

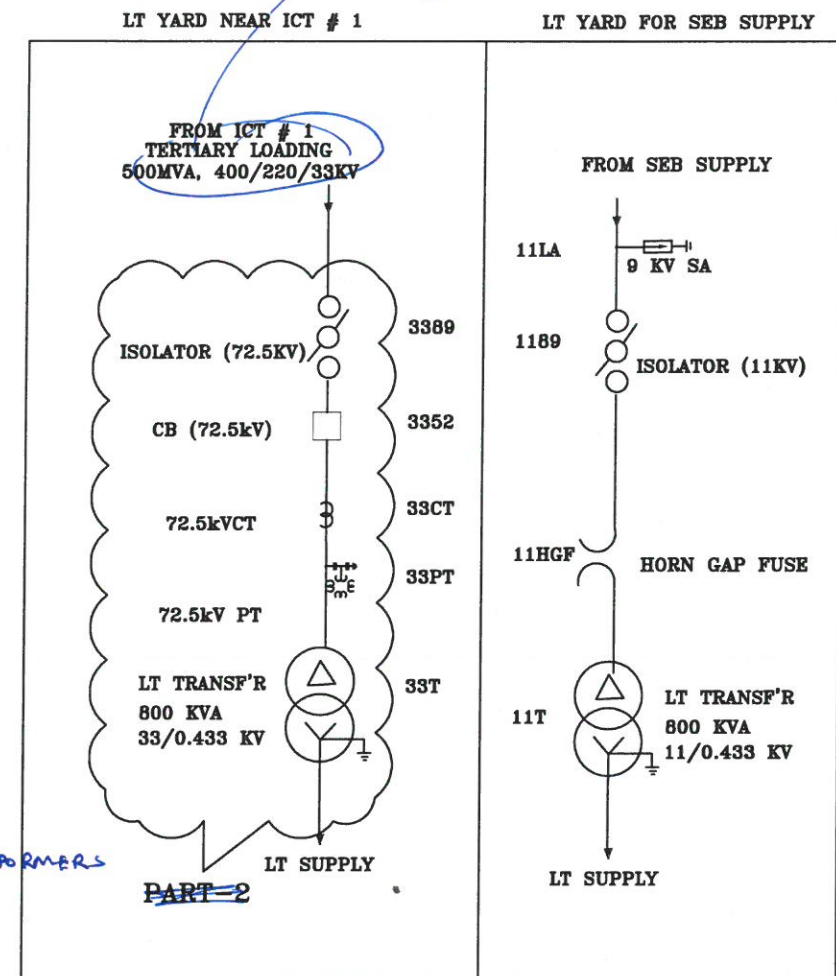
DRAWING No. TB-385-510-001

COMPUTER DRG. PATH NAME :

REF. DRG. No.

SIGN. & DATE

INVENTORY No.



2

Pls. refer NOK. No. 3 of Revised
SLD, & No. 800KVA LT Transformer
shall be loaded at 765/400KV
Transformer.

Cat-I*

I. Approved/Released for Fabrication/
construction

II. Approved/Released for Fabrication/
construction Subject to incorporation
of comments Modification as Noted
Revisions Required.

III. To Be Submitted for Approval at
Incumbent's Office and Comments.
IV. Pending Review and Record.

V. Not Reviewed

VI. Other Corporation or Inst-
tutional or Govt Group Company.

APR 1986

18/4/16

ADDITIONAL INFORMATION
W.O.No. 85003

STATUS OF DRAWING	CONTRACT
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DISTRIBUTION OF PRINTS	
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REV.	DATE	ALTERED
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		APPROVED

ZONE	
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ग्राहक/परियोजना का नाम POWER GRID CORPORATION OF INDIA LIMITED

NAME OF CUSTOMER/PROJECT	SUBSTATION PACKAGE-SS01 FOR CONSTRUCTION OF 765/400/220KV BHUJ S/S & EXT. OF 765KV BANASKANTHA S/S UNDER GREEN ENERGY CORRIDOR ISTS PART- C (PART-1)
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	भारत हेवी इलेक्ट्रिकल्स लिमिटेड	नाम / NAME	हस्ता / SIGN.	दि./DATE	
	ट्रांसमिशन परियोजना विभाग	JS		06.04.16	
	BHARAT HEAVY ELECTRICALS LTD.	जाँचा CHECKED			SK/AA
	TRANSMISSION PROJECTS DIVISION	स्वीकृत APPROVED			AS/RS

विभाग TBEM		अनुपात / SCALE	कार्ड कोड		
कोड 422		NTS	CARD CODE		

CODE	722	715		
शीर्षक/TITLE	डाईया.क./DRAWING NO		पुनः/REV	

SINGLE LINE DIAGRAM	DRAWING NO.	0
500-365-400 (200)X 2 1/2" DIA. C/C	TB-385-510-001	

पृष्ठ क्र./SHEET No. 01 अगला पृष्ठ/NEXT SHEET 02

A horizontal number line with three tick marks labeled 3, 2, and 1 from left to right.

COMPUTER DRG. PATH NAME :

REF. DRG. No.

SIGN. & DATE

INVENTORY No.



SINGLE LINE DIAGRAM *Cat-I**

Approval/Released for Fabrication/Construction

Approval/Released for Incorporation/Commissioning

To Be Submitted to the Commissioning Department for Approval after the Design & Record.

