tender Opening will be held in July 2016.
- Installation work of the Project will start in October, 2016.
- Commissioning of the Project will be in May, 2018.

4. Drawings

Part 1 Substation

Part 2 Transmission and Distribution Lines

Part 3 Architectural

Attachment

1. Member List of the Study Team

First Field Survey

Name	Assignment	Organization
Toshiyuki HAYASHI	Team Leader	Japan International Corporation Agency
Gaku SAITO	Vice Team Leader	Japan International Corporation Agency
Yoshiyuki KUDO	Chief Consultant/ Transmission and distribution Planning	Yachiyo Engineering Co., Ltd.
Kenji SAKEMURA	Substation Facilities	Yachiyo Engineering Co., Ltd.
Keiichiro OHASHI	Power Flow Analysis/ Protection Control	Yachiyo Engineering Co., Ltd.
Atsuhito URUNO	Transmission Facilities	Yachiyo Engineering Co., Ltd.
Yasuo HORIGOME	Facility Planning/ Cost Estimation	Yachiyo Engineering Co., Ltd
Kyohei KUROHANE	Construction Planning/ Cost Estimation	Yachiyo Engineering Co., Ltd.
Asami KABASAWA	Social and Environmental Considerations	Yachiyo Engineering Co., Ltd.
Tomoya NAKASHIMA	Substation Facilities Assistant	Yachiyo Engineering Co., Ltd.

Work Demarcation for the Project

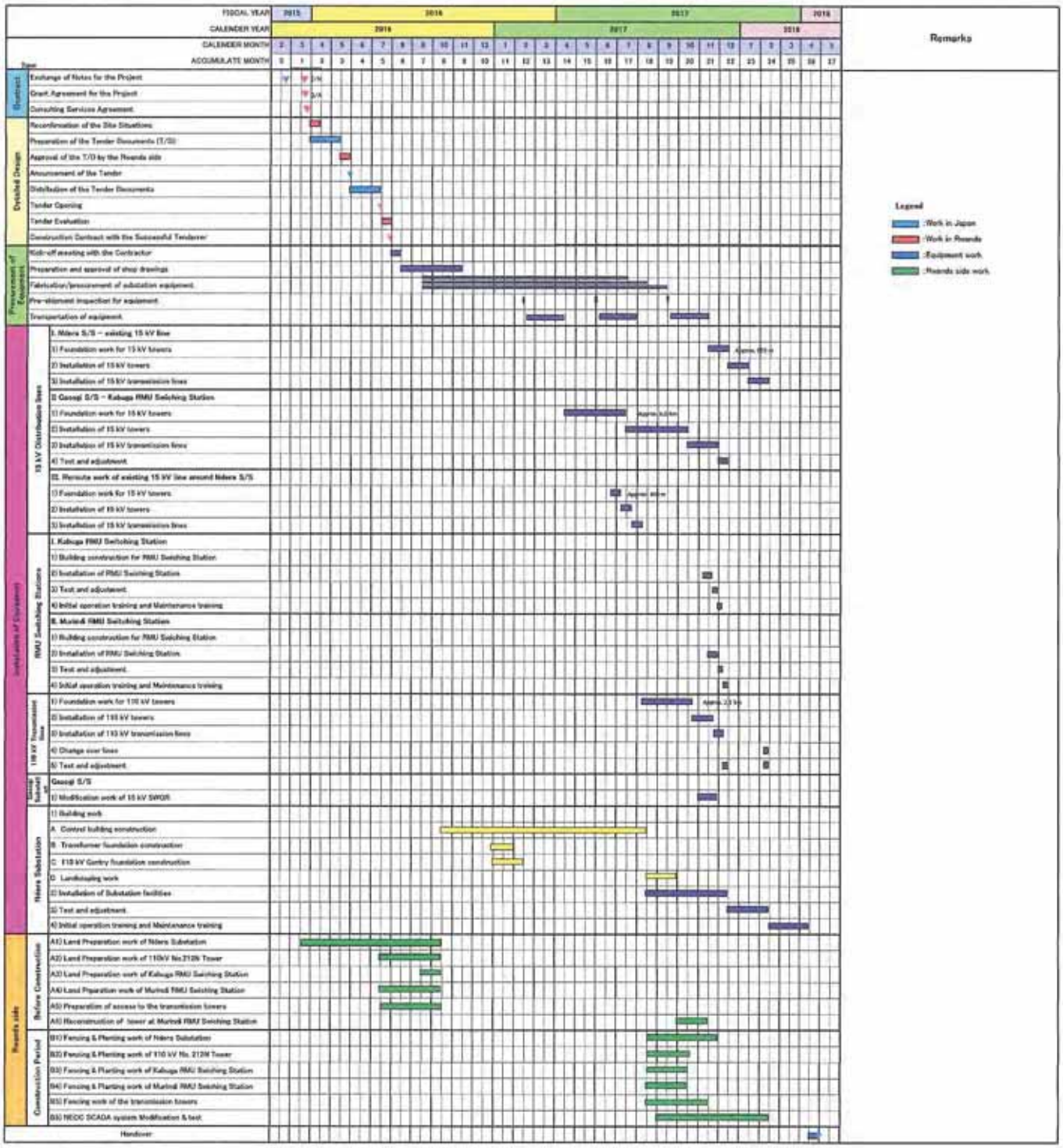
No.	Work Items	Japan Side		Rwanda Side		Remarks
		Proc.	Cons.	Proc.	Cons.	
1.	Ndera Substation					
(1)	Secure the Land			•		In REG Land
(2)	Site Leveling				•	
(3)	Gate and Fence			•	•	
(4)	Building work of the substation	•	•			
(5)	110 kV Switchgear	•	•			
(6)	20 MVA Transformers	•	•			
(7)	250 kVA Auxiliary Transformer	•	•			
(8)	15 kV Switchgear	•	•			
(9)	Substation Control and Protection equipment	•	•			
(10)	110 V DC Battery and Charger	•	•			
(11)	48 V DC Battery and Charger	•	•			
(12)	Communication equipment including RTU and SDH equipment	•	•			
(13)	15kV cables between Transformers and Switchgear	•	•			
(14)	Outgoing 15 kV Cables except item 3.2(2) in this table	•	•			
(15)	Protection Relay setting change of the substations where the transmission lines from Ndera substation to be interconnected				•	Birembo & Musha S/Ss
(16)	Spare parts for Substation	•	•			
(17)	Maintenance tools for Substation, etc	•	•			
(18)	Technical training for equipment		•			
2	110 kV Transmission Line (T/L)					
2.1	Secure of Land and Site leveling					
(1)	T/L Connection Area (32m x 38m)			•		
(2)	Site leveling work at the connecting area				•	
(3)	Right of Way for all T/L (2.2 km) (secure of land at T/L tower foundations, etc)			•	•	
(4)	Storage yard for construction materials			•		
2.2	110kV Transmission Line (Approx. 2.2 km) From connection point to Ndera S/S)					
(1)	Connecting Facility such as gantry, insulator, etc, at connecting point of 110 kV T/L	•	•			

No.	Work Items	Japan Side		Rwanda Side		Remarks
		Proc.	Cons.	Proc.	Cons.	
(2)	Dismantling of existing 110 kV Tower				•	
(3)	Replacement of line conductors and insulator string sets from nearest both towers	•	•			
3.	15 kV Distribution Line (D/L)					
3.1	Route-1: from Gasogi S/S to Kabuga RMU SS					
(1)	Secure the land with ROW			•		
(2)	Cable from 15 kV SWGR at Gasogi S/S to 15 kV D/L tower/pole	•	•			
(3)	Overhead 15 kV D/L from Gasogi S/S to Kabuga SS (Approx. 6.5 km)	•	•			
(4)	Cable from 15 kV D/L tower to 15 kV SWGR at Kabuga RMU SS	•	•			
(5)	Communication cable from Gosogi S/S to Kabuga RMU SS	•	•			
3.2	Route-2: from Ndera S/S to Existing 15 kV D/L					
(1)	Secure the land with ROW			•		
(2)	Cables from 15 kV SWGR at Ndera S/S to 15 kV D/L first tower, 2 circuits	•	•			For Free zone 1 & Birembo S/Ss
(3)	Overhead 15 kV D/L with dual circuits, between Ndera S/S to the Existing line (Approx. 650 m)	•	•			
(4)	Cables from the new tower to existing tower	•	•			
3.3	Route-3: Line Diversion for securing 110 kV T/L tower in front of Ndera S/S (due to 110 kV T/L impossible to pass over in AZAM factory)					
(1)	Secure the land with ROW			•		
(2)	Overhead line of 15 kV D/L between existing towers	•	•			With 2 towers
(3)	Cable(s) from tower to consumer(s)			•	•	
(4)	Dismantle of one (1) existing tower				•	Tower No.
(5)	Construction of new two (2) Tower	•	•			
(6)	15kV cable from 15kV outgoing feeders	•	•			
4.	RMU Switching Stations					
4.1	Construction of Kabuga RMU Station					
(1)	Secure the Land			•		
(2)	Site Leveling				•	

No.	Work Items	Japan Side		Rwanda Side		Remarks
		Proc.	Cons.	Proc.	Cons.	
(3)	Gate and Fence			•	•	
(4)	Building work of the station (8 m x 10 m)	•	•			
(5)	15 kV Switchgear with Bay Control Unit	•	•			
(6)	110 V DC Battery and Charger	•	•			
(7)	48 V DC Battery and Charger	•	•			
(8)	Communication equipment including RTU and SDH equipment	•	•			
(9)	Connection of communication cable at Kabuga RMU SS	•	•			
(10)	Connection of communication cable at Gasogi S/S	•	•			
(11)	630 kVA Auxiliary Transformer	•	•			
(12)	Auxiliary LV distribution Board for the station	•	•			
(13)	LV distribution board for surround consumers	•	•			
(14)	Outgoing LV cables for (13) above			•	•	
(15)	15kV outgoing cables except from Gasogi S/S	•	•			
(16)	Spare parts for Switching station	•	•			
(187	Technical training for equipment		•			
4.2	Construction of Murindi RMU Station					
(1)	Secure the Land of the Station and new Tower			•		
(2)	Site Leveling				•	
(3)	Gate and Fence			•	•	
(4)	Relocation of existing tower	•	•			
(5)	Building work of the station (8m x 10m)	•	•			
(6)	15kV Switchgear with Bay Control Unit	•	•			
(7)	DC 110V Battery and Charger	•	•			
(8)	DC 48V Battery and Charger	•	•			
(9)	Communication equipment including RTU and SDH equipment	•	•			
(10)	Connection of outgoing communication cable from Murindi RMU SS			•	•	
(11)	630kVA Auxiliary Transformer	•	•			
(12)	Auxiliary LV distribution Board for the station	•	•			
(13)	LV distribution board for surround consumers	•	•			
(14)	Outgoing LV cables for (13) above			•	•	
(15)	15kV outgoing cables	•	•			

No.	Work Items	Japan Side		Rwanda Side		Remarks
		Proc.	Cons.	Proc.	Cons.	
(16)	Spare parts for Switching station	•	•			
(17)	Technical training for equipment		•			
(18)	New tension tower near the station	•	•			
(19)	Relocation of 15kV overhead line for Market			•	•	With DS on tower
(20)	Communication network for the Station SCADA			•	•	
5.	Existing Gasogi Substation					
(1)	Expansion of 15kV SWGR for connection of new 15kV cable to Kabuga RMU SS	•	•			
(2)	Expansion of 15kV switchgear room with cable trench				•	
6.	NECC SCADA System					
(1)	Modification of SCADA System of NECC and Network Management system for accommodation of new Ndera S/S, Kabuga RMS SS and Murindi RMS SS			•	•	
(2)	Modification of Gasogi S/S communication equipment (SDH Panel) to connect additional communication cable from Kabuga RMU SS			•	•	

