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COMPUTER FILE NAME

REF. DRG. NO.

SIGN. AND DATE

INVENTORY NO



DRG. NO.

SH. 01 OF 06

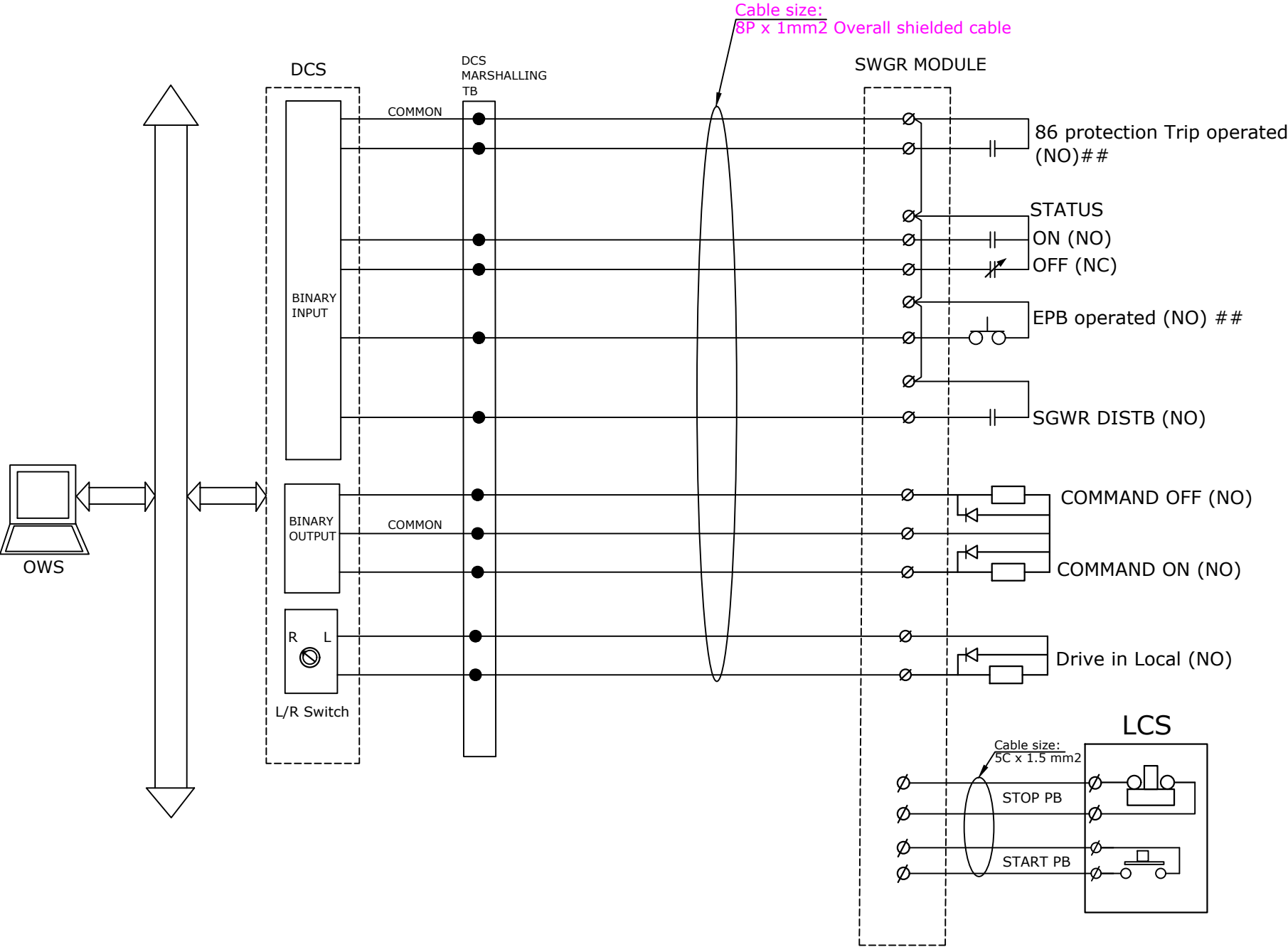
PY-SC-4-M166-9301-01

DRIVE CONTROL PHILOSOPHY

REV.	DATE	ALTERED	REV.	DATE	ALTERED	REV.	DATE	ALTERED	REV.	DATE	ALTERED
		CHD/APPD			CHD/APPD			CHD/APPD	01	20.03.21	VINEET K. CHD/APPD SUJATHA S.
ZONE			ZONE			ZONE			ZONE		1) Document revised as per customer comments given on R00. 2) Changes are highlighted with blue colour & cloud marks.

CLIENT	NATIONAL ALUMINIUM COMPANY LIMITED BHUBANESWAR, ODISHA							
CONSULTANT	M. N. DASTUR & COMPANY (P) LTD CONSULTING ENGINEERS, KOLKATA							
PROJECT	INSTALLATION OF STEAM AND POWER PLANT FOR 5th STREAM ALUMINA REFINERY EXPANSION AT DAMANJODI, ODISHA UNDER PHASE-3 EXPANSION OF M&R COMPLEX							
<div></div> <div>BHARAT HEAVY ELECTRICALS LTD. HYDERABAD</div>					NAME	SIGN.	DATE	NO.OF VAR.
				DRN.	SUJATHA	sd/-	20.11.20	
				CHD.	SUJATHA	sd/-	21.11.20	
				APPD.	K. Anand	sd/-	23.11.20	—N.A.—
DEPT.	UNTOL. DIMS. GR.		SCALE	WEIGHT (KG)	REF. TO ASSY. DRG.		ITEM NO.	NO.OF ITEMS
CODE	G/M/F				—N.A.—		—N.A.—	—N.A.—
TITLE				CARD CODE N.A.	DRG. NO: PY-SC-4-M166-9301-01			REV. 01
DRIVE CONTROL PHILOSOPHY					CUST. DRG. NO: _____			
					SHT. No 01		NO. OF SHT. 06	

DCS Interface with HT Switch Gear (HT)



(*) -> Interrogation voltage for commands & feedbacks shall be 24V DC and same shall be powered from DCS.
(##) -> SOE signal

Write-up:

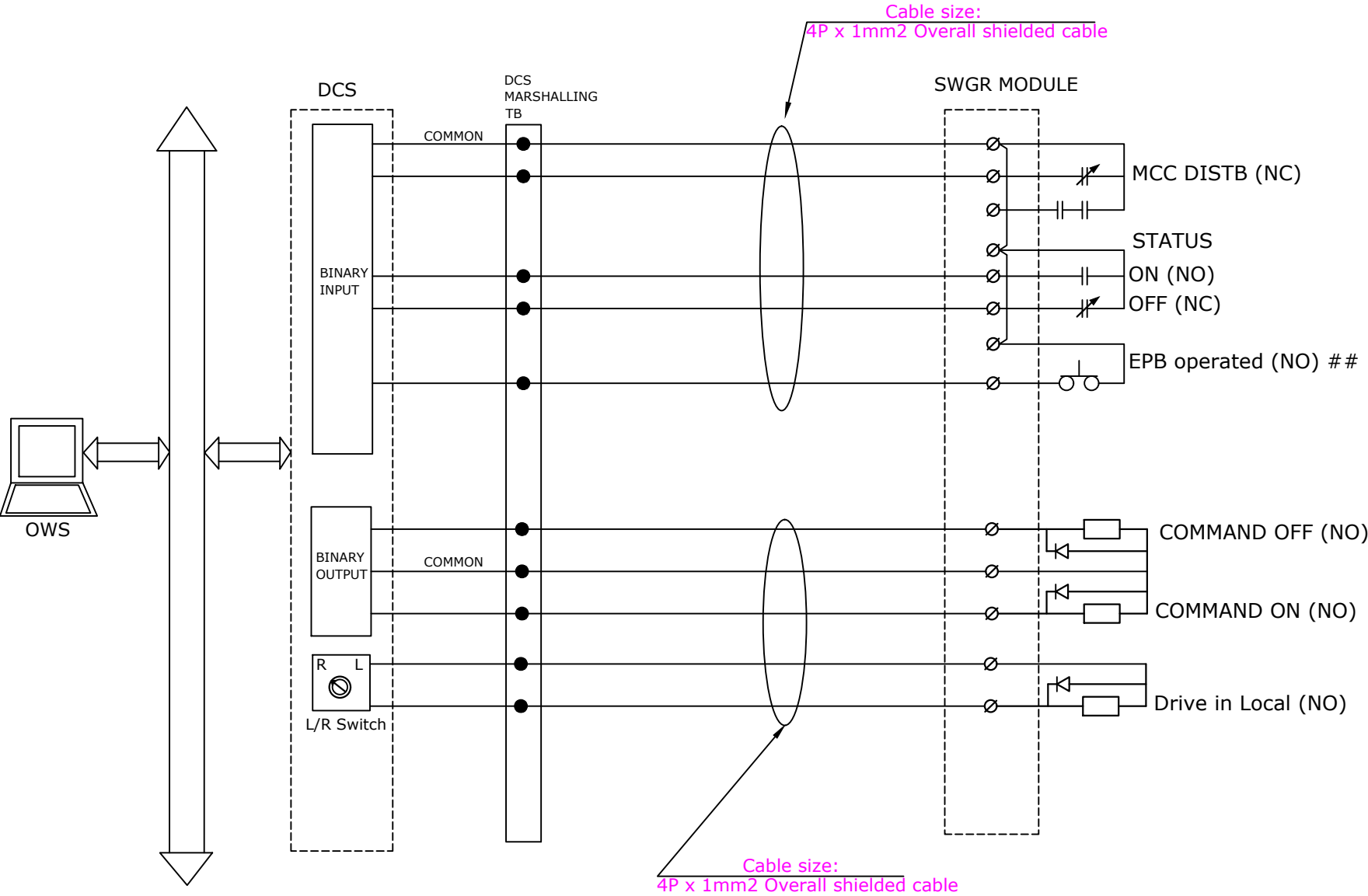
- 1) Inter Posing Relays (IPR) shall be installed in MCC / SWGR.
- 2) Remote manual operation of Breaker operated drives shall be normally from remote i.e. DCS in main Control Room through OWS.
- 3) Remote/Switchgear (SWGR) selection shall be realized from SWGR mounted R/S selector switch.
- 4) Following are the operational combinations for breaker operated drives:
 - SERVICE POSITION – Drive Operation (Start/Stop) shall be from CCR with R/S (Remote/SWGR) selector switch in Remote position.
 - TEST POSITION – SWGR Testing (Start/Stop) from SWGR/CCR.
 - Switchgear mounted ‘Trip/Neutral/Close’ switch shall be provided for testing of switchgear when ‘R/S’ selector switch is selected as ‘SWGR’.
- 4) Remote control commands i.e. start/stop, pulse type, shall be generated from DCS and shall be issued to Switchgear through interposing relays located in respective Switchgear.
- 5) The EPB (in LCS) shall be wired directly to switchgear. The EPB (in LCS)(stay put type) in SWGR supplier’s scope, shall be provided with press to lock and turn to release type, keyless mechanism. Under its locked position, the drive operation shall be inhibited.
- 6) Necessary electrical protections for the drive shall be realised at Switchgear, whereas process interlocks and protections are realised in DCS.
- 7) Following signal exchange shall take place between SWGR and DCS:
 - 1. Drive ON & OFF commands.
 - 2. Drive ON & OFF status feedback.
 - 3. Master Trip Relay (86 Relay) operated.
 - 4. Emergency Stop PB operated.
 - 5. Switch gear disturbed
 - 6. Breaker in service
 - 7. Current transducer (4-20mA type)
- 8) Auxiliary power supply to current transducers shall be provided from the control power supply of the respective switchgear.
- 9) SWGR Disturbed will come any of the following condition:
 - 1. Control supply failure
 - 2. Spring charged not ready
 - 3. BKR in not in service
 - 4. 86 operated
 - 5. Emergncy PB operated
 - 6. Trip circuit unhealthy

INVENTORY NO
SIGN. AND DATE
REF. DRG. NO.
COMPUTER FILE NAME
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REV.	DATE	ALTERED	REV.	DATE	ALTERED	REV.	DATE	ALTERED	REV.	DATE	ALTERED
		CHD/APPD			CHD/APPD			CHD/APPD	01	20.03.21	CHD/APPD
ZONE			ZONE			ZONE			ZONE		1) Document revised as per customer comments given on R00. 2) Changes are highlighted with blue colour & cloud marks.

BHARAT HEAVY ELECTRICALS LTD. HYDERABAD				NAME	SIGN.	DATE	NO.OF VAR.
DRN.	SUJATHA	sd/-	20.11.20				
CHD.	SUJATHA	sd/-	21.11.20				-N.A.-
APPD.	K. Anand	sd/-	23.11.20				
DEPT.	UNTOL. DIMS. GR. C/M/F	SCALE	WEIGHT (KG)	REF. TO ASSY. DRG.	ITEM NO.	NO.OF ITEMS	
CODE				-N.A.-	-N.A.-	-N.A.-	
TITLE				DRG. NO: PY-SC-4-M166-9301-01	REV.		
DRIVE CONTROL PHILOSOPHY				CUST. DRG. NO:	01		
				SHT. No	02	NO. OF SHT.	06

DCS Interface with LT MCC (LT)



Write-up:

- 1) Inter Posing Relays (IPR) shall be installed in MCC / SWGR.
- 2) Remote manual operation of Unidirectional LT drives shall be normally from Remote i.e. DCS in main Control Room through OWS.
- 3) Drives shall be provided with Local Emergency Stop Push Button (EPB).
- 4) Remote control commands i.e. start/stop, shall be generated from DCS and shall be issued to MCC through interposing relays located in respective MCC. DCS output command shall be latched in MCC.
- 5) The EPB shall be wired directly to switchgear. The EPB (stay put type) in MCC supplier's scope, shall be provided with press to lock and turn to release type, keyless mechanism. Under its locked position, the drive operation shall be inhibited.
- 6) Necessary electrical protections for the drive shall be realised at Switchgear, whereas process interlocks and protections are realised in DCS.
- 7) Following signal exchange shall take place between MCC and DCS:
 - 1. Drive ON & OFF commands.
 - 2. Drive ON & OFF status feedback.
 - 3. EPB operated.
 - 4. MCC distrubed (*Thermal O/L operated /Control supply fail/ EPB operated/ MCC switched off*).
 - 5. Current transducer (4-20mA type)
- 8) Auxiliary power supply to current transducers shall be provided from the control power supply of the respective switchgear.

