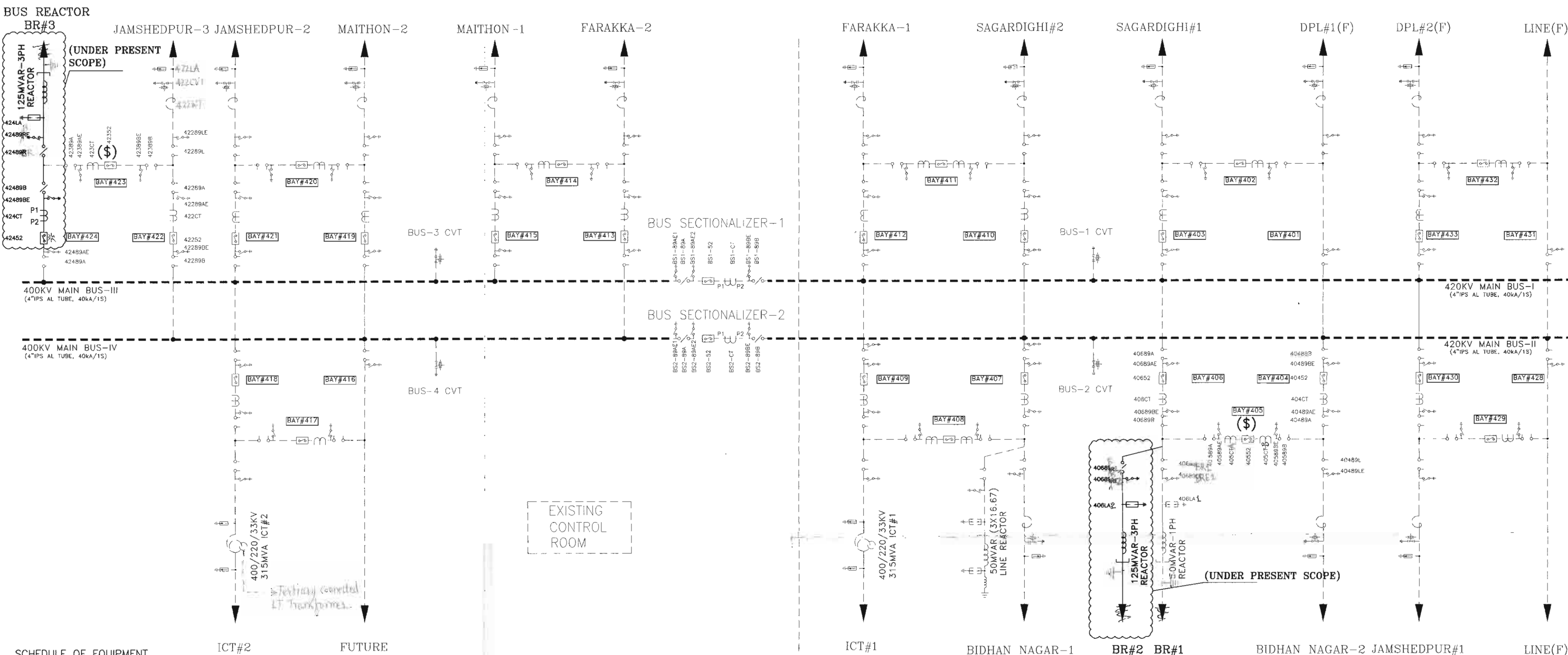


**List of Drawings - 400kV Durgapur S/s Extn.**

| SI No | Doc No.          | Document Details                                      |
|-------|------------------|-------------------------------------------------------|
| 1     | TB-370-316-006   | Single Line Diagram for Durgapur S/s Extn.            |
| 2     | TB-0-370-316-013 | Layout Plan & Elevation for 400 kV Durgapur S/s Extn. |