Tentative Implementation Schedule of the Project



Part 1 Substation

Drawing List

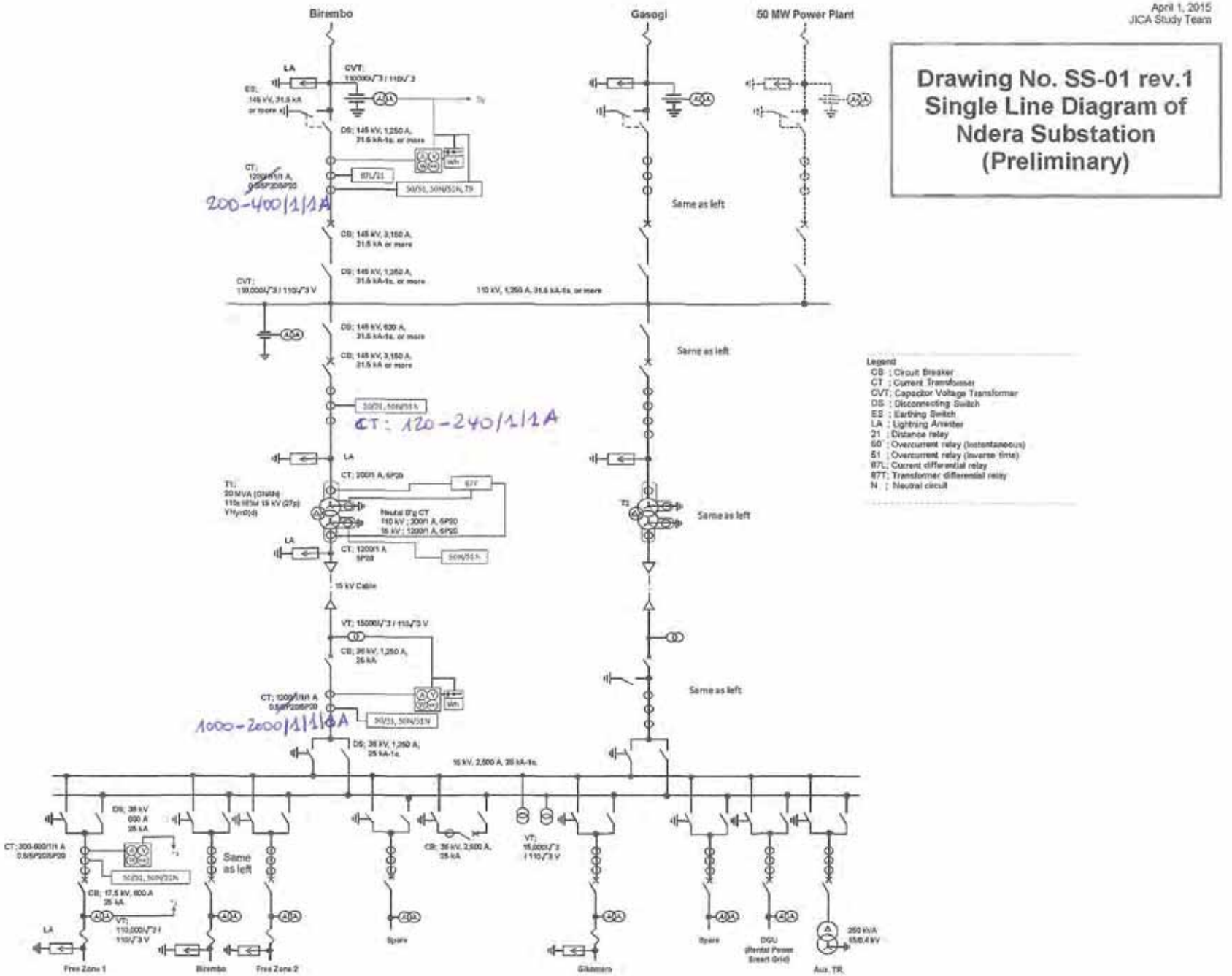
DWG No.	DWG Title

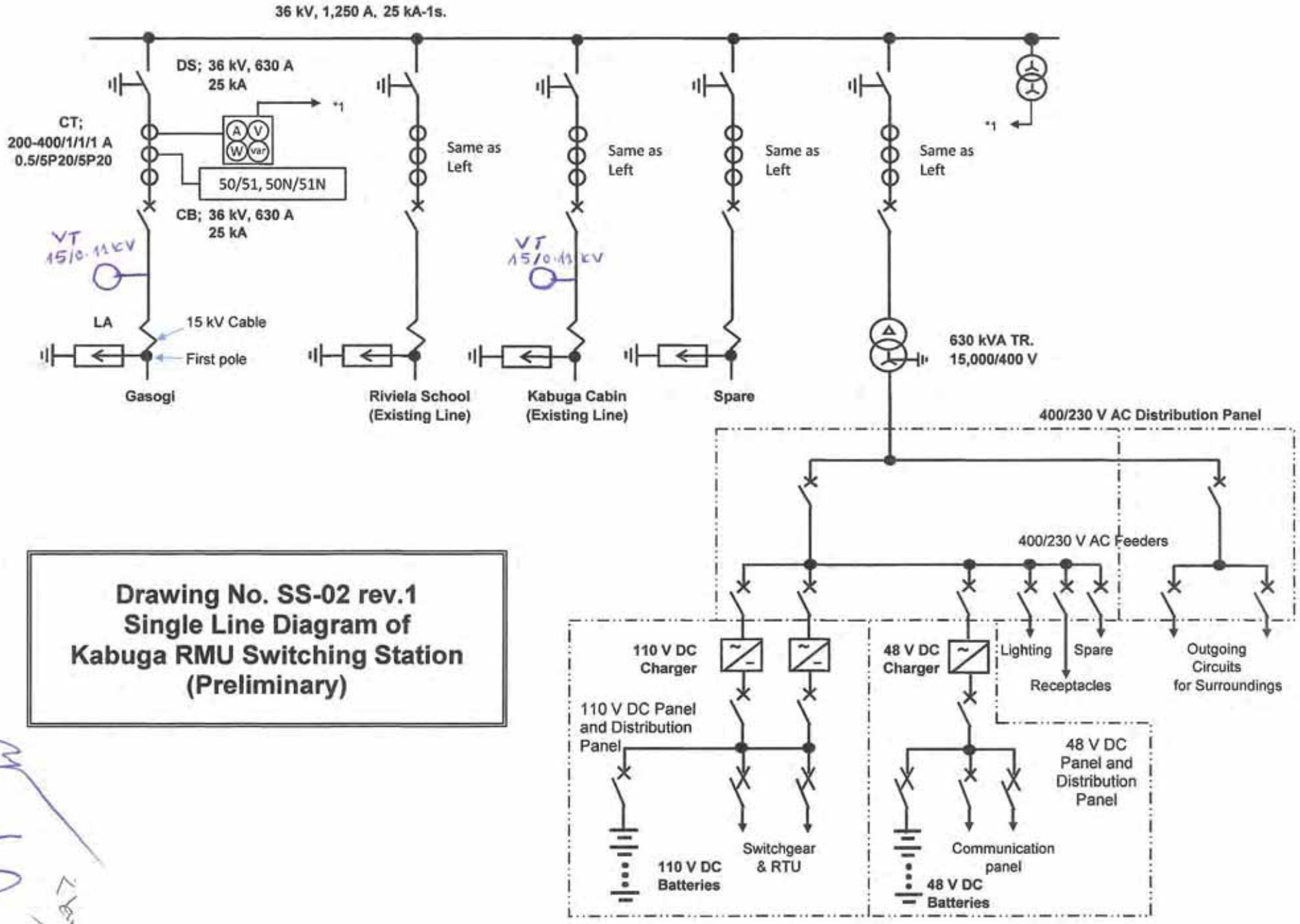
Part 1 Substation

(1)	SS-01:	*Single Line Diagram of Ndera Substation* (Preliminary)
(2)	SS-02	Single Line Diagram of Kabuga RMU Switching Station (Preliminary)
(3)	SS-03	Single Line Diagram of Murindi RMU Switching Station (Preliminary)
(4)	SS-04	Control System Diagram of Ndera Substation and RMU Switching Stations
(5)	SS-05	Single Line Diagram of Gasogi Substation (Preliminary)

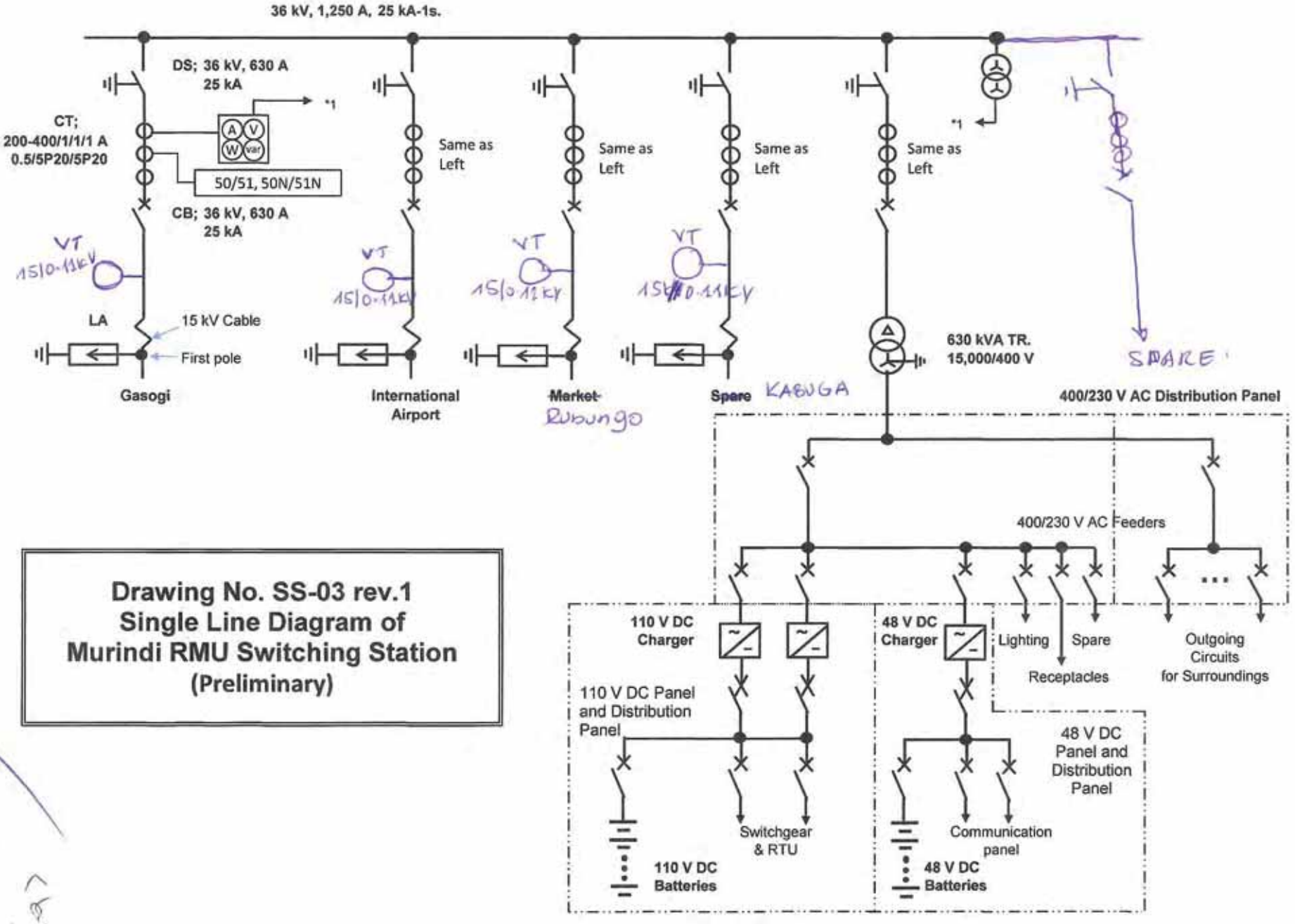
April 1, 2015
JICA Study Team

Drawing No. SS-01 rev.1 Single Line Diagram of Ndera Substation (Preliminary)





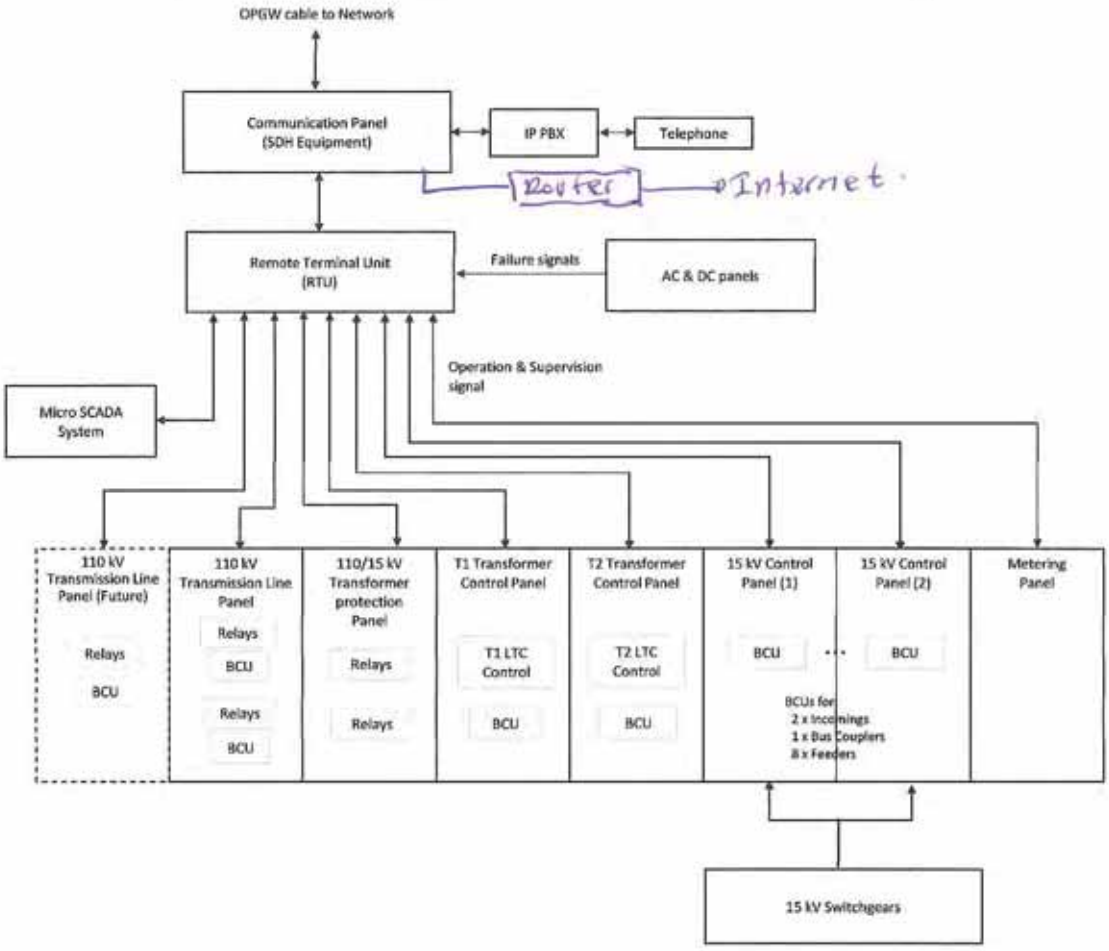
Drawing No. SS-02 rev.1
Single Line Diagram of
Kabuga RMU Switching Station
(Preliminary)



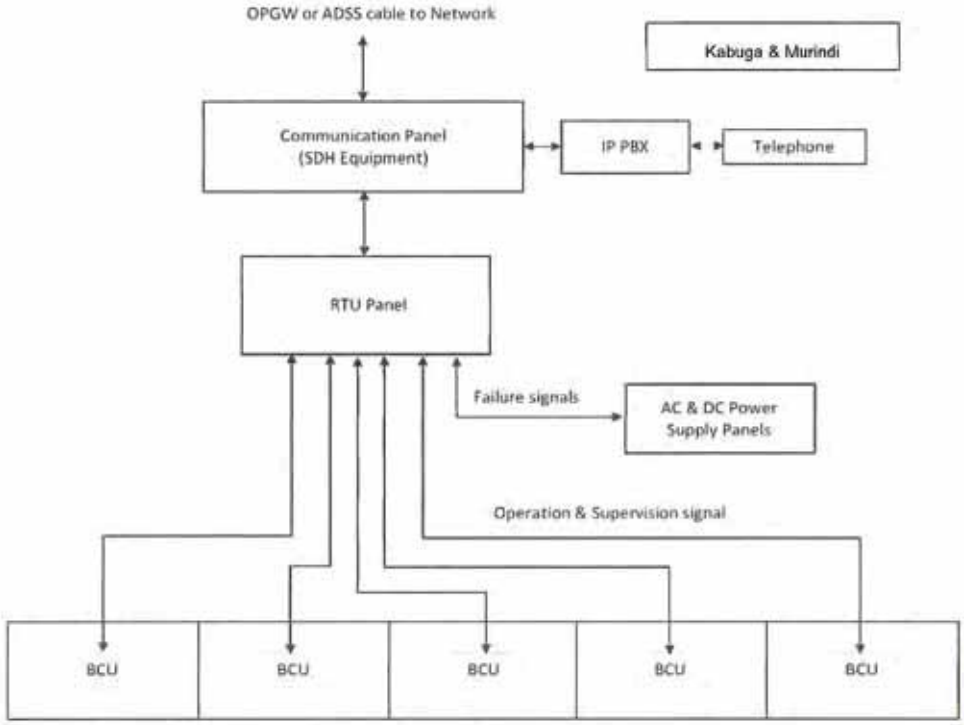
Drawing No. SS-03 rev.1
Single Line Diagram of
Murindi RMU Switching Station
(Preliminary)

