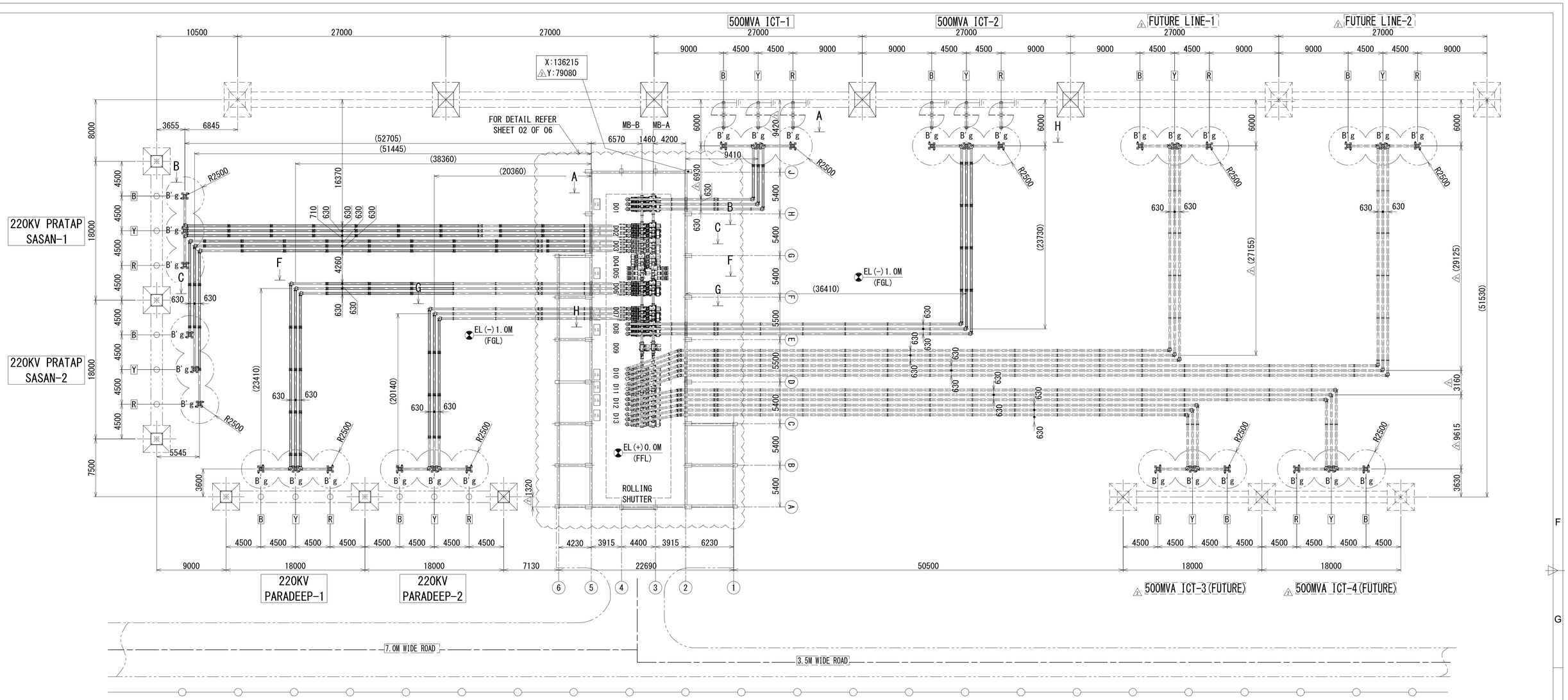



| UNIT No. | BAY NAME |
|---|---|
| D01 | ICT-1 |
| D02 | 220kV PRATAP SHASAN-1 |
| D03 | 220kV PRATAP SHASAN-2 |
| D04 | BUS COUPLER |
| D05 | 220kV BUS PT |
| D06 | 220kV PARADEEP-1 |
| D07 | 220kV PARADEEP-2 |
| D08 | ICT-2 |
| D09 | BUS SECTION |
| D10 | FUTURE LINE-1 |
| D11 | FUTURE LINE-2 |
| D12 | FUTURE ICT-3 |
| D13 | FUTURE ICT-4 |

| PHASE ARRANGEMENT | | |
|---|---|---|
| PHASE | SIGN | MARK/ COLOUR |
| FIRST | R | (R) RED |
| SECOND | Y | (Y) YELLOW |
| THIRD | B | (B) BLUE |

NOTES: (APPLICABLE FOR ALL SHEETS)
1. LCC- LOCAL CONTROL CUBICLE.
2. FFL- GIS FINISHED FLOOR LEVEL.
3. TOC- TOP OF CONCRETE.
4. EL - ELEVATION LEVEL.
5. FGL- FINISH GROUND LEVEL.
6. (*1) THE EXACT DIMENSIONS WILL BE FINALIZED BASED ON THE FINAL CUSTOMER APPROVAL ON THE LCC SCHEMATICS.
7. POSITION OF SUPPORT STRUCTURES IN THE SECTIONAL VIEWS INDICATIVE ONLY & SAME WILL BE FINALISED IN THE FOUNDATION PLAN

APPROVED

REV 1

CHECKED
A.G.M (Elect)
ENGG. & QUALITY
OPTCL, BHUBANESWAR

APPROVED
G.M. (Elect)
ENGG. & QUALITY
OPTCL, BHUBANESWAR

| REV | DETAILS OF MODIFICATION | REV. MARK | DATE | MODIFIED | CHECKED | APPROVED |
|---|---|---|---|---|---|---|
| 02 | Y - CO-ORDINATE UPDATED AS PER BHEL COMMENT | 2 | 27.02.24 | SIGN / NAME: YS / Y. SANDEEP | SM / M.SREEDHAR | KI / K. IKEDA |
| 01 | UPDATED AS PER CUSTOMER COMMENTS(BAY SEQUENCE CHANGED) | 1 | 20.01.24 | SIGN / NAME: YS / Y. SANDEEP | SM / M.SREEDHAR | KI / K. IKEDA |

TOSHIBA
TOSHIBA TRANSMISSION & DISTRIBUTION SYSTEMS (INDIA) PRIVATE LIMITED

| | NAME | SIGN | DATE |
|---|---|---|---|
| DESIGNED | CH.BHAGAVAN | | 06.01.2024 |
| DRAWN | Y.RAMBABU | | 06.01.2024 |
| CHECKED | M.SREEDHAR | | 06.01.2024 |
| APPROVED | K.IKEDA | | 06.01.2024 |

SCALE: 1:60 | SWITCHGEAR PRODUCTS DIVISION | PRODUCT: 245kV GIS

TITLE: 220kV GIS-GENERAL ARRANGEMENT PLAN & SECTIONS-OPTCL ERSAMA

DRAWING NO.: DEDUGBI68011005

SHEET NO: 01 OF 06 REV:02

PROJECT: 400/220kV GIS SUBSTION AT ERSAMA, ODISHA & 400kV AIS FEEDER BAY EXTENSION AT DUBURI, ODISHA

OWNER: ODISHA POWER TRANSMISSION CORPORATION LIMITED

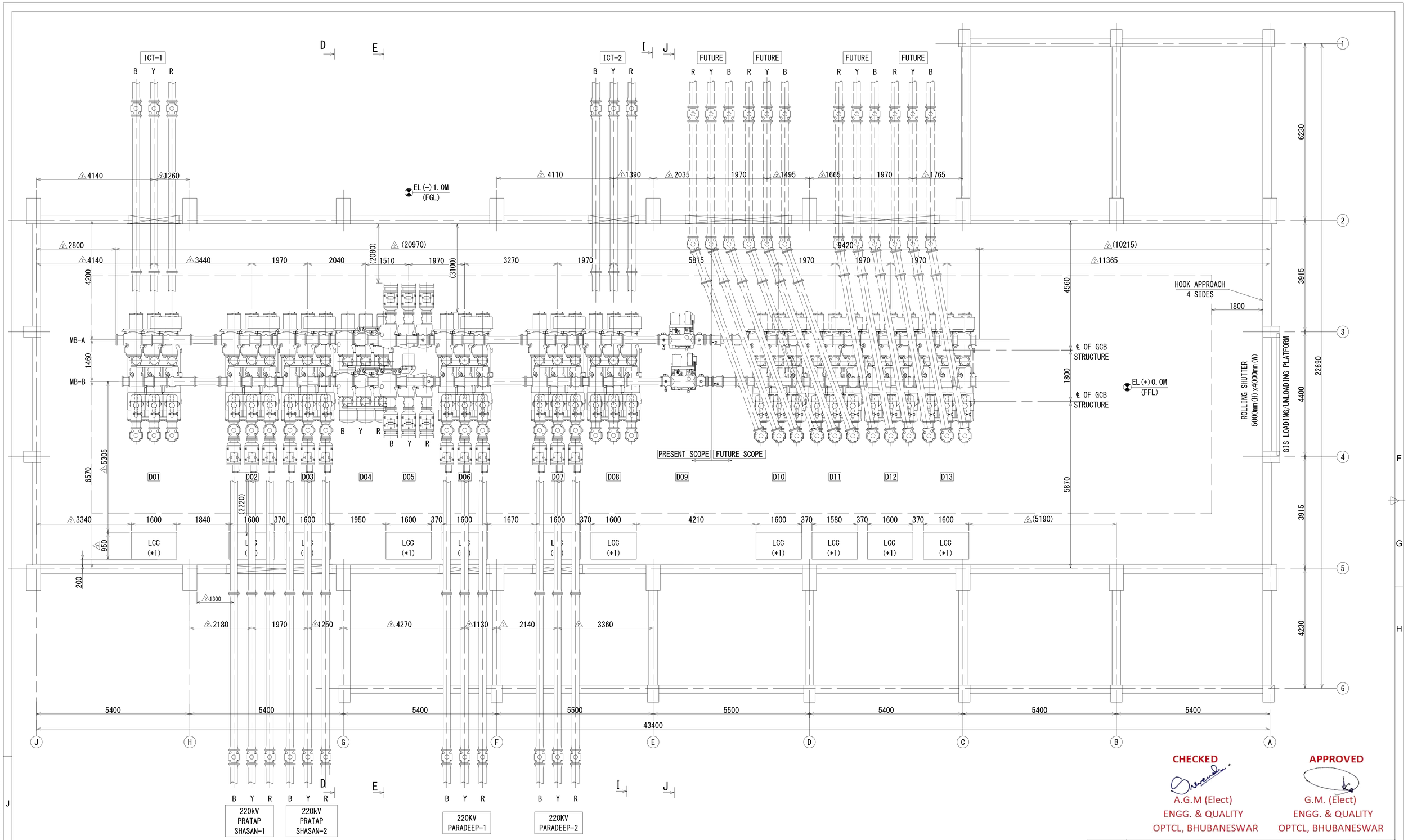
QBTGM: BHARAT HEAVY ELECTRICALS LTD TRANSMISSION BUSINESS GROUP NOIDA

| DEPT CODE | | NAME | SIGN | DATE |
|---|---|---|---|---|
| M | DRN | | | 06.01.2024 |
| | CHD | | | 06.01.2024 |
| | APPD | | | 06.01.2024 |

TITLE: 220kV GIS Indoor Layout, Plan & Section

DEPT. | SCALE 1:60 | DRAWING NO. TB-420-316-071-03A

SIGN | DATE | SHEET 01 OF 06 | REV. 02




| UNIT No. | BAY NAME | UNIT No. | BAY NAME |
|---|---|---|---|
| D01 | ICT-1 | D07 | 220kV PARADEEP-2 |
| D02 | 220kV PRATAP SHASAN-1 | D08 | ICT-2 |
| | | D09 | BUS SECTION |
| D03 | 220kV PRATAP SHASAN-2 | D10 | △2 FUTURE LINE-1 |
| D04 | BUS COUPLER | D11 | △2 FUTURE LINE-2 |
| D05 | 220kV BUS PT | D12 | △2 FUTURE ICT-3 |
| D06 | 220kV PARADEEP-1 | D13 | △2 FUTURE ICT-4 |

| PHASE ARRANGEMENT | | |
|---|---|---|
| PHASE | SIGN | MARK/ COLOUR |
| FIRST | R | (R) RED |
| SECOND | Y | (Y) YELLOW |
| THIRD | B | (B) BLUE |

NOTES:
1. LCC- LOCAL CONTROL CUBICLE.
2. FFL- GIS FINISHED FLOOR LEVEL.
3. TOC- TOP OF CONCRETE.
4. EL - ELEVATION LEVEL.
5. FGL- FINISH GROUND LEVEL.
△2 6. (*1) THE EXACT DIMENSIONS WILL BE FINALIZED BASED ON THE FINAL CUSTOMER APPROVAL ON THE LCC SCHEMATICS.
7. POSITION OF SUPPORT STRUCTURES IN THE SECTIONAL VIEWS INDICATIVE ONLY & SAME WILL BE FINALISED IN THE FOUNDATION PLAN

| REV | DETAILS OF MODIFICATION | REV. MARK | DATE | | MODIFIED | CHECKED | APPROVED |
|---|---|---|---|---|---|---|---|
| 02 | Y – CO-ORDINATE UPDATED AS PER BHEL COMMENTS | △2 | 27.02.24 | SIGN | YS | SW | IK |
| | | | | NAME | Y. SANDEEP | W. SREEDHAR | K. IKEDA |
| 01 | UPDATED AS PER CUSTOMER COMMENTS (BAY SEQUENCE CHANGED) | △1 | 20.01.24 | SIGN | YS | SW | IK |
| | | | | NAME | Y. SANDEEP | W. SREEDHAR | K. IKEDA |

**TOSHIBA**
TOSHIBA TRANSMISSION & DISTRIBUTION SYSTEMS (INDIA) PRIVATE LIMITED

| | NAME | SIGN | DATE |
|---|---|---|---|
| DESIGNED | CH.BHAGAVAN | | 06.01.2024 |
| DRAWN | Y.RAMBABU | | 06.01.2024 |
| CHECKED | M.SREEDHAR | | 06.01.2024 |
| APPROVED | K.IKEDA | | 06.01.2024 |
| PRODUCT | 245kV GIS | | |

SCALE: 1:60 | SWITCHGEAR PRODUCTS DIVISION

TITLE: 220kV GIS-GENERAL ARRANGEMENT PLAN & SECTIONS-OPTCL ERSAMA

DRAWING NO.: DEDUGBI68011005

SHEET NO: 02 OF 06 REV:02

**CHECKED**
A.G.M (Elect)
ENGG. & QUALITY
OPTCL, BHUBANESWAR

**APPROVED**
G.M. (Elect)
ENGG. & QUALITY
OPTCL, BHUBANESWAR

PROJECT: 400/220kV GIS SUBSTION AT ERSAMA, ODISHA & 400kV AIS FEEDER BAY EXTENSION AT DUBURI, ODISHA

OWNER: **ODISHA POWER TRANSMISSION CORPORATION LIMITED**

QBTGM: BHARAT HEAVY ELECTRICALS LTD TRANSMISSION BUSINESS GROUP NOIDA

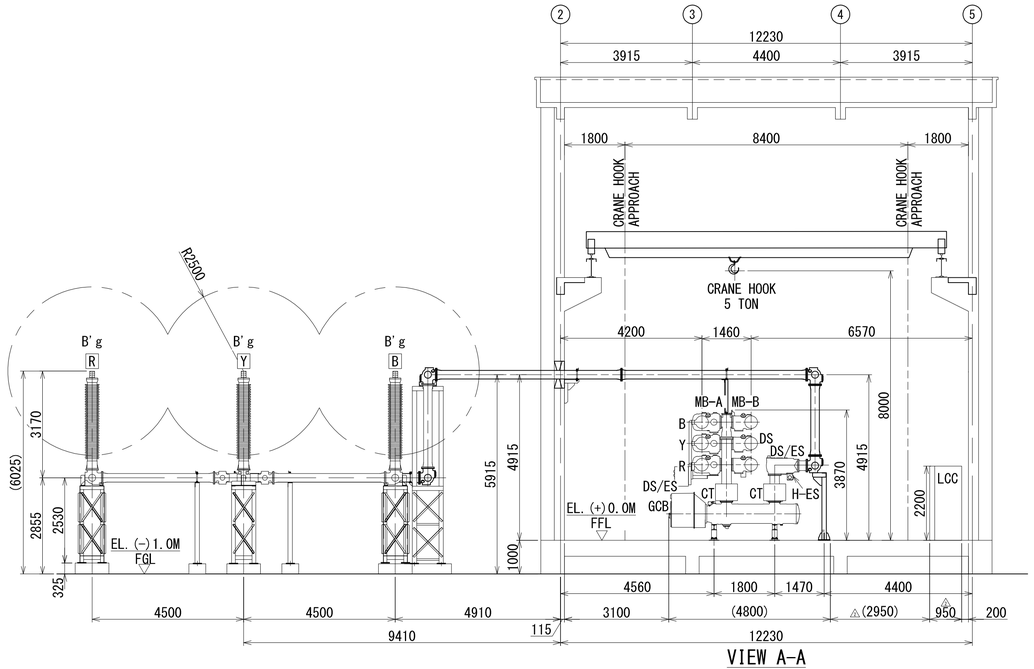
| DEPT CODE | | NAME | SIGN | DATE |
|---|---|---|---|---|
| M | DRN | | | 06.01.2024 |
| | CHD | | | 06.01.2024 |
| | APPD | | | 06.01.2024 |

TITLE: 220kV GIS Indoor Layout, Plan & Section

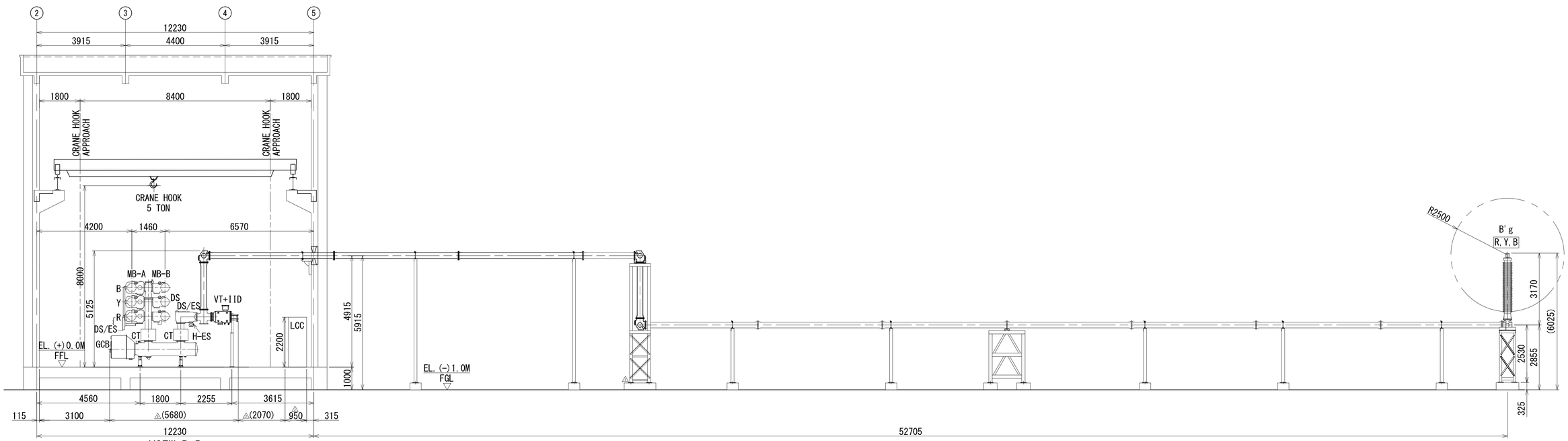
DEPT. SCALE 1:60 | SIGN | DATE

DRAWING NO. TB-420-316-071-03A

SHEET 02 OF 06 REV. 02




VIEW A-A
(D01)




VIEW B-B
(D02)

| REV | DETAILS OF MODIFICATION | REV. MARK | DATE | | MODIFIED | CHECKED | APPROVED |
|---|---|---|---|---|---|---|---|
| 02 | Y – CO-ORDINATE UPDATED AS PER BHEL COMMENT | 2 | 27.02.24 | SIGN | YS | SW | IK |
| | | | | NAME | Y. SANDEEP | W. SREEDHAR | K. IKEDA |
| 01 | UPDATED AS PER CUSTOMER COMMENTS(BAY SEQUENCE CHANGED) | 1 | 20.01.24 | SIGN | YS | SW | IK |
| | | | | NAME | Y. SANDEEP | W. SREEDHAR | K. IKEDA |

**CHECKED**
A.G.M (Elect)
ENGG. & QUALITY
OPTCL, BHUBANESWAR

**APPROVED**
G.M. (Elect)
ENGG. & QUALITY
OPTCL, BHUBANESWAR

**TOSHIBA**
TOSHIBA TRANSMISSION & DISTRIBUTION SYSTEMS (INDIA) PRIVATE LIMITED

| | NAME | SIGN | DATE |
|---|---|---|---|
| DESIGNED | CH.BHAGAVAN | | 06.01.2024 |
| DRAWN | Y.RAMBABU | | 06.01.2024 |
| CHECKED | M.SREEDHAR | | 06.01.2024 |
| APPROVED | K.IKEDA | | 06.01.2024 |

SCALE: 1:90
SWITCHGEAR PRODUCTS DIVISION
PRODUCT: 245kV GIS
TITLE: 220kV GIS–GENERAL ARRANGEMENT PLAN & SECTIONS–OPTCL ERSAMA
DRAWING NO.: DEDUGBI68011005
SHEET NO: 03 OF 06 REV:02

PROJECT: 400/220kV GIS SUBSTION AT ERSAMA, ODISHA & 400kV AIS FEEDER BAY EXTENSION AT DUBURI, ODISHA

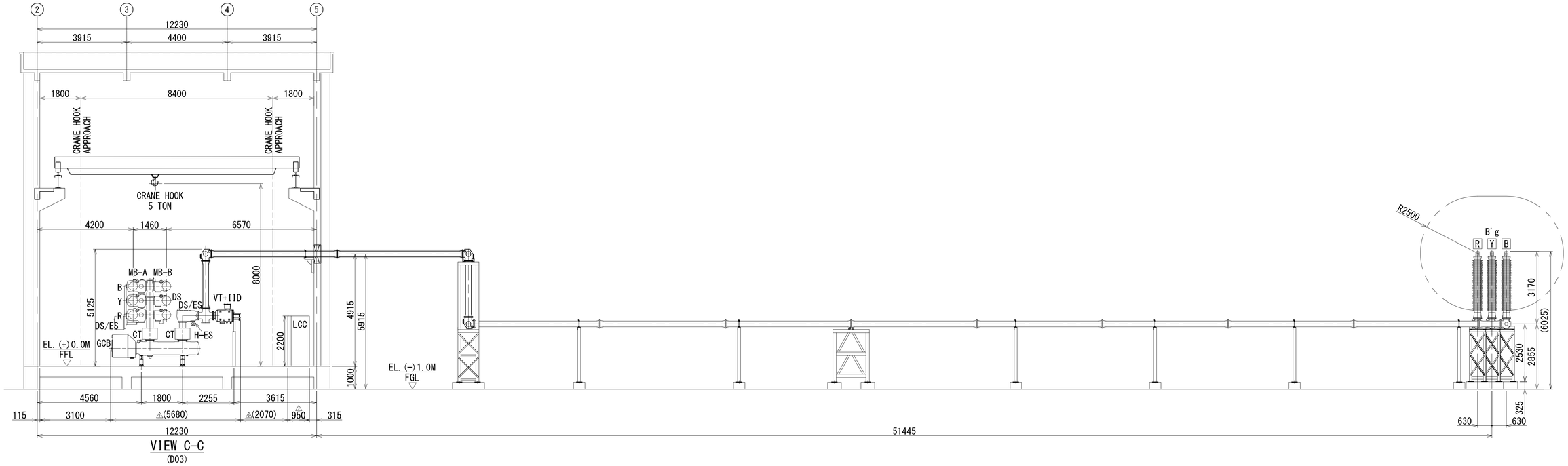
OWNER: ODISHA POWER TRANSMISSION CORPORATION LIMITED

QBTGM: BHARAT HEAVY ELECTRICALS LTD TRANSMISSION BUSINESS GROUP NOIDA

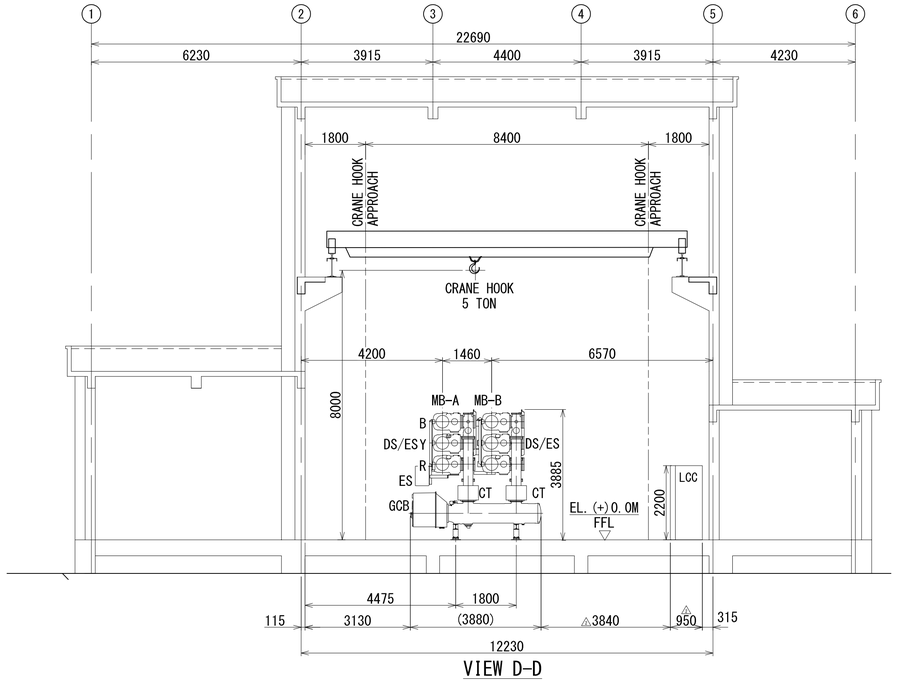
| DEPT CODE | | NAME | SIGN | DATE |
|---|---|---|---|---|
| M | DRN | | | 06.01.2024 |
| | CHD | | | 06.01.2024 |
| | APPD | | | 06.01.2024 |

TITLE: 220kV GIS Indoor Layout, Plan & Section

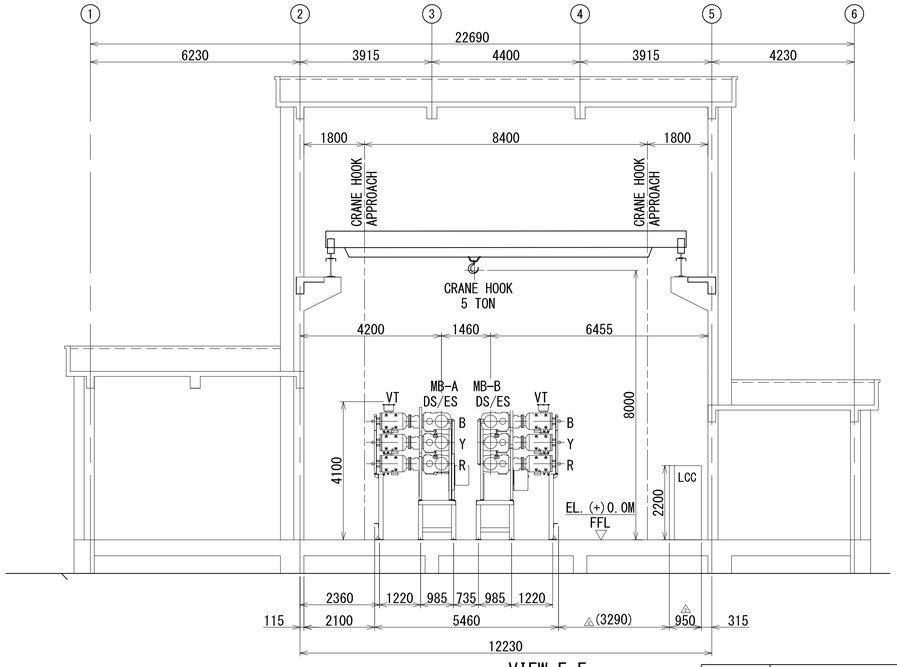
DEPT. / SIGN / DATE
SCALE 1:90
DRAWING NO. TB-420-316-071-03A
SHEET 03 OF 06 REV. 02




VIEW C-C
(D03)




VIEW D-D
(D04)




VIEW E-E
(D05)

| REV | DETAILS OF MODIFICATION | REV. MARK | DATE | | MODIFIED | CHECKED | APPROVED |
|---|---|---|---|---|---|---|---|
| 02 | Y – CO-ORDINATE UPDATED AS PER BHEL COMMENT | 2 | 27.02.24 | SIGN | YS | SW | IK |
| | | | | NAME | Y. SANDEEP | W. SREEDHAR | K. IKEDA |
| 01 | UPDATED AS PER CUSTOMER COMMENTS(BAY SEQUENCE CHANGED) | 1 | 20.01.24 | SIGN | YS | SW | IK |
| | | | | NAME | Y. SANDEEP | W. SREEDHAR | K. IKEDA |

**CHECKED**

A.G.M (Elect)
ENGG. & QUALITY
OPTCL, BHUBANESWAR

**APPROVED**

G.M. (Elect)
ENGG. & QUALITY
OPTCL, BHUBANESWAR

**TOSHIBA**

TOSHIBA TRANSMISSION & DISTRIBUTION SYSTEMS (INDIA) PRIVATE LIMITED

| | NAME | SIGN | DATE |
|---|---|---|---|
| DESIGNED | CH.BHAGAVAN | | 06.01.2024 |
| DRAWN | Y.RAMBABU | | 06.01.2024 |
| CHECKED | M.SREEDHAR | | 06.01.2024 |
| APPROVED | K.IKEDA | | 06.01.2024 |

SCALE: 1:90 | SWITCHGEAR PRODUCTS DIVISION | PRODUCT: 245kV GIS

TITLE: 220kV GIS-GENERAL ARRANGEMENT PLAN & SECTIONS-OPTCL ERSAMA

DRAWING NO.: DEDUGBI68011005

SHEET NO: 04 OF 06 REV:02

PROJECT: 400/220kV GIS SUBSTION AT ERSAMA, ODISHA & 400kV AIS FEEDER BAY EXTENSION AT DUBURI, ODISHA

OWNER: ODISHA POWER TRANSMISSION CORPORATION LIMITED

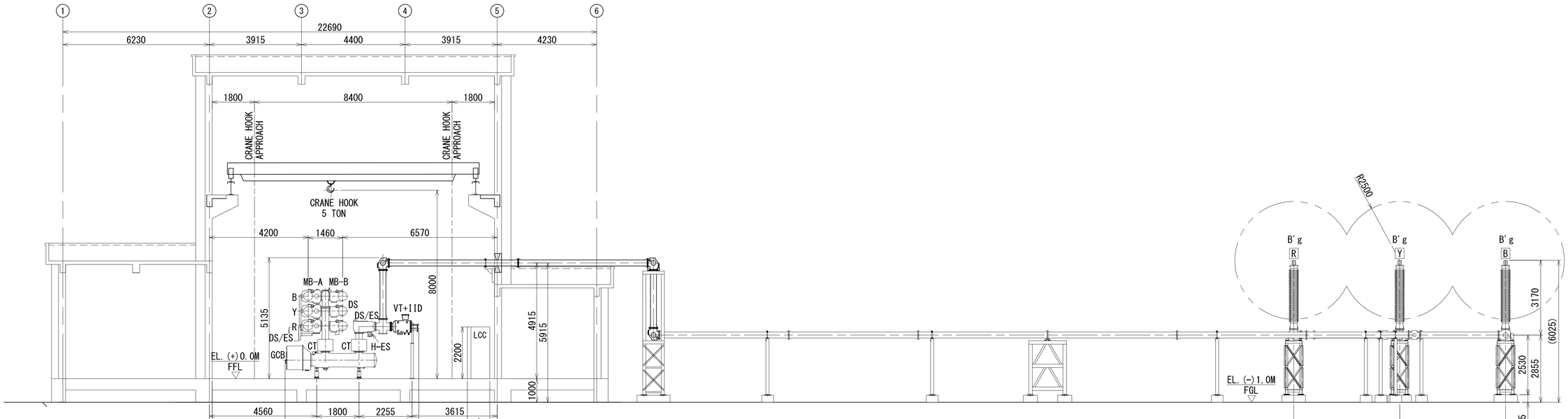
QBTGM: BHARAT HEAVY ELECTRICALS LTD TRANSMISSION BUSINESS GROUP NOIDA

| DEPT CODE | | NAME | SIGN | DATE |
|---|---|---|---|---|
| M | DRN | | | 06.01.2024 |
| | CHD | | | 06.01.2024 |
| | APPD | | | 06.01.2024 |

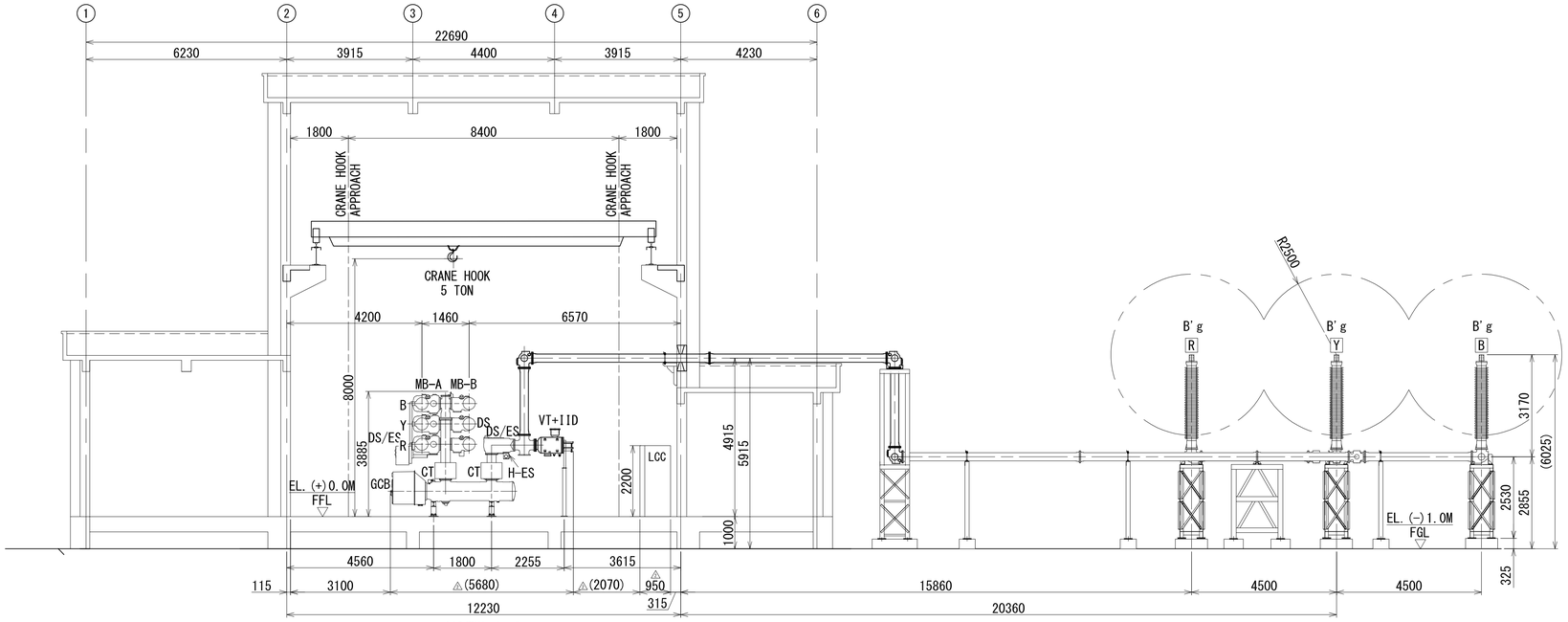
TITLE: 220kV GIS Indoor Layout, Plan & Section

DEPT. | SCALE 1:100 | DRAWING NO. TB-420-316-071-03A

SIGN | DATE | SHEET 04 OF 06 | REV. 02




VIEW F-F
(D06)




VIEW G-G
(D07)

CHECKED
A.G.M (Elect)
ENGG. & QUALITY
OPTCL, BHUBANESWAR

APPROVED
G.M. (Elect)
ENGG. & QUALITY
OPTCL, BHUBANESWAR

| REV | DETAILS OF MODIFICATION | REV. MARK | DATE | | MODIFIED | CHECKED | APPROVED |
|---|---|---|---|---|---|---|---|
| 02 | Y – CO-ORDINATE UPDATED AS PER BHEL COMMENT | 2 | 27.02.24 | SIGN | YS | SM | IK |
| | | | | NAME | Y. SANDEEP | M. SREEDHAR | K. IKEDA |
| 01 | UPDATED AS PER CUSTOMER COMMENTS(BAY SEQUENCE CHANGED) | 1 | 20.01.24 | SIGN | YS | SM | IK |
| | | | | NAME | Y. SANDEEP | M. SREEDHAR | K. IKEDA |

**TOSHIBA**
TOSHIBA TRANSMISSION & DISTRIBUTION SYSTEMS (INDIA) PRIVATE LIMITED

| | NAME | SIGN | DATE |
|---|---|---|---|
| DESIGNED | CH.BHAGAVAN | | 06.01.2024 |
| DRAWN | Y.RAMBABU | | 06.01.2024 |
| CHECKED | M.SREEDHAR | | 06.01.2024 |
| APPROVED | K.IKEDA | | 06.01.2024 |

SCALE: 1:90 | SWITCHGEAR PRODUCTS DIVISION | PRODUCT: 245kV GIS

TITLE: 220kV GIS-GENERAL ARRANGEMENT PLAN & SECTIONS-OPTCL ERSAMA

DRAWING NO.: DEDUGBI68011005

SHEET NO: 05 OF 06 REV: 02

PROJECT: 400/220kV GIS SUBSTION AT ERSAMA, ODISHA & 400kV AIS FEEDER BAY EXTENSION AT DUBURI, ODISHA

OWNER: **ODISHA POWER TRANSMISSION CORPORATION LIMITED**

QBTGM: BHARAT HEAVY ELECTRICALS LTD TRANSMISSION BUSINESS GROUP NOIDA

| DEPT CODE | | NAME | SIGN | DATE |
|---|---|---|---|---|
| M | DRN | | | 06.01.2024 |
| | CHD | | | 06.01.2024 |
| | APPD | | | 06.01.2024 |

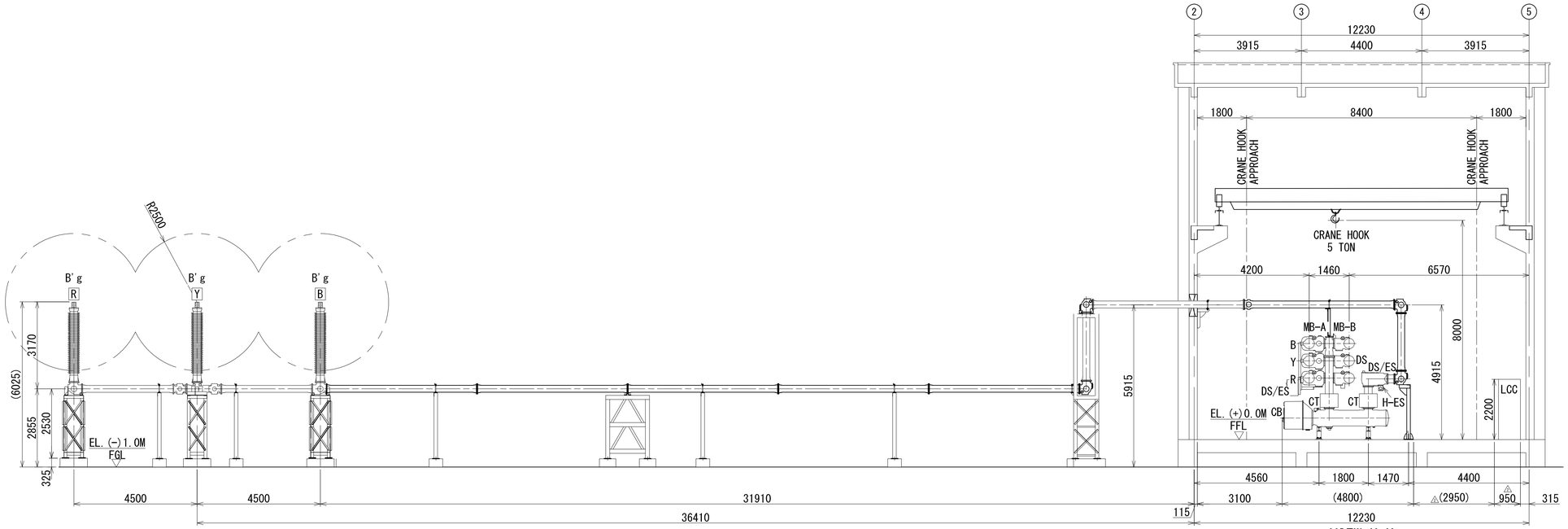
TITLE: 220kV GIS Indoor Layout, Plan & Section

DEPT. | SCALE 1:100 | DRAWING NO. TB-420-316-071-03A

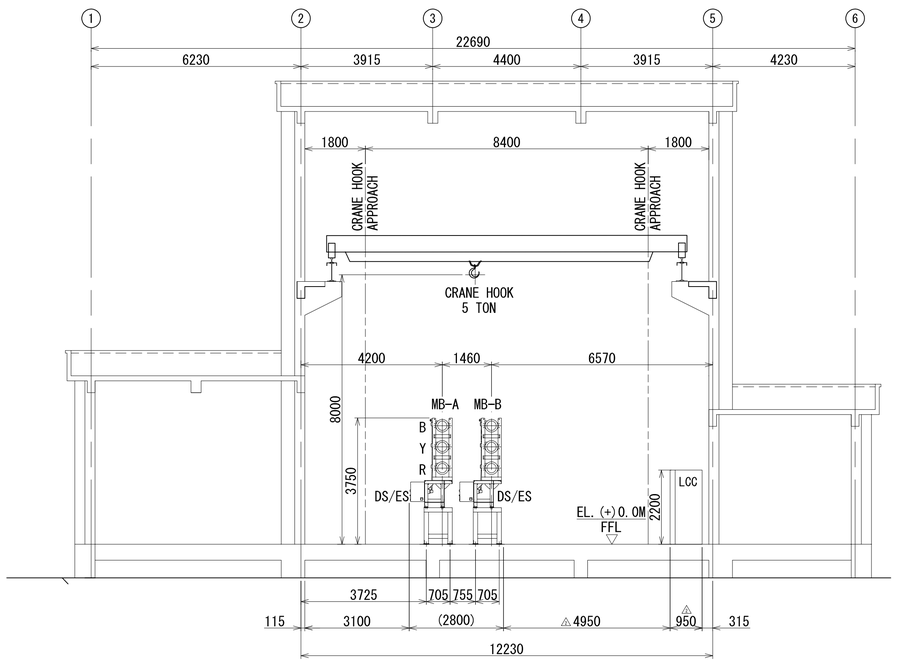
SIGN

DATE

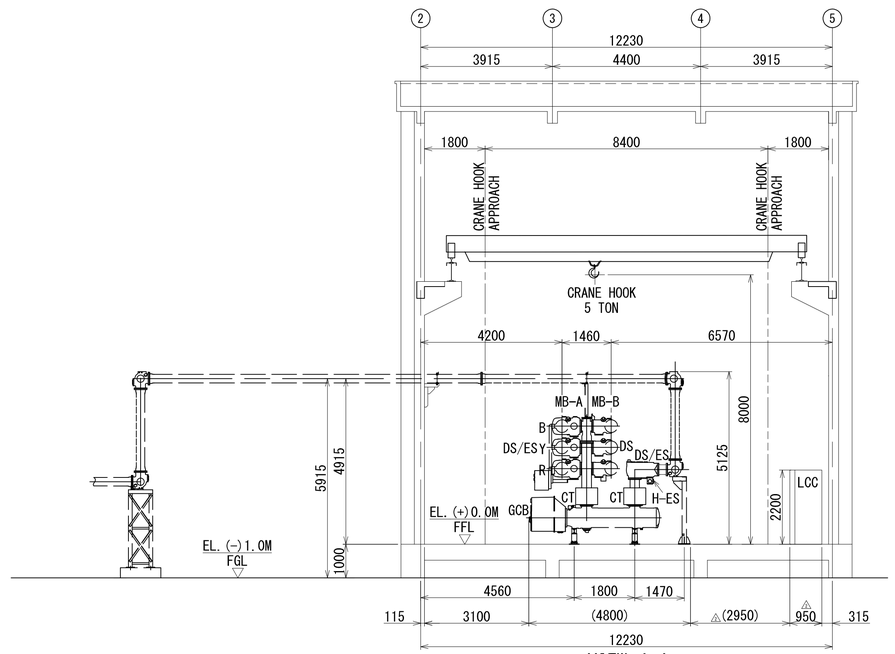
SHEET 05 OF 06 | REV. 02




VIEW H-H
(D08)