(*) -> Interrogation voltage for commands & feedbacks shall be 24V DC and same shall be powered from DCS

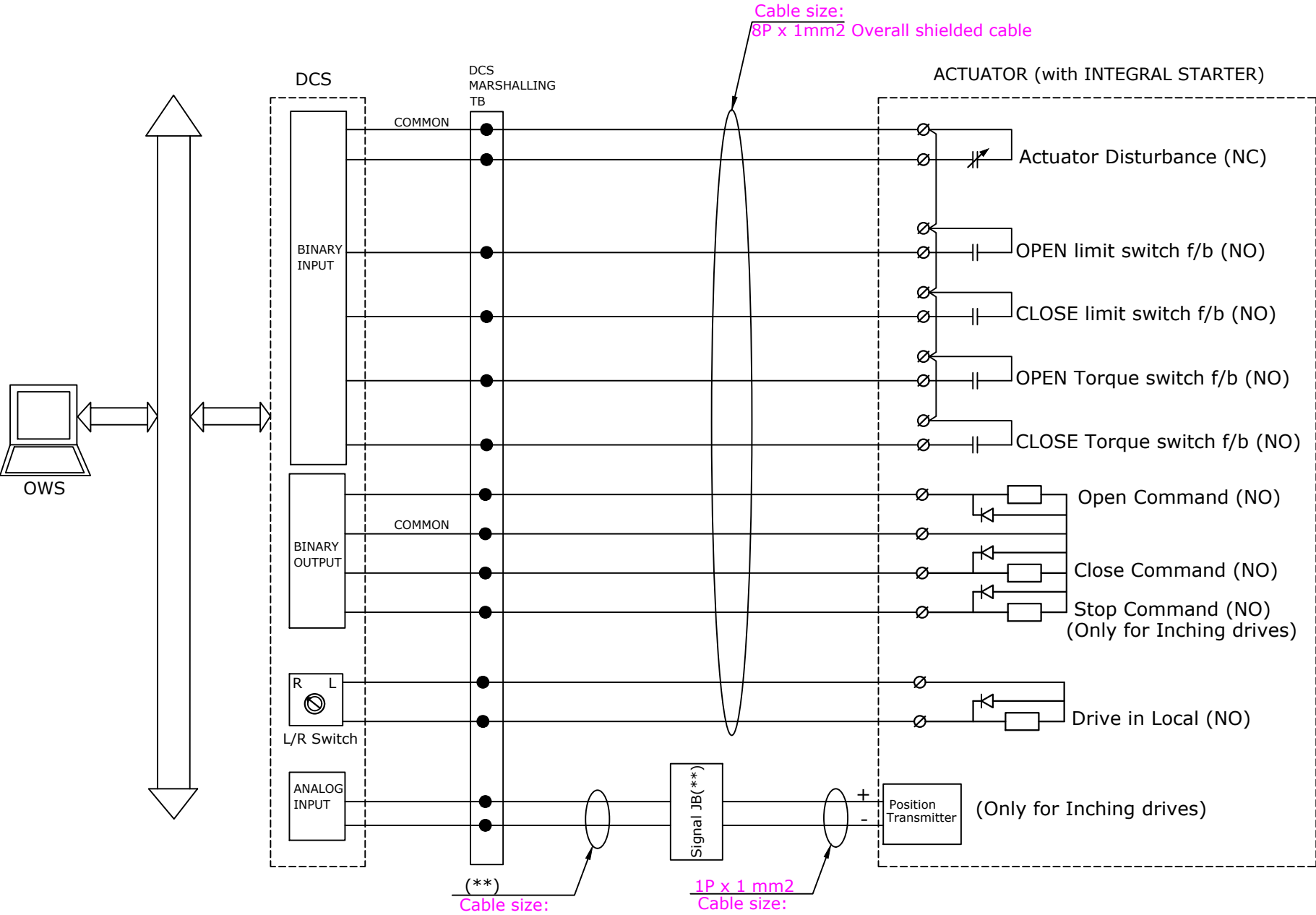
(##) -> SOE signal

INVENTORY NO. SIGN. AND DATE REF. DRG. NO. COMPUTER FILE NAME THE INFORMATION ON THIS DOCUMENT IS THE PROPERTY OF BHARAT HEAVY ELECTRICALS LIMITED. IT MUST NOT BE USED DIRECTLY OR INDIRECTLY IN ANY WAY DETRIMENTAL TO THE INTEREST OF THE COMPANY

REV.	DATE	ALTERED	REV.	DATE	ALTERED	REV.	DATE	ALTERED	REV.	DATE	ALTERED
		CHD/APPD			CHD/APPD			CHD/APPD	01	20.03.21	CHD/APPD
ZONE			ZONE			ZONE			ZONE		1) Document revised as per customer comments given on R00. 2) Changes are highlighted with blue colour & cloud marks.

BHARAT HEAVY ELECTRICALS LTD. HYDERABAD				NAME	SIGN.	DATE	NO.OF VAR.
DRN.	SUJATHA	sd/-	20.11.20				
CHD.	SUJATHA	sd/-	21.11.20				
APPD.	K. Anand	sd/-	23.11.20				-N.A.-
DEPT.	UNTOL. DIMS.	SCALE	WEIGHT (KG)	REF. TO ASSY. DRG.	ITEM NO.	NO.OF ITEMS	
CODE	GR. C/M/F			-N.A.-	-N.A.-	-N.A.-	
TITLE				DRG. NO: PY-SC-4-M166-9301-01	REV.		
DRIVE CONTROL PHILOSOPHY				CUST. DRG. NO:	01		
				SHT. No 03	NO. OF SHT.	06	

DCS Interface with Bi-Directional Drive



Write-up:

- 1) Inter Posing Relays (IPR) shall be installed in ACTUATOR.
- 2) All bi-directional drives shall have integral starter. Remote Manual operation of these drives shall be from Remote i.e. DCS in main Control Room through OWS.
- 3) Remote control commands i.e. open/close generated from DCS shall be issued to Integral Starter through interposing relays, mounted in Integral Starter.
- 4) For open/close duty bi-directional drives, DCS output command shall be latched in DCS, except for inching duty bi-directional drives where latching is not required.
- 5) Necessary electrical protections shall be realized at Integral Starter, whereas process interlocks and protection shall be realized in DCS.
- 6) Following signal exchange shall take place between Integral starter and DCS:
 - 1. OPEN & CLOSE commands.
 - 2. Valve STOP command (applicable only for Inching drives)
 - 3. Valve Open & Close status feedback.
 - 4. Valve Troque switch status
 - 5. Valve Postion feedback (applicable only for Inching drives)
 - 6. Actuator disturbance
- 8) Actuator disturbance / Collective fault shall be generated in Actuator when any of the follwoing fault condition arises:
 - Thermoswitch trip
 - Torque switch trip
 - Thermal overload relay trip
 - Power supply failure / Control supply failure / motor single phase fault annunciation
 - Jammed valve
 - Local stop when actuator in remote mode
 - Actuator in Local / off mode
- 9) MOVs shall be with integral starters and local isolator located on actuator.

(*) -> Interrogation voltage for commands & feedbacks shall be 24V DC and same shall be powered from DCS

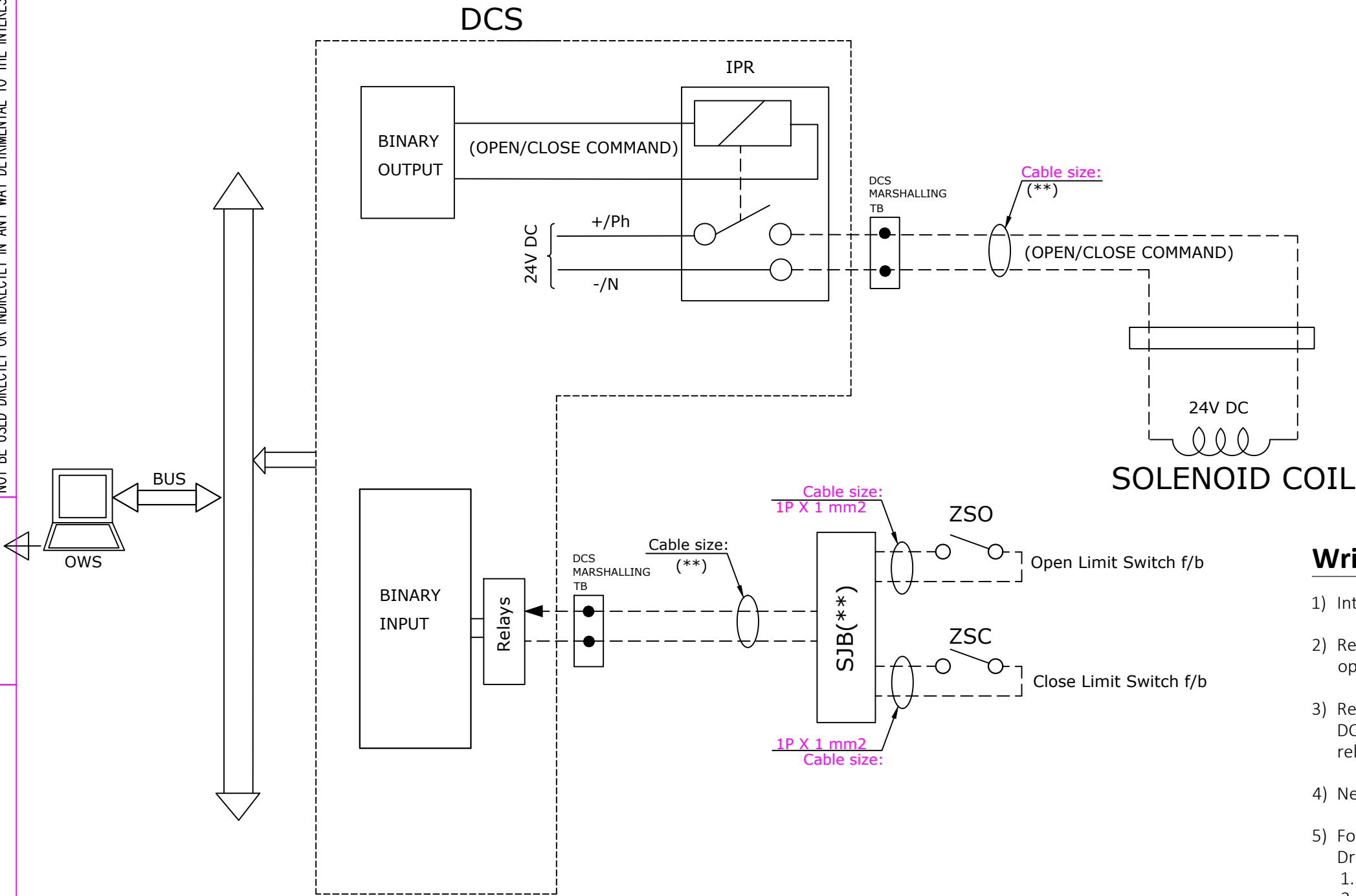
(**) -> For JB grouping and Cable sizes, refer Instrumentation cable schedule document

INVENTORY NO
SIGN. AND DATE
REF. DRG. NO.
COMPUTER FILE NAME
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REV.	DATE	ALTERED	REV.	DATE	ALTERED	REV.	DATE	ALTERED	REV.	DATE	ALTERED
		CHD/APPD			CHD/APPD			CHD/APPD	01	20.03.21	CHD/APPD
ZONE			ZONE			ZONE			ZONE		1) Document revised as per customer comments given on R00. 2) Changes are highlighted with blue colour & cloud marks.

BHARAT HEAVY ELECTRICALS LTD. HYDERABAD				NAME	SIGN.	DATE	NO.OF VAR.
DRN.	SUJATHA	sd/-	20.11.20				
CHD.	SUJATHA	sd/-	21.11.20				-N.A.-
APPD.	K. Anand	sd/-	23.11.20				
DEPT.	UNTOL. DIMS. GR. C/M/F	SCALE	WEIGHT (KG)	REF. TO ASSY. DRG.	ITEM NO.	NO.OF ITEMS	
CODE				-N.A.-	-N.A.-	-N.A.-	
DRIVE CONTROL PHILOSOPHY				DRG. NO: PY-SC-4-M166-9301-01	REV.		
				CUST. DRG. NO:		01	
				SHT. No 04	NO. OF SHT.	06	

DCS Interface for Solenoid (24V DC) operated ON-OFF valve



Write-up:

- 1) Inter Posing Relays (IPR) shall be installed in DCS.
- 2) Remote manual operation of the Solenoid operated drives shall be operable from remote i.e. DCS in main Control Room through OWS.
- 3) Remote control commands i.e. open/close shall be generated from DCS and shall be issued to the respective solenoid through interposing relays located in Interposing Relay panels (of DCS).
- 4) Necessary process interlocks shall be realized in DCS.
- 5) Following signal exchange shall take place between Solenoid Operated Drive and DCS:
 - 1. Valve OPEN & CLOSE commands.
 - 2. Valve Open & Close status feedback by means of limit switches.

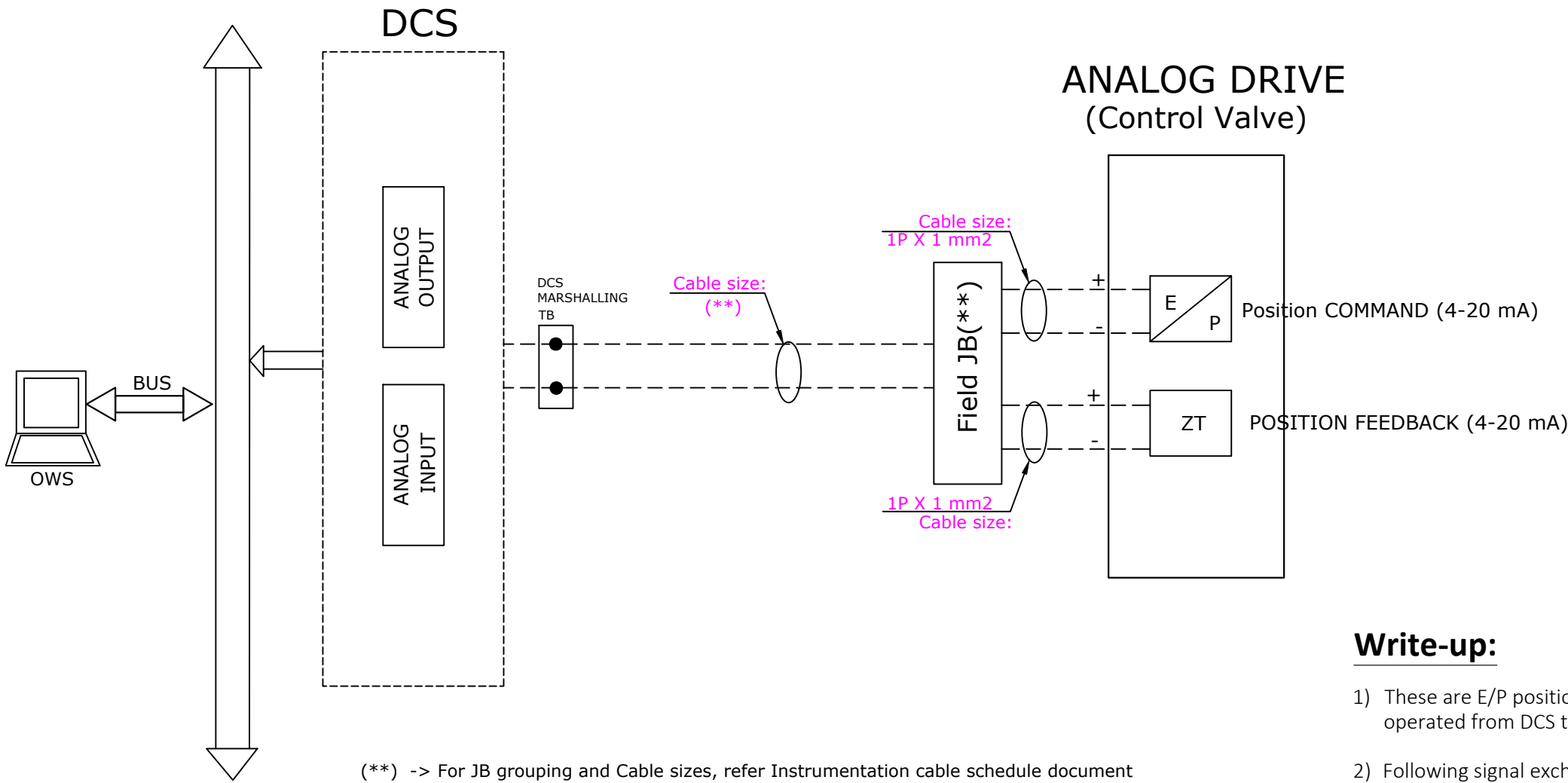
(**) -> For JB grouping and Cable sizes, refer Instrumentation cable schedule document

INVENTORY NO. SIGN. AND DATE REF. DRG. NO. COMPUTER FILE NAME THE INFORMATION ON THIS DOCUMENT IS THE PROPERTY OF BHARAT HEAVY ELECTRICALS LIMITED. IT MUST NOT BE USED DIRECTLY OR INDIRECTLY IN ANY WAY DETRIMENTAL TO THE INTEREST OF THE COMPANY

REV.	DATE	ALTERED	REV.	DATE	ALTERED	REV.	DATE	ALTERED	REV.	DATE	ALTERED
		CHD/APPD			CHD/APPD			CHD/APPD	01	20.03.21	CHD/APPD
ZONE			ZONE			ZONE			ZONE		1) Document revised as per customer comments given on R00. 2) Changes are highlighted with blue colour & cloud marks.