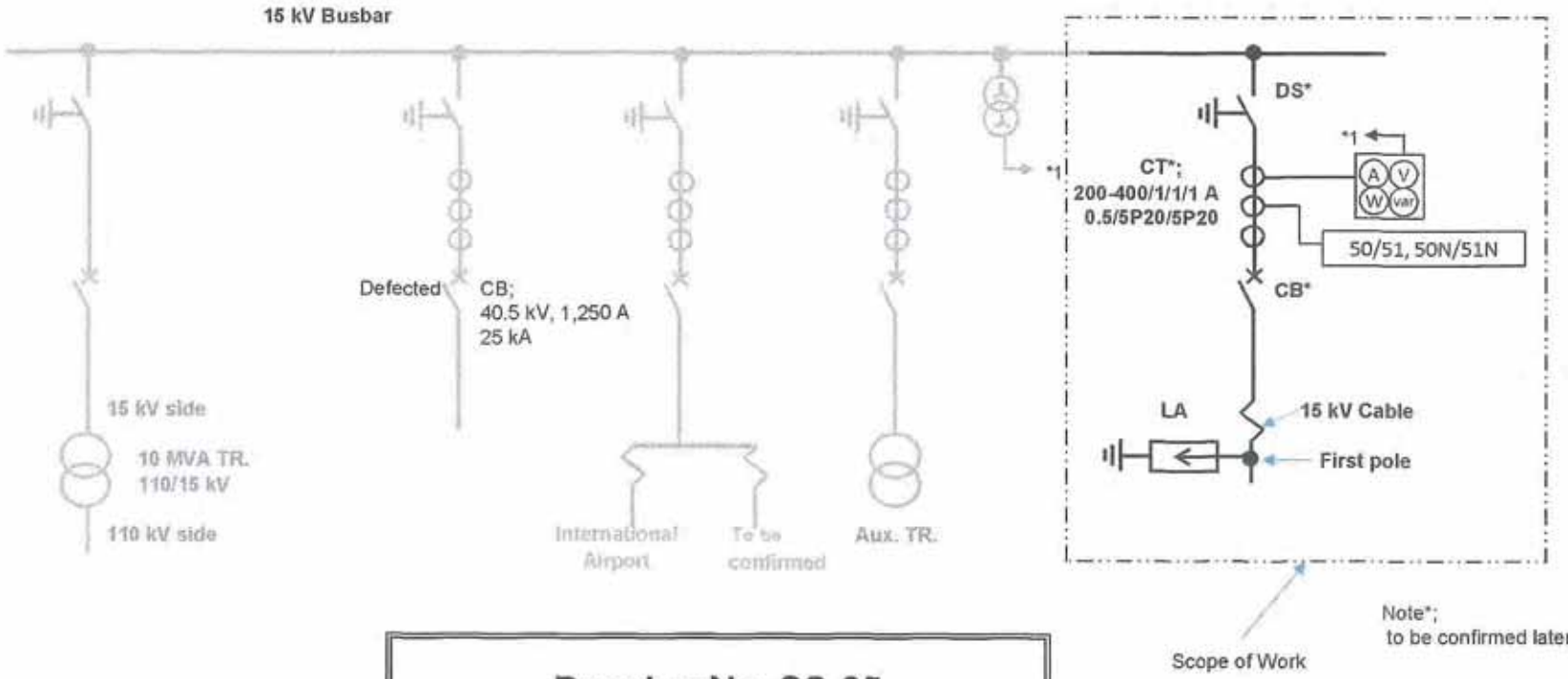
Drawing No. SS-04

Control System Diagram of Ndera Substation



Control System Diagram of RMU Switching station



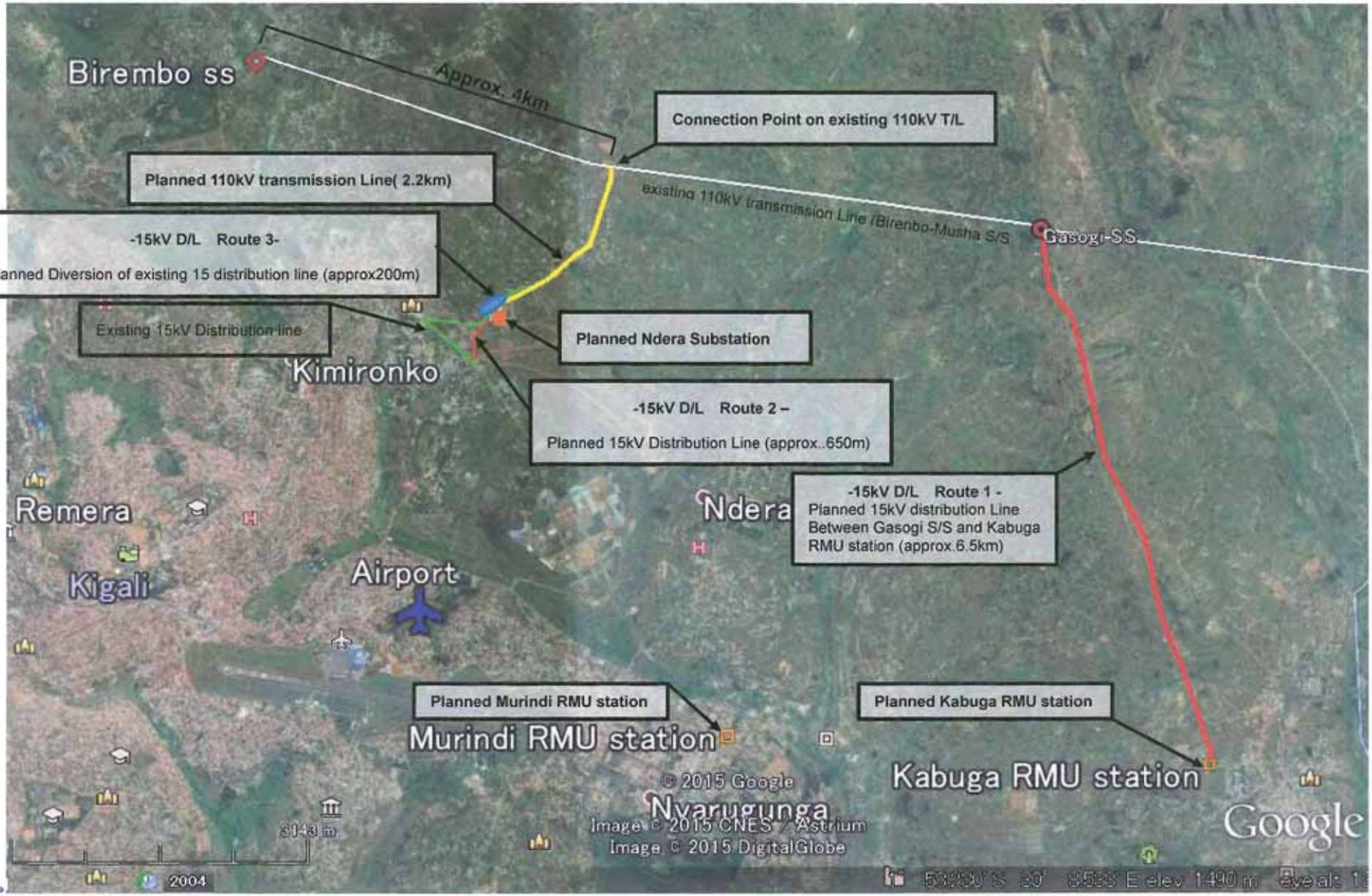


Drawing No. SS-05
Single Line Diagram of
Gasogi Substation
(Preliminary)

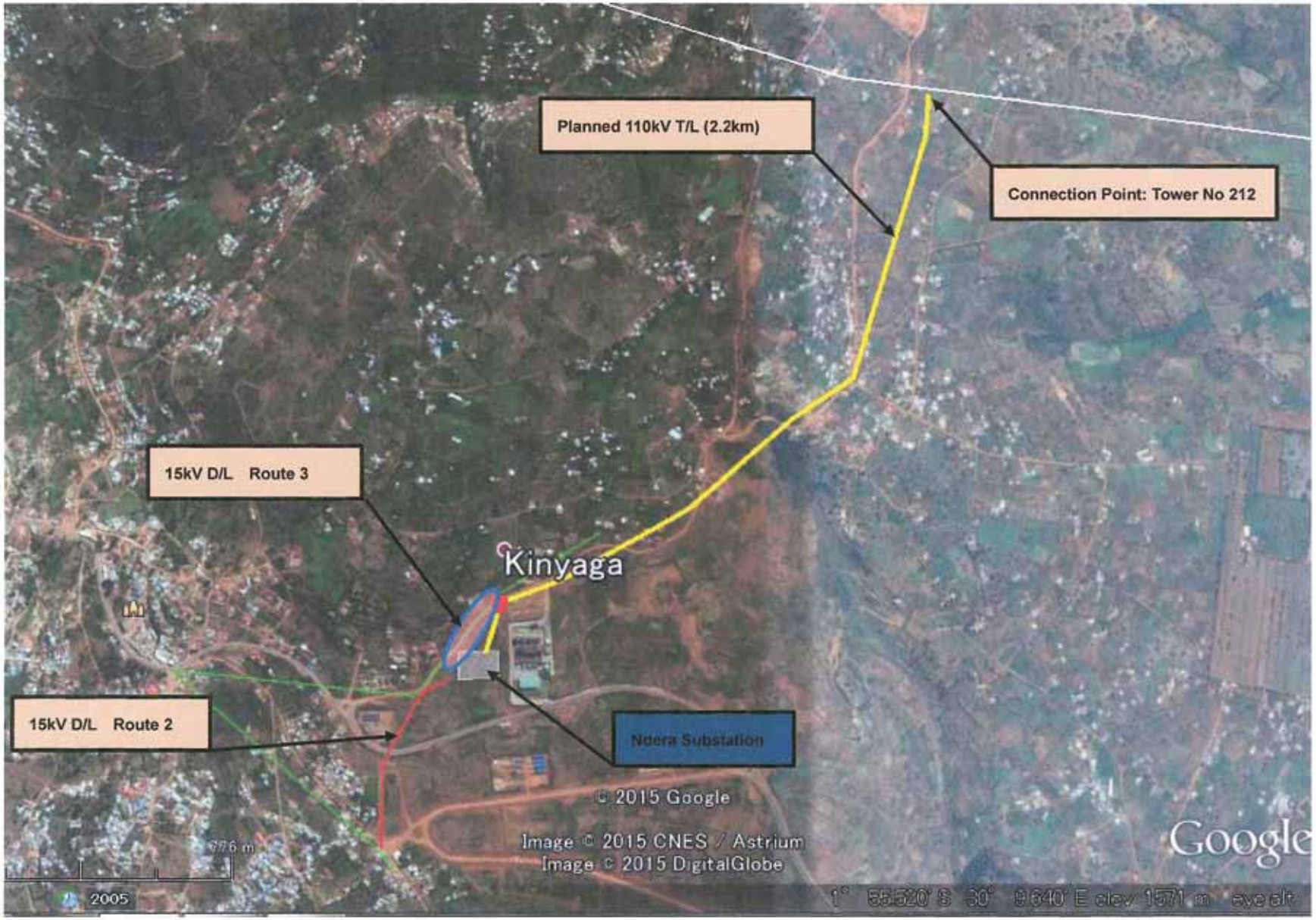
Part 2 Transmission and Distribution Lines

Drawing List

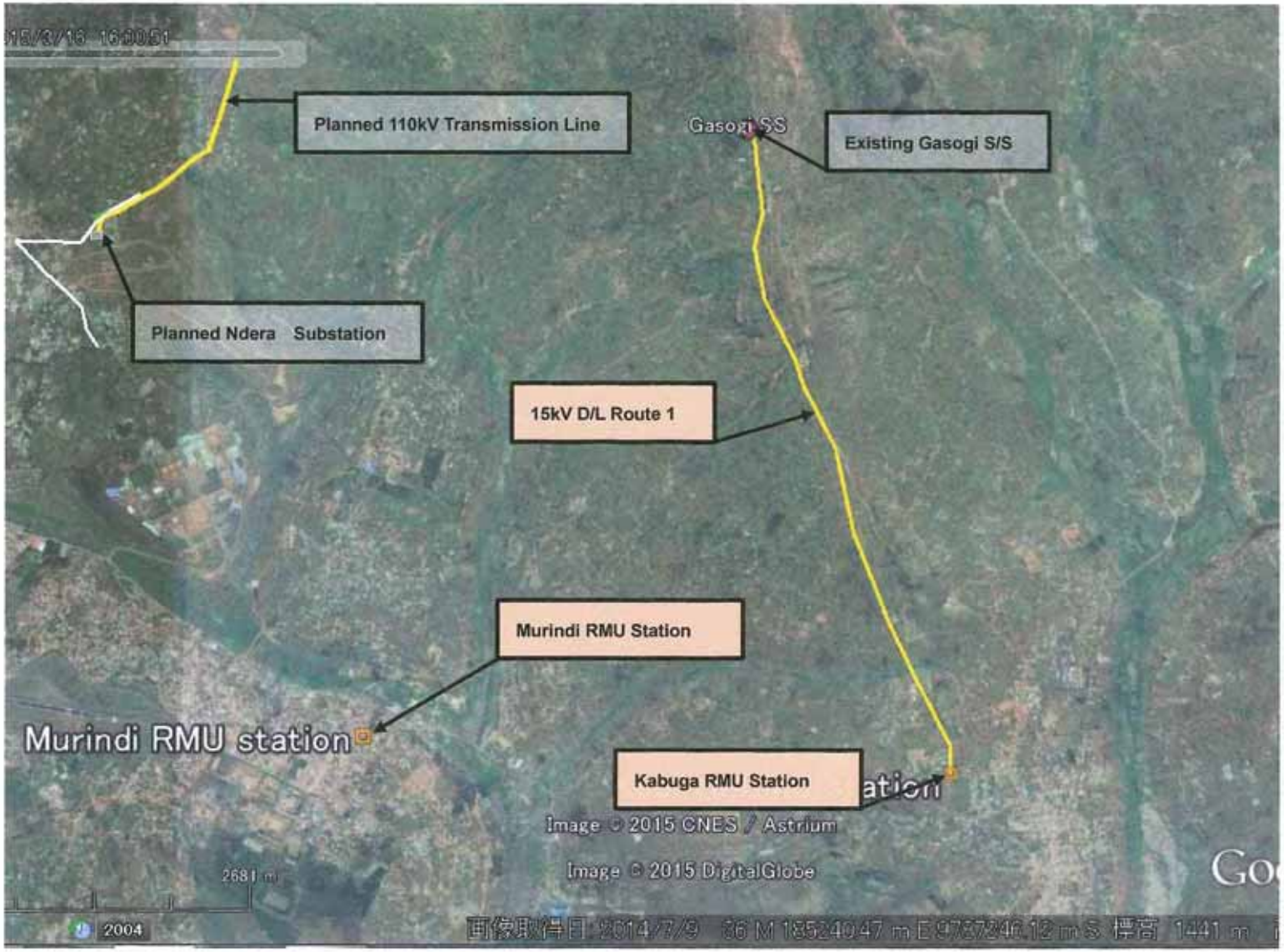
	DWG No.	DWG Title
1.	**General**	
(1)	GA-01:	Project Site Map – Key Map –
(2)	GA-02:	Project Site Map – 110kV T/L, Ndera S/S, 15kV D/L Route 2 &3 -
(3)	GA-03:	Project Site Map – 15kV D/L of Route 1, Kabuga and Murindi RMU Switching Stations -
(4)	GA-04:	Coordination Point of T/L & D/L
(5)	GA-05:	Project Concerned 110/15kV Network Diagram
2.	**110kV Transmission Line (TL)**	
(1)	TL-01:	Plan Drawings for 110kV Transmission Line
(2)	TL-03:	110kV Typical Tower Types (110A2,110B2,110C2&110D2) & (110E1)
(3)	TL-04:	Typical Foundation Plan for 110kV T/L
(4)	TL-05	Plan Drawing at 110kV Connection Point
3.	**15kV Distribution Lines (DL) and Ring Main Unit (RMU) Stations**	
3.1	Route 1: between Gasogi S/S and Kabuga RMU station	
(1)	DL11:	15kV Distribution Line Map: Route-1
(2)	DL12;	Typical Tower/Pole Type of 15kV D/L: Route-1
3.2	Route 2: between Ndera S/S and Existing Connection Point	
(1)	DL21:	15kV Distribution Line Map: Route 2
(2)	DL22:	Typical Tower Type: Route-2
3.3	Route 3: between Existing Connection points	
(1)	DL31:	Re-routing plan of existing 15kV D/L: Route 3
3.4	Site Layout of RMU Switching Station	
(1)	RM01:	Site Layout of Kabuga RMU Station
(2)	RM11:	Site Layout of Murindi RMU Station



