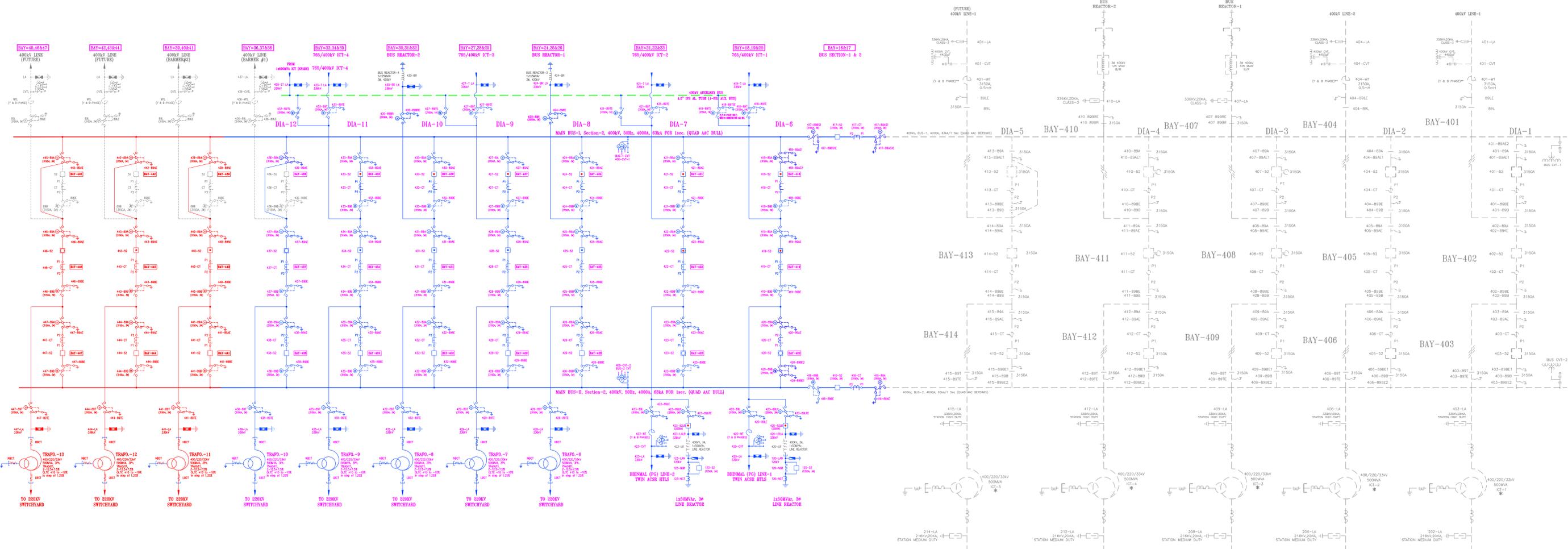


765/400/220kV Fatehgarh-IV PS



SYSTEM PARAMETER DETAILS

| SL. No. | DESCRIPTION OF PARAMETERS | 765kV | 400kV | 220kV | 132kV | 66kV | 52kV | 33kV |
|---------|---|----------------------------------|----------------------------------|------------------------------------|----------------------------------|----------------------------------|----------------------------------|----------------------------------|
| 1 | SYSTEM OPERATING VOLTAGE | 765 kV | 400 kV | 220 kV | 132 kV | 66 kV | 52 kV | 33 kV |
| 2 | MAX. OPERATING VOLTAGE (RMS) | 8000 kV | 420 kV | 245 kV | 145 kV | 72.5 kV | 52 kV | 36 kV |
| 3 | RATED FREQUENCY | 50 Hz | 50 Hz | 50 Hz | 50 Hz | 50 Hz | 50 Hz | 50 Hz |
| 4 | LIGHTNING IMPULSE WITHSTAND VOLTAGE (FOR 1.2/50 microsec) a) FOR EQUIPMENTS b) FOR INSULATOR STRING | 2100 kVp 2100 kVp | 1425 kVp 1550 kVp | 1050 kVp 1050 kVp | 650 kVp 650 kVp | 325 kVp 325 kVp | 250 kVp 250 kVp | 170 kVp 170 kVp |
| 5 | SWITCHING IMPULSE WITHSTAND VOLTAGE (FOR 250/2500 microsec) DRY & WET | 1550 kVp | 1050 kVp | --- | --- | --- | --- | --- |
| 6 | ONE MIN. POWER FREQUENCY WITHSTAND VOLTAGE DRY (RMS) | 830 kV | 630 kV | 460 kV | 275 kV | 140 kV | 95 kV | 70 kV |
| 7 | CORONA EXTINCTION VOLTAGE | 508 kV | 320 kV | --- | --- | --- | --- | --- |
| 8 | MAX. RADIO INTERFERENCE VOLTAGE FOR FREQUENCY BETWEEN 0.5 MHz & 2 MHz | 2500 micro-volts at 508 kV rms | 1000 micro-volts at 266 kV rms | 1000 micro-volts at 156 kV rms | 500 micro-volts at 92 kV rms | --- | --- | --- |
| 9 | MINIMUM CREEPAGE DISTANCE FOR SWITCHING EQUIPMENT (25mm/kV) | 20000 mm | 10500 mm | 6125 mm | 3625 mm | 1812.5 mm | 1612 mm | 900 mm |
| 10 | MIN. CREEPAGE DISTANCE FOR INSULATOR STRING/LONGROD INSULATORS (31mm/kV) | 24800 mm | 13020 mm | 7595 mm | 4495 mm | 2247.5 mm | 1612 mm | 1116 mm |
| 11 | MAX. FAULT CURRENT WITH DURATION | 50kA FOR 1sec. 63kA FOR 1sec. | 63kA FOR 1sec. 50kA FOR 1sec. | 50kA FOR 1sec. 31.5kA FOR 1sec. | 25kA FOR 3sec. 25kA FOR 3sec. |
| 12 | SWITCHING SCHEME | ONE & HALF BREAKER | ONE & HALF BREAKER | DOUBLE MAIN & TRANSFER BUS | DOUBLE MAIN & TRANSFER BUS | --- | --- | --- |

BUSHING CURRENT TRANSFORMER RATING (50MVA LINE REACTOR), 400kV

| LOCATION | CORE NO. | RATIO (A) | APPLICATION | BURDEN VA | CLASS | MAX. RCT @ 75 deg C (Ω) | MAX. I _{CT} (mA) | MAX. I _{CT} @ 75 deg C (mA) | TERMINALS |
|------------------------|----------|-----------|-------------|-----------|-------|-------------------------|---------------------------|--------------------------------------|-----------|
| BAY NO. - 420 & 423 HV | 1 | --- | --- | --- | --- | --- | --- | --- | --- |
| | 2 | --- | --- | --- | --- | --- | --- | --- | --- |
| | 3 | --- | --- | --- | --- | --- | --- | --- | --- |
| | 4 | --- | --- | --- | --- | --- | --- | --- | --- |
| NEUTRAL | 1 | --- | --- | --- | --- | --- | --- | --- | --- |
| | 2 | --- | --- | --- | --- | --- | --- | --- | --- |
| | 3 | --- | --- | --- | --- | --- | --- | --- | --- |
| | 4 | --- | --- | --- | --- | --- | --- | --- | --- |

