



1. ALL DIMENSIONS ARE IN mm AND ELEVATION ARE IN METERS.
UNLESS OTHERWISE SPECIFIED.

FOR DETAILED PROJECT REPORT ONLY

SR. NO.	EQUIPMENT / DETAIL
6.	STATION SERVICE TRANSFORMER
7.	415 V STATION SERVICE BOARD
10.	LOCAL CONTROL BOARD (LCB)
13.	LAVT
15.	EXCITATION TRANSFORMER
16.	UNIT AUXILIARY TRANSFORMER
17.	UNIT AUXILIARY BOARD
33.	GOVERNOR AND OIL PRESSURE UNIT
34.	COOLING WATER CONTROL PANEL
38.	SECONDARY COOLING WATER PUMP / MOTOR
39.	COOLING WATER HEAT EXCHANGER
40.	THRUST BEARING HEAT EXCHANGER

CONNECTED DRG.

DRG. NO.	TITLE
SJEDWA/DPR/01D	STATION LAYOUT PLAN AT E.L. 173.50 GENERATOR FLOOR
SJEDWA/DPR/01E	STATION LAYOUT PLAN AT E.L. 168.00 TURBINE FLOOR
SJEDWA/DPR/01F	STATION LAYOUT PLAN AT E.L. 161.00 MIV FLOOR
SJEDWA/DPR/01G	STATION LAYOUT PLAN AT E.L. 186.00 CONTROL BAY FLOOR
SJEDWA/DPR/01C	STATION LAYOUT PLAN AT 179.00 MACHINE HALL/ SERVICE BAY
SJEDWA/DPR/01B	L- SECTION OF POWER HOUSE

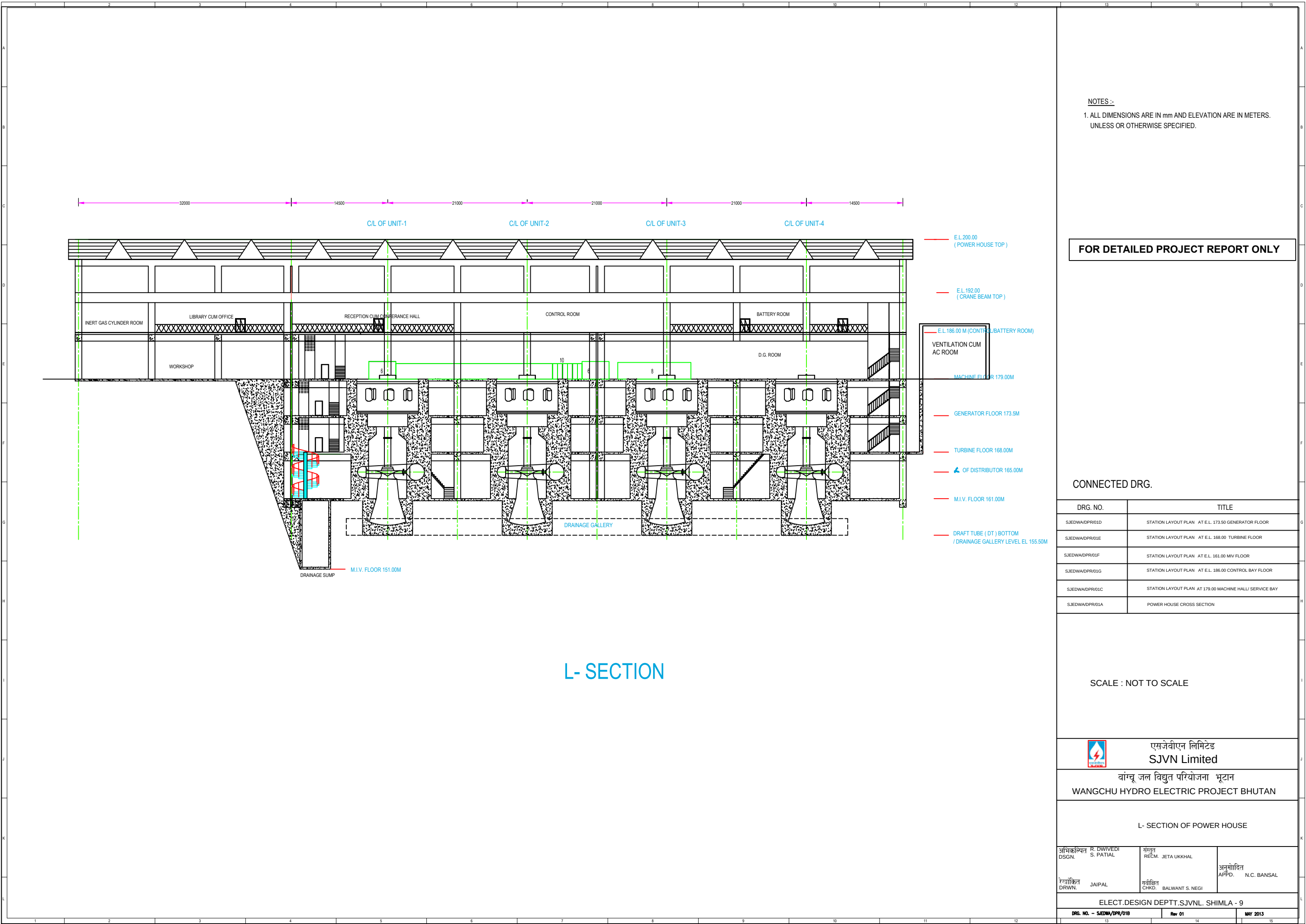
SCALE :- NOT TO SCALE

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SJVN Limited

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WANGCHU HYDRO ELECTRIC PROJECT BHUTAN

CROSS SECTION OF POWER HOUSE

अभिकल्पित DSGN.	S. PATIAL	संस्तुत REC'D. JETA UKKHAL	अनुमोदित APPD. N.C. BANSAL
मंजूर DRWN.	JAIPAL	मंजूर CHK'D. BALWANT S. NEGI	
ELECT. DESIGN DEPTT. SJVN LTD. SHIMLA - 9			
DRG. NO. - SJEDWA/DP/01A		REV. 02	JAN 2014



NOTES :-
1. ALL DIMENSIONS ARE IN mm AND ELEVATION ARE IN METERS.
UNLESS OR OTHERWISE SPECIFIED.

FOR DETAILED PROJECT REPORT ONLY

CONNECTED DRG.

DRG. NO.	TITLE
SJEDWA/DPRI01D	STATION LAYOUT PLAN AT E.L. 173.50 GENERATOR FLOOR
SJEDWA/DPRI01E	STATION LAYOUT PLAN AT E.L. 168.00 TURBINE FLOOR
SJEDWA/DPRI01F	STATION LAYOUT PLAN AT E.L. 161.00 MIV FLOOR
SJEDWA/DPRI01G	STATION LAYOUT PLAN AT E.L. 186.00 CONTROL BAY FLOOR
SJEDWA/DPRI01C	STATION LAYOUT PLAN AT 179.00 MACHINE HALL/ SERVICE BAY
SJEDWA/DPRI01A	POWER HOUSE CROSS SECTION

SCALE : NOT TO SCALE



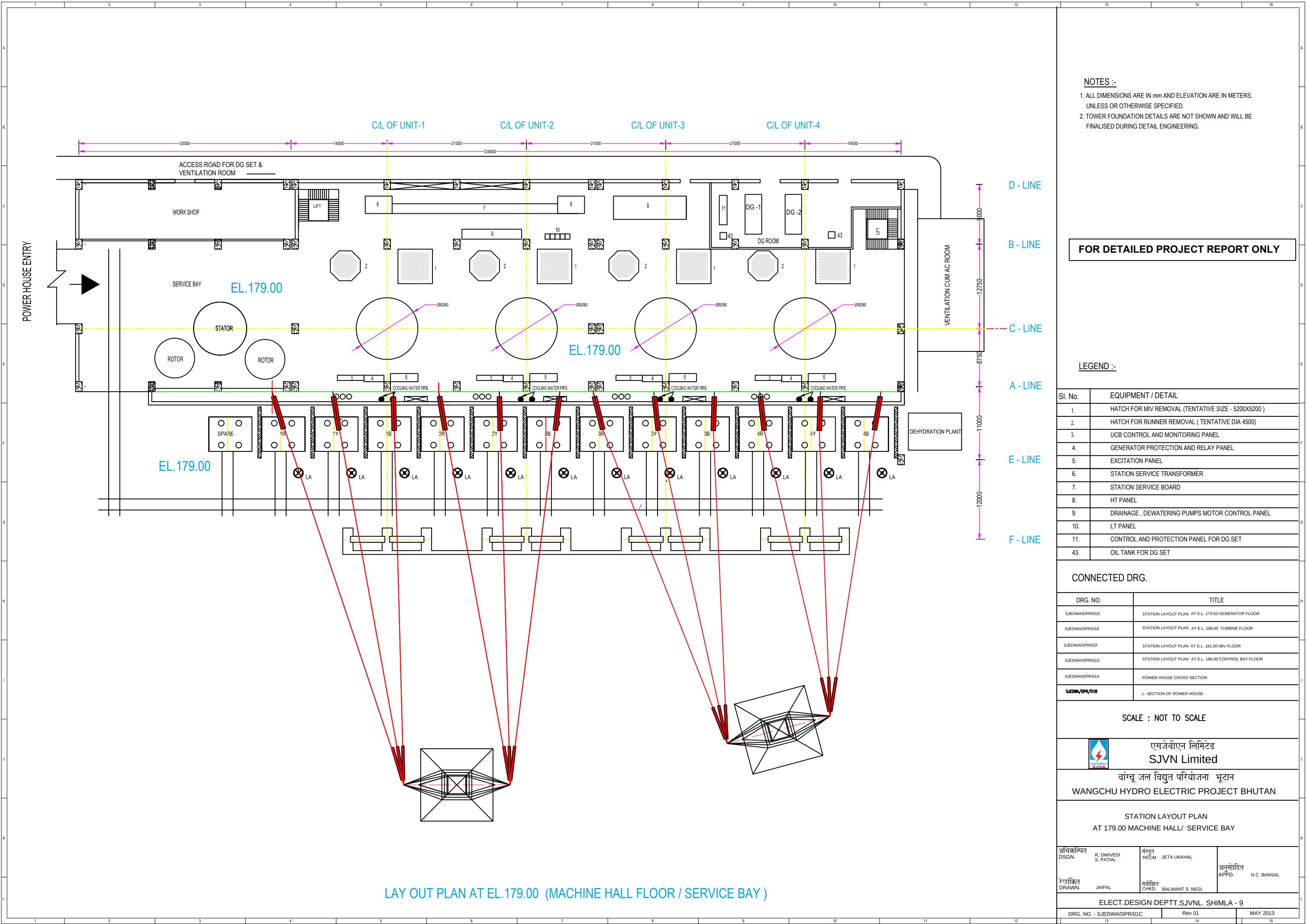
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WANGCHU HYDRO ELECTRIC PROJECT BHUTAN

L- SECTION OF POWER HOUSE

आभिकल्पित DSGN.	R. DWIVEDI S. PATIAL	संस्तुत RECM.	JETA UKKHAL	अनुमोदित APPD.	N.C. BANSAL
रचयिता DRWN.	JAIPAL	सर्वोदित CHKD.	BALWANT S. NEGI		

ELECT.DESIGN DEPTT.SJVNL. SHIMLA - 9

DRG. NO. - SJEDWA/DPRI01B Rev 01 MAY 2013



- NOTES :-
- 1. ALL DIMENSIONS ARE IN mm AND ELEVATION ARE IN METERS. UNLESS OR OTHERWISE SPECIFIED.
 - 2. TOWER FOUNDATION DETAILS ARE NOT SHOWN AND WILL BE FINALISED DURING DETAIL ENGINEERING.

FOR DETAILED PROJECT REPORT ONLY

LEGEND :-

Sl. No.	EQUIPMENT / DETAIL
1.	HATCH FOR MIV REMOVAL (TENTATIVE SIZE - 5200X5200)
2.	HATCH FOR RUNNER REMOVAL (TENTATIVE DIA 4500)
3.	UCB CONTROL AND MONITORING PANEL
4.	GENERATOR PROTECTION AND RELAY PANEL
5.	EXCITATION PANEL
6.	STATION SERVICE TRANSFORMER
7.	STATION SERVICE BOARD
8.	HT PANEL
9.	DRAINAGE , DEWATERING PUMPS MOTOR CONTROL PANEL
10.	LT PANEL
11.	CONTROL AND PROTECTION PANEL FOR DG SET
43.	OIL TANK FOR DG SET

CONNECTED DRG.

DRG. NO.	TITLE
SJEDWA/DPR/01D	STATION LAYOUT PLAN AT E.L. 173.50 GENERATOR FLOOR
SJEDWA/DPR/01E	STATION LAYOUT PLAN AT E.L. 168.00 TURBINE FLOOR
SJEDWA/DPR/01F	STATION LAYOUT PLAN AT E.L. 161.00 MIV FLOOR
SJEDWA/DPR/01G	STATION LAYOUT PLAN AT E.L. 186.00 CONTROL BAY FLOOR
SJEDWA/DPR/01A	POWER HOUSE CROSS SECTION
SJEDWA/DPR/01B	L- SECTION OF POWER HOUSE

SCALE : NOT TO SCALE



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WANGCHU HYDRO ELECTRIC PROJECT BHUTAN