DWG No. GA-01: Project Site Map -Key Map-



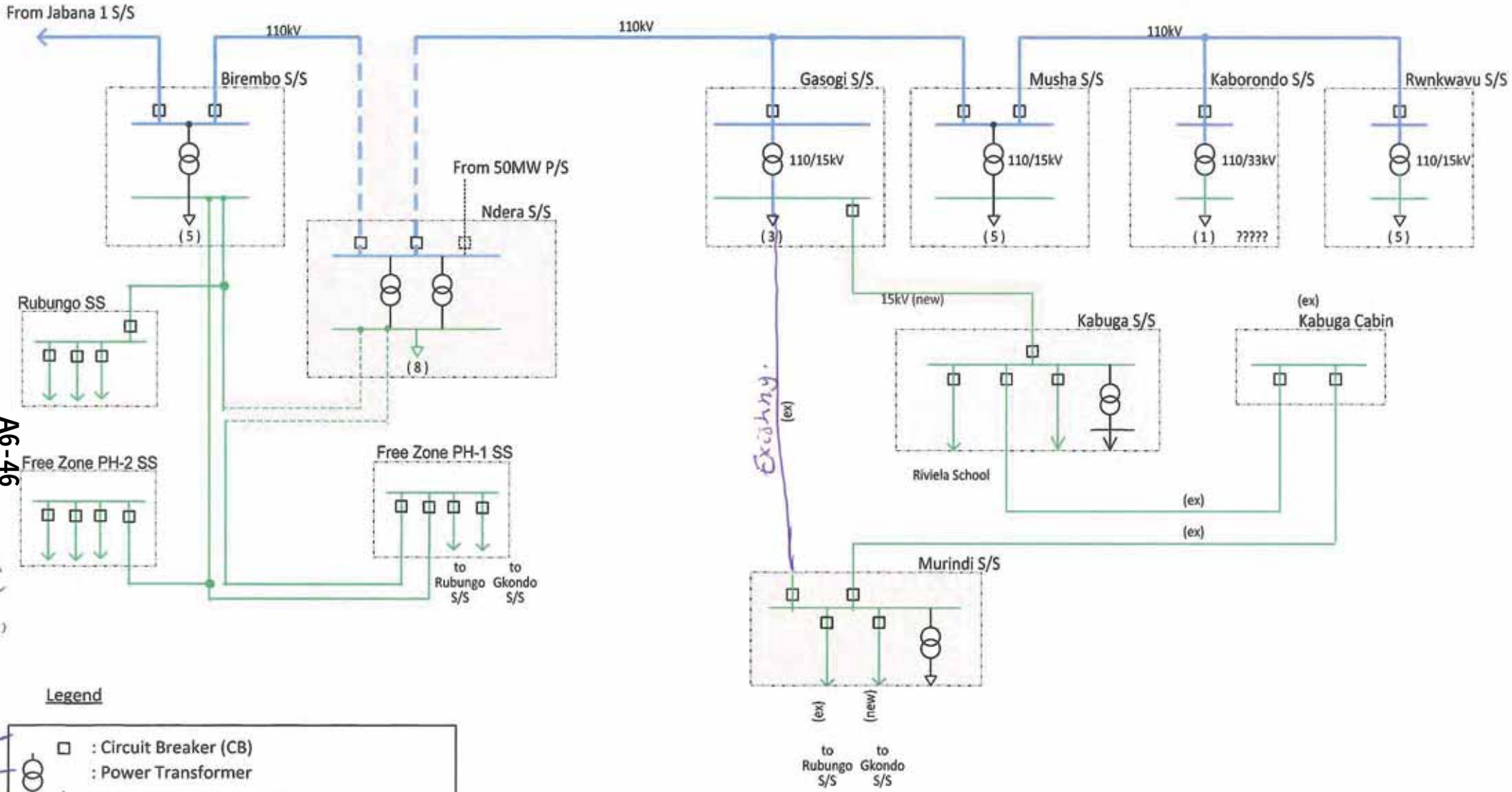
DWG No. GA-02: Project Site Map -110kV T/L, Ndera Substation, 15kV D/L Route 2 and 3-



DWG No. GA-03: Project Site Map -15kV D/L of Route 1, Kabuga and Murindi RMU stations-

DWG No. GA-04: Coordination Point of T/L and D/L (UTM: Zone 36M) by GPS

AP No.	Coordination Point		AP No.	Coordination Point		AP No.	Coordination Point	
	East	North		East	North		East	North
110kV T/L (approx. 2.2km)			15kV D/L: Route-1 (approx. 6km)			15kV D/L: Route-2 (approx. 490m)		
AP1	184120.00	9787770.00	AP1	188793.00	9787106.00	AP1	182851.00	9786243.00
AP2	184107.00	9787745.00	AP2	188870.00	9786382.00	AP2	182744.00	9786070.00
AP3	183887.00	9786949.00	AP3	188794.00	9786060.00	AP3	182637.00	9785922.00
AP4	183717.00	9786833.00	AP4	188887.00	9785586.00	AP4	183887.00	9785680.00
AP5	183437.00	9786586.00	AP5	189157.00	9785028.00			
AP6	183096.00	9786395.00	AP6	189222.00	9784795.00	15kV D/L: Route-3 (approx. 430m)		
AP7	182937.05	9786334.50	AP7	189507.00	9784262.00	AP1	182904.00	9786229.00
			AP8	189663.00	9783517.00	AP2	182900.00	9786339.00
			AP9	189973.00	9782743.00			
			AP10	190493.00	9781671.00	Kabuga RMU Station (≒ 300m2)		
			AP11	190485.00	9781439.00	at corner	190492.00	9781431.00
						Murindi RMU Station(≒80m2)		
						at corner	185371.00	9781726.00



A6-46

Legend

- : Circuit Breaker (CB)
- : Power Transformer
- : 15kV Distribution Feeders
- : Project Scope of Work
- Existing Facility (Solid Line)
- Existing Facility (Solid Line)

DWG No. GA-05: Project Concerned 110/15kV Network Diagram

19th March 2015

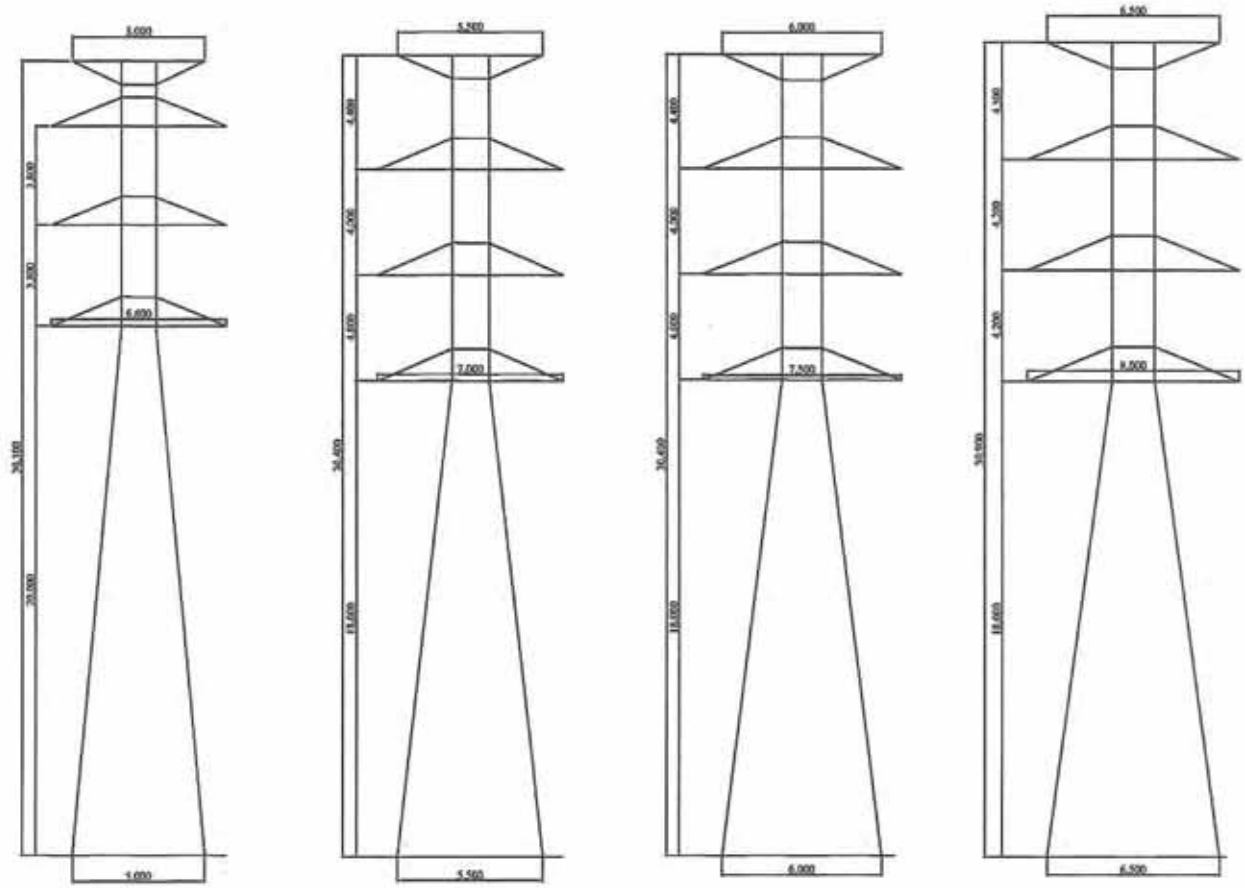
DWG No. TL01: Plan Drawing for 110kV Transmission Line

Type: 110-A2
(Line Angle: 0 - 3 deg.)

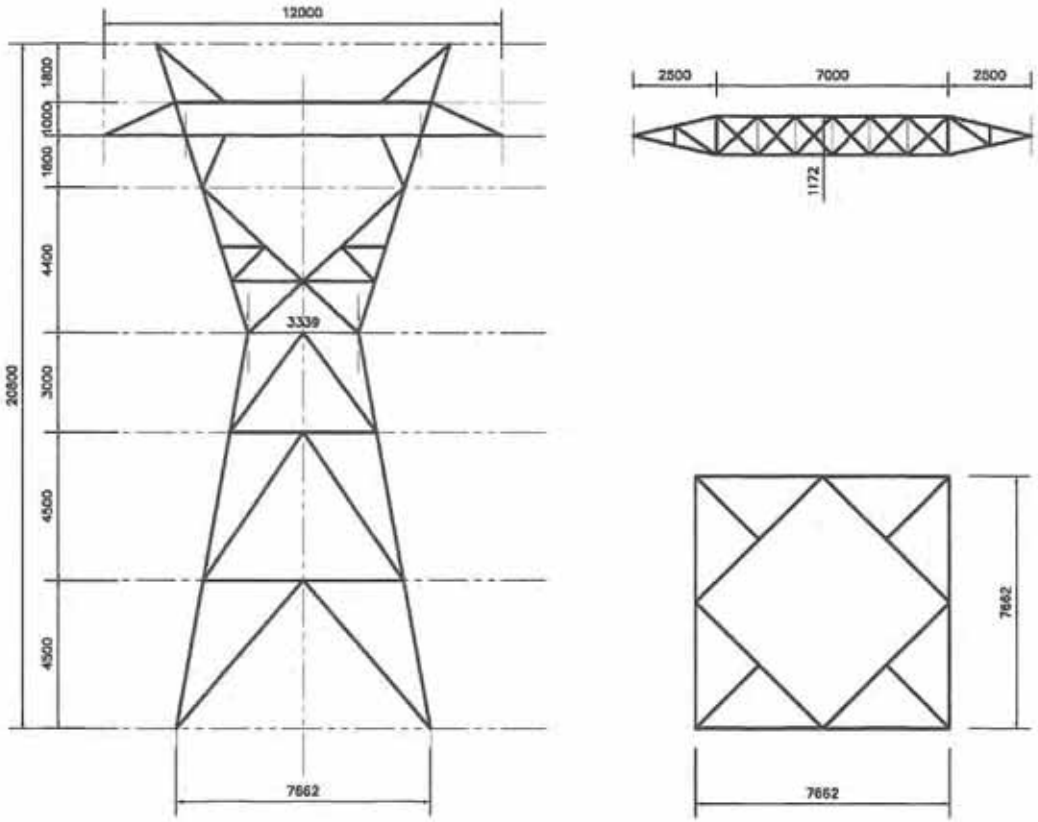
Type: 110-B2
(Line Angle: 3 - 15 deg.)

Type:110-C2
(Line Angle: 15 - 30 deg.)