VIEW I-I
(D09)




VIEW J-J
(FUTURE)

**CHECKED**
A.G.M (Elect)
ENGG. & QUALITY
OPTCL, BHUBANESWAR

**APPROVED**
G.M. (Elect)
ENGG. & QUALITY
OPTCL, BHUBANESWAR

| REV | DETAILS OF MODIFICATION | REV. MARK | DATE | | MODIFIED | CHECKED | APPROVED |
|---|---|---|---|---|---|---|---|
| 02 | Y – CO-ORDINATE UPDATED AS PER BHEL COMMENT | 2 | 27.02.24 | SIGN | YS | SM | IK |
| | | | | NAME | Y. SANDEEP | M. SREEDHAR | K. IKEDA |
| 01 | UPDATED AS PER CUSTOMER COMMENTS(BAY SEQUENCE CHANGED) | 1 | 20.01.24 | SIGN | YS | SM | IK |
| | | | | NAME | Y. SANDEEP | M. SREEDHAR | K. IKEDA |

**TOSHIBA**
TOSHIBA TRANSMISSION & DISTRIBUTION SYSTEMS (INDIA) PRIVATE LIMITED

| | NAME | SIGN | DATE |
|---|---|---|---|
| DESIGNED | CH.BHAGAVAN | | 06.01.2024 |
| DRAWN | Y.RAMBABU | | 06.01.2024 |
| CHECKED | M.SREEDHAR | | 06.01.2024 |
| APPROVED | K.IKEDA | | 06.01.2024 |

SCALE: 1:90 | SWITCHGEAR PRODUCTS DIVISION | PRODUCT 245kV GIS

TITLE: 220kV GIS-GENERAL ARRANGEMENT PLAN & SECTIONS-OPTCL ERSAMA

DRAWING NO.: DEDUGBI68011005
SHEET NO: 06 OF 06 REV:02

PROJECT: 400/220kV GIS SUBSTION AT ERSAMA, ODISHA & 400kV AIS FEEDER BAY EXTENSION AT DUBURI, ODISHA

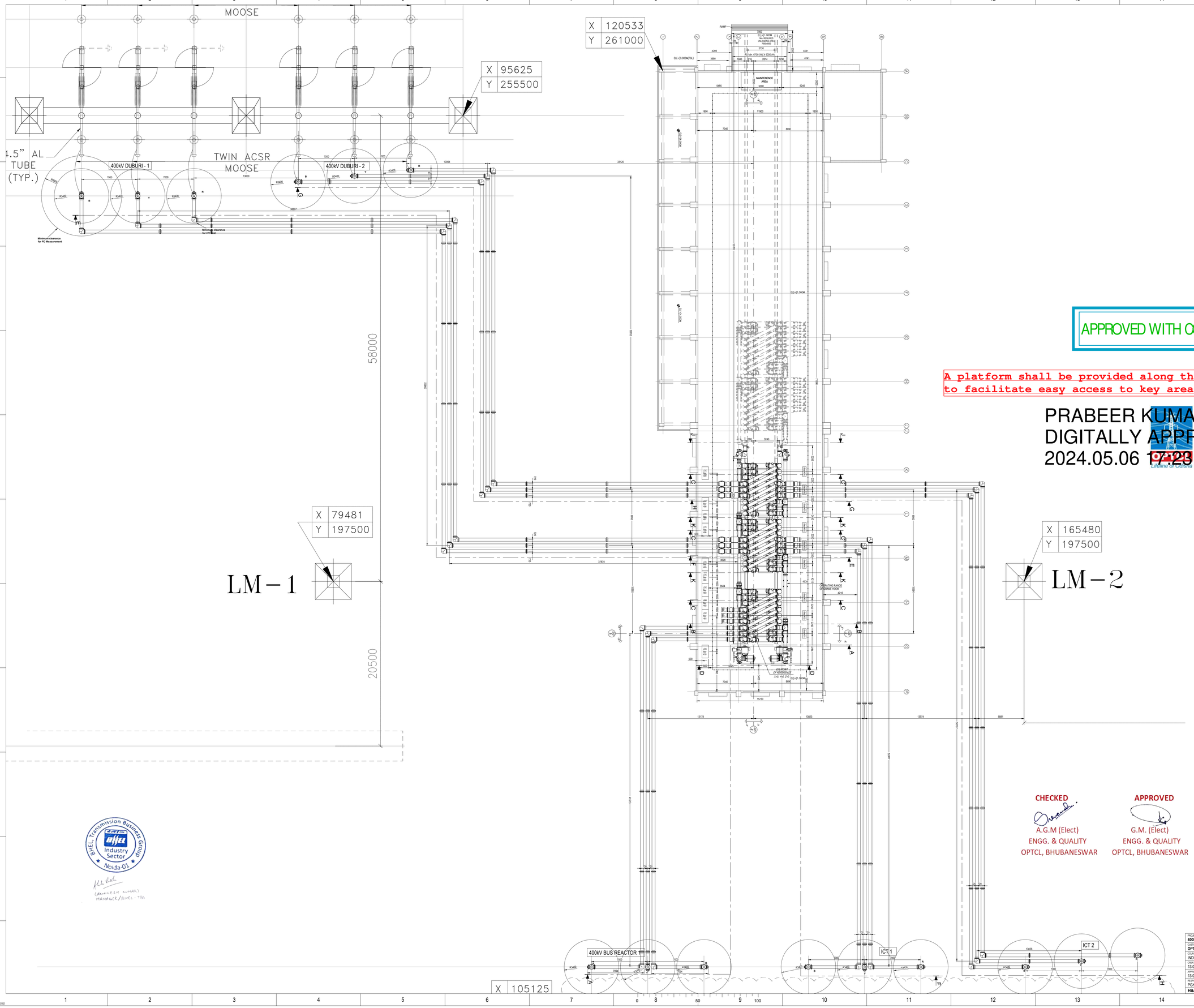
OWNER: ***ODISHA POWER TRANSMISSION CORPORATION LIMITED***

QBTGM: BHARAT HEAVY ELECTRICALS LTD TRANSMISSION BUSINESS GROUP NOIDA

| DEPT CODE | | NAME | SIGN | DATE |
|---|---|---|---|---|
| M | DRN | | | 06.01.2024 |
| | CHD | | | 06.01.2024 |
| | APPD | | | 06.01.2024 |

TITLE: 220kV GIS Indoor Layout, Plan & Section

DEPT. | SCALE 1:100 | DRAWING NO. TB-420-316-071-03A
SIGN
DATE
SHEET 06 OF 06 | REV. 02




APPROVED WITH COMMENTS

A platform shall be provided along the entire length of the GIS to facilitate easy access to key areas for maintenance purpose.

PRABEER KUMAR MALLICK
DIGITALLY APPROVED
2024.05.06 17:23:27+05'30'

## LEGEND

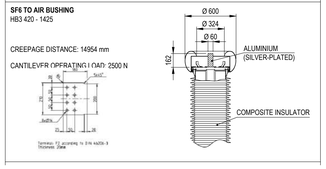
| | |
|---|---|
| 1 | CIRCUIT BREAKER |
| 3 | DISCONNECTOR & EARTHING SWITCH |
| 5 | HIGH SPEED EARTHING SWITCH |
| 6 | CURRENT TRANSFORMER |
| 7 | VOLTAGE TRANSFORMER |
| 9 | SF6 TO AIR BUSHING |
| 12 | LOCAL CONTROL CUBICLE (LCC) |

## INTERFACES

**SF6 TO AIR BUSHING**
HB3 420 - 1425

CREEPAGE DISTANCE: 14964 mm

CANTILEVER OPERATING LOAD: 2500 N




GIS (SCOPE OF SUPPLY)

GIS (FUTURE)

## NOTES

1. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS OTHERWISE NOTED.
2. CIVIL DETAILS (DOORS / STAIRS / ...) AND STEEL STRUCTURE ON THIS DRAWING ARE FOR INFORMATION ONLY. FOR DETAILS REFER TO RELEVANT DRAWINGS.
3. CIVIL CONTRACTOR SHOULD INFORM HITACHI ENERGY ABOUT OTHER INSTALLATION (SUCH AS AIR CONDITIONING, LIGHTING, PANELS, ETC) IN GIS HALL, IN ORDER TO AVOID COLLISION WITH GIS / GIS SUPPORT STRUCTURES.
4. NO DILATATION JOINTS IN THE GIS BUILDING.
   DILATATION JOINTS ONLY AFTER CLARIFICATION WITH HITACHI ENERGY.

**CHECKED**
A.G.M (Elect)
ENGG. & QUALITY
OPTCL, BHUBANESWAR

**APPROVED**
G.M. (Elect)
ENGG. & QUALITY
OPTCL, BHUBANESWAR

BHEL Transmission Business Group
BHEL Industry Sector
Noida-01
(AKHILESH KUMAR)
MANAGER/BHEL - TBG

| REV. | MODIFICATION | MODIFIED BY | MOD. DATE |
|---|---|---|---|
| C | REVISED AS PER CLIENT COMMENTS | VAUR | 07.03.2024 |
| B | REVISED AS PER LAYOUT INPUT | VAUR | 27.02.2024 |
| A | FIRST ISSUE | VAUR | 13.02.2024 |

**FOR APPROVAL**

PROJECT: 400/220kV GIS SUBSTION AT ERSAMA, ODISHA & 400kV AIS FEEDER BAY EXTENSION AT DUBURI, ODISHA

ODISHA POWER TRANSMISSION CORPORATION LIMITED

BHARAT HEAVY ELECTRICALS LTD
TRANSMISSION BUSINESS GROUP
NOIDA

| REV | DATE | NAME | SIGN | DATE |
|---|---|---|---|---|
| A | DRN | SHARMA | | |
| | CHK | SONI | | |
| | APP | SAHOO | | |

TITLE: 400kV GIS LAYOUT DRAWING

SCALE: 1:150 — DRAWING NO. 1HYGS900113-2 — SHEET 01 OF 04 — REV. AA

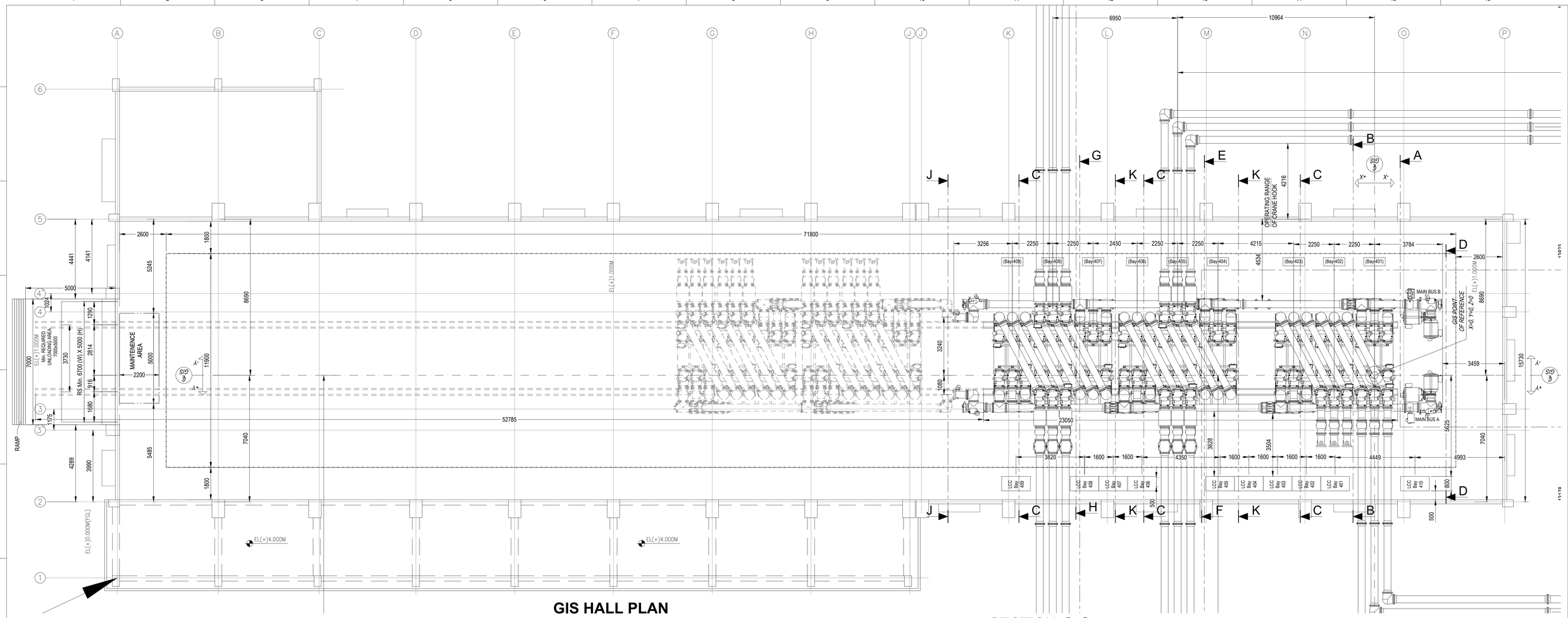
| | |
|---|---|
| PROJECT NAME: 400KV GIS AT OPTCL ERSAMA | HITACHI PROJECT ID: 3100139882 |
| | HITACHI DOCUMENT ID: 1HYGS900113-2 |
| CUSTOMER: OPTCL | CUSTOMER PROJECT ID: - |
| | CUSTOMER DOCUMENT ID: - |
| COUNTRY: INDIA | DOCUMENT KIND: LAYOUT |
| | BASED ON: - |
| CREATED: 13.02.2024 V A U RAJESH | TITLE: 400KV GIS LAYOUT DRAWING |
| APPROVED: 13.02.2024 DEBA | 420 kV SF6-SWITCHGEAR ELK-03 / 420 |
| RESPONSIBLE DEPARTMENT: PGHV-GIS | SIZE: A0 · SCALE: 1:150 · WKZ: DRW · LANGUAGE: EN · REVISION: AC · PAGE: 01 / 04 |

Hitachi Energy INDIA Ltd

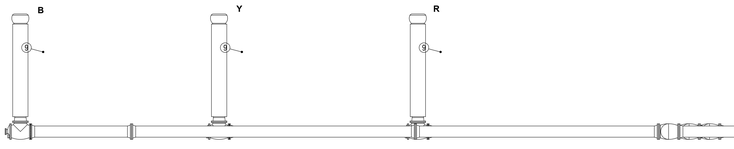


FRAME-A0/2021-12-02

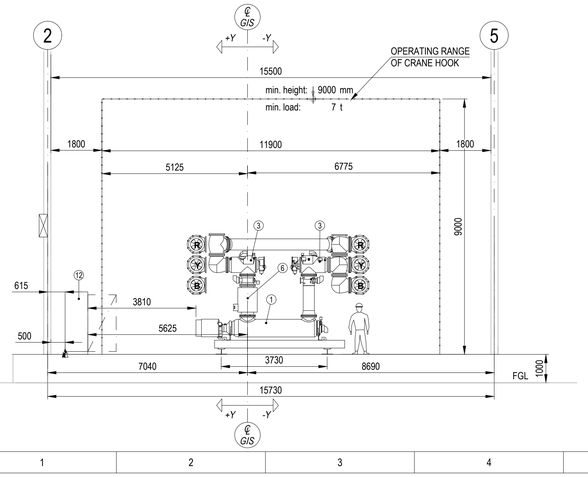
AutoCAD drawing



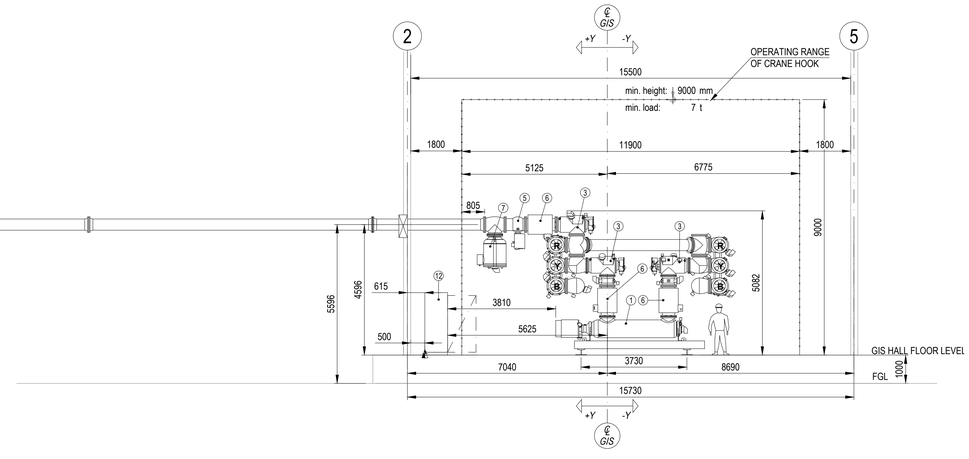

# GIS HALL PLAN




# SECTION K-K




# SECTION G-G




BHEL Transmission Business Group
BHEL Industry Sector Noida-01

(RAMJEEVAN KUMAR)
MANAGER/BHEL-TBG

**CHECKED**

A.G.M (Elect)
ENGG. & QUALITY
OPTCL, BHUBANESWAR

**APPROVED**

G.M. (Elect)
ENGG. & QUALITY
OPTCL, BHUBANESWAR

| REV. | MODIFICATION | MODIFIED BY | MOD. DATE |
|---|---|---|---|
| C | REVISED AS PER CLIENT COMMENTS | VAUR | 07.03.2024 |
| B | REVISED AS PER LAYOUT INPUT | VAUR | 27.02.2024 |
| A | FIRST ISSUE | VAUR | 13.02.2024 |

**FOR APPROVAL**

PROJECT: 400/220kV GIS SUBSTION AT ERSAMA, ODISHA & 400kV AIS FEEDER BAY EXTENSION AT DUBURI, ODISHA

OWNER: ODISHA POWER TRANSMISSION CORPORATION LIMITED

CONTRACTOR: BHARAT HEAVY ELECTRICALS LTD TRANSMISSION BUSINESS GROUP NOIDA

| REV | | NAME | SIGN | DATE |
|---|---|---|---|---|
| CON | DRN | DRAWN | | DATE |
| | CHK | CHKD | | DATE |
| | APP | APPD | | DATE |

TITLE: 400KV GIS LAYOUT DRAWING

SIZE: A0 | SCALE: 1:75 | DRAWING NO.: 1HYG9000113-2 | SHEET: 02/04 | REV.: AA

| | |
|---|---|
| PROJECT NAME | 400KV GIS AT OPTCL ERSAMA |
| CUSTOMER | OPTCL |
| COUNTRY | INDIA |
| CREATED | 13.02.2024 V A U RAJESH |
| APPROVED | 13.02.2024 DEBA |
| RESPONSIBLE DEPARTMENT | PGHV-GIS |
| HITACHI PROJECT ID | 3100139882 |
| CUSTOMER PROJECT ID | - |
| DOCUMENT KIND | LAYOUT |
| TITLE | 400KV GIS LAYOUT DRAWING |
| | 420 kV SF6-SWITCHGEAR ELK-03 / 420 |
| SIZE: AD | SCALE: 1:75 | DRG: DRW | LANGUAGE: EN | REVISION: AC | PAGE: 02 / 04 |
| HITACHI DOCUMENT ID | 1HYG9000113-2 |
| CUSTOMER DOCUMENT ID | - |
| BASED ON | - |

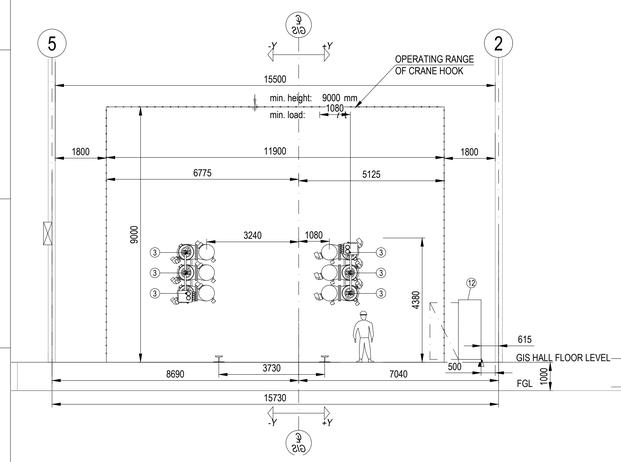
**Hitachi Energy INDIA Ltd**



FRAME-A0/2021-12-02

AutoCAD drawing

## SECTION J-J

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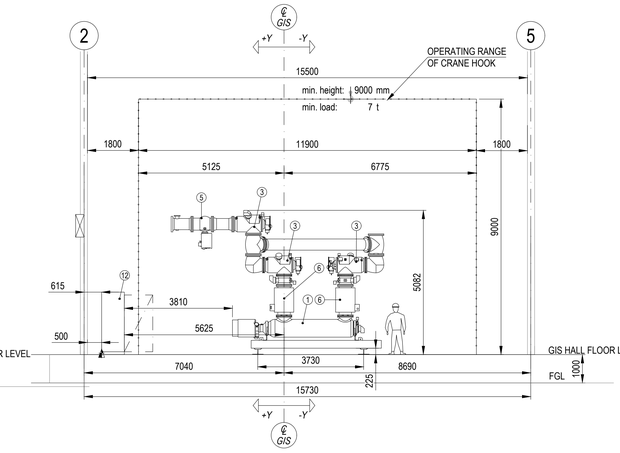


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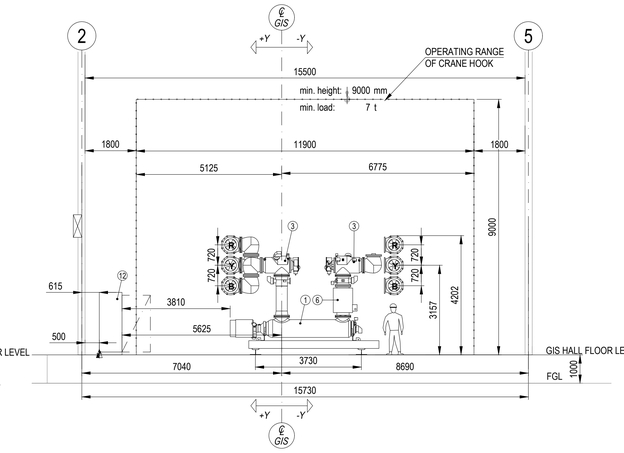


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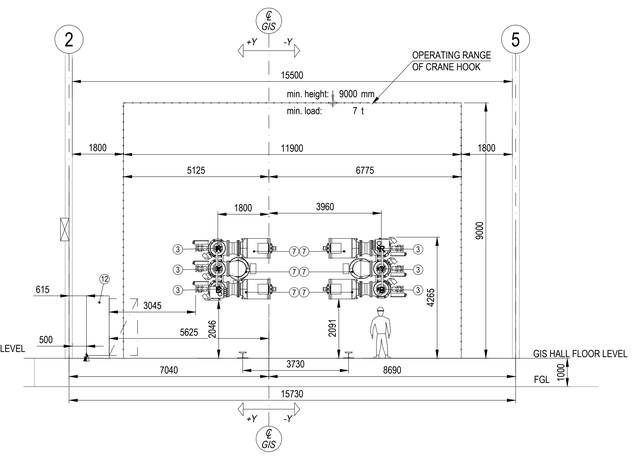
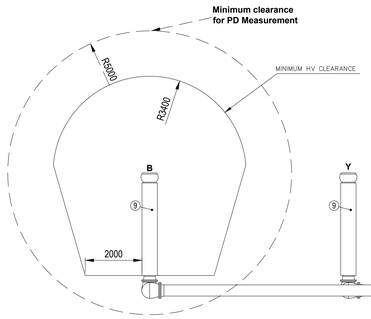
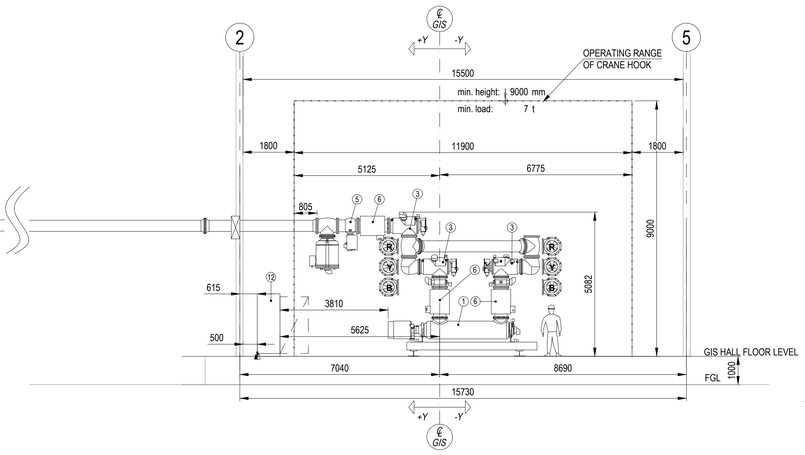



## SECTION E-E

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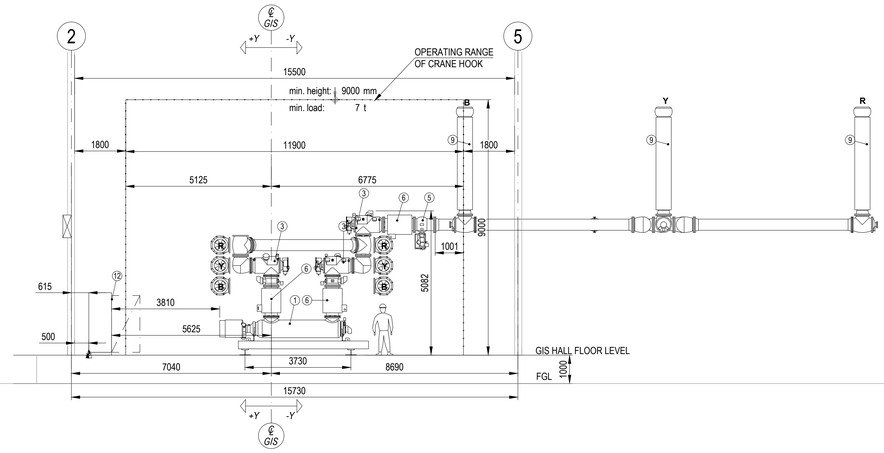
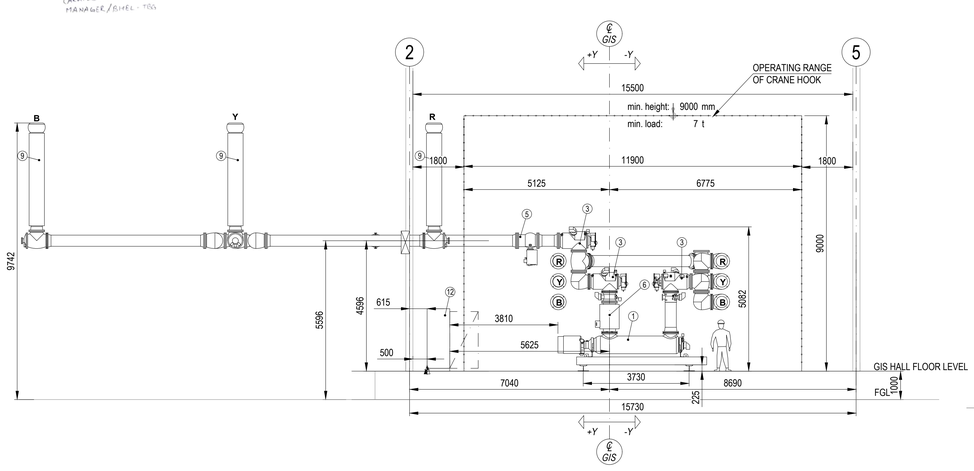


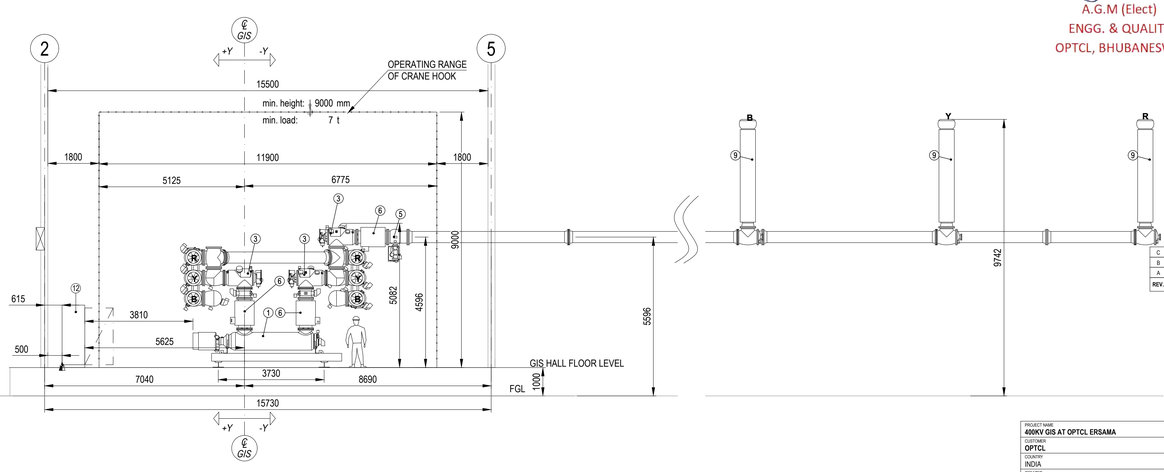

BHEL Transmission Business Group
Industry Sector
Noida-01

(ANIL KUMAR)
MANAGER/BHEL-TBG

## SECTION A-A




## SECTION H-H




**CHECKED**

A.G.M (Elect)
ENGG. & QUALITY
OPTCL, BHUBANESWAR

**APPROVED**

G.M. (Elect)
ENGG. & QUALITY
OPTCL, BHUBANESWAR

| REV. | MODIFICATION | MODIFIED BY | MOD. DATE |
|---|---|---|---|
| C | REVISED AS PER CLIENT COMMENTS | VAUR | 07.03.2024 |
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| A | FIRST ISSUE | VAUR | 13.02.2024 |

PROJECT: 400/220kV GIS SUBSTION AT ERSAMA, ODISHA & 400kV AIS FEEDER BAY EXTENSION AT DUBURI, ODISHA

OWNER: ODISHA POWER TRANSMISSION CORPORATION LIMITED

CONTRACTOR: BHARAT HEAVY ELECTRICALS LTD TRANSMISSION BUSINESS GROUP NEDA

| | BY | DATE |
|---|---|---|
| DRN. | | |
| CHK. | | |
| APP. | | |

TITLE: 400kV GIS LAYOUT DRAWING

SCALE: 1:75 | DRAWING NO. 1HYG0001113-2 | SHEET | COM | D4 | REV. AA

| | |
|---|---|
| PROJECT NAME | 400KV GIS AT OPTCL ERSAMA |
| CUSTOMER | OPTCL |
| COUNTRY | INDIA |
| CREATED | 13.02.2024 V A U RAJESH |
| APPROVED | 13.02.2024 DEBA |
| RESPONSIBLE DEPARTMENT | PGHV-GIS |
| HITACHI PROJECT ID | 3100139882 |
| CUSTOMER PROJECT ID | - |
| DOCUMENT KIND | LAYOUT |
| TITLE | 400KV GIS LAYOUT DRAWING |
| | 420 kV SF6-SWITCHGEAR ELK-03 / 420 |
| SIZE | A0 |
| SCALE | 1:75 |
| DRG | DRW |
| LANGUAGE | EN |
| REVISION | AC |
| PAGE | 03/ 04 |
| HITACHI DOCUMENT ID | 1HYG0001113-2 |
| CUSTOMER DOCUMENT ID | - |
| BASED ON | - |

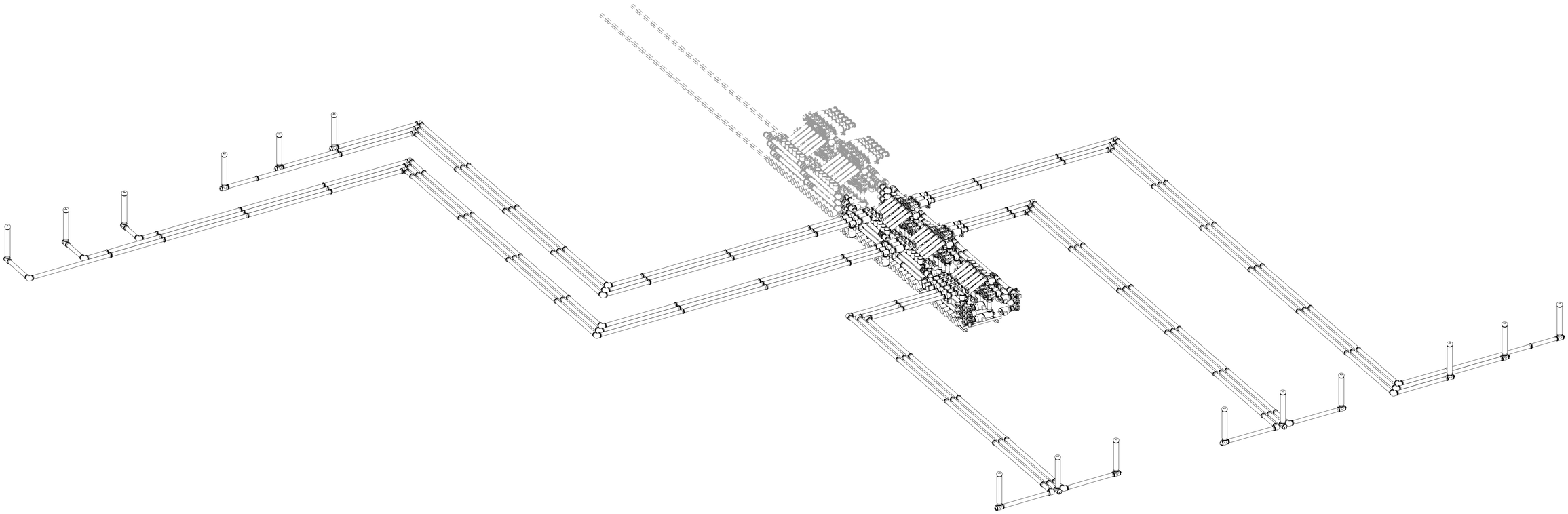
**FOR APPROVAL**

**Hitachi Energy INDIA Ltd**



FRAME-A0-2021-12-02

AutoCAD drawing



**CHECKED**

A.G.M (Elect)
ENGG. & QUALITY
OPTCL, BHUBANESWAR

**APPROVED**

G.M. (Elect)
ENGG. & QUALITY
OPTCL, BHUBANESWAR

BHEL, Transmission Business Group
BHEL Industry Sector
Noida-01

(ANUJEEV KUMAR)
MANAGER/BHEL - TBG

| REV. | MODIFICATION | MODIFIED BY | MOD. DATE |
|---|---|---|---|
| C | REVISED AS PER CLIENT COMMENTS | VAUR | 07.03.2024 |
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| A | FIRST ISSUE | VAUR | 13.02.2024 |

PROJECT: 400/220kV GIS SUBSTION AT ERSAMA, ODISHA & 400kV AIS FEEDER BAY EXTENSION AT DUBURI, ODISHA

OWNER: ODISHA POWER TRANSMISSION CORPORATION LIMITED

CONTRACTOR: BHARAT HEAVY ELECTRICALS LTD TRANSMISSION BUSINESS GROUP NEDIA

| REV | | NAME | SIGN | DATE |
|---|---|---|---|---|
| CHK | DRN | DRAWN | | DATE |
| | | CHK | CHKD | DATE |
| | APP | APPD | | DATE |

TITLE: 400kV GIS LAYOUT DRAWING

SCT. | SCALE | DRAWING NO. 1HYGS00113-2 | SHEET | DRAW | D4 | REV. AA

| | |
|---|---|
| PROJECT NAME | 400KV GIS AT OPTCL ERSAMA |
| CUSTOMER | OPTCL |
| COUNTRY | INDIA |
| CREATED | 13.02.2024 V A U RAJESH |
| APPROVED | 13.02.2024 DEBA |
| RESPONSIBLE DEPARTMENT | PGHV-GIS |
| HITACHI PROJECT ID | 3100139882 |
| CUSTOMER PROJECT ID | - |
| DOCUMENT KIND | LAYOUT |
| TITLE | 400KV GIS LAYOUT DRAWING |
| | 420 kV SF6-SWITCHGEAR ELK-03 / 420 |
| SIZE | AD |
| SCALE | 1:150 |
| REC | DRW |
| LANGUAGE | EN |
| REVISION | AC |
| PAGE | 04 / 04 |
| HITACHI DOCUMENT ID | 1HYGS00113-2 |
| CUSTOMER DOCUMENT ID | - |
| BASED ON | - |

**FOR APPROVAL**

**Hitachi Energy INDIA Ltd**



FRAME-A0/2021-12-02

AutoCAD drawing

# COMPLIANCE SHEET

**Client** OPTCL
**Project:** 400/220kV GIS SUB-STATION, ERSAMA
**Doc:** Structure Loading Diagram For 400/220kV Gis Substation at Ersama (Rev-00)
**Doc. No:** TB-1-420-316-006

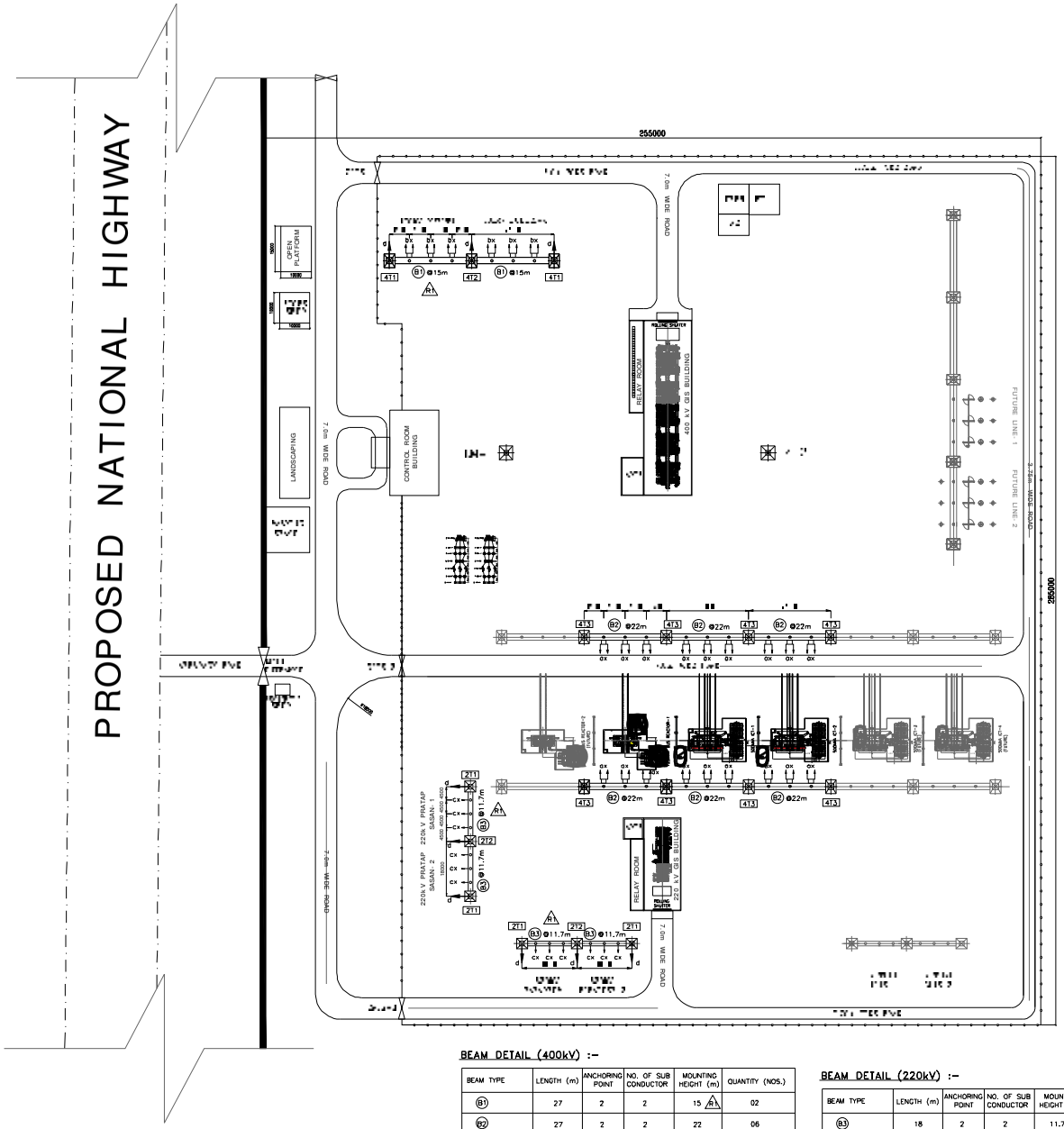
| Sl.No. | Customer Comments | BHEL Clarification/ Compliance |
|---|---|---|
| **OPTCL comments vide mail dated 21.04.23** | | |
| 1 | The following shall be accepted for the substation structures:<br>1. 411 and 412 shall be low gantry type i.e. @15m<br>2. 413 shall be @22m<br>3. 211 & 212 shall be of low gantry type i.e. @10.5m or 11.7m<br>4. cx shall be Single ACSR Zebra<br>5. The DSLP may be re-checked as per the new structures.<br>All other structures shall be as per your drawing no-TB-1-420-316-006 shall remain same. | Noted & incorporated in revised drawing.<br>Revised DSLP will be submitted shortly. |
| **OPTCL comments vide D3 portal dated 28.03.23** | | |
| 2 | The tension per phase for 400kV (bx), 220kV (cx) and Shield Wire (d) shall be considered and mentioned in the drawing. | Forces bx & cx are on the terminal take-off gantries of 400kV & 220kV respectively & there will be stringing only on the line side. Line stringing, being a slack span, the Short Circuit tension is not considered and the take-off gantries are designed only for the Normal tension.<br><br>Normal tensions have been considered as per the contract specification clause no. 2.2, Chapter-L7.<br><br>"Terminal line take off gantries shall be designed for a minimum conductor tension of four metric tons per phase for 400kV and two metric tons per phase for 220kV & 132 kV."<br><br>Similarly for Shield wires (d) Short Circuit forces are not applicable.<br><br>Thus we request OPTCL to accept the proposed loading. |
| 3 | Two nos. of 50m LMs have been considered in the drawing. The BOQ has Three nos. 40m LMs. | BHEL proposes to provide lattice structure type 2 nos. 50m High LMs for Lightning protection of Sub-station. This item is covered in the contract BOQ item sl. no. 20.1 and will be billed by BHEL in MT.<br><br>40m High Monopole Lighting cum Lightning Mast are not covering the entire area for Lightning protection.<br><br>Further, the proposed 50m High LM will be used not only for Lightning protection, but also for Sub-station lighting as platforms will be provided for mounting lights at 12.5m & 25m levels. This is as per the contract specification clause no. 2.2, Chapter-L7.<br><br>40m High monopoles will be provided only in case of illumination requirement of Sub-station. |
| 4 | The revised drawing considering the above may be submitted with signature of M/s BHEL in the pdf file (not scanned) | Noted. Digitally signed revised drawing submitted for final approval. |

AKHILESH KUMAR

Digitally signed by AKHILESH KUMAR
DN: cn=AKHILESH KUMAR, o=BHEL, ou=TBG, email=akhileshk@bhel.in, c=IN
Date: 2023.04.24 16:22:12 +05'30'

FIRST ANGLE PROJECTION (ALL DIMENSIONS ARE IN MM.)