BOQ (400KV EQUIPMENTS)-

| SL. NO. | SYMBOLS | DESCRIPTION | SCOPE QTY. |
|---------|---------|--|------------|
| 1. | | 400KV, 3150A, 63kA FOR 1sec. 3 PHASE, SF6 CIRCUIT BREAKER WITH CLOSING RESISTOR | 05 Nos. |
| 2. | | 400KV, 3150A, 63kA FOR 1sec. 3 PHASE, SF6 CIRCUIT BREAKER WITHOUT CLOSING RESISTOR | 19 Nos. |
| 3. | | CONTROL SWITCHING DEVICE OF SF6 CIRCUIT BREAKER | 14 Nos. |
| 4. | | 400kV, 3000-2000-500/1, 63kA FOR 1sec. CURRENT TRANSFORMER WITH 120kV EXTENDED CURRENT RATING (1kV) | 66 Nos. |
| 5. | | 400kV, 4400pF, 70kV/37.01kV/1/3, 3-CORE (1kV) CAPACITOR VOLTAGE TRANSFORMER | 12 Nos. |
| 6. | | 400kV, 3150A, 63kA FOR 1sec. 3 PHASE, MOTORISED AND ELECTRICALLY GANGED OPERATED HORIZONTAL DOUBLE BREAK TYPE ISOLATOR WITH ONE EARTH SWITCH | 50 Nos. |
| 7. | | 400kV, 3150A, 63kA FOR 1sec. 3 PHASE, MOTORISED AND ELECTRICALLY GANGED OPERATED HORIZONTAL DOUBLE BREAK TYPE ISOLATOR WITH TWO EARTH SWITCH | 02 Nos. |
| 8. | | 400kV, 3150A, 63kA FOR 1sec. 3 PHASE, MOTORISED AND ELECTRICALLY GANGED OPERATED HORIZONTAL DOUBLE BREAK TYPE ISOLATOR WITHOUT EARTH SWITCH | 13 Nos. |
| 9. | | 400kV, 3150A, 63kA FOR 1sec. 3 PHASE, MOTORISED AND ELECTRICALLY GANGED OPERATED HORIZONTAL DOUBLE BREAK TYPE ISOLATOR WITH ONE EARTH SWITCH | 11 Nos. |
| 10. | | 400kV, 3000-2000-500/1, 63kA FOR 1sec. 3 PHASE, MOTORISED AND ELECTRICALLY GANGED OPERATED HORIZONTAL DOUBLE BREAK TYPE ISOLATOR WITH ONE EARTH SWITCH | 04 Nos. |
| 11. | | 400kV, 3150A, 63kA FOR 1sec. 3 PHASE, MOTORISED AND ELECTRICALLY GANGED OPERATED HORIZONTAL DOUBLE BREAK TYPE ISOLATOR WITH ONE EARTH SWITCH | 04 Nos. |
| 12. | | 33kV, 33kA, CLASS-4 (1kV) SURGE ARRESTER WITH SURGE COUNTER | 46 Nos. |
| 13. | | 400kV, 3-Ph, 500kVA, LINE REACTOR (NOT IN SEMENS SCOPE) | 02 Nos. |

BOQ (145KV EQUIPMENTS)-

| SL. NO. | SYMBOLS | DESCRIPTION | SCOPE QTY. |
|---------|---------|---|------------|
| 1. | | 120kV, 10kA, CLASS-3 (1kV) SURGE ARRESTER W/O SURGE COUNTER FOR LINE REACTOR | 02 Nos. |
| 2. | | 145kV, 1-CORE, 31.5kA FOR 1sec. NEUTRAL CURRENT TRANSFORMER (NCT) WITH 120kV EXTENDED CURRENT RATING (1kV) FOR LINE REACTOR | 02 Nos. |
| 3. | | 145kV, 1-CORE, 31.5kA FOR 1 Sec. SF6 CIRCUIT BREAKER FOR LINE REACTOR | 02 Nos. |

CURRENT TRANSFORMER RATING, 400kV

| LOCATION | CORE NO. | RATIO (A) | APPLICATION | ISF AT ALL TAPS | BURDEN (VA) AT ALL TAPS | ACCURACY CLASS AT ALL TAPS | KNEE POINT VOLTAGE (V) | MAGNETIZING CURRENT I _m @ 1/4 (mA) | RESISTANCE R _{ct} (Ω) |
|--|----------|-----------------|-------------|-----------------|-------------------------|----------------------------|------------------------|---|--------------------------------|
| LINE BAY (420, 423) & TRAFO. BAY (418, 421, 427, 433, 435) | 1 | 3000-2000-500/1 | PROTECTION | --- | --- | PX | 3000-2000-500 | 20-30-120 | 15-10-2.5 |
| | 2 | 3000-2000-500/1 | PROTECTION | --- | --- | PX | 3000-2000-500 | 20-30-120 | 15-10-2.5 |
| | 3 | 3000-2000-500/1 | METERING | <5 | 20 | 0.2S | --- | --- | --- |
| | 4 | 3000-2000-500/1 | METERING | <5 | 20 | 0.2S | --- | --- | --- |
| | 5 | 3000-2000-500/1 | PROTECTION | --- | --- | PX | 3000-2000-500 | 20-30-120 | 15-10-2.5 |
| 400KV TR & BUS REACTOR BAY(424, 430) | 1 | 3000-2000-500/1 | PROTECTION | --- | --- | PX | 3000-2000-500 | 20-30-120 | 15-10-2.5 |
| | 2 | 3000-2000-500/1 | PROTECTION | --- | --- | PX | 3000-2000-500 | 20-30-120 | 15-10-2.5 |
| | 3 | 3000-2000-500/1 | METERING | <5 | 20 | 0.2S | --- | --- | --- |
| | 4 | 3000-2000-500/1 | METERING | <5 | 20 | 0.2S | --- | --- | --- |
| | 5 | 3000-2000-500/1 | PROTECTION | --- | --- | PX | 3000-2000-500 | 20-30-120 | 15-10-2.5 |
| | 6 | 3000-2000-500/1 | PROTECTION | --- | --- | PX | 3000-2000-500 | 20-30-120 | 15-10-2.5 |

NEUTRAL BUSHING CURRENT TRANSFORMER (125MVA BUS REACTOR) RATING, 400kV

| LOCATION | CORE NO. | RATIO (A) | APPLICATION | ISF AT ALL TAPS | BURDEN (VA) AT ALL TAPS | ACCURACY CLASS AT ALL TAPS | KNEE POINT VOLTAGE (V) | MAGNETIZING CURRENT I _m @ 1/4 (mA) | RESISTANCE R _{ct} (Ω) |
|----------------------------|----------|-----------------|-------------|-----------------|-------------------------|----------------------------|----------------------------|---|--------------------------------|
| BUS REACTOR BAY (424, 430) | 1 | 3000-2000-500/1 | PROTECTION | --- | --- | PX | AS PER MANUFACTURE DRAWING | --- | --- |
| | 2 | 3000-2000-500/1 | PROTECTION | --- | --- | PX | AS PER MANUFACTURE DRAWING | --- | --- |
| | 3 | (Only 1-Ph) | WTI | --- | --- | 5 | AS PER MANUFACTURE DRAWING | --- | --- |
| | 4 | 200/1 | PROTECTION | --- | --- | PX | AS PER MANUFACTURE DRAWING | --- | --- |