Type-110-D2
(Line Angle: 30-60 deg. & Dead End)



DWG No. TL-03 (1/2) : 110kV Typical Tower Type (110A2, 110B2, 110C2, 110D2 and 110E1)

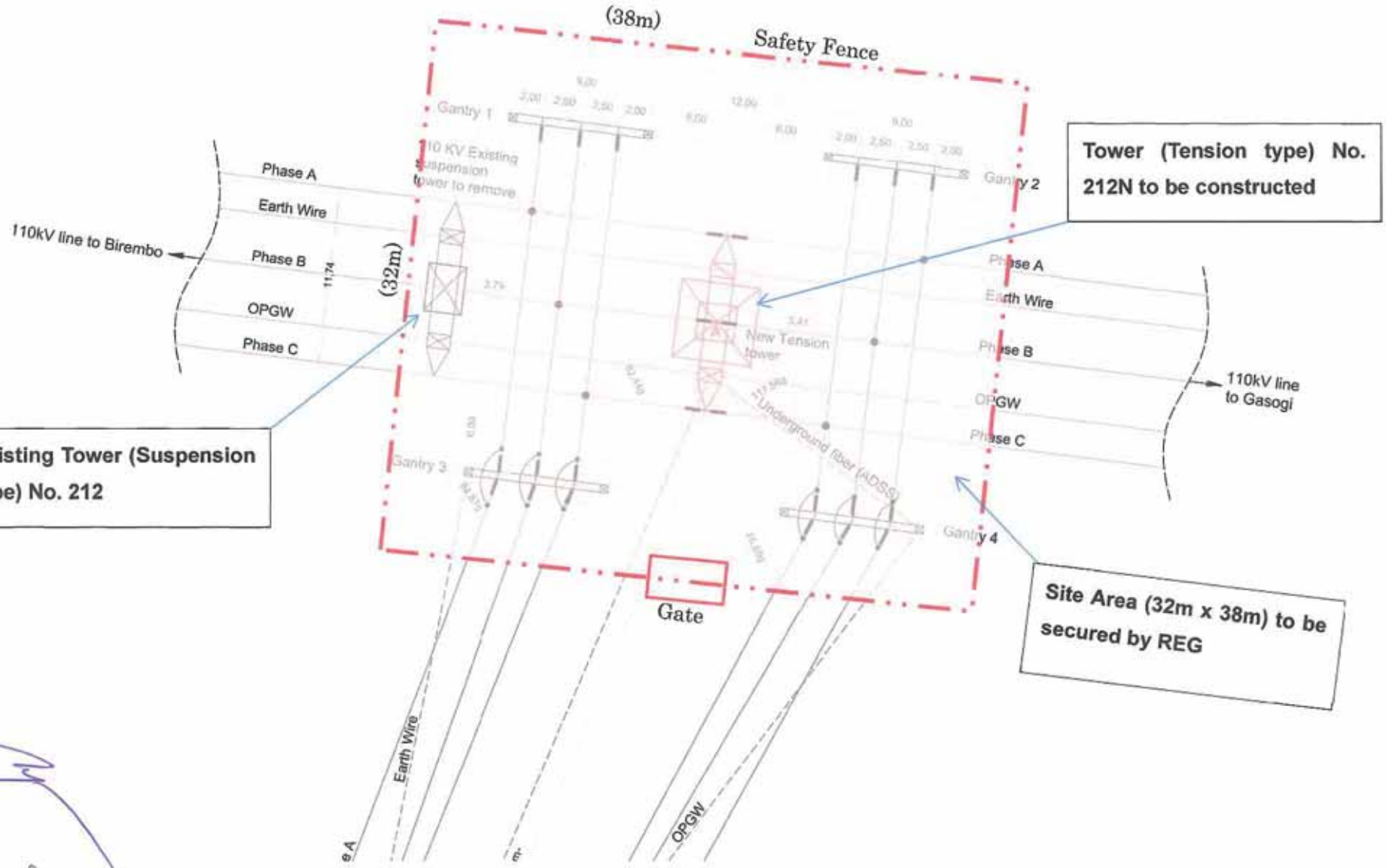


Tower Type 110E1 (110kV Tension type, Single circuit: 1cct)

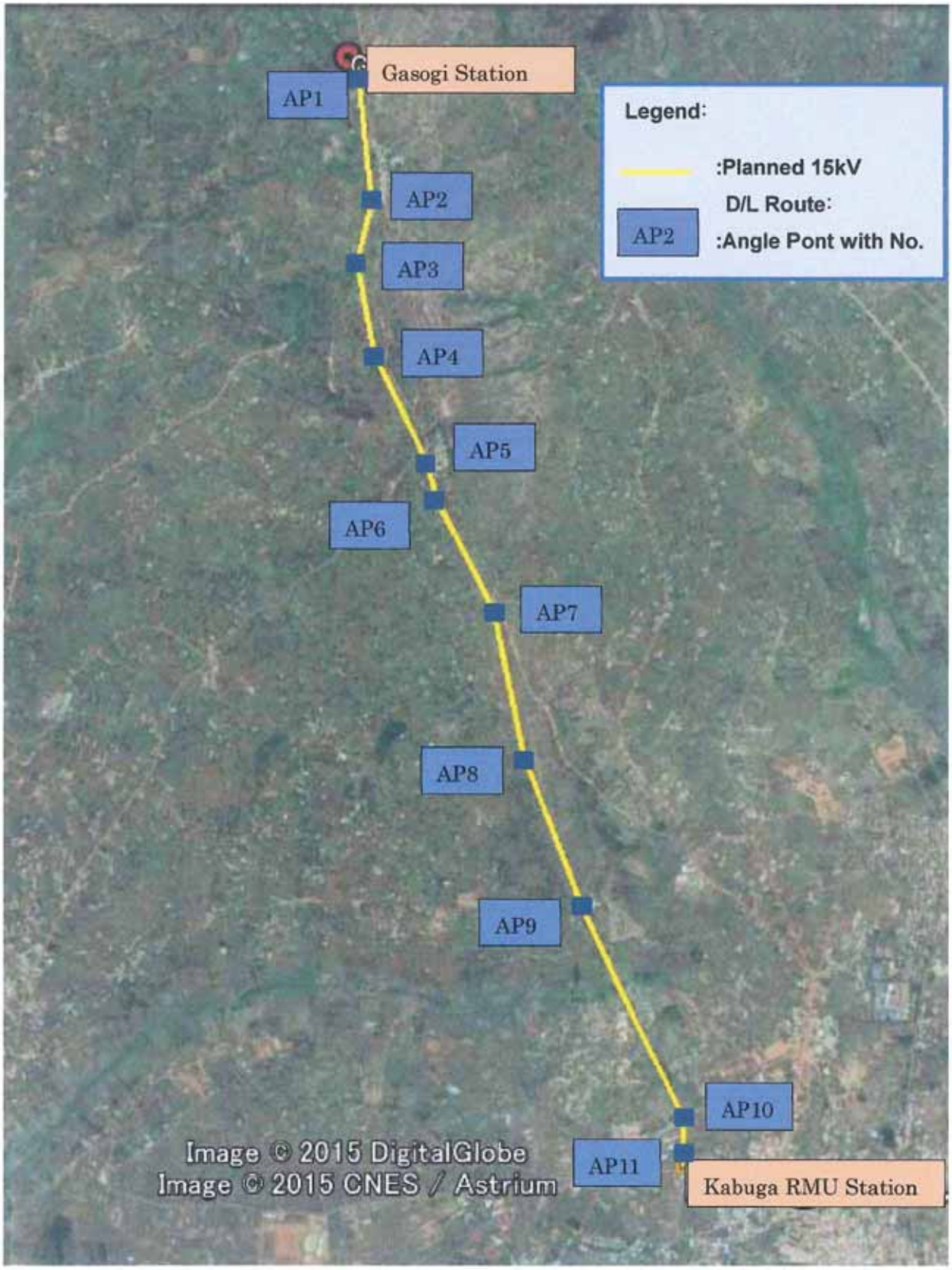
DWG No. TL-03 (2/2): 110kV Typical Tower Type (110A2, 110B2, 110C2, 110D2 & 110E1)

DWG No. TL-04: Typical Foundation Plan for 110kV T/L

110kV Tower type – 110A2 – Land Size to be Secured: 12mx12m 	110kV Tower Type – 110C2 – Land Size to be Secured: 14mx14m
110kV Tower Type – 110B2 – Land Size to be Secured: 13mx13m 	110kV Tower Type – 110D2 – Land Size to be Secured: 16mx16m

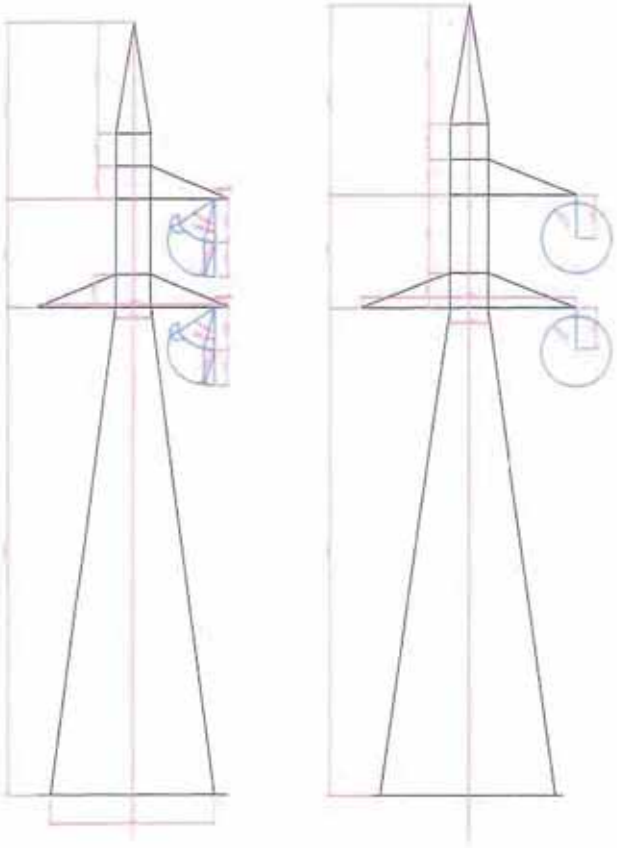


TL-05: Plan Drawing at 110kV Connection Point



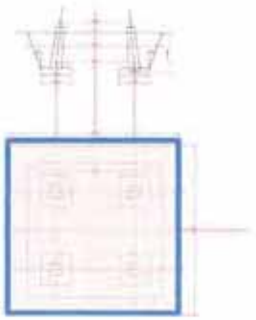
DWG No. DL11: 15kV Distribution Line Map: Route 1

(From Gasogi S/S to Kabuga RMU Station)

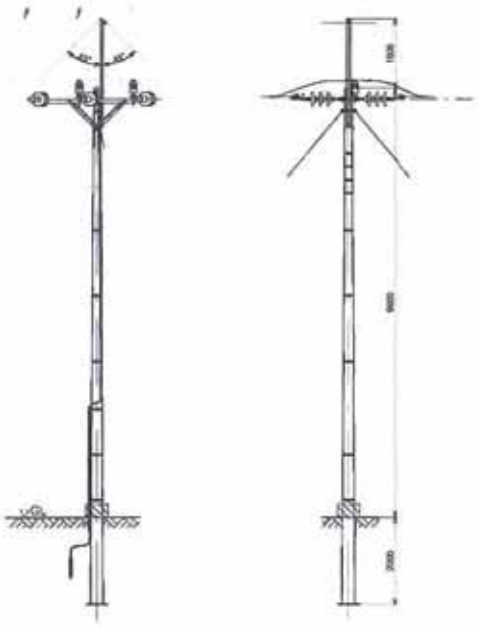


Type 15TB1
(Suspension Tower Type)

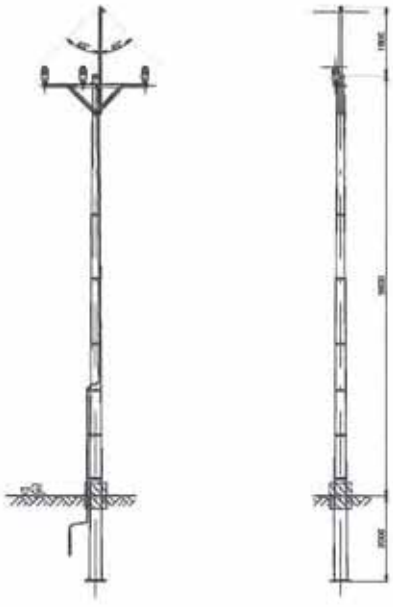
Type 15TD1
(Tension Tower Type)



Typical Tower Foundation Plan
(Land Area: approx. 8m x 8m)



Type 15PB1
(Suspension Pole Type)

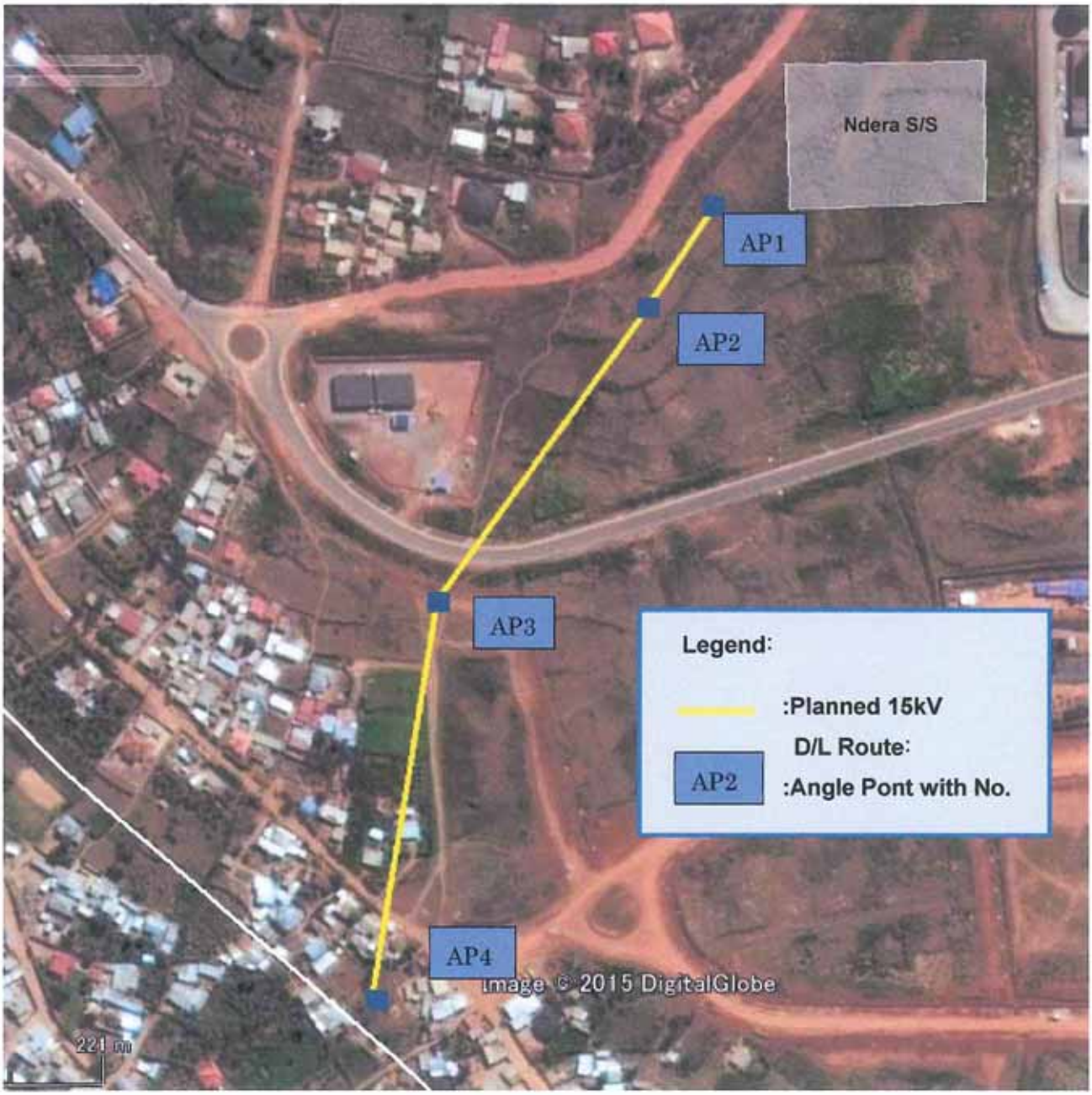


Type 15PA1
(Tension Pole Type)