900-915-370-316-006

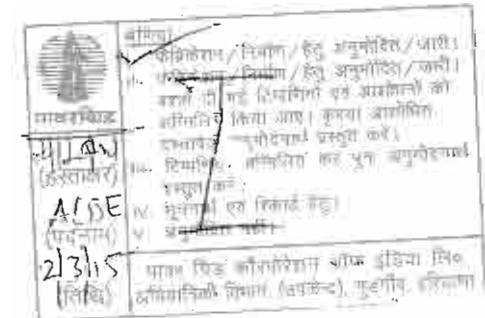


| SCHEDULE OF EQUIPMENT |                                                                                    |        |      |             |
|-----------------------|------------------------------------------------------------------------------------|--------|------|-------------|
| S.NO.                 | DESCRIPTION                                                                        | SYMBOL | QTY. | DESIG. MAKE |
| 1                     | 125 MVAR BUS REACTOR 420kV (3-PH)                                                  |        | 02   | BHEL        |
| 2                     | 420kV, 3150A, 40kA/1s CIRCUIT BREAKER WITHOUT CR (3-PH) (WITH CSD)                 |        | 01   | 52          |
| 3                     | 420kV, 3150A, 40kA/1s HDB ISOLATOR WITH 1 E/S (3-PH)                               |        | 03   | 89          |
| 4                     | 400kV, 3000A, 40kA/1s CT (1-PH)(WITH 120% EXTENDED CURRENT RATING)                 |        | 03   | CT C&L      |
| 5                     | 336kV SURGE ARRESTER (1-PH)                                                        |        | 06   | LA C&L      |
| 6                     | CONTROLLED SWITCHING DEVICE (CSD) FOR EXISTING 400KV CB (ABB MAKE) IN THE BAY#423  |        | 01   | (\$)        |
| 7                     | CONTROLLED SWITCHING DEVICE (CSD) FOR EXISTING 400KV CB (ABB MAKE) IN THE BAY#405  |        | 01   | (\$)        |
| 8                     | CONTROLLED SWITCHING DEVICE (CSD) FOR EXISTING 400KV CB (ABB MAKE) IN MAIN BAY#406 |        | 00   | (\$)        |

| 420 kV, 3000A, CT (6 CORE) |                 |                       |           |               |                 |
|----------------------------|-----------------|-----------------------|-----------|---------------|-----------------|
| Core No.                   | Current Ratio   | Accuracy Output Class | Burden VA | Min kPV (V)   | Max RCT in Ohms |
| 1                          | 3000-2000-500/1 | 1PS                   | -         | 3000-2000-500 | 15/10/2.5       |
| 2                          | 3000-2000-500/1 | 1PS                   | -         | 3000-2000-500 | 15/10/2.5       |
| 3                          | 3000-2000-500/1 | 0.2S                  | 20        | -             | -               |
| 4                          | 3000-2000-500/1 | 0.2S                  | 20        | -             | -               |
| 5                          | 3000-2000-500/1 | 1PS                   | -         | 3000-2000-500 | 15/10/2.5       |
| 6                          | 3000-2000-500/1 | 1PS                   | -         | 3000-2000-500 | 15/10/2.5       |
|                            |                 | Max Im at kPV (mA)    |           | Purpose       |                 |
|                            |                 | 20-30-120             |           | PROTECTION    |                 |
|                            |                 | 20-30-120             |           | PROTECTION    |                 |
|                            |                 | 20-30-120             |           | METERING      |                 |
|                            |                 | 20-30-120             |           | PROTECTION    |                 |
|                            |                 | 20-30-120             |           | PROTECTION    |                 |

BUS SECTION B-B

BUS SECTION A-A



- NOTES:-
- SYSTEM 40kA/1S, 50 Hz, 3 PH, EFFECTIVELY EARTHED.
  - INDICATED CT PARAMETERS ARE AS PER POWERGRID SPECIFICATION.
  - ONE NO. 420KV, 125 MVAR BUS REACTOR SHALL BE PUT IN PARALLEL WITH EXISTING 50MVAR (3X16.67) BUS REACTOR.
  - (\$) CONTROL SWITCHING DEVICE FOR EXISTING 400KV MAIN & TIE CIRCUIT BREAKER ASSOCIATED WITH 125MVAR BUS REACTOR-2 & EXISTING 400KV TIE CIRCUIT BREAKER ASSOCIATED WITH 125MVAR BUS REACTOR-3.
- REF. DWG:-
- DWG NO. C/ENG/ER-II/DRP/ERSS-IX/SLD/01, R0 - TENDER SLD FOR 400KV DURGAPUR S/STN. EXTN.
- DWG NO. NIL - SLD OF 400/220/33KV DURGAPUR S/S.