TB-1-420-316-006




TRUE NORTH

PLANT NORTH

## LOADING DETAILS (400kV):-

| NOTATION | NO. & TYPE OF COND./ SHIELD WIRE PER PHASE | NORMAL TENSION PER PHASE | SPACER SPAN | S/C TENSION PER PHASE |
|---|---|---|---|---|
| ax | TWIN ACSR MOOSE SPAN = 49.0 M WITHOUT DEVIATION | 4000 Kg | 3m | 7200 Kg |
| bx | TWIN ACSR MOOSE SPAN = 200.0 M (SLACK SPAN) WITH ± 30° DEVIATION (MAX) IN HORIZONTAL DIRECTION & ± 15° DEVIATION (MAX) IN VERTICAL DIRECTION | 4000 Kg | - | - |

## LOADING DETAILS (220kV):-

| NOTATION | NO. & TYPE OF COND./ SHIELD WIRE PER PHASE | NORMAL TENSION PER PHASE | SPACER SPAN | S/C TENSION PER PHASE |
|---|---|---|---|---|
| R1 cx | SINGLE ACSR MOOSE SPAN = 200.0 M (SLACK SPAN) WITH ± 30° DEVIATION (MAX) IN HORIZONTAL DIRECTION & ± 15° DEVIATION (MAX) IN VERTICAL DIRECTION | 2000 Kg | - | - |

## LOADING DETAILS (SHIELD WIRE):-

| NOTATION | NO. & TYPE OF COND./ SHIELD WIRE PER PHASE | NORMAL TENSION PER PHASE | SPACER SPAN | S/C TENSION PER PHASE |
|---|---|---|---|---|
| d | SHIELD WIRE WITH ± 30° DEVIATION (MAX) | 800 Kg | -- | -- |

## TOWER DETAIL (400kV) :-

| TOWERS DESIGNATION | STR. HEIGHT DETAIL FROM PLINTH TOP (m) | QUANTITY (NOS.) | BEAMS SUPPORTED |
|---|---|---|---|
| 4T1 | 15+7.5M PEAK | 02 | B1 @15M ON 1 SIDE |
| 4T2 | 15+7.5M PEAK | 01 | B1 @15M ON 2 SIDES AT 180 DEG |
| 4T3 | 22+7.5M PEAK | 08 | B2 @22M ON 2 SIDES AT 180 DEG |
| TOTAL TOWERS | | 11 | |
| LM* | 47.5+2.5M PEAK | 02 | |

'*' - LOCATION & QUANTITY OF LM SHALL BE AS PER APPROVED DSLP.

## TOWER DETAIL (220kV) :-

| TOWERS DESIGNATION | STR. HEIGHT DETAIL FROM PLINTH TOP (m) | QUANTITY (NOS.) | BEAMS SUPPORTED |
|---|---|---|---|
| 2T1 | 11.7+5.0M PEAK | 04 | B3 @11.7M ON 1 SIDE |
| 2T2 | 11.7+5.0M PEAK | 02 | B3 @11.7M ON 2 SIDES AT 180 DEG |
| TOTAL TOWERS | | 06 | |

## NOTES:-

1. ALL DIMENSIONS ARE IN mm.
2. THE STRUCTURE SHALL BE DESIGNED FOR A FACTOR OF SAFETY OF 2 FOR NORMAL CONDITION & 1.5 FOR SHORT CIRCUIT FORCES CONDITION.
3. THE TRANSVERSE, VERTICAL, LONGITUDINAL LOADS SHALL BE CONSIDERED AS PER IS 802
4. WEIGHT OF THE MAN WITH TOOLS AT ANY POINT OF TIME SHALL BE CONSIDERED ON BEAM AS 150 kg.
5. ALL HEIGHTS ARE WITH REFERENCE TO PLINTH LEVEL. PLINTH LEVEL IS 375mm ABOVE FINISHED GROUND LEVEL.
6. ⊖ - DENOTES PROVISION FOR SUSPENSION HARDWARE IN BEAMS.
7. FOR ALL INCOMING AND OUTGOING 400kV & 220kV LINES, CONDUCTOR SPAN SHALL BE TAKEN AS 200m FOR DESIGN PURPOSE.
8. R1 FIXING ARRANGEMENT WOULD BE DOUBLE TENSION/ SUSPENSION HARDWARE WITH DOUBLE ANCHORING POINTS FOR 400kV & SINGLE TENSION/ SUSPENSION HARDWARE WITH SINGLE ANCHORING POINT FOR 220kV.
9. ANCHORING POINT SPACING SHALL BE 450mm for 400kV & 250mm for 220kV (IF APPLICABLE).
10. DRAWING SHALL BE READ ONLY FOR TOWER & BEAM INPUTS. FOR LOCATION OF TOWERS, ROADS, FENCE ETC. LAYOUT DRAWING SHALL BE REFERRED

## BEAM DETAIL (400kV) :-

| BEAM TYPE | LENGTH (m) | ANCHORING POINT | NO. OF SUB CONDUCTOR | MOUNTING HEIGHT (m) | QUANTITY (NOS.) |
|---|---|---|---|---|---|
| B1 | 27 | 2 | 2 | 15 R1 | 02 |
| B2 | 27 | 2 | 2 | 22 | 06 |
| NO. OF BEAMS | | | | | 08 |

## BEAM DETAIL (220kV) :-

| BEAM TYPE | LENGTH (m) | ANCHORING POINT | NO. OF SUB CONDUCTOR | MOUNTING HEIGHT (m) | QUANTITY (NOS.) |
|---|---|---|---|---|---|
| B3 | 18 | 2 | 2 | 11.7 R1 | 04 |
| NO. OF BEAMS | | | | | 04 |

PROJECT: 400/220 kV GIS SUB STATION AT ERSAMA ODISHA & 400kV AIS FEEDER BAY EXTENTION DUBURI ODISHA

OWNER: ODISHA POWER TRANSMISSION CORPORATION LIMITED

BHARAT HEAVY ELECTRICALS LTD.
TRANSMISSION BUSINESS GROUP NOIDA

| | NAME | SIGN. | DATE |
|---|---|---|---|
| DRAWN | AK | -SIGNED- | 18.03.23 |
| CHECKED | AK | -SIGNED- | 18.03.23 |
| APPROVED | DKS | -SIGNED- | |

| REV. | DATE | ALTERED / CHECKED / APPROVED |
|---|---|---|
| 01 | 24.04.23 | ALTERED AK; CHECKED AK; APPROVED DKS |

DRAWING REVISED TO CHANGE THE HEIGHTS OF TOWERS 4T1, 4T2, 2T1 & 2T2 AS PER OPTCL COMMENTS DATED 21.04.23.

DEPT. TBEM
CODE 420
SCALE
CARD CODE

DRG TITLE: STRUCTURE LOADING DIAGRAM FOR 400/220kV GIS SUB STATION AT ERSAMA

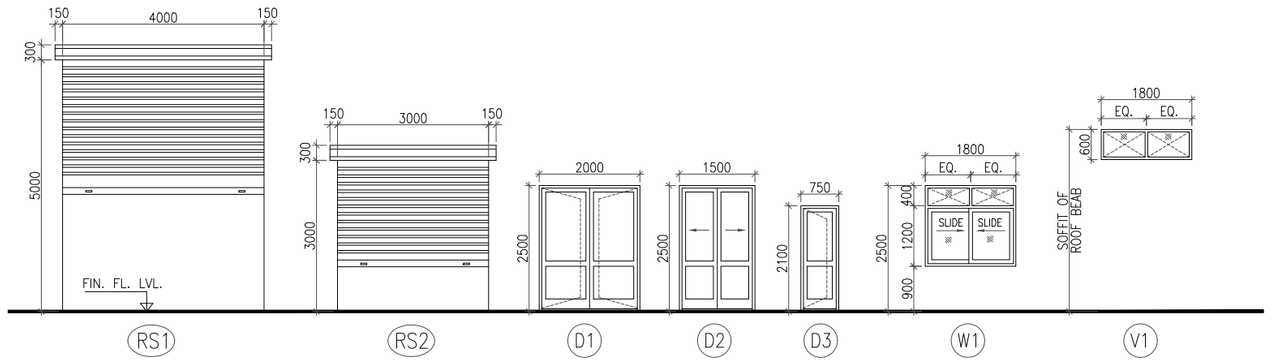
DRAWING NO. TB-1-420-316-006 REV. 01

SHEET No. 01 NEXT SHEET --

FIRST ANGLE PROJECTION

(ALL DIMENSIONS ARE IN mm)

DRG. NO. TB-1-420-607-670

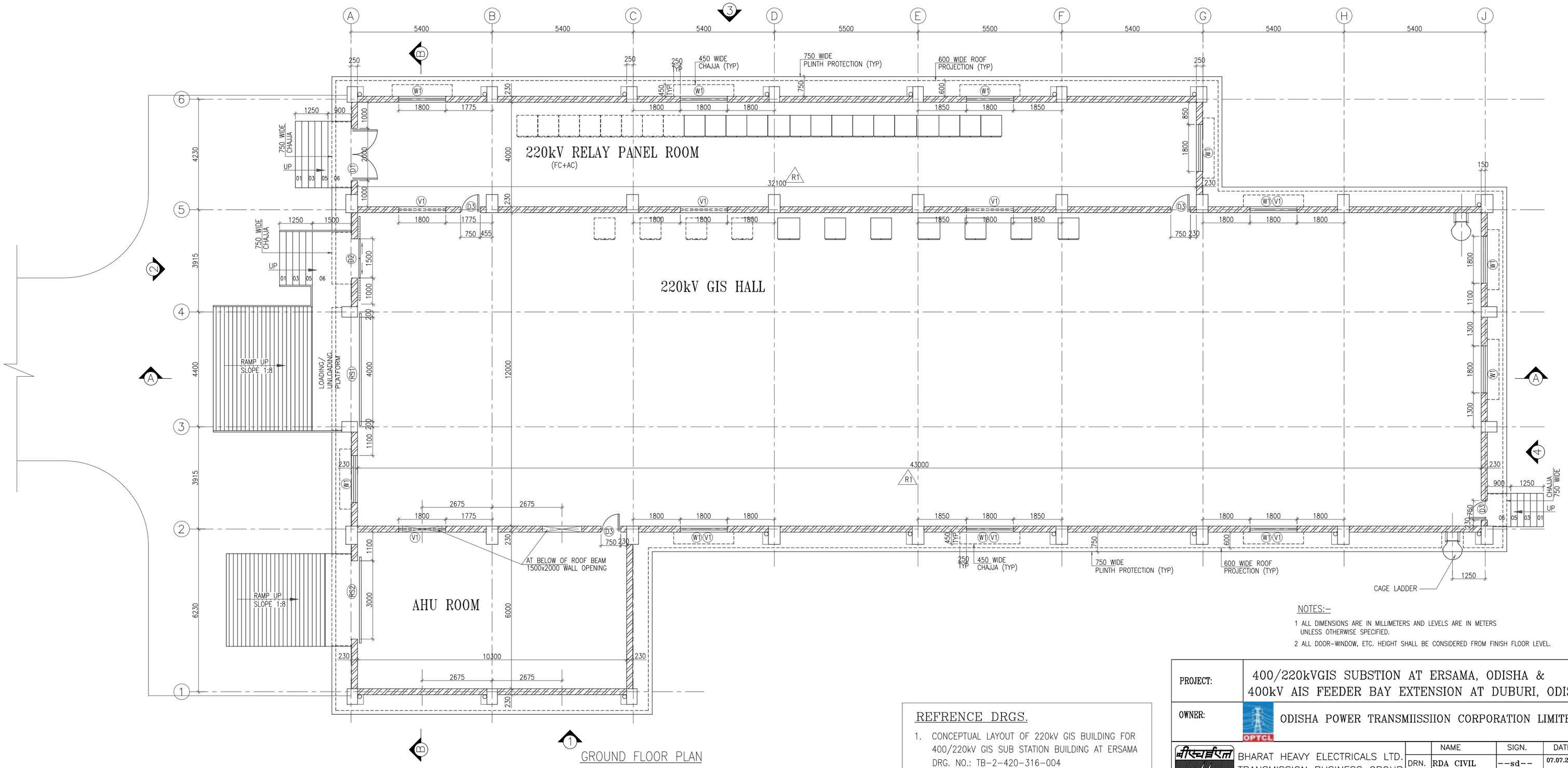



## SCHEDULE OF DOORS & WINDOWS

| TYPE | OPENING SIZE | FRAME SIZE | CILL LEVEL | LINTEL LEVEL | NOS. | DESCRIPTION |
|---|---|---|---|---|---|---|
| RS1 | 4000x5000 | 4000x5000 | – | 5000 | 1 | STEEL ROLLING SHUTTER (AS PER TECH. SPECS) |
| RS2 | 3000x3000 | 3000x3000 | – | 3000 | 1 | STEEL ROLLING SHUTTER (AS PER TECH. SPECS) |
| D1 | 2000x2500 | 1980x2490 | – | 2500 | 1 | DOUBLE SHUTTER UPVC GLAZED DOOR AS PER SPECS. |
| D2 | 1500x2500 | 1480x2490 | – | 2500 | 1 | AUTOMATED SENSOR DOOR AS PER TS & CONTRACT BOQ. |
| D3 | 750x2100 | 730x2090 | – | 2100 | 4 R1 | SINGLE SHUTTER UPVC GLAZED DOOR AS PER SPECS. |
| W1 | 1800x1600 | 1780x1580 | 900 | 2500 | 11 R1 | PARTLY FIXED & PARTLY OPENABLE UPVC FRAME 6MM THK. GLAZED SHUTTER WINDOW AS PER SPECS. |
| V1 | 1800x600 | 1780x580 | – | SOFFIT OF BEAM | 8 R1 | FIXED GLASS UPVC FRAME 6MM THK. GLAZED SHUTTER VENTILATOR AS PER SPECS. |

LEGEND:–

- SIDE HUNG OPENABLE PANEL
- FIXED GLASS PANEL
- FFL. = FINISH FLOOR LEVEL
- FGL. = FINISH GRADE LEVEL
- H.P. = HIGH POINT
- L.P. = LOWER POINT
- E.F. = EXHAUST FAN
- E.L. = ELEVATION LEVEL
- T.O.C = TOP OF CONCRETE
- N.T.S = NOT TO SCALE
- TYP. = TYPICAL
- AC = AIR CONDITIONED
- FC = FALSE CEILING
- FF = FALSE FLOOR




GROUND FLOOR PLAN

NOTES:–

1 ALL DIMENSIONS ARE IN MILLIMETERS AND LEVELS ARE IN METERS UNLESS OTHERWISE SPECIFIED.

2 ALL DOOR-WINDOW, ETC. HEIGHT SHALL BE CONSIDERED FROM FINISH FLOOR LEVEL.

REFRENCE DRGS.

1. CONCEPTUAL LAYOUT OF 220kV GIS BUILDING FOR 400/220kV GIS SUB STATION BUILDING AT ERSAMA DRG. NO.: TB-2-420-316-004

| REV. | DATE | ALTERED | REV. | DATE | ALTERED | REV. | DATE | ALTERED | REV. | DATE | ALTERED |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | CHD/APPD | | | CHD/APPD | | | CHD/APPD | R1 | 30.09.23 | TKR (RDA CIVIL) SV/PLK |
| ZONE | | | ZONE | | | ZONE | | | ZONE | | REVISED AS PER OPTCL COMMENTS VIDE LETTER NO. 1669(4) DTD. 01.09.2023 FOR SPACE PROVISION FOR ADDITIONAL 04 NOS OF BAYS. |

PROJECT: 400/220kVGIS SUBSTION AT ERSAMA, ODISHA & 400kV AIS FEEDER BAY EXTENSION AT DUBURI, ODISHA

OWNER: ODISHA POWER TRANSMIISSIION CORPORATION LIMITED

BHARAT HEAVY ELECTRICALS LTD. TRANSMISSION BUSINESS GROUP NOIDA

| | NAME | SIGN. | DATE | NO.OF VAR. |
|---|---|---|---|---|
| DRN. | RDA CIVIL | --sd-- | 07.07.2023 | N.A. |
| CHD. | SV/DKS | --sd-- | 07.07.2023 | |
| APPD. | PLK | --sd-- | 07.07.2023 | |

| DEPT. | UNTOL. DIMS. | | SCALE | WEIGHT (KG) | REF. TO ASSY. DRG. | ITEM NO. | NO.OF ITEMS |
|---|---|---|---|---|---|---|---|
| TBG | GR. g/M/f | | N.T.S | N.A. | N.A. | N.A. | N.A. |
| CODE | | | | | | | |

TITLE: 220Kv GIS BUILDING-ARCH. GROUND FLOOR PLAN

CARD CODE: NA

DRG.NO. TB-1-420-607-670

REV. 01

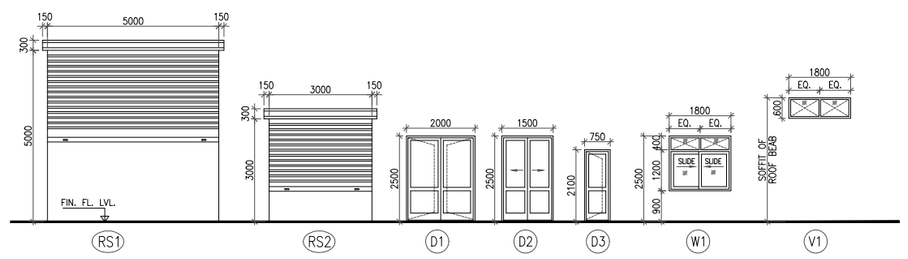
SHT. No 01 NO. OF SHT. 01

SIZE-A1

FIRST ANGLE PROJECTION

(ALL DIMENSIONS ARE IN mm)

DRG. NO. TB-1-420-607-640




## SCHEDULE OF DOORS & WINDOWS

| TYPE | OPENING SIZE | FRAME SIZE | CILL LEVEL | LINTEL LEVEL | NOS. | DESCRIPTION |
|---|---|---|---|---|---|---|
| RS1 | 5000x5000 | 5000x5000 | – | 5000 | 1 | STEEL ROLLING SHUTTER (AS PER TECH. SPECS) |
| RS2 | 3000x3000 | 3000x3000 | – | 3000 | 1 | STEEL ROLLING SHUTTER (AS PER TECH. SPECS) |
| D1 | 2000x2500 | 1980x2490 | – | 2500 | 1 | DOUBLE SHUTTER UPVC GLAZED DOOR AS PER SPECS. |
| D2 | 1500x2500 | 1480x2490 | – | 2500 | 1 | AUTOMATED SENSOR DOOR AS PER TS & CONTRACT BOQ. DETAILS SHALL BE PROVIDED IN SEPARATE DWG. |
| D3 | 750x2100 | 730x2090 | – | 2100 | 4 / R1 | SINGLE SHUTTER UPVC GLAZED DOOR AS PER SPECS. |
| W1 | 1800x1600 | 1780x1580 | 900 | 2500 | 17 / R1 | PARTLY FIXED & PARTLY OPENABLE UPVC FRAME 6MM THK. GLAZED SHUTTER WINDOW AS PER SPECS. |
| V1 | 1800x600 | 1780x580 | – | SOFFIT OF BEAM | 14 / R1 | FIXED GLASS UPVC FRAME 6MM THK. GLAZED SHUTTER VENTILATOR AS PER SPECS. |

## SCHEDULE OF FINISHES

(AS PER TECHNICAL SPECIFICATION)

1.0 BRICK WORK:

1.1 230mm THK. BRICK MASONARY IN C.M. (1:5) USING FLY ASH BRICK AS PER OPTCL TS.

2.0 PLASTER:

2.1 INTERNAL:
12mm THK. PLASTER (1:6 CEMENT : SAND) MORTOR ON SMOOTH SIDE OF WALL.
15mm THK. PLASTER (1:6 CEMENT : SAND) MORTOR ON ROUGH SIDE OF SINGLE OR HALF BRICK WALL.

2.2 EXTERNAL:
18mm THK. PLASTER IN TWO LAYER.
UNDER LAYER 12mm THK. (1:5 CEMENT : SAND) MORTOR AND TOP LAYER 6mm THK. (1:3 CEMENT : SAND) MORTOR

2.3 CEILING EXCEPT FOR WHERE FALSE CEILING WILL BE PROVIDED.
6mm THK. PLASTER (1:3 CEMENT : SAND).

REMARK:
PLASTER & PAINTING OF GIS HALL CEILING MAY BE CARRIED OUT AT THE TIME REMOVAL OF FORM WORK & SCAFFOLDINGS. SCAFFOLDING REMOVAL MAY DONE IN STAGES AFTER COMPLETING PLASTER & PAINTING WORKS OF GIS HALL CEILING.

3.0 FLOORING:

3.1 GIS HALL, AHU ROOM:–
CEMENT CONCRETE WITH METALLIC HARDENER TOPPING.

3.2 RELAY PANEL ROOM:–
VITRIFIED TILE FLOORING.

3.3 SKIRTING:–
150 HIGH SKIRTING MATCHING WITH THE FLOOR SHALL BE PROVIDED.

5.0 PAINTING.

5.1 INSIDE FACES OF BRICK WALL WILL HAVE PLASTIC EMULSION/ACRYLIC EMULSION PAINT IN ALL AC AREA, DISTEMPER IN ALL OTHER AREA.

5.2 OUTSIDE FACES OF WALL BE ACRYLIC SMOOTH EXTERIOR PAINT OVER PLASTER SURFACE.

5.3 CEILING TO HAVE PLASTIC EMULSION PANT.
FALSE CEILING IN RELAY PANEL ROOM.

WATER PROOFING ON ROOF:

CEMENT BASED WATER PROOFING TREATMENT OF ROOFS BALCONIES, TERRACES ETC SHALL BE PROVIDED WITH AVERAGE THICKNESS OF 120MM AND MINIMUM THICKNESS AT KHURRA AS 65 MM AND LAID CONSISTING OF FOLLOWING OPERATIONS:

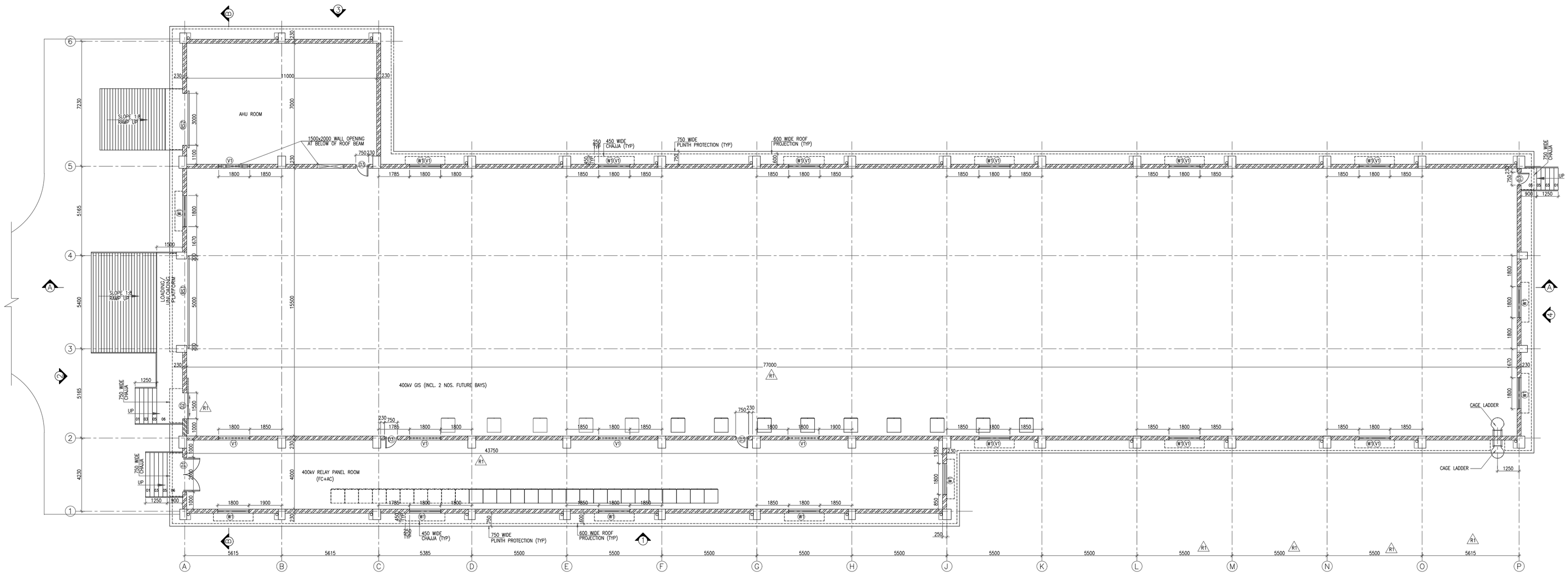
(A) A SLURRY COAT OF NEAT CEMENT USING 2.75 KG/SQM OF CEMENT ADMIXED WITH PROPRIETARY WATER PROOFING COMPOUNDS CONFORMING TO IS: 2645 SHALL BE APPLIED AND GROUTED OVER THE RCC SLAB INCLUDING CLEANING THE SURIACE BEFORE TREATMENT.

(B) PLAIN CEMENT CONCRETE 1:5:10 (1: CEMENT: 5 FINE SAND: 10 BURNT BRICK AGGREGATE OF 40 MM NOMINAI SIZE) ADMIXED WITH PROPRIETARY WATER PROOFING COMPOUND CONFORMING TO IS 2645 OVER 20 MM THICK LAYER OF CEMENT MORTAR OF MIN :5 (CEMENT 5 COARSE SAND) ADMIXED WITH PROPNETARY WATER PROOFING COMPOUND CONFORMING TO IS: 2645 TO REQUIRED SLOPE AN TREATING SIMILARLY THE ADJOINING WALLS UPTO 300 MM HEIGHT INCLUDING ROUNDING OF JUNCTIONS OF WALLS AND SLABS.

(C) AFTER TWO DAY OF PROPER CURING A SECOND COAT OF CEMENT SLURRY ADMIXED WITH PROPRIETARY WATER PROOFING COMPOUND CONFORMING TO IS 2645 SHALL BE APPLIED.

(D) THE SURFACE SHALL BE FINISHED WITH 20 MM THICK JOINT LESS CEMENT MORTAR OF MIX 1:4 (1 CEMENT :4 COURSE SAND) ADMIXED WITH PROPRIETARY WATER PROOFING COMPOUND CONFORMING TO IS : 2645 AND FINALLY THE SURIACE SHALL BE FINISHED WITH TROWEL WITH NEAT CEMENT SLURRY AND MAKING OF 300 X 300 MM SQUARE

(E) THE WHOLE TERRACE SO FINISHED SHALL BE FLOODED WITH WATER FOR A MINIMUM PERIOD OF TWO WEEKS FOR CURING AND FOR FINAL TEST. ALL ABOVE OPERATIONS SHALL BE DONE IN ORDER AN AS DIRECTED AND SPECIFIED BY THE ENGINEER–IN CHARGE.




GROUND FLOOR PLAN

NOTES:–

1 ALL DIMENSIONS ARE IN MILLIMETERS AND LEVELS ARE IN METERS UNLESS OTHERWISE SPECIFIED.

2 ALL DOOR–WINDOW, ETC. HEIGHT SHALL BE CONSIDERED FROM FINISH FLOOR LEVEL.

| REV. | DATE | ALTERED | REV. | DATE | ALTERED | REV. | DATE | ALTERED | REV. | DATE | ALTERED | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | CHD/APPD | | | CHD/APPD | | | CHD/APPD | 01 | 28.09.23 | CHD/APPD | TKR (RDA CIVIL) SV/PLK |
| ZONE | | | ZONE | | | ZONE | | | ZONE | REVISED AS PER OPTCL COMMENTS VIDE LETTER NO. 1669(4) DTD. 01.09.2023 FOR SPACE PROVISION FOR ADDITIONAL 04 NOS OF BAYS. | | |

PROJECT: 400/220kVGIS SUBSTION AT ERSAMA, ODISHA & 400kV AIS FEEDER BAY EXTENSION AT DUBURI, ODISHA

OWNER: ODISHA POWER TRANSMIISSIION CORPORATION LIMITED

BHARAT HEAVY ELECTRICALS LTD. TRANSMISSION BUSINESS GROUP NOIDA

| | NAME | SIGN. | DATE | NO.OF VAR. |
|---|---|---|---|---|
| DRN. | RDA CIVIL | --sd-- | 07.07.2023 | N.A. |
| CHD. | SV/DKS | --sd-- | 07.07.2023 | |
| APPD. | PLK | --sd-- | 07.07.2023 | |

| DEPT. TBG | UNTOL. DIMS. GR. | SCALE | WEIGHT (KG) | REF. TO ASSY. DRG. | ITEM NO. | NO.OF ITEMS |
|---|---|---|---|---|---|---|
| CODE | g/M/f | N.T.S | N.A. | N.A. | N.A. | N.A. |

TITLE: 400Kv GIS BUILDING–ARCH. GROUND FLOOR PLAN

CARD CODE: NA

DRG.NO. TB–1–420–607–640

REV. 01

SHT. No 01 NO. OF SHT. 01

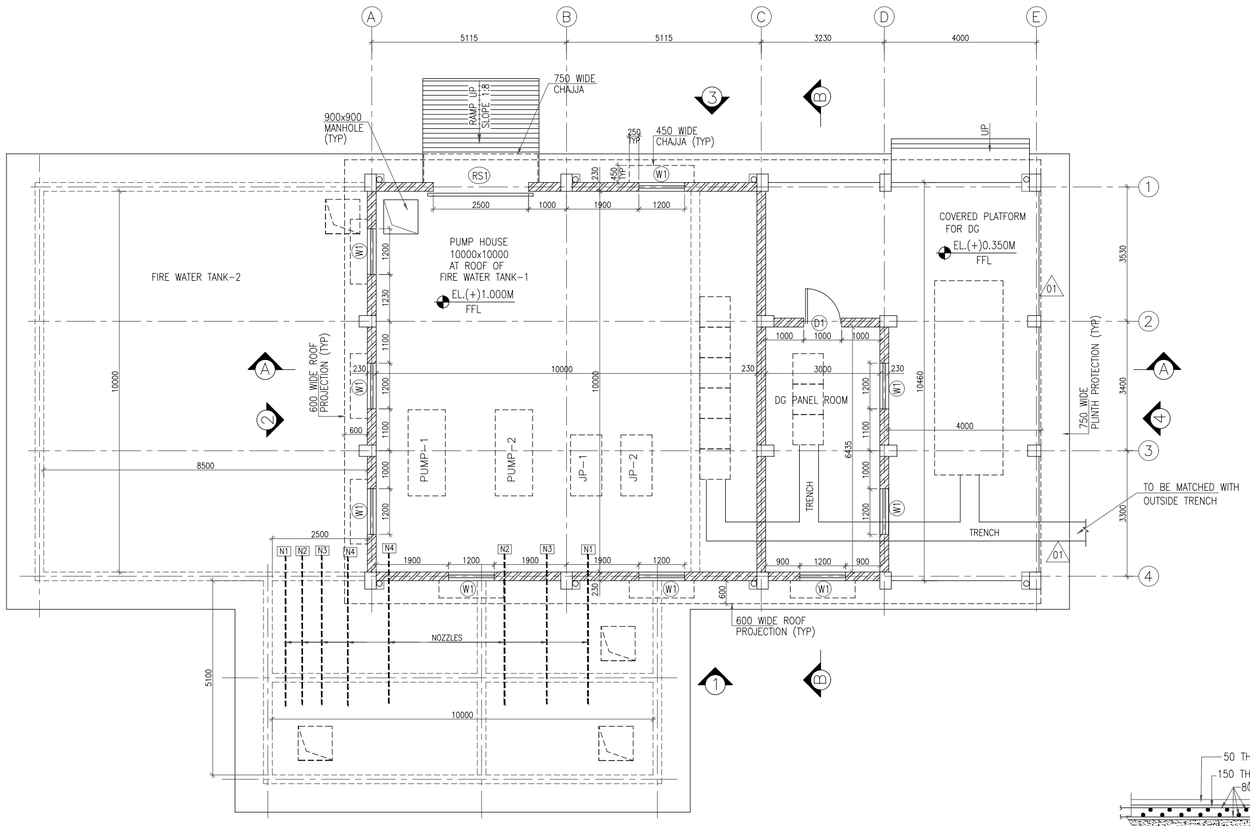
SIZE–A1

FIRST ANGLE PROJECTION

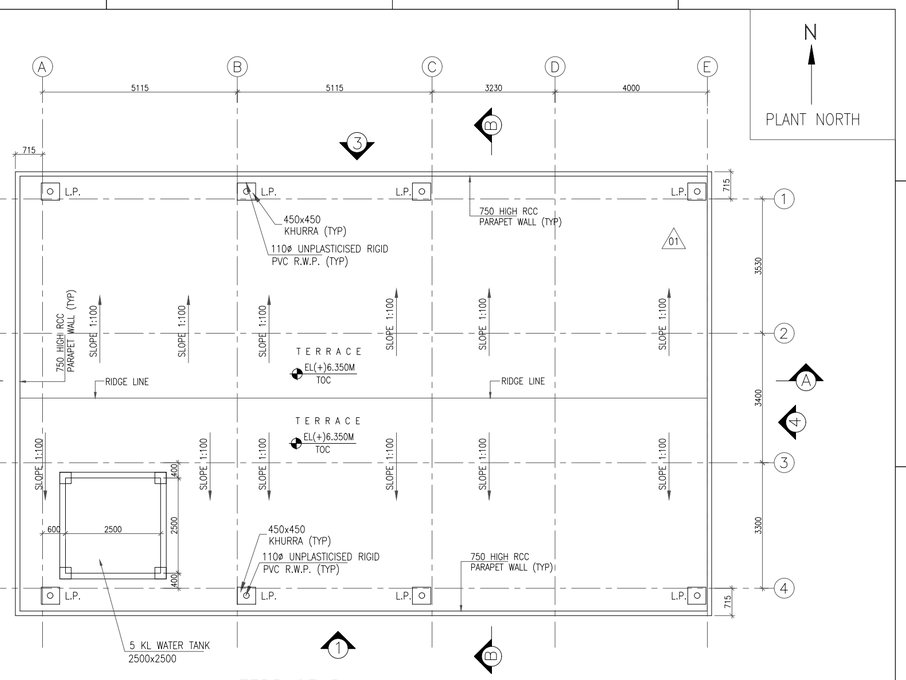
(ALL DIMENSIONS ARE IN mm)

DRG. NO. TB-1-420-607-720





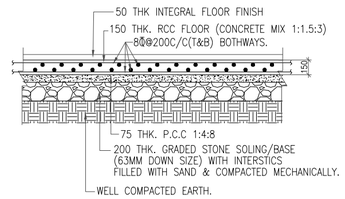

GROUND FLOOR PLAN




TERRACE PLAN

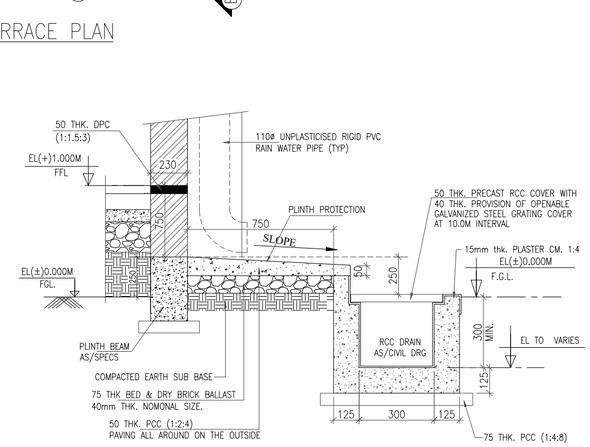
NOTES:–

1. EXACT LOCATION AND SIZE OF NOZZLES (N1,N2,N3,N4) WHICH WILL BE EMBEDDED WHILE CASTING OF UNDERGROUND TANK WALLS, WILL BE SHOWN IN FFPH LAYOUT DRAWING.
2. LOCATIONS AND PUMP FOUNDATION DETAILS SHALL BE PROVIDED IN SEPARATE DRAWING.




DETAIL OF GRADE SLAB

(FOR AREA EXCLUDING ROOF OF WATER TANK)




PLINTH PROTECTION ALONG BUILDING WITH DRAIN–TYPICAL

SCHEDULE OF FINISHES

(AS PER TECHNICAL SPECIFICATION)

1.0 BRICK WORK:

1.1 230mm THK. BRICK MASONARY IN C.M. (1:5) USING FLY ASH BRICK AS PER OPTCL TS.

2.0 PLASTER:

2.1 INTERNAL:
12mm THK. PLASTER (1:6 CEMENT : SAND) MORTOR ON SMOOTH SIDE OF WALL.
15mm THK. PLASTER (1:6 CEMENT : SAND) MORTOR ON ROUGH SIDE OF SINGLE OR HALF BRICK WALL.

2.2 EXTERNAL:
18mm THK. PLASTER IN TWO LAYER.
UNDER LAYER 12mm THK. (1:5 CEMENT : SAND) MORTOR AND TOP LAYER 6mm THK. (1:3 CEMENT : SAND) MORTOR

2.3 CEILING EXCEPT FOR WHERE FALSE CEILING WILL BE PROVIDED.
6mm THK. PLASTER (1:3 CEMENT : SAND)

3.0 FLOORING:

3.1 PANEL ROOM, PUMP HOSE:–
CEMENT CONCRETE WITH METALLIC HARDENER TOPPING.

3.2 SKIRTING:–
150 HIGH SKIRTING MATCHING WITH THE FLOOR SHALL BE PROVIDED.

5.0 PAINTING.

5.1 INSIDE FACES OF BRICK WALL WILL HAVE DISTEMPER.

5.2 OUTSIDE FACES OF WALL BE ACRYLIC SMOOTH EXTERIOR PAINT OVER PLASTER SURFACE.

5.3 CEILING TO HAVE PLASTIC EMULSION PANT.

WATER PROOFING ON ROOF:

CEMENT BASED WATER PROOFING TREATMENT OF ROOFS BALCONIES, TERRACES ETC SHALL BE PROVIDED WITH AVERAGE THICKNESS OF 120MM AND MINIMUM THICKNESS AT KHURRA AS 65 MM AND LAID CONSISTING OF FOLLOWING OPERATIONS:

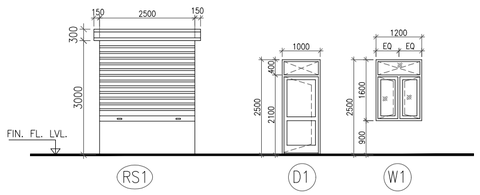
(A) A SLURRY COAT OF NEAT CEMENT USING 2.75 KG/SQM OF CEMENT ADMIXED WITH PROPRIETARY WATER PROOFING COMPOUNDS CONFORMING TO IS: 2645 SHALL BE APPLIED AND GROUTED OVER THE RCC SLAB INCLUDING CLEANING THE SURIACE BEFORE TREATMENT.

(B) PLAIN CEMENT CONCRETE 1:5:10 (1: CEMENT: 5 FINE SAND: 10 BURNT BRICK AGGREGATE OF 40 MM NOMINAI SIZE) ADMIXED WITH PROPRIETARY WATER PROOFING COMPOUND CONFORMING TO IS 2645 OVER 20 MM THICK LAYER OF CEMENT MORTAR OF MIN :5 (CEMENT 5 COARSE SAND) ADMIXED WITH PROPNETARY WATER PROOFING COMPOUND CONFORMING TO IS: 2645 TO REQUIRED SLOPE AN TREATING SIMILARLY THE ADJOINING WALLS UPTO 300 MM HEIGHT INCLUDING ROUNDING OF JUNCTIONS OF WALLS AND SLABS.

(C) AFTER TWO DAY OF PROPER CURMG A SECOND COAT OF CEMENT SLURRY ADMIXED WITH PROPRIETARY WATER PROOFING COMPOUND CONFORMING TO IS 2645 SHALL BE APPLIED.

(D) THE SURFACE SHALL BE FINISHED WITH 20 MM THICK JOINT LESS CEMENT MORTAR OF MIX 1:4 (1 CEMENT :4 COURSE SAND) ADMIXED WITH PROPRIETARY WATER PROOFING COMPOUND CONFORMING TO IS : 2645 AND FINALLY THE SURIACE SHALL BE FINISHED WITH TROWEL WITH NEAT CEMENT SLURRY AND MAKING OF 300 X 300 MM SQUARE

(E) THE WHOLE TERRACE SO FINISHED SHALL BE FLOODED WITH WATER FOR A MINIMUM PERIOD OF TWO WEEKS FOR CURING AND FOR FINAL TEST. ALL ABOVE OPERATIONS SHALL BE DONE IN ORDER AN AS DIRECTED AND SPECIFIED BY THE ENGINEER–IN CHARGE.