BUSHING CURRENT TRANSFORMER (125MVA BUS REACTOR) RATING, 400kV

| LOCATION | CORE NO. | RATIO (A) | APPLICATION | ISF AT ALL TAPS | BURDEN (VA) AT ALL TAPS | ACCURACY CLASS AT ALL TAPS | KNEE POINT VOLTAGE (V) | MAGNETIZING CURRENT I _m @ 1/4 (mA) | RESISTANCE R _{ct} (Ω) |
|----------------------------|----------|-----------|-------------|-----------------|-------------------------|----------------------------|----------------------------|---|--------------------------------|
| BUS REACTOR BAY (424, 430) | 1 | 200/1 | METERING | --- | 10 | 1 | AS PER MANUFACTURE DRAWING | --- | --- |
| | 2 | 200/1 | PROTECTION | --- | --- | PX | AS PER MANUFACTURE DRAWING | --- | --- |
| | 3 | 200/1 | PROTECTION | --- | --- | PX | AS PER MANUFACTURE DRAWING | --- | --- |
| | 4 | 200/1 | PROTECTION | --- | --- | PX | AS PER MANUFACTURE DRAWING | --- | --- |

CAPACITOR VOLTAGE TRANSFORMER, 400kV, 4400pF

| LOCATION | CORE NO. | RATIO (A) | APPLICATION | ISF AT ALL TAPS | BURDEN (VA) AT ALL TAPS | ACCURACY CLASS AT ALL TAPS | KNEE POINT VOLTAGE (V) | MAGNETIZING CURRENT I _m @ 1/4 (mA) | RESISTANCE R _{ct} (Ω) |
|---|----------|-----------|-------------|-----------------|-------------------------|----------------------------|------------------------|---|--------------------------------|
| 400-CVT-1, 400-CVT-2, 420-CVT, 423-CVT. | 1 | 400kV/1/3 | PROTECTION | --- | --- | PX | 3000-2000-500 | 20-30-120 | 15-10-2.5 |
| | 2 | 400kV/1/3 | PROTECTION | --- | --- | PX | 3000-2000-500 | 20-30-120 | 15-10-2.5 |
| | 3 | 400kV/1/3 | PROTECTION | --- | --- | PX | 3000-2000-500 | 20-30-120 | 15-10-2.5 |

BUSHING CURRENT TRANSFORMER RATING (HBCT), 400kV

| LOCATION | CORE NO. | RATIO (A) | APPLICATION | ISF AT ALL TAPS | BURDEN (VA) AT ALL TAPS | ACCURACY CLASS AT ALL TAPS | KNEE POINT VOLTAGE (V) | MAGNETIZING CURRENT I _m @ 1/4 (mA) | RESISTANCE R _{ct} (Ω) |
|--------------------------------------|----------|-----------|-------------|-----------------|-------------------------|----------------------------|----------------------------|---|--------------------------------|
| TRAFO. BAY (418, 421, 427, 433, 438) | 1 | 1600/1 | PROTECTION | --- | --- | PX | AS PER MANUFACTURE DRAWING | --- | --- |

NEUTRAL BUSHING CURRENT TRANSFORMER RATING (NBCT), 400kV

| LOCATION | CORE NO. | RATIO (A) | APPLICATION | ISF AT ALL TAPS | BURDEN (VA) AT ALL TAPS | ACCURACY CLASS AT ALL TAPS | KNEE POINT VOLTAGE (V) | MAGNETIZING CURRENT I _m @ 1/4 (mA) | RESISTANCE R _{ct} (Ω) |
|--------------------------------------|----------|-----------|-------------|-----------------|-------------------------|----------------------------|----------------------------|---|--------------------------------|
| TRAFO. BAY (418, 421, 427, 433, 438) | 1 | 1600/1 | PROTECTION | --- | --- | PX | AS PER MANUFACTURE DRAWING | --- | --- |

BUSHING CURRENT TRANSFORMER RATING (LBCT), 400/200kV

| LOCATION | CORE NO. | RATIO (A) | APPLICATION | ISF AT ALL TAPS | BURDEN (VA) AT ALL TAPS | ACCURACY CLASS AT ALL TAPS | KNEE POINT VOLTAGE (V) | MAGNETIZING CURRENT I _m @ 1/4 (mA) | RESISTANCE R _{ct} (Ω) |
|--------------------------------------|----------|-----------|-------------|-----------------|-------------------------|----------------------------|----------------------------|---|--------------------------------|
| TRAFO. BAY (223, 225, 227, 233, 235) | 1 | 1600/1 | PROTECTION | --- | --- | PX | AS PER MANUFACTURE DRAWING | --- | --- |

EQUIPMENT IDENTIFICATION- 401-BAY

| EQUIPMENT ID | DESCRIPTION |
|--------------|---|
| 1 | REPRESENTS EARTH SWITCH |
| 2 | FOR SMALLER EQP. ON SAME BAY |
| 3 | FOR REACTOR BAY |
| 4 | FOR LINE BAY |
| 5 | FOR TRANSFORMER BAY |
| 6 | FOR SF6 TRANSFORMER/REACTOR BAY |
| 7 | FOR CIRCUIT BREAKER |
| 8 | FOR ISOLATOR |
| 9 | FOR CURRENT TRANSFORMER |
| 10 | FOR CAPACITIVE VOLTAGE TRANSFORMER |
| 11 | FOR LIGHTNING ARRESTOR |
| 12 | WAVE TRAP |
| 13 | WAVE TRAP FOR LIGHTNING ARRESTOR OF REACTOR |
| 14 | FOR CIRCUIT BREAKER (BYPASS FOR NCR) |
| 15 | FOR TRANSFORMER |
| 16 | FOR 220KV SYSTEM |
| 17 | FOR 400KV SYSTEM |
| 18 | FOR 110KV SYSTEM |
| 19 | FOR 33KV SYSTEM |
| 20 | FOR 72.5KV SYSTEM |