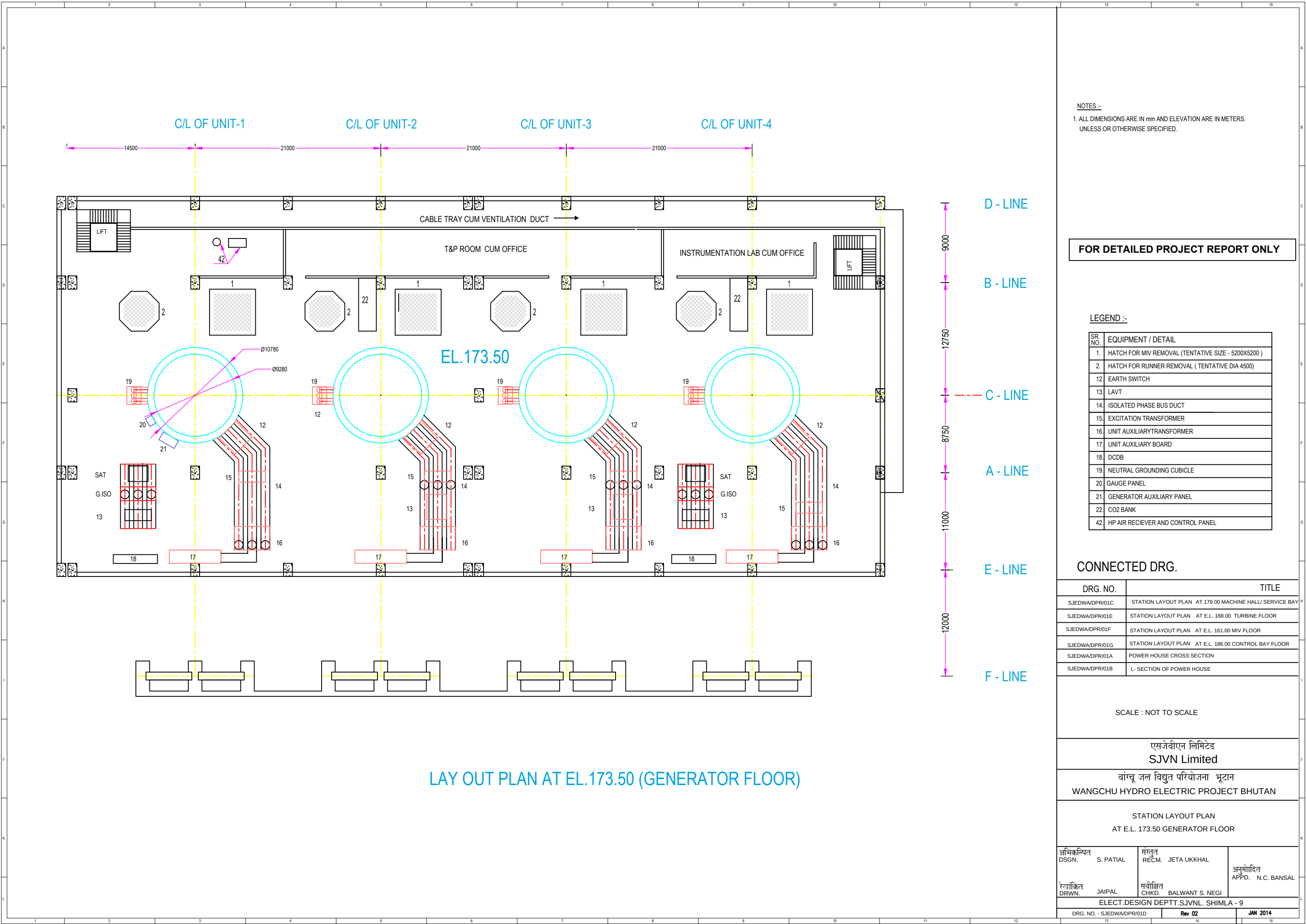
STATION LAYOUT PLAN
AT 179.00 MACHINE HALL/ SERVICE BAY

आभिकल्पित DSGN.	R. DWIVEDI S. PATIL	संस्तुत RECM.	JETA UKKHAL	अनुमोदित APPD.	N.C. BANSAL
रेखांकित DRAWN.	JAIPAL	सर्वोदित CHKD.	BALWANT S. NEGI		

ELECT.DESIGN DEPTT.SJVN.L. SHIMLA - 9

DRG. NO. - SJEDWA/DPR/01C Rev 01 MAY 2013

LAY OUT PLAN AT EL.179.00 (MACHINE HALL FLOOR / SERVICE BAY)



LAY OUT PLAN AT EL.173.50 (GENERATOR FLOOR)

NOTES :-
1. ALL DIMENSIONS ARE IN mm AND ELEVATION ARE IN METERS.
UNLESS OR OTHERWISE SPECIFIED.

FOR DETAILED PROJECT REPORT ONLY

LEGEND :-

SR. NO.	EQUIPMENT / DETAIL
1.	HATCH FOR MIV REMOVAL (TENTATIVE SIZE - 5200X5200)
2.	HATCH FOR RUNNER REMOVAL (TENTATIVE DIA 4500)
12.	EARTH SWITCH
13.	LAVT
14.	ISOLATED PHASE BUS DUCT
15.	EXCITATION TRANSFORMER
16.	UNIT AUXILIARYTRANSFORMER
17.	UNIT AUXILIARY BOARD
18.	DCDB
19.	NEUTRAL GROUNDING CUBICLE
20.	GAUGE PANEL
21.	GENERATOR AUXILIARY PANEL
22.	CO2 BANK
42.	HP AIR RECIEVER AND CONTROL PANEL

CONNECTED DRG.

DRG. NO.	TITLE
SJEDWA/DPR/01C	STATION LAYOUT PLAN AT 179.00 MACHINE HALL/ SERVICE BAY
SJEDWA/DPR/01E	STATION LAYOUT PLAN AT E.L. 168.00 TURBINE FLOOR
SJEDWA/DPR/01F	STATION LAYOUT PLAN AT E.L. 161.00 MIV FLOOR
SJEDWA/DPR/01G	STATION LAYOUT PLAN AT E.L. 186.00 CONTROL BAY FLOOR
SJEDWA/DPR/01A	POWER HOUSE CROSS SECTION
SJEDWA/DPR/01B	L- SECTION OF POWER HOUSE

SCALE : NOT TO SCALE

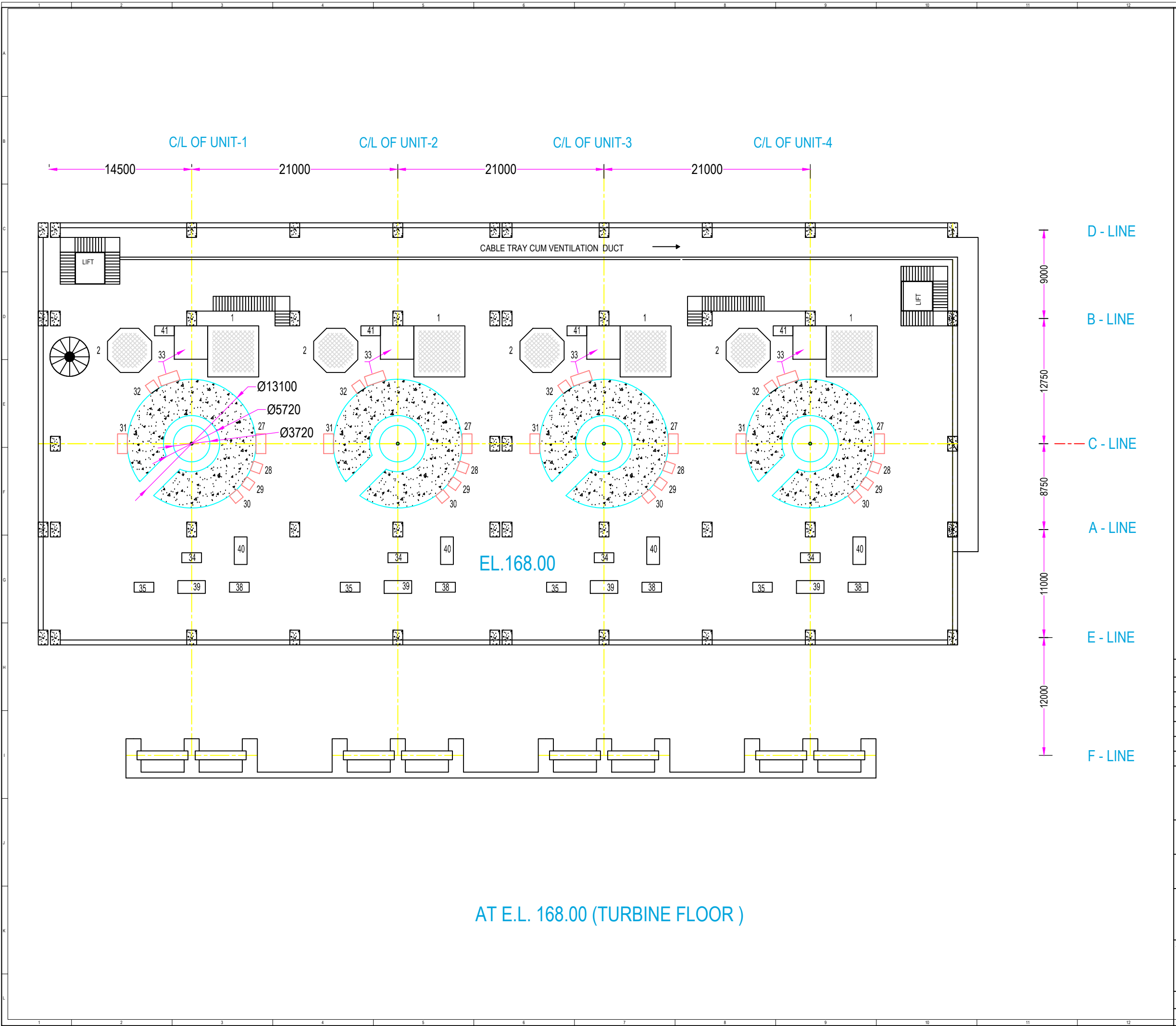
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WANGCHU HYDRO ELECTRIC PROJECT BHUTAN

STATION LAYOUT PLAN
AT E.L. 173.50 GENERATOR FLOOR

अभिकल्पित DSGN.	S. PATIAL	संस्तुत RECM.	JETA UKKHAL	अनुमोदित APPD.	N.C. BANSAL
रचयिता DRWN.	JAIPAL	सर्वोचित CHKD.	BALWANT S. NEGI		

ELECT.DESIGN DEPTT.SJVN. SHIMLA - 9



NOTES :-
1. ALL DIMENSIONS ARE IN mm AND ELEVATION ARE IN METERS.
UNLESS OR OTHERWISE SPECIFIED.

FOR DETAILED PROJECT REPORT ONLY

SR. NO.	EQUIPMENT / DETAIL
1.	HATCH FOR MIV REMOVAL (TENTATIVE SIZE - 5200X5200)
2.	HATCH FOR RUNNER REMOVAL (TENTATIVE DIA 4500)
27.	TURBINE TERMINAL PANEL
28.	VAPOUR EXTRACTION
29.	BRAKE DUST COLLECTOR
30.	HP OIL PUMP
31.	BRAKING AND JACKING SYSTEM
32.	SHAFT SEAL SYSTEM
33.	GOVERNOR AND OIL PRESSURE UNIT
34.	COOLING WATER CONTROL PANEL
35.	PRIMARY COOLING WATER PUMP/MOTOR
38.	SECONDARY COOLING WATER PUMP/MOTOR
39.	COOLING WATER HEAT EXCHANGER
40.	THRUST BEARING HEAT EXCHANGER
41.	NITROGEN BANK
45.	STAIRCASE

CONNECTED DRG.

DRG. NO.	
SJEDWA/DPR/01C	STATION LAYOUT PLAN AT 179.00 MACHINE HALL/ SERVICE BAY
SJEDWA/DPR/01D	STATION LAYOUT PLAN AT E.L. 173.50 GENERATOR FLOOR
SJEDWA/DPR/01F	STATION LAYOUT PLAN AT E.L.161.00 MIV FLOOR
SJEDWA/DPR/01G	STATION LAYOUT PLAN AT E.L. 186.00 CONTROL BAY FLOOR
SJEDWA/DPR/01A	POWER HOUSE CROSS SECTION
SJEDWA/DPR/01B	L- SECTION OF POWER HOUSE

SCALE : NOT TO SCALE



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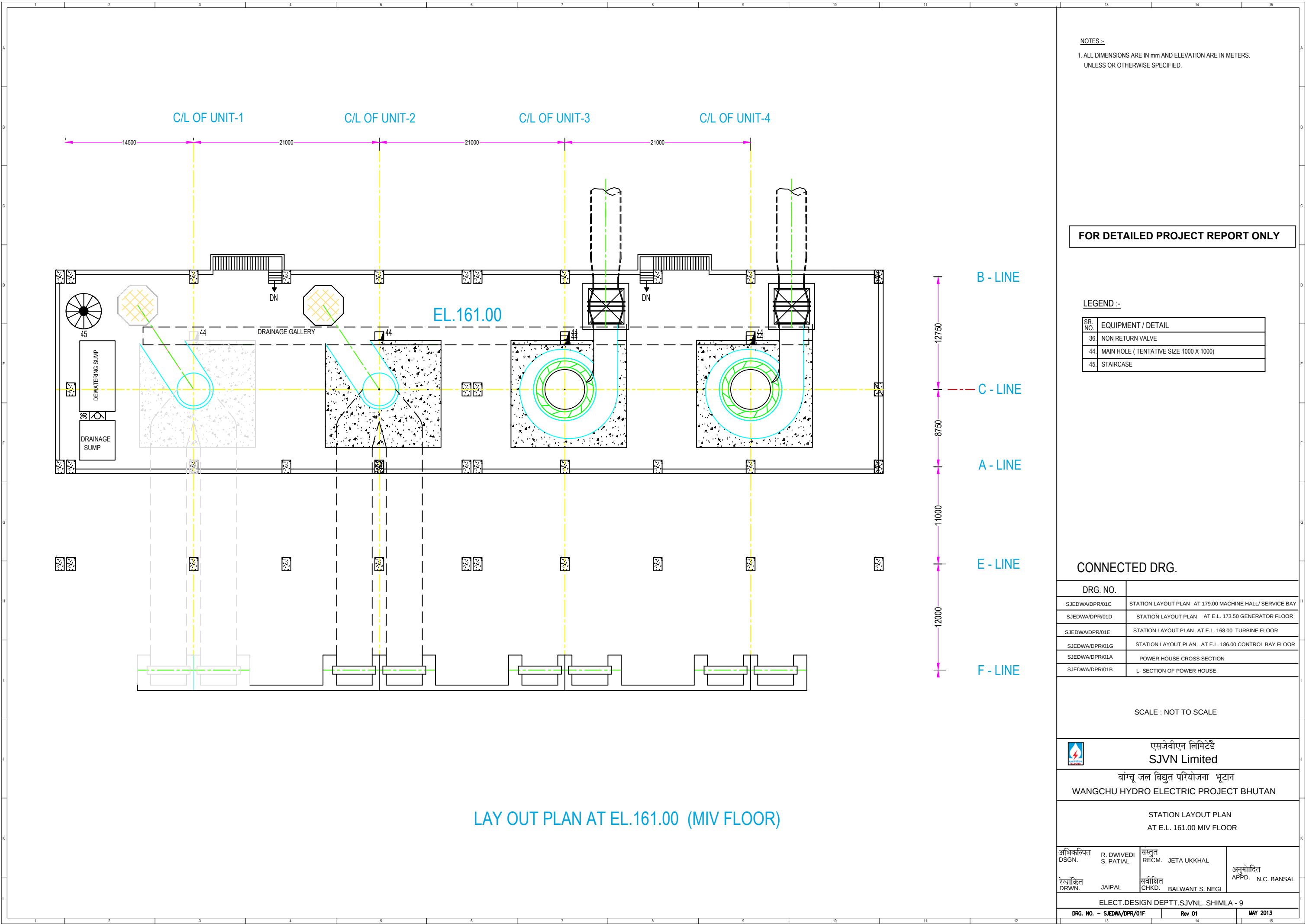
वांग्चू जल विद्युत परियोजना भूटान
WANGCHU HYDRO ELECTRIC PROJECT BHUTAN

STATION LAYOUT PLAN
AT E.L. 168.00 TURBINE FLOOR

अभिकल्पित DSGN.	R. DWIVEDI S. PATIAL	संस्तुत RECM.	JETA UKKHAL	अनुमोदित APPD. N.C. BANSAL
रज्यांकित DRWN.	JAIPAL	सर्वोक्षित CHKD.	BALWANT S. NEGI	

ELECT.DESIGN DEPTT.SJVN.L. SHIMLA - 9

DRG. NO. - SJEDWA/DPR/01E	Rev 01	MAY 2013
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NOTES :-
1. ALL DIMENSIONS ARE IN mm AND ELEVATION ARE IN METERS.
UNLESS OR OTHERWISE SPECIFIED.