Approved by: *R413*

SDE

12/4/16

ADDITIONAL INFORMATION
W.O.No. 85003

STATUS OF DRAWING	CONTRACT
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DISTRIBUTION OF PRINTS

REV.	DATE	ALTERED
		CHECKED
		APPROVED

DATE	
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ग्राहक/परियोजना का नाम POWER GRID CORPORATION OF INDIA LIMITED

NAME OF CUSTOMER/PROJECT	SUBSTATION PACKAGE-SS01 FOR CONSTRUCTION OF 765/400/220KV BHUJ S/S & EXT. OF 765KV BANASKANTHA S/S UNDER GREEN ENERGY CORRIDOR ISTS PART-C (PART-1)
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भारत हेवी इलेक्ट्रिकल्स लिमिटेड
BHEL
 दूरसंचालन परियोजना विभाग
 BHARAT HEAVY ELECTRICALS LTD.
 TRANSMISSION PROJECTS DIVISION

विभाग	TBEM
DEPT.	
कोड	422

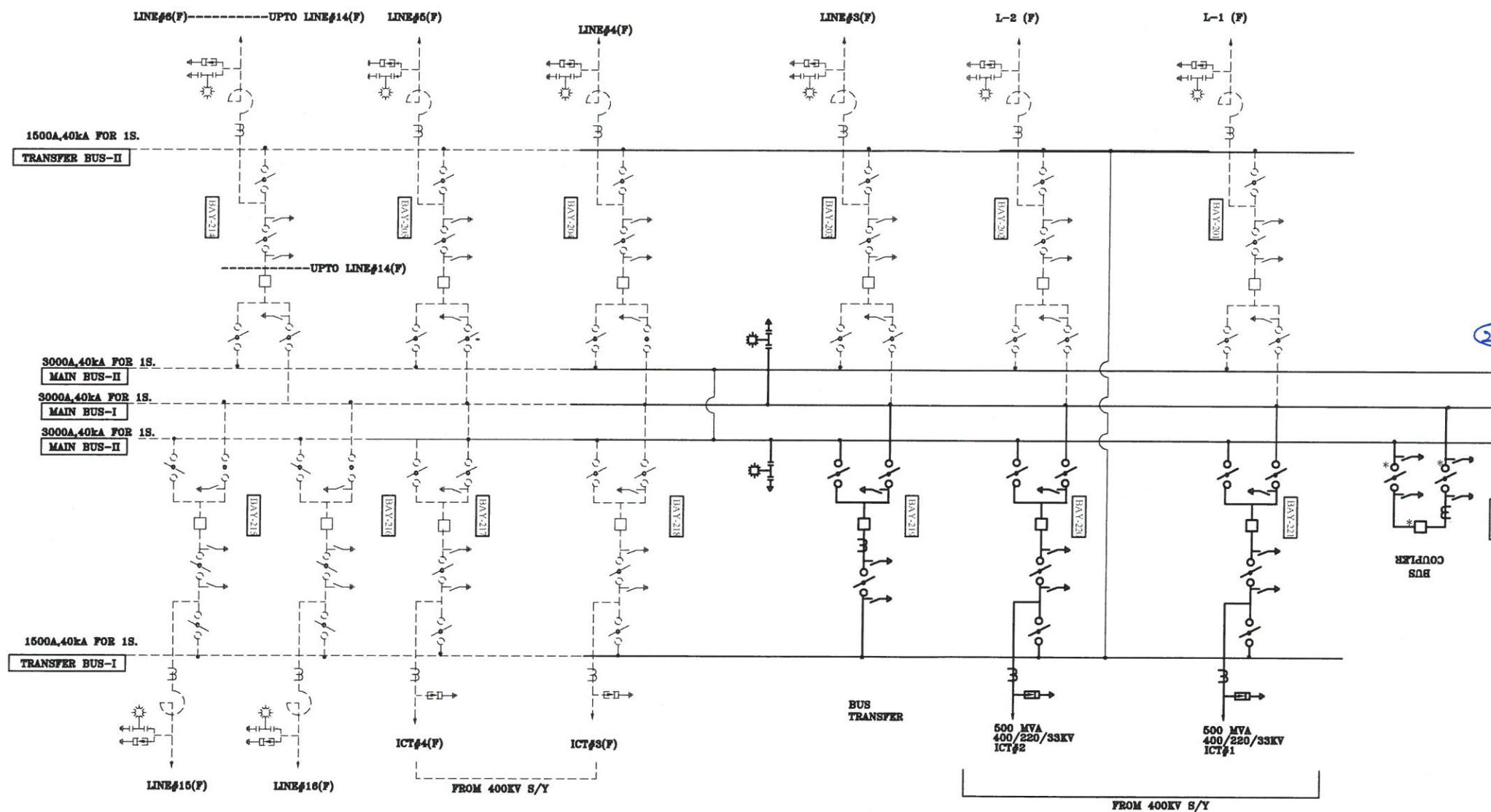
SINGLE LINE DIAGRAM
FOR 765/400/220kV BHUJ S/S.