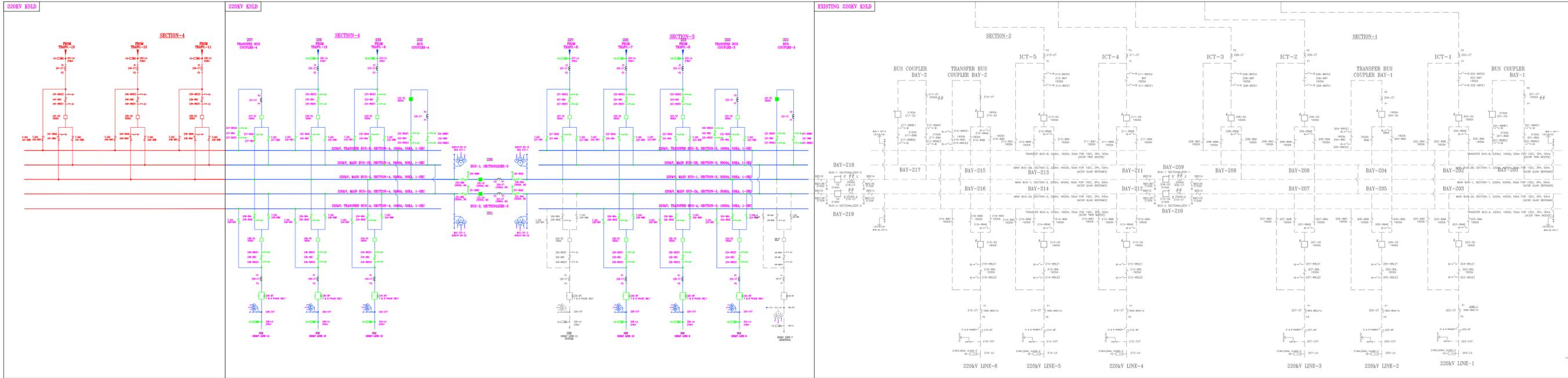
ENGG. REFERENCE DOCUMENT:-

1. WAVE TRAP CONSIDERED ANY OF TWO PHASES ONLY. FOR LOCATION OF WAVE TRAP TO BE CONFIRMED BY M/S AEP.
2. SUPPLY OF 1380V SINGLE PHASE, 5000VA, 765/400V ICT'S A SINGLE PHASE 7 NOS.
3. 765V, 50MVA BUS REACTORS & 110KV LINE REACTOR ARE NOT IN SCOPE OF M/S SEMENS.
4. 765V, 50MVA BUS REACTORS & 110KV LINE REACTOR ARE NOT IN SCOPE OF M/S SEMENS.
5. THE BURDEN OF CT'S ARE AS PER APPROVED EQUIPMENTS (C/P) OF M/S SEMENS.
6. THE CT'S TYPE PARAMETER SHALL BE AS PER APPROVED EQUIPMENT DRAWINGS.
7. PHASE SEQUENCE TO BE FOLLOWED AS R-Y-B FROM ANTI-CLOCKWISE DIRECTION.
8. CREANAGE PROGRAM.
9. CT POLARITY SHALL BE CHECKED AT SITE.
10. FOR TERTIARY LOADING EQUIPMENTS FAULT LEVEL SHALL BE 25KA FOR 3 SEC.

Drawing Control

Employer's Approval Stamp

| <p>Revision History</p> <table border="1"> <thead> <tr> <th>Rev.</th> <th>Rev. Code</th> <th>Modification</th> <th>Drawn By</th> <th>Created By</th> <th>Approved By</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>2024/07/18</td> <td>FIRST SUBMISSION</td> <td></td> <td></td> <td></td> </tr> <tr> <td>1</td> <td>2024/07/18</td> <td>REVISION</td> <td></td> <td></td> <td></td> </tr> </tbody> </table> | Rev. | Rev. Code | Modification | Drawn By | Created By | Approved By | 0 | 2024/07/18 | FIRST SUBMISSION | | | | 1 | 2024/07/18 | REVISION | | | | <p>Project Information</p> <p>Project: TRANSMISSION SYSTEM FOR EVALUATION OF POWER FROM RAJASTHAN HV POWER TRANSMISSION LTD. (APRAJAH HV POWER TRANSMISSION LTD.)</p> <p>Location: FATEHGARH, RAJASTHAN</p> <p>Substation Type: AIS SUBSTATION</p> <p>Voltage Level: 765/400/220KV</p> |
|--|--|------------------|--------------|------------|-------------|-------------|---|------------|------------------|--|--|--|---|------------|----------|--|--|--|--|
| Rev. | Rev. Code | Modification | Drawn By | Created By | Approved By | | | | | | | | | | | | | | |
| 0 | 2024/07/18 | FIRST SUBMISSION | | | | | | | | | | | | | | | | | |
| 1 | 2024/07/18 | REVISION | | | | | | | | | | | | | | | | | |
| <p>Client: RAJASTHAN HV POWER TRANSMISSION LTD. (APRAJAH HV POWER TRANSMISSION LTD.)</p> <p>Consultant: TATA CONSULTING ENGINEERS LIMITED</p> | <p>Approval</p> <p>Checked By: [Signature]</p> <p>Approved By: [Signature]</p> | | | | | | | | | | | | | | | | | | |



| SYSTEM PARAMETER DETAILS | | | | | | | |
|--------------------------|---|--------------------------------|--------------------------------|--------------------------------|------------------------------|----------------|----------------|
| Sl. No. | DESCRIPTION OF PARAMETERS | 765kV | 400kV | 220kV | 132kV | 66kV | 33kV |
| 1 | SYSTEM OPERATING VOLTAGE | 765 kV | 400 kV | 220 kV | 132 kV | 66 kV | 33 kV |
| 2 | MAX. OPERATING VOLTAGE (RMS) | 8000 kV | 420 kV | 245 kV | 145 kV | 72.5 kV | 36 kV |
| 3 | RATED FREQUENCY | 50 Hz | 50 Hz | 50 Hz | 50 Hz | 50 Hz | 50 Hz |
| 4 | LIGHTNING IMPULSE WITHSTAND VOLTAGE (FOR 1.2/50 microsec) | | | | | | |
| | a). FOR EQUIPMENTS | 2100 kVp | 1425 kVp | 1050 kVp | 650 kVp | 325 kVp | 170 kVp |
| | b). FOR INSULATOR STRING | 2100 kVp | 1550 kVp | 1050 kVp | 650 kVp | 325 kVp | 170 kVp |
| 5 | SWITCHING IMPULSE WITHSTAND VOLTAGE (FOR 250/2500 microsec) DRY & WET | 1550 kVp | 1050 kVp | --- | --- | --- | --- |
| 6 | ONE MIN. POWER FREQUENCY WITHSTAND VOLTAGE DRY (RMS) | 830 kV | 630 kV | 460 kV | 275 kV | 140 kV | 70 kV |
| 7 | CORONA EXTINCTION VOLTAGE | 508 kV | 320 kV | --- | --- | --- | --- |
| 8 | MAX. RADIO INTERFERENCE VOLTAGE FOR FREQUENCY BETWEEN 0.5 MHZ & 2 MHZ | 2500 micro-volts at 508 kV rms | 1000 micro-volts at 266 kV rms | 1000 micro-volts at 156 kV rms | 500 micro-volts at 92 kV rms | --- | --- |
| 9 | MINIMUM CREEPAGE DISTANCE FOR SWITCHYARD EQUIPMENT (25mm/kV) | 20000 mm | 10500 mm | 6125 mm | 3625 mm | 1812.5 mm | 900 mm |
| 10 | MIN. CREEPAGE DISTANCE FOR INSULATOR STRINGS/LONGROD INSULATORS (31mm/kV) | 24800 mm | 13020 mm | 7595 mm | 4495 mm | 2247.5 mm | 1116 mm |
| 11 | MAX. FAULT CURRENT WITH DURATION | 50KA FOR 1sec. | 63KA FOR 1sec. | 50KA FOR 1sec. | 31.5KA FOR 1sec. | 25KA FOR 3sec. | 25KA FOR 3sec. |
| 12 | SWITCHING SCHEME | ONE & HALF BREAKER | ONE & HALF BREAKER | DOUBLE MAIN & TRANSFER BUS | DOUBLE MAIN & TRANSFER BUS | --- | --- |

| 220kV CURRENT TRANSFORMER DATA | | | | | | | | | |
|--|----------|-------------|--------------|-----------------|-------|-------------|--------------------------|--------------------|---------------------------|
| FIELD TYPE | CORE NO. | APPLICATION | CT RATIO (A) | ISF AT ALL TAPS | CLASS | BURDEN (VA) | KNEE POINT VOLTAGE V (V) | RESISTANCE Rct (Ω) | MAGN. CURRENT Im (mA) @ V |
| 220kV LINE FEEDER (BAY-224, 226, 228, 234, 236 & 238) | Core 1 | Protection | 1600-800/1 | --- | PX | --- | 1600-800 | 8-4 | 25-50 |
| | Core 2 | Protection | 1600-800/1 | --- | PX | --- | 1600-800 | 8-4 | 25-50 |
| | Core 3 | Metering | 1600-800/1 | <5 | 0.2S | 20 | --- | --- | --- |
| | Core 4 | Protection | 1600-800/1 | --- | PX | --- | 1600-800 | 8-4 | 25-50 |
| 220kV TRANSFORMER FEEDER (BAY- 223, 225, 227, 233 & 235) | Core 5 | Protection | 1600-800/1 | --- | PX | --- | 1600-800 | 8-4 | 25-50 |
| | Core 6 | Protection | 1600-800/1 | --- | PX | --- | 1600-800 | 8-4 | 25-50 |
| 220kV TRANSFER BUS COUPLER (BAY- 222 & 237) | Core 1 | Protection | 3000-2000/1 | --- | PX | --- | 3000-2000 | 15-10 | 20-30 |
| | Core 2 | Protection | 3000-2000/1 | --- | PX | --- | 3000-2000 | 15-10 | 20-30 |
| BUS COUPLER & BUS SECTION (BAY- 221, 229, 230 & 231) | Core 3 | Metering | 3000-2000/1 | <5 | 0.2S | 20 | --- | --- | --- |
| | Core 4 | Protection | 3000-2000/1 | --- | PX | --- | 3000-2000 | 15-10 | 20-30 |
| | Core 5 | Protection | 3000-2000/1 | --- | PX | --- | 3000-2000 | 15-10 | 20-30 |