FOR DETAILED PROJECT REPORT ONLY

LEGEND :-

SR. NO.	EQUIPMENT / DETAIL
36.	NON RETURN VALVE
44.	MAIN HOLE (TENTATIVE SIZE 1000 X 1000)
45.	STAIRCASE

CONNECTED DRG.

DRG. NO.	
SJEDWA/DPR/01C	STATION LAYOUT PLAN AT 179.00 MACHINE HALL/ SERVICE BAY
SJEDWA/DPR/01D	STATION LAYOUT PLAN AT E.L. 173.50 GENERATOR FLOOR
SJEDWA/DPR/01E	STATION LAYOUT PLAN AT E.L. 168.00 TURBINE FLOOR
SJEDWA/DPR/01G	STATION LAYOUT PLAN AT E.L. 186.00 CONTROL BAY FLOOR
SJEDWA/DPR/01A	POWER HOUSE CROSS SECTION
SJEDWA/DPR/01B	L- SECTION OF POWER HOUSE

SCALE : NOT TO SCALE



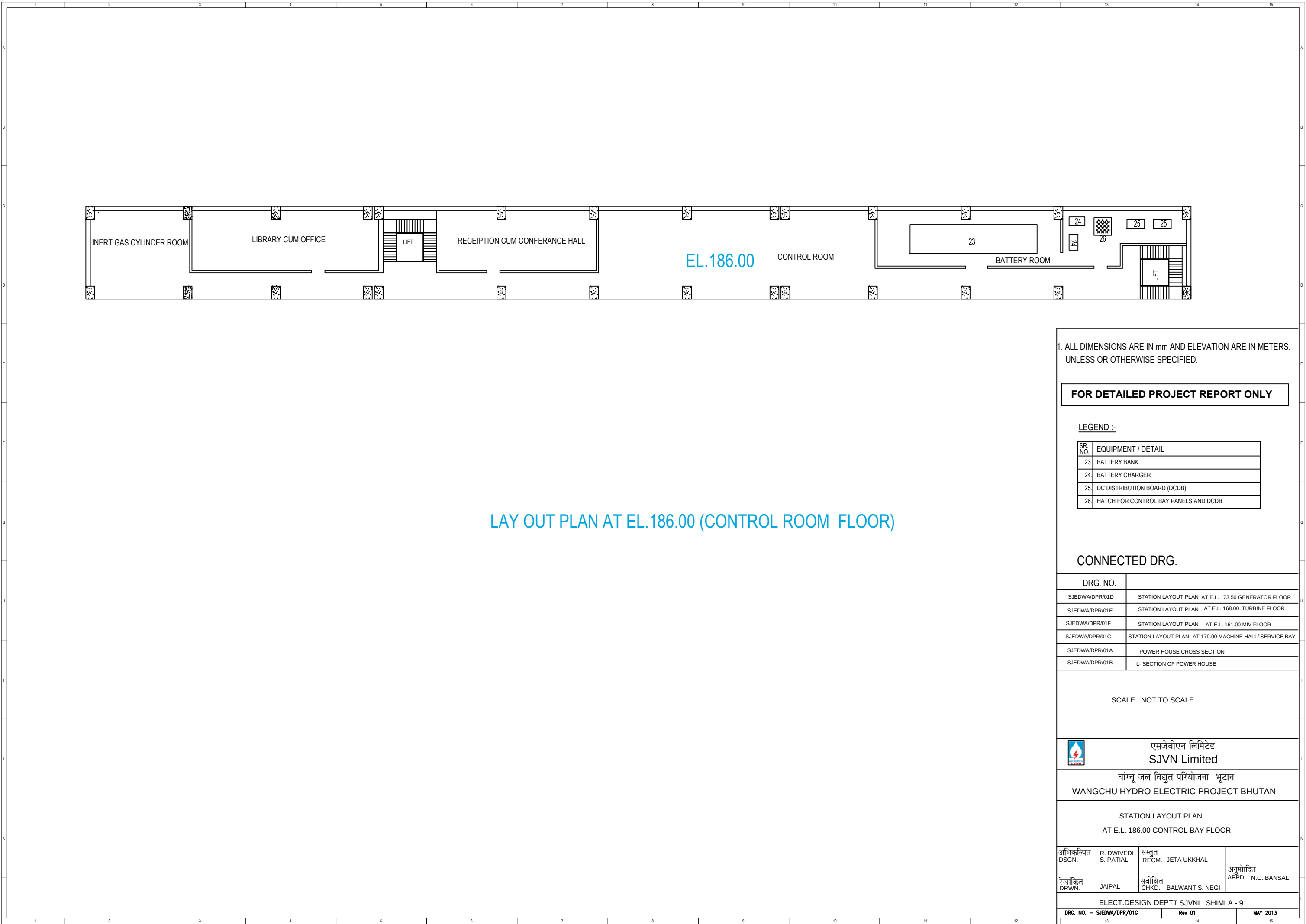
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WANGCHU HYDRO ELECTRIC PROJECT BHUTAN

STATION LAYOUT PLAN
AT E.L. 161.00 MIV FLOOR

अभिकल्पित DSGN.	R. DWIVEDI S. PATIAL	संमतुत RECM.	JETA UKKHAL	अनुमोदित APPD.	N.C. BANSAL
रखवाकित DRWN.	JAIPAL	सर्वोक्षित CHKD.	BALWANT S. NEGI		

ELECT.DESIGN DEPTT.SJVNL. SHIMLA - 9

DRG. NO. - SJEDWA/DPR/01F	Rev 01	MAY 2013
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LAY OUT PLAN AT EL.186.00 (CONTROL ROOM FLOOR)

1. ALL DIMENSIONS ARE IN mm AND ELEVATION ARE IN METERS. UNLESS OR OTHERWISE SPECIFIED.

FOR DETAILED PROJECT REPORT ONLY

LEGEND :-

SR. NO.	EQUIPMENT / DETAIL
23.	BATTERY BANK
24.	BATTERY CHARGER
25.	DC DISTRIBUTION BOARD (DCDB)
26.	HATCH FOR CONTROL BAY PANELS AND DCDB

CONNECTED DRG.

DRG. NO.	
SJEDWA/DPR/01D	STATION LAYOUT PLAN AT E.L. 173.50 GENERATOR FLOOR
SJEDWA/DPR/01E	STATION LAYOUT PLAN AT E.L. 168.00 TURBINE FLOOR
SJEDWA/DPR/01F	STATION LAYOUT PLAN AT E.L. 161.00 MIV FLOOR
SJEDWA/DPR/01C	STATION LAYOUT PLAN AT 179.00 MACHINE HALL/ SERVICE BAY
SJEDWA/DPR/01A	POWER HOUSE CROSS SECTION
SJEDWA/DPR/01B	L- SECTION OF POWER HOUSE

SCALE ; NOT TO SCALE

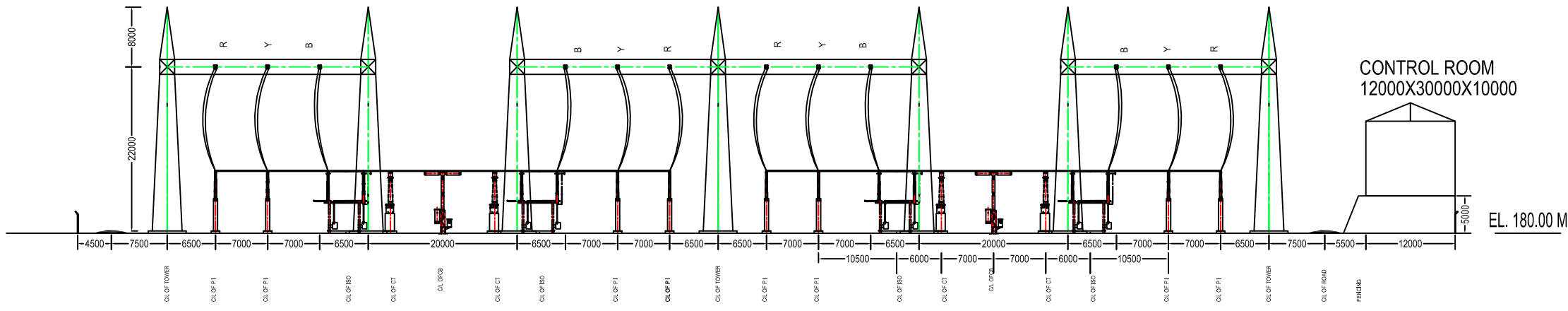
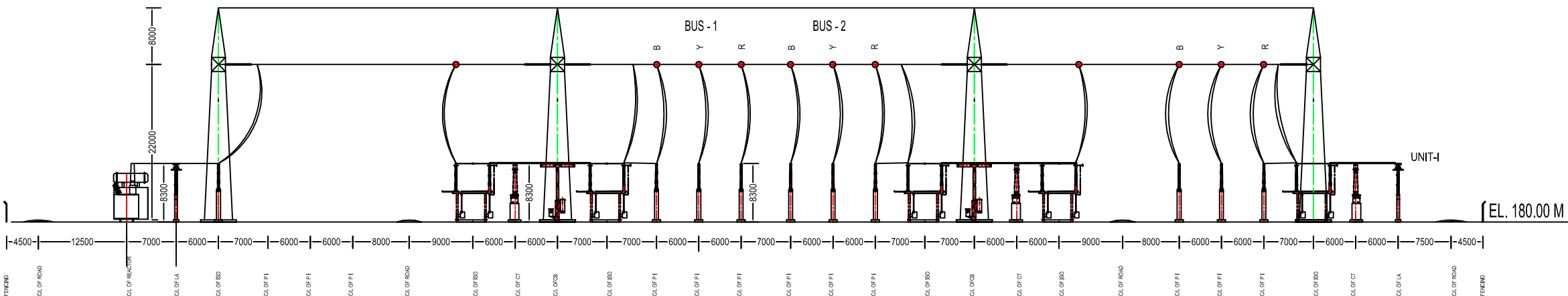
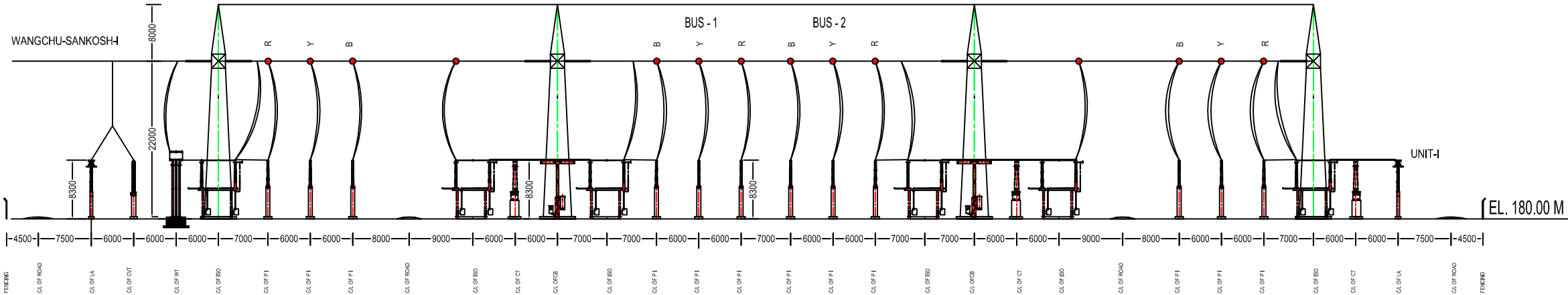


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STATION LAYOUT PLAN
AT E.L. 186.00 CONTROL BAY FLOOR

अभिकल्पित DSGN.	R. DWIVEDI S. PATIAL	संमत RECM. JETA UKKHAL	अनुमोदित APPD. N.C. BANSAL
रखांकित DRWN.	JAIPAL	सर्वोक्षित CHKD. BALWANT S. NEGI	

ELECT.DESIGN DEPTT.SJVN.L. SHIMLA - 9		
DRG. NO. - SJEDWA/DPR/01G	Rev 01	MAY 2013



NOTES -

1 ALL DIMENSIONS ARE IN MM. UNLESS OTHERWISE

2. THE PARAMETERS FOR WHICH THE SYSTEM IS DEPENDENT FOR ARE :-

a.) HIGHEST SYSTEM VOLTAGE (RMS)	420 KV
b.) LIGHTING IMPULSE WITHSTAND VOLTAGE (KVP)	1425
c.) SWITCHING IMPULSE WITHSTAND VOLTAGE (KVP)	1050
d.) POWER FREQUENCY WITH STAND VOLTAGE (RMS)	630 KV
e.) MAXIMUM FAULT LEVEL - FOR 1 SEC	40 KA

3. MAXIMUM CLEARANCE TABLE AS PER SPECIFICATION

PHASE TO PHASE	= 4000 MM.
PHASE TO EARTH	= 3500 MM.
SECTIONAL CLEARANCE	= 6500 MM.
GROUND CLEARANCE	= 8000 MM.