SCHEDULE OF DOORS & WINDOWS

| TYPE | OPENING SIZE | FRAME SIZE | CILL LEVEL | LINTEL LEVEL | NOS. | DESCRIPTION |
|---|---|---|---|---|---|---|
| RS1 | 2500x3000 | 2500x3000 | – | 3000 | 1 | SEPARATE DRG SHALL BE REFERRED FOR DOOR/WINDOW DETAILS. |
| D1 | 1000x2500 | 980x2490 | – | 2500 | 1 | |
| W1 | 1200x1600 | 1180x1580 | 900 | 2500 | 9 | |
| | | | | | | |

LEGEND:–

SIDE HUNG OPENABLE PANEL

FIXED GLASS PANEL

FFL. = FINISH FLOOR LEVEL
FGL. = FINISH GRADE LEVEL
H.P. = HIGH POINT
L.P. = LOWER POINT
E.F. = EXHAUST FAN
E.L. = ELEVATION LEVEL
T.O.C = TOP OF CONCRETE
N.T.S = NOT TO SCALE
TYP. = TYPICAL

NOTES:–

1 ALL DIMENSIONS ARE IN MILLIMETERS AND LEVELS ARE IN METERS UNLESS OTHERWISE SPECIFIED.

2 ALL DOOR–WINDOW, ETC. HEIGHT SHALL BE CONSIDERED FROM FINISH FLOOR LEVEL.

| REV. | DATE | ALTERED | REV. | DATE | ALTERED | REV. | DATE | ALTERED | REV. | DATE | ALTERED |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | CHD/APPD | | | CHD/APPD | | | CHD/APPD | 01 | 13.10.2023 | TKR (RDA CIVIL) --sd-- CHD/APPD SV/PLK --sd-- |
| ZONE | | | ZONE | | | ZONE | | | ZONE | | REVISED AS PER COMMENTS VIDE OPTCL LETTER NO. CAMP/BBSR/119 DTD. 31.08.2023. |

PROJECT: 400/220kVGIS SUBSTION AT ERSAMA, ODISHA & 400kV AIS FEEDER BAY EXTENSION AT DUBURI, ODISHA

OWNER: ODISHA POWER TRANSMIISSIION CORPORATION LIMITED

BHARAT HEAVY ELECTRICALS LTD. TRANSMISSION BUSINESS GROUP NOIDA

| | NAME | SIGN. | DATE | NO.OF VAR. |
|---|---|---|---|---|
| DRN. | RDA CIVIL | --sd-- | 01.08.2023 | N.A. |
| CHD. | SV/AR | --sd-- | 01.08.2023 | |
| APPD. | PLK | --sd-- | 02.08.2023 | |

| DEPT. TBG | UNTOL. DIMS. GR. | | SCALE | WEIGHT (KG) | REF. TO ASSY. DRG. | ITEM NO. | NO.OF ITEMS |
|---|---|---|---|---|---|---|---|
| CODE | g/M/g | | N.T.S | N.A. | N.A. | N.A. | N.A. |

TITLE: FIRE FIGHTING PUMP HOUSE & DG ROOM– GROUND FLOOR PLAN & TERRACE PLAN

CARD CODE: NA

DRG.NO. TB–1–420–607–720

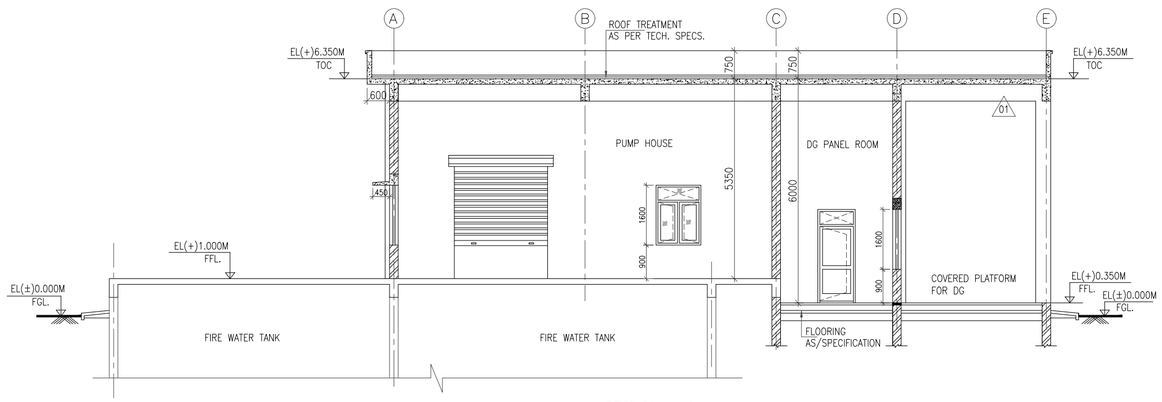
REV. 01

SHT. No 01 NO. OF SHT. 01

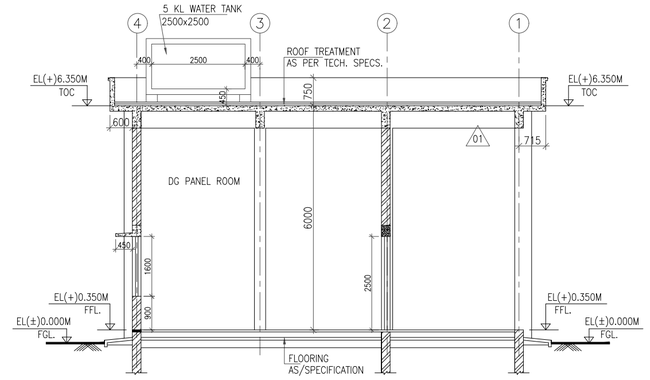
FIRST ANGLE PROJECTION

(ALL DIMENSIONS ARE IN mm)

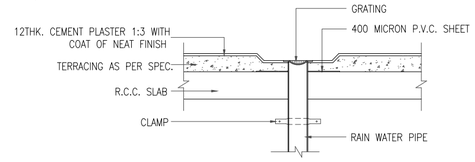
DRG. NO. TB-1-420-607-721



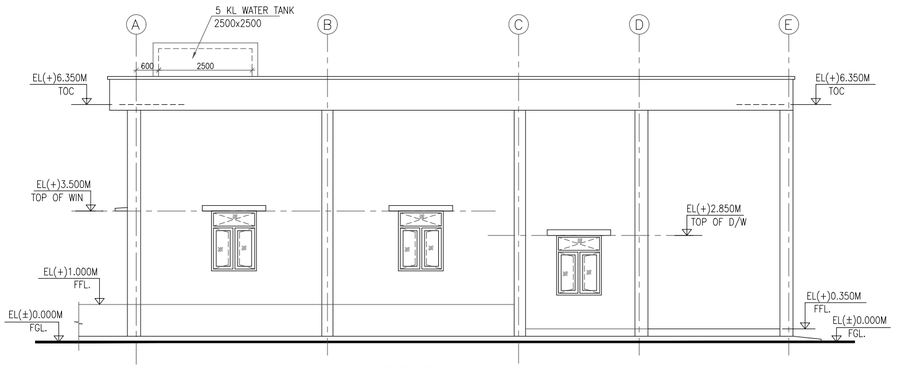

SECTION A–A



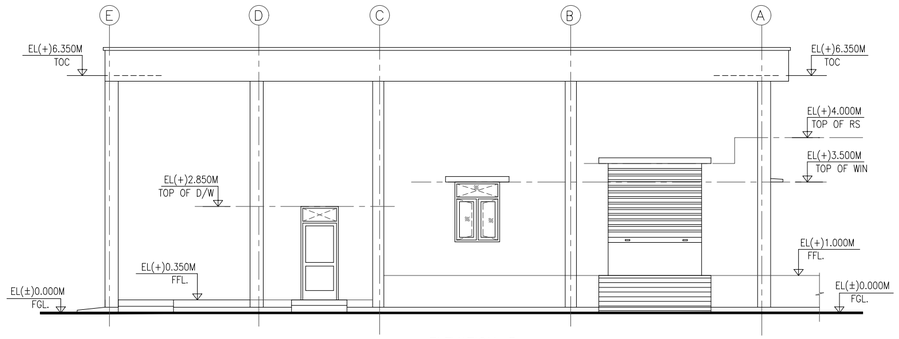

SECTION B–B



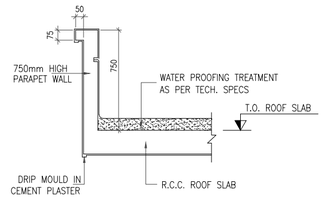

TYPICAL DETAIL OF KHURRA WITH RAIN WATER PIPE



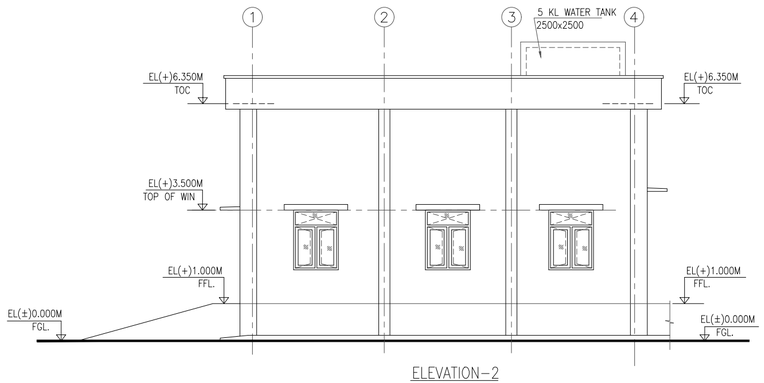

ELEVATION–1



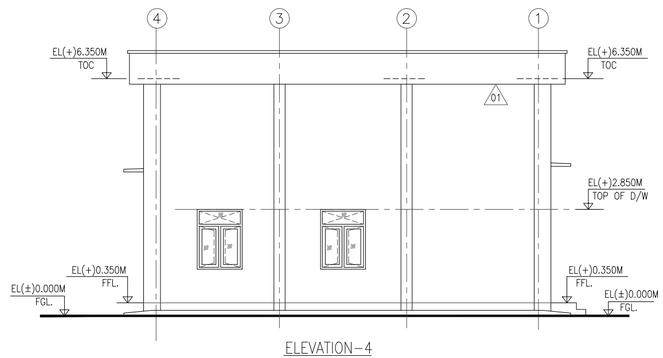

ELEVATION–3



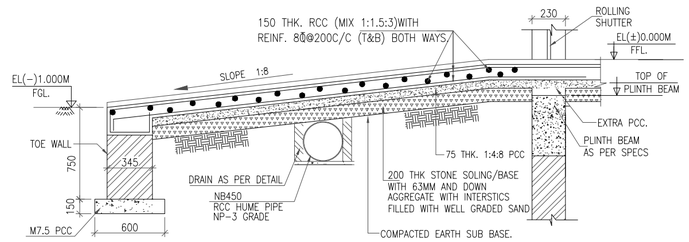

TYP. DETAIL OF PARAPET




ELEVATION–2




ELEVATION–4




DETAIL OF RAMP

NOTES:–

1 ALL DIMENSIONS ARE IN MILLIMETERS AND LEVELS ARE IN METERS UNLESS OTHERWISE SPECIFIED.

2 ALL DOOR–WINDOW, ETC. HEIGHT SHALL BE CONSIDERED FROM FINISH FLOOR LEVEL.

| | |
|---|---|
| PROJECT: | 400/220kVGIS SUBSTION AT ERSAMA, ODISHA & 400kV AIS FEEDER BAY EXTENSION AT DUBURI, ODISHA |
| OWNER: | ODISHA POWER TRANSMIISSIION CORPORATION LIMITED |

BHARAT HEAVY ELECTRICALS LTD. TRANSMISSION BUSINESS GROUP NOIDA

| | NAME | SIGN. | DATE | NO.OF VAR. |
|---|---|---|---|---|
| DRN. | RDA CIVIL | --sd-- | 01.08.2023 | N.A. |
| CHD. | SV/AR | --sd-- | 01.08.2023 | |
| APPD. | PLK | --sd-- | 02.08.2023 | |

| DEPT. | UNTOL. DIMS. | SCALE | WEIGHT (KG) | REF. TO ASSY. DRG. | ITEM NO. | NO.OF ITEMS |
|---|---|---|---|---|---|---|
| TBG | GR. g/M/g | N.T.S | N.A. | N.A. | N.A. | N.A. |
| CODE | | | | | | |

TITLE: FIRE FIGHTING PUMP HOUSE & DG ROOM– SECTIONS & ELEVATIONS

CARD CODE: NA

DRG.NO. TB–1–420–607–721

REV. 01

SHT. No 01 NO. OF SHT. 01

| REV. | DATE | ALTERED | REV. | DATE | ALTERED | REV. | DATE | ALTERED | REV. | DATE | ALTERED |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | CHD/APPD | | | CHD/APPD | | | CHD/APPD | 01 | 13.10.2023 | TKR (RDA CIVIL) --sd-- SV/PLK --sd-- CHD/APPD |
| ZONE | | | ZONE | | | ZONE | | | ZONE | | REVISED AS PER COMMENTS VIDE OPTCL LETTER NO. CAMP/BBSR/119 DTD. 31.08.2023. |

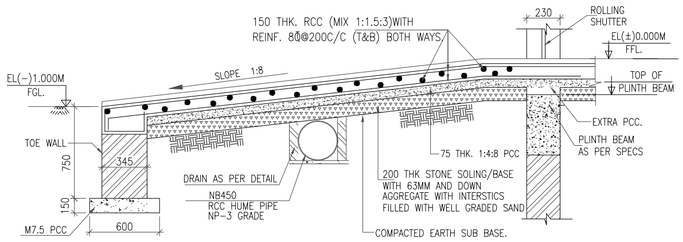
SIZE–A1

FIRST ANGLE PROJECTION

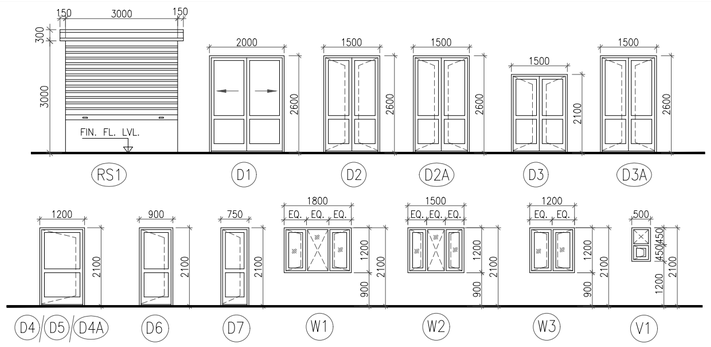
(ALL DIMENSIONS ARE IN mm)

DRG. NO. TB-1-420-607-700



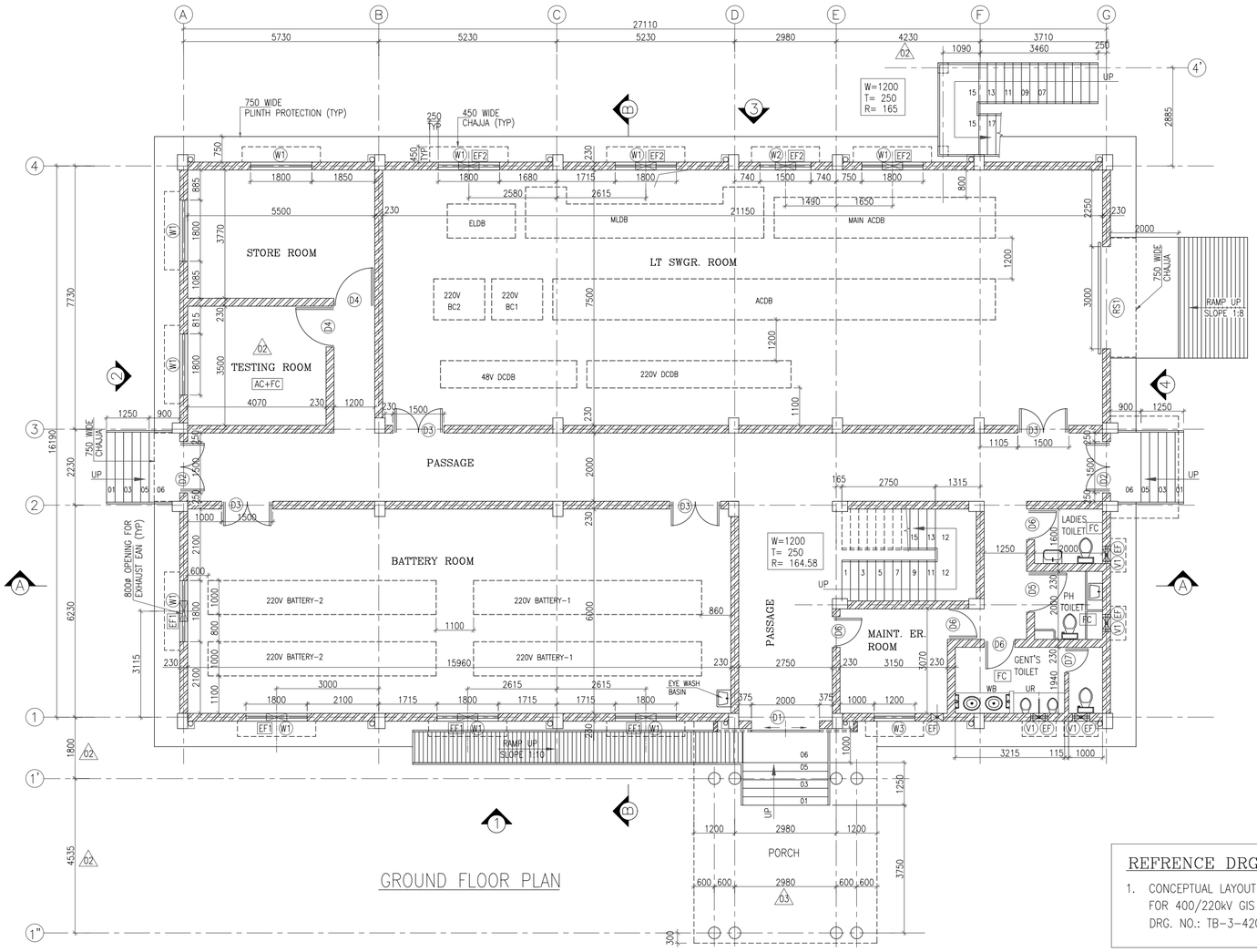



DETAIL OF RAMP

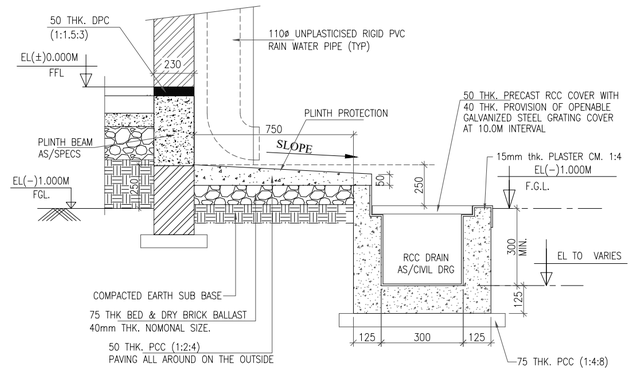



## SCHEDULE OF DOORS & WINDOWS

| TYPE | OPENING SIZE | FRAME SIZE | CILL LEVEL | LINTEL LEVEL | NOS. (GR. FL.) | NOS. (FIRST+ TERRACE FL) | REMARK | DESCRIPTION |
|---|---|---|---|---|---|---|---|---|
| RS1 | 3000x3000 | 3000x3000 | – | 3000 | 1 | – | AS PER SPEC & CONTRACT BOQ | SEPARATE DRAWING SHALL BE REFERRED FOR DOOR/WINDOW DETAILS. |
| D1 | 2000x2600 | 1980x2590 | – | 2600 | 1 | – | AUTOMATED SENSOR SLIDING DOOR AS PER SPEC & CONTRACT BOQ | |
| D2 | 1500x2600 | 1480x2590 | – | 2600 | 2 | – | AS PER SPEC & CONTRACT BOQ | |
| D2A | 1500x2600 | 1480x2590 | – | 2600 | – | 1 | AS PER SPEC & CONTRACT BOQ | |
| D3 | 1500x2100 | 1380x2090 | – | 2100 | 5 | – | AS PER SPEC & CONTRACT BOQ | |
| D3A | 1500x2600 | 1380x2590 | – | 2600 | – | 1 | AUTOMATED SENSOR DOOR AS PER SPEC & CONTRACT BOQ | |
| D3B | 1500x2600 | 1380x2590 | – | 2600 | – | 1 | AS PER SPEC & CONTRACT BOQ | |
| D4 | 1200x2100 | 1180x2090 | – | 2100 | – | 5+1=6 | AS PER SPEC & CONTRACT BOQ | |
| D4A | 1200x2100 | 1180x2090 | – | 2100 | – | 1 | AS PER SPEC & CONTRACT BOQ | |
| D5 | 1200x2100 | 1180x2090 | – | 2100 | 1 | 1 | AS PER SPEC & CONTRACT BOQ | |
| D6 | 900x2100 | 880x2090 | – | 2100 | 4 | 4 | AS PER SPEC & CONTRACT BOQ | |
| D7 | 750x2100 | 730x2090 | – | 2100 | 1 | 4 | AS PER SPEC & CONTRACT BOQ | |
| W1 | 1800x1200 | 1780x1180 | 900 | 2100 | 11 | 6 | AS PER SPEC & CONTRACT BOQ | |
| W2 | 1500x1200 | 1480x1180 | 900 | 2100 | 2 | 3 | AS PER SPEC & CONTRACT BOQ | |
| W3 | 1200x1200 | 1180x1180 | 900 | 2100 | – | 4 | AS PER SPEC & CONTRACT BOQ | |
| V1 | 500x900 | 480x880 | 1600 | 2100 | 4 | 7 | AS PER SPEC & CONTRACT BOQ | |
| FG1 | 5540x1800 | 5520x1780 | 300 | 2100 | – | 1 | AS PER SPEC & CONTRACT BOQ | |
| FG2 | 3400x1800 | 3380x1780 | 300 | 2100 | – | 1 | AS PER SPEC & CONTRACT BOQ | |
| FG3 | 3020x1800 | 3000x1780 | 300 | 2100 | – | 1 | AS PER SPEC & CONTRACT BOQ | |
| FG4 | 2290x1800 | 2270x1780 | 300 | 2100 | – | 1 | AS PER SPEC & CONTRACT BOQ | |




GROUND FLOOR PLAN




PLINTH PROTECTION ALONG BUILDING WITH DRAIN-TYPICAL

LEGEND:-

- SIDE HUNG OPENABLE PANEL
- FIXED GLASS PANEL

FFL. = FINISH FLOOR LEVEL
FGL. = FINISH GRADE LEVEL
H.P. = HIGH POINT
L.P. = LOWER POINT
E.F. = EXHAUST FAN
E.L. = ELEVATION LEVEL
T.O.C = TOP OF CONCRETE
N.T.S = NOT TO SCALE
TYP. = TYPICAL
AC = AIR CONDITIONED
FC = FALSE CEILING
FF = FALSE FLOOR

NOTES:-

1 ALL DIMENSIONS ARE IN MILLIMETERS AND LEVELS ARE IN METERS UNLESS OTHERWISE SPECIFIED.

2 ALL DOOR-WINDOW, ETC. HEIGHT SHALL BE CONSIDERED FROM FINISH FLOOR LEVEL.

REFRENCE DRGS.

1. CONCEPTUAL LAYOUT OF CONTROL ROOM BUILDING FOR 400/220kV GIS SUB STATION AT ERSAMA DRG. NO.: TB-3-420-316-002

| REV. | DATE | ALTERED | REV. | DATE | ALTERED RDA | REV. | DATE | ALTERED RDA CIVIL | REV. | DATE | ALTERED RDA |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | CHD/APPD | 03 | 13-10-23 | CHD/APPD SV/AK | 02 | 18-08-23 | CHD/APPD SV/AK | 01 | 14-06-23 | CHD/APPD SV/AK |
| ZONE | | | ZONE | REVISED AS PER COMMENTS BY OPTCL DTD. 11.10.23. | | ZONE | REVISED AS PER COMMENTS BY OPTCL | | ZONE | REVISED AS PER COMMENTS BY OPTCL INFORMED IN THE DISCUSSIONS & MEETING DTD. 22-25.05.2023 AT OPTCL BHUBANESWAR OFFICE AND AS PER ELECTRICAL / MECHANICAL REQUIREMENTS. | |

PROJECT: 400/220kVGIS SUBSTION AT ERSAMA, ODISHA & 400kV AIS FEEDER BAY EXTENSION AT DUBURI, ODISHA

OWNER: ODISHA POWER TRANSMIISSIION CORPORATION LIMITED

BHARAT HEAVY ELECTRICALS LTD. TRANSMISSION BUSINESS GROUP NOIDA

| | NAME | SIGN. | DATE | NO.OF VAR. |
|---|---|---|---|---|
| DRN. | RDA CIVIL | --sd-- | 01.05.2023 | N.A. |
| CHD. | SV/AK | --sd-- | 02.05.2023 | |
| APPD. | PLK | --sd-- | 02.05.2023 | |

| DEPT. TBG CODE | UNTOL. DIMS. GR. G/M/F | SCALE N.T.S | WEIGHT (KG) N.A. | REF. TO ASSY. DRG. N.A. | ITEM NO. N.A. | NO.OF ITEMS N.A. |
|---|---|---|---|---|---|---|

TITLE: CONTROL ROOM BUILDING – GROUND FLOOR PLAN

CARD CODE: NA

DRG.NO. TB-1-420-607-700 REV. 03

SHT. No 01 NO. OF SHT. 01

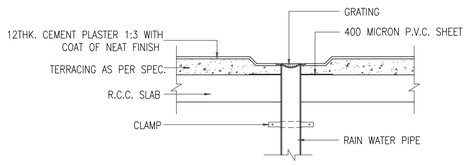
SIZE-A1

FIRST ANGLE PROJECTION

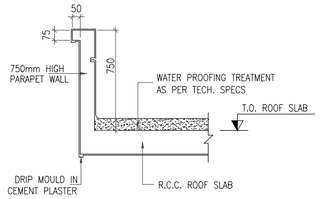
(ALL DIMENSIONS ARE IN mm)

DRG. NO. TB-1-420-607-701

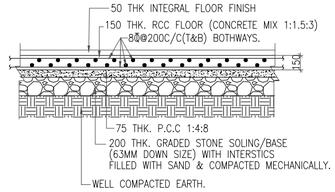




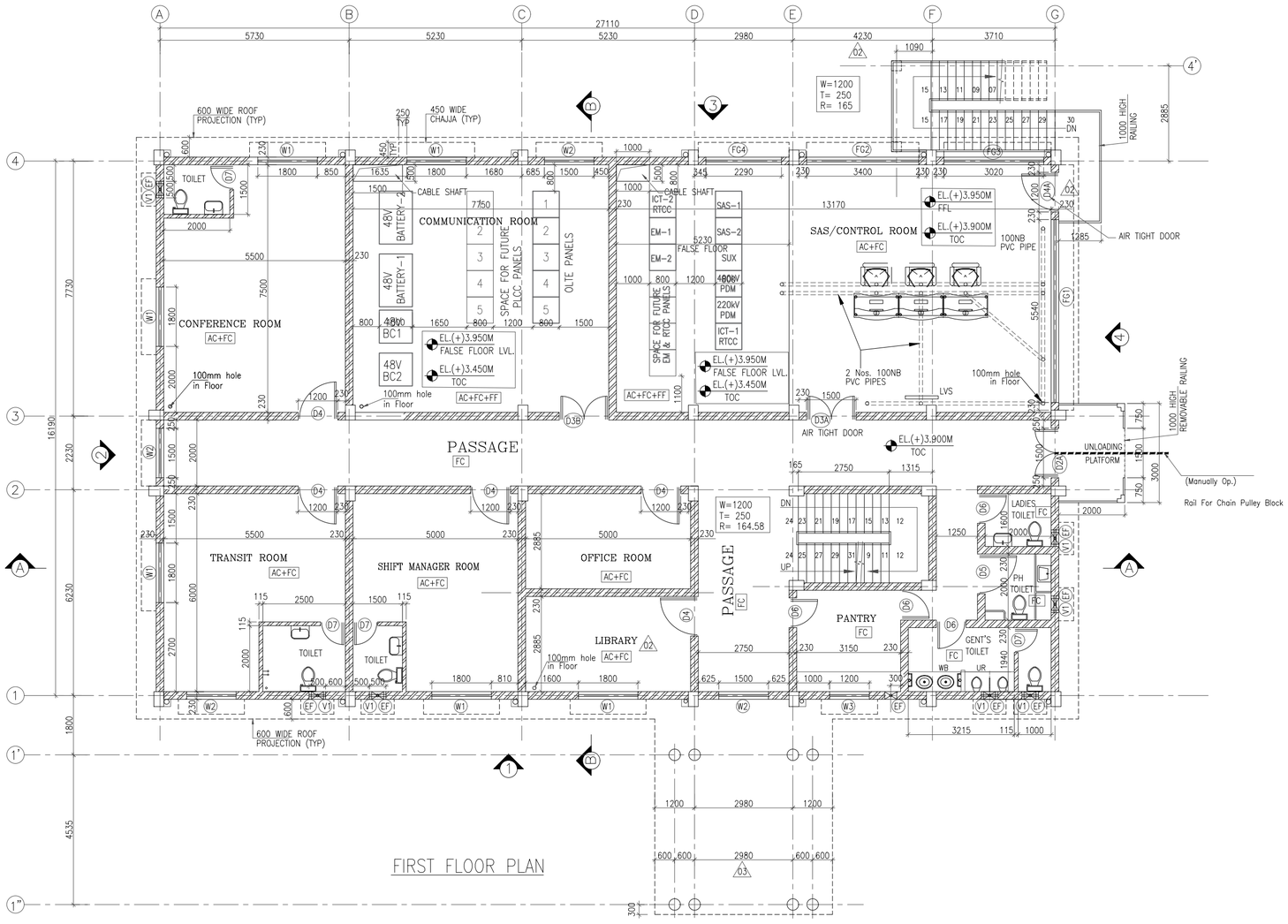

TYPICAL DETAIL OF KHURRA WITH RAIN WATER PIPE




TYP. DETAIL OF PARAPET




DETAIL OF GRADE SLAB




FIRST FLOOR PLAN

SCHEDULE OF FINISHES

(AS PER TECHNICAL SPECIFICATION)

1.0 BRICK WORK:

1.1 230mm THK. BRICK MASONARY IN C.M. (1:5) USING FLY ASH BRICK AS PER OPTCL TS.

2.0 PLASTER:

2.1 INTERNAL:
12mm THK. PLASTER (1:6 CEMENT : SAND) MORTOR ON SMOOTH SIDE OF WALL.
15mm THK. PLASTER (1:6 CEMENT : SAND) MORTOR ON ROUGH SIDE OF SINGLE OR HALF BRICK WALL.

2.2 EXTERNAL:
18mm THK. PLASTER IN TWO LAYER.
UNDER LAYER 12mm THK. (1:5 CEMENT : SAND) MORTOR AND TOP LAYER 6mm THK. (1:3 CEMENT : SAND) MORTOR

2.3 CEILING EXCEPT FOR WHERE FALSE CEILING WILL BE PROVIDED.
6mm THK. PLASTER (1:3 CEMENT : SAND)

3.0 FLOORING:

3.1 OFFICE, PASSAGE, TRANSIT ROOM, CONFERENCE RM, SAS ROOM:–
DOUBLE CHARGED GLAZED VITRIFIED DIGITAL TILE FLOORING AS PER OPTCL TS. 02

3.2 BATTERY ROOM:–
ACID AND ALKALI RESISTANT TILES FLOORING.
ACID AND ALKALI RESISTANT TILES UPTO FULL WALL OF BATTERY ROOM. 02

3.3 LT SWITCH GEAR ROOM, MAINTENANCE ROOM, STORE ROOM:–
DOUBLE CHARGED GLAZED VITRIFIED DIGITAL TILE FLOORING AS PER OPTCL TS. 02

3.4 SHIFT MANAGER ROOM, CHARGER ROOM, STORE ROOM:–
DOUBLE CHARGED GLAZED VITRIFIED DIGITAL TILE FLOORING AS PER OPTCL TS. 02

3.5 TOILET, PANTRY:–
ANTI–SKID CERAMIC DIGITAL TILES IN TOILET FLOORING AND DOUBLE CHARGED
02 VITRIFIED DIGITAL TILE IN PANTRY FLOORING AND SAME TILE ON WALL UPTO CEILING.

3.6 SKIRTING:–
02 230 HIGH SKIRTING MATCHING WITH THE FLOOR SHALL BE PROVIDED.

5.0 PAINTING. AS PER TS MENTIONED IN CIVIL (PAINTING DETAILS)

5.1 INSIDE FACES OF BRICK WALL WILL HAVE PLASTIC EMULSION/ACRYLIC EMULSION PAINT IN ALL AC AREA, DISTEMPER IN ALL OTHER AREA AND IN TOILET WILL HAVE ABOVE DADO WHITE WASH.

5.2 OUTSIDE FACES OF WALL BE ACRYLIC SMOOTH EXTERIOR PAINT OVER PLASTER SURFACE.

5.3 CEILING TO HAVE PLASTIC EMULSION PANT, IN BATTERY ROOM HAVE ACID PROOF PAINT. FALSE CEILING IN PASSAGE AT FIRST FLOOR, CHARGER ROOM, TRANSIT ROOM, SAS ROOM, OFFICE ROOM, CONFERENCE ROOM, CHARGER ROOM, TOILET & PANTRY.

6.0 FURNITURE

6.1 CHAIR, TABLE/DESK & OTHER FURNITURE SHOWN IN THIS DRAWING ARE INDICATIVE. THEIR SUPPLY iS NOT IN THE SCOPE OF BHEL.

WATER PROOFING ON ROOF:

CEMENT BASED WATER PROOFING TREATMENT OF ROOFS BALCONIES, TERRACES ETC SHALL BE PROVIDED WITH AVERAGE THICKNESS OF 120MM AND MINIMUM THICKNESS AT KHURRA AS 65 MM AND LAID CONSISTING OF FOLLOWING OPERATIONS:

(A) A SLURRY COAT OF NEAT CEMENT USING 2.75 KG/SQM OF CEMENT ADMIXED WITH PROPRIETARY WATER PROOFING COMPOUNDS CONFORMING TO IS: 2645 SHALL BE APPLIED AND GROUTED OVER THE RCC SLAB INCLUDING CLEANING THE SURIACE BEFORE TREATMENT.

(B) PLAIN CEMENT CONCRETE 1:5:10 (1: CEMENT: 5 FINE SAND: 10 BURNT BRICK AGGREGATE OF 40 MM NOMINAI SIZE) ADMIXED WITH PROPRIETARY WATER PROOFING COMPOUND CONFORMING TO IS 2645 OVER 20 MM THICK LAYER OF CEMENT MORTAR OF MIN :5 (CEMENT 5 COARSE SAND) ADMIXED WITH PROPNETARY WATER PROOFING COMPOUND CONFORMING TO IS: 2645 TO REQUIRED SLOPE AN TREATING SIMILARLY THE ADJOINING WALLS UPTO 300 MM HEIGHT INCLUDING ROUNDING OF JUNCTIONS OF WALLS AND SLABS.

(C) AFTER TWO DAY OF PROPER CURMG A SECOND COAT OF CEMENT SLURRY ADMIXED WITH PROPRIETARY WATER PROOFING COMPOUND CONFORMING TO IS 2645 SHALL BE APPLIED.

(D) THE SURFACE SHALL BE FINISHED WITH 20 MM THICK JOINT LESS CEMENT MORTAR OF MIX 1:4 (1 CEMENT :4 COURSE SAND) ADMIXED WITH PROPRIETARY WATER PROOFING COMPOUND CONFORMING TO IS : 2645 AND FINALLY THE SURIACE SHALL BE FINISHED WITH TROWEL WITH NEAT CEMENT SLURRY AND MAKING OF 300 X 300 MM SQUARE

(E) THE WHOLE TERRACE SO FINISHED SHALL BE FLOODED WITH WATER FOR A MINIMUM PERIOD OF TWO WEEKS FOR CURING AND FOR FINAL TEST. ALL ABOVE OPERATIONS SHALL BE DONE IN ORDER AN AS DIRECTED AND SPECIFIED BY THE ENGINEER–IN CHARGE.

NOTES:–

1 ALL DIMENSIONS ARE IN MILLIMETERS AND LEVELS ARE IN METERS UNLESS OTHERWISE SPECIFIED.

2 ALL DOOR–WINDOW, ETC. HEIGHT SHALL BE CONSIDERED FROM FINISH FLOOR LEVEL.

| REV. | DATE | ALTERED | REV. | DATE | ALTERED RDA | REV. | DATE | ALTERED RDA CIVIL | REV. | DATE | ALTERED RDA CIVIL |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | CHD/APPD | 03 | 13–10–23 | CHD/APPD SV/AK | 02 | 18–08–23 | CHD/APPD SV/AK | 01 | 14–06–23 | CHD/APPD SV/AK |
| ZONE | | | ZONE | REVISED AS PER COMMENTS BY OPTCL DTD. 11.10.23. | | ZONE | REVISED AS PER COMMENTS BY OPTCL | | ZONE | REVISED AS PER COMMENTS BY OPTCL INFORMED IN THE DISCUSSIONS & MEETING DTD. 22–25.05.2023 AT OPTCL BHUBANESWAR OFFICE AND AS PER ELECTRICAL / MECHANICAL REQUIREMENTS. | |

PROJECT: 400/220kVGIS SUBSTION AT ERSAMA, ODISHA & 400kV AIS FEEDER BAY EXTENSION AT DUBURI, ODISHA

OWNER: ODISHA POWER TRANSMIISSIION CORPORATION LIMITED

BHARAT HEAVY ELECTRICALS LTD. TRANSMISSION BUSINESS GROUP NOIDA

| | NAME | SIGN. | DATE | NO.OF VAR. |
|---|---|---|---|---|
| DRN. | RDA CIVIL | --sd-- | 01.05.2023 | N.A. |
| CHD. | SV/AK | --sd-- | 02.05.2023 | |
| APPD. | PLK | --sd-- | 02.05.2023 | |

| DEPT. TBG CODE | UNTOL. DIMS. GR. g/M/f | SCALE N.T.S | WEIGHT (KG) N.A. | REF. TO ASSY. DRG. N.A. | ITEM NO. N.A. | NO.OF ITEMS N.A. |
|---|---|---|---|---|---|---|

TITLE: CONTROL ROOM BUILDING – FIRST FLOOR PLAN

CARD CODE: NA

DRG.NO. TB–1–420–607–701 REV. 03

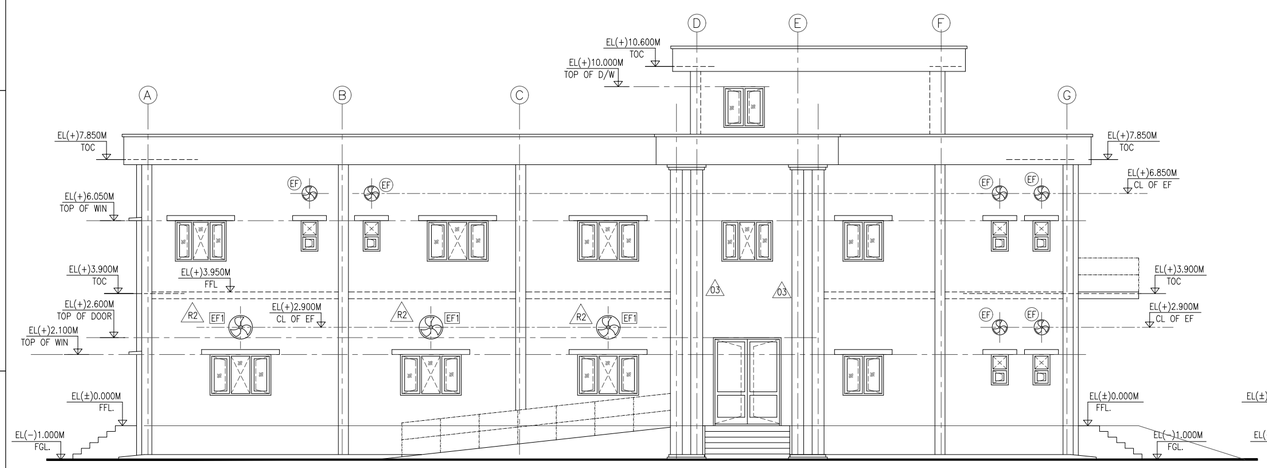
SHT. No 01 NO. OF SHT. 01

SIZE–A1

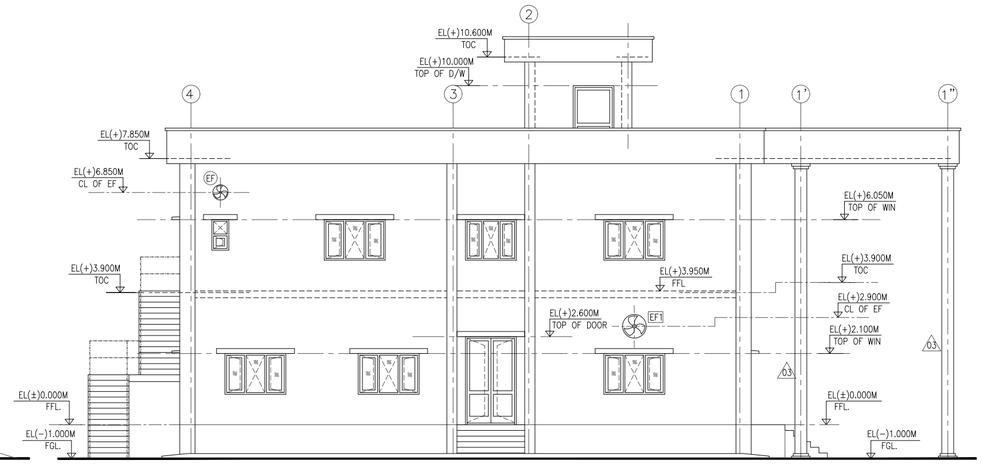
FIRST ANGLE PROJECTION

(ALL DIMENSIONS ARE IN mm)

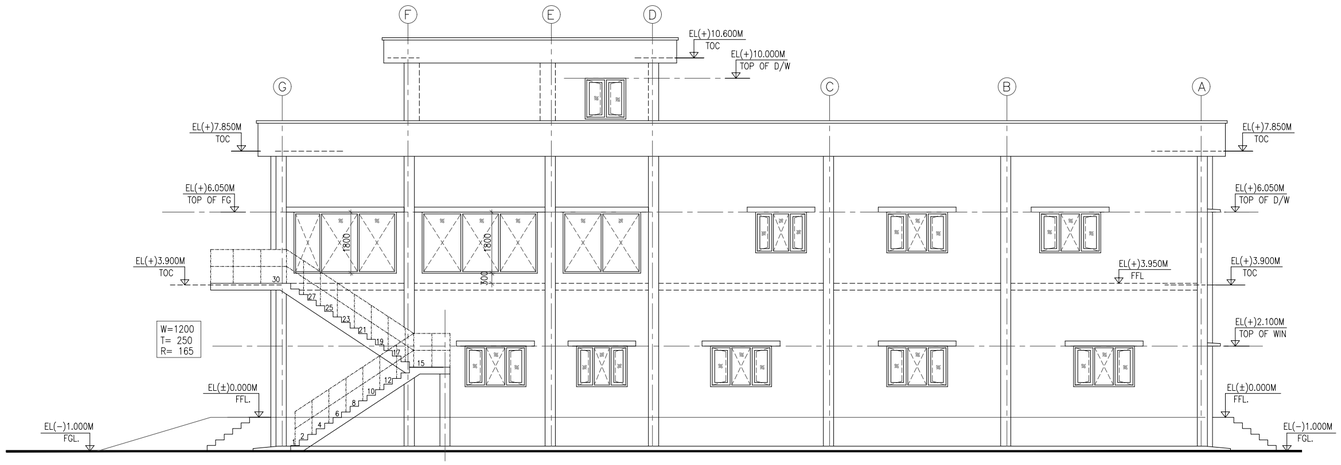
DRG. NO. TB-1-420-607-703




ELEVATION–1




ELEVATION–2




ELEVATION–3

NOTES:–

1 ALL DIMENSIONS ARE IN MILLIMETERS AND LEVELS ARE IN METERS UNLESS OTHERWISE SPECIFIED.

2 ALL DOOR–WINDOW, ETC. HEIGHT SHALL BE CONSIDERED FROM FINISH FLOOR LEVEL.

| | |
|---|---|
| PROJECT: | 400/220kVGIS SUBSTION AT ERSAMA, ODISHA & 400kV AIS FEEDER BAY EXTENSION AT DUBURI, ODISHA |
| OWNER: | ODISHA POWER TRANSMIISSIION CORPORATION LIMITED (OPTCL) |

BHARAT HEAVY ELECTRICALS LTD.
TRANSMISSION BUSINESS GROUP
NOIDA

| | NAME | SIGN. | DATE | NO.OF VAR. |
|---|---|---|---|---|
| DRN. | RDA CIVIL | --sd-- | 01.05.2023 | N.A. |
| CHD. | SV/AK | --sd-- | 02.05.2023 | |
| APPD. | PLK | --sd-- | 02.05.2023 | |

| DEPT. TBG | UNTOL. DIMS. GR. | SCALE | WEIGHT (KG) | REF. TO ASSY. DRG. | ITEM NO. | NO.OF ITEMS |
|---|---|---|---|---|---|---|
| CODE | g/M/f | N.T.S | N.A. | N.A. | N.A. | N.A. |

TITLE: CONTROL ROOM BUILDING – ELEVATIONS

CARD CODE: NA

DRG.NO. TB–1–420–607–703

REV. 03

SHT. No 01 NO. OF SHT. 01

| REV. | DATE | ALTERED | REV. | DATE | ALTERED | REV. | DATE | ALTERED | REV. | DATE | ALTERED |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | CHD/APPD | 03 | 13–10–23 | RDA CIVIL CHD/APPD SV/AK | 02 | 18–08–23 | RDA CIVIL CHD/APPD SV/AK | 01 | 14–06–23 | RDA CIVIL CHD/APPD SV/AK |
| ZONE | | | ZONE | REVISED AS PER COMMENTS BY OPTCL DTD. 11.10.23. | | ZONE | REVISED AS PER COMMENTS BY OPTCL | | ZONE | REVISED AS PER COMMENTS BY OPTCL INFORMED IN THE DISCUSSIONS & MEETING DTD. 22–25.05.2023 AT OPTCL BHUBANESWAR OFFICE AND AS PER ELECTRICAL / MECHANICAL REQUIREMENTS.. | |