|                              |                                                                                                                                              |
|------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------|
| CUSTOMER:                    | POWER GRID CORPORATION OF INDIA LTD.                                                                                                         |
| PROJECT:                     | SUBSTATION PACKAGE-SS02 FOR EXTN OF BIHARSHARIFF, JAMSHEDPUR, GAJUWAKA, RENGALI, ROURLKELA, DURGAPUR AND GORAKHPUR SUBSTATIONS UNDER ERSS-IX |
| NOA REF NO.                  | CC-CS/393-ER2/SS-2266/3/G6/NOA-I/4991, DATED 23.06.2014                                                                                      |
| STATUS CONTRACT DISTRIBUTION |                                                                                                                                              |

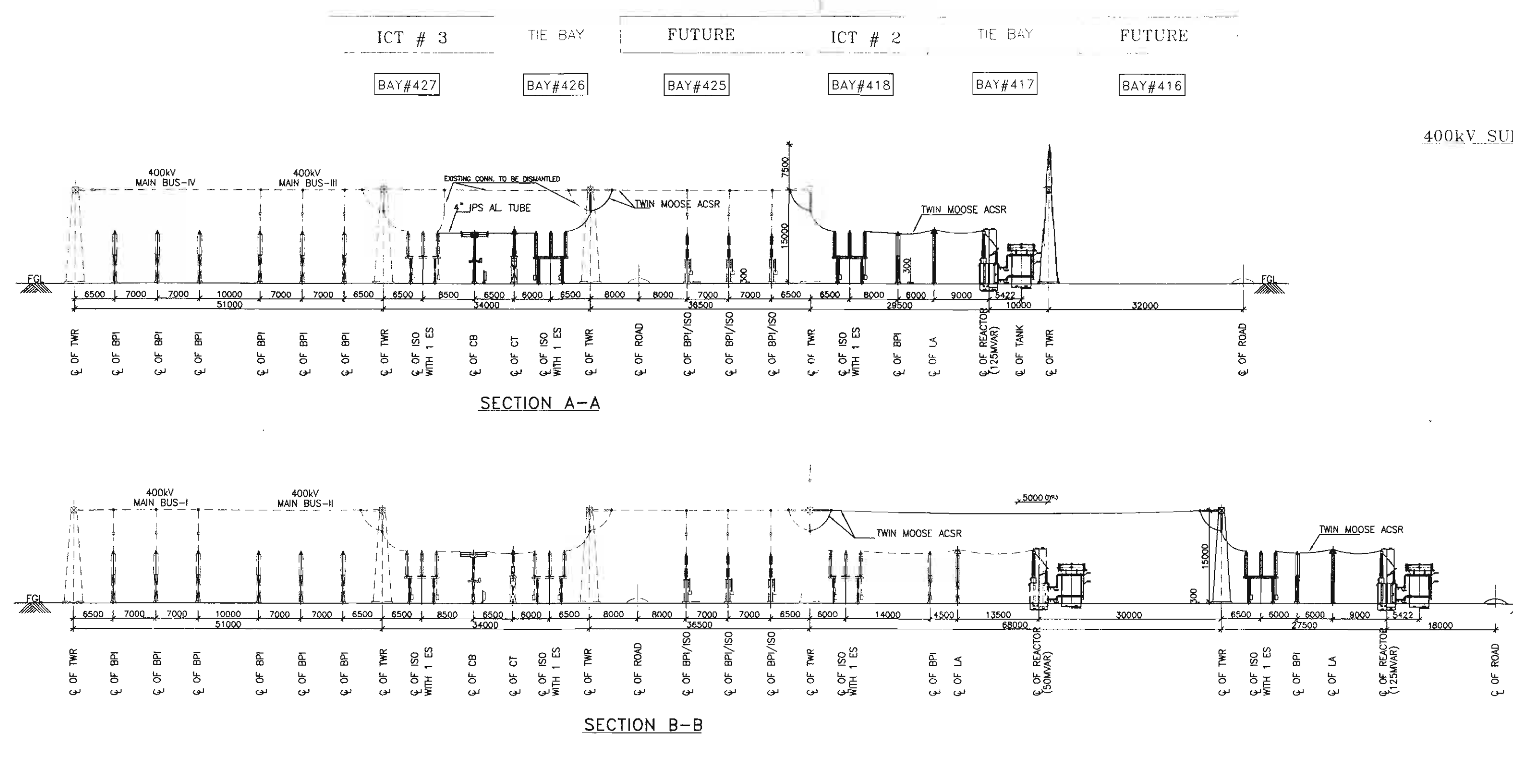
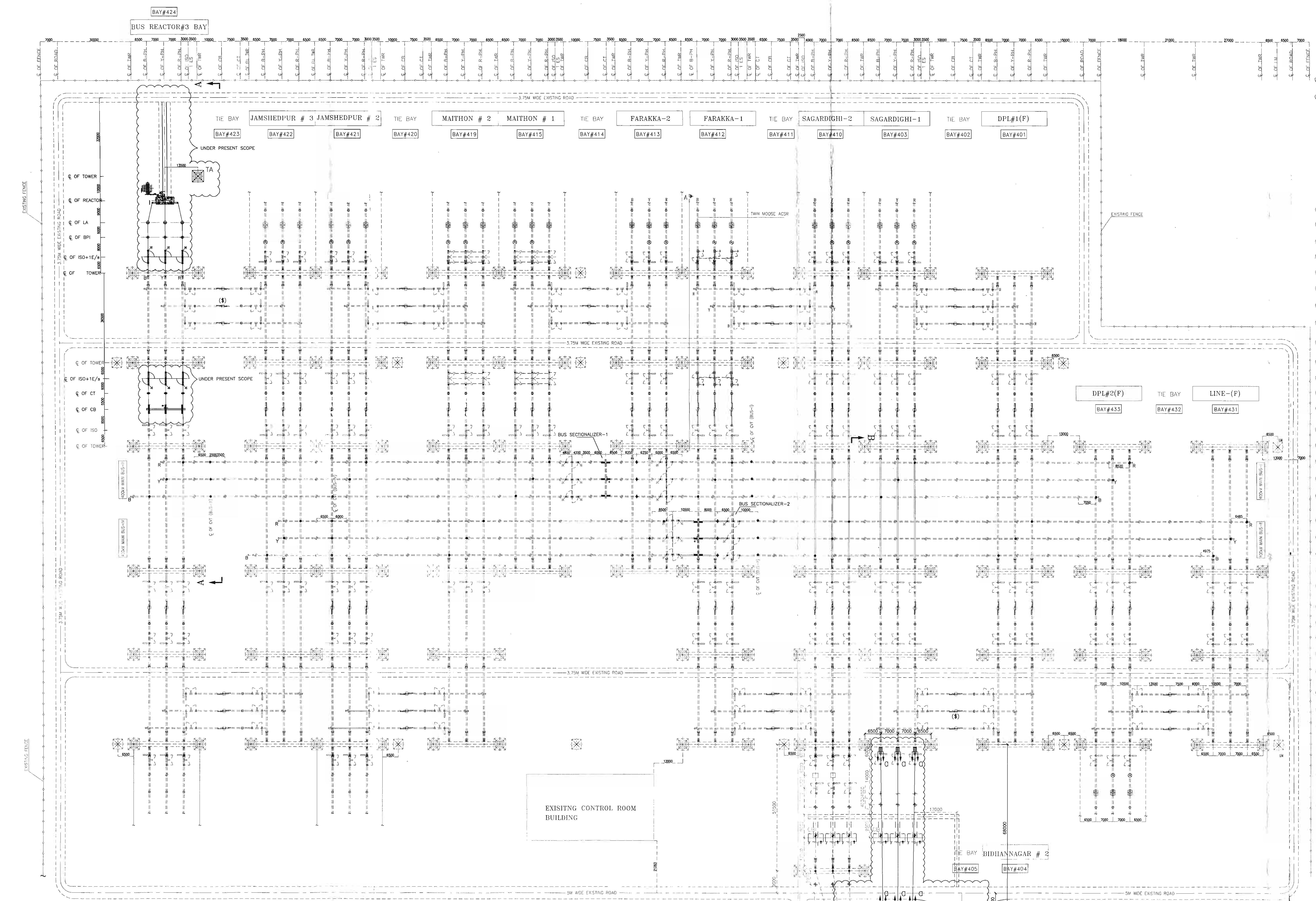
| REV.                                               | DATE     | ALTD. | CHD. | APPD. | REV. | DATE     | ALTD. | CHD. | APPD. | NAME                   | SIGN.  | DATE     |
|----------------------------------------------------|----------|-------|------|-------|------|----------|-------|------|-------|------------------------|--------|----------|
| 01                                                 | 17.02.15 |       |      |       | 01   | 17.02.15 |       |      |       | MVK                    |        | 14.08.14 |
| 1) REVISED AS PER POWERGRID COMMENTS DT. 19.09.14. |          |       |      |       |      |          |       |      |       | CHECKED                | MVK/RK | 14.08.14 |
|                                                    |          |       |      |       |      |          |       |      |       | APPROVED               | SKS/VK | 14.08.14 |
|                                                    |          |       |      |       |      |          |       |      |       | DISTRIBUTION OF PRINTS |        |          |
|                                                    |          |       |      |       |      |          |       |      |       | DEPT.                  | CODE   |          |
|                                                    |          |       |      |       |      |          |       |      |       | TBEM                   | 422    |          |