Note: Land area to be secured for 15kV pole foundation: approx. 2m x 2m each

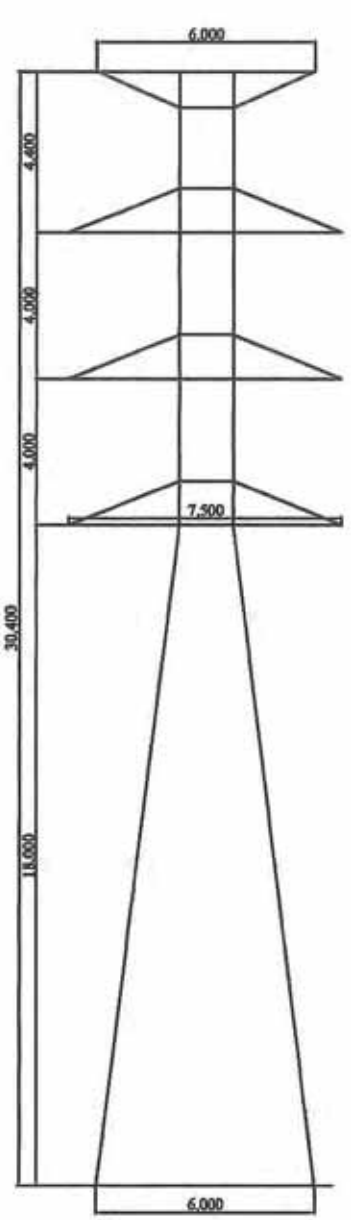
DWG No. DL12: Typical Tower/Pole Type of 15kV D/L (Single Circuit)

(For 15kV D/L Route 1 and 3, Single Circuit)



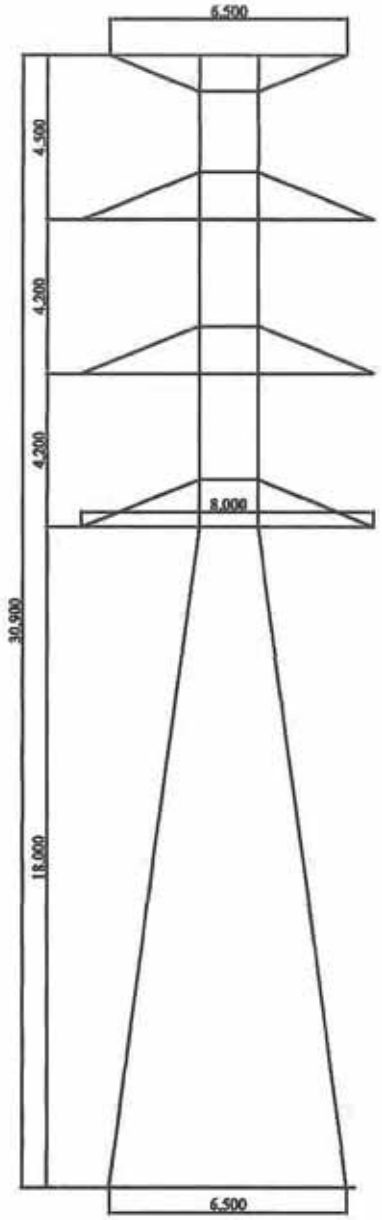
DWG No. DL21: 15kV Distribution Line Map: Route 2

(From Ndera S/S to Existing Tower)



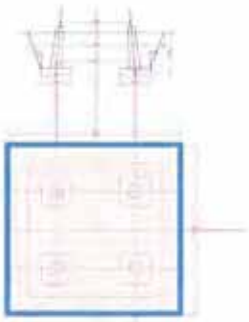
Type 15TB2

(For Tension type, 2 cct)



Type 15TD2

(for Tension and Dead end, 2cct)

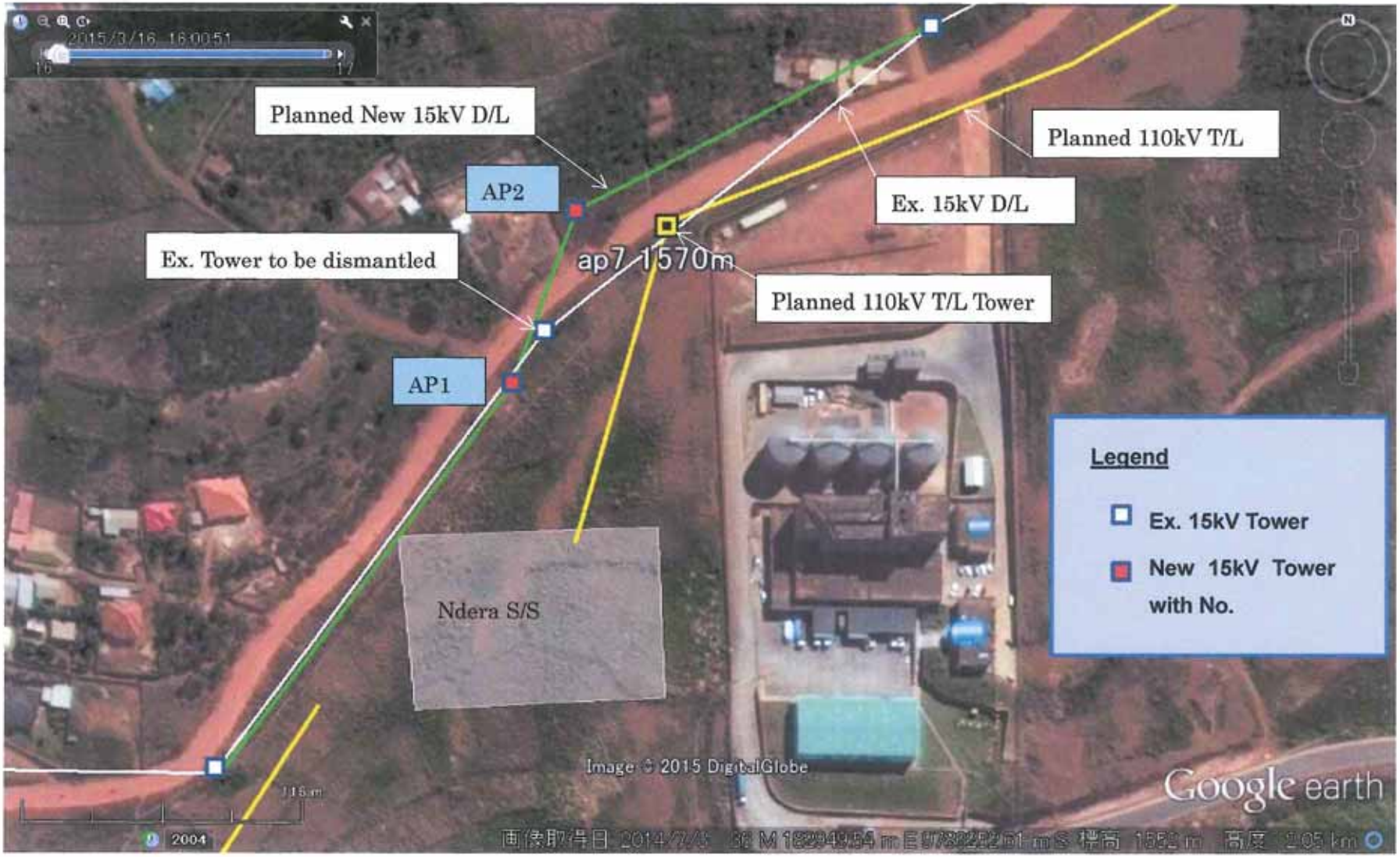


Tower Type Foundation Plan

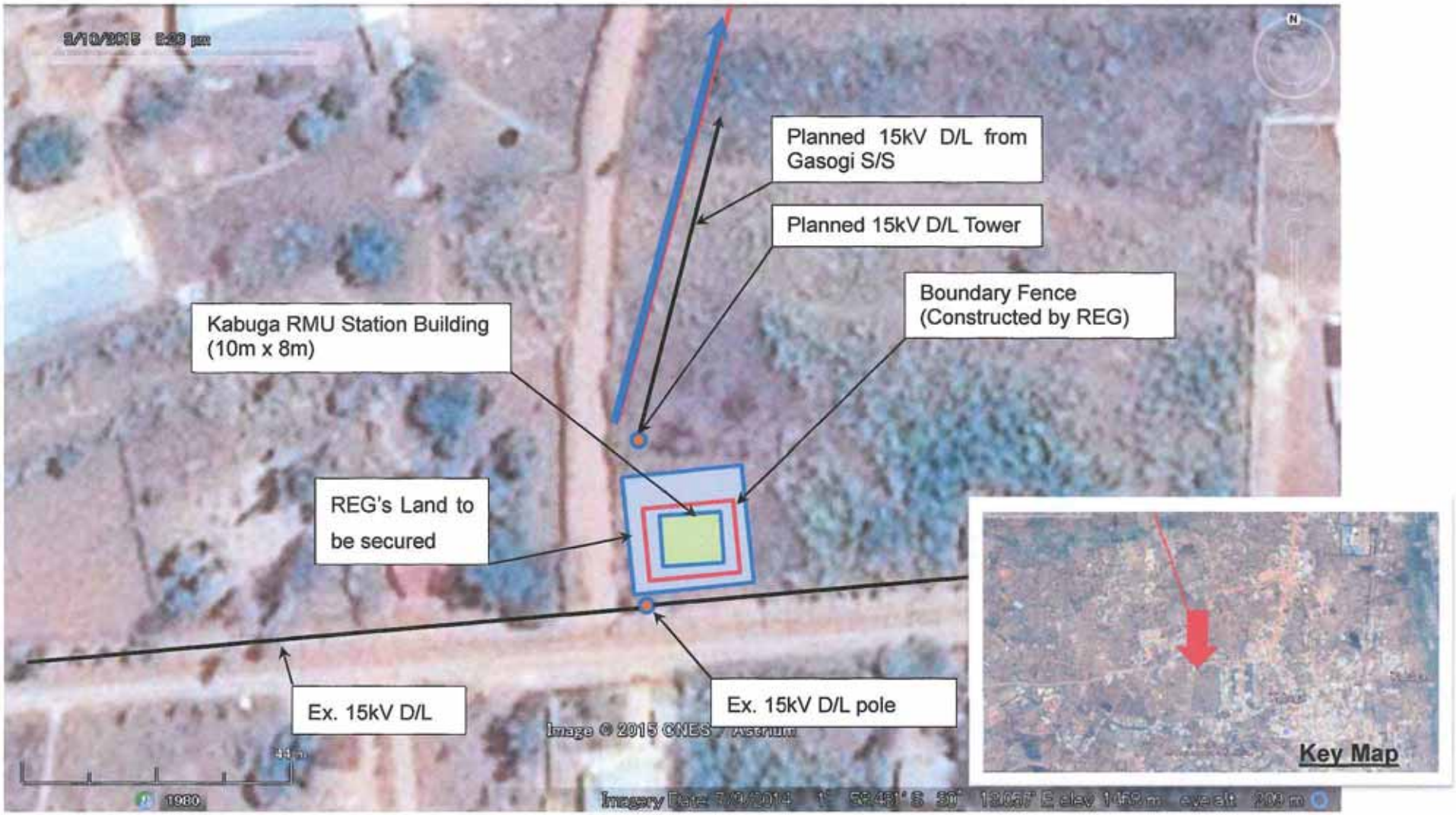
Land Area to be secured: 8m x 8m each

DWG No. DL22: Typical Tower Type of 15kV D/L

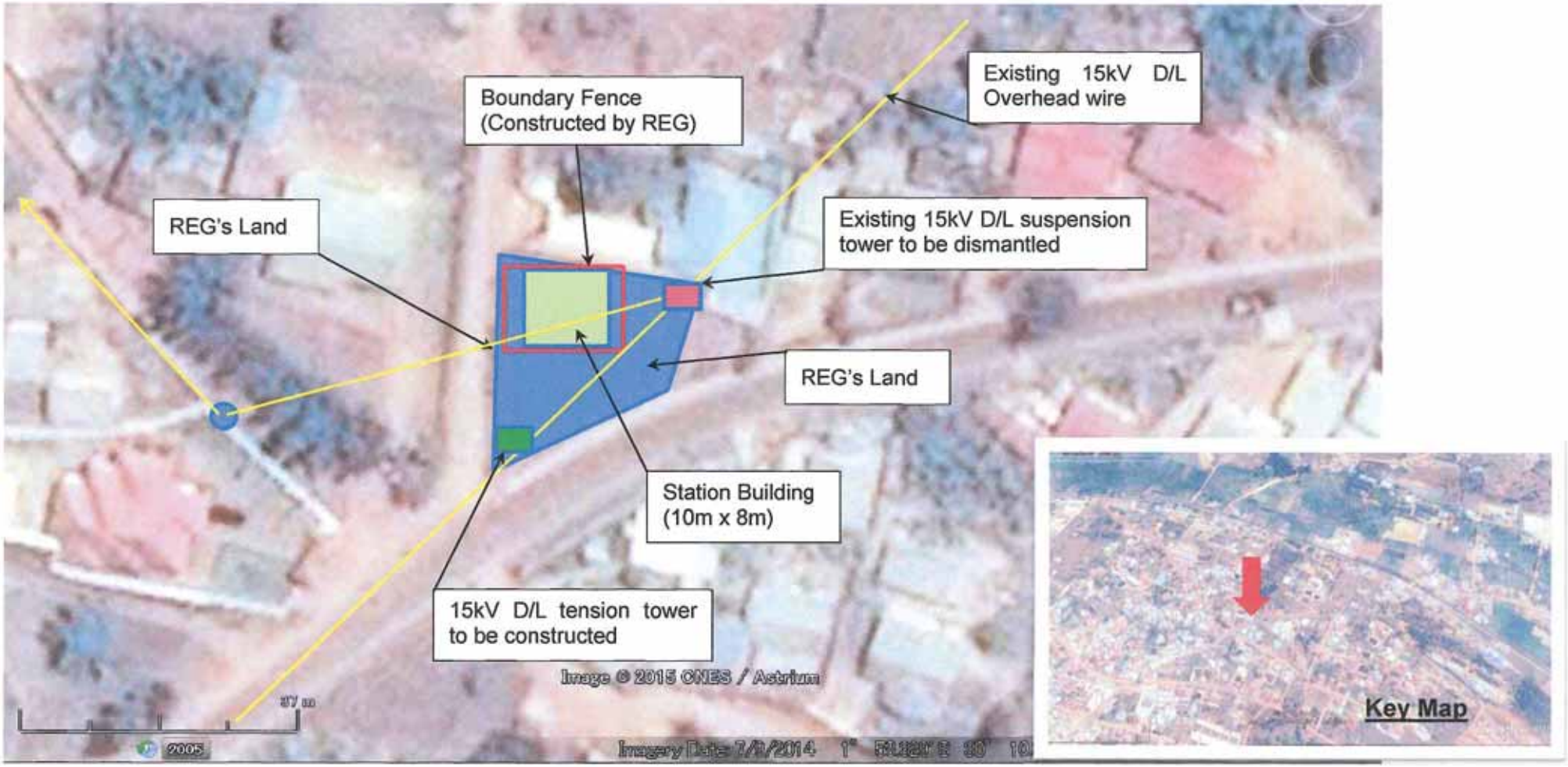
(For 15kV D/L: Route 2)