BHARAT HEAVY ELECTRICALS LTD. HYDERABAD				NAME	SIGN.	DATE	NO.OF VAR.
DEPT.	UNTOL. DIMS. GR.	SCALE	WEIGHT (KG)	DRN.	SUJATHA	sd/-	20.11.20
CODE	G/M/F			CHD.	SUJATHA	sd/-	21.11.20
TITLE				APPD.	K. Anand	sd/-	23.11.20
DRIVE CONTROL PHILOSOPHY				REF. TO ASSY. DRG.	-N.A.-	ITEM NO.	-N.A.-
				DRG. NO:	PY-SC-4-M166-9301-01	REV.	01
				CUST. DRG. NO:			
				SHT. No	05	NO. OF SHT.	06

DCS Interface for ANALOG DRIVE



(**) -> For JB grouping and Cable sizes, refer Instrumentation cable schedule document

Write-up:

- 1) These are E/P positioner operated Control valves and shall be operated from DCS through OWS using PID controllers.
- 2) Following signal exchange shall take place between Analog Drive and DCS:
 - 1. Valve OPEN/CLOSE commands through 4-20mA signal.
 - 2. Valve position feedback in 4-20mA signal.

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COMPUTER FILE NAME

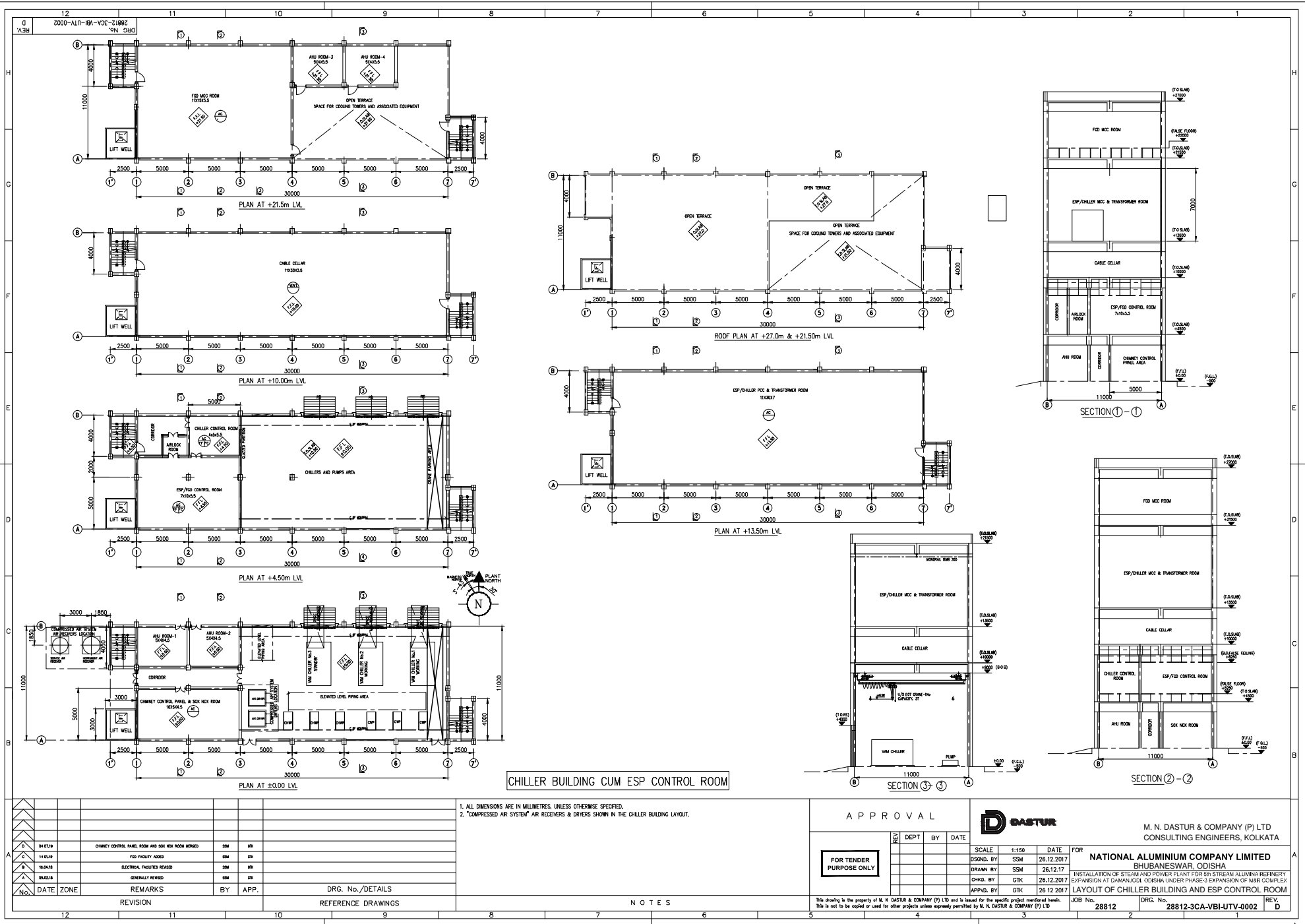
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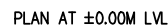
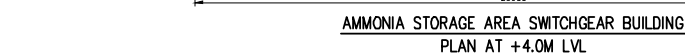
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ZONE			ZONE			ZONE			ZONE		

- 1) Document revised as per customer comments given on R00.
- 2) Changes are highlighted with blue colour & cloud marks.

BHARAT HEAVY ELECTRICALS LTD. HYDERABAD				NAME	SIGN.	DATE	NO.OF VAR.
				DRN.	SUJATHA	sd/-	20.11.20
				CHD.	SUJATHA	sd/-	21.11.20
				APPD.	K. Anand	sd/-	23.11.20
DEPT.	UNTOL. DIMS.	SCALE	WEIGHT (KG)	REF. TO ASSY. DRG.	ITEM NO.	NO.OF ITEMS	
CODE	GR. C/M/F			-N.A.-	-N.A.-	-N.A.-	
TITLE				DRG. NO: PY-SC-4-M166-9301-01	REV.		
DRIVE CONTROL PHILOSOPHY				CUST. DRG. NO:	01		
				SHT. No	06	NO. OF SHT.	06





SL. No.	DESCRIPTION	SCOPE OF WORK
1	11KV PANEL, TRANSFORMER BUSDUCT, 415V MCC, MDOB AND LTG. TR. AS MCC, LS MCC, PDB, UPS DB, UPS BATTERY AND MISC. BOARDS	BTG CONTRACTOR

NOTES: –

1. ALL DIMENSIONS ARE IN MM. AND LEVELS ARE IN METERS.
2. EQUIPMENT LAYOUT AND THE DETAILS OF PANELS ARE SHOWN FOR INDICATIVE PURPOSE.
3. REQUIRED ENTRY/EXIT LOCATIONS OF DOORS/WINDOWS WITH TYPE AND THE NECESSARY WALL OPENINGS FOR EQUIPMENT ERECTION, ETC SHALL BE INDICATED BY THE TENDERER.

A						
No.	DATE	ZONE	REMARKS	BY	APP.	DRG. No./DETAILS
REVISION						REFERENCE DRAWINGS
8			7			6

A P P R O V A L



M. N. DASTUR & COMPANY (P) LTD
CONSULTING ENGINEERS, KOLKATA

**FOR TENDER
PURPOSE ONLY**

REV	DEPT	BY	DATE

SCALE	1:125	DATE
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DSGND. BY	KNK	23.11.2018
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DRAWN BY	TS	23.11.2018
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CHKD. BY	KNK	23.11.2018
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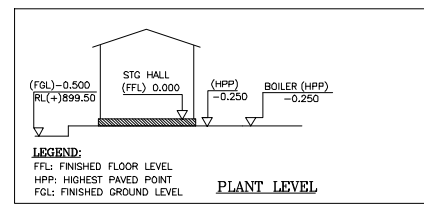
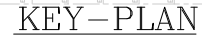
APPVD. BY	KEVR	23.11.2018
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FOR	NATIONAL ALUMINIUM COMPANY LIMITED
	BHUBANESWAR, ODISHA
	INSTALLATION OF STEAM AND POWER PLANT FOR 5th STREAM ALUMINA REFINERY
	EXPANSION AT DAMANJODI, ODISHA UNDER PHASE-3 EXPANSION OF M&R COMPLEX
	AMMONIA STORAGE AREA SWITCHGEAR BUILDING
	LAYOUT PLAN AND SECTION

LAYOUT PLAN AND SECTION		
JOB No.	DRG. No.	REV.

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NOTES

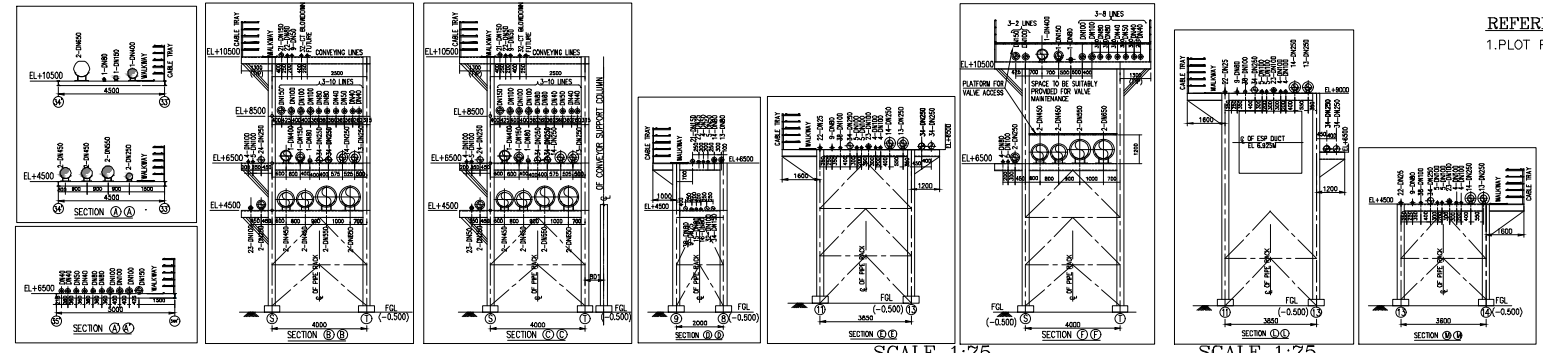
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2.ALL ELEVATIONS ARE IN METER
3.FFL EL (+) 0.00 of STG HALL corresponds to RL (+)900.000
4.REFER SHEET NO.03 FOR LEGEND (XX)
(for PROPOSED POWER PLANT FACILITIES)

LEGEND:

PIPE RACK PROPOSED:


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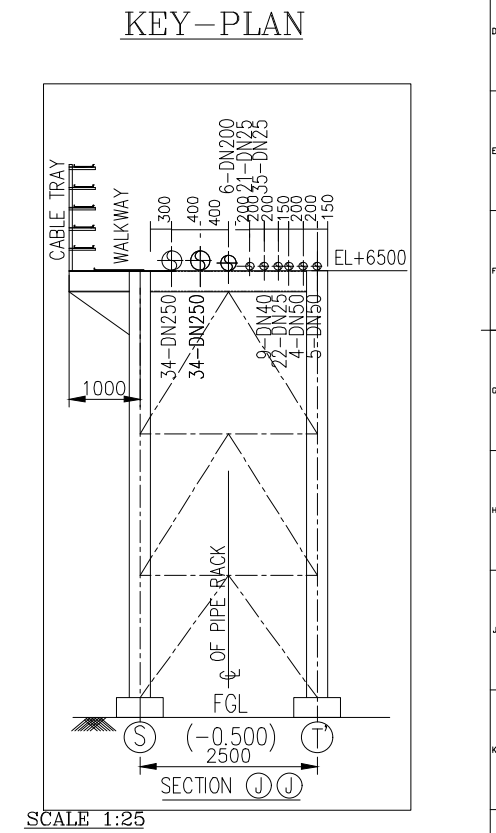
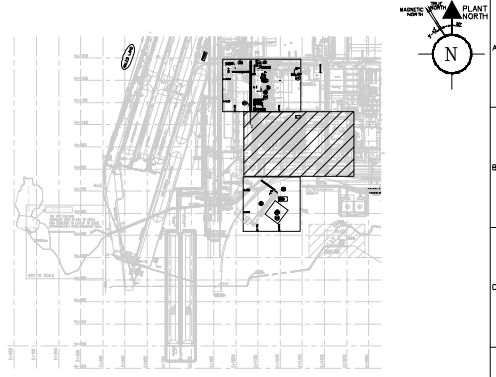
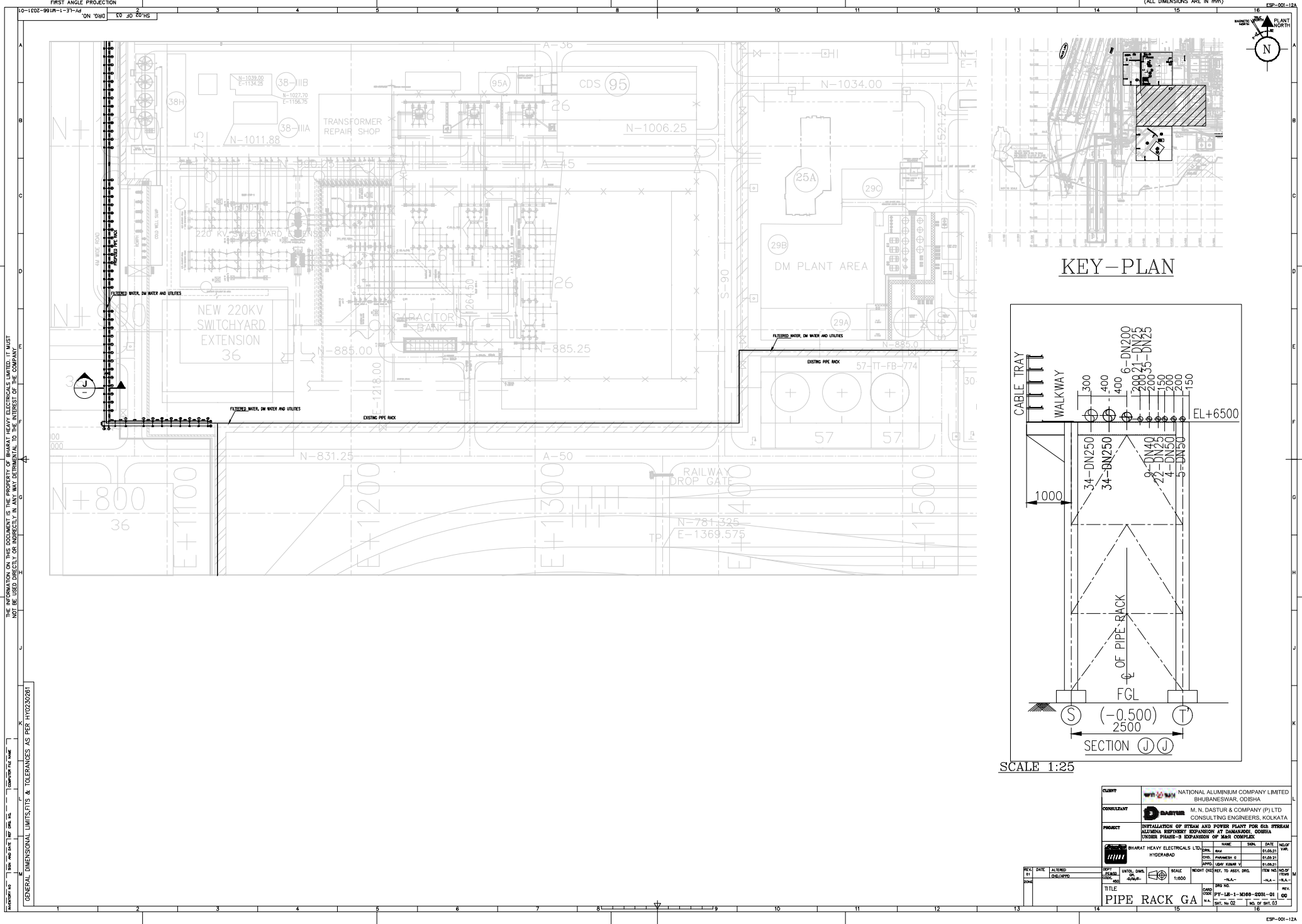
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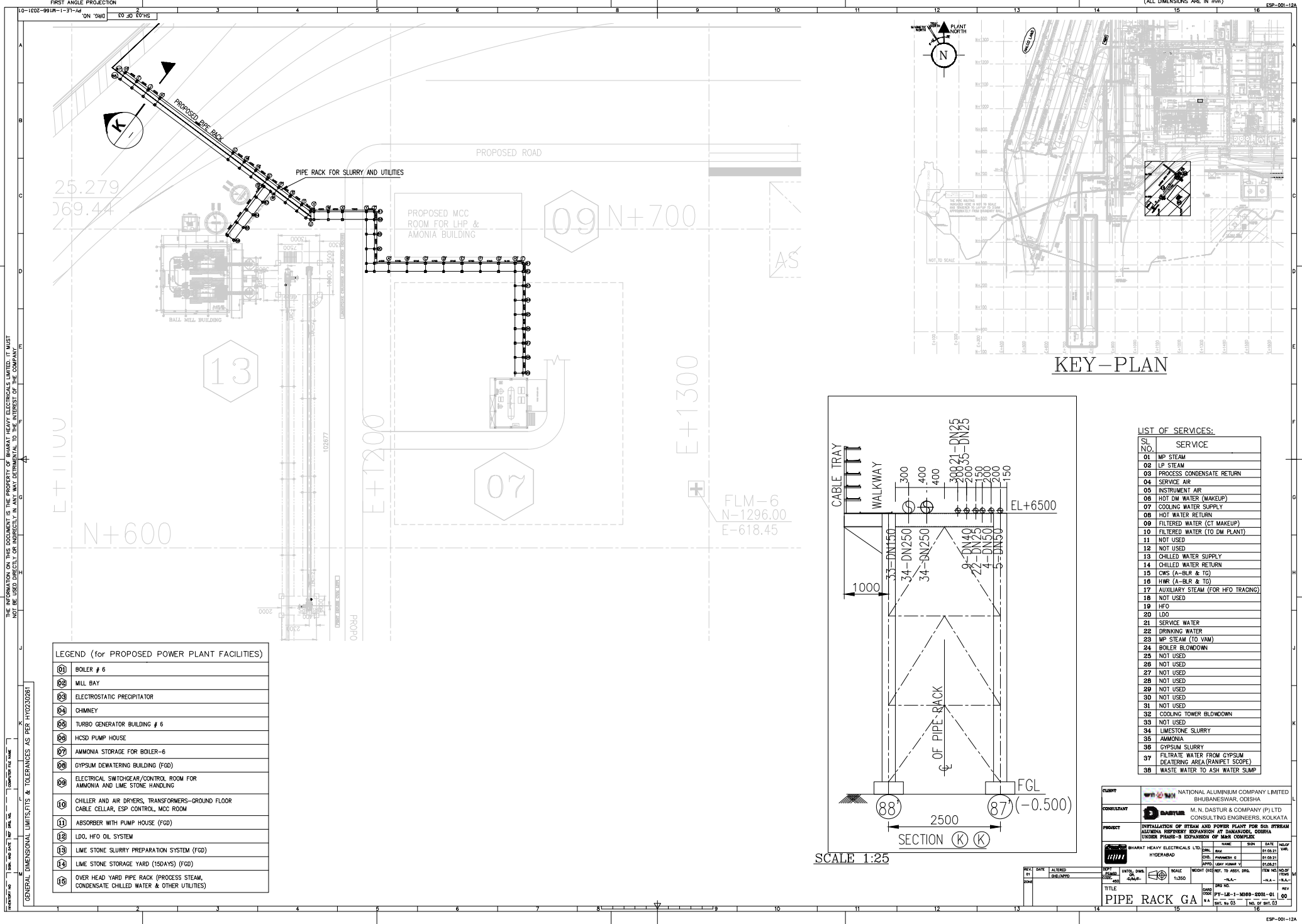
SCALE 1:75

SCALE 1:75

CUSTOMER	 NATIONAL ALUMINUM COMPANY LIMITED BHUBANESHWAR, ODISHA						
CONSULTANT	 M. N. DASGUPTA & COMPANY (P) LTD CONSULTING ENGINEERS, KOLKATA						
PROJECT	INSTALLATION OF STEAM AND POWER PLANT FOR SS STEAM ALUMINA REFINERY EXPANSION AT DAMARDIGI, GOINDIA UNDER PHASE - I						
	BHARAT HEAVY ELECTRICALS LTD. HYDRABAD		NAME	SIGN.	DATE	NELAP	
DEPT. CHARGE	DRAWN BY	ROD.	CHKD BY	DATE	NO. OF SHEETS	TOTAL NO. OF SHEETS	
INTL. DESK	SCALE	MOUNT	FOR: ASSESS. DRG.	ITEM NO.	REV.	REVISION	
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		A	SHEET NO. 01		NO. OF SHEET 03		



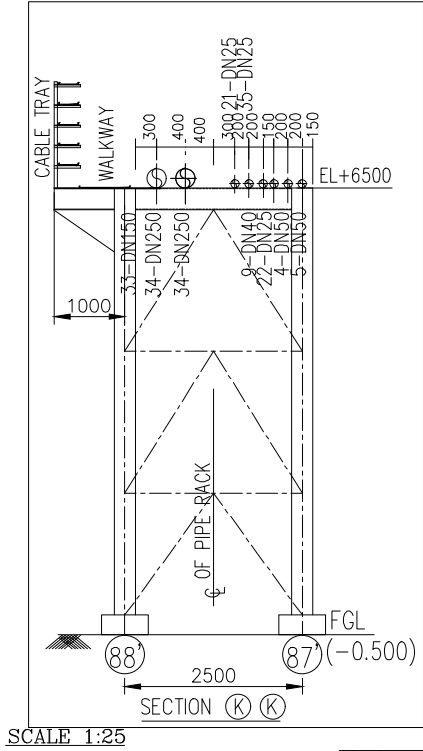
CLIENT		NATIONAL ALUMINIUM COMPANY LIMITED BHUBANESWAR, ODISHA					
CONSULTANT		M. N. DASTUR & COMPANY (P) LTD CONSULTING ENGINEERS, KOLKATA					
PROJECT		INSTALLATION OF STEAM AND POWER PLANT FOR GAS REFINERY ALUMINA REFINERY EXPANSION AT DAMANADI, ODISHA (UNDER PHASE-3 EXPANSION OF B&A COMPLEX)					
DRAWING		BHARAT HEAVY ELECTRICALS LTD HYDERABAD		NAME	SCALE	DATE	NO OF SHEETS
REV		DATE		BY	SCALE	DATE	NO OF SHEETS
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03		01/05/21		03	1:25	01/05/21	03
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GENERAL DIMENSIONAL LIMITS, FITS & TOLERANCES AS PER HYD-30261

LEGEND (for PROPOSED POWER PLANT FACILITIES)	
01	BOILER # 6
02	MILL BAY
03	ELECTROSTATIC PRECIPITATOR
04	CHIMNEY
05	TURBO GENERATOR BUILDING # 6
06	HCS PUMP HOUSE
07	AMMONIA STORAGE FOR BOILER-6
08	GYPSUM DEWATERING BUILDING (FGD)
09	ELECTRICAL SWITCHGEAR/CONTROL ROOM FOR AMMONIA AND LIME STONE HANDLING
10	CHILLER AND AIR DRYERS, TRANSFORMERS-GROUND FLOOR
11	CABLE CELLAR, ESP CONTROL, MCC ROOM
12	ABSORBER WITH PUMP HOUSE (FGD)
13	LDO, HFO OIL SYSTEM
14	LIME STONE SLURRY PREPARATION SYSTEM (FGD)
15	LIME STONE STORAGE YARD (15DAYS) (FGD)
16	OVER HEAD YARD PIPE RACK (PROCESS STEAM, CONDENSATE CHILLED WATER & OTHER UTILITIES)



LIST OF SERVICES:	
SL NO.	SERVICE
01	MP STEAM
02	LP STEAM
03	PROCESS CONDENSATE RETURN
04	SERVICE AIR
05	INSTRUMENT AIR
06	HOT DM WATER (MAKEUP)
07	COOLING WATER SUPPLY
08	HOT WATER RETURN
09	FILTERED WATER (CT (MAKEUP)
10	FILTERED WATER (TO DM PLANT)
11	NOT USED
12	NOT USED
13	CHILLED WATER SUPPLY
14	CHILLED WATER RETURN
15	CWS (A-BLR & TO)
16	HWR (A-BLR & TO)
17	AUXILIARY STEAM (FOR HFO TRACING)
18	NOT USED
19	HFO
20	LDO
21	SERVICE WATER
22	DRINKING WATER
23	MP STEAM (TO VAM)
24	BOILER BLOWDOWN
25	NOT USED
26	NOT USED
27	NOT USED
28	NOT USED
29	NOT USED
30	NOT USED
31	NOT USED
32	COOLING TOWER BLOWDOWN
33	NOT USED
34	LIMESTONE SLURRY
35	AMMONIA
36	GYPSUM SLURRY
37	FILTRATE WATER FROM GYPSUM DEATERING AREA (RANIPET SCOPE)
38	WASTE WATER TO ASH WATER SUMP

CUSTOMER

NATIONAL ALUMINIUM COMPANY LIMITED
BHUBANESWAR, ODISHA

CONSULTANT

M. N. DASTUR & COMPANY (P) LTD
CONSULTING ENGINEERS, KOLKATA

PROJECT

INSTALLATION OF STEAM AND POWER PLANT FOR 600 MW REFRAM ALUMINA REFINERY EXPANSION AT DANANAGH, ODISHA
(UNDER PHASE-B EXPANSION OF MARK COMPLEX)

DESIGNER

HYDERABAD

CHECKED BY

HYDERABAD

DATE

01.09.21

SCALE

1:350

WEIGHT

1:350


NO. OF SHEETS


16

TITLE

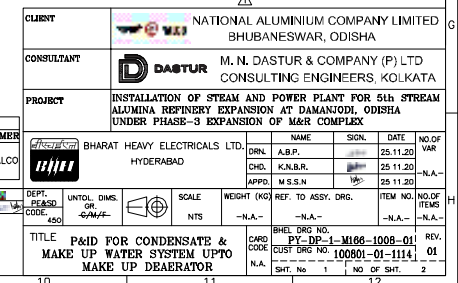
PIPE RACK GA

ESP-001-12A

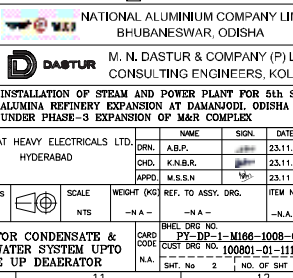
Form no/Rev no	PE&SD/ENGG/007			Doc. No :- PY-IS-4-M1XX-0000-01//6/E			
		AVAILABLE POWER SUPPLY LIST		PAGE 1 OF 2			
COPYRIGHT AND CONFIDENTIAL The information on this document is the property of BHARAT HEAVY ELECTRICALS LIMITED It must not be used directly or indirectly in any way detrimental to the interest of the company.		PROJECT: NALCO-DAMANJODI(1X18.5MW STG+300TPH BOILER) W.O NO: W-1085254800 CONTRACTS ENGINEER: Saroj Kumar, P Suresh, A V Suresh, Ch Mahesh, Shadab Ahmad, Srinivasa Rao K, A V V S Vara Prasad & G Monica.					
		DETAILS OF AVAILABLE POWER SUPPLIES :					
		Sl. No.	DESCRIPTION	VOLTAGE IN VOLTS /Variations	SYSTEM Ph/Hz, Variations	FAULT LEVEL (KA/ MVA)	Remarks
		01.	A.C. SUPPLY				
			a) Generation Voltage (ST Generator)	11KV (±10%)	3-Phase, 3W, 50Hz	N.A	NGT Grounding
			b) HV Auxiliary Supply for LV Distribution Transformers (11/0.433KV Dry type) (From 11KV H.T SWBRD-By Customer)	11KV (±10%)	3-Phase, 3W, 50Hz	40KA for 3Sec.	High Resistance Grounding
			c) Plant HV Auxiliary Supply for High Voltage Motors Above 180 kW (From 6.6KV H.T SWBRD-By Customer)	6.6KV (±10%)	3-Phase, 3W, 50Hz	40 kA for 3Sec	High Resistance Grounding
			d) Plant LT Auxiliary Supply For AC Motors & Non Motors other than VFD motors (0.18KW<=KW<=180KW) & All actuators and MOVs)	415V (±10%)	3-PH, 4W, 50Hz	50 kA for 1sec	Solidly Earthed.
			e) Single Phase AC supply (For Motor rating less than 0.18kW & For Space Heater)	240V (±10%)	1-Phase, 2W, 50Hz	N.A	With one point earthed
		Concurred	STANDARDS	Revisions:		Issued:	
Rev. No.	Rev. Date:			Prepared:	Checked:	Approved:	
		08/10/2020	CHM/AVS	Suresh P	Saroj Kumar		

Form no/Rev no		PE&SD/ENGG/007				Doc. No :- PY-IS-4-M1XX-0000-01//6/E			
				AVAILABLE POWER SUPPLY LIST		PAGE 2 OF 2			
COPYRIGHT AND CONFIDENTIAL The information on this document is the property of BHARAT HEAVY ELECTRICALS LIMITED It must not be used directly or indirectly in any way detrimental to the interest of the company.				PROJECT: NALCO-DAMANJODI(1X18.5MW STG+300TPH BOILER) W.O NO: W-1085254800 CONTRACTS ENGINEER: Saroj Kumar, P Suresh, A V Suresh, Ch Mahesh, Shadab Ahmad, Srinivasa Rao K, A V V S Vara Prasad.					
				DETAILS OF AVAILABLE POWER SUPPLIES :					
				Sl. No.	DESCRIPTION	VOLTAGE IN VOLTS /Variations	SYSTEM Ph/Hz, Variations	FAULT LEVEL (KA/ MVA)	Remarks
				--	f) Emergency Power supply (From 415V Emergency EMCC-BHEL and input from Customer DG)	415V (±10%)	3-Phase, 3W, 50Hz (±3%)	50 kA for 1sec	Solidly Earthed.
				02.	D.C. SUPPLY a) For Plant DC Supply for Control, protection, Breaker Feeders, Motors.	110V DC ±10%	2 Wire DC	25kA/ 1Sec	
				03.	UPS SUPPLY a) Plant UPS Supply for instrumentation/DCS/PLC Systems, etc.	230 V AC ±10%	1 Phase, 2W,50Hz ±3%,	25kA/ 1Sec	--
				b) UPS Supply for Critical Lighting	415V AC ±10%	3 Phase, 3W,50Hz ±3%	10kA/ 1Sec.	--	
Concurred STANDARDS		Revisions:		Issued: PROJECT ENGINEERING & SYSTEMS DIVISION					
		Rev. No.	Rev. Date:	Prepared:	Checked:		Approved:		
		00	08/10/2020	CHM/AVS	Suresh P		Saroj Kumar		