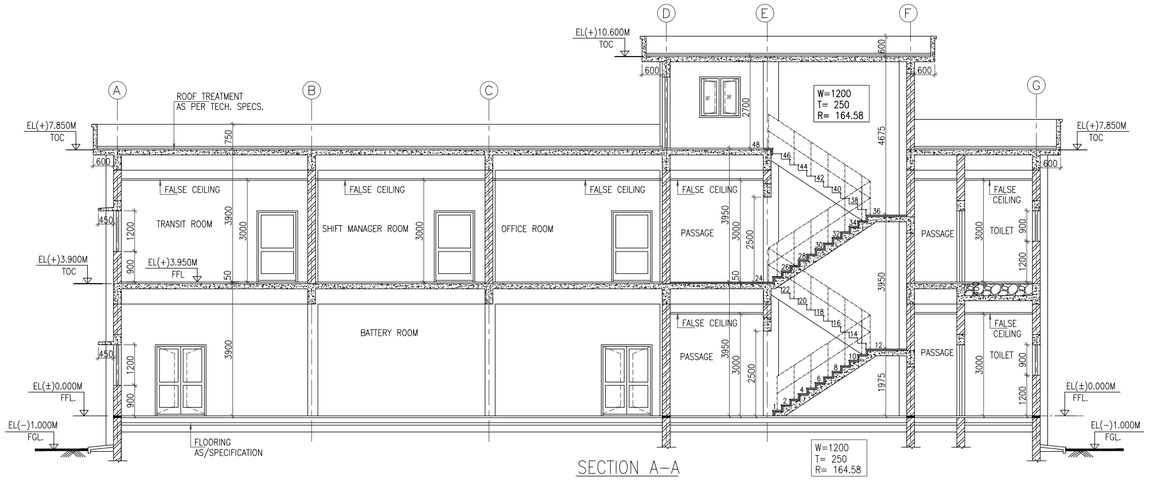
SIZE–A1

FIRST ANGLE PROJECTION

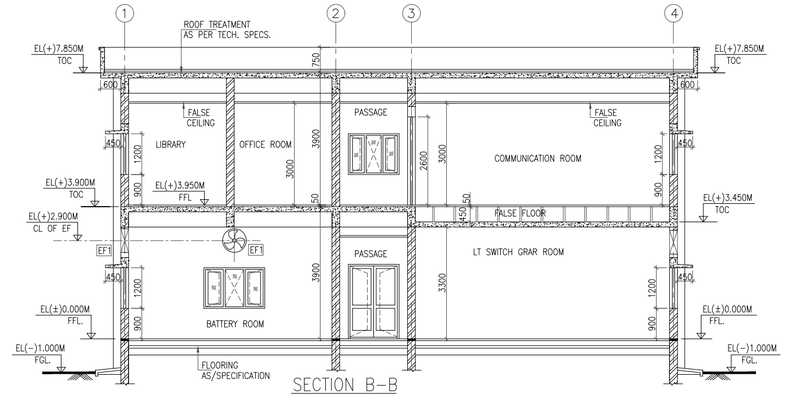
(ALL DIMENSIONS ARE IN mm)

DRG. NO. TB-1-420-607-702

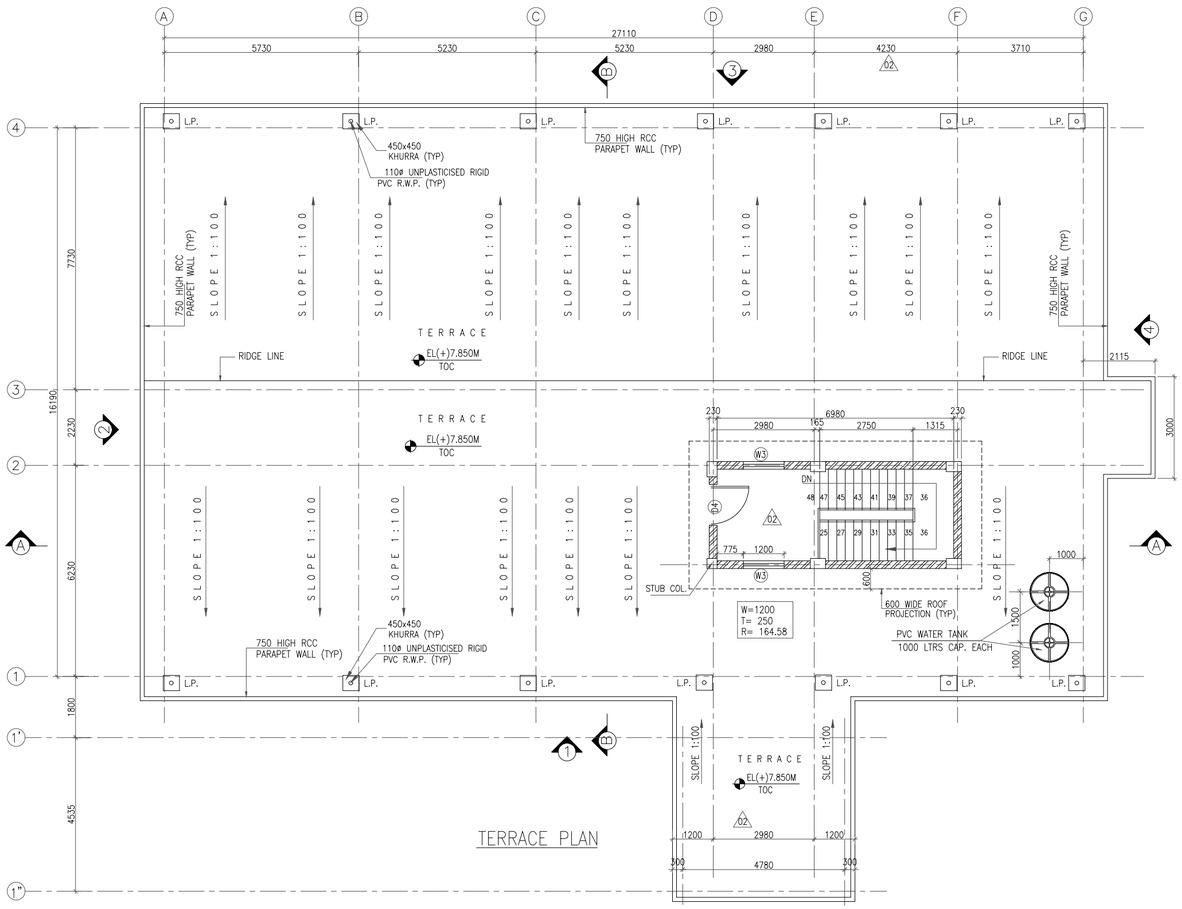




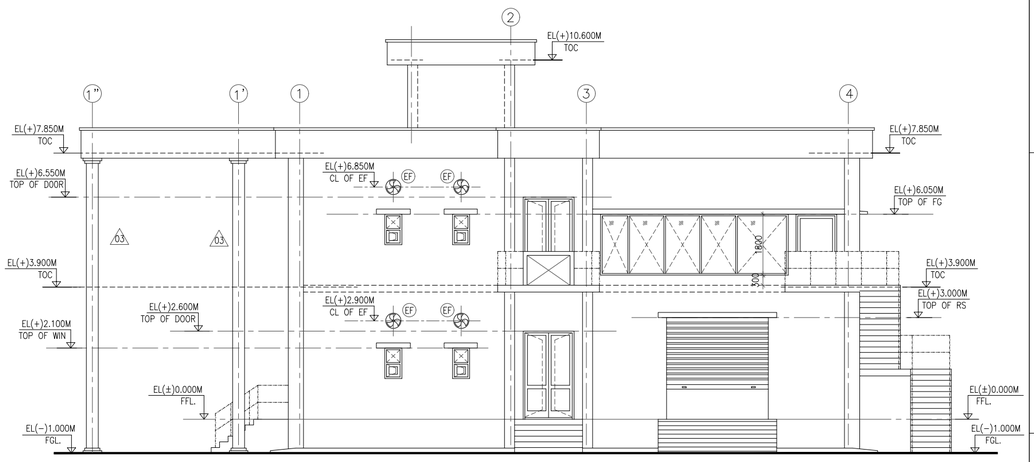

SECTION A–A




SECTION B–B




TERRACE PLAN




ELEVATION–4

NOTES:–

1 ALL DIMENSIONS ARE IN MILLIMETERS AND LEVELS ARE IN METERS UNLESS OTHERWISE SPECIFIED.

2 ALL DOOR–WINDOW, ETC. HEIGHT SHALL BE CONSIDERED FROM FINISH FLOOR LEVEL.

| | |
|---|---|
| PROJECT: | 400/220kVGIS SUBSTION AT ERSAMA, ODISHA & 400kV AIS FEEDER BAY EXTENSION AT DUBURI, ODISHA |
| OWNER: | ODISHA POWER TRANSMIISSIION CORPORATION LIMITED |

BHARAT HEAVY ELECTRICALS LTD. TRANSMISSION BUSINESS GROUP NOIDA

| | NAME | SIGN. | DATE | NO.OF VAR. |
|---|---|---|---|---|
| DRN. | RDA CIVIL | --sd-- | 01.05.2023 | N.A. |
| CHD. | SV/AK | --sd-- | 02.05.2023 | |
| APPD. | PLK | --sd-- | 02.05.2023 | |

| DEPT. | UNTOL. DIMS. | | SCALE | WEIGHT (KG) | REF. TO ASSY. DRG. | ITEM NO. | NO.OF ITEMS |
|---|---|---|---|---|---|---|---|
| TBG | GR. | | | | | | |
| CODE | g/m/f | | N.T.S | N.A. | N.A. | N.A. | N.A. |

TITLE: CONTROL ROOM BUILDING – TERRACE PLAN & SECTIONS

CARD CODE: NA

DRG.NO. TB–1–420–607–702

REV. 03

SHT. No 01 NO. OF SHT. 01

SIZE–A1

| REV. | DATE | ALTERED | REV. | DATE | ALTERED RDA CIVIL | REV. | DATE | ALTERED RDA CIVIL | REV. | DATE | ALTERED RDA CIVIL |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | CHD/APPD | 03 | 13–10–23 | CHD/APPD SV/AK | 02 | 18–08–23 | CHD/APPD SV/AK | 01 | 14–06–23 | CHD/APPD SV/AK |
| ZONE | | | ZONE | REVISED AS PER COMMENTS BY OPTCL DTD. 11.10.23. | | ZONE | REVISED AS PER COMMENTS BY OPTCL | | ZONE | REVISED AS PER COMMENTS BY OPTCL INFORMED IN THE DISCUSSIONS & MEETING DTD. 22–25.05.2023 AT OPTCL BHUBANESWAR OFFICE AND AS PER ELECTRICAL / MECHANICAL REQUIREMENTS. | |

FIRST ANGLE PROJECTION ALL DIMENSIONS ARE IN MM

DRAWING NO. TB-4-420-316-009

## LEGEND

CONNECTION TO GROUND MAT THROUGH RISER

PE CONNECTION TO PIPE ELECTRODE WITH TREATED EARTH PIT

75X10 G.I. FLAT

50x6mm GS FLAT

40mm DIA MS ROD

## GENERAL NOTES:

1 EARTH STRIP CLEATED TO LATTICE /PIPE TYPE STRUCTURE AT AN INTERVAL OF 1.0M SUITABLE PROVISION SHALL BE MADE WITH SUPPORT STRUCTURE.

2 ALL EARTH STRIPS SHALL BE TAKEN ALONG EDGE OF STRUCTURE. ALL DRAWING SHOWS TYPICAL ARRANGEMENT ONLY.

3 ALL STRUCTURES/EQUIPMENTS SHALL BE EARTHED AS SHOWN IN THE FOLLOWING SHEETS.

4 BOLT SIZE FOR CONNECTING EARTHING FLAT TO THE EQPT/STRUCTURE SHALL BE TO SUIT RESPECTIVE HOLE SIZE.

5. ALL EARTHING SHALL BE DONE IN ACCORDANCE WITH IS:3043 UNLESS OTHERWISE STATED IN TECHNICAL SPECIFICATION

6 EACH RISER OF A PARTICULAR EQUIPMENT SHALL BE CONNECTED TO A DIFFERENT EARTHROD (EITHER HORIZONTAL OR VERTICAL CONDUCTORS OF MAIN EARTHMAT).

7 FOR WELDING DETAILS REFER SHEET #19 & 20.

8 E/WIRE DOWN CONDUCTOR SHALL BE CLEATED AT AN INTERVAL OF 2.0 M ALONG WITH STRUCTURE .

9 OEM DRAWING FOR GIS AND IT'S ACCESSORIES ITEM SHALL BE SUBMITTED SEPARATELY.

| SHEET NO. | DESCRIPTION |
|---|---|
| 01. | TITLE |
| 02. | EARTHING NOTES |
| 03. | MATERIAL & SIZES OF BELOW & ABOVE GROUND EARTHING |
| 04. | 400kV & 220kV POST INSULATOR |
| 05. | 390kV & 216kV SURGE ARRESTER |
| 06. | 400kV HORIZONTAL DOUBLE BREAK ISOLATOR WITH ONE EARTH SWITCH (TYPICAL) |
| 07. | AUXILIARY EARTH MAT FOR ISOLATOR MAIN MECH.,E/S MECH. BOX |
| 08. | 400/220kV 315MVA AUTO TRANSFORMER & 33/0.433kV STATION TRANSFORMER |
| 09. | REACTOR |
| 10. | TOWER WITH PEAK |
| 11. | LIGHTENING MAST (LM) |
| 12. | GATE/FENCE POST |
| 13. | CABLE TRENCH |
| 14. | RAIL BONDING |
| 15. | PIPE EARTH ELECTRODE WITH TREATED PIT |
| 16. | DELETED |
| 17. | CONTROL AND RELAY PANELS/BATTERY CHARGER/ AC DC BOARDS/MLDB |
| 18. | TYPICAL ARRANGEMENT OF BOLTED JOINTS |
| 19. | WELDING DETAILS |
| 20. | WELDING DETAILS |



| REV. | DATE | ALTERED / CHECKED / APPROVED | REV. | DATE | ALTERED AK / CHECKED AK / APPROVED VK |
|---|---|---|---|---|---|
| | | | 01 | 16.03.24 | |
| ZONE | | | ZONE | DOCUMENT REVISED AS PER OPTCL COMMENTS. | |

PROJECT: EQUIPMENT EARTHING PHILOSOPHY & DETAILS FOR 400kV/220kV GIS SUB STATION AT ERSAMA

OWNER: ODISHA POWER TRANSMISSION CORPORATION LIMITED

BHARAT HEAVY ELECTRICALS LTD
TRANSMISSION BUSINESS GROUP
NOIDA

| DEPT CODE | | NAME | SIGN | DATE |
|---|---|---|---|---|
| M | DESN | AK | | |
| | CHD | AK | | |
| | APPD | DKS | | |

TITLE: EQUIPMENT EARTHING PHILOSOPHY AND DETAILS FOR 400/220kV GIS SUB STATION AT ERSAMA

DEPT. SCALE

SIGN

DATE

DRAWING NO. TB-4-420-316-009

SHEET 01 OF 20 REV. 01

FORMAT SIZE A4

FILE NAME : 100_MG38R0

1. RISER FROM THE EARTH GRID SHALL BE 40MM DIAMETER MILD STEEL ROD. RISER SHALL RISE FROM THE GROUND ALONG THE NEAREST EQUIPMENT FOUNDATION/BUILDING COLUMN/WALL TO AVOID ANY OBSTRUCTION TO MOVEMENT OF PERSONNEL.

2. CONNECTION TO ALL EQUIPMENT AND TOWERS SHALL BE BY BOLTED JOINTS. CONTACT SURFACES SHALL BE THOROUGHLY CLEANED BEFORE CONNECTIONS. EQUIPMENT BOLTED CONNECTIONS AFTER BEING TESTED AND CHECKED SHALL BE PAINTED WITH ANTI CORROSIVE PAINT/COMPOUND.

3. CONNECTIONS BETWEEN EQUIPMENT EARTHING LEADS AND BETWEEN MAIN EARTHING CONDUCTORS SHALL BE OF WELDED TYPE. FOR RUST PROTECTION THE WELDS SHOULD BE TREATED WITH RED LEAD COMPOUND AND AFTERWARDS THICKLY COATED WITH BITUMEN COMPOUND.
THE SURFACES TO BE WELDED SHALL BE CLEANED OF DIRT, OIL, GREASE AND OXIDES BEFORE WELDING.
ANY OXIDE FILMS THAT MAY HAVE FORMED DURING WELDING MUST BE REMOVED FROM THE WELDED JOINT.

4. EARTHING CONDUCTOR FOR EQUIPMENT SHALL BE OF GALVANISED STEEL OF SIZE 75x10/50x6 mm.
THE CONDUCTOR BELOW THE GROUND LEVEL SHALL BE 40 mm DIA MS ROD.

5. IN THE ATTACHED DRAWINGS FGL REPRESENTS FINISHED GROUND LEVEL.

6. ALL EQUIPMENT STRUCTURES & TOWERS SHALL BE EARTHED AT TWO POINTS WITH 75x10 mm GI FLAT EVEN THOUGH THEY ARE SHOWN OR NOT IN THE DRAWING DUE TO CLARITY.

7. ALL JUNCTION BOXES, MECHANISM BOXES, GROUND MOUNTED CONTROL CABINETS, CUBICLES, PANELS, MBs ETC. SHALL BE EARTHEDAT TWO POINTS WITH 50x6mm G.I. FLAT BY TWO SEPARATE AND DISTINCT EARTH CONNECTERS.

8. THE GROUNDING MAT (40mm DIA. MS ROD) SHALL BE BURIED AT 700mm BELOW FGL IN COMPLETE FENCED AREA AND EXTENDING 2m BEYONG THE FENCE. AT THE PERIPHERY OF MAIN MAT, PIPE ELECTRODES AT EVERY 5m SHALL BE PROVIDED.

9. EARTHING CONDUCTORS FROM EQUIPMEMT STRUCTURES SHALL BE CONNECTED TO THE NEAREST POSSIBLE EARTH MAT RISER. EQUIPMENT EARTHING SHALL BE AS PER IS 3043.

10. ALL JOINTS BETWEEN 40 DIA M.S. ROD AND 75x10 mm. G.I. FLAT SHALL BE 150mm ABOVE GROUND LEVEL.

11. FOR WELDED JOINTS LOW HYDROGEN CONTENT ELECTRODES SHALL BE USED.

12. METTALIC SHEATHS/SCREENS, AND ARMOUR OF MULTI CORE CABLES SHALL BE EARTHED AT BOTH ENDS.
METTALIC SHEATHS AND ARMOUR OF SINGLE CORE CABLES SHALL BE EARTHED AT SWITCHGEAR END ONLY UNLESS OTHERWISE INSTRUCTED BY THE EMPLOYER.

13. EQUIPMENT BOLTED CONNECTIONS AFTER BEING TESTED AND CHECKED SHALL BE PAINTED WITH ANTI CORROSIVE PAINT/COMPOUND.

14. LOCATION OF EARTHING CONDUCTORS/RISERS SHOWN IN THE EARTHING DRAWING MAY CHANGE TO SUIT THE SITE CONDITION.

15. FOR SURGE ARRESTER, EARTHING LEAD FROM SURGE COUNTER TO MAIN EARTHMAT SHALL BE SHORTEST IN LENGTH AS PRACTICALLY AS POSSIBLE.

16. AN ADDITIONAL AUXILIARY GRID OF 1500MMX1500MM COMPRISING OF CLOSELY SPACED(300MMX300MM) 40mm DIA CONDUCTORS AT A DEPTH OF 300MM FROM FINISHED GROUND LEVEL SHALL BE PROVIDED BELOW THE OPERATING HANDLE OF ISOLATORS AND EARTH SWITCHES. THIS GRID SHALL BE CONNECTED TO THE MAIN GROUND GRID.
THE EARTH CONNECTION TO OPERATING HANDLE SHALL BE MADE OF FLEXIBLE CONNECTION. THE MOM BOX OF THE ISOLATOR TO BE CONNECTED TO THIS AUX. GRID.

17. ALL NON CURRENT CARRYING METALIC PARTS SHALL BE EARTHED AT TWO DIFFERENT PLACES.

18. ALL EQUIPMENT DRAWINGS SHOWN ARE INDICATIVE ONLY.

19. WELDING OF EARTHING CONDUCTOR SHALL BE CONNECTED IN VERTICAL PLANE WHEREVER POSSIBLE.

20. ALL GROUND CONNECTIONS SHALL BE MADE BY ELECTRIC ARC WELDING.

21. ALL THE EQUIPMENT/ SYSTEM SHOWN ARE INDICATIVE AND SCHEMATIC, HENCE ANY ADDITIONAL REQUIREMENT PERTAINING TO EARTHING SHALL BE CARRIED OUT AT SITE TO MEET THE REQUIREMENT.

22. ANY OTHER SYSTEM/ EQUIPMENT FOR WHICH EARTHING PHILOSOPHY IS NOT COVERED HERE, SHALL BE DONE AS PER OEM RECOMMENDATION.

| | | |
|---|---|---|
| बीएचईएल BHEL | EQUIPMENT EARTHING DETAILS<br>EARTHING NOTES | |
| COMPUTERREF.NO. | DRG. No. TB-4-420-316-009 | SHEET No. 02 |

BELOW AND ABOVE GROUND EARTHING CONDUCTOR DETAILS :-

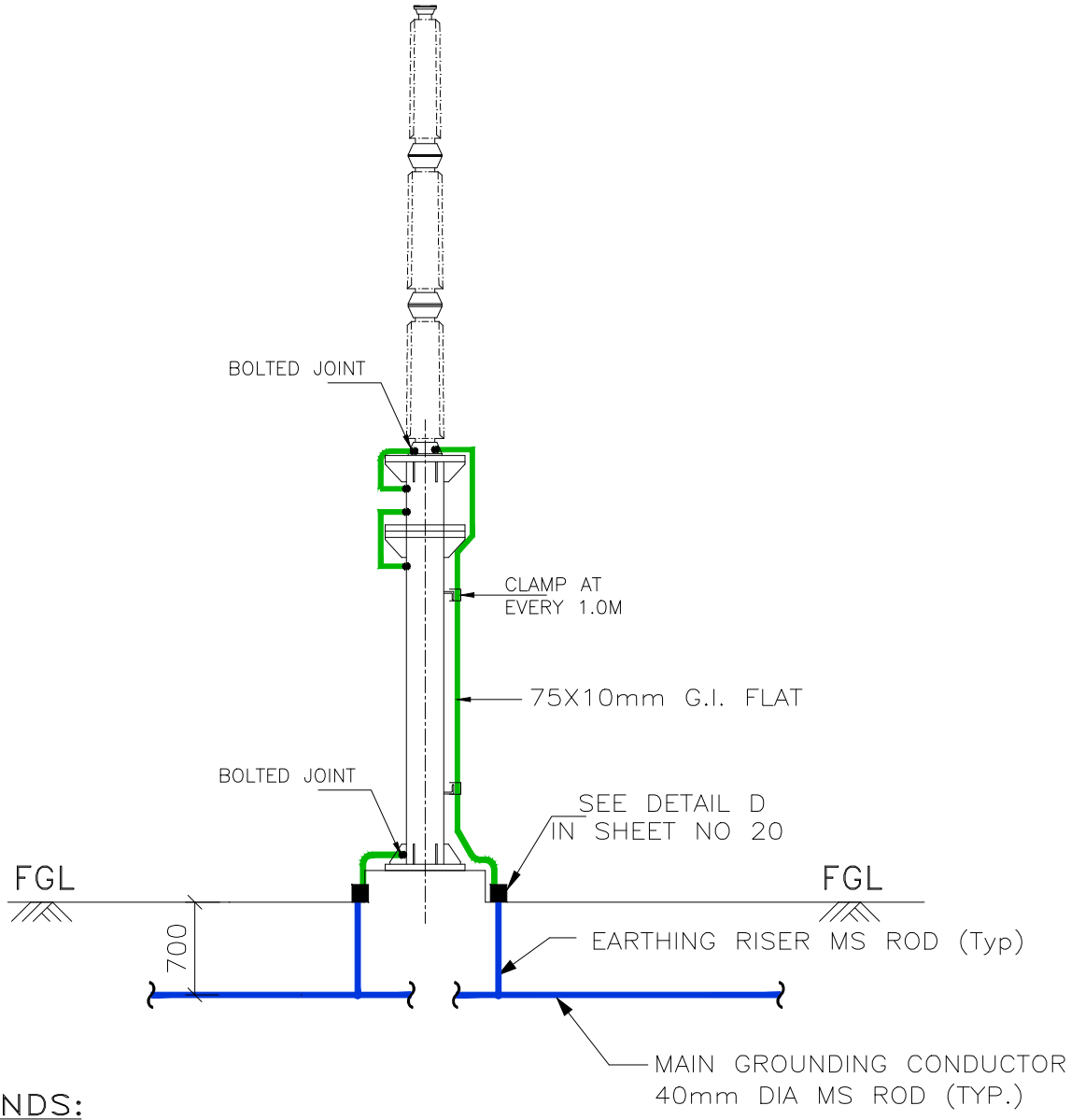
**ANNEXURE - MATERIALS AND SIZE OF BELOW/ ABOVE GRADE GROUNDING SYSTEM**

**TABLE 1: BELOW GROUND EARTHING SYSTEM - CONDUCTOR MATERIAL AND SIZE**

| SL. No. | Description | Material | Size | Remarks |
|---|---|---|---|---|
| 1 | Main Grounding Grid Conductor | Mild Steel Rod | 40mm Dia | |
| 2 | Auxiliary Grounding Mat Conductor | Mild Steel Rod | 40mm Dia | |
| 3 | Riser (For connection between ground grid & above ground equipment earthing strip) | Mild Steel Rod | 40mm Dia | |
| 4 | Electrode for Auto transformer/ Reactor/ Station & Lighting transformers' neutral and Surge Arresters | Mild Steel Pipe Electrode | 50mm Dia, 3m Long | Treated pit with test link |
| 5 | Fence Corners, Main mat periphery, Down conductors/ corners of GIS building/ CRB/ FFPH building etc. | Mild Steel Pipe Electrode | 50mm Dia, 3m Long | Treated pit with test link |

**TABLE 2: ABOVE GROUND EARTHING SYSTEM - CONDUCTOR MATERIAL AND SIZE**

| SL. No. | Description | Material | Size (mm) | Remarks |
|---|---|---|---|---|
| 1 | 400kV, 220kV & 33kV Outdoor Equipment | GI Mild Steel Flat | 75 X 10 | |
| 2 | 400/220kV Auto Transformer, 400kV Reactor and 33/0.433kV Station Transformer | GI Mild Steel Flat | 75 X 10 | |
| 3 | Towers and Structure/ Lightning Masts | GI Mild Steel Flat | 75 X 10 | |
| 4 | Cable trench, hanger/ rack assembly and cable tresle | GI Mild Steel Flat | 50 X 6 | |
| 4 | Building Lightning Protection (if required) | GI Mild Steel Flat | 50 X 6 | |
| 6 | LT ACDB, DCDB and other Switchgear including Battery charger panel | GI Mild Steel Flat | 50 X 6 | |
| 7 | Control & Protection Panel, Control desk, Distribution Boards, Lighting Panels, Lighting Poles and lighting transformer | GI Mild Steel Flat | 50 X 6 | |
| 8 | Outdoor Kiosks, Junction Box | GI Mild Steel Flat | 50 X 6 | |
| 9 | HV/LV/ LV Neutral cable box, Drive mechanism boxes | GI Mild Steel Flat | 50 X 6 | |
| 10 | Gates and Fence | GI Mild Steel Flat flexible copper braid | 75 X 10/ 50 X 6 | |
| 11 | Lighting Fixtures and Receptaces | GI Steel Wire | 16 SWG | |




## LEGENDS:

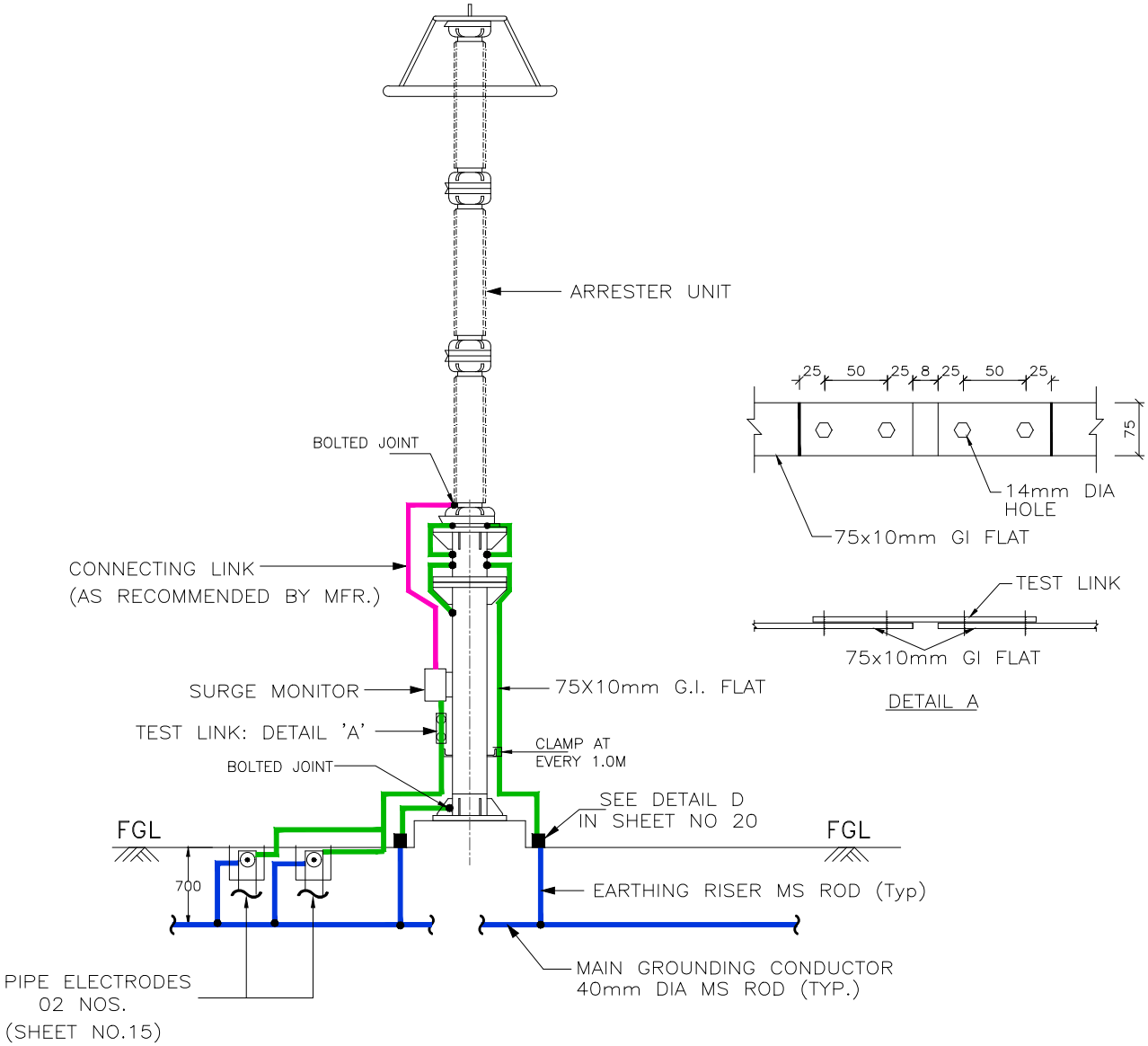
40mmø MS ROD

75x10mm GI FLAT

## NOTES:

1. NO. OF RISERS= 2NOS./PHASE

| | | |
|---|---|---|
| बीएचईएल BHEL | EQUIPMENT EARTHING DETAILS<br>400kV & 220kV POST INSULATOR | |
| COMPUTERREF.NO. | DRG. No. TB-4-369-316-009 | SHEET No. 04 |



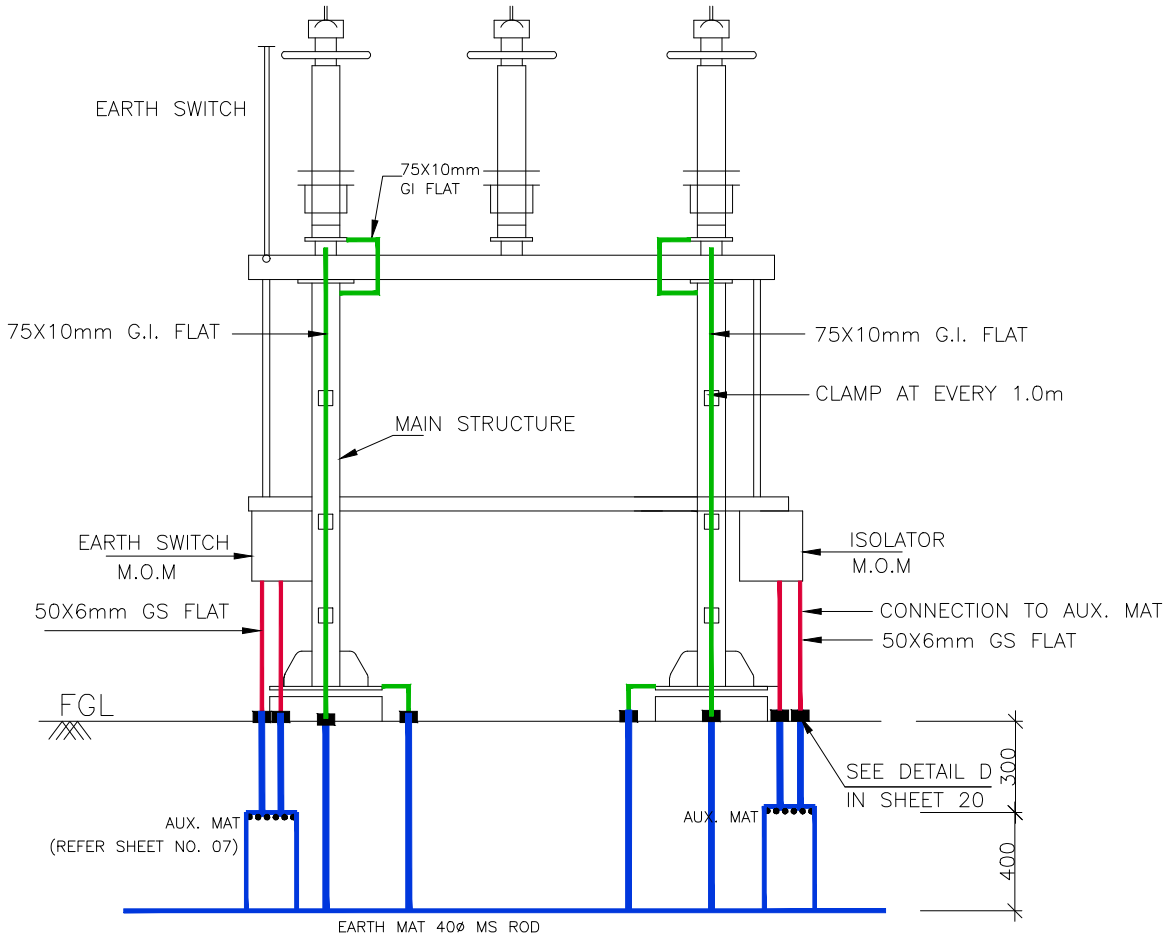

## LEGENDS:

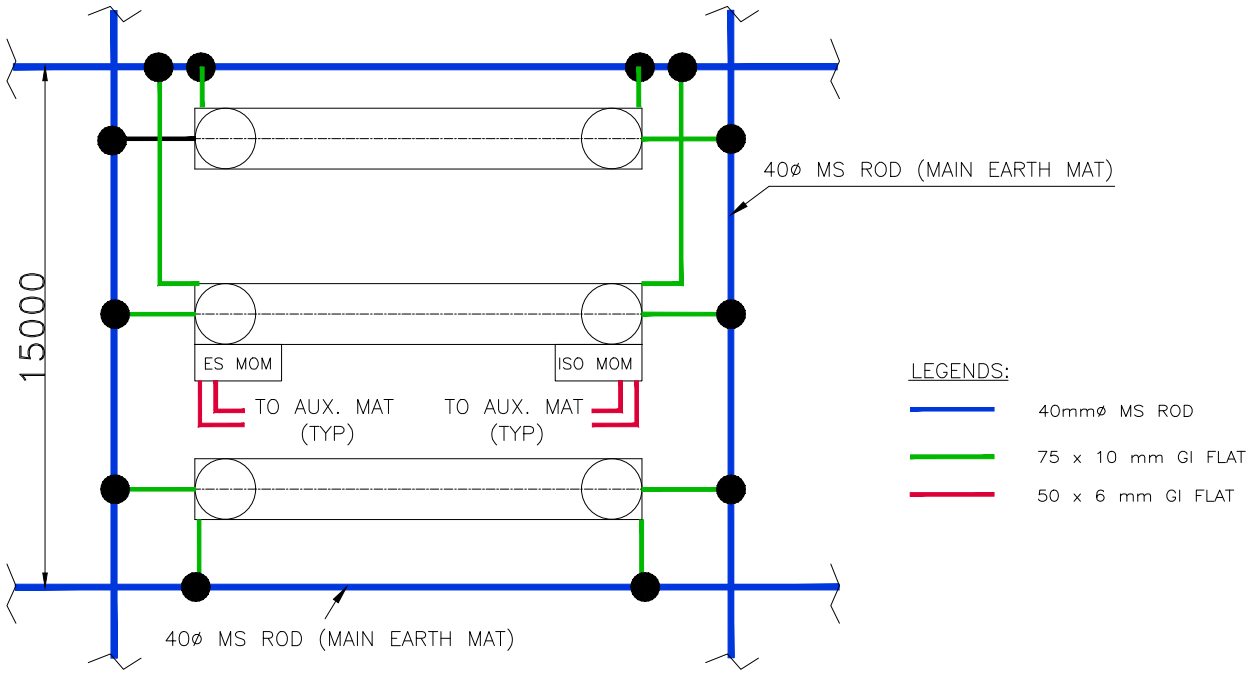
- 40mmø MS ROD
- 75x10mm GI FLAT
- CONNECTING LINK AS PER OEM

## NOTES:

1. NO. OF RISERS= 3NOS./PHASE
2. NO. OF PIPE ELECTRODE IN TREATED PIT WITH TEST LINK= 2NOS./ PHASE
3. CLEAT CLAMP SHALL BE PROVIDED AT 1m INTERVAL.
4. MINIMUM DISTANCE OF 5000MM SHALL BE MAINTAINED BETWEEN TWO TREATED (PIPE) ELECTRODES.
5. SURGE COUNTER EARTHING SHALL NOT PASS THROUGH ANY PIPE AND SHALL HAVE SHORTEST LENGTH.

| | | |
|---|---|---|
| बीएचईएल BHEL | EQUIPMENT EARTHING DETAILS<br>390kV & 216kV SURGE ARRESTER | |
| COMPUTERREF.NO. | DRG. No. TB-4-420-316-009 | SHEET No. 05 |

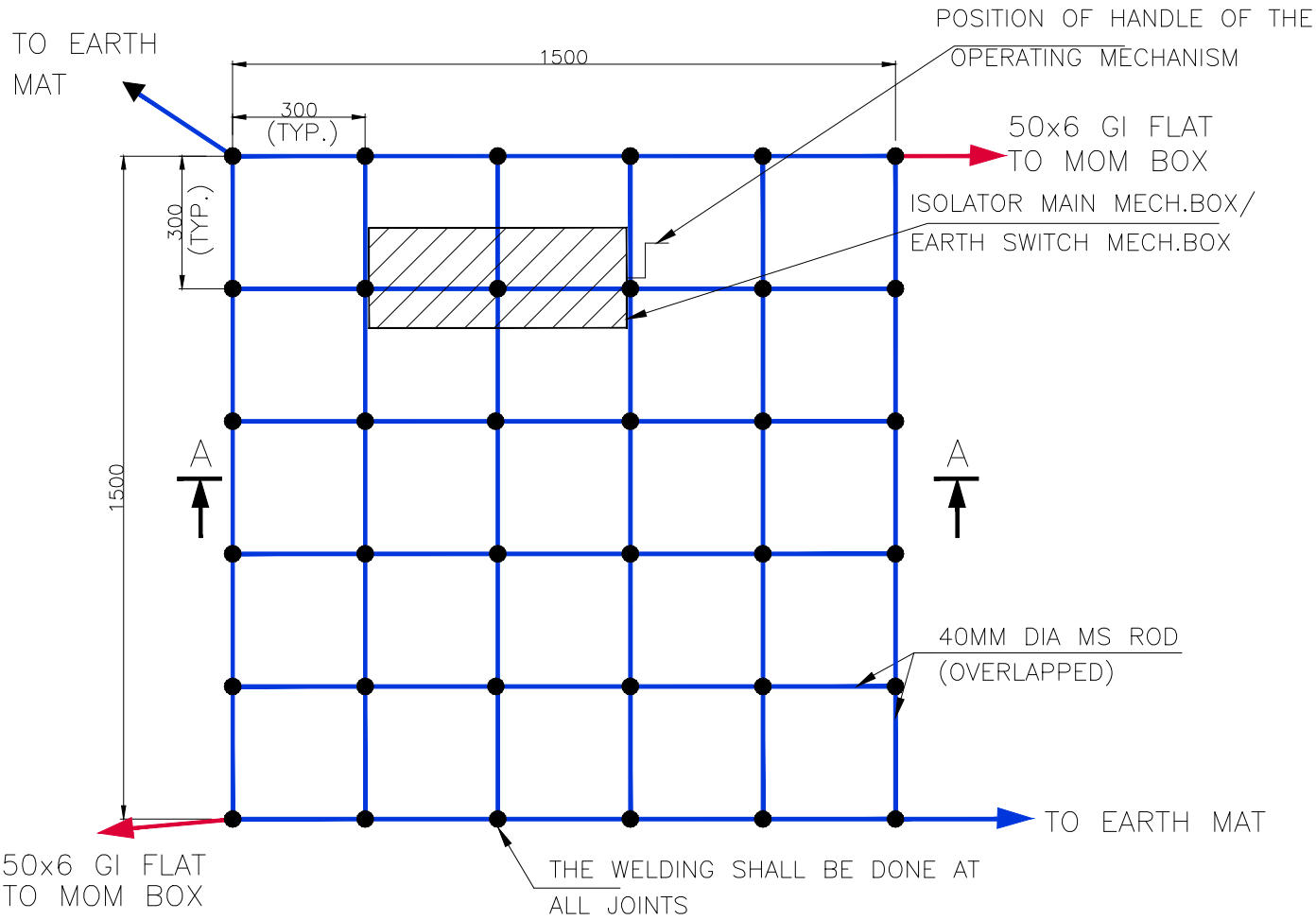


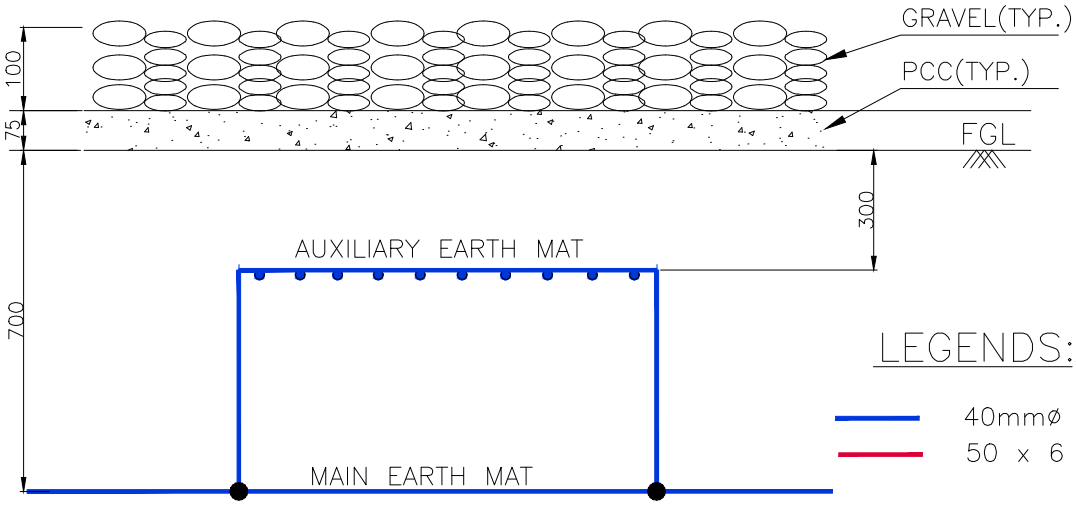




NOTES:

1. NO. OF RISER FOR EQUIPMENT = 4 Nos./PHASE (EXCLUDING RISERS FOR MOM BOXES)
2. NO. OF RISER FOR MECHANISM BOX = 2 Nos./BOX
3. NO. OF AUXILIARY MAT = 1 No./BOX

| | | |
|---|---|---|
| बीएचईएल BHEL | EQUIPMENT EARTHING DETAILS<br>400kV & 220kV DOUBLE BREAK<br>ISOLATOR (TYPICAL) WITH ONE EARTHSWITCH | |
| COMPUTERREF.NO. | DRG. No. TB-4-420-316-009 | SHEET No. 06 |




SECTION AA

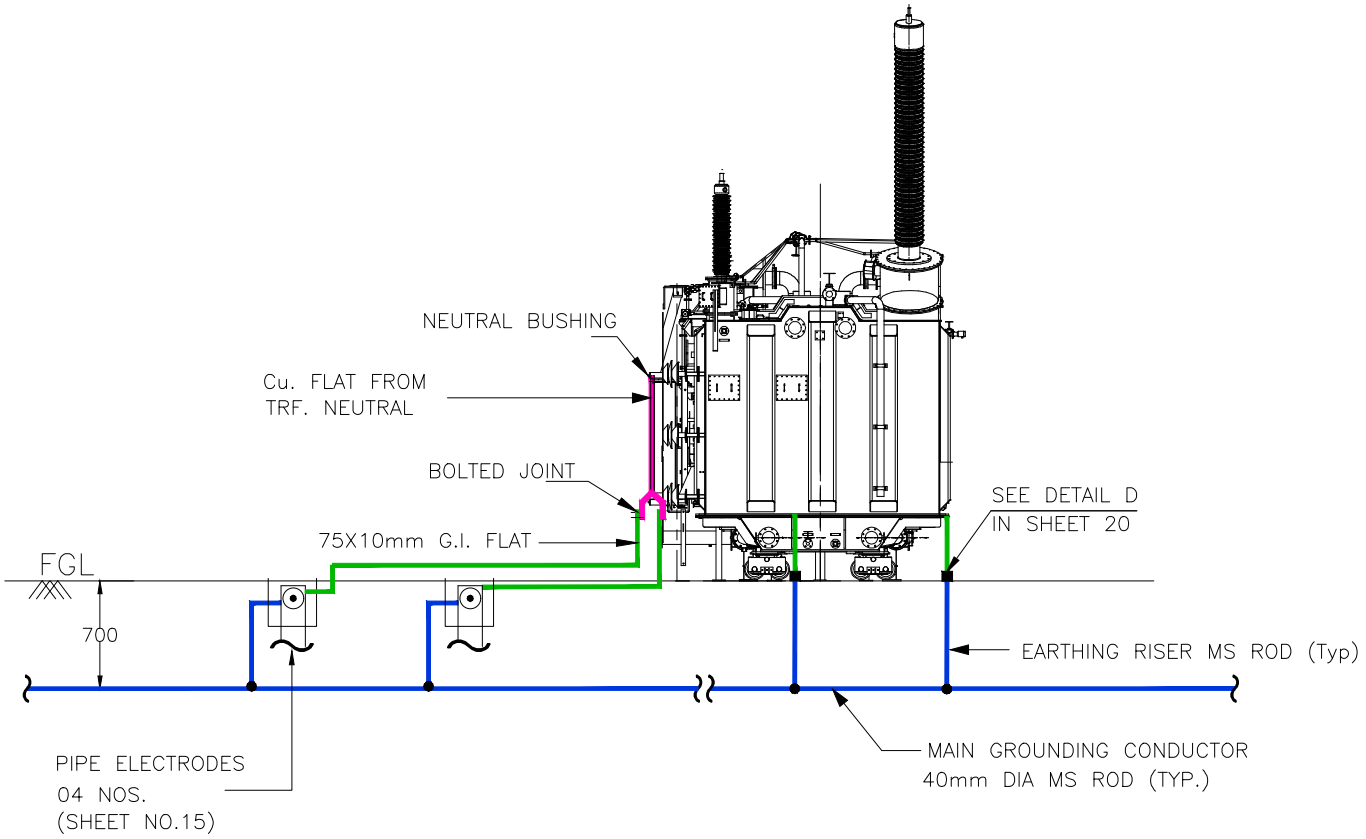
## LEGENDS:

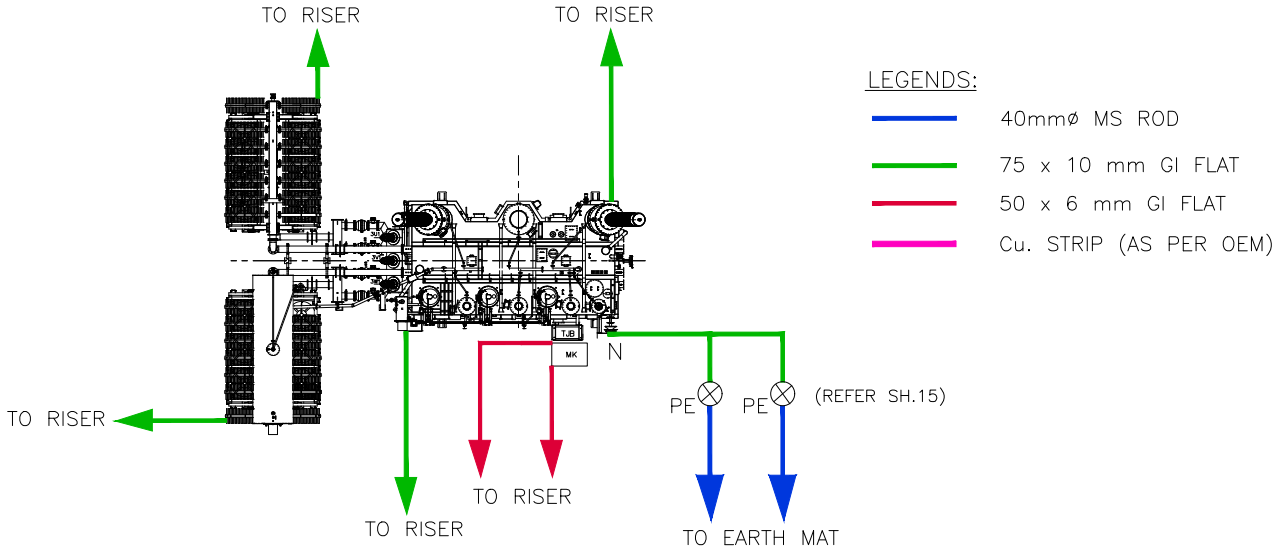
- 40mmø MS ROD
- 50 x 6 mm GI FLAT

## NOTES:

1. AUX. EARTH MAT SHALL BE SO POSITIONED THAT THE FOOT OF THE OPERATOR ALWAYS LIE OVER THE AUX. EARTH MAT AREA WHILE ATTENDING / OPERATING THE MECH. BOX THE CABLE TRENCH ROUTING SHALL BE PLANNED ACCORDINGLY.

| | | |
|---|---|---|
| बीएचईएल BHEL | EQUIPMENT EARTHING DETAILS<br>AUXILIARY EARTH MAT FOR ISOLATOR MAIN MECH.,E/S MECH. BOX | |
| COMPUTERREF.NO. | DRG. No. TB-4-420-316-009 | SHEET No. 07 |




## NOTES:

MINIMUM DISTANCE OF 5000MM SHALL BE MAINTAINED BETWEEN TWO TREATED (PIPE) ELECTRODES.