4. CONDUCTOR DETAIL = MAIN BUS 1 @ 2 = 4" IPS TUBE

EQUIPMENT INTERCONNECTOR = 4" IPS TUBE

JACK BUS / JUMPERS = TWIN MOOSE ACSR

BAY = TWIN MOOSE ACSR

5. TWIN MOOSE ACSR SUB CONDUCTORSPACING = 450 MM.

6. ALL HEIGHTS ARE REFERRED FROM TOP OF PLINTH LEVEL.

7. PLINTH OF FOUNDATIONS WILL BE +- 300 MM. FROM FINISHEDGROUND LEVEL (FGL)

8. GROUND TOP LEVEL WILL BE +- 100 MM. FROM FINISHED GROUND LEVEL

9. ELEVATION OF SWITCHYARD = 180M & 185M.

FOR DETAILED PROJECT REPORT ONLY

REFERENCE DRAWING -

SR. NO.	TITLE	DRAWING NO.	REV.
1.	MAIN SINGLE LINE DIAGRAM	SJEDWA/DPR/02A	01
2.	LAYOUT OF 400 KV OUTDOOR SWITCHYARD H - TYPE SCHEME	SJEDWA/DPR/02H	01

SCALE :- NOT TO SCALE



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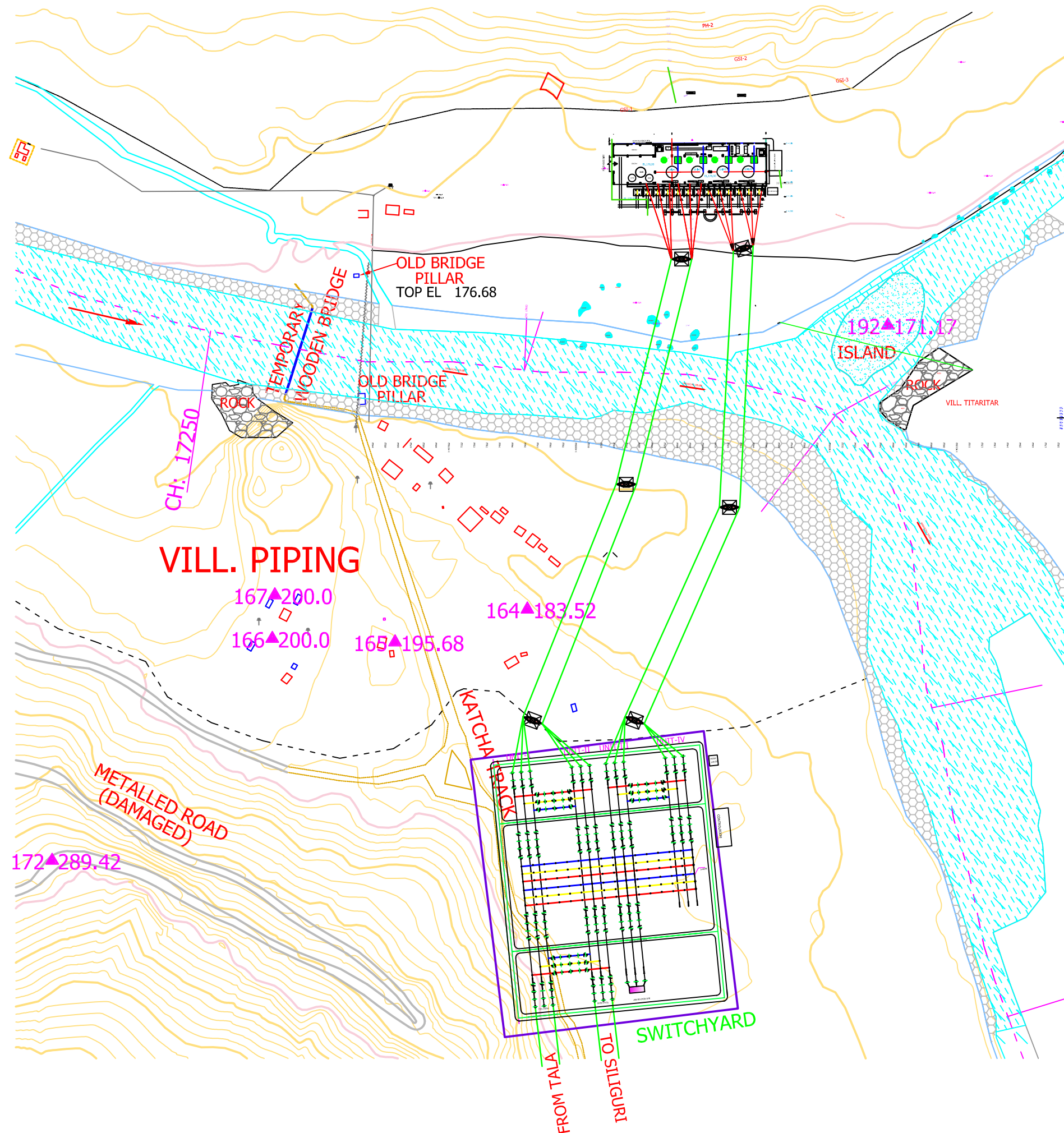
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WANGCHU HYDRO ELECTRIC PROJECT BHUTAN

LAYOUT OF 400 KV OUTDOOR SWITCHYARD
H - TYPE SCHEME (SECTION)

अभिकल्पित DSGN. S.PATIAL/ NEHA MAHAJAN	सन्तुत RECM. JETA UKKHAL	अनुमोदित APP'D. N.C. BANSAL
रेखांकित DRWN. JAIPAL	सर्वोचित CHKD. BALWANT S. NEGI	

ELECT. DESIGN DEPTT. SJVN LTD. SHIMLA-9

DRG. NO. - SJEDWA/DPR/011	REV. 01	DEC. 2012	
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APPENDIX-II

FOR DETAILED PROJECT REPORT ONLY

SCALE :-NOT TO SCALE



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WANGCHU HYDRO ELECTRIC PROJECT BHUTAN
4 X 142.5 MW

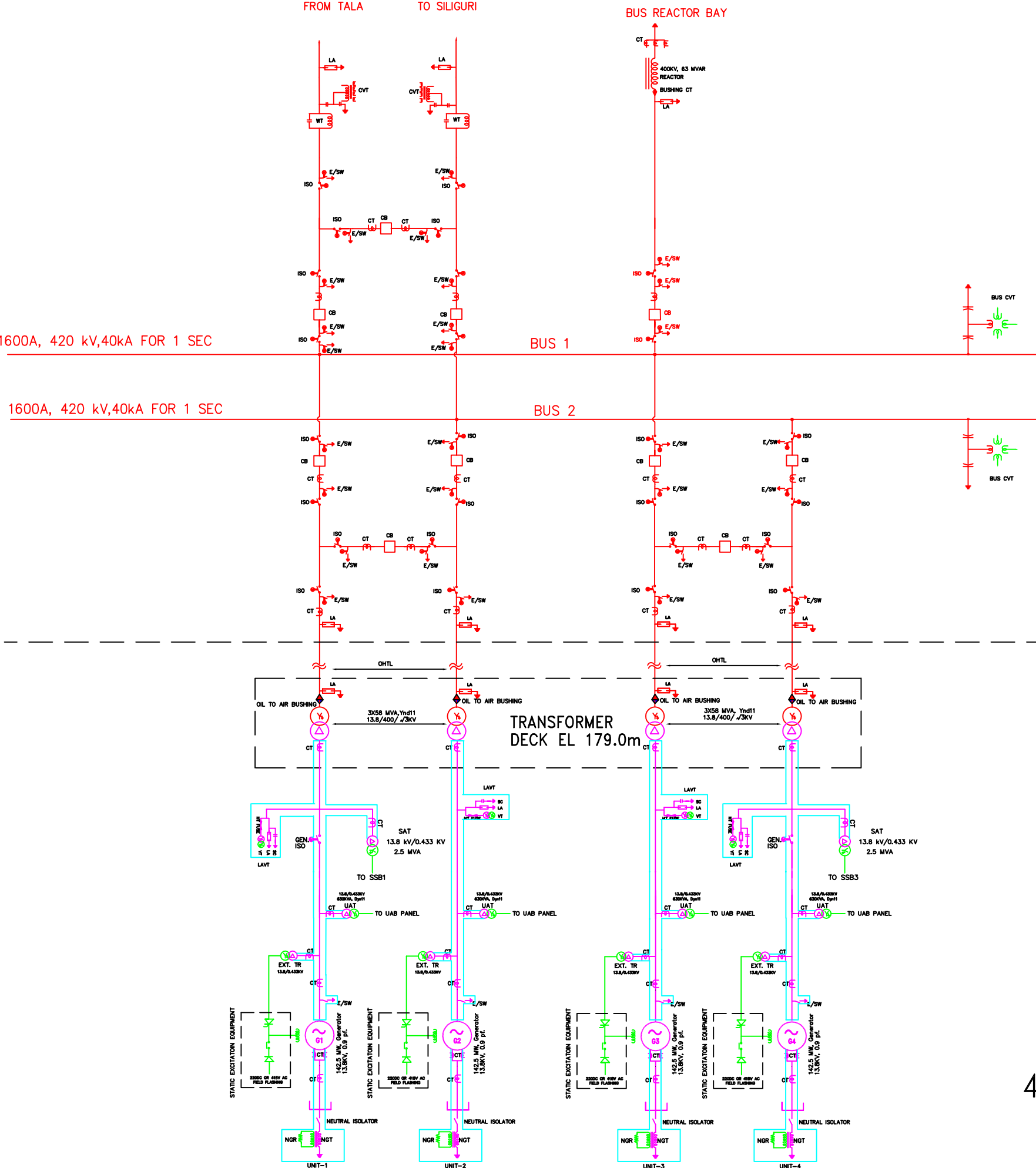
LAYOUT PLAN FOR SWITCH YARD
AND POWER HOUSE

अभिकल्पित DSGN.	R. DWIVEDI S. PATIAL	संरतुत RECM. JETA UKKHAL	अनुमोदित APPD. N.C. BANSAL
रेखांकित DRWN.	JAIPAL	संवीक्षित CHKD. BALWANT S.NEGI	

ELECT. DESIGN DEPTT. SJVN LTD. SHIMLA-9

DRG. NO. - SJEDWA/DPR/01J	REV. 01		MAY 2013
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400KV AIR INSULATED SWITCHYARD



NOTES: –

- 1. RED COLOUR DENOTES 420KV VOLTAGE CLASS
- 2. MAGENTA COLOUR DENOTES 13.8KV VOLTAGE CLASS
- 3. GREEN COLOUR DENOTES LV VOLTAGE CLASS < 415V
- 4. CT, PT SHOWN ARE TENTATIVE. EXACT QUANTITY AS PER ACTUAL REQUIREMENT.
- 5. RELAYING AND METERING ARE NOT SHOWN.THEY ARE OF STATE OF ART TECHNOLOGY AND AS PER ACTUAL REQUIREMENT OF THE SYSTEM BASED ON IEC 61850 PROTOCOL UNDER SUB-STATION AUTOMATION SYSTEM (SAS)

FOR DETAILED PROJECT REPORT ONLY

LEGEND: –

SR. NO.	SYMBOL	DESCRIPTION
1.		GENERATOR
2.		POWER TRANSFORMER
3.		ISOLATOR
4.		LIGHTENING ARRESTOR (LA)
5.		SURGE CAPACITOR(SC)
6.		SHORTING/EARTH SWITCH
7.		NEUTRAL GROUNDING TRANSFORMER NEUTRAL GROUNDING RESISTOR (NGT/NGR)
8.		STATIC EXCITATION EQUIPMENT
9.		CURRENT TRANSFORMER
10.		CIRCUIT BREAKER
11.		CAPCITIVE VOLTAGE TRANSFORMER
12.		WAVE TRAP
13.		63 MVAR REACTOR WITH BUSHING CT
14.		OIL TO AIR BUSHING

PROTECTION RELAYS–DEVICE FUNCTION ##

DEVICE NO.	FUNCTION
21G	GEN. BACK-UP IMPEDANCE PROT.
27G	UNDER VOLTAGE PROT.
32G	REVERSE POWER
40G	LOSS OF EXCITATION
46G	NEGATIVE PHASE SEQUENCE
27/50G	DEAD MACHINE PROTECTION
49R	ROTOR OVERLOAD PROTECTION
49S	STATOR OVERLOAD PROTECTION
50E/51E	ET INST. & IDMT O/C PROT.
50U/51U	UAT INST. & IDMT O/C PROT.
51NGT	GEN. TRANS. B/U E/F RELAY
51GT	GEN. TRANS. OVERCURRENT RELAY
59G	GEN. OVERVOLTAGE PROTECTION
60	PT FUSE FAILURE RELAY FOR VT
64G1	100% STATOR E. F. PROT.
64G2	95% STATOR E. F. PROT.
64GT	GEN. TRANS. R. E. F. PROT.
64E	ET R. E. F. PROT.
64U	UAT R. E. F. PROT.
64R	ROTOR E/F PROTECTION
78G	POLE SLIPPING/OUT OF STEP
810/U	OVER/UNDER FREQUENCY
87G	GENERATOR DIFFERENTIAL
87T	GT DIFFERENTIAL PROT.
87GT	OVERALL DIFFERENTIAL PROT.
99G	GT OVER FLUXING PROT.
87B	BUSBAR DIFFERENTIAL PROTECTION(INBUILT LBB)
21M1	MAIN -I DISTANCE PROTECTION
21M2	MAIN -II DISTANCE PROTECTION
79	AUTO RECLOSURE
59L1	OVERVOLTAGE DEFINITE TIME
59L2	OVERVOLTAGE INSTANTANEOUS
64L	LINE BACK UP EARTH FAULT PROTECTION

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SJVN Limited

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WANGCHU HYDRO ELECTRIC PROJECT BHUTAN

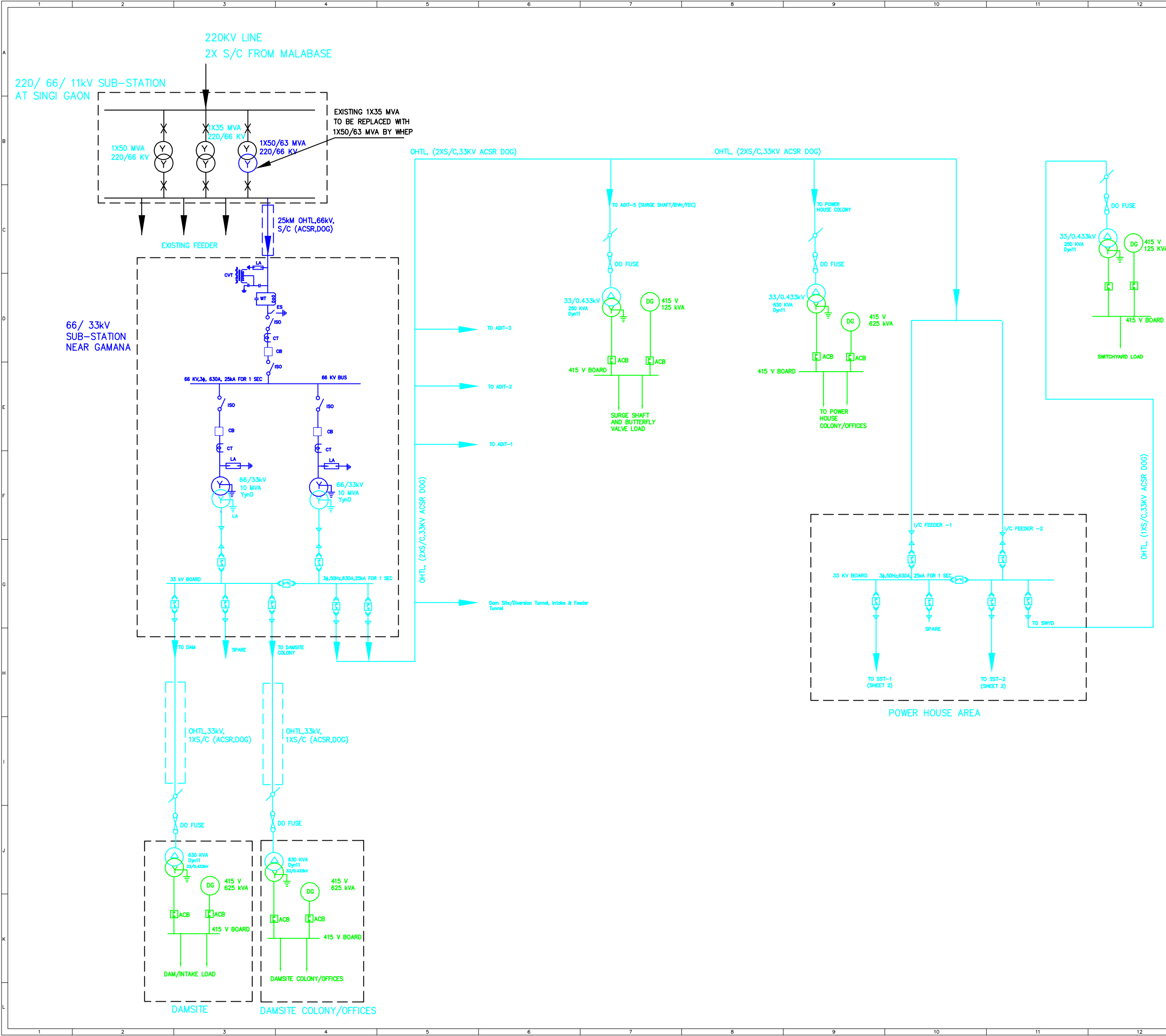
MAIN SINGLE LINE DIAGRAM

अधिकृत DSGN. NEHA MAHAJAN/ S. PATIAL	समस्तुत RECM. JETA UKKHAL	अनुमोदित APPD. N. C. BANSAL
रेखांकित DRWN. JAIPAL	समीक्षित CHKD. BALWANT S. NEGI	
ELECT. DESIGN DEPTT. SJVN LTD. SHIMLA–9		
ORG. NO. – SJEDWA/DPR/02A	REV. 02	JAN 2014

4X142.5 MW POWER HOUSE

##DETAILING OF PROTECTION SCHEME
WILL BE CARRIED OUT IN RELAYING AND
METERING SLD AND WILL BE PREPARED
BEFORE TENDERING STAGE.