INVENTORY NO	SIGN. AND DATE	REF. DRG. NO.	COMPUTER FILE NAME
			NY-98-1-W204-1001-01-000-1033.DWG



CPD			CHD/APPD		CHD/APPD
	ZONE			ZONE	
		4		5	



413



Comments on Document/Drawing : P&ID FOR CONDENSATE & MAKE UP WATER SYSTEM UPTO MAKE UP DEARATOR Drawing no: ...PY-DP-1-M166-1008-01...		
S.No	NALCO/DASTUR OBSERVATION ON REV.00A (16.12.2020)	BHEL RESPONSE DATED 30.01.21
1	COMMENTS 1. INSTRUMENT TAG NUMBERS TO BE INDICATED 2. LINE TAG NUMBERS TO BE INDICATED	Noted and same are indicated in the revised document.
2	<u>sheet1. On S6 nozzle of condenser:</u> is it vacuum breaker ?	Please note, S6 nozzle is Bursting diaphragm. For description of nozzles please refer the GA drawing of condenser. Also note, vacuum breaker connection is shown in Turbine integral steam & drain flow P&ID as nozzle S18.
3	<u>sheet1. On CEP discharge header :</u> To show Analysers for conductivity & PH	Please note, SWAS sampling connection from CEP discharge is already considered and shown in Zone E5, sheet 1 of the P&ID and analysers for conductivity & PH are also considered. Please refer P&ID for SWAS for other details.
4	<u>sheet1. On CEP discharge header :</u> To show sample line	Please refer the reply in Sl. No. 3 above.
5	<u>sheet1. On CEPs:</u> To show VFD	As CEPs are small in rating, as per standard practice constant speed motors are envisaged for this application.
6	<u>sheet1. On individual CEP suction line:</u> To show PG connection	Please note, PT is already there is common suction line for remote indication of pressure in CEP sction line. There'll not be much pressure drop from common suction line to individual suction line. So, separate PG in individual lines are not required hence not provided.
7	<u>sheet2. On DM water line :</u> To show Analysers for PH	Please note, SWAS sampling connection from DM water header is already considered and shown in Zone G2, sheet 2 of the P&ID and analysers for DO2 & PH are also considered. Please refer P&ID for SWAS for other details.
8	<u>sheet2. On TP-1411 :</u> To change the description from security filtration to product filtration	Noted, same is updated in the revised document.
9	<u>sheet2. On refer note-6 :</u> CHECK	Noted, same is updated in the revised document.
10	<u>sheet2. On PSV set pressure of make up water tank :</u> To update	Please note, safety valve along with set pressure will be shown and indicated in Rev01 of P&ID for LP steam system. Please refer the same for details.
11	interconnection with existing makeup water tank (unit 4).refer tender P&ID 28812-3CA-VBA-UTL-0011A	Please note, as per the discussion with customer on 12.01.2021, we understood that customer requirement is to connect the return condensate lines individually to the make up water tank inline with the existing set up of make up water tank-4 of STG-5. As per the customer requirement individual connection of return condensate lines to make water tank is considered similar to the existing make up water tank-4 of STG-5. P&ID is revised to update arrangement inline with the above.
12	customer has Indicated hold on BHEL line sizes	Please note, individual Return condensate line sizes are finalised and indicated in the revised P&ID based on the maximum flows confirmed by the customer. BHEL has considered suitable expander or reducer to match the return condensate battery limit sizes and same is indicated in the revised P&ID.
13	To remove Preliminary block	Noted, same is removed in the revised document.
14	To update the title block, interlock summary table & Tag number table	Noted, same are updated in the revised document.

ANNEXURE-32

SI No.	Area	Eqpt Heat Disspation Rate (w)	Remarks
A	TG Hall Area		
1	Control Room at EL. 8.5M in TG Hall		
i	DCS OPERATOR ROOM-8.5M	4000	
ii	ELEC EQPT ROOM-8.5M	18000	
iii	VFD & UPS ROOM-8.5M	8000	
2	Switchgear Room at EL. 3.5M in TG Hall	64400	
3	Switchgear Room at EL. 12.0M in TG Hall	53000	
4	TG HALL OPERATING FLOOR (8.5M TO 18M)	58000	
B	Chiller cum ESP Bldg.		
6	ESP/Chiller MCC & Trafo Room-EL. 13.5M.	77000	
7	FGD/ESP MCC Room at EL. 21.5M	18000	
8	SWAS Room	1000	
9	Chimney Control Panel Area AT EL 0.0M	5000	
10	SOx & NOx Room at EL. 0.0M	6000	
11	Chiller Control Room at EL. 4.5M	1000	
12	ESP/FGD Control Room at EL. 4.5M	6000	
C	ASH HANDLING BLDG.		
13	CONTROL ROOM-ASH	6000	
14	Switchgear Room-ASH	30000	
D	COAL HANDLING BLDG.		
15	CONTROL ROOM-CHS	5000	
16	Switchgear Room-CHS	35000	
E	RCWPH		
17	CONTROL ROOM-RCWPH	5000	
18	Switchgear Room-RCWPH	35000	
F	Ammonia Storage Area		
18	Switchgear Room at EL. 4.5M	50000	
19	LDO PH- MCC Room	1000	
20	LDO PH- Control Room	1000	
21	Control Room- Ammonia Storage	1000	

Note: Above data may change slightly during detail engineering stage.


ANNEXURE-33

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Gauge Pressure Transmitter (PT) & Differential Pressure Transmitter (DPT) Technical Data Sheet							
GENERAL	1	Range & Qty.	Refer BOM (Annexure-I)	ACCESSORIES	29	Universal Mounting Bracket	Reqd, For 2" pipe mounting, SS304
	2	Type	Intrinsic Safe (or) EX 'd' type [Note-(a)]		30	U Clamp+Fastner	Reqd, SS 304
	3				31	Cable Glands (flame proof)	1 No's NI plated brass Double Compr.+Flameproof
	4	Ambient Temp Limit	- 30 to 80°C		32	Cable entry Plugs	Reqd, SS (1 No) + Flameproof
	5	Process Temp. Limit	- 40 to 120°C		33	Vent/Drain Plugs	Reqd, SS 304 (1 No)
SENSOR	6	Accuracy	a) For Range ≥ 760 mmWC: ±0.075% within a turndown of 1:10 of the offered span b) For Range < 760 mmWC: ±0.15% within a turndown of 1:10 of the offered span	ACCESSORIES	34	Tag Plate	Reqd, SS 304 (1 No) [Note-(b)]
	7	Response Time [Note-(g)& (h)]	As per OEM recommendation		35	Bolts + Nuts	Reqd. A193GrB7 + A194Gr2H
	8	Stability	As per OEM recommendation		36		
TRANSMITTER	9	Turn Down Ratio	As per OEM recommendation	TEST REPORT/CERTIFICATE	37		
	10	Process Connection	1/2" NPT (F)		38	Bill of Material (model, Tag no's)	100% Witness
	11	Electrical Connection	2 No's of 1/2" NPT (F)		39	Spares (BOM, part no's)	100% Witness (if ordered)
	12	Power Supply	24V DC, Loop Powered, 2 wire		40	Statutory approvals (PESO,BIS, etc)	100% Review (For Instrument+Glands+Plugs)
	13	Over Range Protection	As per Note-(j) given in this data sheet		41	Material compliance for housing	100% Review
	14	Protection	IP-65 as defined in IEC 60529 [Note-(c)]		42	Calibration	100% review & 10% or min 2no's witness with random selection.
	15	Zero & Span adjustment	Required.		43	Functional test (Output, HART, accuracy, Diagnosis, display)	100% review & 10% or min 2no's witness with random selection.
	16	Display	Integral LCD Digital (in Engg Units & in %).		44	Hydro test for pressure parts	100% Review
	17	Impulse Entry	-		45	Internal IR test for all cards, assembly	100% Review
	18	Load Resistance	600Ω @ 24 VDC		46	Ingress Protection Test	100% Review of Type test reports
	19	Output	4-20mA + HART		47	Intrinsic Safety Test	100% Review of Type test reports
	20	Diagnostic Features	Required.		48		
MATERIAL	21	Hazardous area class	Suitable for Zone-1, IIA/IB, T3.	PROJECT SPECIFIC	49		
	22	Body	SS316 (or) better		50	Manifold Type (MOC: SS316)	Integral; 2-Vlv for PTs and 5-vlv manifold for DPTs;
	23	Element	SS316 (or) better		51		
	24	Sensor O-Ring	Glass-filled PTFE/Teflon		52	Corrosive Protection	Required
	25				53	Terminal Block type	Integral, Non-fly leads
	26	Electronic Housing	Die cast aluminium with epoxy coating		54	Approved Makes / Vendors	As per approved vendor list
	27	Sensor fill fluid	Silicon Oil		55	Surge & Lightning protection	Required
	28	Humidity	0 - 100% RH		56	FRP-canopy	Required
				57			

NOTES::

- If Intrinsically safe item is not available for any instruments, then it must be Flame proof.
- Electronic Instruments shall have the following information stamped:
Instrument Tag No., Make & Model no., Serial number, Instrument Range, Calibrated Range, Body and element material, Power Supply, Area Certification & IP Class.
- Vendor shall submit the consolidated BOM sheet along with accessories of instruments, finalised make /models of instruments, etc for approval.
- GA drawings shall be submitted for approval (if applicable)
- Transmitter shall update the output at least 8 times a second unless otherwise specified
- The response time of the transmitter shall be considered as the sum of dead time and 63.2% step response time of the transmitter.
- Following to be taken care for DPTs:
 - All integral parts of the transmitter shall be suitable for the differential over-range in either direction equal to the full rated pressure of the body with the opposite side vented to atmosphere without permanent distortion or calibration error. For vacuum service, the element shall have under-range protection to full vacuum.
 - Transmitter shall indicate both DP & flow values.
- Unless specified otherwise, the over-range/static pressure protection of the transmitter shall be as follows;

Range of Transmitter (R)	Over range/ static pressure <N1>		Remarks
	Pressure Transmitter (kg/cm2)	Differential PressureTransmitter (kg/cm2)	
0 < R < 250 mm WC	20	20	<N1> However if the Over range/ static pressure value specified above is less than the maximum/ design pressure of service conditions, offered instrument shall be suitable for the maximum/ design pressure.
250 < R < 1000 mm WC	40	52	
250 < R < 1000 mm WC	40	70	
5000 < R < 10000 mm WC	40	160	
1 < R < 10 kg/cm2	40	160	
10 < R < 100 kg/cm2	160	210	
R > 100 kg/cm2	210	210	

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Differential Pressure Transmitter (DPT) with Remote/Diaphragm Seal- Technical Data Sheet

GENERAL	1	Range & Qty.	As per BOM (Annexure-1 of specification)	ACCESSORIES	28	Mounting Bracket	Reqd, For 2" pipe mounting, SS304
	2	Type	Electronic Smart,2-Wire		29	U Clamp+Fastner	Reqd, SS 304
	3	Principle of Sensor	Vendor Std.,		30	Cable Glands	1No's Ni Plated Brass, Double Compression
	4	Ambient Temp Limit	- 40 to 80°C		31	Cable entry Plugs	Reqd, SS 304 (1 No)
	5	Process Temp. Limit	- 40 to 120°C		32	Tag Plate	Reqd, SS 304 (1 No)
SENSOR	6	Accuracy	±0.1% of span or better	ACCESSORIES	33	Manifold Type	Integral 5-Way, 1/2" NPT(F), SS 316
	7	Response Time	As per OEM recommendation		34	Spacer ring & Plug	Required, SS, with SS316 Vent/Drain Plugs
	8	Stability	As per OEM recommendation		35	Diaphragm Assembly	SS316L, Flush flange type (Refer fig.1)
TRANSMITTER	9	Turn Down Ratio	100:1		36	Armoured Capillary	Reqd. 5 Mts, SS316L with PVC Coat
	10	Process Connection	As per tag list		37	Gasket	Reqd. Spiral Wound, SS
	11	Electrical Connection	2 Nos of 1/2" NPT (F)	TEST REPORT/CERTIFICATE	36	Bolts + Nuts	Reqd. A193GrB7 + A194Gr2H(min. 120mm long)
	12	Power Supply	24V DC, Loop Powered				
	13	Over Range Protection	As per flange Rating		37	5-Point Calibration	100% Review
	14	Protection	IP 65		38	Hydro test	100% Review
	15	Zero & Span adjustment	Required.		39	Material compliance	100% Review
	16	Display	Integral LCD Digital (in Engg Units & in %).		40	Functional Test	100% Review
	17	Impulse Entry	Not Applicable		41	Performance Test	100% Review
	18	Load Resistance	600Ω @ 24 VDC		42	Ingress Prot. Test	100% Review
	19	Output	4-20mA + HART		43	Intrinsic Safety Test	100% Review
	20	Diagnostic Features	Required.		44	Conformity Test	100% Review
					45	Internal tests (like IR etc.)	100% Review
MATERIAL	21	Hazardous area class	NA	PROJECT SPECIFIC			
	22	Body	SS316L		46	Certification	As per OEM recommendation
	23	Element	SS316L		47	Compartments	As per OEM recommendation
	24	Sensor O-Ring	Glass-filled PTFE/Teflon		48	Statutory Approvals	SIL2
	25	Electronic Housing	Die cast aluminium with epoxy coating		49	Sensor Type	Non-Inductive type.
	26	Sensor fill fluid	Silicon Oil		50	Corrosive Protection	Certified to ISA G3 class corrosion
	27	Humidity	0 - 100% RH		51	Terminal Block type	Integral, Non-fly leads
					52	Makes/ Vendors	As per approved vendor list

NOTES:


- a All integral parts of the transmitter shall be suitable for the differential over-range in either direction equal to the full rated pressure of the body with the opposite side vented to atmosphere without permanent distortion or calibration error. For vacuum service, the element shall have under-range protection to full vacuum.
- b The square root extraction for the differential pressure based flow measurement shall be carried out in DCS. Transmitter shall indicate both DP & flow values.

NOTES::		
	1	Above data sheet shall be used for inspection along with BOM sheet and Tag List.
	2	Tag list with process parameters shall be furnished by BHEL after P.O. placement
	3	Vendor shall submit the consolidated BOM sheet along with accessories of instruments, finalised make /models of instruments, etc for approval.
	4	GA drawings shall be submitted for approval (if applicable)
5		Items to be provided as per recommended vendor list only.