NO.OF PIPE EARTH ELECTRODE WITH TREATED PIT = 2NOS. (NEUTRAL–ICT)
= 2NOS. (NEUTRAL–ST)

NO.OF RISERS = 08 NOS. FOR EARTHING OF FOLLOWING PARTS OF AUTO TRANSFORMER
(TWO EARTHING STRIPS CAN BE CONNECTED TO ONE RISER)

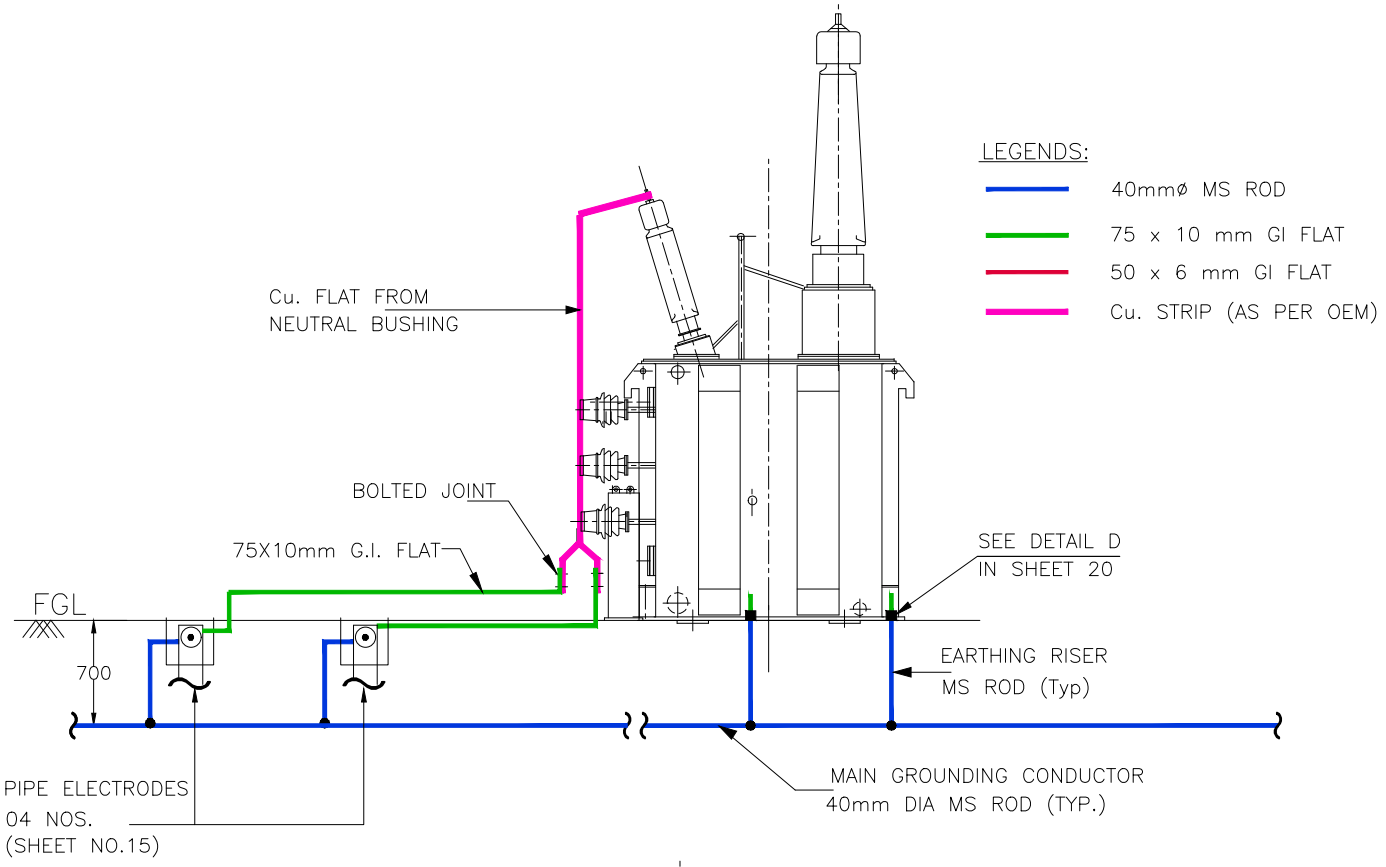
| | | |
|---|---|---|
| MAIN TANK | : | 2 Nos. (75X10 GI FLAT) |
| RADIATOR BANK | : | 2 Nos. (75X10 GI FLAT) – NOT FOR ST (TANK MOUNTED RADIATOR) |
| MARSHALLING BOX | : | 2 Nos./BOX (50x6 GS FLAT) |
| NEUTRAL (for ICT) | : | 2 Nos. (75X10 GI FLAT THROUGH PIPE ELECTRODE) |
| NEUTRAL (for ST) | : | 2 Nos. (75X10 GI FLAT THROUGH PIPE ELECTRODE) |

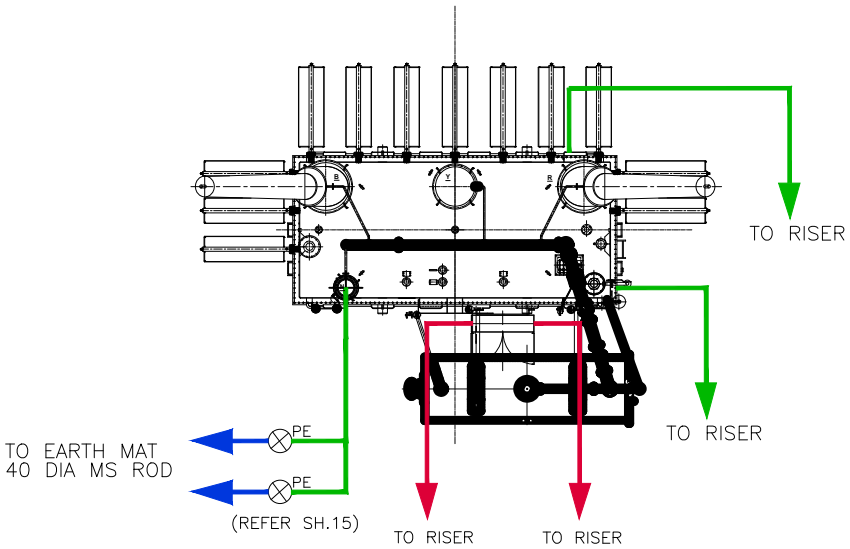
बीएचईएल BHEL

# EQUIPMENT EARTHING DETAILS

400/220kV 315MVA AUTO TRANSFORMER &
33/0.433kV STATION TRANSFORMER

| COMPUTERREF.NO. | DRG. No. | SHEET No. |
|---|---|---|
| | TB–4–420–316–009 | 08 |




## NOTES:

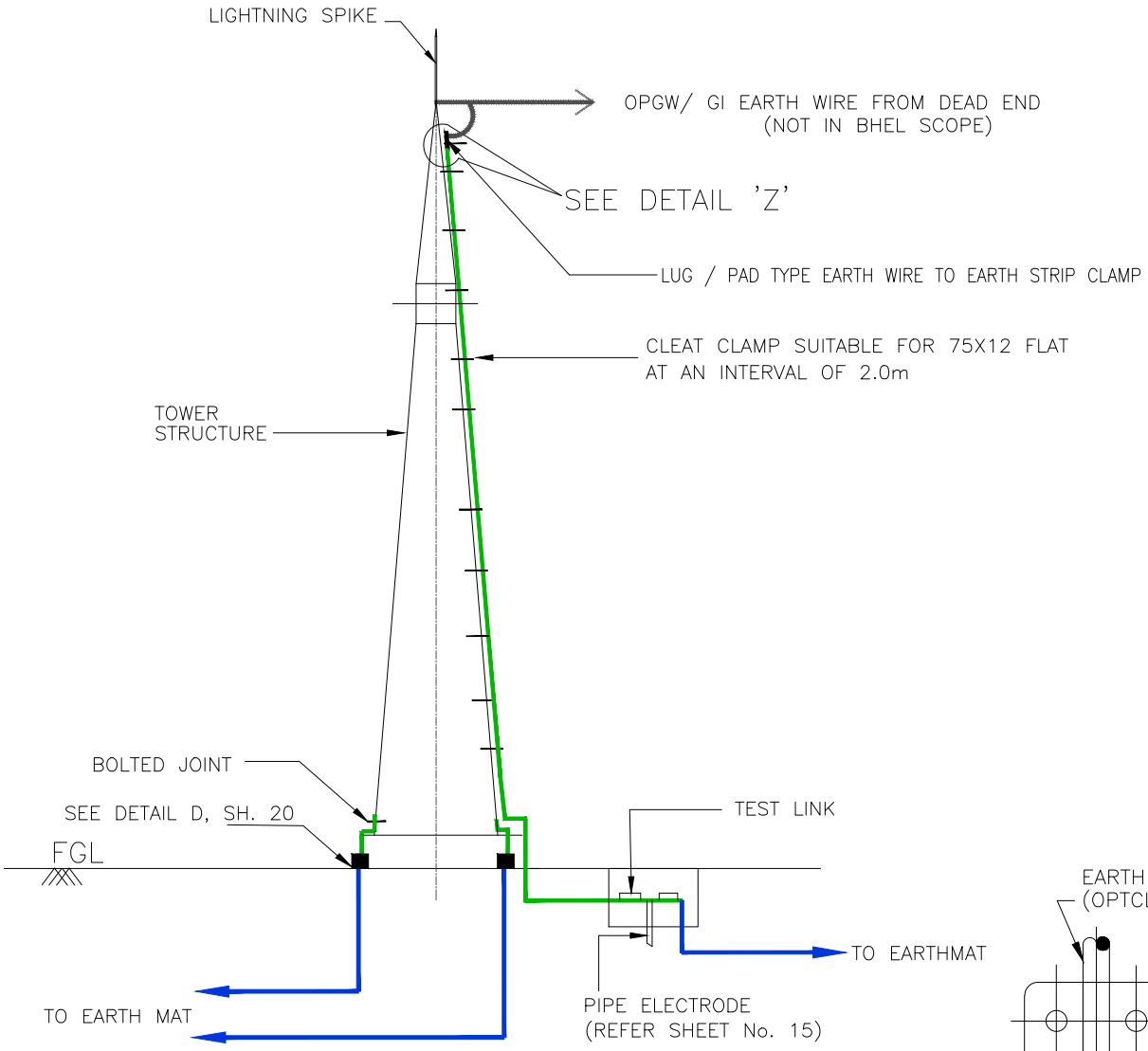
MINIMUM DISTANCE OF 5000MM SHALL BE MAINTAINED BETWEEN TWO TREATED (PIPE) ELECTRODES.

NO. OF PIPE EARTH ELECTRODE WITH TREATED PIT = 2NOS. (NEUTRAL)

NO.OF RISERS = 06 NOS. FOR EARTHING OF FOLLOWING PARTS OF REACTOR
(TWO EARTHING STRIPS CAN BE CONNECTED TO ONE RISER)

| | |
|---|---|
| MAIN TANK | – 2 Nos. (75X10 GI FLAT) |
| CONTROL CABINET/MB | – 2 Nos. (50x6 GS FLAT) |
| NEUTRAL EARTHING | – 2 Nos. (75X10 GI FLAT THROUGH PIPE ELECTRODE) |

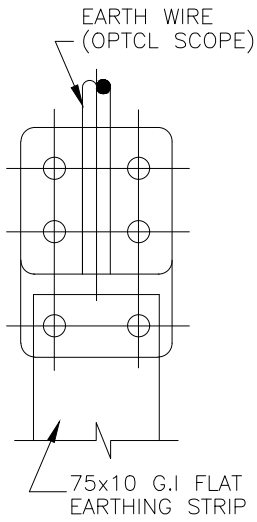
| | | |
|---|---|---|
| बीएचईएल BHEL | EQUIPMENT EARTHING DETAILS<br>REACTOR | |
| COMPUTERREF.NO. | DRG. No. TB–4–420–316–009 | SHEET No. 09 |




LEGENDS:

40mmø MS ROD

75 x 10 mm GI FLAT



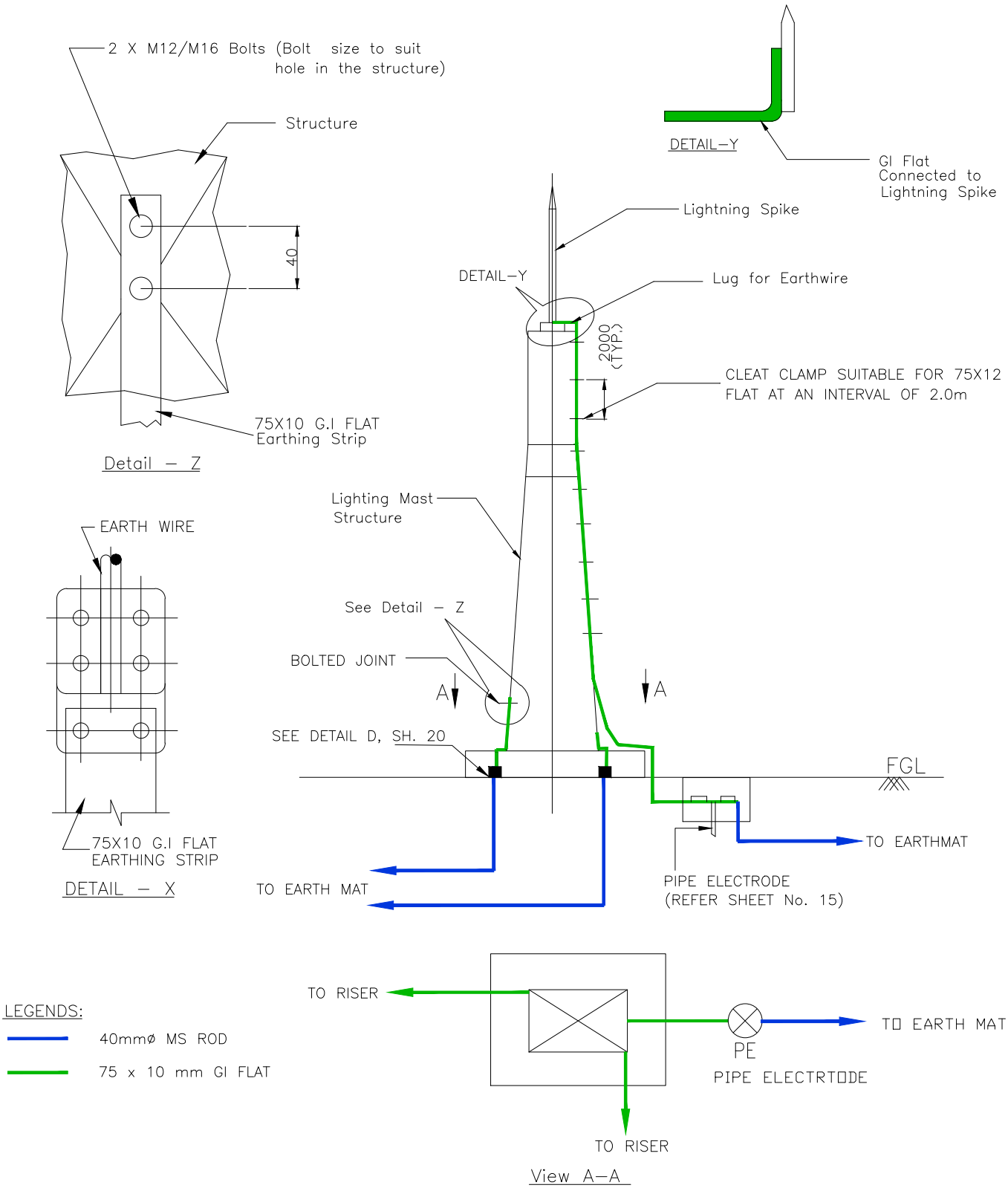

DETAIL – Z

NOTES:

1 NO. OF PIPE ELECTRODE : 1 NO. PER TOWER WITH DOWN CONDUCTOR.

2. NO. OF RISERS = 2 NOS.

| | | |
|---|---|---|
| बीएचईएल BHEL | EQUIPMENT EARTHING DETAILS<br>TOWER WITH PEAK | |
| COMPUTERREF.NO. | DRG. No. TB–4–420–316–009 | SHEET No. 10 |



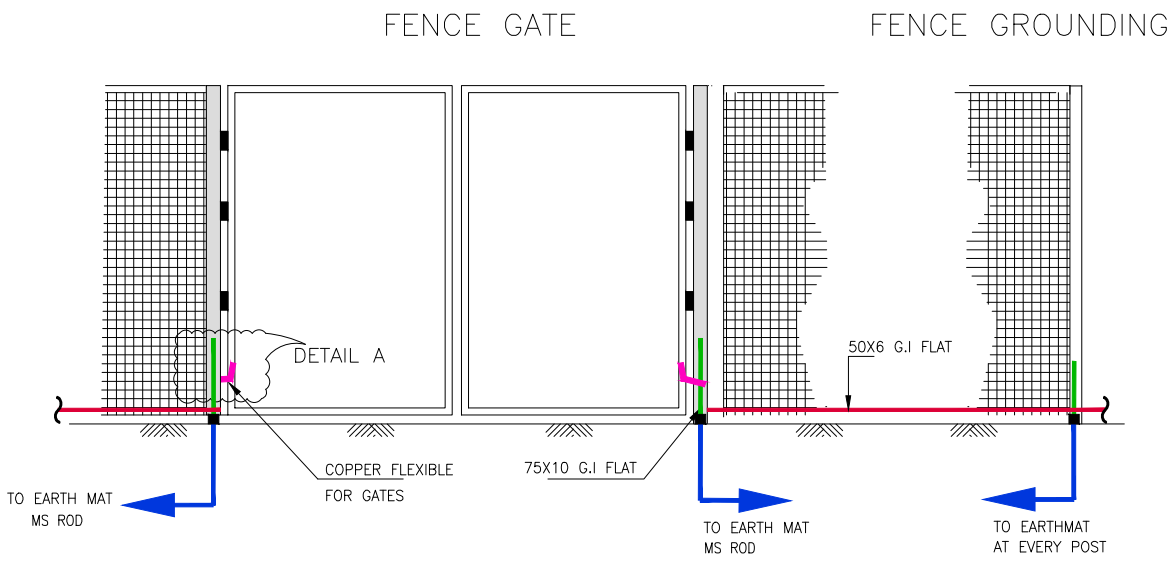

LEGENDS:

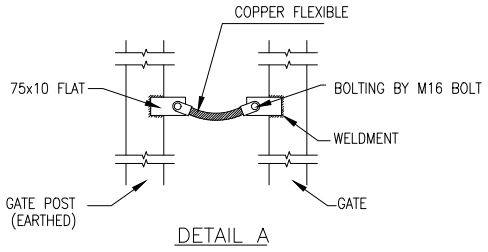
- 40mmø MS ROD
- 75 x 10 mm GI FLAT

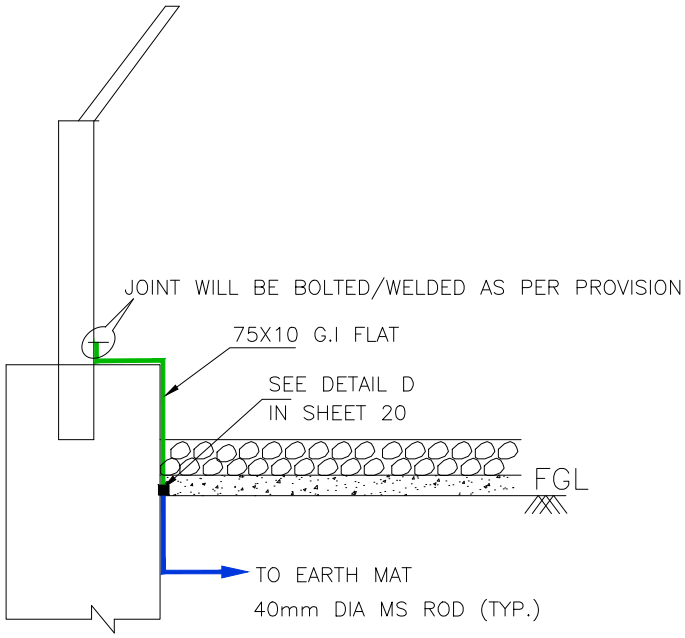
NOTES:

1. NO. OF PIPE ELECTRODE : 1 NO.
2. NO. OF RISERS = 2 NOS.

| | | |
|---|---|---|
| बीएचईएल BHEL | EQUIPMENT EARTHING DETAILS<br>LIGHTENING MAST (LM) | |
| COMPUTERREF.NO. | DRG. No. TB–4–420–316–009 | SHEET No. 11 |



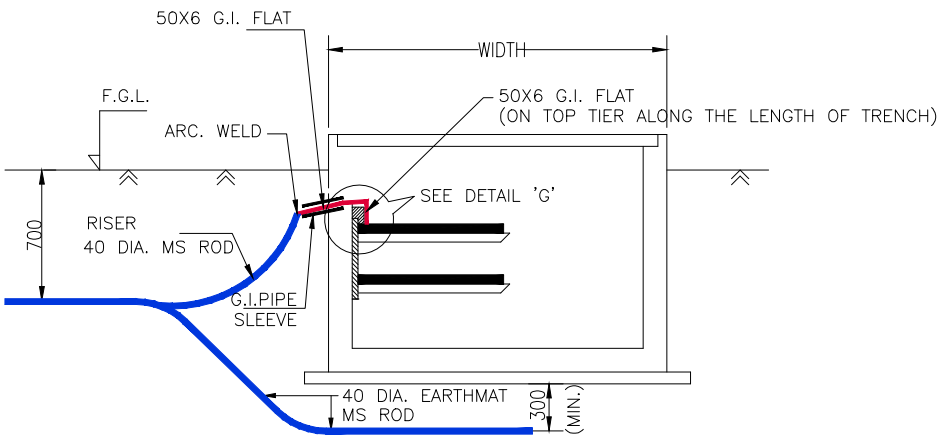

LEGENDS:

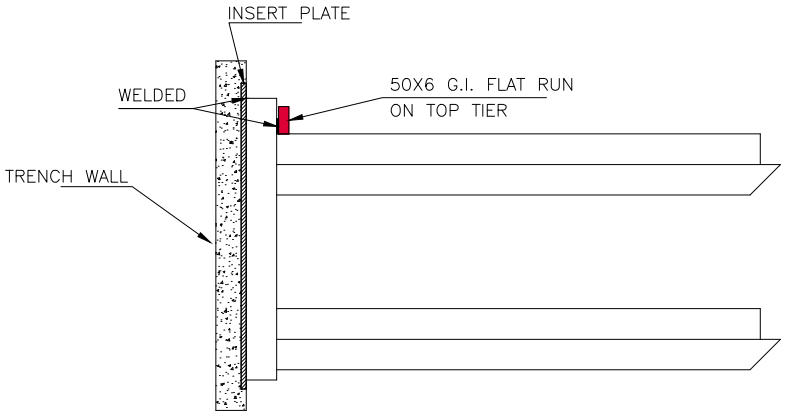
- 40mmø MS ROD
- 75 x 10 mm GI FLAT
- 50 x 6 mm GI FLAT
- BRAIDED Cu. CONDUCTOR (FOR EARTHING OF GATES)

NOTES:

1. EVERY POST OF FENCE & GATES SHALL BE CONNECTED TO EARTHING GRID BY 75X10 MM GI FLAT.
2. A CONTINUOUS EARTH STRIP OF SIZE 50X6mm SHALL RUN ALL THROUGH THE FENCE.
3. EARTHING CONDUCTOR SHALL BE BURIED 2000mm OUTSIDE THE SWITCHYARD FENCE.

| | | |
|---|---|---|
| बीएचईएल BHEL | EQUIPMENT EARTHING DETAILS<br>GATE/FENCE POST | |
| COMPUTERREF.NO. | DRG. No. TB-4-420-316-009 | SHEET No. 12 |




DETAIL 'G'

DETAIL FOR CONNECTING GI FLAT RUNNING
ON TOP TIER TRENCH TO EMBEDDED PLATE.

## LEGENDS:

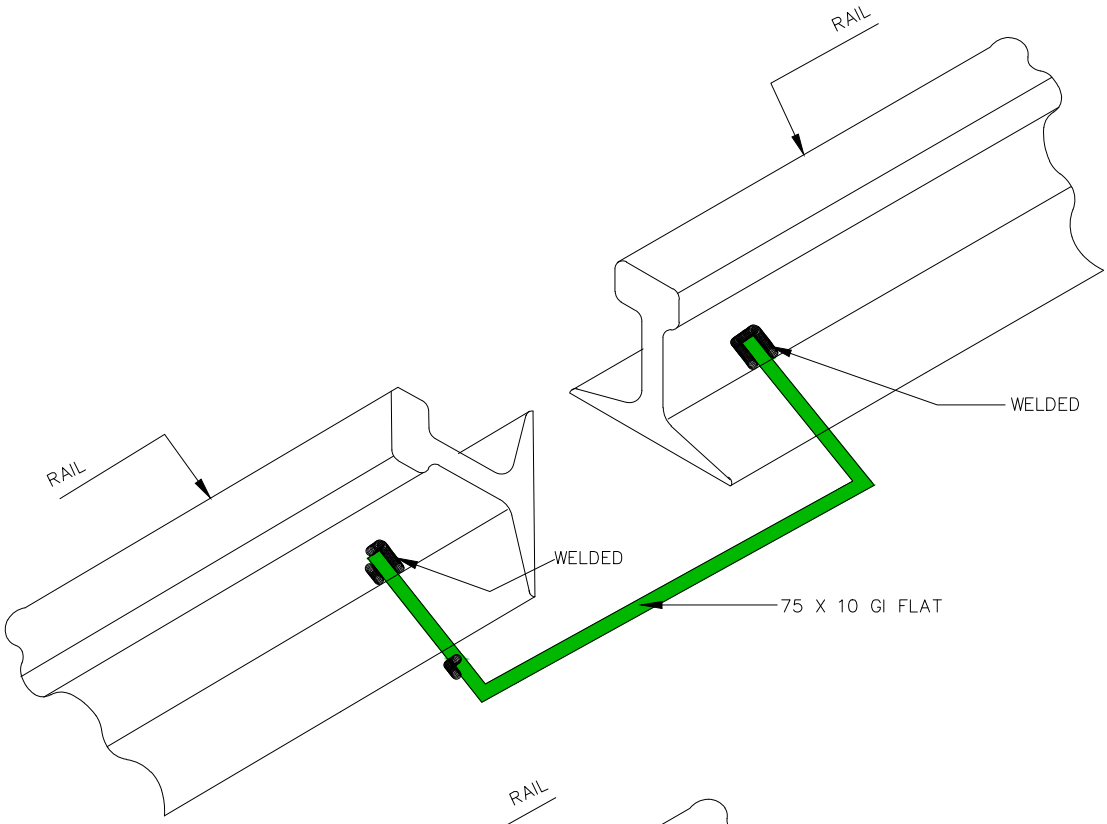
40mmø MS ROD

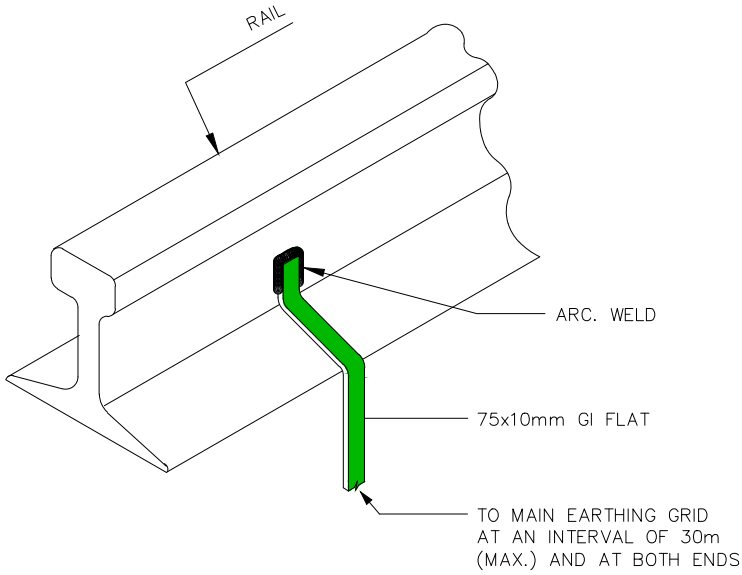
50x6mm GI FLAT

## NOTES:

1. RISERS SHALL BE PROVIDED AT AN INTERVAL OF 20M ALONG THE LENGTH OF TRENCH.
2. THE EARTH STRIP (50x6mm G.I. FLAT) SHALL BE WELDED/CLEATED TO TOP RACK ALONG THE TRENCH RUN AT EVERY 1.5M.
3. WHERE THE CABLE RACKS ARE PROVIDED ON BOTH SIDES OF THE TRENCH, BOTH SIDES SHALL BE EARTHED AS PER ABOVE.
4. CABLE & CABLE TRAY EARTHING SHALL BE DONE AS PER SPECIFICATION.

| | | |
|---|---|---|
| बीएचईएल BHEL | EQUIPMENT EARTHING DETAILS<br>CABLE TRENCH | |
| COMPUTERREF.NO. | DRG. No. TB-4-420-316-009 | SHEET No. 13 |



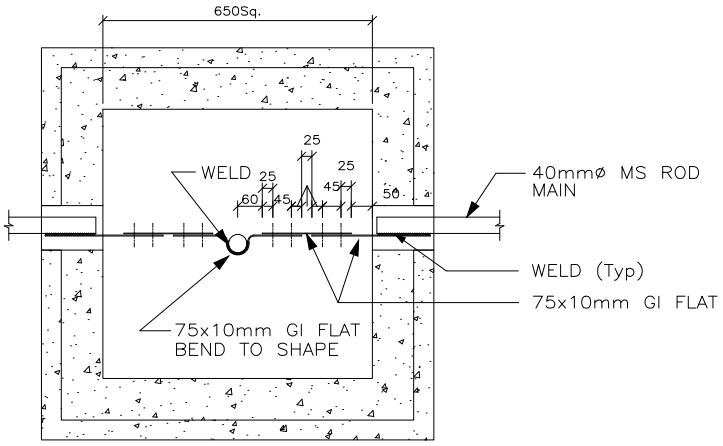

## LEGENDS:

75x10mm GI FLAT

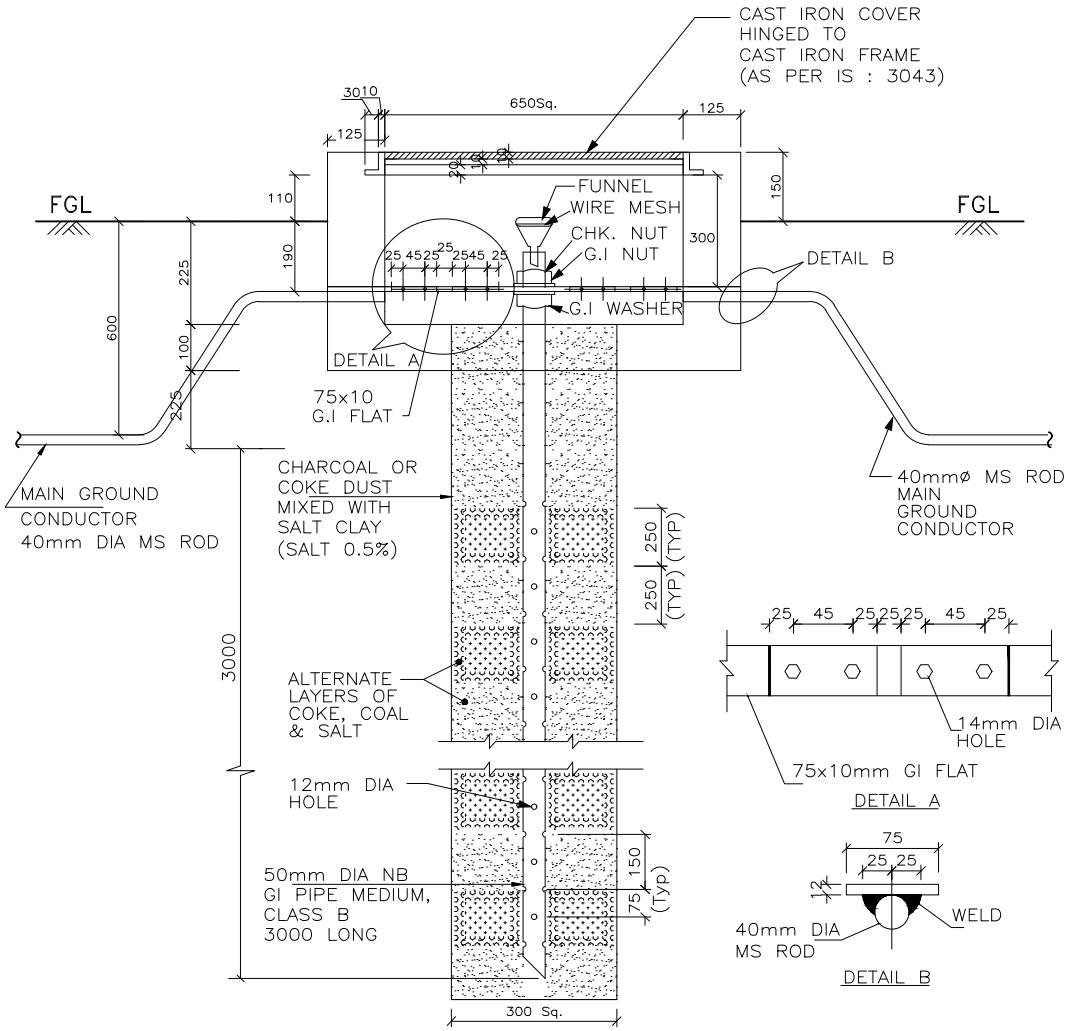
## NOTES:

1. RAILWAY TRACKS WITHIN SWITCHYARD AREA SHALL BE EARTHED AT A SPACING OF NOT MORE THAN 30m AND ALSO AT BOTH ENDS.

| | | |
|---|---|---|
| बीएचईएल BHEL | EQUIPMENT EARTHING DETAILS<br>RAIL BONDING | |
| COMPUTERREF.NO. | DRG. No. TB-4-420-316-009 | SHEET No. 14 |



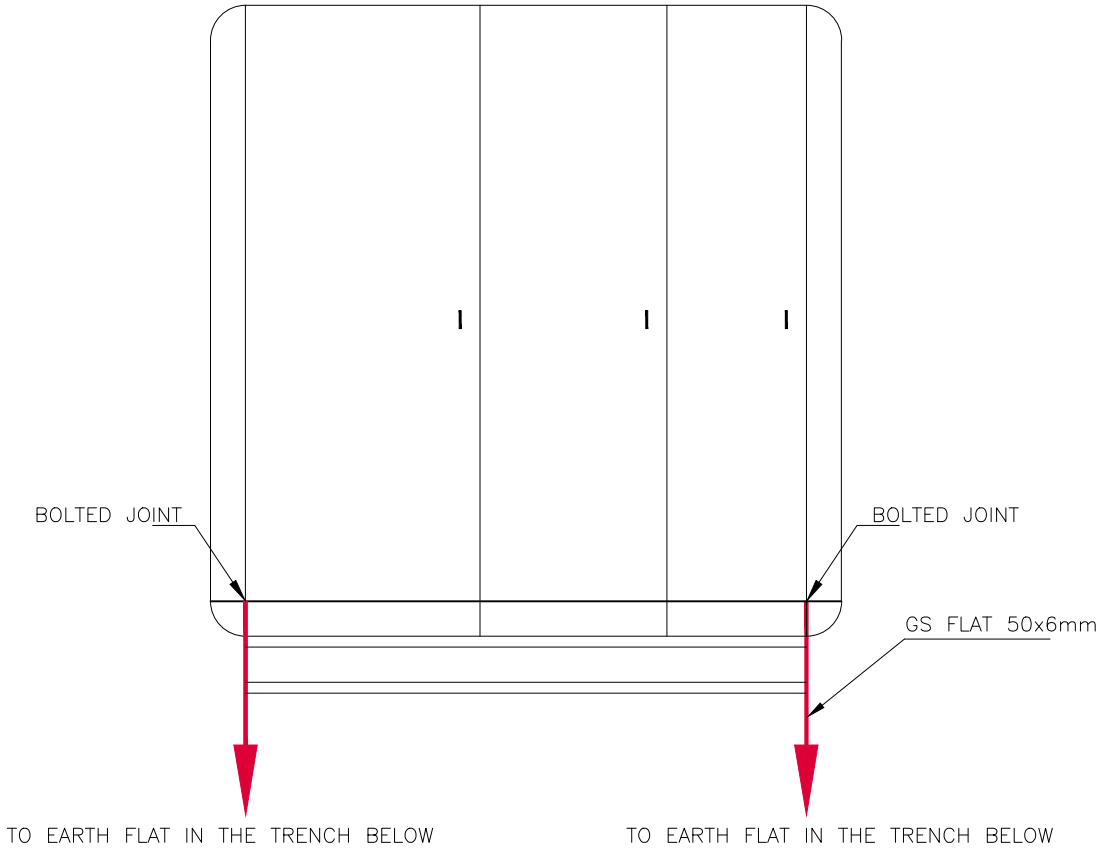

PLAN




NOTES:

1. SUPPLY OF FIXING BOLTS NUTS & WASHERS FOR GI FLAT EARTHING CONDUCTOR IS ALSO FORMS PART OF THE SCOPE.
2. TO BE USED FOR TRANSFORMER /REACTOR NEUTRAL EARTHING AND FOR SURGE ARRESTER.

| | | |
|---|---|---|
| बीएचईएल BHEL | EQUIPMENT EARTHING DETAILS<br>PIPE EARTH ELECTRODE WITH TREATED PIT | |
| COMPUTERREF.NO. | DRG. No. TB-4-420-316-009 | SHEET No. 15 |