| CAPACITOR VOLTAGE TRANSFORMER, 220kV, 4400pF | | | | |
|---|----------|---|--------|----------------|
| LOCATION | CORE NO. | RATIO | BURDEN | ACCURACY CLASS |
| 200-CVT-1, 200-CVT-2, 224-CVT, 226-CVT, 228-CVT, 234-CVT, 236-CVT, 237-CVT, | 1 | 220kV/V _N / 0.110kV/V _N | 50 | 0.5/3P |
| | 2 | 220kV/V _N / 0.110kV/V _N | 50 | 0.5/3P |
| | 3 | 220kV/V _N / 0.110kV/V _N | 50 | 0.2 |

| BOQ (245kV EQUIPMENTS):- | | | |
|--------------------------|---------|---|------------|
| Sl. No. | SYMBOLS | DESCRIPTION | SCOPE QTY. |
| 1. | | 245kV, 3150A, 50KA FOR 1sec., 3 PHASE, SF6 CIRCUIT BREAKER | 04 Nos. |
| 2. | | 245kV, 1600A, 50KA FOR 1sec., 3 PHASE, SF6 CIRCUIT BREAKER | 13 Nos. |
| 3. | | 245kV, 1600A, 50KA FOR 1sec., 3 PHASE, MOTORISED AND ELECTRICALLY GANG OPERATED HORIZONTAL DOUBLE BREAK TYPE TANDEM ISOLATOR WITHOUT EARTH SWITCH | 24 Nos. |
| 4. | | 245kV, 3000A, 50KA FOR 1sec., 3 PHASE, MOTORISED AND ELECTRICALLY GANG OPERATED HORIZONTAL DOUBLE BREAK TYPE ISOLATOR WITH ONE EARTH SWITCH | 04 Nos. |
| 5. | | 245kV, 1600A, 50KA FOR 1sec., 3 PHASE, MOTORISED AND ELECTRICALLY GANG OPERATED HORIZONTAL DOUBLE BREAK TYPE ISOLATOR WITH ONE EARTH SWITCH | 11 Nos. |
| 6. | | 245kV, 3000A, 50KA FOR 1sec., 3 PHASE, MOTORISED AND ELECTRICALLY GANG OPERATED HORIZONTAL DOUBLE BREAK TYPE ISOLATOR WITH TWO EARTH SWITCH | 04 Nos. |
| 7. | | 245kV, 1600A, 50KA FOR 1sec., 3 PHASE, MOTORISED AND ELECTRICALLY GANG OPERATED HORIZONTAL DOUBLE BREAK TYPE ISOLATOR WITH TWO EARTH SWITCH | 13 Nos. |
| 8. | | 245kV, 3000-2000/1A, 50KA FOR 1sec., CURRENT TRANSFORMER WITH 120% EXTENDED CURRENT RATING (14) | 12 Nos. |
| 9. | | 245kV, 1600-800/1A, 50KA FOR 1sec., CURRENT TRANSFORMER WITH 120% EXTENDED CURRENT RATING (14) | 39 Nos. |
| 10. | | 245kV, 4400pF, 245kV/V _N /V _N , 3-CORE (14) CAPACITOR VOLTAGE TRANSFORMER | 30 Nos. |
| 11. | | 245kV, 0.5mH, 1600A, 50KA FOR 1sec., (14) WAVE TRAP | 12 Nos. |
| 12. | | 245kV, 10kA, CLASS-4, (14) SURGE ARRESTER WITH SURGE COUNTER | 33 Nos. |

EQUIPMENT IDENTIFICATION:-
 201-B0A0E

- EQUIPMENT ID: E REPRESENTS EARTH SWITCH, A,B,C FOR SIMILAR COP. ON SAME BAY, L FOR LINE BAY, R FOR REACTOR BAY, S FOR TRANSFORMER BAY, T FOR SPARE TRANSFORMER/REACTOR BAY
- STANDARD EQUIPMENT NO: 52 FOR CIRCUIT BREAKER, 49 FOR ISOLATOR, CT FOR CURRENT TRANSFORMER, CVT FOR CAPACITIVE VOLTAGE TRANSFORMER, LA FOR LIGHTNING ARRESTOR, WT FOR WAVE TRAP, LAN/R FOR LIGHTNING ARRESTOR OF REACTOR, 52B FOR CIRCUIT BREAKER (BYPASS OF NGR)
- BAY NUMBER: 7 FOR 765kV SYSTEM, 4 FOR 400kV SYSTEM, 2 FOR 220kV SYSTEM, 1 FOR 145kV SYSTEM, 3 FOR 33kV SYSTEM, 8 FOR 72.5kV SYSTEM
- VOLTAGE LEVEL

ENGG. REFERENCE DOCUMENT:-
 TENDER DRG. NO. SEDTA-2402500

LEGEND:-
 --- PRESENT SCOPE
 - - - FUTURE / EXISTING NOT IN SCOPE OF M/S SIEMENS

NOTES:-
 1. WAVE TRAP CONSIDERED ANY OF TWO PHASES ONLY. FOR LOCATION OF WAVE TRAP TO BE CONFIRMED BY M/S AEP.
 2. SUPPLY OF LINES, SINGLE PHASE, 500MVA, 765/400kV ICT'S & SINGLE PHASE 7 NOS. 765KV, 80MVAR BUS REACTORS & 110MVAR LINE REACTOR ARE NOT IN SCOPE OF M/S SIEMENS.
 3. 765KV AUXILIARY BUS OF TRANSFORMERS & REACTORS WITH ASSOCIATED NEUTRAL BUS ARE IN SCOPE OF M/S SIEMENS.
 4. THE BURDEN OF CT'S ARE AS PER APPROVED EQUIPMENTS CT/PT DRAWINGS.
 5. THE CT'S/CVT'S PARAMETER SHALL BE AS PER APPROVED EQUIPMENT DRAWINGS.
 6. PHASE SEQUENCE TO BE FOLLOWED AS R-Y-B FROM ANTI-CLOCKWISE DIRECTION.
 7. ORIENTATION OF EARTH SWITCH INDICATED IS TENTATIVE & MAY BE CHANGE DEPENDING UPON CLEARANCE DIAGRAM.
 8. CT POLARITY SHALL BE CHECKED AT SITE.
 9. FOR TERTIARY LOADING EQUIPMENT'S FAULT LEVEL SHALL BE 25KA FOR 3 SEC.