खींचा DRAWN	नाम /NAME	हस्ता./SIGN.	दि./DATE
	JS		06.04.1
जाँचा CHECKED	SK/AA		
स्वीकृत	AS/RS		

डाईंग.क्र./DRAWING NO.	पुनः/RE
TB-385-510-001	0

पृष्ठ क्र./SHEET No. 02
 अगला पृष्ठ /NEXT SHEET 03

DRAWING No. TB-385-510-001



① Put the complete 220kV SLD in cloud and indicate the same under Part-2.

② Part-2 not under present scope of award.

220KV SINGLE LINE DIAGRAM

NOA NO. : CC-CS/484-WR2/SS-2953/11/G8/NOA-1&2/5727 & 5728 DT. 31.03.16		POWER GRID CORPORATION OF INDIA LIMITED																			
ADDITIONAL INFORMATION W.O.No. 85003		NAME OF CUSTOMER/PROJECT SUBSTATION PACKAGE-SS01 FOR CONSTRUCTION OF 765/400/220KV BHUJ S/S & EXT. OF 765KV BANASKANTHA S/S UNDER GREEN ENERGY CORRIDOR ISTS PART- C (PART-1)																			
STATUS OF DRAWING CONTRACT		DISTRIBUTION OF PRINTS																			
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TB-385-510-001	0																				
SINGLE LINE DIAGRAM FOR 765/400/220KV BHUJ S/S.		पृष्ठ नं./SHEET No.03 अगला पृष्ठ/NEXT SHEET 04																			

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COMPUTER DRG. PATH NAME :

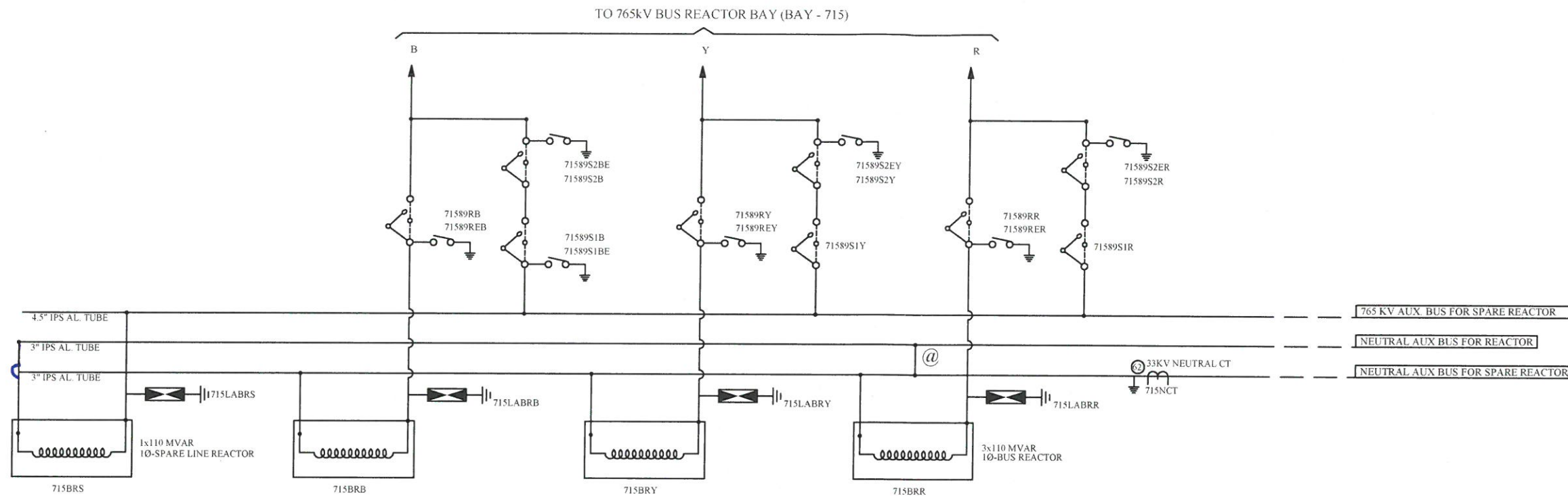
REF. DRG. No.