DWG No. DL-31: Reroute of existing 15kV D/L: Route-3



DWG No. RM-01: Site Layout of Kabuga RMU Station



DWG No. RM-11: Site Layout of Murindi RMU Station

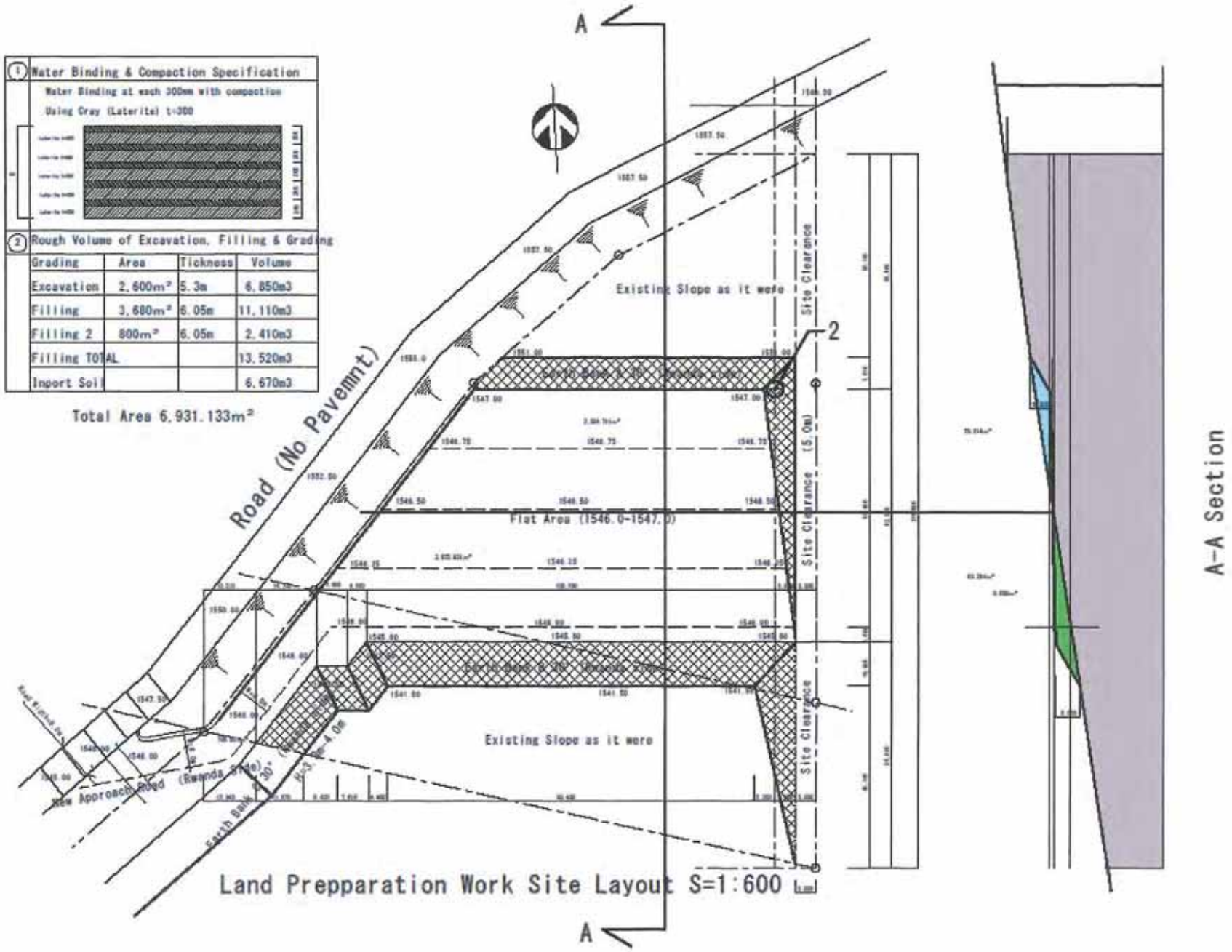
Part 3 Architectural

Drawing List

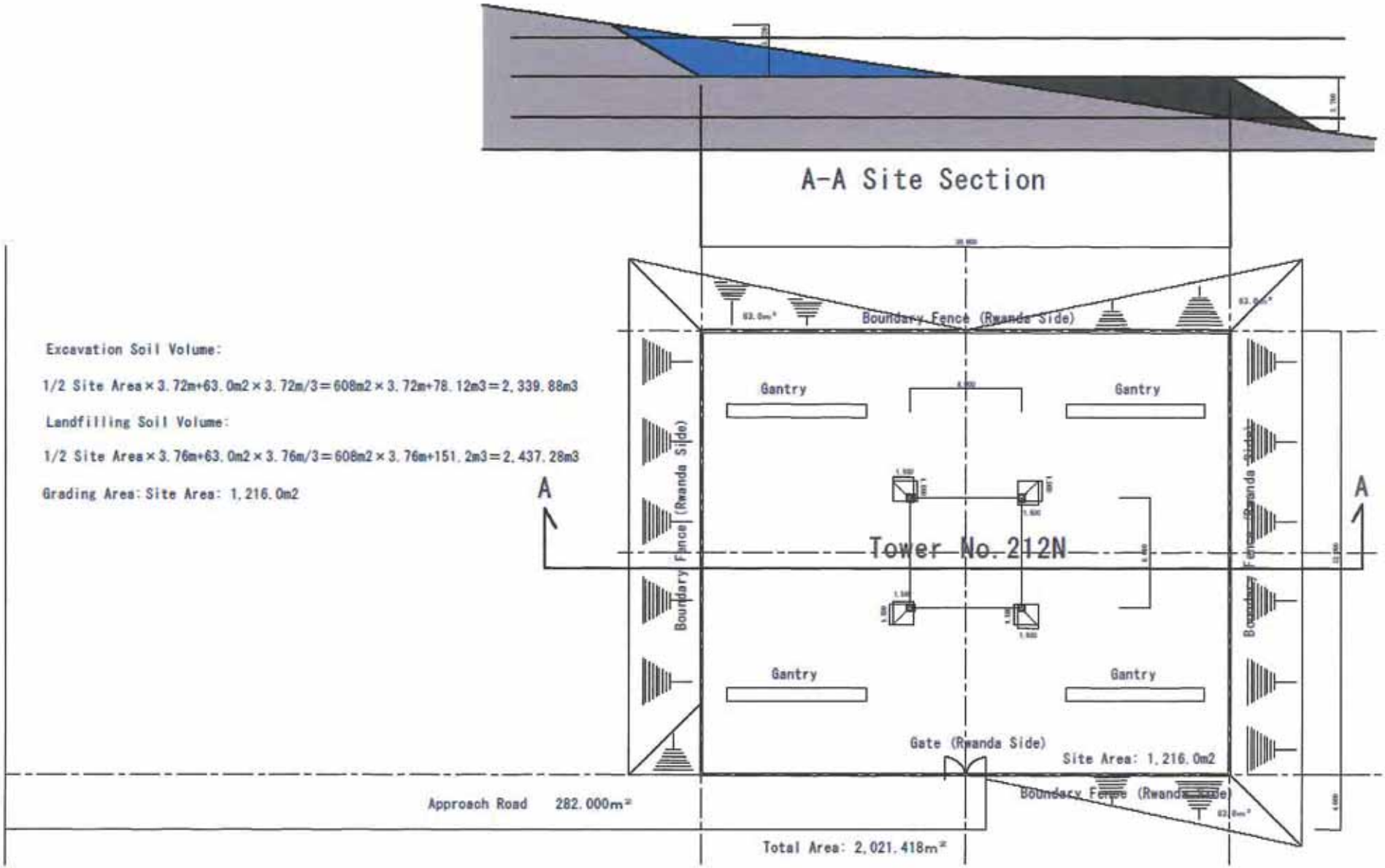
DWG No. DWG Title

Part 3 Architectural

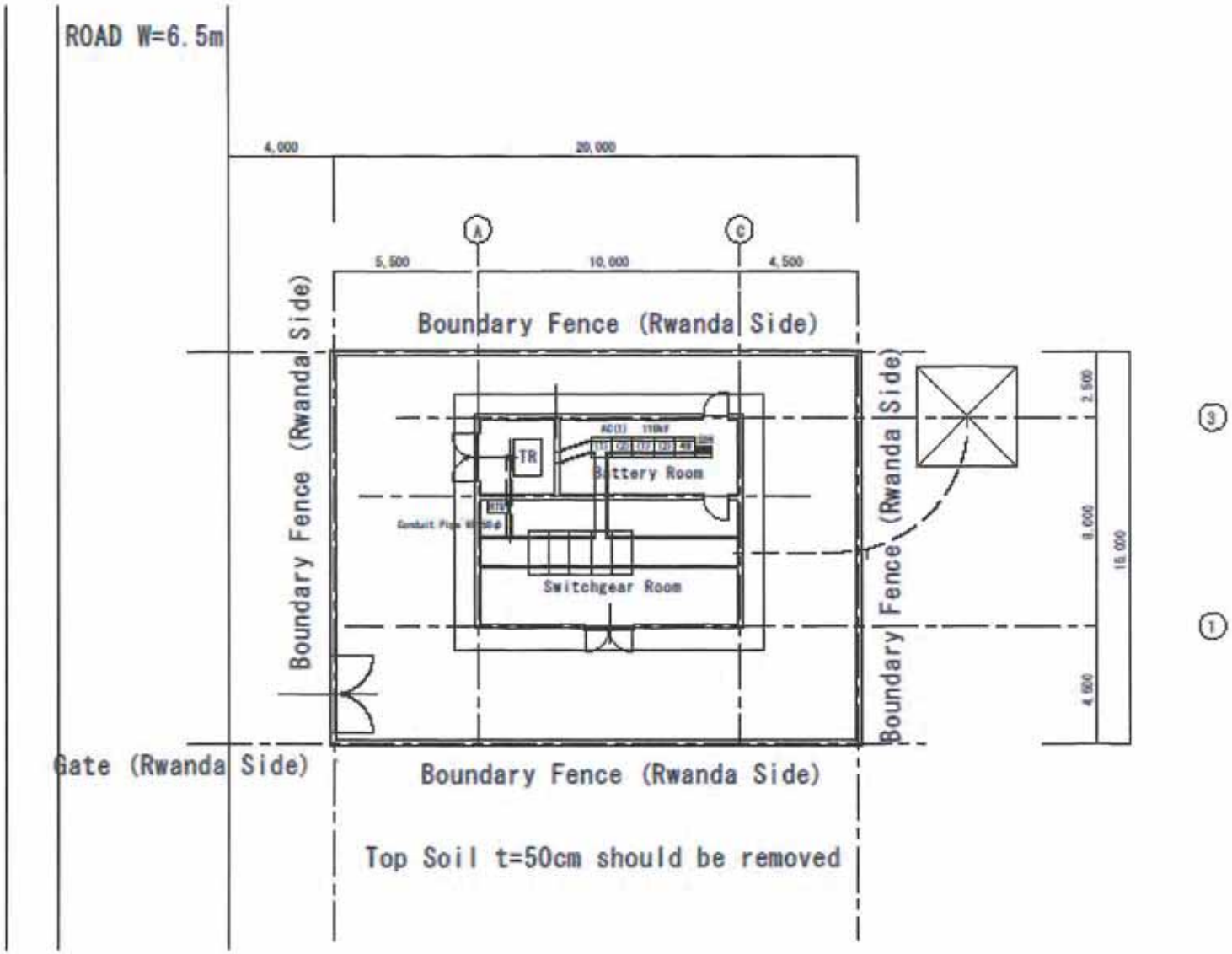
(1) A-1 Land Preparation Work of Ndera Substation
(2) A-2 Land Preparation Work of Tower No.212N
(3) A-3 Land Preparation Work of Kabuga RMU Switching Station
(4) A-4 Land Preparation Work of Murindi RMU Switching Station
(5) A-5 NDERA Substation Site Layout
(6) A-6 NDERA Substation Control Building Plan
(7) A-7 NDERA Substation Control Building Section & Elevation
(8) A-8 NDERA Substation Control Building Section Detail