Drawing Control

| Rev. | Rev. Date | Modification | Drawn By | Created By | Approved By |
|------|------------|---|----------|------------|-------------|
| A | 2024.08.21 | REVISED AS PER CLIENT'S COMMENTS ON DTD: 07.08.24 | SK | RV | NYK |
| B | 2024.07.18 | FIRST SUBMISSION | SK | RV | NYK |

Employer's Approval Stamp

Customer: RAJASTHAN IV POWER TRANSMISSION LTD. (APRAVA ENERGY PRIVATE LIMITED)

Project: TRANSMISSION SYSTEM FOR EVALUATION OF POWER FROM RAJASTHAN REZ PH-V (PART-2: 5.5 GW) PART A

Substation: 4x1500 MVA, 765/400 kV AND 540/300 MVA, 400/220 kV FATEHGARH-IV SECTION'S VOLTAGE STATION

Location: FATEHGARH, RAJASTHAN

Station Type: AIS SUBSTATION

Voltage Level: 765/400/220kV

Scale: 1:1

Drawn By: SK

Checked By: NYK

Approved By: NYK

Date: 2024.07.18

Document Type: SLD

Document No: 00000000000000000000

Revision: 1

Revision For: PRELIMINARY ENGINEERING APPROVAL CONSTRUCTION

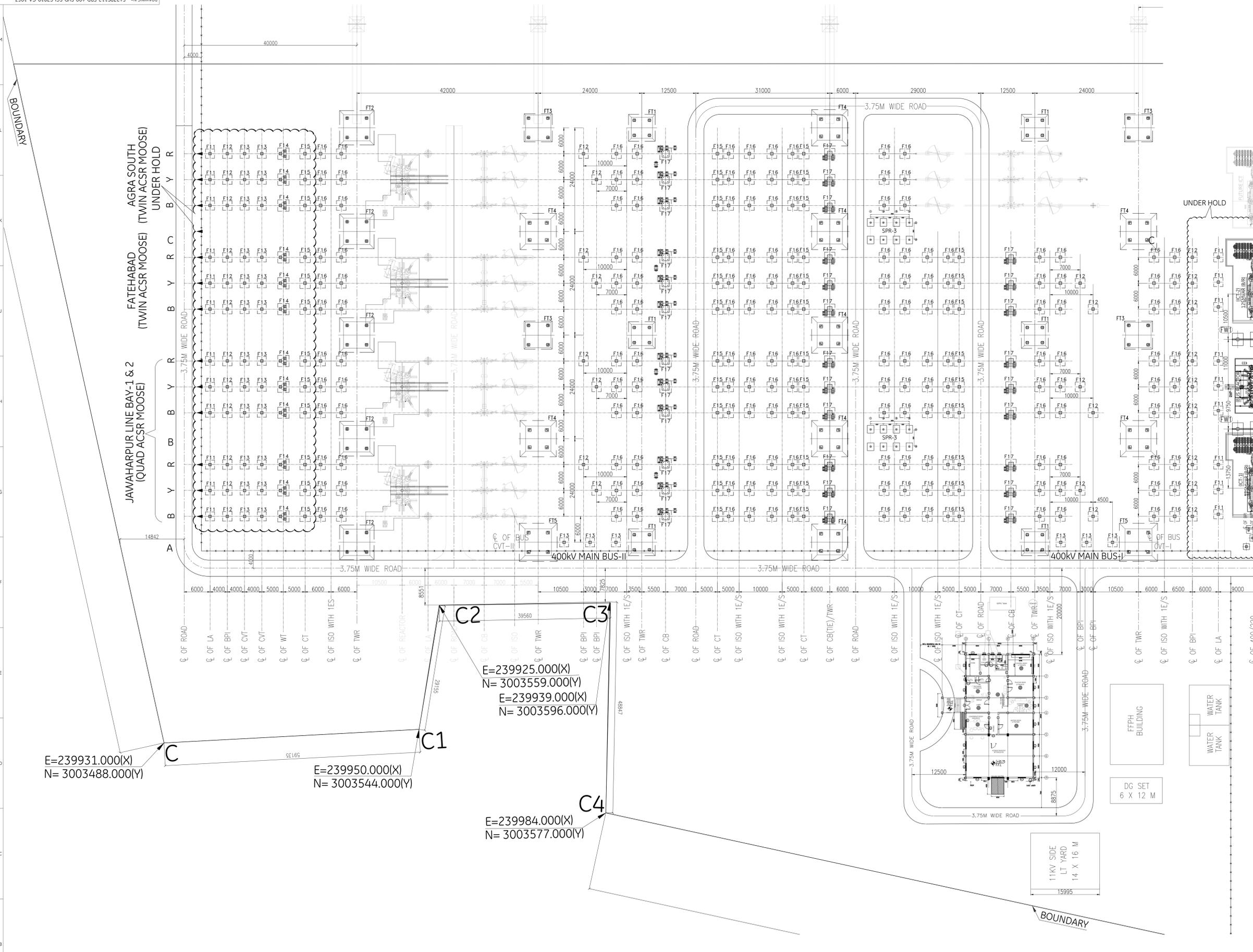
Sheet: 24 of 33

765/400kV Dausa S/S

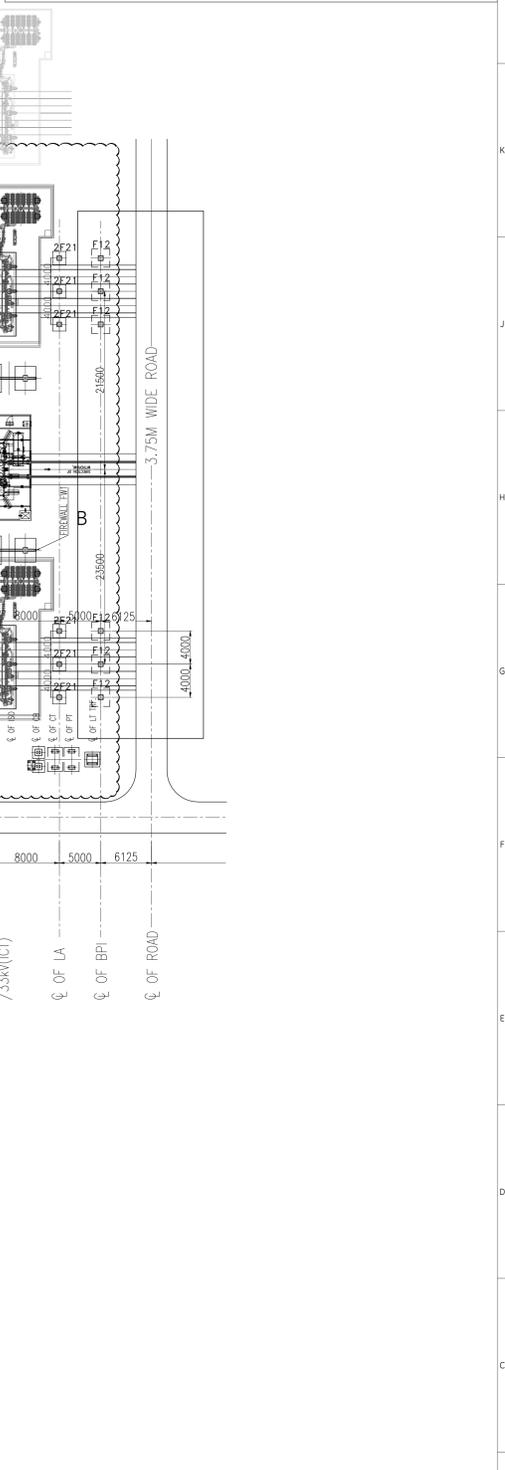
400/220/132kV Firozabad Substation

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| 400kV EQUIPMENT FOUNDATION | | | | | |
|----------------------------|----------------|----------|---------------|-----------------|--------|
| S. NO. | EQUIPMENT TYPE | FDN TYPE | TOTAL QTY. | FDN DRAWING NO. | REMARK |
| 1. | 400kV 'LA' | F11 | 21 | | HOLD |
| 2. | 400kV 'BPI' | F12 | 35 | | HOLD |
| 3. | 400kV 'CVT' | F13 | 30 | | HOLD |
| 4. | 400kV 'WT' | F14 | 12 | | HOLD |
| 5. | 400kV 'CT' | F15 | 45 | | HOLD |
| 6. | 400kV 'ISO' | F16 | 29x6=174 NOS. | | HOLD |
| 7. | 400kV 'CB' | F17 | 11x3=33 NOS. | | HOLD |
| 8. | SPR TYPE 3 | | 2 | | HOLD |