SCALE :- NOT TO SCALE



APPENDIX-III

NOTES:
1. BLUE COLOUR DENOTES 66KV VOLTAGE CLASS
2. CYAN COLOUR DENOTES 33KV VOLTAGE CLASS
3. GREEN COLOUR DENOTES LV VOLTAGE CLASS 415V

FOR DETAILED PROJECT REPORT ONLY

LEGEND :-

SR. NO	SYMBOL	DESCRIPTION
1.		POWER TRANSFORMER
2.		GANG OPERATED(GO) SWITCH
3.		DROPOUT(DO) FUSE
4.		415V AIR CIRCUIT BREAKER(ACB)
5.		33KV VACCUUM CIRCUIT BREAKER(VCB)
6.		DIESEL GENERATOR SET
7.		CURRENT TRANSFORMER
8.		LIGHTNING ARRESTER
9.		CAPACITIVE VOLTAGE TRANSFORMER
10.		WAVE TRAP

SCALE :NOT TO SCALE

एसजेवीएन लिमिटेड
SJVN Limited

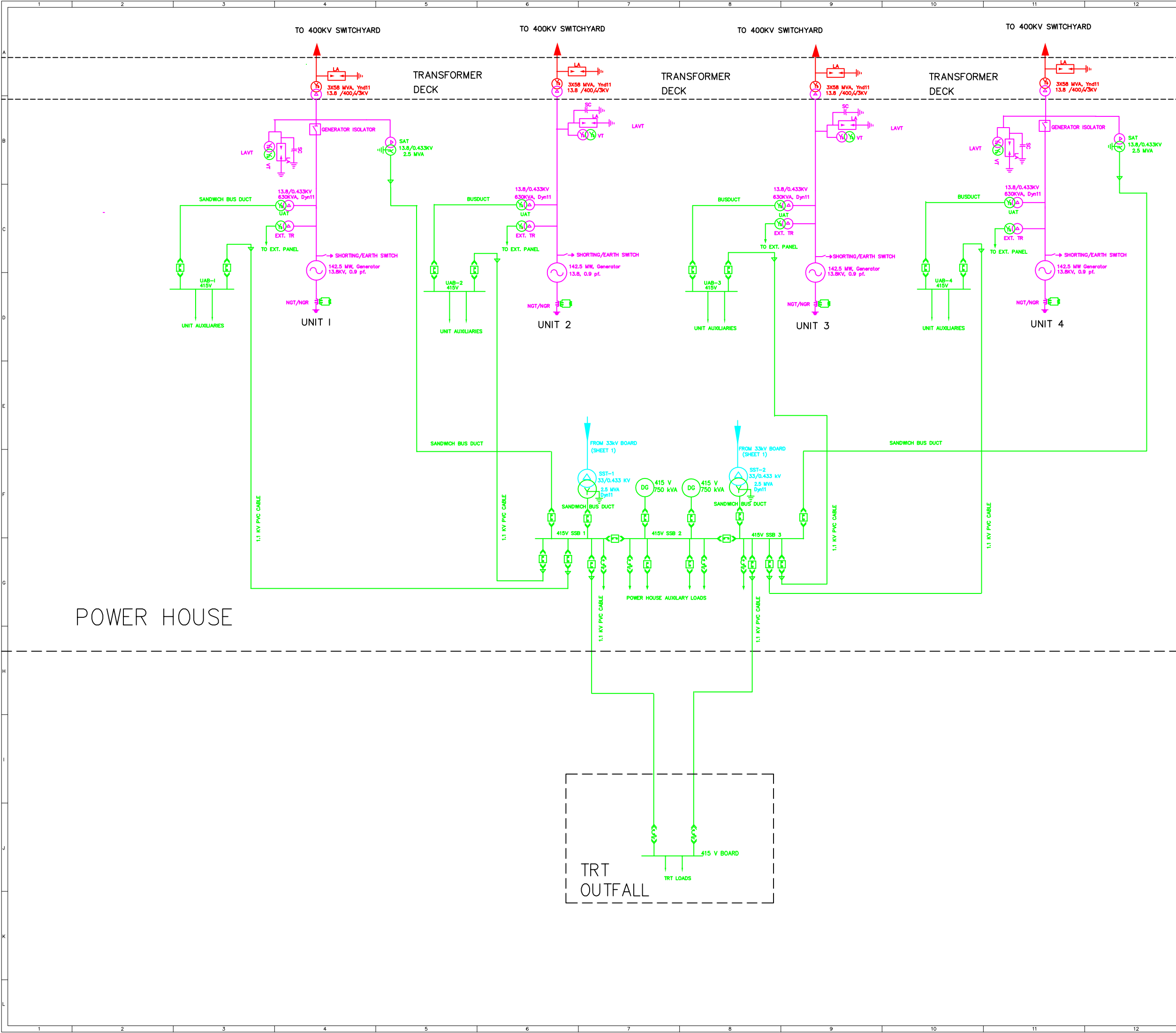
वांग्चू जल विद्युत परियोजना भूटान
WANGCHU HYDRO ELECTRIC PROJECT BHUTAN

SINGLE LINE DIAGRAM FOR 33KV,
415 V AC SYSTEM

अभिधीनित DSGN. NEHA MAHAJAN/ S. PATIAL	समीक्षित CHKD. JETA UKKHAL	अनुमोदित APPD. N.C. BANSAL
रेखांकित DRWN. JAIPAL	प्रस्तुत SUBM. BALWANT S. NEGI	

ELECT. DESIGN DEPTT. SJVNL.SHIMLA-9

DRG. NO. - SJEDWA/DPR/02B	REV. 01	OCT. 2013	SHEET 2 OF 2
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- NOTES:
1. RED COLOUR DENOTES 400KV VOLTAGE CLASS
 2. CYAN COLOUR DENOTES 33KV VOLTAGE CLASS
 3. MAGENTA COLOUR DENOTES 13.8kv VOLTAGE CLASS
 4. GREEN COLOUR DENOTES LV VOLTAGE CLASS 415V

FOR DETAILED PROJECT REPORT ONLY

LEGEND :-

SR. NO.	SYMBOL	DESCRIPTION
1.		GENERATOR
2.		POWER TRANSFORMER
3.		GENERATOR ISOLATOR
4.		LIGHTENING ARRESTOR (LA)
5.		SURGE CAPACITOR(SC)
6.		SHORTING/EARTH SWITCH
7.		INSTRUMENT TRANSFORMER
8.		NUETRAL GROUNDING TRANSFORMER/ NUETRAL GROUNDING RESISITOR(NGT/NGR)
9.		33KV VACCUMCIRCUIT BREAKER
10.		415V AIR CIRCUIT BREAKER
11.		MOULDED CASE CIRCUIT BREAKER
12.		STATION AUXILIARY TRANSFORMER STATION SUPPLY TRANSFORMER UNIT AUXILIARY TRANSFORMER UNIT AUXILIARY BOARD HIGH TENSION
13.		GENERATOR ISOLATOR

SCALE :- NOT TO SCALE

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वांग्चू जल विद्युत परियोजना भूटान
WANGCHU HYDRO ELECTRIC PROJECT BHUTAN

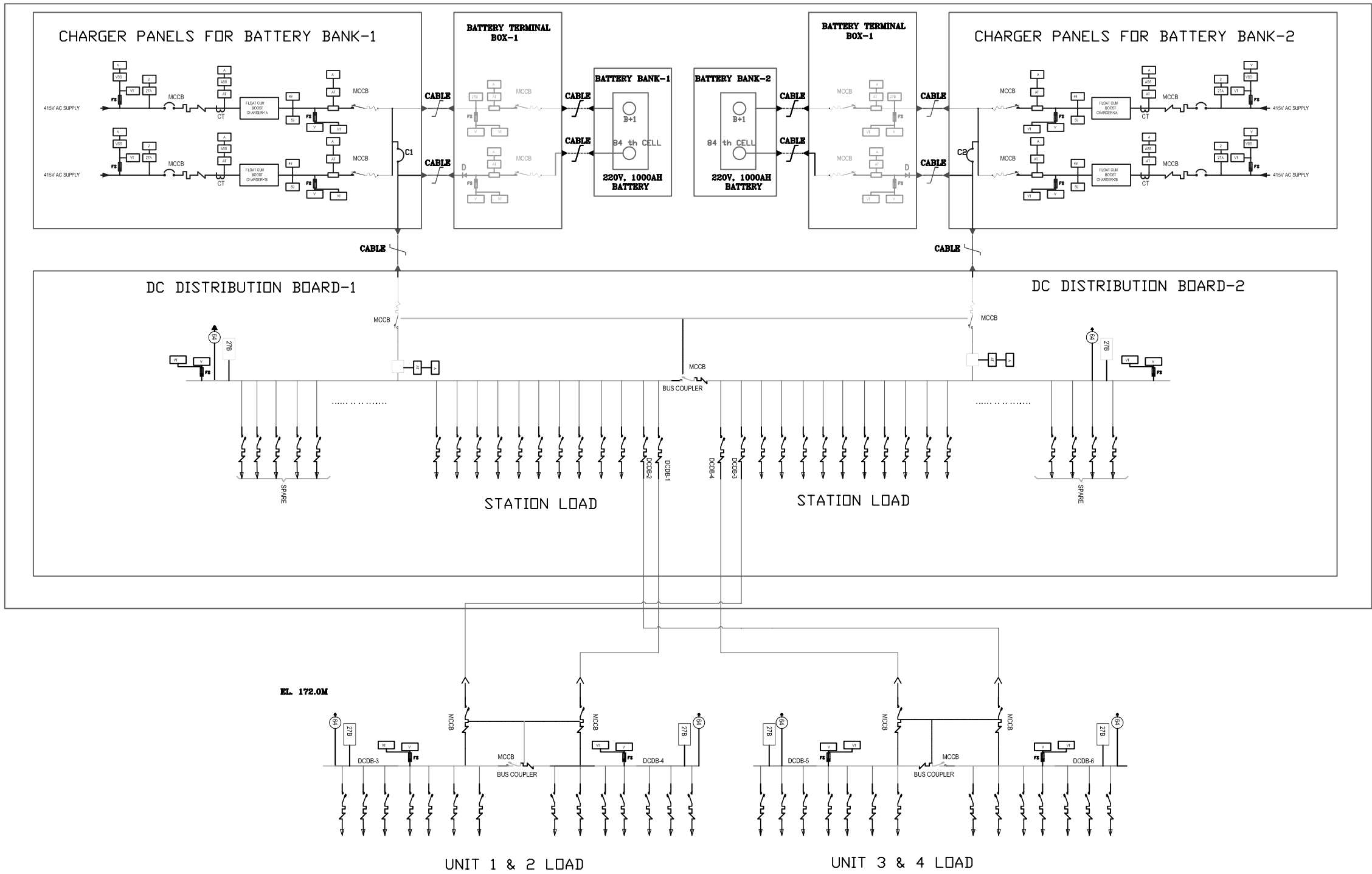
SINGLE LINE DIAGRAM FOR 33KV,
415 V AC SYSTEM

अभिधीनित DSGN. SHIVENDER PATIAL	समीक्षित CHKD. JETA UKKHAL	अनुमोदित APPD. N. C BANSAL
दस्तावेजित DRWN. JAIPAL	समस्त SUBM. B. S. NEGI	

ELECT. DESIGN DEPTT. SJVNL.SHIMLA-9

DRG. NO. - SJEDWA/DPR/02B REV. 01 JAN. 2014 SHEET 1 OF 2

EL. 186.00M



- NOTES:-
1. THIS DRAWINGS DEPICTS THE 220V DC SCHEME ONLY.
 2. DC FEEDER RATING & QUANTITIES SHALL BE FINALIZED DURING DETAIL ENGINEERING AS PER SYSTEM REQUIREMENT.
 3. THE BATTERY CHARGERS PROPOSED ARE FLOAT CUM BOOST CHARGER PROVIDING 100% REDUNDANCY FOR EACH BATTERY BANK.
 4. THE BATTERIES SHALL BE 2NOS. OF LEAD ACID PLANTE TYPE.
 5. 24V/48V DC SCHEME IS NOT COVERED IN THIS SCHEME.
 6. MINIMUM 20% SPARE DC FEEDERS FOR EACH SIZE SHALL BE KEPT AS SPARE & MINIMUM ONE.
 - 7.ALL TRANSDUCER SHALL PROVIDE ANALOG INTERFACE TO SCADA.