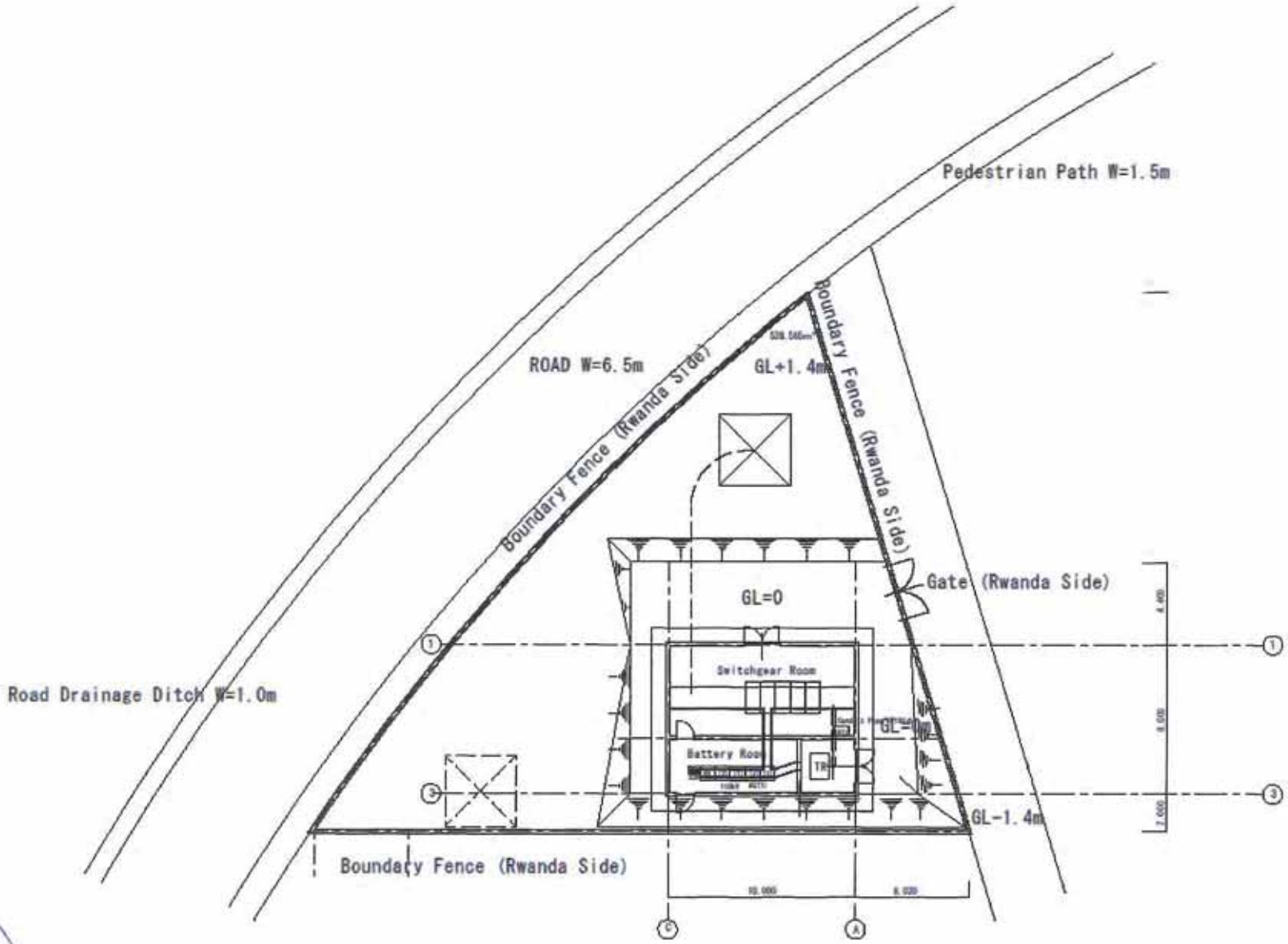
A-1 Land Preparation Work of Ndera Substation



A-2 Land Preparation Work of Tower No.212N

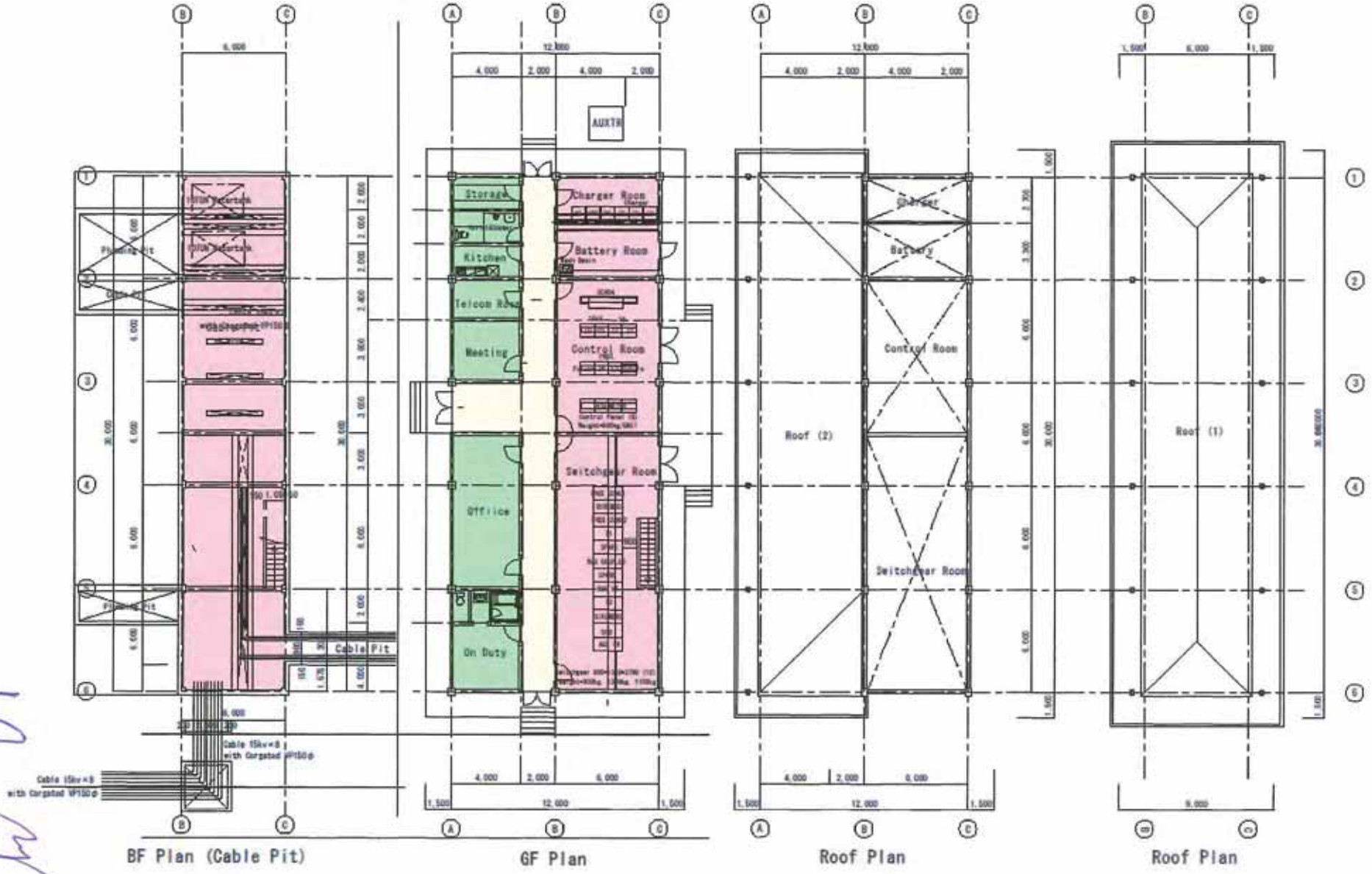


A-3 Land Preparation Work of KABUGA Ring Main Unit

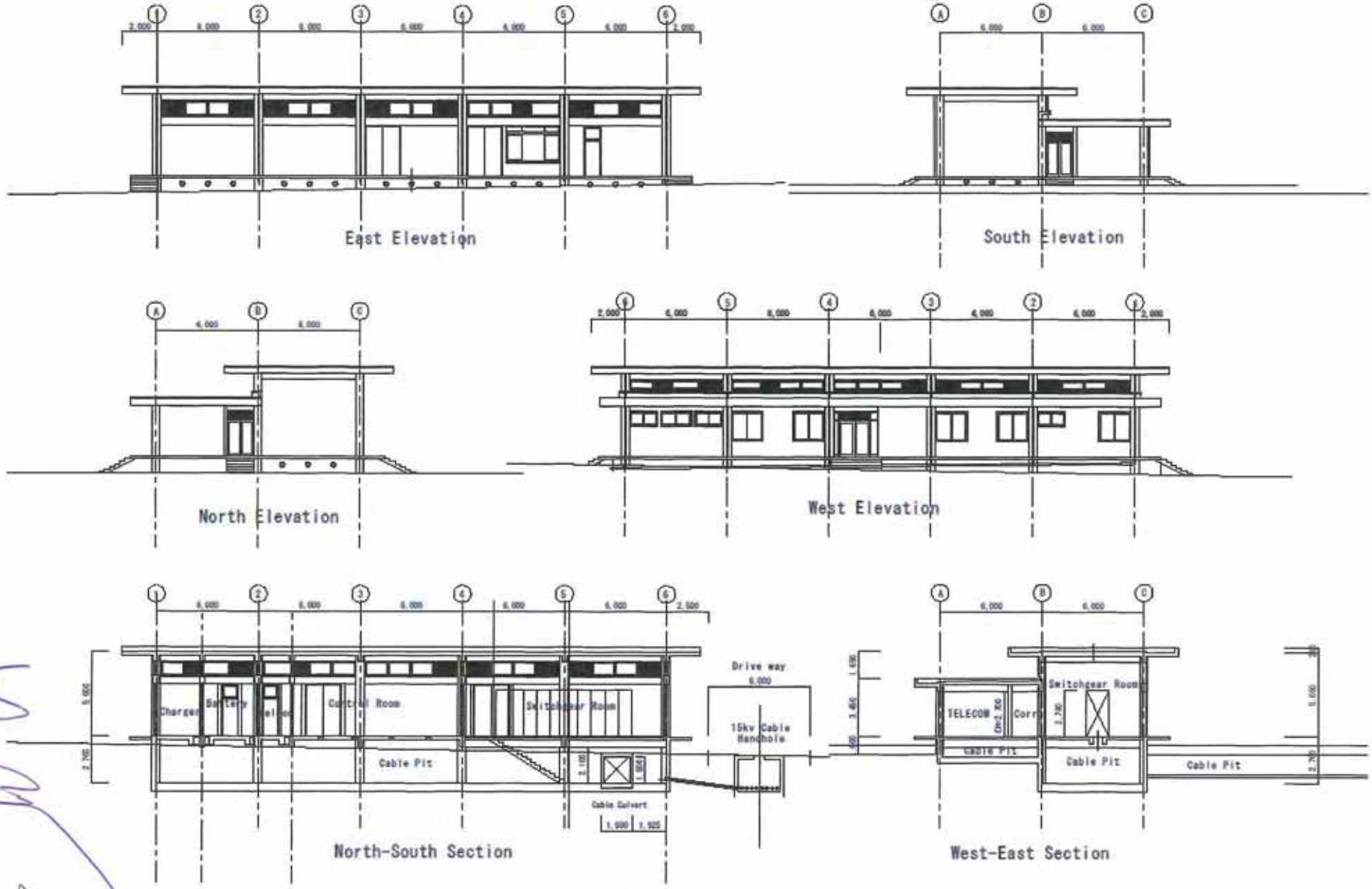


A-4 Land Preparation Work of MURINDI Ring Main Unit

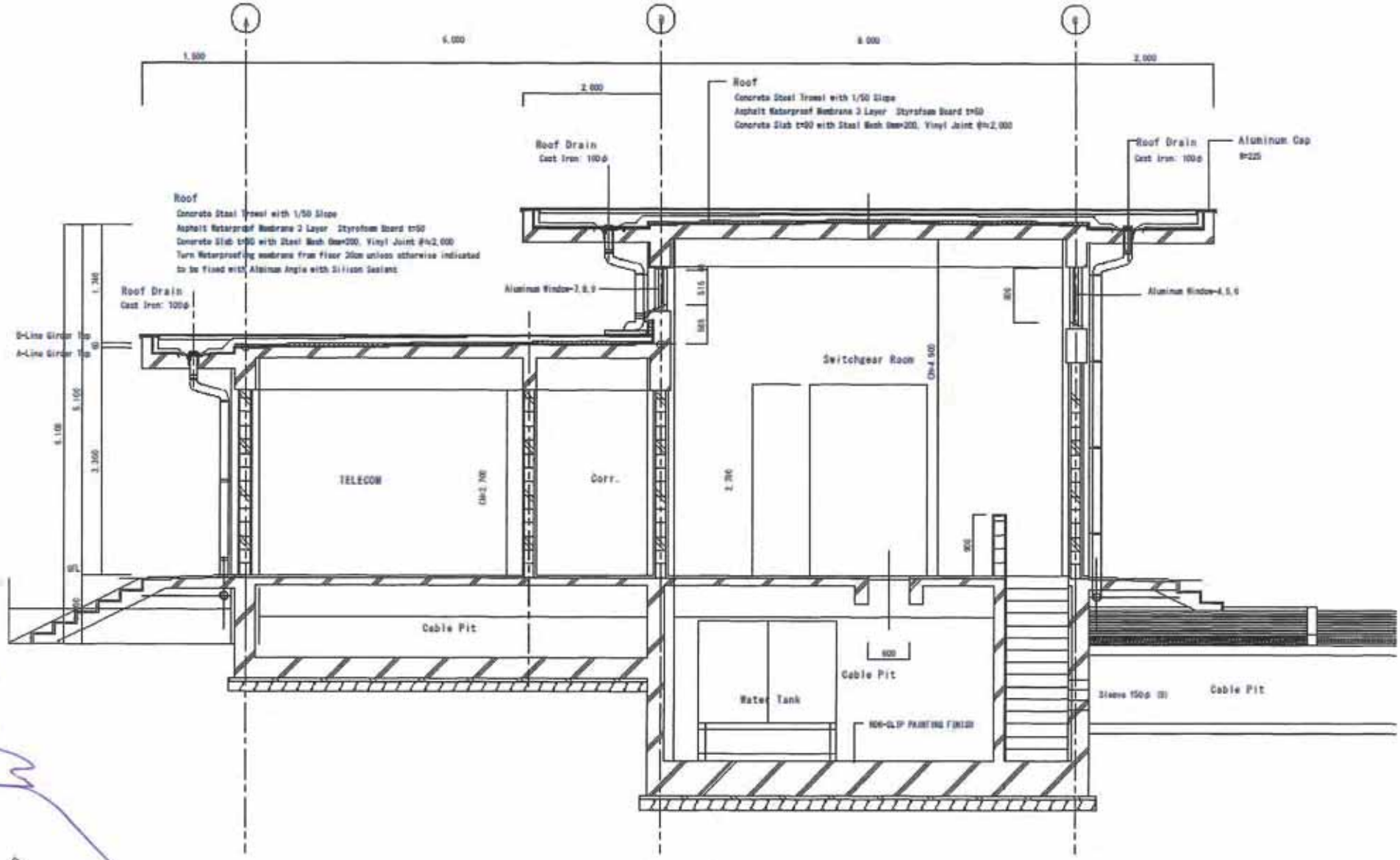
A-5 NDERA Substation SITE LAYOUT



A-6 NDERA Substation Plan



A-7 NDERA Substation Section & Elevation



A-8 NDERA Substation Section Detail