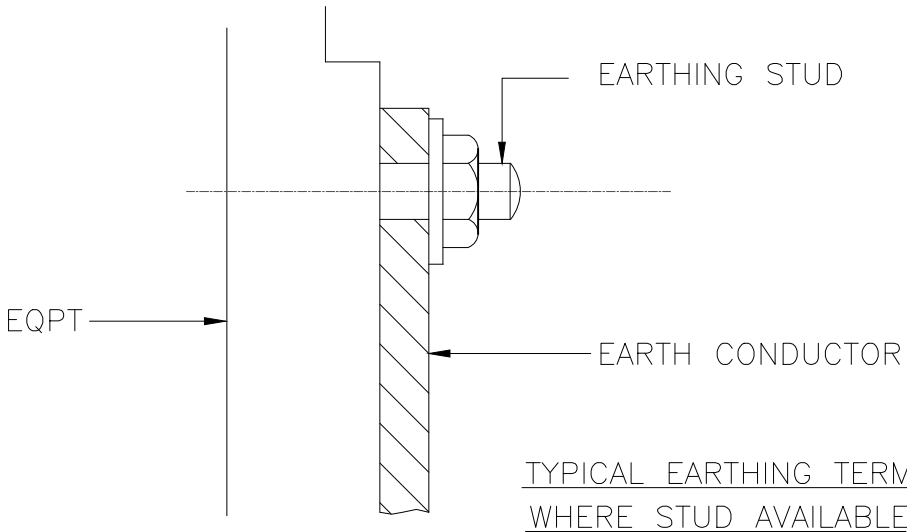

## LEGENDS:

50x6mm GI FLAT

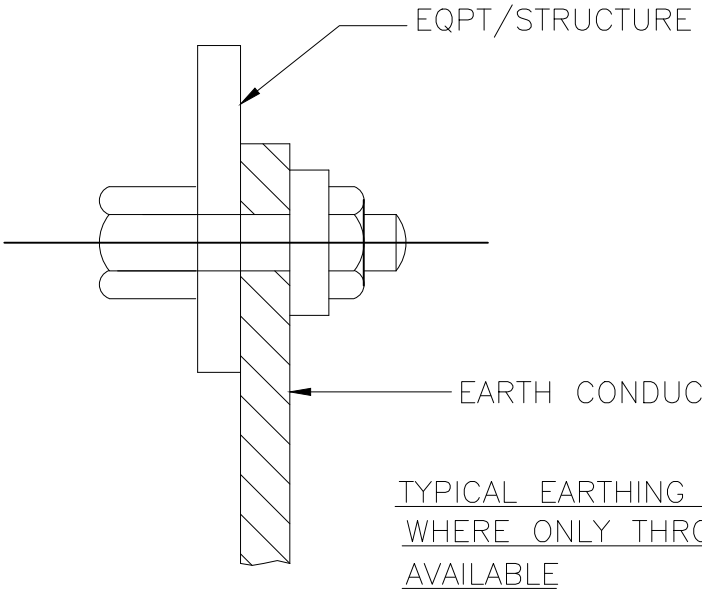
## NOTES:

1. ALL PANELS/ BOARDS/ KIOSKS/ MBs SHALL BE EARTHED AT TWO LOCATIONS USING 50x6mm GI FLAT, WHICH IN TURN SHALL BE CONNECTED TO MAIN EARTH MAT THROUGH EARTH CONDUCTORS IN TRENCHES OR THROUGH RISERS.

| | | |
|---|---|---|
| बीएचईएल BHEL | EQUIPMENT EARTHING DETAILS<br>CONTROL AND RELAY PANELS/BATTERY CHARGER/AC DC BOARDS/MLDB | |
| COMPUTERREF.NO. | DRG. No. TB-4-420-316-009 | SHEET No. 17 |




TYPICAL EARTHING TERMINAL JOINT WHERE STUD AVAILABLE




TYPICAL EARTHING TERMINAL JOINT WHERE ONLY THROUGH HOLE IS AVAILABLE

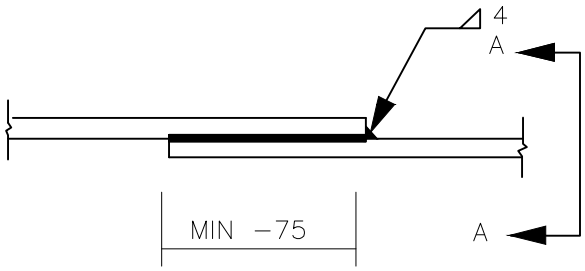
## NOTE

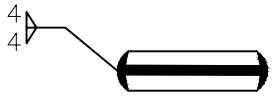
1. THIS IS GENERAL TYPICAL BOLTING ARRANGEMENT APPLICABLE TO ALL PANELS, EQUIPMENT ETC. WHERE BOLTING ARRANGEMENT IS PROVIDED.
2. IN CASE EARTHING TERMINAL COMPRISES ONLY A TAPPED HOLE SUITABLE BOLT/ SCREW WITH WASHER MAY BE USED FOR EARTHING CONDUCTOR TERMINATION

| | | |
|---|---|---|
| बीएचईएल BHEL | EQUIPMENT EARTHING DETAILS<br>TYPICAL ARRANGEMENT OF BOLTED JOINTS | |
| COMPUTERREF.NO. | DRG. No. TB-4-420-316-009 | SHEET No. 18 |

# STRIP TO STRIP (75x10/50X6 GI FLAT)

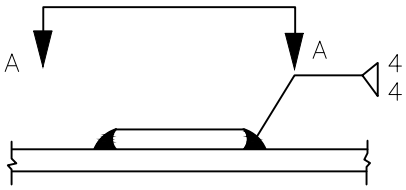
1. STRAIGHT LAP JOINT/RISER

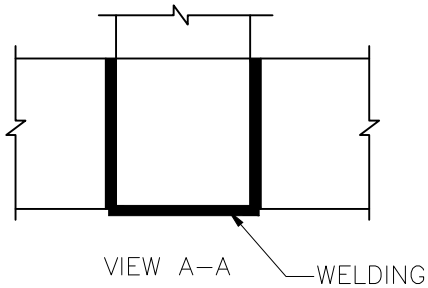


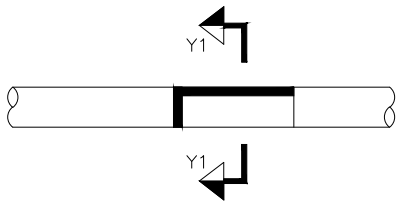

VIEW–A–A

2. CROSS LAP JOINT



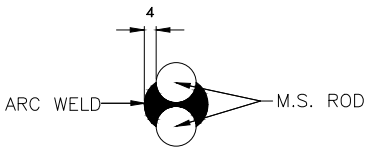




| | | |
|---|---|---|
| बीएचईएल BHEL | EQUIPMENT EARTHING DETAILS<br>WELDING DETAILS | |
| COMPUTERREF.NO. | DRG. No. TB–4–420–316–009 | SHEET No. 19 |

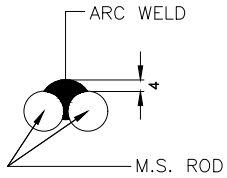



ELEVATION

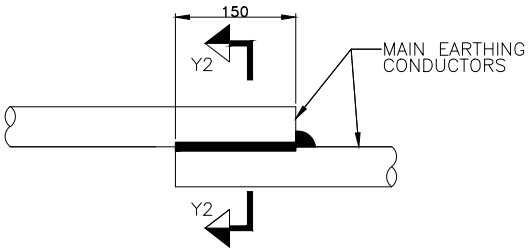
(CONDUCTOR IN HORIZONTAL PLANE)




SECTION Y2-Y2

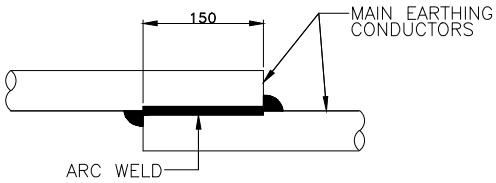


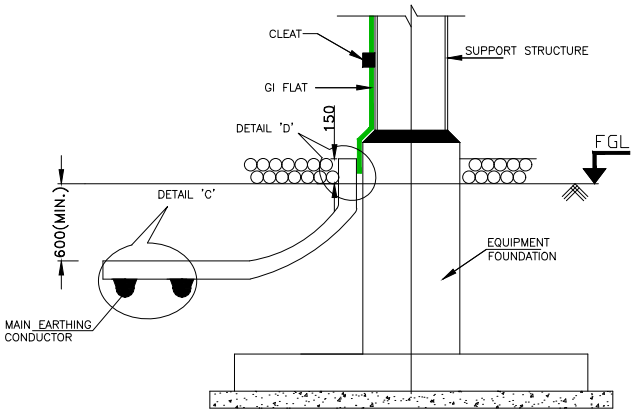

SECTION Y1-Y1



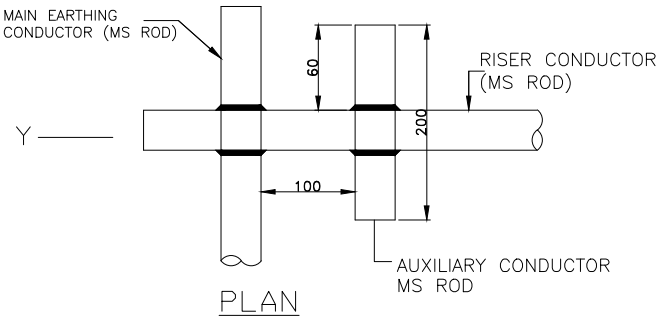

ELEVATION

(CONDUCTOR IN VERTICAL PLANE)

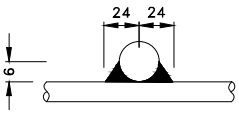


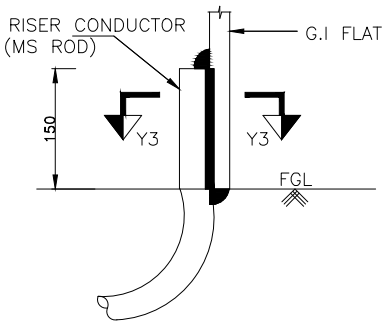

TYPICAL DETAILS OF RISER



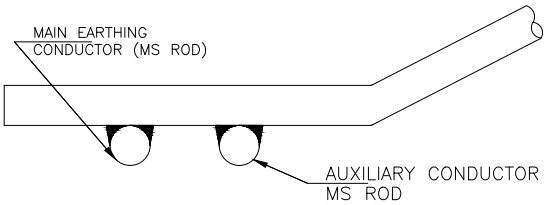

PLAN



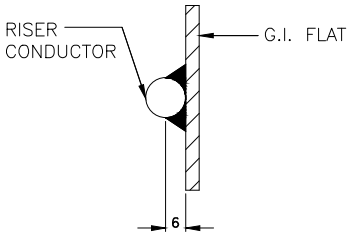

VIEW-Y




ELEVATION
DETAIL-D




ELEVATION
DETAIL-C



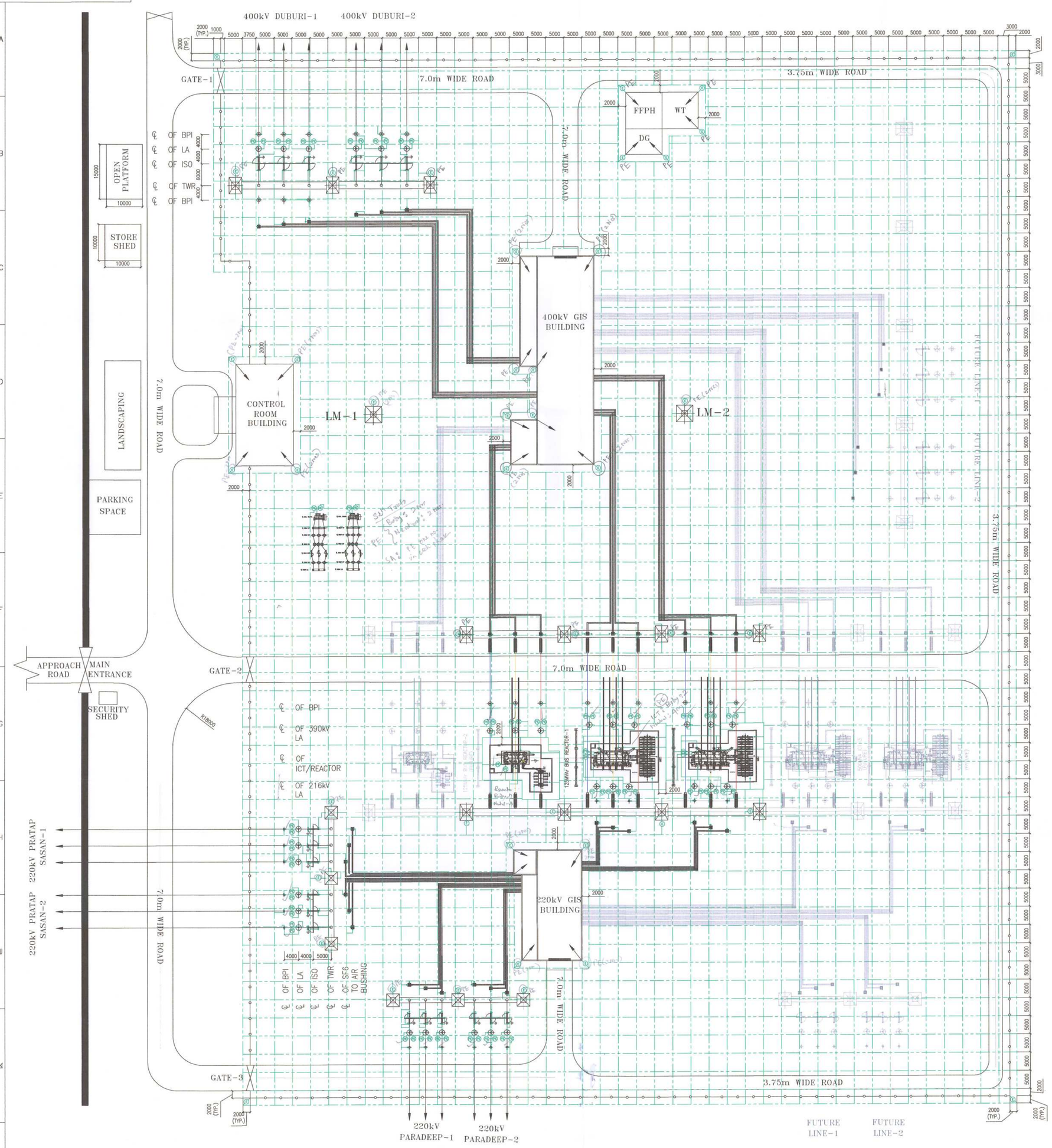

SECTION Y3-Y3

TYPICAL OVERLAPPING JOINT OF TWO CONDUCTORS

| | | |
|---|---|---|
| बीएचईएल BHEL | EQUIPMENT EARTHING DETAILS<br>WELDING DETAILS | |
| COMPUTERREF.NO. | DRG. No. TB-4-420-316-009 | SHEET No. 20 |

FIRST ANGLE PROJECTION (ALL DIMENSIONS ARE IN MM.)

DRG. NO. TB-0-420-316-008




TRUE NORTH
PLANT NORTH
15°

## NOTES:-

1. THE EARTHING SYSTEM SHOWN IS SCHEMATIC. EXACT LOCATION OF EARTH CONDUCTOR, RISER PIGTAILS, ROD ELECTRODES, PIPE ELECTRODES WITH TEST PIT SHALL BE DETERMINED AT SITE AS PER SITE CONDITIONS.
2. ALL EQUIPMENT AND STRUCTURES SHALL, IN GENERAL, BE GROUNDED AT TWO POINTS AT OPPOSITE CORNERS WHETHER SHOWN IN DRAWING OR NOT AND THESE SHALL BE CONNECTED TO DIFFERENT PARTS OF THE MATS WHEREVER POSSIBLE IN ADDITION ALL EARTHING AS PER TYPICAL EARTHING DETAIL IN DRG. NO. TB-4-420-316-009 TO BE FOLLOWED.
3. SPACING OF BURIED CONDUCTOR SHALL BE 5M IN BOTH DIRECTIONS AS FAR AS POSSIBLE EXCEPT WHERE ADDITIONAL CONDUCTORS ARE SHOWN FOR GROUNDING OF MAJOR STRUCTURAL COLUMNS/BUILDINGS/EQUIPMENT.
4. THE GROUNDING MAT (40mm DIA. MS ROD) SHALL BE BURIED AT 700mm BELOW FGL.
5. CONNECTION WITH EQUIPMENT EARTHING PAD SHALL BE BOLTED TYPE; CONNECTION BETWEEN EQUIPMENT GROUNDING LEADS AND MAIN GROUND CONDUCTORS SHALL BE WELDED TYPE. FOR RUST PROTECTION THE WELDS SHALL BE CLEANED WITH WIRE BRUSH, TREATED WITH RED PRIMER AND AFTERWARDS THICKLY COATED WITH BITUMEN.
6. ALL GROUND CONNECTIONS SHALL BE MADE BY ELECTRIC ARC WELDING. ALL WELDED JOINTS SHALL BE ALLOWED TO COOL DOWN GRADUALLY TO ATMOSPHERIC TEMPERATURE BEFORE PUTTING ANY LOAD ON THEM. ARTIFICIAL COOLING SHALL NOT BE ALLOWED.
7. ALL ARC WELDING OF LARGE DIAMETER CONDUCTORS SHALL BE DONE BY NORMAL LOW HYDROGEN CONTENT ELECTRODES.
8. IN CASE HIGH TEMPERATURE IS ENCOUNTERED AT SOME LOCATION THE EARTHING CONDUCTOR SHALL BE LAID MINIMUM 1500mm AWAY FROM SUCH LOCATIONS.
9. EARTHING OF GAS INSULATED BUS DUCT SUPPORT STRUCTURE SHALL BE SHOWN SEPERATLY ALONG WITH GIS
10. ALL STEEL COLUMNS & RCC COLUMNS WHETHER SPECIFICALLY SHOWN OR NOT, SHALL BE CONNECTED TO EARTHING SYSTEM.
11. WHEREVER EARTHING CONDUCTOR CROSSES UNDER GROUND SERVICE DUCTS, PIPES, TRENCHES, RAILWAY TRACKS ETC., IT SHALL BE LAID MINIMUM 300MM BELOW OR AT A SUITABLE DEPTH TO CLEAR THEIR CIVIL WORKS, THE EARTHING CONDUCTOR SHALL BE RE-ROUTED IN CASE IT FOULS WITH EQUIPMENT FOUNDATIONS ALREADY ERECTED.
12. GROUNDING CONDUCTOR AROUND THE BUILDING SHALL BE BURIED IN EARTH AT A MINIMUM DISTANCE OF 2m FROM THE OUTER WALL / FOUNDATION / BOUNDARY OF THE BUILDING.
13. EACH EARTHING LEAD FROM THE NEUTRAL OF H.T./L.T. POWER TRANSFORMER/REACTOR & EACH SURGE ARRESTER SHALL BE DIRECTLY CONNECTED TO TWO INDEPENDENT PIPE ELECTRODES WITH TEST PITS WHICH IN TURN SHALL BE CONNECTED TO STATION EARTH GRID. MINIMUM 5000mm SPACING BETWEEN PIPE ELECTRODES SHALL BE PROVIDED.
14. EARTHING TERMINAL OF LIGHTNING DOWN CONDUCTOR (FROM TOWER WITH PEAK, LM, BUILDINGS) CORNERS OF FENCE SHALL BE DIRECTLY CONNECTED TO ROD ELECTRODE WHICH IN TURN SHALL BE CONNECTED TO STATION EARTHING GRID.
15. LOCATION OF PIPE ELETRODES, PE & ROD ELECTRODES, E ARE SHOWN TENTATIVELY.
16. EARTHMAT SHOULD BE LAID 2m BEYOND FENCE ON ALL SIDES.
17. 50X6 MM GI FLAT SHALL BE USED FOR EARTHING OF CABLE TRENCHES, ALL TRENCHES SHALL BE EARTHED THROUGH RISERS AT AND INTERVAL OF 20m ALONG THE LENGTH OF THE TRENCH & AT ALL BENDS OF THE TRENCHES.
18. GROUNDING CONDUCTORS EMBEDDED IN CONCRETE SHALL HAVE APPROXIMATELY 50MM CONCRETE COVER. IF GROUNDING CONDUCTOR IS REQUIRED TO BE EMBEDDED IN MAJOR FOUNDATIONS, THEN IT SHALL BE LAID IN A SLEEVE.
19. RAILWAY TRACKS WITHIN SWITCHYARD AREA SHALL BE BONDED ACROSS FISH PLATES AND CONNECTED TO EARTHING GRID AT SEVERAL LOCATIONS.
20. RISERS FOR KIOSK, JB, ICT/REACTOR/ISOLATOR MBs AND 33kV EQUIPMENT ARE NOT SHOWN FOR THE SAKE OF CLARITY. FOR TYPICAL DETAILS PLEASE REFER SEPARATE EQUIPMENT EARTHING DRG. NO. TB-4-420-316-009.
21. CONDUCTORS SHALL BE LAID AFTER COMPLETION OF ADJACENT COLUMN/ EQUIPMENT FOUNDATIONS. LAYING OF GROUND CONDUCTORS SHALL BE SEQUENTIALLY COORDINATED WITH THE ERECTION OF ALL UNDERGROUND FACILITIES CABLE TRENCH, SUMP PITS, DRAINS ETC.
22. GROUNDING CONDUCTORS ALONG THEIR RUN ON CABLE TRENCH, LADDER, COLUMNS, BEAMS, WALLS, ETC, SHALL BE SUPPORTED BY SUITABLE WELDING/CLEATING AT AN INTERVALS OF 1.5m. GROUNDING CONDUCTOR ALONG CABLE TRENCHES SHALL BE ON THE WALL NEAR TO THE EQUIPMENT. WHEREVER A GROUNDING CONDUCTOR PASSES THROUGH WALL, FLOORS ETC GALVANIZED IRON SLEEVE SHALL BE PROVIDED FOR THE PASSAGE OF THE CONDUCTOR. BOTH END OF THE SLEEVE SHALL. BE SEALED TO PREVENT THE PASSAGE OF WATER THROUGH THE SLEEVE.
23. ALL STEEL COLUMNS, METALLIC STAIRS ETC. SHALL BE CONNECTED TO THE NEAREST GROUNDING CONDUCTOR BY GROUNDING LEADS. ELECTRICAL CONTINUITY SHALL BE ENSURED BY BONDING THE DIFFERENT SECTIONS OF HAND RAILS AND METALLIC STAIRS.
24. METALLIC PIPES, CONDUITS AND CABLE TRAY SECTION FOR CABLE INSTALLATION SHALL BE BONDED TO ENSURE ELECTRICAL CONNECTION TO GROUNDING CONDUCTOR AT NOT MORE THAN 20m INTERVAL APART FROM INTERMEDIATE CONNECTION, BOTH ENDS SHALL ALSO BE CONNECTED TO THE GROUNDING SYSTEM.
25. WHEREVER GROUNDING CONDUCTOR CROSSES OR RUNS ALONG METALLIC STRUCTURES SUCH AS GAS/WATER/STEAM CONDUIT/PIPES ETC. AND STEEL REINFORCEMENT OF CONCRETE. IT SHALL BE BONDED TO THE SAME.
26. FOR EQUIPMENT, FENCE, GATE, AUXILIARY EARTH MAT, ELECTRODES ETC. DETAILS REFER EQUIPMENT EARTHING DETAILS DRAWING NO. TB-4-420-316-009.
27. EVERY POST OF FENCE AND GATE SHALL BE CONNECTED TO EARTH GRID BY ONE LEAD.
28. THE EARTHING LAYOUT SHOWN IN DRAWING IS FOR BASIC UNDERSTANDING PURPOSE ONLY. THE CONDUCTOR SPACING CAN BE CHANGED SLIGHTLY TO SUIT THE SITE CONDITIONS,
29. THIS DRAWING IS TO BE READ FOR EARTHING/ GROUNDING FOR OUTDOOR SUB-STATION AREA ONLY.
30. Auxiliary Earth mat to be provided below the E/W and connected to Earthmat
31. Gate posts, fencing posts of S/S, shall be bonded together with below ground connections. The gate themselves shall be electrically bonded to the post at two points through flexible braids.

## PIPE ELECTRODE WITH TREATED EARTH PIT (PE)

| SN | EQUIPMENT/ FACILITY | ELECTRODES PER EQPT. | NO. OF EQUIPMENT | TOTAL NO. OF ELECTRODES |
|---|---|---|---|---|
| 1 | ICT | 02 6 | 02 | 04 12 |
| 2 | REACTOR | 02 6 | 01 | 02 06 |
| 3 | LT TRASFORMER | 02 04 | 02 | 04 8 |
| 4 | 390kV LA | 02 | 15 | 30 |
| 5 | 216kV LA | 02 | 18 | 36 |
| TOTAL NO. OF PIPE ELECTRODES | | | | 76 |

## ROD ELECTRODES WITH TEST PIT (E)

| SN | EQUIPMENT/ FACILITY | ELECTRODES PER EQPT. | NO. OF EQUIPMENT | TOTAL NO. OF ELECTRODES |
|---|---|---|---|---|
| 1 | CONTROL ROOM BUILDING | 04 | 01 | 04 |
| 2 | 400kV GIS BUILDING | 08 | 01 | 08 |
| 3 | 220kV GIS BUILDING | 05 | 01 | 05 |
| 4 | FFPH/ DG BUILDING | 05 | 01 | 05 |
| 5 | FENCE | 01 | 04 | 04 |
| 6 | LM | 01 | 02 | 02 |
| 7 | TOWER WITH PEAKS | 01 | 17 | 17 |
| TOTAL NO. OF ROD ELECTRODES | | | | 45 |

## QUANTITY OF RISERS

| S.NO. | EQUIPMENT/ FACILITY | NO. OF RISERS PER EQPT |
|---|---|---|
| 1 | 400/220kV ICT | 08 |
| 2 | 400kV REACTOR | 08 |
| 3 | 33/0.433kV STATION TRANSFORMER | 04 |
| 4 | SURGE ARRESTER | 03 |
| 5 | POST INSULATOR | 02 |
| 6 | TOWER WITH PEAK/ LM | 03 |
| 7 | OUTDOOR KIOSK/ JB/ PANEL | 02 |
| 8 | CONTROL ROOM BUILDING | 04 |
| 9 | FFPH/ DG BUILDING | 05 |
| 10 | 400kV GIS BUILDING | AS PER THE EARTHING PHILOSOPHY OF GIS OEM * |
| 11 | 220kV GIS BUILDING | |
| 12 | SF6 TO AIR BUSHING | |
| 13 | GIB SUPPORT STRUCTURE | |
| 14 | GIS BUILDING STEEL COLUMN | |

* – A SEPARATE DOCUMENT WILL BE SUBMITTED FOR GIS & RELATED EQPT. EARTHING PHILOSOPHY.

## LEGENDS:

- MAIN EARTH CONDUCTOR: 40mm DIA MS ROD CONDUCTOR, 700mm BELOW FGL.
- RISER FOR CONNECTION TO EQUIPMENT IN CR BUILDING, GIS BUILDING/ FFPH/ABOVE GROUND RISERS
- RISER FOR CONNECTION TO EQUIPMENT/ ABOVE GROUND RISERS.
- (E) ELECTRODE WITHOUT TEST PIT: 40mm DIA., 3m LONG, VERTICAL MS ROD WITH NON TREATED TEST PIT.
- (PE) ELECTRODE WITH TEST PIT: 50mm DIA., 3m LONG, VERTICAL PERFORATED GI PIPE WITH TREATED EARTH PIT.

| PROJECT: | 400/220 kV GIS SUB STATION AT ERSAMA ODISHA & 400kV AIS FEEDER BAY EXTENTION DUBURI ODISHA |
|---|---|
| OWNER: | ODISHA POWER TRANSMISSION CORPORATION LIMITED |
| | BHARAT HEAVY ELECTRICALS LTD. TRANSMISSION BUSINESS GROUP NOIDA |

| | NAME | SIGN. | DATE |
|---|---|---|---|
| DRAWN | AK | | 12.04.23 |
| CHECKED | AK | | 13.04.23 |
| APPROVED | DKS | –SIGNED– | 13.04.23 |

DEPT. TBEM CODE 420 | SCALE | CARD CODE

DRG TITLE: EARTHING LAYOUT FOR 400/220kV GIS SUB STATION AT ERSAMA

DRAWING NO. TB-0-420-316-008 | REV. 00 | SHEET No. 01 | NEXT SHEET ---

FIRST ANGLE PROJECTION (ALL DIMENSIONS ARE IN MM.)

DRG. NO. TB-0-420-316-010


## BILL OF QUANTITY (CABLE TRENCHES)*:- A1

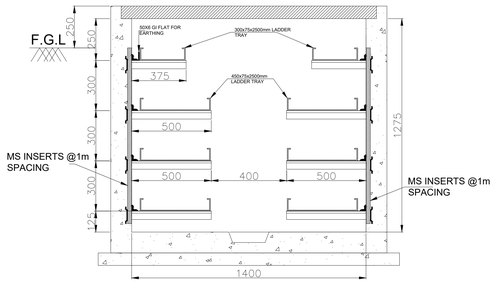
| S.NO. | DESCRIPTION | UNIT | QUANTITY (As per Tender BPS) | QUANTITY (As per DRG.) |
|---|---|---|---|---|
| 1 | TR 1-1 | m | 350 | 480 |
| 2 | TR 2-2 | m | 300 | 260 |
| 3 | TR 3-3 | m | 250 | 330 |
| 4 | TR 4-4 | m | 300 | 165 |

* - ABOVE MENTIONED QUANTITY INCLUDES INDOOR TRENCHES.

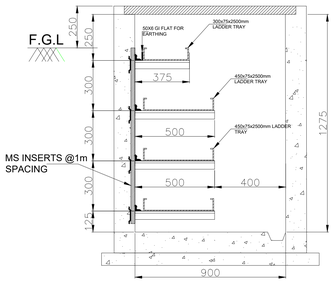
## BILL OF QUANTITY (TRAYS & SUPPORT ANGLE)*:- A1

| S.NO. | DESCRIPTION | UNIT | QUANTITY (As per Tender BPS) | QUANTITY (As per DRG.) |
|---|---|---|---|---|
| 1 | GI CABLE TRAY (SIZE 450x75x2500mm LADDER) | m | 1500 | 4875 |
| 2 | GI CABLE TRAY (SIZE 300x75x2500mm LADDER) | m | 1250 | 1750 |
| 3 | GI CABLE TRAY (SIZE 150x75x2500mm PERFORATED) | m | 1000 | 250 |
| 4 | GI ANGLE (SIZE 50x50x6mm) FOR TRAY SUPPORT | MT | 5 | 13.3 |
| 5 | HARD CONDUIT (50/100mm GI PIPE INCLUDING BENDS & SOCKETS) | LOT | 1 | 1 |

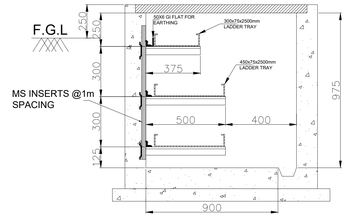
* - ABOVE MENTIONED QUANTITY INCLUDES INDOOR TRENCH MATERIAL QUANTITY.



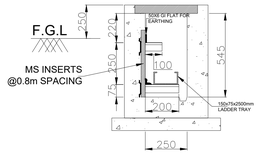

TR 1-1
(NTS)




TR 2-2
(NTS)




TR 3-3
(NTS)




TR 4-4
(NTS)

## NOTES :-

1. ALL DIMENSIONS ARE IN mm.
2. THE LOCATION OF CABLE TRENCHES MARKED IN THIS DWG. MAY BE SLIGHTLY MODIFIED TO SUIT SITE CONDITIONS.
3. OPENINGS FOR TAKING OUT PVC PIPES TO EQUIPMENTS SHALL BE PROVIDED IN CABLE TRENCHES. OPENING OF SIZE SUITABLE TO DIA. 50/100 PIPE SHALL BE PROVIDED BELOW TOP CABLE SUPPORT.
4. LOCATIONS OF OUTDOOR KIOSKS, CONSOLE BOXES TO BE SUITABLY DECIDED AT SITE.
5. CABLE ENTRY/EXIT FROM TRENCH IS INDICATED AS
6. PULL BOXES (600x600x400) SHALL BE USED AT THE FREE END TURNING AND @15M IF PIPE LENGTH EXCEEDS 15M.
7. CABLE SUPPORT FOR OUTDOOR TRENCHES SHALL BE PROVIDED AT EVERY 1m INTERVAL. SUPPORT CHANNEL SHALL BE FIXED TO WELDED ON INSERTS IN TRENCH WALL USING MS/ GI FLAT CHAIR.
8. 1.1kV CONTROL CABLE SHALL BE PLACED IN MULTILAYER ON TRAYS SUPPORTED BY GI CABLE RACK SUPPORT (ANGLE).
9. AUXILARY POWER CABLES SHALL BE LAID IN TOP TIERS AND CONTROL CABLES IN BOTTOM TIERS.
10. FIBER OPTIC CABLE (IF PROVIDED) SHALL BE LAID IN HDPE PIPE AND SAME SHALL BE ROUTED THROUGH BOTTOM OF CABLE TRENCH.
11. CABLES FOR LIGHTING PURPOSE SHALL BE LAID IN GI PIPE/ TRENCH. SEPARATE DRAWING SHALL BE SUBMITTED FOR LIGHTING SYSTEM.
12. LOCATION OF CABLE TRENCHES INSIDE CONTROL ROOM SHALL BE SHOWN IN SEPARATE DRAWING.
13. EARTH CONDUCTOR 50X6 GI FLAT TO BE WELDED IN VERTICAL ON THE CABLE SUPPORT BIEFORE INSTALLATION OF CABLES.
14. FOR POWER & CONTROL CABLES, SEPARATE PIPES SHALL BE USED CONSIDERING 60% VOID FOR EACH PIPE I.E., 40% FILLING CRITERIA.
15. ALL OTHER DETAILS PERTAINING TO CIVIL WORKS SHALL BE REFLECTED IN THE RESPECTIVE CIVIL DRAWINGS.
16. GI PIPES SHALL BE SECURELY FIXED AT BOTH ENDS.
17. AFTER LAYING THE CABLES THE ENDS OF PIPES SHALL BE FULLY SEALED TO PREVENT INGRESS OF WATER INSIDE THE PIPE.
18. THE PURPOSE OF TRENCH LAYOUT DRAWING IS FOR USE AS FOLLOWS: - TO BE USED AS CIVIL INPUT FOR CABLE TRENCHES. - FOR ERECTION OF CABLE RACKS & TRAYS AT SITE. - FOR CABLE LAYING AND ROUTING AT SITE.
19. INDICATES CULVERT FOR ROAD CROSSING OF CABLE TRENCHES.
20. INDICATES ROUTE OF 33kV CABLE FROM TERTIARY OF ICT TO STATION TRANSFORMER.



COMPUTER FILE NAME | REF. DRG. NO. | SIGN. AND DATE | INVENTORY NO

| REV. | DATE | ALTERED | CHECKED | APPROVED |
|---|---|---|---|---|
| 01 | 05.09.23 | AK | AK | DKS |

DRAWING REVISED AS PER OPTCL COMMENTS GIVEN DURING MEETING DATED 02.09.23.
1. REVISED ELEC. LAYOUT PLAN INCORPORATED.
2. EARTHING MATERIAL QTY REVISED ACCORDINGLY.
3. TR 4-4 TRENCH PROVIDED UPTO ISOLATOR MBs.

PROJECT: 400/220 kV GIS SUB STATION AT ERSAMA ODISHA & 400kV AIS FEEDER BAY EXTENTION DUBURI ODISHA

OWNER: ODISHA POWER TRANSMISSION CORPORATION LIMITED

BHARAT HEAVY ELECTRICALS LTD. TRANSMISSION BUSINESS GROUP NOIDA

| | NAME | SIGN. | DATE |
|---|---|---|---|
| DRAWN | AK | -SIGNED- | 17.07.23 |
| CHECKED | AK | -SIGNED- | 21.07.23 |
| APPROVED | DKS | -SIGNED- | 22.07.23 |

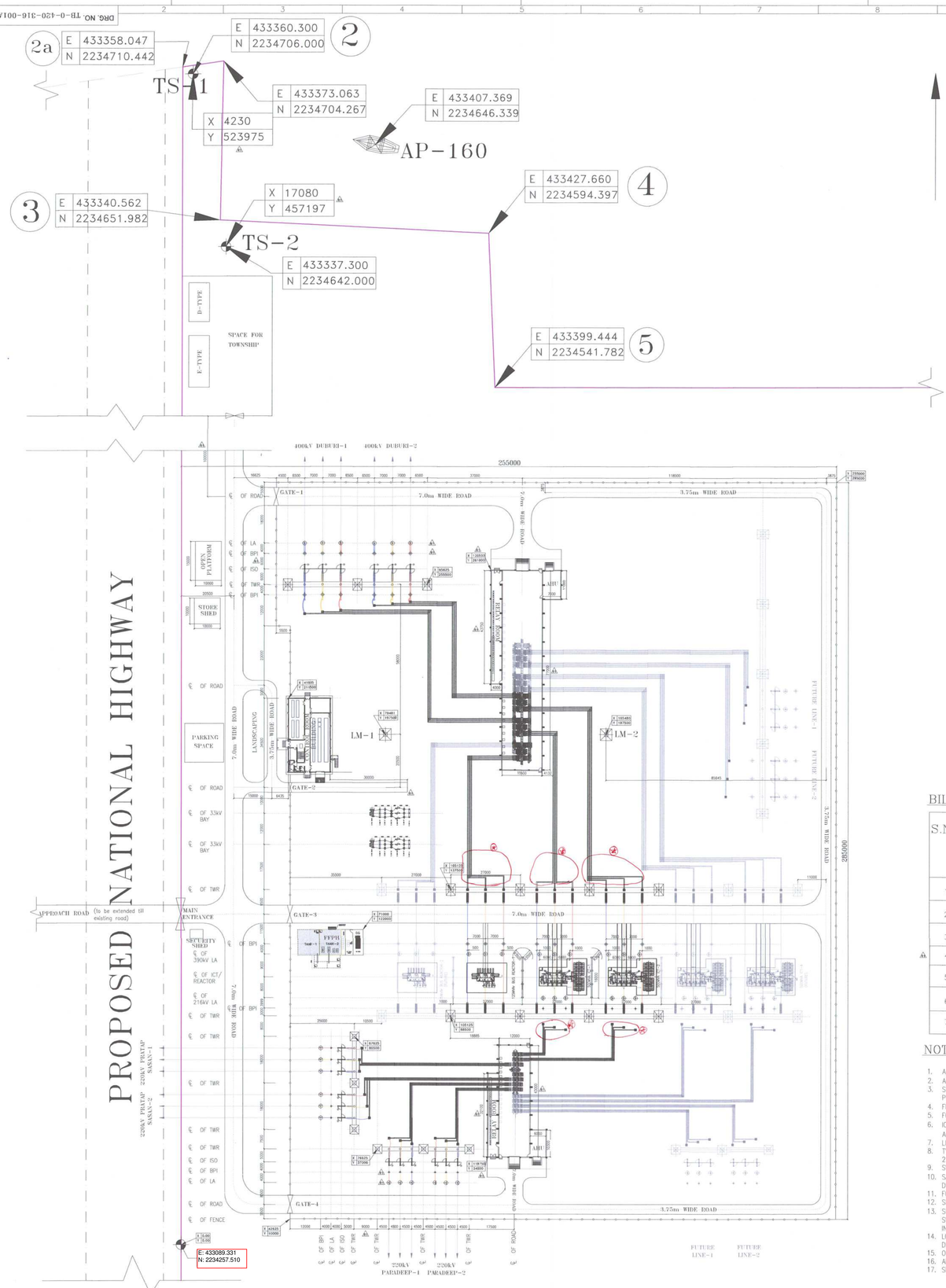
DEPT. CODE: TBEM 422 | SCALE | CARD CODE

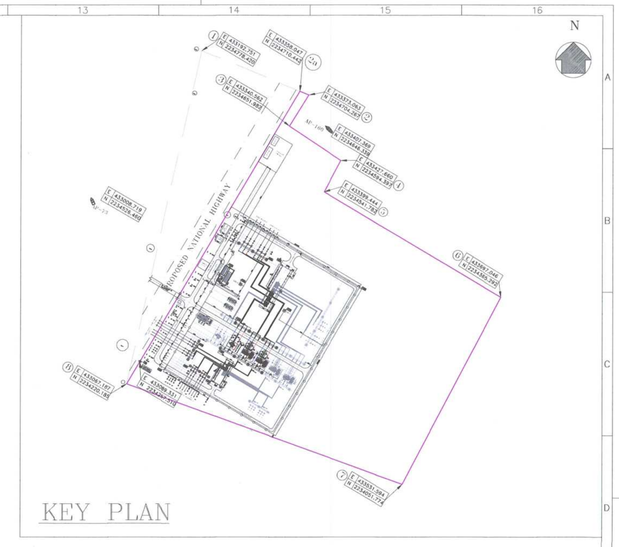
DRG TITLE: OUTDOOR CABLE TRENCH LAYOUT FOR 400/220kV GIS SUB STATION AT ERSAMA

DRAWING NO. TB-0-420-316-010 | REV. 01 | SHEET No. 01 | NEXT SHEET --

FIRST ANGLE PROJECTION (ALL DIMENSIONS ARE IN MM.)

DRG. NO. TB-0-420-316-001A




SYSTEM PARAMETERS:-

| S.N. | SYSTEM PARAMETERS | 400kV | 220kV |
|---|---|---|---|
| 1. | NOMINAL VOLTAGE | 400kV | 220kV |
| 2. | HIGHEST SYSTEM VOLTAGE | 420kV | 245kV |
| 3. | RATED FREQUENCY | 50Hz | 50Hz |
| 4. | RATED SHORT TIME CURRENT | 63kA for 3s/1s (as applicable) | 50kA for 3s/1s (as applicable) |
| 5. | POWER FREQUENCY WITHSTAND VOLTAGE | 630kV (rms) | 460Kv (rms) |
| 6. | LIGHTNING IMPULSE WITHSTAND VOLTAGE | ±1425 kV peak | ±1050 kV peak |
| 7. | SWITCHING IMPULSE WITHSTAND VOLTAGE | ±1050 kV peak | N.A |
| 8. | CREEPAGE | 31mm/kV (13020mm) | 31mm/kV (7595mm) |
| 9. | GROUNDING | Effectively earthed | Effectively earthed |
| 10. | MINIMUM ELECRTRICAL CLEARANCES:<br>i) PHASE TO PHASE<br>ii) PHASE TO EARTH<br>iii) SECTIONAL CLEARANCE | <br>i) 4000 mm<br>ii) 3500 mm<br>iii) 6500 mm | <br>i) 2160 mm<br>ii) 2160 mm<br>iii) 5000 mm |

**BHEL**

**RELEASED FOR CONSTRUCTION**
**DESTROY EARLIER PRINTS**

SIGNED AKH DATE 31.10.23

**Transmission Business Engineering Management**

Notes:
1) Provision shall be made for installation of isolators on both sides of 400/220kV ICTs and 400kV side of bus reactor (and BPTs if required).
2) The 400kV & 220kV bus duct length shall be reduced accordingly.
3) The 400kV & 220kV isolators shall be supplied by OPTCL and all civil & electrical erection work shall be executed by M/s BHEL.