FOR DETAILED PROJECT REPORT ONLY

LEGEND:-

S.No.	SYMBOLS	DESCRIPTION
1.		MOULDED CASE CIRCUIT BREAKER WITH THERMAL & SHORT CIRCUIT RELEASE (AC-4POLE)
2.		MOULDED CASE CIRCUIT BREAKER (DC FIXED TYPE 2 POLE)
3.		VOLTMETER WITH HRC FUSE
4.		AMMETER WITH SHUNT
5.		VOLTAGE TRANSDUCER
6.		CURRENT TRANSDUCER
7.		VOLTAGE SELECTOR SWITCH
8.		CURRENT SELECTOR SWITCH
9.		HRC FUSE
10.		BLOCKING DIODE
11.		CURRENT TRANSFORMER
12.		TIMER

PROTECTIVE RELAYS :-

DEVICE NO.	DESCRIPTION	TYPE
27A	AC UNDERVOLTAGE PROTECTION	E/M
27B	DC UNDERVOLTAGE PROTECTION	E/M
59	OVER VOLTAGE RELAY	E/M
64	EARTH FAULT RELAY	E/M
49	OVER LOADING RELAY	E/M

SCALE :- NOT TO SCALE



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SJVN Limited

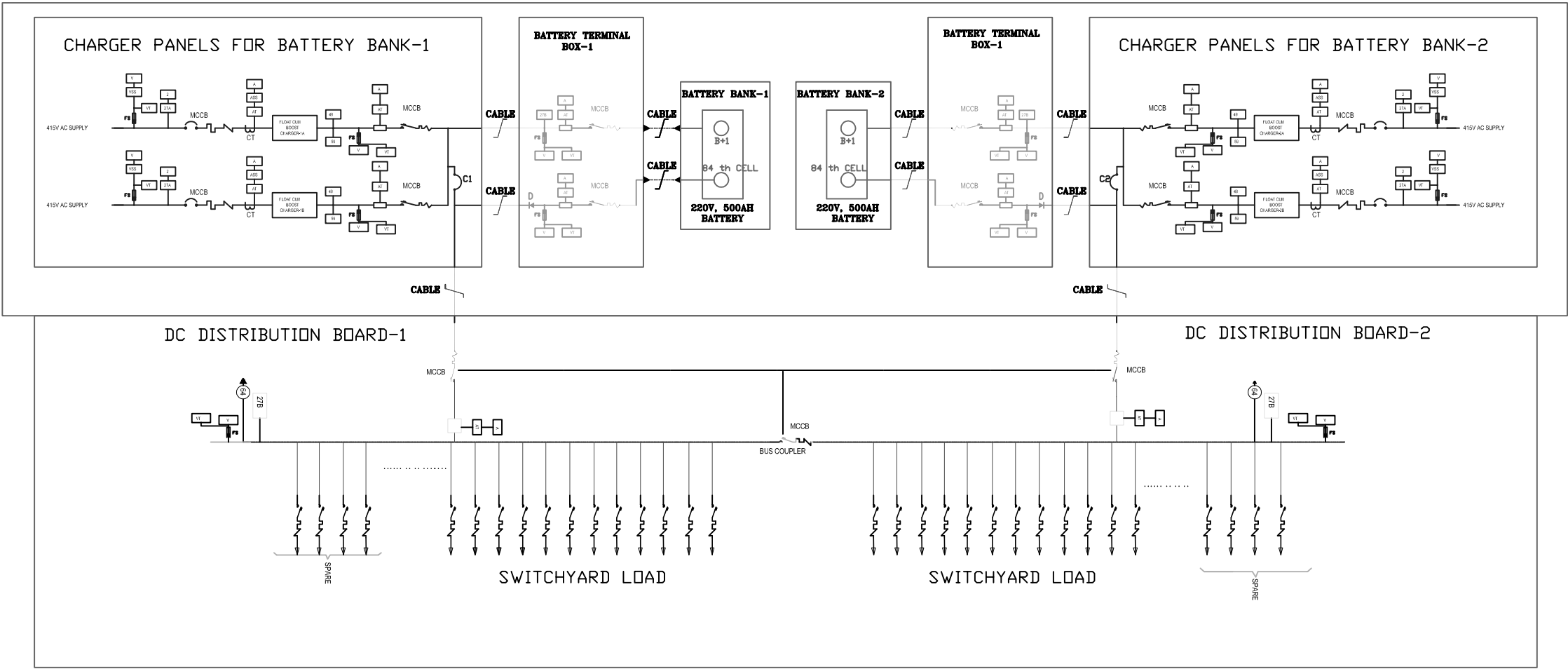
वांग्चू जल विद्युत परियोजना भूटान
WANGCHU HYDRO ELECTRIC PROJECT BHUTAN

SINGLE LINE DIAGRAM OF 220 V DC SYSTEM
AT POWER HOUSE

अभिेकल्पित DSGN. NEHA MAHAJAN/ S.PATIAL	सन्तुत RECM. JETA UKKHAL	अनुमोदित APPD. N.C. BANSAL
रेखांकित DRWN. JAIPAL	सर्वोचित CHKD. BALWANT S. NEGI	

ELECT. DESIGN DEPTT. SJVN LTD. SHIMLA - 9

DRG. NO. - SJEDWA/DPR/02C1 REV. 01 MAY 2013



- NOTES:
1. THIS DRAWINGS DEPICTS THE 220V DC SCHEME ONLY.
 2. DC FEEDER RATING & QUANTITIES SHALL BE FINALIZED DURING DETAIL ENGINEERING AS PER SYSTEM REQUIREMENT.
 3. THE BATTERY CHARGERS PROPOSED ARE FLOAT CUM BOOST CHARGER PROVIDING 100% REDUNDANCY FOR EACH BATTERY BANK.
 4. THE BATTERIES SHALL BE 2NOS. OF Pb Add/N-Cd PLANTE TYPE.
 5. 24V/48V DC SCHEME IS NOT COVERED IN THIS SCHEME.
 6. MINIMUM 20% SPARE DC FEEDERS FOR EACH SIZE SHALL BE KEPT AS SPARE & MINIMUM ONE.
 - 7.ALL TRANSDUCER SHALL PROVIDE ANALOG INTERFACE TO SCADA.

FOR DETAILED PROJECT REPORT ONLY

LEGEND:-

S.No.	SYMBOLS	DESCRIPTION
1.		MOULDED CASE CIRCUIT BREAKER WITH THERMAL & SHORT CIRCUIT RELEASE (AC-4POLE)
2.		MOULDED CASE CIRCUIT BREAKER (DC FIXED TYPE 2 POLE)
3.		VOLTMETER WITH HRC FUSE
4.		AMMETER WITH SHUNT
5.		VOLTAGE TRANSDUCER
6.		CURRENT TRANSDUCER
7.		VOLTAGE SELECTOR SWITCH
8.		CURRENT SELECTOR SWITCH
9.		HRC FUSE
10.		BLOCKING DIODE
11.		CURRENT TRANSFORMER
12.		TIMER

PROTECTIVE RELAYS :-

DEVICE NO.	DESCRIPTION	TYPE
27A	AC UNDERVOLTAGE PROTECTION	E/M
27B	DC UNDERVOLTAGE PROTECTION	E/M
59	OVER VOLTAGE RELAY	E/M
64	EARTH FAULT RELAY	E/M
49	OVER LOADING RELAY	E/M

SCALE :- NOT TO SCALE



एसजेवीएन लिमिटेड
SJVN Limited

वांग्चू जल विद्युत परियोजना भूटान
WANGCHU HYDRO ELECTRIC PROJECT BHUTAN

SINGLE LINE DIAGRAM OF 220 V DC SYSTEM
AT SWITCHYARD

अभिवाचित
DSGN. NEHA MAHAJAN /
S.PATIAL

समस्तुत
RECM. JETA UKKHAL

अनुमोदित
APPD. N.C. BANSAL

रखाकित
DRWN. JAIPAL

समीक्षित
CHKD. BALWANT S. NEGI

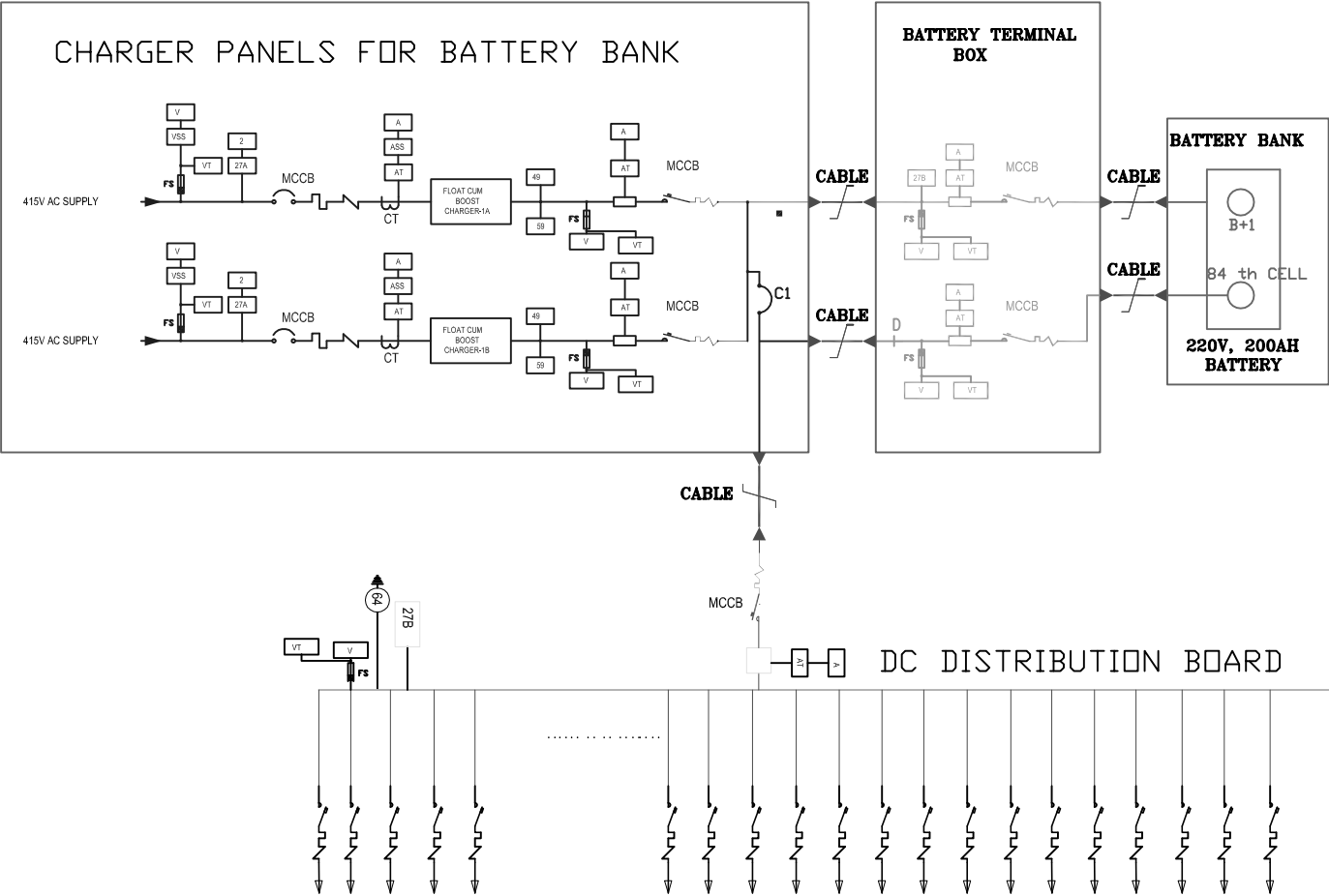
ELECT. DESIGN DEPTT. SJVN LTD. SHIMLA - 9

DRG. NO. - SJEDWA/DPR/02C2

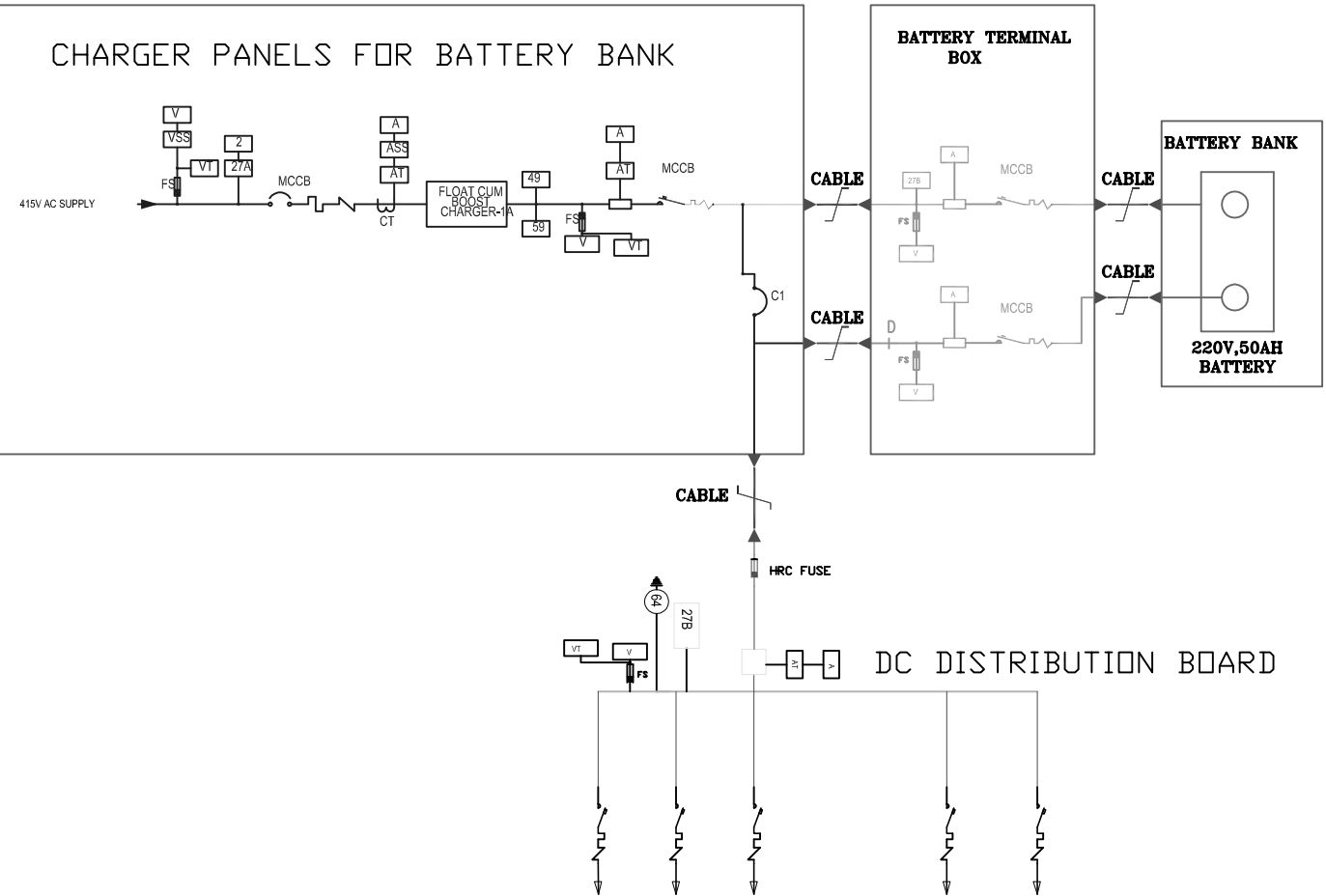
REV. 00

MAY 2013

SLD FOR DC SYSTEM AT DAM SITE



SLD FOR DC SYSTEM AT BFV AREA



- NOTES:
1. THIS DRAWINGS DEPICTS THE 220V DC SCHEME ONLY.
 2. DC FEEDER RATING & QUANTITIES SHALL BE FINALIZED DURING DETAIL ENGINEERING AS PER SYSTEM REQUIREMENT.
 3. THE BATTERY CHARGERS PROPOSED ARE FLOAT CUM BOOST CHARGER PROVIDING 100% REDUNDANCY FOR EACH BATTERY BANK.
 4. THE BATTERIES SHALL BE 2NOS. OF LEAD ACID PLANTE TYPE.
 5. 24V/48V DC SCHEME IS NOT COVERED IN THIS SCHEME.
 6. MINIMUM 20% SPARE DC FEEDERS FOR EACH SIZE SHALL BE KEPT AS SPARE & MINIMUM ONE.
 7. ALL TRANSDUCER SHALL PROVIDE ANALOG INTERFACE TO SCADA.