SIGN. & DATE

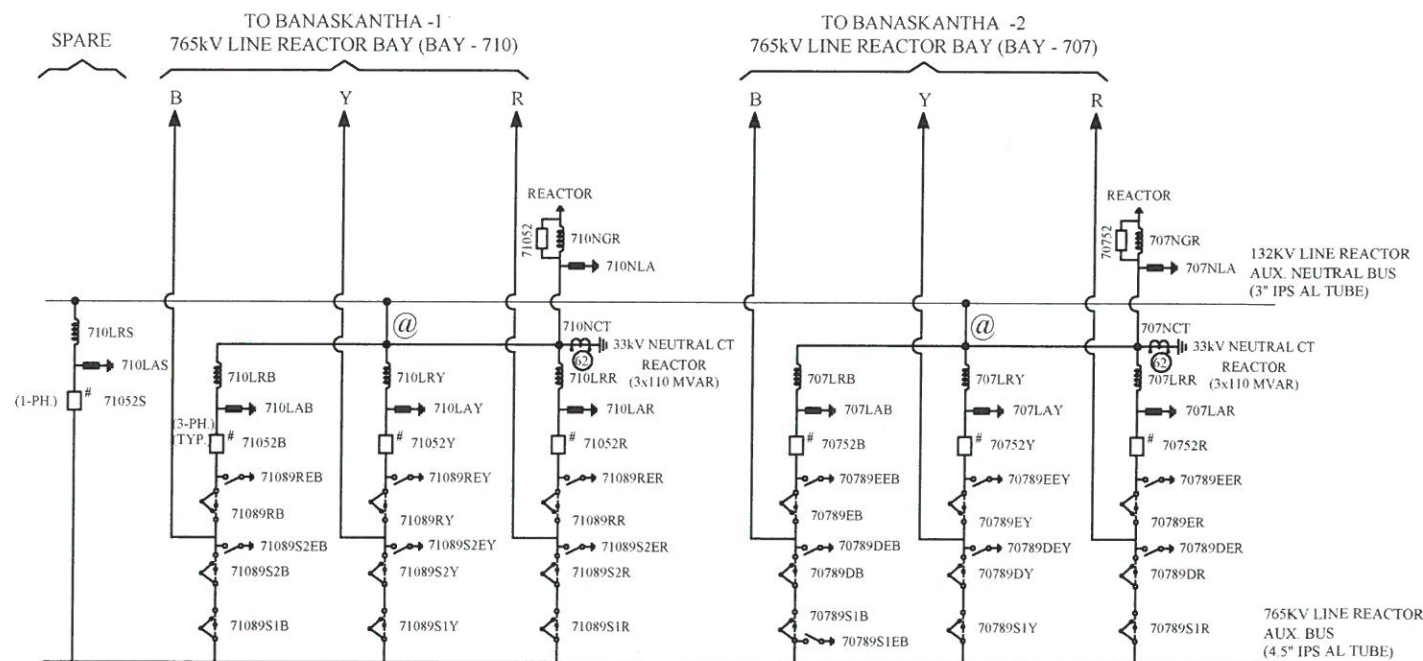
INVENTORY No.

FIRST ANGLE PROJECTION (ALL DIMENSIONS ARE IN MM.)

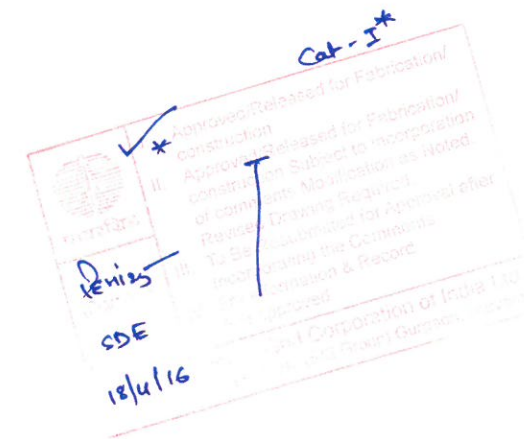
100-015-510-001 DRAWING No.



DETAIL-B
(ARRANGEMENT OF 765kV BUS REACTOR AND AUX. BUS.)



DETAIL-A
(ARRANGEMENT OF 765kV LINE REACTOR AND AUX. BUS.)



NOA NO. : CC-CS/484-WR2/SS-2953/11/G8/NOA-1&2/5727 & 5728 DT. 31.03.16		POWER GRID CORPORATION OF INDIA LIMITED											
ADDITIONAL INFORMATION W.O.No. 85003		NAME OF CUSTOMER/PROJECT SUBSTATION PACKAGE-SS01 FOR CONSTRUCTION OF 765/400/220KV BHUJ S/S & EXT. OF 765KV BANASKANTHA S/S UNDER GREEN ENERGY CORRIDOR ISTS PART-C (PART-1)											
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SINGLE LINE DIAGRAM FOR 765/400/220KV BHUJ S/S.		<table border="1"> <tr> <th>REV.</th> <th>DATE</th> <th>ALTERED</th> <th>CHECKED</th> <th>APPROVED</th> </tr> <tr> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> </table>		REV.	DATE	ALTERED	CHECKED	APPROVED					
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FIRST ANGLE PROJECTION (ALL DIMENSIONS ARE IN MM.)

TB-385-510-001

DRAWING No.