|                                                  |                  |              |
|--------------------------------------------------|------------------|--------------|
| BHARAT HEAVY ELECTRICALS LIMITED                 |                  | CARD CODE    |
| TRANSMISSION PROJECTS DIVISION                   |                  |              |
| SINGLE LINE DIAGRAM FOR 400kV DURGAPUR S/S EXTN. |                  | NEXT SHEET - |
|                                                  |                  | SHEET No. 01 |
| SCALE                                            | W.O. No. 84001   | REV. 01      |
| DRG. No.                                         | TB-3-370-316-006 |              |

FIRST ANGLE PROJECTION ( ALL DIMENSIONS ARE IN MM. )

PAYING NO. 18-0-370-316-015



| ITEM CODE | DESCRIPTION                                                                        | SYMBOL | QTY. | MAKE    |
|-----------|------------------------------------------------------------------------------------|--------|------|---------|
| 1         | 420KV, 125 MVAR BUS REACTOR (3-Ph)                                                 |        | 02   | BHEL    |
| 2         | 420KV, 3150A, 40KA/1s CIRCUIT BREAKER WITHOUT CLOSING RESISTOR (3-Ph) (WITH CSD)   |        | 01   | SIEMENS |
| 3         | 420KV, 3150A, 40KA/1s HDB ISOLATOR WITH 1 E/S (3-Ph)                               |        | 03   | SIEMENS |
| 4         | 420KV, 3000A, 40KA/1s CURRENT TRANSFORMER (1-Ph) (WITH 120% EXTENDED CURRENT)      |        | 03   | CCL     |
| 5         | 33KV SURGE ARRESTER (1-Ph)                                                         |        | 06   | CCL     |
| 6         | 420KV BUS POST INSULATOR (1-Ph)                                                    |        | 06   |         |
| 7         | CONTROLLED SWITCHING DEVICE (CSD) FOR EXISTING 400KV CB (ABB MAKE) IN MAIN BUS-405 |        | 01   |         |
| 8         | CONTROLLED SWITCHING DEVICE (CSD) FOR EXISTING 400KV CB (ABB MAKE) IN MAIN BUS-406 |        | 01   |         |
| 9         | CONTROLLED SWITCHING DEVICE (CSD) FOR EXISTING 400KV CB (ABB MAKE) IN THE BAY#405  |        | 01   |         |

| SYSTEM PARAMETERS :-                                |                     |
|-----------------------------------------------------|---------------------|
| 1. NOMINAL SYSTEM VOLTAGE                           | 400KV               |
| 2. HIGHEST SYSTEM VOLTAGE                           | 420KV               |
| 3. RATED FREQUENCY                                  | 50Hz                |
| 4. RATED SHORT TIME CURRENT FOR 1 SEC               | 40KA                |
| 5. RATED FULL WAVE IMPULSE WITHSTAND VOLTAGE        | 1550kVp             |
| 6. SWITCHING IMPULSE WITHSTAND VOLTAGE              | 1050kVp             |
| 7. ONE MINUTE POWER FREQUENCY DRY WITHSTAND VOLTAGE | 850kVrms            |
| 8. MINIMUM CREEPAGE (25MM/KV)                       | 10500MM             |
| 9. SYSTEM NEUTRAL EARTHING                          | EFFECTIVELY EARTHED |