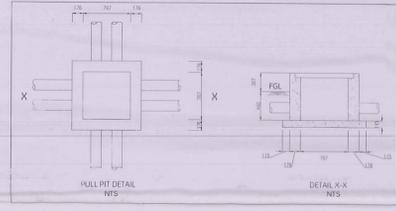
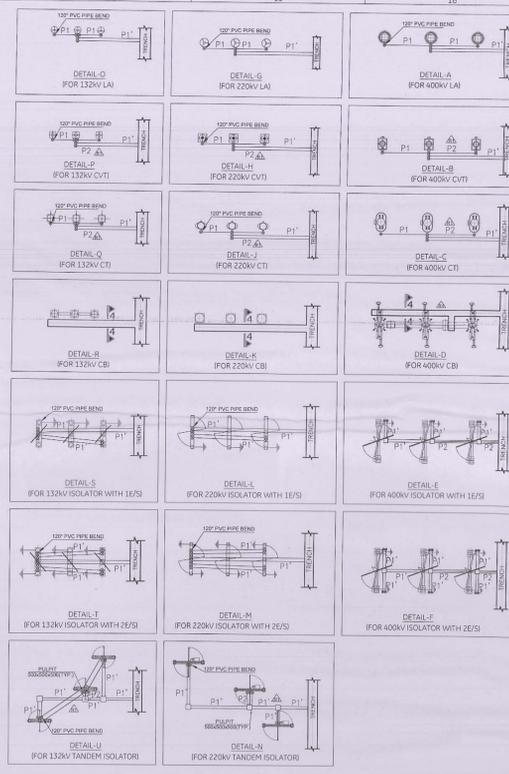


| REFERENCE NO. | DESCRIPTION | NOTES |
|---------------|---|--|
| 1. | 5427PS112-FRD-E-SYD-SYS-0002-GA | ELECTRICAL LAYOUT PLAN & SECTION FOR 400/220/132KV FIROZABAD SUBSTATION |
| 2. | C/ENG2/STD/2016/RCT/01 | DETAIL OF CABLE TRENCH & CABLE TRENCH CROSSING |
| 3. | C/ENG2/STD/ROAD/2016/02 OF 02 | DETAIL OF CONCRETE ROAD(RIGID PAVEMENT) WITH P.C.C. SHOULDER |
| 4. | C/ENG2/CV/STD/FENCE/2016/01 OF 01 | STANDARD DETAIL FOR SWITCHYARD CHAIN LINK FENCE |
| 5. | C/ENG2/CV/STD/GATE/2016/01 OF 01 | DETAIL FOR SWITCHYARD GATE |
| 6. | C/ENG2/CM/PRF/FAB/01-R4 | DETAIL FOR PRE FABRICATED RCC BOUNDARY WALL |
| 7. | 5427PS112-FRD-000-SYD-SCI-S7010-GA-1001 | PLAN OF SUB-STATION SITE SHOWING LEVELS FOR LAND DEVELOPMENT FOR 400/220/132KV FIROZABAD SUBSTATION |
| 8. | 5427PS112-FRD-000-SYD-SCI-S7140-CW-1403 | CONTROL ROOM BUILDING :- GA AND RCC DETAIL OF FOUNDATIONS |
| 1. | | 1. ALL DIMENSIONS ARE IN MM & LEVELS IN METERS. 2. ± 0.0 CORRESPOND TO F.G.L. (FINISHED GROUND LEVEL) OF S/S i.e. RL. 146.85 M. 3. UNLESS MENTIONED IN DETAIL, NO FOUNDATION SHALL REST ON FILLED UP SOIL. IN CASE FILLED UP SOIL ENCOUNTERS, THE FOUNDATION SHALL BE TAKEN 1500mm BELOW VIRGIN SOIL FOR TOWERS/ CONTROL ROOM BUILDING AND 1000mm BELOW VIRGIN SOIL FOR EQUIPMENT FOUNDATIONS. 4. FOR EQUIPMENT, TRANSFORMER & REACTOR FOUNDATIONS REFER RESPECTIVE DRAWINGS. 5. FOR CABLE TRENCH ROUTING AND SECTION DETAILS REFER SUBSEQUENT DRAWING. 6. WHEREVER EQUIPMENT RAFT SHALL COME IN THE BACK FILLING IN ADJACENT TO TOWER FOUNDATION, THE SOIL IN BETWEEN THE TOWER RAFT TOP AND PCC BOTTOM OF EQUIPMENT IN THE OVER LAPPING AREA SHALL BE WELL COMPACTED IN LAYERS UPTO 95% OF PROCTOR DENSITY. |
| 7. | | 7. TOWER MARK GIVEN IN THIS DRAWING IS BASED ON STRUCTURAL LAYOUT. 8. FOUNDATION SIZES SHOWN IN THIS DRAWING ARE INDICATIVE ONLY FOR EXACT DETAILS OF FOUNDATION REFER INDIVIDUAL FOUNDATION DRG. OF EQUIPMENT/TOWER/ CONTROL ROOM BUILDING. 9. LAYOUT SHALL BE DONE ONLY AFTER CO-ORDINATING AS PER LATEST/APPROVED S/Y PLAN & DISCREPANCY IF ANY SHALL BE BROUGHT TO NOTICE BEFORE EXECUTION. 10. ALL OIL SOAK PIT WALLS OF TRAFD. & REACTOR SHALL BE UNDER HOLD FOR CONSTRUCTION TILL FURTHER NOTICE. 11. LOCATION SIZE OF WATER TANK, PUMP HOUSE & DG SET ARE TENTATIVE AND FOR INDICATIVE PURPOSE ONLY. |