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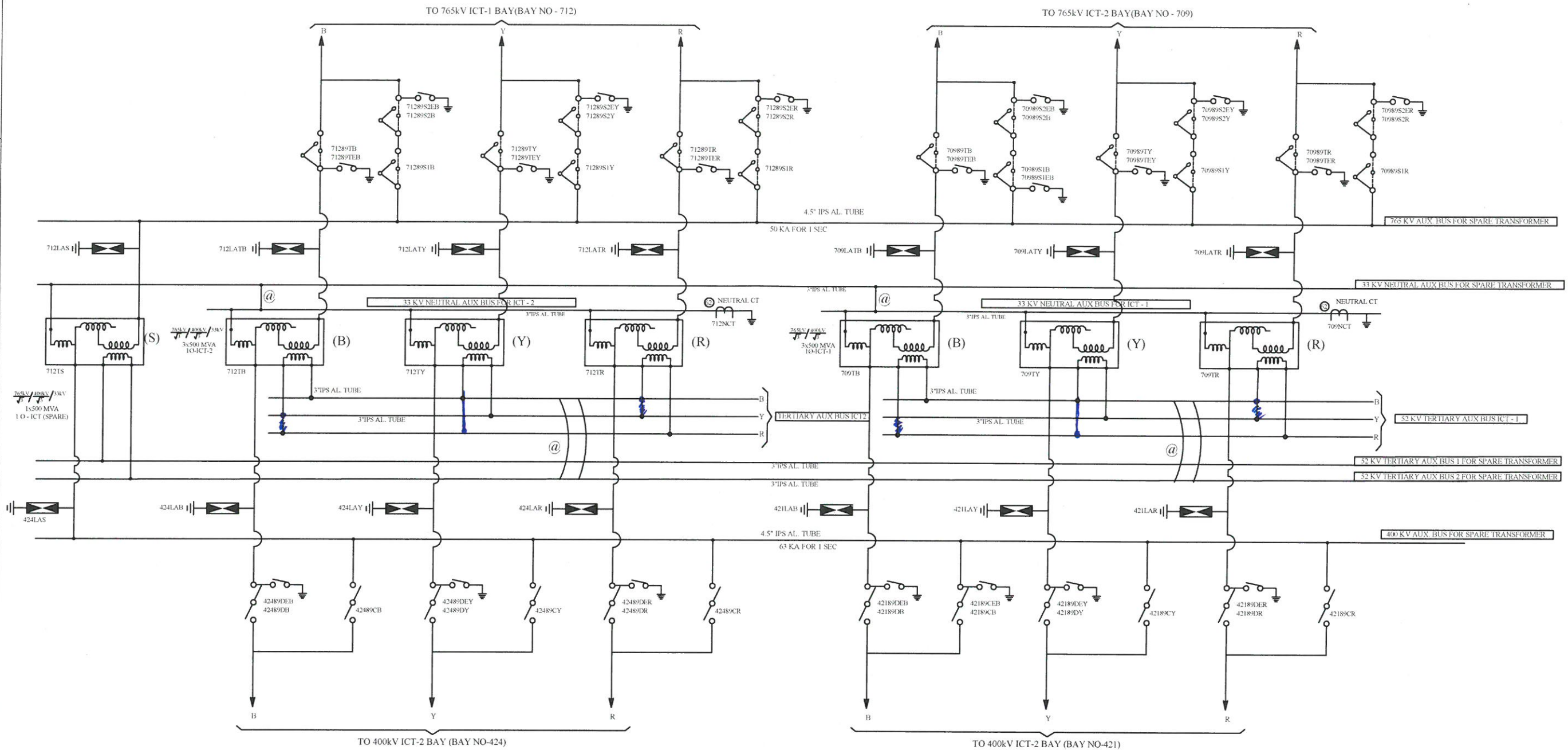
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DETAIL-C
(ARRANGEMENT OF 765/400kV ICT AND AUX. BUS.)

NOA NO. : CC-CS/484-WR2/SS-2953/11/G8/NOA-1&2/5727 & 5728 DT. 31.03.16

ADDITIONAL INFORMATION
W.O.No. 85003

STATUS OF DRAWING CONTRACT
DISTRIBUTION OF PRINTS

POWER GRID CORPORATION OF INDIA LIMITED

NAME OF CUSTOMER/PROJECT SUBSTATION PACKAGE-SS01 FOR CONSTRUCTION OF 765/400/220KV BHUJ S/S & EXT. OF 765KV BANASKANTHA S/S UNDER GREEN ENERGY CORRIDOR ISTS PART- C (PART-1)

आवृत्ति हेवी इलेक्ट्रिकल्स लिमिटेड
इंजीनियरिंग परियोजना विभाग
BHARAT HEAVY ELECTRICALS LTD.
TRANSMISSION PROJECTS DIVISION

क्रमांक	नाम /NAME	हस्ता./SIGN.	दि./DATE
ड्राफ्ट	JS		23.11.15
जैला	SK/AA		
स्वीकृत	AS/RS		

REV.	DATE	ALTERED
		CHECKED
		APPROVED

विभाग DEPT. TBEM
कोड CODE 422
शीर्षक/TITLE

अनुपात / SCALE
कार्ड कोड CARD CODE

SINGLE LINE DIAGRAM
FOR 765/400/220KV BHUJ S/S.

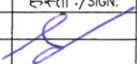
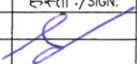
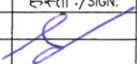
ड्राइंग.क./DRAWING NO.
TB-385-510-001
पृष्ठ नं./SHEET No.05 अगला पृष्ठ/NEXT SHEET 06

पुनः/REV. 0

BILL OF QTY. FOR 400kV MAIN EQUIPMENTS: (63KA for 1sec)

SL.NO	DESCRIPTION	RATING	QTY. (PART-1) (NO.)	QTY. (PART-2) (NO.)	SYMBOL	SCOPE OF SUPPLY	LEGEND
20	500MVA, (3-PH) AUTOTRANSFORMER.	400/220/33KV	0	1		BHEL	T
21	125MVAR BUS REACTOR (3-PH)	420 kV	1	0		BHEL	BR
22	SF6 CIRCUIT BREAKER WITH CR, WITH CSD (3-PH)	3150A	4	7		BHEL	52
23	SF6 CIRCUIT BREAKER WITHOUT CR, WITH CSD (3-PH)	3150A	3	7		BHEL	52
24	SF6 CIRCUIT BREAKER WITHOUT CR, WITHOUT CSD (3-PH)	3150A	0	7		BHEL	52
25	ISOLATOR WITH ONE E/SW (3 PH) DOUBLE BREAK TYPE	3150A	17	6		BHEL	89/89E
26	ISOLATOR WITH TWO E/SW (3 PH) DOUBLE BREAK TYPE	3150A	2	7		BHEL	89/89E /89E2
27	ISOLATOR WITH ONE E/SW (3 PH) DOUBLE BREAK TYPE	2000A	1	7		BHEL	89/89E
28	ISOLATOR WITH ONE E/SW (1 PH) DOUBLE BREAK TYPE	3150A	7	7		BHEL	89/89E
29	ISOLATOR WITHOUT E/SW (1 PH) DOUBLE BREAK TYPE	3150A	5	7		BHEL	89
30	CURRENT TRANSFORMER (1 PH.) WITH 120% EXTENDED CURRENT RATING.	3000A	21	7		BHEL	CT
31	CVT (1 PH.)	4400pF	6	7		BHEL	CVT
32	SURGE ARRESTER (1 PH.)	336 kV	10	7		BHEL	LA
33	WAVE TRAP (1 PH.) PEDESTAL TYPE.	0.5mH, 2000A	7	7		BHEL	WT