| CLEARANCE TABLE :-                                                |               |
|-------------------------------------------------------------------|---------------|
| MINIMUM CLEARANCE TABLE                                           | 400KV         |
| PHASE TO PHASE (PP) (for Conductor-Conductor Config.)             | 4000mm        |
| PHASE TO PHASE (PP) (for Rod-Conductor Config.)                   | 4200mm        |
| PHASE TO EARTH (PE)                                               | 3500mm        |
| SECTION CLEARANCE (SC)                                            | 6500mm        |
| HT. OF EQUIP. BUS CENTRE LINE ABOVE PLINTH (LVL. MIN.)            | 8000mm        |
| VERTICAL DISTANCE BETWEEN LOWEST PART OF INSULATOR & PLINTH LEVEL | 2550mm (min.) |

| STRINGING DETAILS :-                 |                                                                     |
|--------------------------------------|---------------------------------------------------------------------|
| JACK BUS & JUMPING                   | CONDUCTOR TWIN MOOSE DOUBLE TENSION & INS. STRING SINGLE SUSPENSION |
| ALL EQUIPMENT INTERCONNECTION        | TWIN MOOSE                                                          |
| SUB CONDUCTOR SPACING FOR TWIN MOOSE | 450 mm                                                              |
| EARTHWIRE                            | 10.98MM DIA GS WIRE.                                                |

| STRUCTURE LOADING 400KV |                                            |
|-------------------------|--------------------------------------------|
| NOTATION                | No. & Type of Cond / Shield Wire per Phase |
| 0                       | TWIN ACSR MOOSE                            |
|                         | Normal Tension Per Phase(kg)               |
|                         | S/C Tension Per Phase(kg)                  |
|                         | Separation Between Spacers (meters)        |
|                         | 4000                                       |
|                         | 5100                                       |
|                         | 5                                          |

| DETAILS OF TOWERS/BEAMS : 400KV |                  |              |      |
|---------------------------------|------------------|--------------|------|
| S.NO.                           | STR. DESIGNATION | STR. HT/SPAN | QTY. |
| 1                               | TC               | 15M          | 2    |
| 2                               | G2               | 24M          | 1    |
| 3                               | LM               | 50M          | 1    |
| 4                               | TA               | 22+7.5M      | 1    |

| LEGEND TABLE :- |                                  |
|-----------------|----------------------------------|
|                 | PRESENT SCOPE                    |
|                 | FUTURE/EXISTING                  |
|                 | SHIELD WIRE                      |
|                 | FENCE                            |
|                 | TENSION STRING INSULATOR (400KV) |
|                 | SUSPENSION STRING INSULATOR      |
|                 | ISO AND E/S BOX, CT/PT/CYUB      |
|                 | COLUMN WITHOUT PEAK              |
|                 | COLUMN WITH PEAK                 |