FOR DETAILED PROJECT REPORT ONLY

LEGEND:-

S.No.	SYMBOLS	DESCRIPTION
1.		MOULDED CASE CIRCUIT BREAKER WITH THERMAL & SHORT CIRCUIT RELEASE (AC-4POLE)
2.		MOULDED CASE CIRCUIT BREAKER (DC FIXED TYPE 2 POLE)
3.		VOLTMETER WITH HRC FUSE
4.		AMMETER WITH SHUNT
5.		VOLTAGE TRANSDUCER
6.		CURRENT TRANSDUCER
7.		VOLTAGE SELECTOR SWITCH
8.		CURRENT SELECTOR SWITCH
9.		HRC FUSE
10.		BLOCKING DIODE
11.		CURRENT TRANSFORMER
12.		TIMER

PROTECTIVE RELAYS :-

DEVICE NO.	DESCRIPTION	TYPE
27A	AC UNDERVOLTAGE PROTECTION	E/M
27B	DC UNDERVOLTAGE PROTECTION	E/M
59	OVER VOLTAGE RELAY	E/M
64	EARTH FAULT RELAY	E/M
49	OVER LOADING RELAY	E/M

SCALE :- NOT TO SCALE



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SJVN Limited

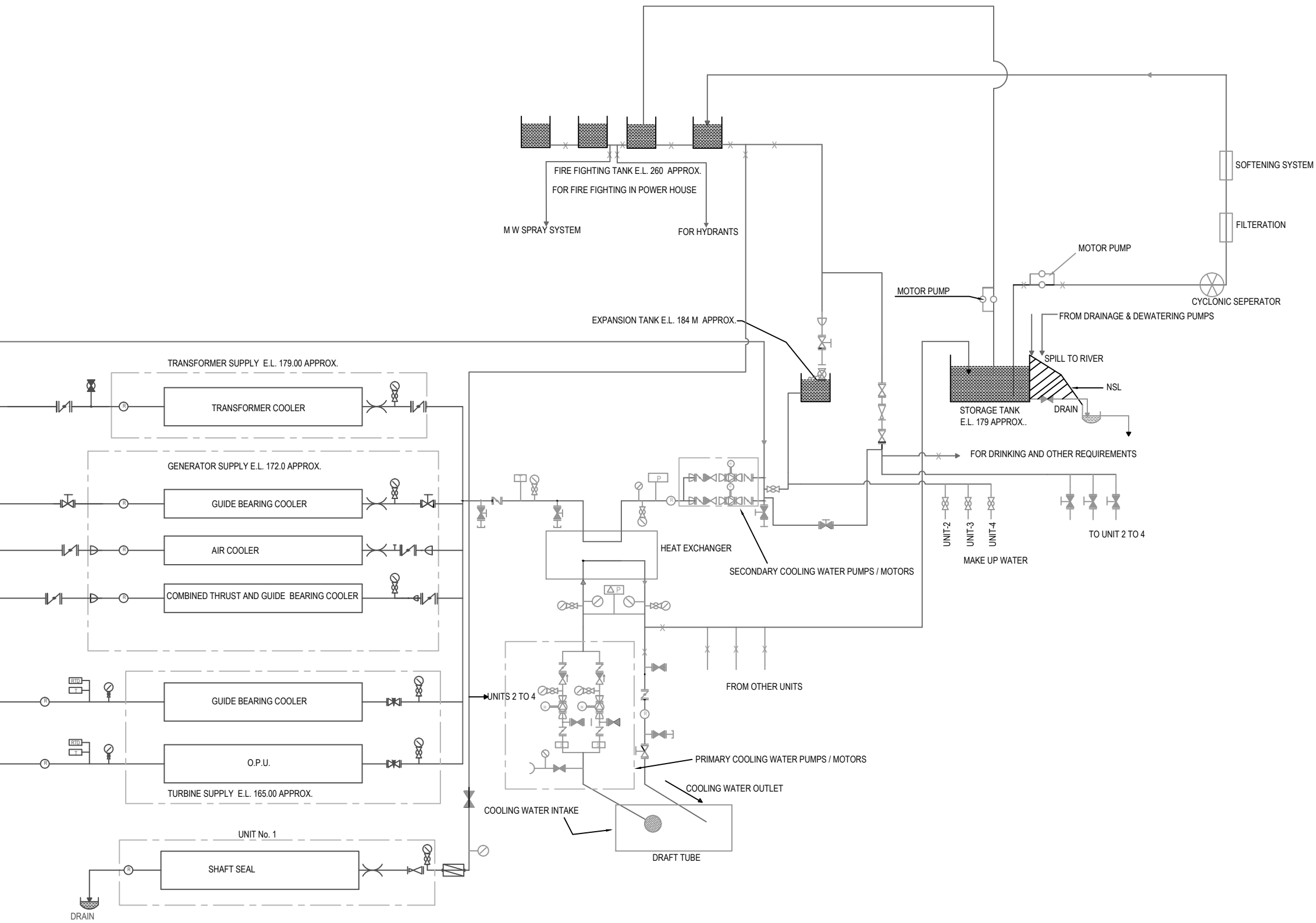
वांग्चू जल विद्युत परियोजना भूटान
WANGCHU HYDRO ELECTRIC PROJECT BHUTAN

SINGLE LINE DIAGRAM 220 V DC SYSTEM
AT DAM SITE AND BUTTERFLY VALVE HOUSE

अभिेकल्पित DSGN. NEHA MAHAJAN / S.PATIL	संस्तुतः RECM. JETA UKKHAL	अनुमोदित APPD. N.C. BANSAL
रेखांकित DRWN. JAIPAL	सवीक्षित CHKD. BALWANT S. NEGI	

ELECT. DESIGN DEPTT. SJVN LTD. SHIMLA-9

DRG. NO. - SJEDWA/DPR/02C3 REV. 00 MAY 2013



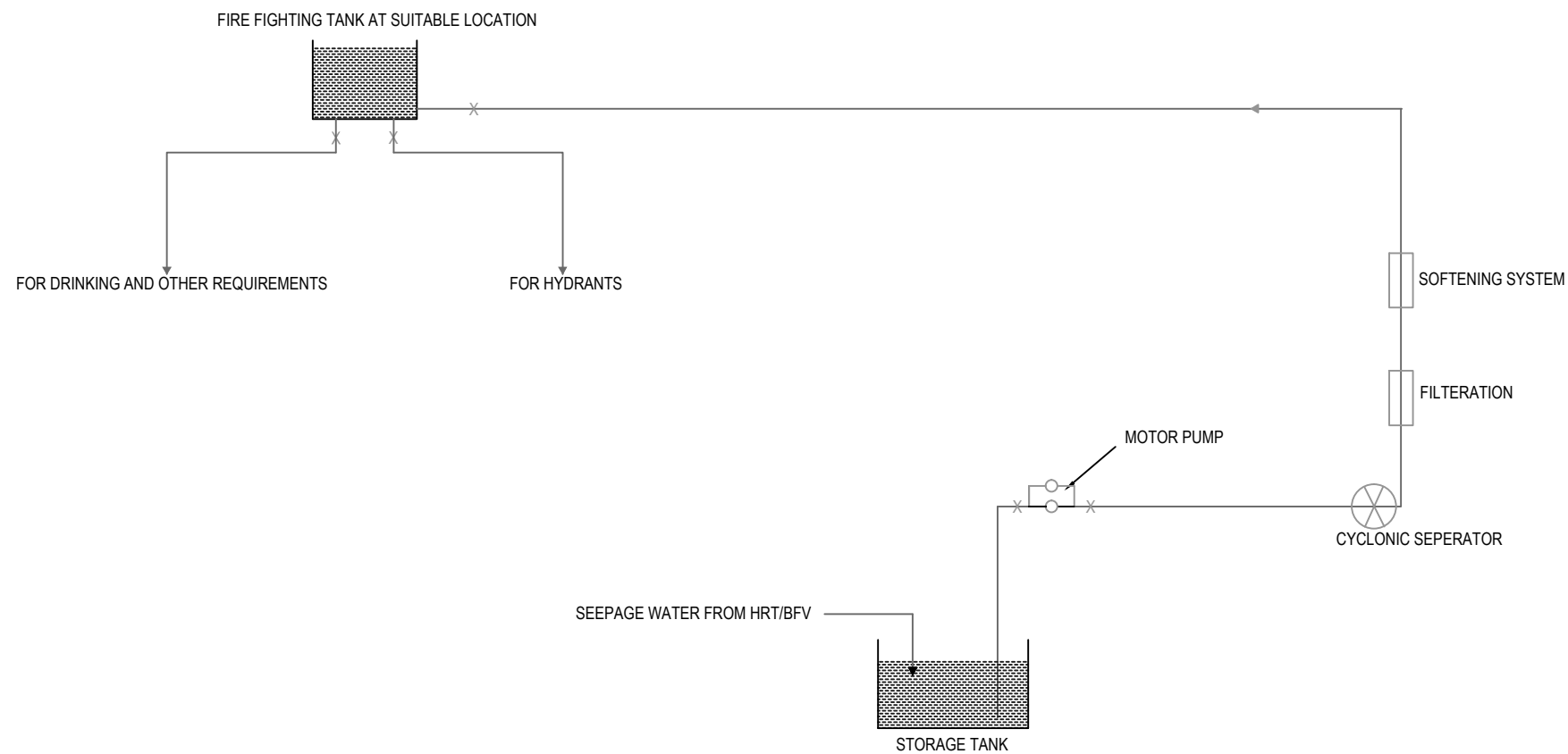
FOR DETAILED PROJECT REPORT ONLY

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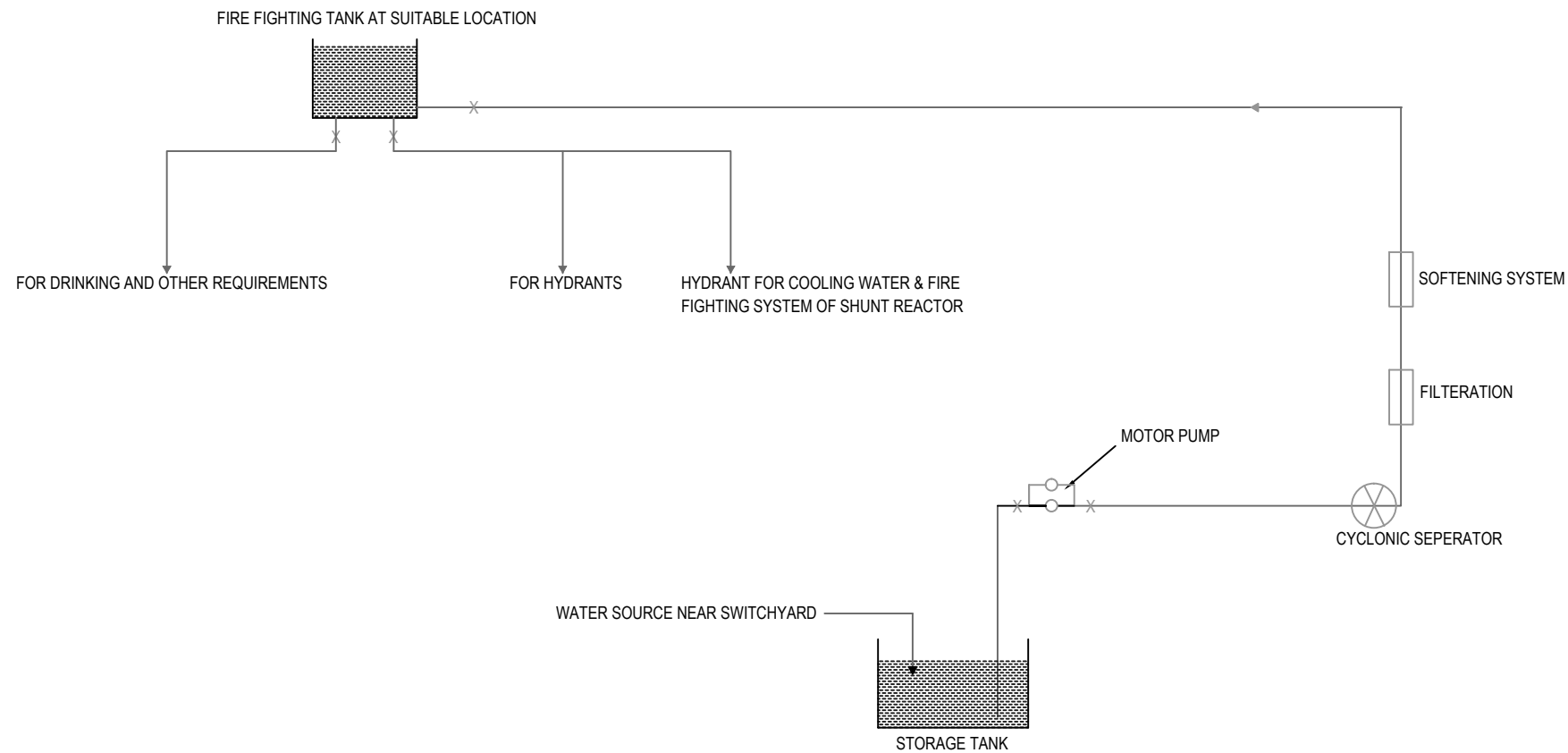
SR. NO.	SYMBOL	DESCRIPTION
1.	X	VALVE
2.		MANUAL OPERATING VALVE
3.		CHECK VALVE
4.		MOTOR
5.		GAUGE VALVE
6.		CENTRIFUGAL PUMP
7.		BUTTERFLY VALVE
8.		GAUGE VALVE
9.		FLOAT ACTIVATED GAUGE VALVE
10.		ORIFICE
11.		GATE VALVE
12.		NEEDLE VALVE
13.		FLOW SWITCH
14.		PRESSURE SWITCH
15.		RESISTANCE TEMP. DETECTOR
16.		TEMPRATURE SWITCH
17.		PRESSURE GAUGE
18.		DIFFERENTIAL PRESSURE SWITCH
19.		PRESSURE REDUCING VALVE
20.		DUPLEX FINE FILTER
21.		STRAINER

SCALE :- NOT TO SCALE

 एसजेवीएन लिमिटेड SJVN Limited			
वांग्चू जल विद्युत परियोजना भूटान WANGCHU HYDRO ELECTRIC PROJECT BHUTAN			
COOLING WATER AND FIRE FIGHTING SYSTEM AT POWER HOUSE			
अभिवादन DSGN.	R. DWIVEDI S. PATIAL	समस्त RECM.	JETA UKKHAL
संशोधित DRWN.	JAIPAL	संशोधित CHKD.	BALWANT. S. NEGI
अनुमोदित APPD.			
N.C. BANSAL			
ELECT. DESIGN DEPTT. SJVN LTD.SHIMLA-9			
DRG. NO. - SJEDWA/DPR/05A1		REV. 01	MAY 2013