SL.NO.	DESCRIPTION	RATING	QTY. (NO.)	SYMBOL	SCOPE OF SUPPLY	LEGEN
60	SF6 CIRCUIT BREAKER FOR NGR BYPASS (1-PH)	132 KV, 1250A 145 KV	2		BHEL	S2
61	SURGE ARRESTER (1 PH.)	120 kV, 10 KA 5 KJ/KV	2		PGCIL	LA
62	NEUTRAL CT. (1 PH.) WITH 120% EXTENDED CURRENT RATING.	33KV	5		PGCIL	CT

NOA NO. : CC-CS/484-WR2/SS-2953/11/G8/NOA-1&2/5727 & 5728 DT. 31.03.16																			
ADDITIONAL INFORMATION W.O.No. 85003			ग्राहक/परियोजना का नाम POWER GRID CORPORATION OF INDIA LIMITED NAME OF CUSTOMER/PROJECT SUBSTATION PACKAGE-SS01 FOR CONSTRUCTION OF 765/400/220KV BHUJ S/S & EXT. OF 765KV BANASKANTHA S/S UNDER GREEN ENERGY CORRIDOR ISTS PART-C (PART-1)																
STATUS OF DRAWING																			
DISTRIBUTION OF PRINTS			 भारत हेवी इलेक्ट्रिकल्स लिमिटेड ट्रांसमिशन परियोजना विभाग BHARAT HEAVY ELECTRICALS LTD. TRANSMISSION PROJECTS DIVISION <table border="1" style="width: 100%;"> <tr> <th>खसरा DRAWN</th> <th>नाम /NAME</th> <th>हस्ता./SIGN.</th> <th>दि./DATE</th> </tr> <tr> <td>जेका CHECKED</td> <td>SK/AA</td> <td rowspan="2" style="text-align: center; vertical-align: middle;">  </td> <td rowspan="2" style="text-align: center; vertical-align: middle;">23.11.15</td> </tr> <tr> <td>स्वीकृत APPROVED</td> <td>AS/RS</td> </tr> </table>							खसरा DRAWN	नाम /NAME	हस्ता./SIGN.	दि./DATE	जेका CHECKED	SK/AA		23.11.15	स्वीकृत APPROVED	AS/RS
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जेका CHECKED	SK/AA		23.11.15																
स्वीकृत APPROVED	AS/RS																		
REV.	DATE	ALTERED CHECKED APPROVED	विभाग TBEM DEPT. कोड 422 CODE		अनुपात / SCALE NTS	कार्ड कोड CARD CODE													
ZONE		शीर्षक/TITLE SINGLE LINE DIAGRAM FOR 765/400/220KV BHUJ S/S.					ड्राईंग.क./DRAWING NO. TB-385-510-001		पुनः/REV. 0										
							पृष्ठ क्र./SHEET No.06 अगला पृष्ठ/NEXT SHEET 07												

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COMPUTER DRG. PATH NAME :

REF. DRG. No.

SIGN. & DATE

INVENTORY No.

100-015-585-81 DRAWING No.

SYSTEM PARAMETERS

DESCRIPTION	765 kV	400 kV	220 kV	132 kV	66 kV	11 kV
1) HIGHEST SYSTEM VOLTAGE	800kV (r.m.s.)	420kV (r.m.s.)	245kV (r.m.s.)	145kV (r.m.s.)	72.5kV (r.m.s.)	12kV (r.m.s.)
2) SYSTEM OPERATING VOLTAGE	765kV	400kV	220kV	132kV	66kV	11kV
3) P.F. WITHSTAND VOLTAGE	830kV (r.m.s.)	630kV (r.m.s.)	460kV (r.m.s.) dry and wet	275kV (r.m.s.) dry and wet	140kV (r.m.s.) dry and wet	28kV (r.m.s.) dry and wet
4) LIGHTING IMPULSE WITHSTAND VOLTAGE	2100 kVP	1550 kVP	1050 kVP	650 kVP	325 kVP	75 kVP
5) SWITCHING IMPULSE WITHSTAND VOLTAGE	1550 kVP	1050 kVP	---	---	---	---
6) SYSTEM FAULT LEVEL	50KA FOR 1 Sec.	63KA FOR 1 Sec.	40KA FOR 1 Sec.	31.5KA FOR 1 Sec.	31.5KA FOR 1 Sec.	25KA FOR 1 Sec.
7) CREEPAGE	31 MM/KV	31 MM/KV	31 MM/KV	31 MM/KV	31 MM/KV	31 MM/KV
8) SYSTEM EARTHING	EFFECTIVELY	EFFECTIVELY	EFFECTIVELY	EFFECTIVELY	EFFECTIVELY	EFFECTIVELY