- NOTES :-
- ALL DIMENSIONS ARE IN MM UNLESS SPECIFIED OTHERWISE.
  - PLINTH LEVEL 300mm ABOVE FGL.
  - CONDUCTOR TENSION - 2000KG/CONDUCTOR I.E. 4000KG/PHASE.
  - NO 420KV, 125MVAR BUS REACTOR#2 SHALL BE KEPT IN PARALLEL WITH EXISTING 420KV, 30MVAR (3150A) BUS REACTOR#1. INSTALLATION OF 1 NO. NEW 420KV, 125MVAR BUS REACTOR#2 IS ALSO IN SCOPE OF BHEL.
  - CONTROL SWITCHING DEVICE SHALL BE PROVIDED FOR EXISTING 400KV MAIN & THE CIRCUIT BREAKER ASSOCIATED WITH 125MVAR BUS REACTOR-2 & EXISTING 400KV THE CIRCUIT BREAKER ASSOCIATED WITH 125MVAR BUS REACTOR-3 UNDER PRESENT SCOPE.
| 6 | FIRE PROTECTION SYSTEM (FIRE SPRAY SYSTEM & HYDRANT SYSTEM) FOR 2 NO. 420KV 125MVAR BUS REACTORS. |
| 7 | EXISTING ADJACENT PIPING (FOR FIRE PROTECTION SYSTEM OF EXISTING 30MVAR BUS REACTOR WITH JAMSHEDPUR LINE DIAMETER AND EXISTING 315MVA ICT#2) SHALL FURTHER BE EXTENDED FOR THIS PURPOSE. (SEPARATE DRG SHALL BE SUBMITTED). |
| 8 | MAIN EARTH MAT IS TO BE EXTENDED IN AREA UNDER PRESENT SCOPE. ALL THE EQUIPMENTS, BUS REACTORS, CABLE TRENCHES, AUXILIARY EARTH MAT FOR ISOLATORS ETC. SHALL BE EARTHED BY CONNECTING THEM TO THE MAIN EARTH MAT (SEPARATE DRG SHALL BE SUBMITTED). |
| 9 | LIGHTING & ILLUMINATION SYSTEM SWITCHYARD EXTENSION AREA UNDER PRESENT SCOPE (SEPARATE DRG SHALL BE SUBMITTED). |
| 10 | STONE HAS ALREADY BEEN LAID IN SOME PORTION OF THE SWITCHYARD AREA UNDER PRESENT SCOPE. REMOVAL, CLEANING AND WASHING OF EXISTING STONE AND RE-SPREADING AFTER DONG ANTI-WEED TREATMENT & POC AS PER SECTION-CIVIL WORKS. |
| 11 | THE REQUIRED CLEARANCES AS PER CLEARANCE TABLE ABOVE AND AS PER PROVISION OF I.E. RULE & OTHER STATUTORY REGULATION ETC. SHALL BE MAINTAINED BY BHEL. |
| 12 | FENCE TO BE DISMANTLED UNDER PRESENT SCOPE IS A-D & FENCE TO BE CONSTRUCTED UNDER PRESENT SCOPE IS A-B-C-D. |
| 13 | LIGHTNING PROTECTION IN THE EXTENSION SWITCHYARD AREA IS TO BE PROVIDED THROUGH LM/TA TYPE TOWER. |

| REFERENCE DWG :-                       |                                                                              |
|----------------------------------------|------------------------------------------------------------------------------|
| DWG. NO.                               | TITLE                                                                        |
| C/ENG/ER-II/DRP/ERSS-K/GA/01, R0       | GENERAL ARRANGEMENT DRAWING (TENDER DRG.)                                    |
| C/ENG/ER-II/DRP/ERSS-K/PLAN/SECTION/01 | ELECTRICAL PLAN & SECTION LAYOUT FOR 400 KV DURGAPUR S/S EXTN. (TENDER DRG.) |
| TB-3-370-316-006                       | SINGLE LINE DIAGRAM FOR 400KV DURGAPUR S/S EXTN.                             |

ADDITIONAL INFORMATION

W.D. No. 84801

STATUS OF DRAWING

DISTRIBUTION OF PRINTS

POWER GRID CORPORATION OF INDIA LTD.

NAME OF CUSTOMER/PROJECT

STATION/PROJECT

REVISIONS

| REV. | DATE     | ALTERED BY  | CHKD BY       | APPROVED BY |
|------|----------|-------------|---------------|-------------|
| 01   | 17.02.15 | CHEXED. MKK | APPROVED. SES |             |

1) REVISIONS AS PER POWERGRID COMMENTS ON LAYOUT DRG. DT. 02.05.15.

APPROVED BY

POWER GRID CORPORATION OF INDIA LTD.

STATION/PROJECT

REVISIONS

| REV. | DATE     | ALTERED BY  | CHKD BY       | APPROVED BY |
|------|----------|-------------|---------------|-------------|
| 01   | 17.02.15 | CHEXED. MKK | APPROVED. SES |             |

1) REVISIONS AS PER POWERGRID COMMENTS ON LAYOUT DRG. DT. 02.05.15.

DATE

16.09.14

16.09.14

16.09.14