BILL OF QUANTITY (420kV EQUIPMENT):-

| S.NO. | DESCRIPTION | QUANTITY (As per Tender BPS) | QUANTITY (As per DRG.) |
|---|---|---|---|
| 1 | 420kV INDOOR GIS | 01 | 01 |
| 2 | 400kV, 125MVAr BUS REACTOR | 01 | 01 |
| 3 | 400/220/33kV, 500MVA ICT | 02 | 02 |
| 4 | 420kV, 3150A, 63kA/3s, 3-ph HDB ISOLATOR | 00 | 02 |
| 5 | 420kV, 1-ph SF6 TO AIR BUSHING | 15 | 15 |
| 6 | 390kV, 1-ph SURGE ARRESTER | 24 | 15 |
| 7 | 420kV, 8kN , 1-ph, BUS POST INSULATOR | 16 | 21 |

BILL OF QUANTITY (245kV EQUIPMENT):-

| S.NO. | DESCRIPTION | QUANTITY (As per Tender BPS) | QUANTITY (As per DRG.) |
|---|---|---|---|
| 1 | 245 kV INDOOR GIS | 01 | 01 |
| 2 | 245kV, 3150A, 50kA/3s, 3-ph HDB ISOLATOR | 00 | 04 |
| 2 | 245kV, 1-ph SF6 TO AIR BUSHING | 18 | 18 |
| 3 | 216kV, 1-ph SURGE ARRESTER | 18 | 18 |
| 4 | 245kV, 8kN , 1-ph, BUS POST INSULATOR | 24 | 18 |

NOTES:-

1. ALL DIMENSIONS ARE IN mm UNLESS SPECIFIED OTHERWISE.
2. ALL STRUCTURE/CONDUCTOR HEIGHTS ARE ABOVE PLINTH LEVEL. PLINTH LEVEL IS 325 MM ABOVE F.G.L.
3. SUITABLE QUANTITY AMENDMENT ALONG WITH ADDITIONAL REQUIREMENT OVER & ABOVE EXISTING CONTRACT BOQ TO BE SETTLED COMMERCIALLY BASED ON THIS LAYOUT AS PER PROVISIONS IN CONTRACT.
4. FUTURE FACILITIES/ FACILITIES NOT IN BHEL SCOPE ARE MARKED IN GREY COLOUR.
5. FOR 400kV & 220kV GIS, INDICATIVE LAYOUT IS SHOWN, HOWEVER IT MAY CHANGE DURING DETAILED ENGINEERING AS PER OEM DESIGN. ALSO,
6. ICT/ REACTOR ALONG WITH ASSOCIATED 400kV & 220kV LA & BPI LOCATIONS ARE INDICATIVE IN THIS LAYOUT AND ARE ON HOLD. SAME SHALL BE FINALIZED AS PER ACTUAL ICT/ REACTOR GA DRAWINGS RECEIVED FROM BHEL BHOPAL.
7. LINE SIDE EQUIPMENT LOCATIONS ARE ALSO ON HOLD TILL CONFIRMATION FROM OPTCL REGARDING FINAL LOCATION OF DEAD END TL TOWERS.
8. TYPE OF GANTRY STRUCTURES SHALL BE AS PER APPROVED STRUCTURAL LAYOUT DRAWING. LINE CONDUCTORS CONSIDERED AS CONFIRMED BY OPTCL MAIL DATED 21.04.23 i.e. TWINO MOOSE FOR 400kV & SINGLE ZEBRA FOR 220kV.
9. SWITCHYARD LIGHTNING PROTECTION IS ACHIEVED THROUGH SPIKES PROVIDED AT TOWER PEAKS AS PER APPROVED DSLP.
10. SA PRESSURE RELIEF VALVE SHALL NOT BE TOWARDS TRANSFORMER/ REACTOR/ ANY EQUIPMENT KEPT NEAR LIGHTING ARRESTER AND THE SAME SHALL BE ENSURED DURING ERECTION AT SITE.
11. FOR SECTION DETAILS, REFER SEPARATE DRAWING.
12. SIZE OF GIS BUILDINGS, CONTROL ROOM BUILDING AND OTHER BUILDINGS ARE TENTATIVE & MAY CHANGE AS PER THE ACTUAL REQUIREMENT.
13. SUPPLY AND STRINGING OF 400kV & 220kV LINE CONDUCTORS, SHIELD WIRE/ OPGW, INSULATOR AND HARDWARE BETWEEN 400kV & 220kV DEAD END TOWERS AND SWITCHYARD TERMINAL GANTRIES ARE NOT IN BHEL SCOPE. HOWEVER, JUMPERING FOR THE RESPECTIVE EQUIPMENT, JUMPERS & HARDWARE REQUIRED FOR JUMPERS ARE IN SCOPE OF BHEL.
14. LOCATIONS OF 400kV & 220kV TRANSMISSION LINE TOWERS ARE AS PER CUSTOMER INPUT PROVIDED DURING DISCUSSIONS AND APPROVAL OF LAND USAGE PLAN LAYOUT DRG. NO. TB-420-316-000 DATED 04.03.2023.
15. OPTCL TO ENSURE THE LOCATION OF DEAD END TRANSMISSION LINE TOWERS AS PER THE TAKE OFF GANTRIES LOCATION MARKED IN THIS LAYOUT.
16. APPROACH ROAD TO SUBSTATION AREA WILL BE PROVIDED FROM THE EXISTING ROAD.
17. SPACE FOR TOWNSHIP AREA IS INDICATIVE AND WILL BE FINALIZED AS PER APPROVED CIVIL DRAWINGS OF QUARTERS.

PRESENT SCOPE
FUTURE/ NOT IN BHEL SCOPE
BOUNDARY WALL IN BHEL SCOPE

REFERENCE DRG.

LAND USAGE PLAN LAYOUT OF 400/220KV GIS SUB STATION AT ERSAMA (DRG. NO. TB-420-316-000, Rev.0)

| | |
|---|---|
| PROJECT: | 400/220 kV GIS SUB STATION AT ERSAMA ODISHA & 400kV AIS FEEDER BAY EXTENTION DUBURI ODISHA |
| OWNER: | ODISHA POWER TRANSMISSION CORPORATION LIMITED |
| BHARAT HEAVY ELECTRICALS LTD. TRANSMISSION BUSINESS GROUP NOIDA | |

| | NAME | SIGN. | DATE |
|---|---|---|---|
| DRAWN | AK | -SIGNED- | 04.07.23 |
| CHKD | DKS | -SIGNED- | 04.07.23 |
| APPROVD | WK | -SIGNED- | 04.07.23 |

DEPT. TBEM | CODE 422 | SCALE | CARD CODE

DRG TITLE: LAYOUT PLAN OF 400/220KV GIS SUB STATION AT ERSAMA

DRAWING NO. TB-0-420-316-001A REV. 01

SHEET No. 01 NEXT SHEET –

| REV. | DATE | ALTERED |
|---|---|---|
| 01 | 04.09.23 | AK |

CHECKED DKS
APPROVED

DRAWING REVISED TO INCORPORATE FOLLOWING CHANGES PROPOSED BY OPTCL DURING MEETING DATED 02.09.23:
1. 400kV & 220kV GIS BLDG. SIZE INCREASED.
2. COMPLETE SUBSTATION SHIFTED TOWARDS SOUTH SIDE BOUNDARY WALL.



COMPUTER FILE NAME | REF. DRG. NO. | SIGN. AND DATE | INVENTORY NO.

Deputy General Manager (R) Zonal Office, OPTCL, Bhubaneswar 5/10/2023

Provisionally APPROVED 17.10.2023 Executive Director Zonal Office, OPTCL, BBSR

Deputy General Manager (Elect.) E.H.T. Construction Division, OPTCL, Paradeep

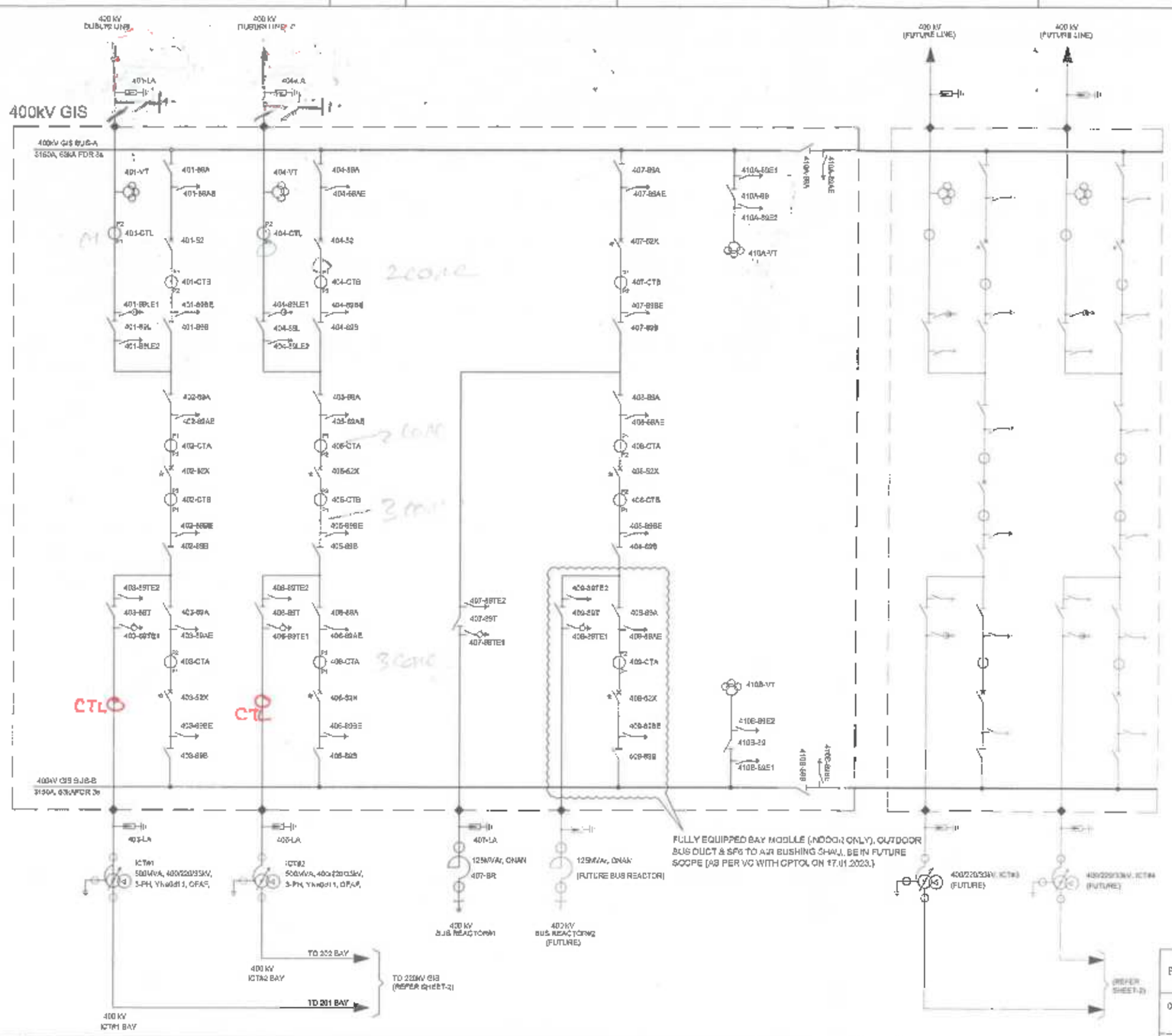
COUNTERSIGNED 23/10/23 Sr. General Manager (Elect.) EHT Construction Circle OPTCL, Bhubaneswar

Manager (El.) EHT (C) Circle, OPTCL, Bhubaneswar

FIRST ANGLE PROJECTION

(ALL DIMENSIONS ARE IN mm)

DRG. NO. TB-3-420-510-001




APPROVED
17.03.2023
Executive Director
Zonal Office, OPTCL, BBSR

15/03/2023
Deputy General Manager (EL.)
Zonal Office, OPTCL
Bhubaneswar

EQUIPMENT DESIGNATION FOR SLD

| 4 | 01 | - | 08 | A/B/L/T | Z |
|---|---|---|---|---|---|

EARTH SWITCH

A–EQUIPMENT CONNECTED ON BUS–1 SIDE
B–EQUIPMENT CONNECTED ON BUS–2 SIDE
L–DEVICE CONNECTED TO LINE SIDE
T–EQUIPMENT CONNECTED TO TRANSFORMER/REACTOR

EQUIPMENT IDENTIFICATION (ISOLATOR)

BAY NO. : 01-02....n

VOLTAGE LEVEL – 400kV

15/3/23
Deputy Manager (EL.)
Zonal Office, OPTCL
Bhubaneswar

COUNTERSIGNED
13/3/23
General Manager (EL.)
EHT Construction Circle
OPTCL, Bhubaneswar

NOTES :

1. PRESENT ———
   FUTURE - - - - - -
2. * - CB WITH CONTROLLED SWITCHING DEVICE SHALL BE PROVIDED IN 400kV ICT#1, ICT#2 & BUS REACTOR BAYS ALONG WITH THEIR ASSOCIATED TIE BAYS.
3. BAY SEQUENCE FOR GIS IS TENTATIVE & MAY CHANGE IN LINE WITH THE REQUIREMENTS OF SERVICE CONTINUITY AND STANDARD DESIGN OF OEM.
4. LOCATION OF GIS CT IN BAY MAY CHANGE AS PER THE RECOMMENDATIONS OF OEM.
5. INDIVIDUAL EQUIPMENT OF GIS OR AIS WILL BE PROVIDED AS PER REQUIREMENTS OF TECHNICAL SPECIFICATION & DEVIATIONS (IF ANY) FROM TECHNICAL SPECIFICATION WILL BE TAKEN UP SEPARATELY.
6. CT/VT PARAMETERS OF 400kV GIS ARE DETAILED IN SEPARATE SHEET OF THIS DRAWING. PARAMETERS OF BUSHING CT OF TRANSFROMERS AND BUS REACTOR WILL BE PROVIDED LATER.
7. 420kV 3150A, 63K isolator with one E/S to be provided in each line feeder.
8. CSD to be provided on both the 400kV line bay.

06/03/2023
Deputy General Manager (Elect.)
E.H.T. Construction Division,
OPTCL, Paradeep

Manager(Elect.)
EHT (Const.) Circle,
OPTCL, Bhubaneswar

THIS INFORMATION ON THIS DOCUMENT IS THE PROPERTY OF BHARAT HEAVY ELECTRICALS LIMITED. IT MUST NOT BE USED DIRECTLY OR INDIRECTLY IN ANY WAY DETRIMENTAL TO THE INTEREST OF THE COMPANY.

| REV. | DATE | ALTERED CHD/APPD | REV. | DATE | ALTERED CHD/APPD | REV. | DATE | ALTERED CHD/APPD | REV. | DATE | ALTERED CHD/APPD |
|---|---|---|---|---|---|---|---|---|---|---|---|
| ZONE | | | ZONE | | | ZONE | | | ZONE | | |

PROJECT: 400/220kVGIS SUBSTION AT ERSAMA, ODISHA & 400kV AIS FEEDER BAY EXTENSION AT DUBURI, ODISHA

OTHER: ODISHA POWER TRANSMISSION CORPORATION LIMITED

BHARAT HEAVY ELECTRICALS LTD. TRANSMISSION BUSINESS GROUP NOIDA

| | NAME | SIGN. | DATE |
|---|---|---|---|
| DRN. | AK | | |
| CHD. | DKS | | |
| APPD. | VK | | |

NO. OF VAR. N.A.

| DEPT. CODE | UNTOL. DIMS. OR. +/-0.1 | SCALE | WEIGHT (KG) | REF. TO ASSY. DRG. | ITEM NO. | NO. OF ITEMS |
|---|---|---|---|---|---|---|
| TEG | | N.T.S | N.A. | N.A. | N.A. | N.A. |

TITLE: SINGLE LINE DIAGRAM OF 400/220kV GIS SUB STATION AT ERSAMA

CARD CODE: NA

DRG. NO. TB-3-420-510-001

REV. 00

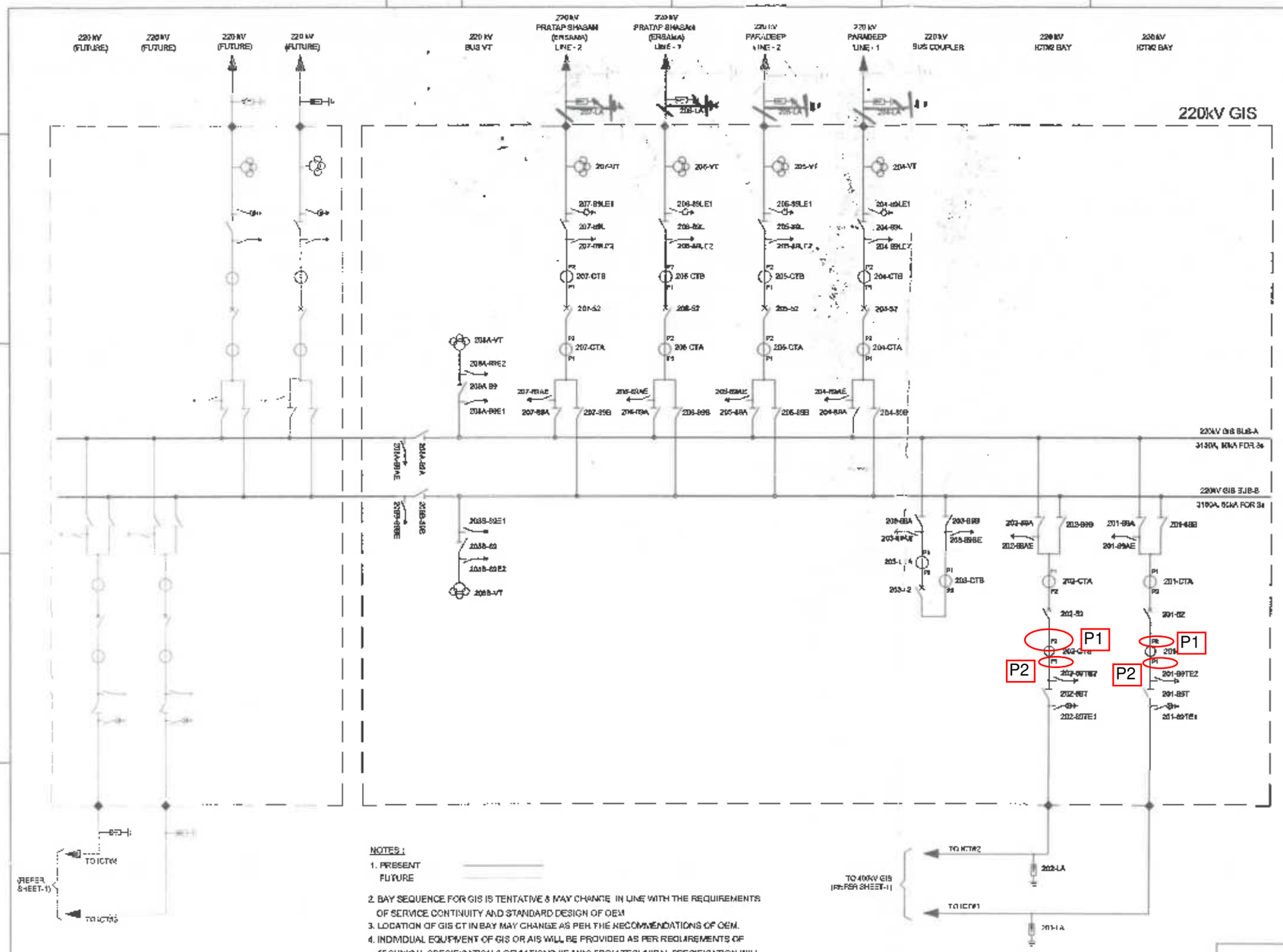
SHT. No. 01 NO. OF SHT. 05

SIZE-A3

FIRST ANGLE PROJECTION

(ALL DIMENSIONS ARE IN mm)

DRG. NO. TB-3-420-510-001




NOTES :

1. PRESENT
   FUTURE
2. BAY SEQUENCE FOR GIS IS TENTATIVE & MAY CHANGE IN LINE WITH THE REQUIREMENTS OF SERVICE CONTINUITY AND STANDARD DESIGN OF OEM
3. LOCATION OF GIS CT IN BAY MAY CHANGE AS PER THE RECOMMENDATIONS OF OEM.
4. INDIVIDUAL EQUIPMENT OF GIS OR AIS WILL BE PROVIDED AS PER REQUIREMENTS OF TECHNICAL SPECIFICATION & DEVIATIONS (IF ANY) FROM TECHNICAL SPECIFICATION WILL BE TAKEN UP SEPARATELY.
5. CT/VT PARAMETERS OF 220kV GIS ARE DETAILED IN SEPARATE SHEET OF THIS DRAWING. PARAMETERS OF BUSHING CT OF TRANSFROMERS AND BUS REACTOR WILL BE PROVIDED LATER.
6. 245 kV 2000A 40 KA 5/1 with one E/S to be provided in each line feeder.

| REV. | DATE | ALTERED | REV. | DATE | ALTERED | REV. | DATE | ALTERED | REV. | DATE | ALTERED |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | CHD/APPD | | | CHD/APPD | | | CHD/APPD | | | CHD/APPD |
| ZONE | | | ZONE | | | ZONE | | | ZONE | | |

APPROVED
17.03.2023
Executive Director
Zonal Office, OPTCL, BBSR

15/03/2023
Deputy General Manager (EL.)
Zonal Office, OPTCL
Bhubaneswar

EQUIPMENT DESIGNATION FOR STD

| 2 | 01 | - | 89 | A/B/L/T | E |
|---|---|---|---|---|---|

EARTH SWITCH
A-EQUIPMENT CONNECTED ON BUS-1 SIDE
B-EQUIPMENT CONNECTED ON BUS-2 SIDE
L-DEVICE CONNECTED TO LINE SIDE
T-EQUIPMENT CONNECTED TO TRANSFORMER/REACTOR
EQUIPMENT IDENTIFICATION (ISOLATOR)
BAY NO. : 01,02,...n
VOLTAGE LEVEL - 220kV

15/3/23
Deputy Manager (EL.)
Zonal Office, OPTCL
Bhubaneswar

06/03/2023
Deputy General Manager (Elect.)
E.H.T. Construction Division,
OPTCL, Paradeep

Manager(Elect.)
EHT (Const.) Circle,
OPTCL, Bhubaneswar

COUNTERSIGNED
13/3/23
General Manager (EL.C.)
EHT Construction Circle
OPTCL, Bhubaneswar

| | |
|---|---|
| PROJECT: | 400/220kVGIS SUBSTION AT ERSAMA, ODISHA & 400kV AIS FEEDER BAY EXTENSION AT DUBURI, ODISHA |
| OWNER: | ODISHA POWER TRANSMISSION CORPORATION LIMITED |

BHARAT HEAVY ELECTRICALS LTD.
TRANSMISSION BUSINESS GROUP
NOIDA

| | NAME | SIGN. | DATE |
|---|---|---|---|
| DRN. | AK | | |
| CHD. | JKS | | |
| APPD. | VK | | |

NO. OF WKR. N.A.

| DEPT. TDG CODE | UNTOL. DIMS. OR. g/N/f | SCALE | WEIGHT (KG) | REF. TO ASSY. DRG. | ITEM NO. | NO. OF ITEMS |
|---|---|---|---|---|---|---|
| | | N.T.S | N.A. | N.A. | N.A. | N.A. |

TITLE
SINGLE LINE DIAGRAM OF 400/220kV GIS SUB STATION AT ERSAMA

CARD CODE NA

DRAG. TB-3-420-510-001 REV. D0

SHT. No 02 NO. OF SHT. 05

SIZE-A3

FIRST ANGLE PROJECTION (ALL DIMENSIONS ARE IN mm)

DRG. NO. TB-3-420-510-001

APPROVED
17.03.2023
Executive Director
Zonal Office, OPTCL, BBSR

## A. 400kV GIS EQUIPMENT:-

| S.N. | DESCRIPTION | SYMBOL | LEGEND | BAY NO/LOCATION | UNIT | QTY |
|---|---|---|---|---|---|---|
| 1. | 400kV, 3150A, 63kA FOR 3 SEC, 3-PH CIRCUIT BREAKER | | 52 | 401, 404 | SETS | 02 |
| 2. | 400kV, 3150A, 63kA FOR 3 SEC, 3-PH CIRCUIT BREAKER WITH CSD | | 52X | 402, 403, 405, 406, 407, 408, 409 | SETS | 07 |
| 3. | 400kV, 3150A, 63kA FOR 1 SEC, 3-PH DISCONNECTOR | | 89A<br>89B<br>89L<br>89T<br>89 | 401, 402, 403, 404, 405, 406, 407, 408, 409, 410A<br>401, 402, 403, 404, 405, 406, 407, 408, 409, 410B<br>401, 404<br>403, 406, 407, 409<br>410A, 410B | SETS | 28 |
| 4. | EARTH SWITCH, 3-PH, GROUP OPERATED | | 89AE<br>89BE<br>89LE2<br>89TE2<br>89E1<br>89E2 | 401, 402, 403, 404, 405, 406, 407, 408, 409, 410A<br>401, 402, 403, 404, 405, 406, 407, 408, 409, 410B<br>401, 404<br>403, 406, 407, 409<br>410A, 410B<br>410A, 410B | SETS | 30 |
| 5. | HIGH SPEED EARTHING SWITCH, 3-PH, GROUP OPERATED | | 89LE1<br>89TE1 | 401, 404<br>403, 406, 407, 409 | SETS | 06 |
| 6. | 400kV, 3000A, 63kA FOR 1 SEC, 1-PH, CURRENT TRANSFORMER (5-CORE) | | CTA<br>CTB | 402, 403, 405, 406, 408, 409<br>401, 402, 404, 405, 407, 408 | SETS | 36 |
| 7. | 400kV, 3000A, 63kA FOR 1 SEC, 1-PH, CURRENT TRANSFORMER (2-CORE) | | CTL | 401, 404 | SETS | 08 |
| 8. | 400kV, 1-PH, 3 SECONDARY VOLTAGE TRANSFORMER | | VT | 401, 404, 410A, 410B | SETS | 12 |

## B. 220 kV INDOOR GIS:-

| S.N. | DESCRIPTION | SYMBOL | LEGEND | BAY NO/LOCATION | UNIT | QTY |
|---|---|---|---|---|---|---|
| 1. | 220kV, 3150A, 50kA FOR 3 SEC, 3-PH CIRCUIT BREAKER | | 52 | 201, 202, 203, 204, 205, 206, 207 | SETS | 07 |
| 2. | 220kV, 3150A, 50kA FOR 1 SEC, 3-PH GROUP OPERATED DISCONNECTOR | | 89<br>89A<br>89B<br>89L<br>89T | 208A, 208B<br>201, 202, 203, 204, 205, 206, 207, 208A<br>201, 202, 203, 204, 205, 206, 207, 208B<br>204, 205, 206, 207<br>201, 202 | SETS | 24 |
| 3. | EARTH SWITCH, 3-PH, GROUP OPERATED | | 89AE<br>89BE<br>89LE2<br>89TE2<br>89E1<br>89E2 | 201, 202, 203, 204, 205, 206, 207, 208A<br>203, 208B<br>204, 205, 206, 207<br>201, 202<br>208A, 208B<br>208A, 208B | SETS | 20 |
| 4. | HIGH SPEED EARTHING SWITCH, 3-PH, GROUP OPERATED | | 89TE1<br>89LE1 | 201, 202<br>204, 205, 206, 207 | SETS | 06 |
| 5. | 220kV, 3000A, 50kA FOR 1 SEC, 1-PH, CURRENT TRANSFORMER (2-CORE) | | CTA | 201, 202, 203, 204, 205, 206, 207 | SETS | 21 |
| 6. | 220kV, 3000A, 50kA FOR 1 SEC, 1-PH, CURRENT TRANSFORMER (3-CORE) | | CTB | 201, 202, 203, 204, 205, 206, 207 | SETS | 21 |
| 7. | 220kV, 1-PH, 3 SECONDARY VOLTAGE TRANSFORMER | | VT | 204, 205, 206, 207, 208A, 208B | SETS | 18 |

## C. OUTDOOR EQUIPMENT:-

| S.N. | DESCRIPTION | SYMBOL | LEGEND | BAY NO/LOCATION | UNIT | QTY |
|---|---|---|---|---|---|---|
| 1. | 500MVA, 400/220/33KV, YNa0d11,OFAF, 3-PH ICT | | ICT | ICT#1, ICT#2 | NOS | 02 |
| 2. | 400kV, 125MVA, 3-PH BUS REACTOR | | BR | 409 | NOS | 01 |
| 3. | 390kV, 20kA, CLASS-IV, 63kA, 1-PH, SURGE ARRESTER | | LA | 401, 403, 404, 406, 409 | NOS | 15 |
| 4. | 216kV, 10kA, CLASS-III, 50kA, 1-PH, SURGE ARRESTER | | LA | 201, 202, 204, 205, 206, 207 | NOS | 18 |
| 5. | 400kV, 3150A, 63kA FOR 1 SEC. SF6 TO AIR BUSHING | | | 401, 403, 404, 406, 407, 409 | NOS | 15 |
| 6. | 220kV, 3150A, 50kA FOR 1 SEC. SF6 TO AIR BUSHING | | | 201, 202, 204, 205, 206, 207 | NOS | 18 |

## SYSTEM PARAMETERS:-

| S.N. | SYSTEM PARAMETERS | 400kV | 220kV |
|---|---|---|---|
| 1. | NOMINAL VOLTAGE | 400kV | 220kV |
| 2. | HIGHEST SYSTEM VOLTAGE | 420kV | 245kV |
| 3. | RATED FREQUENCY | 50Hz | 50Hz |
| 4. | RATED SHORT TIME CURRENT | 63kA for 3s/1s (as applicable) | 50kA for 3s/1s (as applicable) |
| 5. | POWER FREQUENCY WITHSTAND VOLTAGE | 630kV (rms) | 460Kv (rms) |
| 6. | LIGHTNING IMPULSE WITHSTAND VOLTAGE | ±1425 kV peak | ±1050 kV peak |
| 7. | SWITCHING IMPULSE WITHSTAND VOLTAGE | ±1050 kV peak | N.A |
| 8. | CREEPAGE | 31mm/kV (13020mm) | 31mm/kV (7595mm) |
| 9. | GROUNDING | Effectively earthed | Effectively earthed |

15/03/2023
Deputy General Manager (EL.)
Zonal Office, OPTCL
Bhubaneswar

COUNTERSIGNED
13/3/23
General Manager (E.L.C.)
EHT, Construction Circle
OPTCL, Bhubaneswar

Manager(Elect.)
EHT (Const.) Circle,
OPTCL, Bhubaneswar

15/3/23
Deputy Manager (EL.)
Zonal Office, OPTCL
Bhubaneswar

06/03/2023
Deputy General Manager (Elect.)
E.H.T. Construction Division,
OPTCL, Paradeep

| REV. | DATE | ALTERED | REV. | DATE | ALTERED | REV. | DATE | ALTERED | REV. | DATE | ALTERED |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | CHD/APPD | | | CHD/APPD | | | CHD/APPD | | | CHD/APPD |
| ZONE | | | ZONE | | | ZONE | | | ZONE | | |

PROJECT: 400/220kVGIS SUBSTION AT ERSAMA, ODISHA & 400kV AIS FEEDER BAY EXTENSION AT DUDURI, ODISHA

OWNER: ODISHA POWER TRANSMISSION CORPORATION LIMITED

BHARAT HEAVY ELECTRICALS LTD. TRANSMISSION BUSINESS GROUP NOIDA

| | NAME | SIGN. | DATE |
|---|---|---|---|
| DRN. | AK | | |
| CHD. | DKS | | |
| APPD. | VK | | |

NO OF VAR. N.A.

SCALE N.T.S WEIGHT (KG) N.A. REF. TO ASSY. DRG. N.A. ITEM NO. N.A. NO OF ITEMS N.A.

TITLE: SINGLE LINE DIAGRAM OF 400/220kV GIS SUB STATION AT ERSAMA

DRG NO TB-3-420-510-001 REV. 00

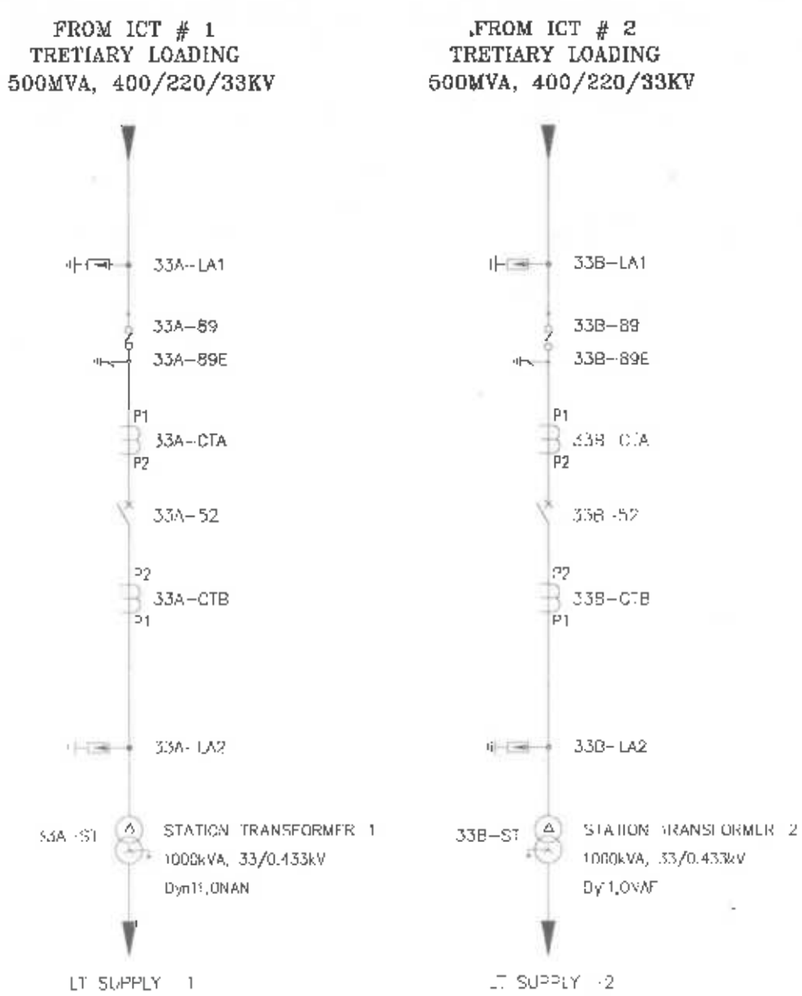
SHT. No. 03 TOT. NO. OF SHT. 05

SIZE-A3

FIRST ANGLE PROJECTION

(ALL DIMENSIONS ARE IN mm)

DRG. NO. TB-3-420-510-001




## 33kV SYSTEM PARAMETERS: –

| S.N. | SYSTEM PARAMETERS | 33kV |
|---|---|---|
| 1. | NOMINAL VOLTAGE | 33kV 52kV |
| 2. | HIGHEST SYSTEM VOLTAGE | 36kV 52kV |
| 3. | RATED FREQUENCY | 50Hz |
| 4. | RATED SHORT TIME CURRENT | 31.5kA for 3s/1s (as applicable) |
| 5. | POWER FREQUENCY WITHSTAND VOLTAGE | 70kV (rms) 95kV(rms) |
| 6. | LIGHTNING IMPULSE WITHSTAND VOLTAGE | ±170 kV peak 250kV peak |
| 7. | CREEPAGE | 31mm/kV (1116mm) (1612mm) |
| 8. | GROUNDING | Effectively earthed |

## BILL OF QTY. FOR 33kV OUTDOOR EQUIPMENT:

| SL.NO. | DESCRIPTION | SYMBOL | LEGEND | BAY NO./ LOCATION | UNIT | QTY. (NO.) |
|---|---|---|---|---|---|---|
| 1 | 33/0.433kV, 1000kVA, 3-PH OIL FILLED STATION TRANSFORMER | | ST | 33A, 33B | SET | 02 |
| 2 | 36kV, 1250A, 31.5kA FOR 3 SEC., 3-PH VACUUM CIRCUIT BREAKER | | 52 | 33A, 33B | SET | 02 |
| 3 | 36kV, 1250A, 31.5kA FOR 1 SEC., 3-PH ISOLATOR WITH ONE EARTH SWITCH | | 89 | 33A, 33B | SET | 02 |
| 4 | 36kV, 50A, 31.5kA FOR 1 SEC., 1-PH, CURRENT TRANSFORMER | | CTA | 33A, 33B | NOS. | 06 |
| 5 | 36kV, 1200A, 31.5kA FOR 1 SEC., 1-PH, CURRENT TRANSFORMER | | CTB | 33A, 33B | NOS. | 06 |
| 6 | 30kV, 10kA, CLASS-III, 1-PH, LIGHTNING ARRESTER | | LA1/LA2 | 33A, 33B | NOS. | 12 |

APPROVED
17.03.2023
Executive Director
Zonal Office, OPTCL, BBSR

Deputy General Manager (EL.)
Zonal Office, OPTCL
Bhubaneswar
15/03/2023

COUNTERSIGNED
13/3/23

Deputy Manager (EL.)
Zonal Office, OPTCL
Bhubaneswar
15/3/23

Manager(Elect.)
EHT (Con...) Circle,
OPTCL, Bhubaneswar

General Manager (E.C.)
EHT, Construction Circle
OPTCL, Bhubaneswar

Deputy General Manager(Elect.)
E.H.T. Construction Division,
OPTCL, Paradeep
06/03/2023

NOTES :

1. LT SUPPLY SOURCE –1 & 2: 33kV SIDE OF STATION TRANSFORMERS–1 & 2 ARE TO BE FED THROUGH TERTIARY LOADING OF ICT#1 & ICT#2. FURTHER, AS PER THE REPLY TO PRE-BID QUERY OF PKG-36(I)/2020-21, PROVIDED BY OPTCL IN ADDENDUM-2, EQUIPMENT WITH HIGHEST SYSTEM VOLTAGE OF 36kV ARE BEING PROVIDED IN THIS CIRCUIT.

2. As per tender condition complete design & engineering is on the scope of M/s BHEL, Hence 33kV equipment is to be supplied as per DTL of ICT tertiary Bushing.

| REV. | DATE | ALTERED | REV. | DATE | ALTERED | REV. | DATE | ALTERED | REV. | DATE | ALTERED |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | CHD/APPD | | | CHD/APPD | | | CHD/APPD | | | CHD/APPD |
| ZONE | | | ZONE | | | ZONE | | | ZONE | | |

PROJECT: 400/220kVGIS SUBSTION AT ERSAMA, ODISHA & 400kV AIS FEEDER BAY EXTENSION AT DUBURI, ODISHA

OWNER: ODISHA POWER TRANSMISSION CORPORATION LIMITED

BHARAT HEAVY ELECTRICALS LTD. TRANSMISSION BUSINESS GROUP NOIDA

| | NAME | SIGN. | DATE |
|---|---|---|---|
| DRN. | AK | | |
| CHD. | DKS | | |
| APPD. | VK | | |

NO. OF VAR. N.A.

DCPT. TOG CODE | CNTOL. DMS. GR. 0/4/F | SCALE N.T.S | WEIGHT (KG) N.A. | REF. TO ASSY. DRG. N.A. | ITEM NO. N.A. | NO. OF ITEMS N.A.

TITLE: SINGLE LINE DIAGRAM OF 400/220kV GIS SUB STATION AT ERSAMA

CARD CODE: NA

DRGNO. TB-3-420-510-001 REV. 00

SHT. No. 04 NO. OF SHT. 05

912E-A3

FIRST ANGLE PROJECTION

(ALL DIMENSIONS ARE IN mm)

DRG. NO. TB-3-420-510-001

## 400kV GIS CT DETAILS (CTA & CTB)

| Core No. | Current Ratio | Ooutput Burden at Lowest Tap (VA) | Minimum KPV (V) | Max. Ie(mA) at KPV | Maximum Rct (Ohms) | Accuracy Class | Purpose |
|---|---|---|---|---|---|---|---|
| 1 | 3000-2000-1000/1A | - | 3000-2000-1000 | 20-30-40 | 15-10-5 | PS | Protection |
| 2 | 3000-2000-1000/1A | - | 3000-2000-1000 | 20-30-40 | 15-10-5 | PS | Protection |
| 3 | 3000-2000-1000/1A | 20 | - | - | - | 0.2s, ISF≤5 | Metering |
| 4 | 3000-2000-1000/1A | - | 3000-2000-1000 | 20-30-40 | 15-10-5 | PS | Protection |
| 5 | 3000-2000-1000/1A | - | 3000-2000-1000 | 20-30-40 | 15-10-5 | PS | Protection |

## 400kV GIS LINE CT DETAILS (CTL)

| Core No. | Current Ratio | Ooutput Burden at Lowest Tap (VA) | Minimum KPV (V) | Max. Ie(mA) at KPV | Maximum Rct (Ohms) | Accuracy Class | Purpose |
|---|---|---|---|---|---|---|---|
| 1 | 3000-2000-1000/1A | 10 | - | - | - | 0.2s, ISF≤5 | Metering |
| 2 | 3000-2000-1000/1A | 10 | - | - | - | 0.2s, ISF≤5 | Metering |

## 220kV GIS CT DETAILS

| Core No. | Current Ratio | Ooutput Burden at Lowest Tap (VA) | Minimum KPV (V) | Max. Ie(mA) at KPV | Maximum Rct (Ohms) | Accuracy Class | Purpose |
|---|---|---|---|---|---|---|---|
| **CTA** | | | | | | | |
| 1 | 1600-800/1 A | - | 1600-800 | 20-40 | 8-4 | PS | Protection |
| 2 | 1600-800/1 A | - | 1600-800 | 20-40 | 8-4 | PS | Protection |
| **CTB** | | | | | | | |
| 3 1 | 1600-800/1 A | - | 1600-800 | 20-40 | 8-4 | PS | Protection |
| 2 | 1600-800/1 A | - | 1600-800 | 20-40 | 8-4 | PS | Protection |
| 1 3 | 1600-800/1 A | 20 | - | - | 8-4 | 0.2s, ISF≤5 | Metering |

## 33kV OUTDOOR CT DETAILS

| Core No. | Current Ratio | Ooutput Burden at Lowest Tap (VA) | Minimum KPV (V) | Max. Ie(mA) at KPV | Maximum Rct (Ohms) | Accuracy Class | Purpose |
|---|---|---|---|---|---|---|---|
| **CTA** | | | | | | | |
| 1 | 50-25/1 A | 15 | - | - | - | PS | Protection |
| 2 | 50-25/1 A | 15 | - | - | - | 0.2s, ISF≤5 | Metering |
| **CTB** | | | | | | | |
| 1 | 1200-600/1 A | - | 1200-600 | 50-100 | 6-3 | PS | Protection |
| 2 | 1200-600/1 A | - | 1200-600 | 50-100 | 6-3 | PS | Protection |
| 3 | 1200-600/1 A | - | 1200-600 | 50-100 | 6-3 | PS | Protection |

## 400kV GIS VT DETAILS (VT)

| Winding No. | Ratio | Accuracy Class | Rated Burden (VA) | Purpose |
|---|---|---|---|---|
| 1 | (400kV/√3) / 110V/√3) | 0.2 | 50 | Metering |
| 2 | (400kV/√3) / 110V/√3) | 3P | 50 | Protection |
| 3 | (400kV/√3) / 110V/√3) | 3P | 50 | Protection |

## 220kV GIS VT DETAILS (VT)

| Winding No. | Ratio | Accuracy Class | Rated Burden (VA) | Purpose |
|---|---|---|---|---|
| 1 | (220kV/√3) / 110V/√3) | 0.2 | 50 | Metering |
| 2 | (220kV/√3) / 110V/√3) | 3P | 50 | Protection |
| 3 | (220kV/√3) / 110V/√3) | 3P | 50 | Protection |

NOTES:

1. PARAMETERS OF BUSHING CT OF TRANSFROMERS AND BUS REACTOR WILL BE PROVIDED LATER.



| REV. | DATE | ALTERED | REV. | DATE | ALTERED | REV | DATE | ALTERED | REV. | DATE | ALTERED |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | CHD/APPD | | | CHD/APPD | | | CHD/APPD | | | CHD/APPD |
| ZONE | | | ZONE | | | ZONE | | | ZONE | | |

| | | | | | |
|---|---|---|---|---|---|
| PROJECT | 400/220kVGIS SUBSTION AT ERSAMA, ODISHA & 400kV AIS FEEDER BAY EXTENSION AT DUBURI, ODISHA | | | | |
| OWNER: | ODISHA POWER TRANSMISSION CORPORATION LIMITED | | | | |
| BHARAT HEAVY ELECTRICALS LTD. TRANSMISSION BUSINESS GROUP NOIDA | | NAME | SIGN. | DATE | NO.OF VAR. |
| | DRN. | AK | | | N.A. |
| | CHD. | DKS | | | |
| | APPD. | VK | | | |
| DEPT. CODE: BG | UNIT CL. DWG. CR. | SCALE N.T.S | WEIGHT (KG) N.A. | REF. TO ASSY. DWG. N.A. | ITEM NO. N.A. / NO.OF ITEMS N.A. |
| TITLE: SINGLE LINE DIAGRAM OF 400/220kV GIS SUB STATION AT ERSAMA | | | CARD CODE NA | DRG.NO. TB-3-420-510-001 | REV. 00 |
| | | | | SHT. No 05 | NO. OF SHT. 06 |

SIZE-A0