800kV, 3000A, CT

Core No.	Current Ratio	Accuracy Class	Output Burden VA	Min kPV (V)	Max RCT in Ohms	Max Im at kPV (mA)	Purpose
1	3000-2000-500 / 1	TPS	-	3000-2000-500	15-10-2.5	20mA on 3000/1 Tap 30mA on 2000/1 Tap 120mA on 500/1 Tap	BUS DIFF. CHECK
2	3000-2000-500 / 1	TPS	-	3000-2000-500	15-10-2.5	20mA on 3000/1 Tap 30mA on 2000/1 Tap 120mA on 500/1 Tap	BUS DIFF. MAIN
3	3000-2000-500 / 1	0.2S 0.2S 0.2S	20 20 20	-	-	-	METERING
4	3000-2000-500 / 1	0.2S 0.2S 0.2S	20 20 20	-	-	-	METERING
5	3000-2000-500 / 1	TPS	-	3000-2000-500	15-10-2.5	20mA on 3000/1 Tap 30mA on 2000/1 Tap 120mA on 500/1 Tap	TRANS. BACKUP/LINE BACKUP PROTIN.
6	3000-2000-500 / 1	TPS	-	3000-2000-500	15-10-2.5	20mA on 3000/1 Tap 30mA on 2000/1 Tap 120mA on 500/1 Tap	LINE PROTIN /LBB PROTIN

All protection class shall be accuracy class TPS as per IEC 60044-1. Metering cores shall be accuracy class 0.2S as per IEC: 60044-1

400kV, 3000A, CT

Core No.	Current Ratio	Accuracy Class	Output Burden VA	Min kPV (V)	Max RCT in Ohms	Max Im at kPV (mA)	Purpose
1	3000-2000-500 / 1	TPS	-	3000-2000-500	15-10-2.5	20mA on 3000/1 Tap 30mA on 2000/1 Tap 120mA on 500/1 Tap	BUS DIFF. CHECK
2	3000-2000-500 / 1	TPS	-	3000-2000-500	15-10-2.5	20mA on 3000/1 Tap 30mA on 2000/1 Tap 120mA on 500/1 Tap	BUS DIFF. MAIN
3	3000-2000-500 / 1	0.2S 0.2S 0.2S	20 20 20	-	-	-	METERING
4	3000-2000-500 / 1	0.2S 0.2S 0.2S	20 20 20	-	-	-	METERING
5	3000-2000-500 / 1	TPS	-	3000-2000-500	15-10-2.5	20mA on 3000/1 Tap 30mA on 2000/1 Tap 120mA on 500/1 Tap	TRANS. BACKUP/LINE BACKUP PROTIN.
6	3000-2000-500 / 1	TPS	-	3000-2000-500	15-10-2.5	20mA on 3000/1 Tap 30mA on 2000/1 Tap 120mA on 500/1 Tap	TRANS. DIFF./LINE PROTIN

All protection class shall be accuracy class TPS as per IEC 60044-1. Metering cores shall be accuracy class 0.2S as per IEC: 60044-1

800KV CVT:

Ratio	756KV / $\sqrt{3}$	110V / $\sqrt{3}$	110V / $\sqrt{3}$	110V / $\sqrt{3}$
Sec-I	Class - 0.5/3P, 50VA			
Sec-II	Class - 0.5/3P, 50VA			
Sec-III	Class - 0.2, 50VA			
	Capacitance - 8800 pF (+10%, -5%)			

Rated Voltage Factor: 1.2 Continuous
1.5 for 30 Seconds

400KV CVT:

Ratio	400KV / $\sqrt{3}$	110V / $\sqrt{3}$	110V / $\sqrt{3}$	110V / $\sqrt{3}$
Sec-I	Class - 0.5/3P, 50VA			
Sec-II	Class - 0.5/3P, 50VA			
Sec-III	Class - 0.2, 50VA			
	Capacitance - 4400 pF (+10%, -5%)			

Rated Voltage Factor: 1.2 Continuous
1.5 for 30 Seconds

NOA NO. : CC-CS/484-WR2/SS-2953/11/G8/NOA-1&2/5727 & 5728 DT. 31.03.16

ADDITIONAL INFORMATION
W.O.No.

ग्राहक/परियोजना का नाम POWER GRID CORPORATION OF INDIA LIMITED

NAME OF CUSTOMER/PROJECT SUBSTATION PACKAGE-SS01 FOR CONSTRUCTION OF 765/400/220KV
BHUI S/S & EXT. OF 765KV BANASKANTHA S/S
UNDER GREEN ENERGY CORRIDOR ISTS PART-C (PART-1)

STATUS OF DRAWING

DISTRIBUTION OF PRINTS

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BHARAT HEAVY ELECTRICALS LTD.
TRANSMISSION PROJECTS DIVISION

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कोड 422
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शीर्षक/TITLE
SINGLE LINE DIAGRAM
FOR 765/400/220KV BHUI S/S.