FOR BUTTERFLY VALVE HOUSE



FOR SWITCHYARD AREA

FOR DETAILED PROJECT REPORT ONLY

LEGEND :-

SR. NO.	SYMBOL	DESCRIPTION
1.	X	VALVE

SCALE :- NOT TO SCALE



एसजेवीएन लिमिटेड
SJVN Limited

वांग्चू जल विद्युत परियोजना भूटान
WANGCHU HYDRO ELECTRIC PROJECT BHUTAN

COOLING WATER AND FIRE FIGHTING SYSTEM
AT SWITCHTARD & BFV HOUSE

अभिकल्पित
DSGN. S. PATIAL

संस्तुत
RECM JETA UKKHAL

अनुमोदित
APPD. N.C. BANSAL

रेखांकित
DRWN. JAIPAL

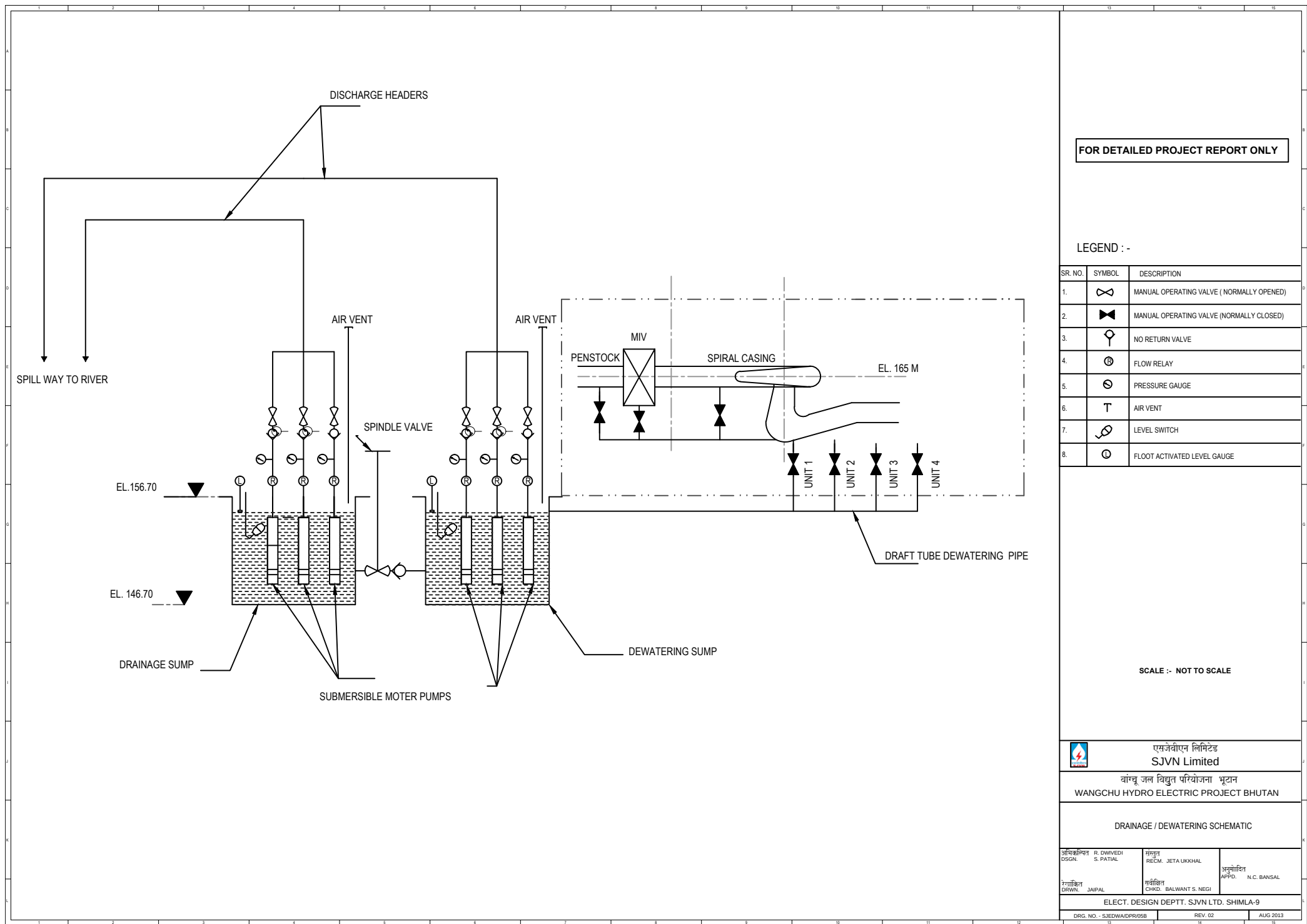
सर्वीक्षित
CHKD. BALWANT. S. NEGI

ELECT. DESIGN DEPTT. SJVNL.SHIMLA-9

DRG. NO. - SJEDWA/DPR/05A2

REV. 01

JAN 2014



FOR DETAILED PROJECT REPORT ONLY

LEGEND :-

SR. NO.	SYMBOL	DESCRIPTION
1.		AIR COMPRESSOR
2.		SUCTION FILTER
3.		AIR SAFETY VALVE
4.		AIR COOLER
5.		VALVE
6.		PRESSURE GAUGE
7.		CENTRIFUGAL UNLOADER VALVE
8.		NO LOAD STARTING VALVE
9.		AUTOMATIC DRAIN VALVE
10.		DRAIN SELECTOR
11.		AIR DRIER
12.		AIR FILTER
13.		NON RETURN VALVE
14.		THERMOMETER
15.		PRESSURE SWITCH
16.		AUTOMATIC MOISTURE TRAP

SCALE :- NOT TO SCALE



एसजेवीएन लिमिटेड
SJVN Limited

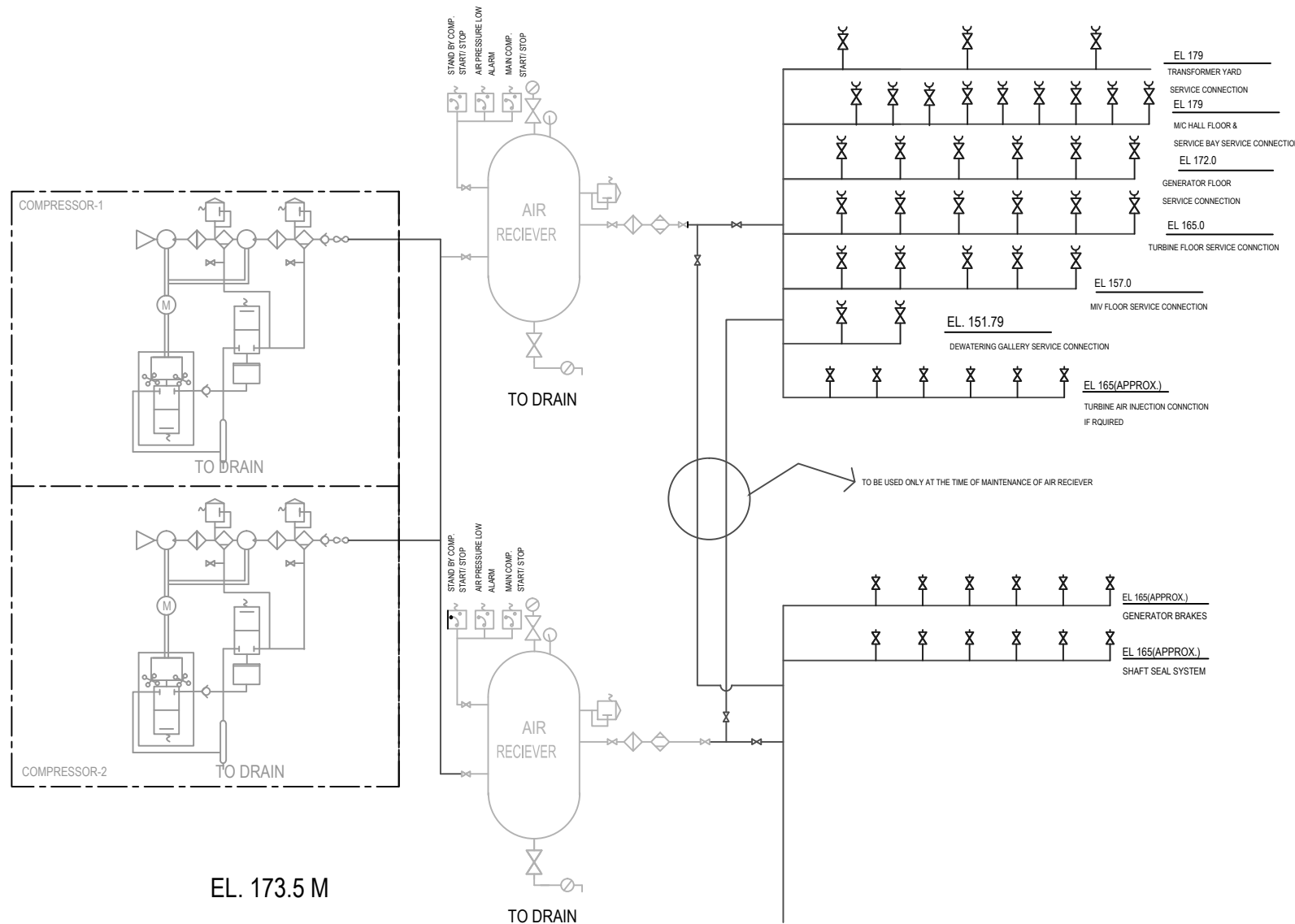
वांग्चू जल विद्युत परियोजना भूटान
WANGCHU HYDRO ELECTRIC PROJECT BHUTAN

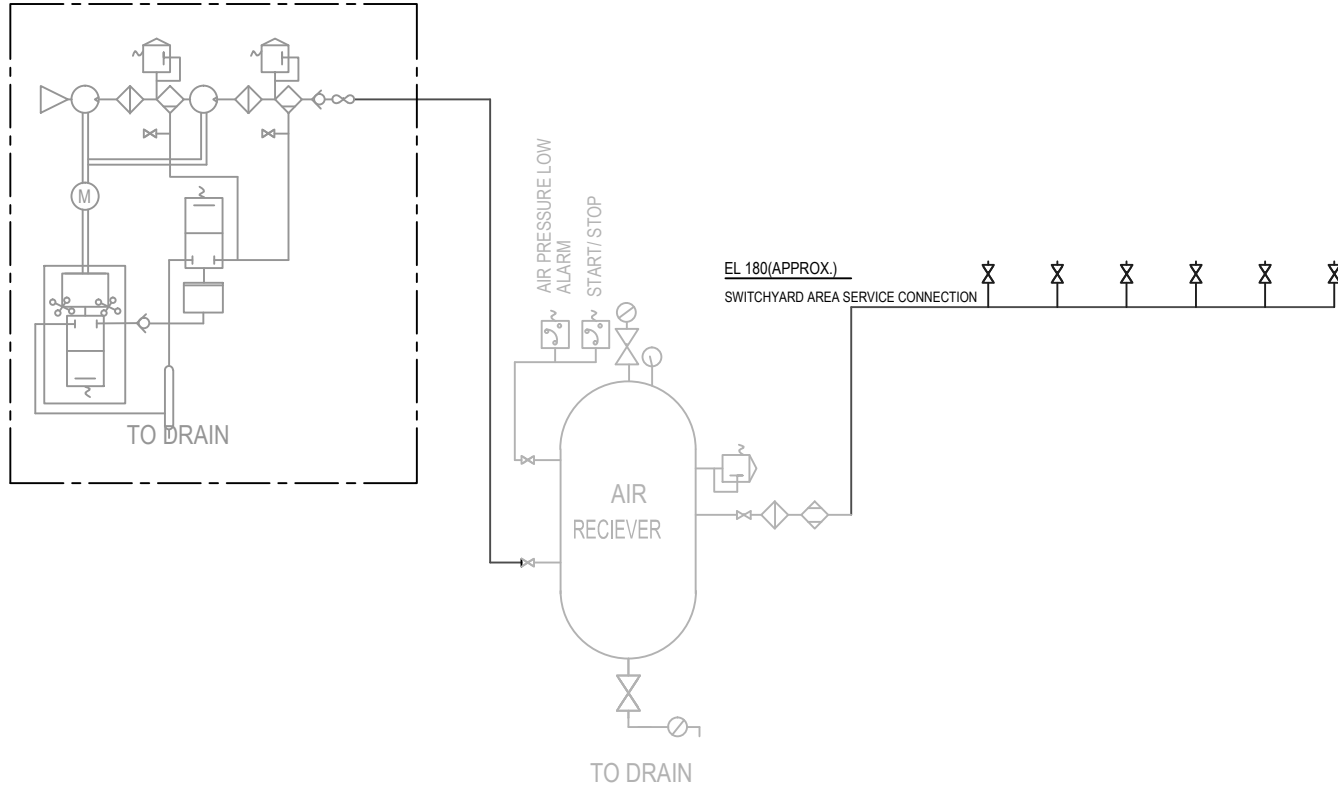
COMPRESSED AIR SYSTEM AT POWER HOUSE

आपसकृत DSGN.	RISHAB DIVEDI S PATIAL	संस्तुत RECM.	JETA UKKHAAL	अनुमोदित APPD.	N.C. BANSAL
रचयित DRWN.	JAI PAL	यकीकृत CHKD.	BALWANT S. NEGI		

ELECT. DESIGN DEPTT. SJVN LTD. SHIMLA-9

DRG. NO. - SJEDWA/DP/05C1 REV. 01 MAY. 2013





EL. 180 M

FOR DETAILED PROJECT REPORT ONLY

LEGEND :-

SR. NO.	SYMBOL	DESCRIPTION
1.		AIR COMPRESSOR
2.		SUCTION FILTER
3.		AIR SAFETY VALVE
4.		AIR COOLER
5.		VALVE
6.		PRESSURE GAUGE
7.		CENTRIFUGAL UNLOADER VALVE
8.		NO LOAD STARTING VALVE
9.		AUTOMATIC DRAIN VALVE
10.		DRAIN SELECTOR
11.		AIR DRIER
12.		AIR FILTER
13.		NON RETURN VALVE
14.		THERMOMETER
15.		PRESSURE SWITCH
16.		AUTOMATIC MOISTURE TRAP

SCALE :- NOT TO SCALE



एसजेवीएन लिमिटेड
SJVN Limited

वांग्चू जल विद्युत परियोजना भूटान
WANGCHU HYDRO ELECTRIC PROJECT BHUTAN

COMPRESSED AIR SYSTEM AT SWITCHYARD

आपसकारिता DESIGN	R. DWIVEDI S. PATIAL	संलग्न RECM. JETA UKKHAL	अनुमोदित APPD. N. C. BANSAL
जांचाई CHECK	JAIPAL	जांचाई CHKD. BALWANT S. NEGI	

ELECT. DESIGN DEPTT. SJVN LTD. SHIMLA-9

DRG. NO. - SIEDWA/DPR/OS22	REV. 00	MAY 2013
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