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Temperature Transmitter (TT) Technical Data Sheet							
GENERAL	1	Range & Qty.	Refer BOM (Annexure-I)	ACCESSORIES	29	Universal Mounting Bracket	Reqd, For 2" pipe mounting, SS304
	2	Type	Intrinsic Safe (or) EX 'd' type [Note-(a)]		30	U Clamp+Fastner	Reqd, SS 304
	3				31	Cable Glands (flame proof)	2 No's NI plated brass Double Compr.+Flameproof
	4	Ambient Temp Limit	- 30 to 80°C		32		
	5				33		
SENSOR	6	Input	2/3/4 wire RTD as per IEC751 and all types of T/C inputs as per IEC584 (both grounded/ ungrounded) with dual i/p	ACCESSORIES	34	Tag Plate	Reqd, SS 304 (1 No) [Note-(b)]
	7	Dual sensor inputs	Bumpless automatic switchover		35		
	8	Accuracy	For temp range > 350°C: ± 0.075% of full scale		36		
			For range between 150°C & 350°C: ± 0.15% of URL		37		
			For temp < 150°C: ± 0.2% of full scale		38		
	9	Updated Time & Response Time [Note-(g)& (h)]	As per OEM recommendation		39		
TRANSMITTER	8	Ref. Junction Compensation	Required (automatic for thermocouple sensors).	TEST REPORT/CERTIFICATE	40		
	9	Burnout protection	Required and selectable UP scale / DOWN scale		41	Bill of Material (model, Tag no's)	100% Witness
	10	Process Connection	Not applicable		42	Spares (BOM, part no's)	100% Witness (if ordered)
	11	Electrical Connection	2 No's of 1/2" NPT (F)		43	Statutory approvals like PESO, BIS, etc	100% Review (For Instrument+Glands+Plugs)
	12	Power Supply	24V DC, Loop Powered, 2 wire		44	Material compliance for housing	100% Review
	13	Configuration	By Hand Held Calibrator.		45	Calibration	100% review & 10% or min 2no's witness with random selection.
	14	Protection	IP-65 as defined in IEC 60529 [Note-(c)]		46	Functional test (Output, HART, accuracy, Diagnosis, display)	100% review & 10% or min 2no's witness with random selection.
	15				47	Hydro test for pressure parts	NOT APPLICABLE
	16	Display	Integral LCD Digital (in Engg Units & in %).		48	Conformity & update time test	100% Review of Type test reports
	17	Damping	0-32 Sec Adjustable		49	Ingress Protection Test	100% Review of Type test reports
	18	Load Resistance	600Ω @ 24 VDC		50	Intrinsic Safety Test	100% Review of Type test reports
	19	Output	4-20mA + HART		51		
MATERIAL	20	Diagnostic Features	Required.	PROJECT SPECIFIC	52		
	21	Hazardous area class	Suitable for Zone-1, IIA/IIB, T3.		53	Manifold Type	NOT APPLICABLE
	22				54	Pre-fab Hookup Drg	NOT APPLICABLE
	23				55	Corrosive Protection	Required
	24				56	Terminal Block type	Integral, Non-fly leads
	25	Electronic Housing	Dual compartment housing: YES		57	Approved Makes / Vendors	As per approved vendor list
	26	Electronic Housing	Die cast aluminium with epoxy coating		58	Surge & Lightning protection	Required
	27				59	FRP canopy	Required
	28	Humidity	0 - 100% RH		60		

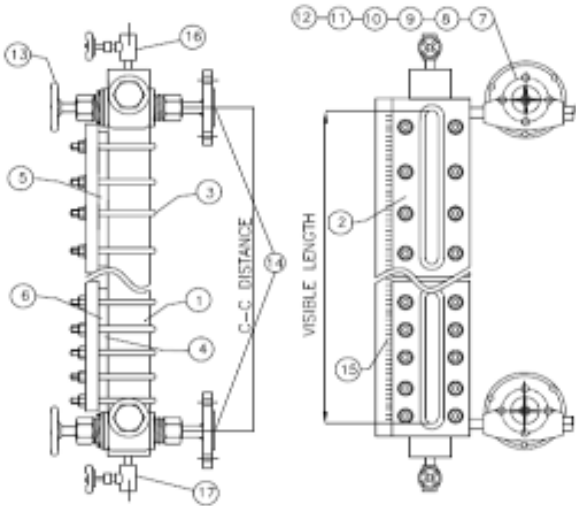
NOTES::

- If Intrinsically safe item is not available for any instruments, then it must be Flame proof.
- Electronic Instruments shall have the following information stamped:
Instrument Tag No., Make & Model no., Serial number, Instrument Range, Calibrated Range, Body and element material, Power Supply, Area Certification & IP Class.
- Vendor shall submit the consolidated BOM sheet along with accessories of instruments, finalised make /models of instruments, etc for approval.

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DATA SHEET for REFLEX type LEVEL GAUGE (SIDE MOUNTED)						
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GENERAL	1	Range & Qty.	Refer BOM (Annexure-I)	ACCESSORIES	11	Vent & Drain needle valve	2 No's; MOC: SS316; Size : ½" NPT(F)
	2	Type	Field mounted, Weather proof to IP 65		12	Tag Plate	Required, SS 316
	3	Ambient Temp Limit	0 to 50°C and 95% RH max; suitable for tropical climate, ambient of Ammonia & Sulphur; Copper and copper alloys shall be avoided for all the parts exposed to atmosphere.		13	Bolts + Nuts	Required. A193GrB7 + A194Gr2H
LEVEL GAUGE	4	Type	Reflex type		14		
	5	Body material	SS 316		15		
	6	Cover plate	SS 316		16		
	7	Glass	Toughened Borosilicate (Klinger/Moxos/Bont)		17		
	8	Gauge Valves	Required at top & bottom of gauge with auto shutoff ball check arrangement		18		
	9	Minimum Visible length	To be decided by vendor				
	10	Hydraulic test pressure	1.5 times of Design pressure @ room temp				
				TEST REPORT/CERTIFICATE	19	Bill of Material (model, dim., Ta	100% Witness
					20	Spares (BOM, part no's)	100% Witness (if ordered)
					21	Material compliance certificate	100% Review
					22	Hydraulic test	100% Review
					23	Radiography for weld joints	100% Review
					24	IBR in Form IIC (if applicable)	100% Review
					25	Ingress Protection Test	100% Review
					26		
					A	Makes/ Vendors	As per approved vendor list



BILL OF MATERIAL		
S.NO.	DESCRIPTION	MATERIAL
1	CHAMBER	S.S-316
2	COVER PLATE	S.S-316
3	U/BOLTS/NUTS	ASTM A193 Gr.-B7/A194 Gr.2H
4	GASKET	NON ASBESTOS
5	CUSHION	NON ASBESTOS
6	GLASS	TOUGHENED BOROSILICATE
7	VALVE BODY	S.S-316
8	VALVE BONNET	S.S-316
9	SPINDLE (TRIM)	S.S-316
10	BALL CHECK	S.S-316
11	RENEWABLE SEAT	S.S-316
12	VALVE PACKING	GRAFOL
13	HAND WHEEL	C.S
14	PROCESS CONN. (1"x300# RF)	S.S-316
15	SCALE	S.S-304
16	VENT NEEDLE VALVE 1/2" NPT(F)	S.S-316
17	DRAIN NEEDLE VALVE 1/2" NPT (F)	S.S-316

- (1) The elastic element material shall be as follows:
 - (a) For range ≤ 60 Kg/cm² - AISI-316 seamless drawn stainless steel tube, argon arc welded at AISI-316 forged or wrought stainless steel tube anchorage and tube end piece.
 - (b) For range > 60 Kg/cm² - AISI-316 bored stainless steel.

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Pressure Gauge - Diaphragm Seal (PGD) Technical Data Sheet



GENERAL	1	Range & Qty.	Refer BOM (Annexure-I)	MATERIAL	26	Case Material	SS304	
	2	Type / Std	Diaphragm Sealed / IS3624		27	Element Material	SS316 (minimum)	
	3	Ambient Temp Limit	0 to 65°C		28	Window Glass	3mm thick Shatter Proof glass	
	4				29	Pointer	Alluminium.	
GAUGE	5	Sensing Element	Diaphragm, SS 316		30	Blow out Disc	SS 304	
	6	Dial Size	150MM		31	Bezel ring	SS 316 (minimum)	
	7	Accuracy	±1% of full scale deflection		32	Movement	SS 304	
	8	Process Connection	1½” 300 # RF		33	Socket Material	SS 316 (minimum)	
	9	Instrument connection	½” NPT(M)		34	Tip material	SS 316 (minimum)	
	10	Solid Front Case	Required for toxic service or with ranges 0-100 kg/cm2(g) and above		35	Process Flange	SS 316	
	11	Blow out Disc	Required.		36			
	12	Over Range Protection	> 130% of full scale.		ACCESSORIES	37	Tag Plate	Required, 1 No per Gauge, SS304
	13	Protection	IP 65			38	Spacer Ring	Required, SS
	14	Zero & Span adjustment	External Required.			39	Vent+Drain plugs	Required, SS, In built to Spacer
	15	Anti-corrosive Dial	Non-Rusting Plastic, White background with black lettering & shall confirm to IS-3624			40	Armoured Capillary	Reqd. 3 Mts, SS316L with PVC Coat
	16	Micro meter Adjustment	Required for pointers.			41	Stud Nuts+Bolts	Reqd. A194Gr2H+A193GrB7 (Min 120mm long)
	17	Scale type	Concentric, Graduated units	42		Gasket	Reqd. Spriral Wound, SS	
	TEST REPORT/CERTIFICATE	18	Pointer-270° Deflection	Yes, Metal with Black Finish	43	Bill of Material (model, dim., Tag no's)	100% Witness	
		19	Pointer Stop	Required at both end	44	Spares (BOM, part no's)	100% Witness (if ordered)	
		20	Bezel ring	Bayonet Lock Type	45	Material compliance certificate	100% Review	
		21	Movement	Geared / Cam-roller type	46	Calibration	10% witness or min. 2 of each range	
		22	Fill fluid	Silicon	47	Over Protection Test for 30 min.	10% witness or min. 2 of each range	
		23			48	Accuracy Test	10% witness or min. 2 of each range	
		24			49	Vibration test	100% Review	
		25			50	Ingress Protection Test	100% Review	
				A	Makes/ Vendors	As per approved vendor list		


NOTES:


- The dial of all gauges shall have yellow, green and red bands to indicate respectively, the lower, middle and upper one-thirds of the calibrated range. This requirement shall be revisited during detailed engineering.



REMARKS:

- The elastic element material shall be as follows:
 - For range ≤ 60 Kg/cm2 - AISI-316 seamless drawn stainless steel tube, argon arc welded at AISI-316 forged or wrought stain less steel tube anchorage and tube end piece.
 - For range > 60 Kg/cm2 - AISI-316 bored stainless steel.

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Differential Pressure Gauge (DPG) Technical Data Sheet										
GENERAL	1	Range & Qty.	Refer BOM (Annexure-I)		ACCESSORIES	28	Mounting Bracket	Reqd, For 2" pipe mounting, SS304		
	2	Type	Bottom entry, 2" Pipe mounting			29	U Clamp+Fastner	Reqd, SS 304		
	3	Ambient Temp Limit	0 to 65°C			30				
	4	Static Pressure	As per Tag list			31				
	5					32	Vent/Drain Plugs	Required, SS 316 (1 No)		
GAUGE	6	Sensing material	Diaphragm in SS 316/ Bellows in SS 316		TEST REPORT/CERTIFICATE	33	Tag Plate	Required, 1 No per Gauge, SS304		
		Dial Size	150MM (6")			34	Bolts + Nuts	Reqd. A193GrB7 + A194Gr2H		
		Case & Bezel	SS 304, Bayonet type bezel			35				
	7	Windows	Toughened Glass with rubber ring			36				
	8	Accuracy	±1.6% of full scale deflection or Better			37				
	9	Process Connection	1/2" NPT(F)			38	Bill of Material (model, Tag no's)	100% Witness		
	10	Blow out Disc	Required.			39	Spares (BOM, part no's)	100% Witness (if ordered)		
	11	Over Range Protection	> 130% of full scale.			40	Material compliance certificate	100% Review		
	12	Ingress Protection	IP 65			41	Calibration	10% witness or min. 2 of each range		
	13	Zero & Span adjustment	External Required.			42	Over Protection Test for 30 min.	10% witness or min. 2 of each range		
	14	Anti-corrosive Dial	Aluminum, White with black figure & shall confirm to IS-3624			43	Accuracy Test	10% witness or min. 2 of each range		
	15	Micro meter Adjustment	Required for pointers.			44	Vibration test	100% Review		
	16	Scale type	Concentric, Graduated units			45	Ingress Protection Test	100% Review		
	17	Pointer-270 ^o Deflection	Yes, Metal with Black Finish			46				
	18	Pointer Stop	Required at both end			47				
	19	Bezel ring	Bayonet Lock Type			48				
	20	Movement	Geared / Cam-roller type			49				
	MATERIAL	21				PROJECT SPECIFIC	50	Manifold Type	5-vlv manifold(Compatible to DPG)	
		22	Case Material	SS304			51	Pre-fab Hookup Drg	Not applicable	
		23	Element & Wetted parts	SS316 (minimum)			52	Makes/ Vendors	As per approved vendor list	
24		Windows	3mm thick Shatter Proof glass		53					
25		Pointer	Aluminum.		54					
26		Movement	SS 304		55					
27		Socket Material	SS 316 (minimum)		56					
NOTES:										
1	The dial of all gauges shall have yellow, green and red bands to indicate respectively, the lower, middle and upper one-thirds of the calibrated range. This requirement shall be revisited during detailed engineering.									

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Pressure Swith (PS) & Differential Pressure Switch (DPS) Technical Data Sheet							
GENERAL	1	Range & Qty.	Refer BOM (Annexure-I)	MATERIAL	24	Mounting Bracket with U clamp and fasteners	Suitable for 2" pipe mounting, MOC: SS304; 1 Set per Switch
	2	Type	Field mounted, Weather proof, Blind pressure switch		25	Cable Glands with Slipper type PVC sleeves cable shrouds	Nickel plated brass Double Compression type; 2 No's per switch
	3	Ambient Temp Limit	0 to 65°C		26	Cable entry Dummy Plugs	Required, SS 304 ; 1 No per switch
	4				27	Tag Plate	Required, SS 316
SWITCH	5	Switching differential	Adjustable	ACCESSORIES	28	Bolts + Nuts	Required. A193GrB7 + A194Gr2H
	6	Switch type	Auto reset with internal Adjustable snap action micro switch, hermetically sealed		29		
	7	Contact rating	2 SPDT, 5A @ 240 V AC & 1A @ 24 V DC		30		
	8	Set point adjuster & terminal block	Shall be inside the switch housing. a) Internal setpoint b) Differential adjustment		31		
	9	Repeatability	± 0.5 % of full scale range		32		
	10	Accuracy	± 1 % of full scale range		33		
	11	Safe working/Static pressure	180 Kg/cm2(g) or less (exact details shall intimated after P.O. placement)		34		
	12	Process Connection	As per tag list		35		
	13	Instrument connection	1/2" NPT (M)		36		
		Electrical Connection	2 No's of 1/2" NPT (F)		37	Manifold Type	Three valve- 1/2" NPT for PS Five Valve - 1/2" NPT for DPS (M.O.C-SS316)- Barstock manifold
	14	Protection	Weather proof to IP 65		38		
	15	Over Range protection	150% of Full scale		39	Bill of Material (model, dim., Tag no's)	100% Witness
	16	Impulse Entry	Side / Bottom (Shall be finalized at the datasheet approval)		40	Spares (BOM, part no's)	100% Witness (if ordered)
	17	Sensing material	SS 316L Diaphragm sealed piston		41	Material compliance certificate	100% Review
	18	Wetted parts	SS316		42	Statutory approvals (main inst & accessories) like CCOE/PESO, BIS, etc	10% witness or min. 2 of each range
	19	Case	SS304		43	Over Protection Test for 30 min.	10% witness or min. 2 of each range
	20	Humidity limits	0 - 100% RH		44	Calibration certificate	10% witness or min. 2 of each range
	21	Setter Scale	Black graduation on white linear scale. Graduation 0-100% with red pointer for set points		45	Hydro test for pressure parts	100% Review
	22	Terminal Block	Suitable for full ring lugs		46	Ingress Protection Test	100% Review
23			A	Makes/ Vendors	As per approved vendor list		
NOTES: 1							
REMARKS: (1) (a) (b)							