ड्राइंग.क्र./DRAWING NO.
TB-385-510-001

पृष्ठ क्र./SHEET No.07 अगला पृष्ठ/NEXT SHEET 08

DRAWING No. TB-385-510-001

220kV, 1600A, CT

- a) 120% Extended Rating applicable for ICT#1.#2 and Transfer Bus Bays
b) 150% Extended Rating applicable for Bus Coupler Bay

Core No.	Current Ratio	Accuracy Class	Output Burden VA	Min kPV (V)	Max RCT in Ohms	Max Im at kPV (mA)	Purpose
1	1600-800 / 1	PS	-	1600-800	8-4	25mA on 1600/1 Tap 50mA on 800/1 Tap	BUS DIFF. CHECK
2	1600-800 / 1	PS	-	1600-800	8-4	25mA on 1600/1 Tap 50mA on 800/1 Tap	BUS DIFF. MAIN
3	1600-800 / 1	0.2S	20	-	-	-	METERING
4	1600-800 / 1	PS	-	1600-800	8-4	25mA on 1600/1 Tap 50mA on 800/1 Tap	TRANS. BACKUP LINE BACKUP PROTIN.
5	1600-800 / 1	PS	-	1600-800	8-4	25mA on 1600/1 Tap 50mA on 800/1 Tap	TRANS. DIFF. LINE PROTIN

Accuracy class PS as per IS:2705

220KV CVT:

Ratio	220KV / $\sqrt{3}$	110V / $\sqrt{3}$	110V / $\sqrt{3}$	110V / $\sqrt{3}$
Sec-I	Class - 3P, 50VA			
Sec-II	Class - 3P, 50VA			
Sec-III	Class - 0.2, 50VA			
	Capacitance - 4400 pF (+10%, -5%)			

Rated Voltage Factor: 1.2 Continuous
1.5 for 30 Seconds

72.5kV, 50A, CT

Core No.	Current Ratio	Accuracy Class	Output Burden VA	Min kPV (V)	Max RCT in Ohms	Max Im at kPV (mA)	Purpose
1	50 / 1	5P10	10	-	-	-	O/C & E/F
2	50 / 1	0.5	10	-	-	-	Metering

72.5KV VT:

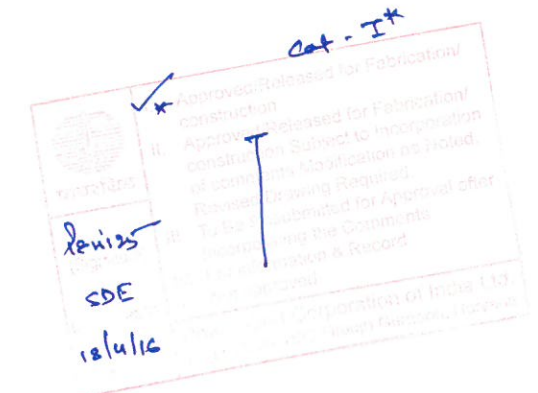
Ratio	33KV / $\sqrt{3}$	110V / $\sqrt{3}$	110V / $\sqrt{3}$	110V / $\sqrt{3}$
Sec-I	Class - 3P, 10VA			
Sec-II	Class - 0.5, 10VA			

LEGENDS:-

————	PRESENT SCOPE
—— ———	FUTURE/EXISTING SCOPE

NOTES:

- (a) ELECTRICAL CONNECTION SHALL BE MADE MANUALLY DEPENDING UPON 765kV SIDE SWITCHING OF DIFFERENT FEEDERS OF AUTOTRANSFORMER/REACTOR.
- SUPPLY, ERECTION, TESTING & COMMISSIONING INCLUDING FORMATION OF HV, LV, NEUTRAL, TERTIARY & AUXILIARY BUSES OF 3x500MVA, (765kV / $\sqrt{3}$) / (400kV / $\sqrt{3}$) / 33kV IO AUTO TRANSFORMERS AND LINE/BUS REACTOR ARE NOT IN BHEL SCOPE.
- 765kV WAVE TRAP SHALL BE PROVIDED IN TWO PHASE ONLY.
- 400kV WAVE TRAP SHALL BE PROVIDED IN ONE PHASE ONLY.
- PART-2 EQUIPMENTS SHALL BE SUPPLIED BY BHEL AFTER ORDER RECEIVED FROM RGCN.



NOA NO. : CC-CS/484-WR2/SS-2953/11/G8/NOA-1&2/5727 & 5728 DT. 31.03.16

ADDITIONAL INFORMATION W.O.No. 85003		POWER GRID CORPORATION OF INDIA LIMITED NAME OF CUSTOMER/PROJECT SUBSTATION PACKAGE-SS01 FOR CONSTRUCTION OF 765/400/220KV BHUJ S/S & EXT. OF 765KV BANASKANTHA S/S UNDER GREEN ENERGY CORRIDOR ISTS PART-C (PART-1)	
STATUS OF DRAWING CONTRACT		DISTRIBUTION OF PRINTS	
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चेक/ CHECKED SK/AA स्वीकृत/ APPROVED AS/RS			
सिंगल लाइन डायग्राम SINGLE LINE DIAGRAM FOR 765/400/220KV BHUJ S/S. ड्राइंग.क्र./DRAWING NO. TB-385-510-001		पृष्ठ क्र./SHEET No.08 अगला पृष्ठ/NEXT SHEET -	