THIS DRAWING SHALL BE READ FOR LOCATION OF TOWER EQUIPMENTS & CRB

| | | |
|-------------|---|--|
| CLIENT: | POWER GRID CORPORATION OF INDIA LIMITED | 2nd FLOOR, PLOT No.-2 SECTOR-29 GURGAON-122 001 HARYANA |
| CUSTOMER: | JAWAHARPUR FIROZABAD TRANSMISSION LIMITED (100% WHOLLY OWNED SUBSIDIARY OF POWERGRID) | |
| PROJECT: | EVALUATION OF POWER FROM 2X600MW JAWAHARPUR THERMAL POWER PROJECT AND CONSTRUCTION OF 400KV SUBSTATION AT FIROZABAD ALONGWITH ASSOCIATED TRANSMISSION LINES | |
| CONTRACTOR: | GE T&D INDIA LTD. T-5 & T-6, PLOT 1-14 AXIS HOUSE, JAYPEE WISHTOWN SECTOR-128, NOIDA-201304 UTTAR PRADESH (INDIA) | |
| LOA No.: | JFTL/400KV/SSO1/NOA-1/0211 DATED: 11.01.2019. JFTL/400KV/SSO1/NOA-1/0210 DATED: 11.01.2019 | |
| TITLE: | 400KV FOUNDATION LAYOUT PLAN 400/220/132KV FIROZABAD SUBSTATION | |
| APPROVAL: | DATE: 02.04.19 DRAWN: 02.04.19 CHECKED: 02.04.19 APPROVED: 02.04.19 | STATUS: APPROVED |
| DRAWING No. | 5427PS112-FRD-400-SYD-SCI-S7010-GA-1053 | TOTAL SH. 03 SCALE: 01 |



| DESCRIPTION | ACTUAL QUANTITY | BPS QUANTITY |
|-------------|-----------------|--------------|
| SECTION 1-1 | 100 Mtrs. ΔΔ | 20 Mtrs. |
| SECTION 2-2 | 711 Mtrs. ΔΔ | 230 Mtrs. |
| SECTION 3-3 | 575 Mtrs. ΔΔ | 450 Mtrs. |
| SECTION 4-4 | 580 Mtrs. ΔΔ | 230 Mtrs. |

CAUTION
 This drawing is for reference only. It is not to be used for construction without the approval of the Engineer-in-Charge. Any modification to the drawing shall be approved by the Engineer-in-Charge. The contractor shall be responsible for the accuracy of the data and quantities shown in this drawing.

- NOTES-**
1. ALL DIMENSIONS ARE IN MM.
 2. THIS DRAWING SHALL BE REFERRED FOR CABLE ROUTING PURPOSE ONLY AND REQUIRED CABLE TRENCH WIDTH, FOR CIVIL ACTIVITIES, FOUNDATION AND CABLE TRENCH LAYOUT TO BE REFERRED.
 3. APPROVED 132KV/CT REACTOR AND ITS ASSOCIATED EQUIPMENT ARE UNDER HOLD. THE SAME SHALL TO BE FINALIZED AFTER RECEIPT OF RESPECTIVE GA DRAWINGS.
 4. DETAIL OF CABLE TRENCHES AND CABLE TRENCH ROAD CROSSINGS ARE REFERRED FROM PGCL STANDARD DRAWINGS. (ICENGG/STO/2016/ACT/01)
 5. MINOR CHANGES IF REQUIRED IN CABLE TRENCH ROUTING MAY BE DONE AS PER SITE CONDITIONS IN CASE IT DOES NOT AFFECT FOUNDATION WITH APPROVAL OF SITE ENGINEER.
 6. SEPARATE PIPE SHALL BE USED FOR POWER & CONTROL CABLE FROM TRENCH TO THE EQUIPMENTS. POWER & CONTROL CABLES IN CABLE TRENCH SHALL BE LAID IN SEPARATE TIERS. POWER CABLES TO BE LAID IN SINGLE LAYER ON TOP TIER & CONTROL CABLE MAY BE LAID IN DOUBLE LAYERS IN BOTTOM TIERS. TIERS ARE MARKED WITH 'PC' FOR POWER CABLES & 'CC' FOR CONTROL CABLES.
 7. AFTER LAYING CABLES ENDS OF CONDUITS SHALL BE SEALED BY SUITABLE PACKING MATERIAL TO PREVENT INGRESS OF WATER.
 8. CABLE LAYING SHALL BE DONE AS PER TECHNICAL SPECIFICATION.
 9. CABLES FROM TRENCH TO EQUIPMENT SHALL BE RUN IN PVC PIPE. CABLE FROM GROUND TO EQUIPMENT SHALL BE TAKEN IN PVC PIPE.
 10. WHILE ROUTING CABLE TRENCH NEAR ISOLATORS, PLACE FOR AUK, EARTH MAT BELOW MOAT FOR MAIN AND SARTH BLADE SHOULD BE ENSURED.
 11. CABLE TRENCHES SHALL BE BROUGHT JUST BELOW THE LV CABLE BOX FOR EASY TERMINATION OF POWER CABLES.
 12. OPTICAL FIBER CABLE SHALL RUN THROUGH 50MM DIA GI PIPE INSIDE THE CABLE TRENCH.
 13. IN CASE REFER CIVIL DRAWING FOR SLOPE & TRENCH DIMENSION.
 14. PIPE/TRENCH LOCATION SHOWN FOR ISOLATOR SHALL BE LOCATED AT SITE BEFORE LAYING OF PIPE BASED ON ACTUAL POSITION OF MOM BASE ACCORDINGLY OPENING AT MAIN TRENCH FOR PIPE ENTRY IS PROVIDED.

LEGEND:

| | |
|--|-----------------------------------|
| | CABLE TRENCH |
| | PVC PIPE 100/50mm DIA |
| | 500x500x600mm PULL BOX |
| | 120° PVC PIPE BEND (100/50mm) |
| | 1No. 110mmØ PVC PIPE |
| | 1No. 110mmØ & 1No. 50mmØ PVC PIPE |
| | 2No. 110mm & 1No. 50mmØ PVC PIPE |
| | ROAD CROSSING |

| REFERENCE NO. | DESCRIPTION |
|---------------|-------------|
| 1 | |
| 2 | |
| 3 | |
| 4 | |
| 5 | |
| 6 | |
| 7 | |
| 8 | |
| 9 | |
| 10 | |
| 11 | |
| 12 | |
| 13 | |
| 14 | |
| 15 | |
| 16 | |

| REV No. | DESCRIPTION | DATE | DRAWN | ELE | CIVIL | MECH | APPROVED | STATUS |
|---------|---|----------|-------|----------|-------|------|----------|--------------|
| R1 | REVISED AS PER PGCL COMMENTS DATED-19.07.19 | 19.07.19 | WAG | 05.08.19 | | | | FOR APPROVAL |
| RO | FIRST ISSUE | 20.06.19 | WAG | 20.06.19 | | | | CAT-II |

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APPROVAL: AS BUILT CONSTRUCTION
 PHOTO: PLANNING REFERENCE
 MANUFACTURING: IDENTIFICATION EXECUTION
 RECORD: EXECUTION

CLIENT: JAWAHARPUR FIRZOABAD TRANSMISSION LIMITED (100% WHOLLY OWNED SUBSIDIARY OF POWERGRID)

CUSTOMER: JAWAHARPUR FIRZOABAD TRANSMISSION LIMITED (100% WHOLLY OWNED SUBSIDIARY OF POWERGRID)

PROJECT: EVACUATION OF POWER FROM 2X630MW JAWAHARPUR THERMAL POWER PROJECT AND CONSTRUCTION OF 400KV SUBSTATION AT FIRZOABAD ALONGWITH ASSOCIATED TRANSMISSION LINES

CONTRACTOR: GE T&D INDIA LTD. (P. S. 6, PLOT 1-24, ANE HOUSE, WAPDA WASHINGTON SECTION, 12A, NOKA-201304, UTTAR PRADESH, INDIA)

LOA No.: JTI/400KV/SS/JNKA-02/01 DATED: 11.01.2019
 JTI/400KV/SS/JNKA-02/02 DATED: 11.01.2019

TITLE: OUTDOOR CABLE ROUTING TRENCH LAYOUT FOR 400/220/132KV FIRZOABAD SUBSTATION

DRAWING No.: 5427FS112-FRD-000-SYS-SCI-GA-0005

TOTAL SH: 901
SCALE: 1:575

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