 HYDERABAD		PRODUCT STANDARD PROJECT ENGINEERING & SYSTEMS DIVISION HYDERABAD		Annexure-2 of PY56559 REV. 00				
Thermocouple (T/C) With ThermoWell (TW) Technical Data Sheet								
GENERAL	1	Range & Qty.	As per BOM (Annexure-1 of specification)		29	TW Const.	Drilled Bar Stock	
	2	Type	K-Type.		30	TW material	SS 316	
	3	Ambient Temp Limit	- 40 to 80°C		31	Insertion length "L1"	As per note-b below & suitable as per wake frequency.	
					32	Extension length "N1"	100mm	
					33	Process Connection.	Screw (M33/2)	
ELEMENT SPECIFICATION	4	Sensor Type	Duplex ungrounded, Insulated, filled with MgO		34	rating	As per BOM (Annexure-1 of specification) (Suitable for Pressure :40Kgf/cm2 & temprature 450 degC) or (Suitable for Pressure :40 to 250Kgf/cm2 & temprature 450 degC)	
	5	Leads	Hermitically sealed		35			
	6	Accuracy	ClassA/Class1 as per IEC751 / ANSI MC96.1(special Class)		36	Instrument connection	½" NPT(F)	
	7	Instrument connection	1/2" NPT(M)		37	Bore diameter	Suitable to TE stem diameter	
	8	Head Type/Connection	Screwed / 1/2" NPT (F)		38	Compatibility (TC+TW)	10% or min. 2 of each range / type	
	9	Protection	IP 65		39	Functional Test	10% or min. 2 of each range / type	
	10	Sensor Wire Size	20 AWG for duplex type-Refer note-a		40	Calibration & Accuracy	10% or min. 2 of each range / type	
	11	Element outer dia	6 MM(min.)					
	12	Element Length	Suitable to reach at bottom of TW		40	Material compliance	100% Review	
	13	Hot Junction	Ungrounded		41	Internal Test Reports	100% Review	
	14	Terminal Block	Screw Type		42	Calibration	100% Review	
	15	Electrical Connection	2 Nos of 1/2" NPT (F)/3/4" NPT(F)		43	Functional test	100% Review	
	16	Immersion Adjustment	Required, 100mm to 300mm		44	Ingress prot. Test	100% Review	
	17	Thermoelectric properties	as per ANSI MC 96.1		45	Over Temp Stability	100% Review	
					46	StatutoryApprovals	NA	
	ACCESSORIES	18	Adjustable, 3-piece union	Required for 150 MM.				
		19	Cable Glands	2 No's Ni Plated Brass Double Compression		47	Compatibility (TG+TW)	10% or min. 2 of each type
20		Cable entry Plugs	Reqd, SS 304 (1 No)		48	Dimensional Check	10% or min. 2 of each type	
21		Cap Chain	Reqd, SS 304		49	Hydrotest	10% or min. 2 of each type	
22		FRP canopy	NA					
MATERIAL	23	Hazardous area class	NA		50	Material compliance	100% Review	
	24	Case	SS304		51	Radiography	100% Review	
	25	Sheath	SS316		52	Dimensional Check	100% Review	
	26	Head	SS304		53	Hydrotest	100% Review	
	27	Terminal Block	Heat Resist Ceramic		54	Liquidd penetration test	100% Review for weld joints	
	28	Tag Plate	SS304		55	IBR Form-IIIC	100% Review	
				56	PMI test-SS & AS	100% Review		
				57	Wake Frequency calc.	100% Review as per PTC 19.3 TW: latest standard Refer*		
For process temperature above 200 DegC, thermocouple to be considered.								
NOTES ::				A Makes/ Vendors		As per approved vendor list		
a) Both the element shall terminate through TT and then Junction box								
* Thermowell in higher velocity steam services shall be checked with Strouhal's frequency limit to arrive at safer size & design of thermowell.								
b) Line/Pipe OD								

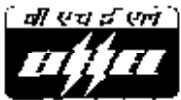
ESP-001-2A Rev.00	 		PRODUCT STANDARD PROJECT ENGINEERING & SYSTEMS DIVISION HYDERABAD		Std. / Doc. Number		
					Annexure-(II) of PY56559		
					Rev. No.	00	
RTD With ThermoWell (TW) Technical Data Sheet							
GENERAL	1	Range & Qty.	Refer BOM (Annexure-I)	THERMOWELL	31	TW Const.	Drilled Bar Stock
	2	Type	3-Wire, PT100, Duplex		32	TW material	SS 316 /446 & Inconel for temp > 600°C
	3	Enclosure	Intrinsic Safe (or) EX 'd' type [Note-(a)]		33	Insertion length "U"	Refer BOM (Annexure-I of PY56552)
	4				34	Dimension	Tapered from 28mm to 18 mm (min.) (or) Higher to suit to Wake frequency calulations
	5				35	Process Conn.	Refer BOM (Annexure-I of PY56552)
	6				36		
ELEMENT SPECIFICATION	7	Sensor Type	Duplex, Insulated, filled with MgO	THERMOWELL	37	Instrument connection	½” NPT(F)
	8	Leads	Hermitically sealed		38	Bore diameter	Suitable to TE stem dia (i.e. 9MM)
	9	Accuracy	As per IEC 60751,CLASS-A		39		
	10	Instrument connection	1/2" NPT(M)		40		
	11	Head Type/Connection	Screwed / 1/2" NPT (F)		41		
	12	Protection	IP 65		42		
	13	Sensor Wire Size	1.5 sqmm		43		
	14	Element outer dia	8 MM		44	Material compliance	100% Review
	15	Element Length	Suitable to reach at bottom of TW		45	Internal Test Reports	100% Review
	16	Hot Junction	Grounded/Ungrounded		RTD TESTS / CERTIFICATES	46	Compatibility (RTD+TW)
17	Terminal Block	Screw Type	47	Calibration & Accuracy		10% or min. 2 of each range / type	
18	Electrical Connection	2 Nos of 1/2" NPT (F)	48	Ingress prot. Test		100% Review	
19	Immersion Adjustment	Required; 100mm to 300mm	49	Over Temp Stability		100% Review	
20	Adjustable, 3-piece union	Required for 150mm	50	Statutory Approvals		PESO (For Instrument + Glands + Plugs)	
ACCESSORIES	21	Cable Glands (Exproof)	1No's Ni plated brass Double Compression	THERMOWELL TESTS/CERTIFICATES	51		
	22	Cable entry Plugs	Reqd, SS (1 No) + Flameproof		52		
	23	Cap Chain	Reqd, SS 304		53	Dimensional Check	10% or min. 2 of each type
	24	FRP canopy	Required		54	Hydrotest	10% or min. 2 of each type
MATERIAL	25	Hazardous area class	Suitable for Zone-1, IIA/IIB, T3.		55	Material compliance	100% Review
	26	Case	SS304		56	Radiography	100% Review (if applicable)
	27	Sheath	SS316		57	Hydrotest	100% Review
	28	Head	SS316		58	Liquidd penetration test	100% Review for weld joints
	29	Terminal Block	Heat Resist Ceramic		59	IBR Form-IIIC (TW)	100% Review
	30	Tag Plate	SS		60	Wake Frequency calc.	100% Review as per latest ASME PTC19.3 standard
					61		
					62		

A Makes/ Vendors

As per approved vendor list

NOTES::

- If Intrinsically safe item is not available for any instruments, then it must be Flame proof.
- Deleted
Vendor shall carryout the Wake Frequency Calculations (WFC) [after receipt of tag list and process data] and thermowell dimensions shall be finalised based on approved WFC report.
- Vendor shall submit the consolidated BOM sheet along with accessories of instruments, finalised make /models of instruments, etc for approval.
- GA drawings shall be submitted for approval.


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			Annexure-(II) of PY56559	
			Rev. No.	00

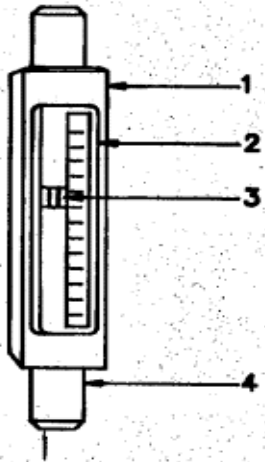
Temperature Gauge (TG) With Thermowell (TW) Technical Data Sheet

GENERAL	1	Range & Qty.	Refer BOM (Annexure-I)	THERMOWELL	34	TW Const.	Drilled Bar Stock
	2	Type	Every angle type		35	TW material	SS 316 /446 & Inconel for temp > 600°C
	3	Ambient Temp Limit	- 40 to 80°C		36	Insertion length "U"	Refer BOM (Annexure-I of PY56552)
	4				37	Process Connection	Refer BOM (Annexure-I of PY56552)
	5				38	Dimension	Tapered from 28mm to 18 mm (min.) (or)
GAUGE SPECIFICATION	6	Sensor Type	Bi-Metallic		39		Higher to suit to Wake frequency calulations
	7	Dial Size	150MM (6")	TEST REPORT/CERTIFICATE	40		
	8	Accuracy	±1% of full scale deflection		41	Instrument connection	½" NPT(F)
	9	Instrument connection	1/2" NPT(M)		42	Bore diameter	Suitable to TG/TE stem dia (i.e. 9MM)
	10	Over Range Protection	> 130% of full scale.		43		
	11	Protection	IP 65		44		
	12	Zero & Span adjustment	External / Internal		45		
	13	Anti-corrossive Dial	Aluminum, White with black figure & shall confirm to IS-3624		46		
	14	Micro meter Adjustment	Required for pointers.		47		
	15	Scale type	Concentric, Graduated units		48		
	16	Pointer-270° Deflection	Yes, Metal with Black Finish		49	Bill of Material (model, Tag no's)	100% Witness
	17	Stem outer dia	8 MM		50	Spares (BOM, part no's)	100% Witness (if ordered)
	18	Adjustable, 3-piece union	Required for 150 MM.		51	Compatibility (TG+TW)	10% or min. 2 of each range / type
	19	Immersion Adjustment	Required, 100mm to 300mm		52	Material compliance (TG+TW)	100% Review
	20	Bezel ring	Bayonet Lock Type		53	Calibration & Accuracy test for TG	10% or min. 2 of each range / type
	21	Movement	Geared / Cam-roller type		54	Ingress Protection Test for TG	100% Review
	22	Pointer Stop	Required at both end		55	Over Temp Stability for TG	100% Review
	23	Case	SS304		56	Dimensional Check	10% or min. 2 of each type
	24	Stem	SS316		57	Radiography for weld joints	100% Review
MATERIAL	25	Window Glass	Shatter Proof or Crystal clear glass of 3mm thickness (min.)		58	Hydrotest	100% Review
	26	Tag Plate	SS 304.		59	Liquidd penetration test	100% Review for weld joints
	27	3 piece Union	SS304		60	IBR Form-IIIC (TW)	100% Review
	28	Pointer	Alluminium.		61	Wake Frequency calculation	100% Review as per PTC 19.3 TW: 2010
	29	Bezel Ring	SS 304		62		
	30	Temperature Bulb	Min. SS 316		63		
	31				64		
	32				65		
	33				A	Makes/ Vendors	As per approved vendor list

NOTES::

- Deleted
- Vendor shall carryout the Wake Frequency Calculations (WFC) [after receipt of tag list and process data] and thermowell dimensions shall be finalised based on approved WFC report.
- Vendor shall submit the consolidated BOM sheet along with accessories of instruments, finalised make /models of instruments, etc for approval.
- GA drawings shall be submitted for approval (if applicable)
- The dial of all gauges shall have yellow, green and red bands to indicate respectively, the lower, middle and upper one-thirds of the calibrated range. This requirement shall be revisited during detailed engineering.

		PRODUCT STANDARD PROJECT ENGINEERING & SYSTEMS DIVISION HYDERABAD		Annexure-2 of PY56559 REV. 00			
ROTAMETER Technical Data Sheet							
GENERAL	1	Range & Qty.	Refer BOM (Annexure-I)	ACCESSORIES	19	Cable Glands	NA
	2	Type	Air flow ,Float type		20	Cable entry Plugs	NA
	3	Process fluid	Air +Saturated Steam		21	Tag Plate	Reqd, SS 304
	4	OperatingDensity, Viscosity	1.219Kg/m3,0.02CP				
	5	Operating Pressure,temperature	1.1ATA,70 Deg C		22	Gasket	SS 316, Spiral wound type.
SPECIFICATION	6	Orientation	Top & Bottom/Bottom side shall be after PO		23	Screws/Hinges	SS
	7	Case	Sides with mild steel,front & back: Acrylic		24		
	8	End connection	1.5",300#RF with counter Flanges, Gaskets, and Fasteners.				
	9	Float	SS-316	TEST / CERTIFICATE	25	Dimensional Check	100 % Witness
	10	Tube	Toughened Borosilicate		26	BOM verification & Visual check	100 % Witness
	11	Flange	Carbon steel		27	Tag Plate Marking	100 % Witness
		Gland Packing	Teflon		28	Calibration test	100%, Certificate review
	12	Scale length	250mm		29	Hydrostatic test at 1.5 times of max pressure.	100%, Certificate review
	13	End fitting	SS316		30	Material compliance	100 % Certificate Review
	14				31		
	15	Accuracy	(+) / (-) 1% of full scale		32	Strength, Transparency, dimensions for glass tube	100 % Witness
	16	Direction of Flow to be marked on Rotameter	YES		33		
	17						
18			A	Makes/ Vendors	As per approved vendor list		



1. CASE

2. TUBE

3. FLOAT


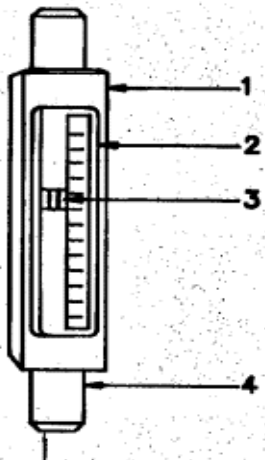
4. END FITTING

(Typical Drawing)

NOTES::

1	Above data sheet shall be used for inspection along with BOM sheet and Tag List.
2	Tag list with process parameters shall be furnished by BHEL after P.O. placement
3	Vendor shall submit the consolidated BOM sheet along with accessories of

3	instruments, finalised make /models of instruments, etc for approval.	
4	GA drawings shall be submitted for approval (if applicable)	
5	Items to be provided as per recommended vendor list only.	

		PRODUCT STANDARD PROJECT ENGINEERING & SYSTEMS DIVISION HYDERABAD		Annexure-2 of PY56559 REV. 00			
Vortex Flowmeter Technical Data Sheet							
GENERAL	1	Range & Qty.	Refer BOM (Annexure-I)	ACCESSORIES	20	Cable Glands	Ni Plated Brass, Double Compression
	2	Type	Integral, Smart		21	Cable entry Plugs	Reqd, SS 304 (1 No)
	3	Process fluid	Air		22	Tag Plate	Reqd, SS 304 (1 No)
	4	Operating Density, Viscosity					
	5	Operating Pressure, temperature	1.1ATA, 100 Deg C		23	Gasket	SS 316, Spiral wound type.
SPECIFICATION	6	Repeatability	± 0.2% of Reading	24	Screws/Hinges	SS	
	7	Accuracy	(+) / (-) 1% of full scale	25			
	8	Line Size	As per tag list, BOM				
	9	Power Supply	24V DC, Loop Powered	TEST / CERTIFICATE	26	Dimensional Check	100 % Witness
	10	Wetted Parts	SS316		27	BOM verification & Visual check	100 % Witness
	11	Protection	IP 65 or above		28	Tag Plate Marking	100 % Witness
	12	Electrical Connection	1/2" NPT (F)		29	Calibration test	100%, Certificate review
	13	Housing (Case, Cover)	Die cast aluminium with epoxy coating		30	Hydrostatic test at 1.5 times of max pressure.	100%, Certificate review
	14	Output	4-20mA + HART		31	Material compliance	100 % Certificate Review
	15	Diagnostic Features	Required.		32		
	16				33	Strength, Transparency, dimensions for glass tube	100 % Witness
	17				34		
	18						
	19			A	Makes/ Vendors	As per approved vendor list	
 <p>(Typical Drawing)</p>							
NOTES::							
1	Above data sheet shall be used for inspection along with BOM sheet and Tag List.						
2	Tag list with process parameters shall be furnished by BHEL after P.O. placement						
3	Vendor shall submit the consolidated BOM sheet along with accessories of instruments, finalised make /models of instruments, etc for approval.						

4	GA drawings shall be submitted for approval (if applicable)
5	Items to be provided as per recommended vendor list only.

Annexure-34 _ Technical Specification of PLC for VAM

1. Technical Specification:

S. No.	System	:	Technical specifications
[A]	VAM PLC System9		
1	Bill of material	:	Refer Annexure-34A of this specification for <u>Main Supply</u>
2	PLC configuration	:	Refer Annexure-34B of this specification
3	I/O Count + sizing criteria	:	Bidder to decide. However, Bidder to consider 16 nos of I/O for BHEL supplied equipment (Dosing System etc.)
4	System Loading	:	Loading of controller shall not exceed 50% with installed spares;
5	System Redundancy	:	Controller - 1:1; Communication / Network cords – 1:1; Power supply – 1:1; I/O cards – 1:1; All the control processors offered for the Standalone VAM PLC shall be in dual redundant configuration with redundancy in memory, power supply, communication interface etc. The system shall be designed to ensure that failure of any single control processor or communication processor in the system shall not cause the operator to loose control of visual communication with the process. Redundant control processors shall be in separate racks to maximize availability. The failure shall be annunciated on the operator station. The system offered shall be expandable, flexible and upgradable and shall be able to be configured for wide range of process application and easily field changeable with the help of user-friendly software. Redundant hardware like memory, power supply, communication interface etc. shall be in separate racks. Controllers shall be one-to-one redundant. i.e. redundant controller shall not support more than one controller for redundant functions. Data Highway connecting all Controllers, Operator Stations, Printers, remote I/O system shall be dual redundant data cable, so that failure of one shall be taken over by the other automatically and the failure shall be communicated/annunciated.
6	Engineering Station	:	Configuration change of logic and application program in standalone PLC shall be possible through engineering station (laptop). All required hardware and software shall be considered and offered by the bidder.
7	Work stations' Control desk	:	CRCA Sheet consoles (Desktop type) for mounting the monitors and printer (A4) consoles along with operator chairs The console shall have provision for mounting the PC's in closed enclosure with lock and key arrangement, surge protected power sockets, cooling fans provision for mounting key boards, mouse in guide mounted trays shall be considered. Refer Annexure-[E] of this specification
8	Operating Station, Engineering Station & Printers	:	<ol style="list-style-type: none"> 1) The Operating Station shall present the necessary plant information in a manner, which can be easily understood and absorbed by the Operator. 2) These displays shall be in the form of plant overviews, area overviews, group and sub group overviews, drive level displays, alarm list, sequences of event list with time stamping, mimic diagrams, hardware status displays, logs, bar charts, trends curves, etc. 3) All the Operating Stations (HMI) and Engineering Stations shall be of desktop mounted workstations and one number of portable Laptop (EWS & Documentation). All the Operating Stations & Engineering Stations shall be of open architecture with universal hardware and software platform with plug and play feature and shall be suitable for continuous operation in industrial environment. 4) The Operating Stations envisaged standalone PLC system (LDO/HFO pump house) Plant) shall be complete with processor, memory, power supply, bulk memory units, high resolution color monitor, key-board, mouse, communication interface modules, printer etc. along with necessary software modules. Dual screen (side-by-side) shall be provided with operation by single mouse and keyboard having full screen mode and multi window mode. Selection of screens shall not be required. Multi-window environment shall also be provided. Operating Stations shall acquire process data by an event driven method (on demand by the operator to avoid unnecessary loading in the network). All the operating commands / actions shall be stored, logged and protected with password identity. Modifications/alterations on such stored commands/actions shall not be permitted. Such commands / actions shall be printed out only on demand with password. 5) Each Engineering station, Operating Workstation, printer server shall have the following minimum design features and shall be identical and interchangeable: <ul style="list-style-type: none"> ◆ CPU Processor shall be latest configuration. ◆ Minimum 8 GB RAM and shall be expandable. ◆ Minimum 500 GB internal Hard Disc.

Annexure-34 _ Technical Specification of PLC for VAM

			<ul style="list-style-type: none"> ◆ High resolution 24" LED Flat panel, TFT active matrix type colour monitor with minimum pixel resolution of 1080 x 1920, 32 bit colour support with mounting arm provisions / tilt swivel bases of reputed makes. ◆ Minimum six(6) USB Ports & HDMI ports ◆ Serial, Parallel, USB, Network interface ports for connecting the data highway, printers etc. One spare serial and parallel port shall be provided additionally. ◆ Consoles for mounting the monitors, key-board, mouse and the electronic unit of the Operating stations. ◆ Optical Mouse with enable/disable provision. Fixed pad types finger move only mouse shall be offered. ◆ Latest DVD-RW for data back-up and installation. ◆ Dust and drip proof QWERTY keyboard for operating and other functions. ◆ Dynamic graphic capability with control through dynamic graphics. ◆ Minimum 8 levels of software security feature shall be provided. <p>6) Colour Laser Jet Printer (Multifunction) – A4, 600 x 600 DPI, Duplex printing – 1 no. shall be offered for connection to the console for data logging, Report generation, SOE & Alarm printing. Covers shall be provided for all printers with locking facilities.</p> <p>7) Printers shall be provided with required printer stands/tables with required number of power supply points.</p> <p>8) Consumables such as printer papers, cartridges, etc. shall be provided along with the printers. Sufficient quantity of consumables shall be supplied for operating the system up to guarantee period and hand over the excess after commissioning.</p> <p>9) The engineering station offered shall have provision for performing the following minimum engineering functions.</p> <ul style="list-style-type: none"> ◆ Database configuration. ◆ Automatic downloading of the configurations to respective control stations. ◆ Configuration of various control functions, displays ◆ Configuration of alarm settings, values, changing PID values. ◆ Disk initialization. ◆ Calling of detailed self-diagnostic displays for ◆ maintenance aid. ◆ Documentation software for system engineering
9	Chairs	:	2 No Industry standard revolving chairs for each work station with wheels and with provision for adjustment of height (hydraulically/gas lift) shall be provided. These shall be designed for sitting for long duration such that these are comfortable for the back.
10	Other technical & software requirements	:	<p>1) Refer Annexure-[E] of this specification for all other technical requirements</p> <p>2) Software Licenses shall be valid for lifetime.</p> <p>3) All softwares provided shall necessarily include the cost for perpetual license(s) for use on all the machines and shall include software upgrades as & when released by the software agency for a period of three (3) years after warranty/guarantee period.</p> <p>4) PLC shall be provided with necessary interface hardware and software for dual fiber optic connectivity & interconnection with Plant DCS for two-way transfer of signals for information sharing. The information shall be made available through communication link conforming to protocol FO/UTP interface modules as per the requirement of third-party devices. Bidder scope includes the design, engineering, supply, erection, testing and commissioning the necessary media convert and LIU and its accessories with necessary cables.</p> <p>5) For time synchronization of PLC, 1 Number redundant SNTP signal from EDN Master clock shall be provided.</p> <p>6) Bidder shall confirm the Design & development of logics, LDO/HFO system, important selective data viewing should be envisaged in Boiler-6 DCS system, SCADA and alarm displays in Standalone PLC for ES/OWS (All in 1 Desktop) system at the respective control room</p>

Annexure-34 _ Technical Specification of PLC for VAM


11	Cycle time, scan time & response time for PLC	<ul style="list-style-type: none"> ◆ The cycle time for analog measurements shall be better than 250 milliseconds and the cycle time for closed loops shall be better than 100 milliseconds. Cycle time includes scanning, signal conditioning and execution of the control software blocks and updating the database. Cycle time shall be continuously and freely configurable without discrete steps. ◆ Scan time is defined as time taken by system to read input, process input executing logic and update control output for all the logics configured within the system. ◆ The dynamic parameters on the VDU screen shall be updated in one second or better. ◆ Window / display call up time shall be one second or better. This is the time between pressing of the last key/mouse click and appearance of the last character on the screen.
12	<i>Installed Spares for I/Os and cables, Commissioning spares and consumable</i>	: As per Annexure-[E] of this specification
13	Special Tools and Tackles	Special tools and tackles required for regular operation and maintenance of the system and equipment quoted by the Tenderer shall be included in the scope of supply. Itemized list and quantity of tools and tackles included shall be indicated in the offer.
14	Additional points	Tenderer shall confirm the Design & development of logics, VAM important selective data viewing should be envisaged in Boiler-6 DCS system through hardwired I/Os. I/O list of the same shall be provided by vendor during execution.

2. Panel Specification

2.1 PLC Panels shall be designed & manufactured as per Annexure-[E] of this specification.

2.2 Other requirements shall be as given below:

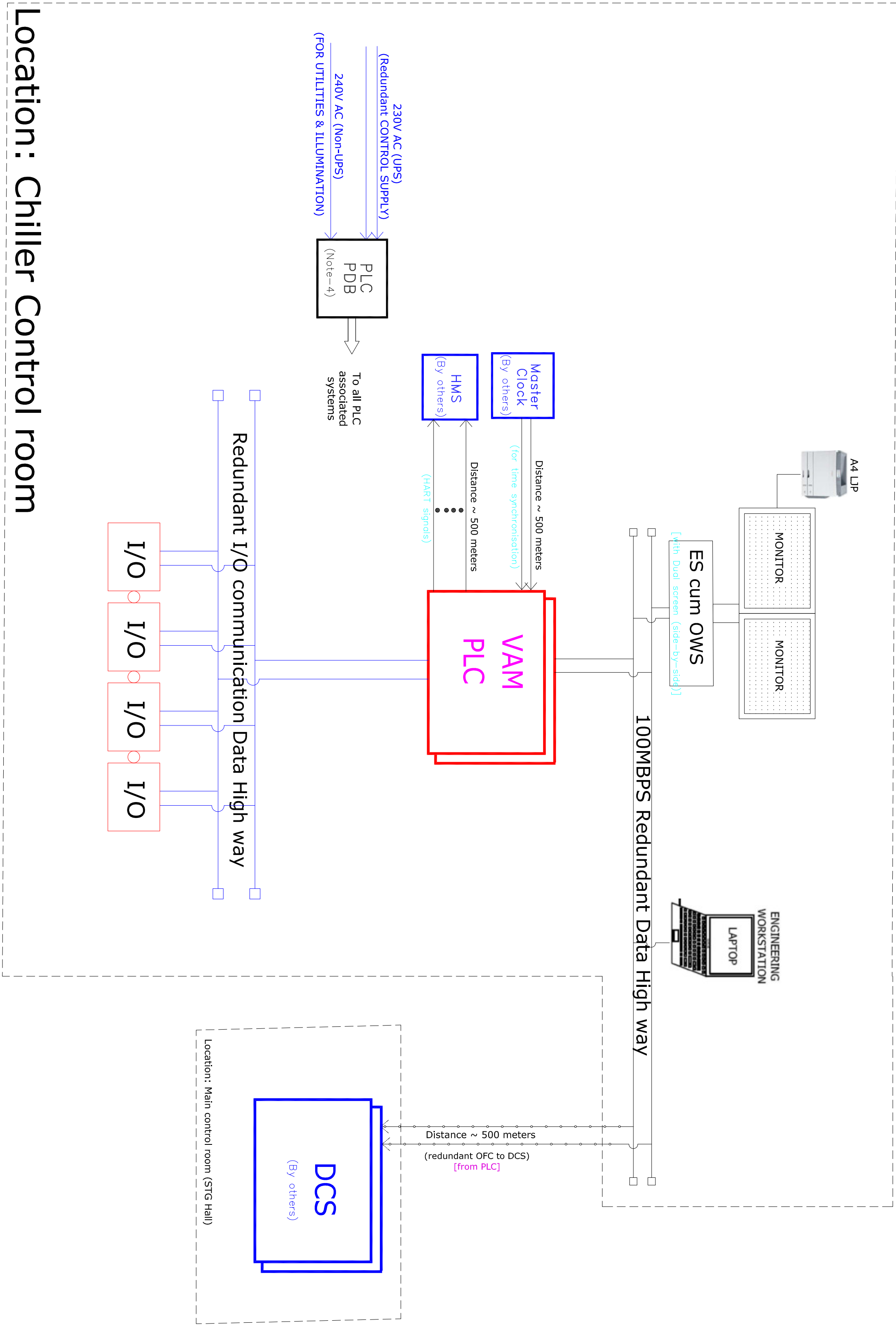
a)	Installation location	:	Chiller Control Room (in ESP bldg.); Indoor in air-conditioned room
b)	Panel color	:	To be intimated during detail engineering
c)	Panel Cable entry	:	From Bottom
d)	Removable gland plate at bottom	:	Required

		<u>Bill of material</u>		Annexure -[34A] of PY51737	
		<u>VAM PLC System</u>		Rev 00	
		Project: Nalco Damanjodi 18.5 MW STG + 300 TPG Boiler Project			
S. No	Item Description	Quantity	Units	Remarks	
[A]	VAM PLC - Supply, Design, Engg, Testing & Training - [MAIN SUPPLY]				
1	PLC Pkg	1	Set		
2	1 No 24" TFT-LCD ES/OWS (All in 1 Desktop) with a A4 size colour Laser jet printer and operator consoles with all sets of licensed Softwares, UPS + Furniture & chairs as required for work station & printer as per PY56562 and its annexures	1	Set		
3	1 No Laptop [EWS] with all sets of licensed Softwares + Furniture & chairs as required for work station as per PY56562 and its annexures	1	Set		
4	Armoured Fibre Optic cable with 2" rodent proof HDPE conduits (for purchaser's use - connecting cable between VAM PLC and DCS)	1	Set		
5	Armoured cable for Time synchronisation of VAM PLC with EDN master clock	1	Set		
6	All other cables (signal, control, power & other special cables like pre-fab cables, etc.) required between bidder supplied equipments	1	Set		
7	Termination accessories like cable glands, lugs, etc for all incoming / outgoing cables of bidder supplied panels / Systems / items	1	Set		
8	Erection / Commissioning material required for completeness of above system	1	Lot	Note-(1)	
9	Any Special tools & tackles (as required)	1	Set		
10	Consumables as per Annexure-34	1	Set	Note-(2)	
11	FAT (BHEL+M. N. DASTUR +NALCO)	1	Set		
12	Documentation (Engg + As-ship+Erection & commission docs + As-Built+O&M manuals+test certificates+Catalogues+etc)	1	Set		
13	PLC - TRAINING: System Hardware & Software Maintenance, Plant Operation training as per Annexure-[E]	1	Set		

NOTES ::

- List and Quantities shall be reviewed during detail engineering.
- Consumables used for commissioning shall be considered part of commissioning spares and shall be supplied by package vendor.

VAM PLC Configuration Diagram



Location: Chiller Control room

Items / Cables indicated with BLUE colour are NOT in BIDDER SCOPE

- NOTES:**
- 1) This configuration diagram is for tender purpose only.
 - 2) Bidder shall refer different Annexures of the technical specification for system deign requirements.
 - 3) Grouping of I/Os and distribution of hardwares will be finalised during detail engineering.
 - 4) Power supply arrangement for all PLC associated HMIs / systems shall be as per technical specification.
 - 5) All analog input / output signals (which are with HART) shall be provided in separate TBs in PLC marshalling for further wiring to HMS System

FOR TENDER PURPOSE ONLY

LEGENDS:

- HARDWIRED CONNECTION
- Communication cable
- NETWORK CABLE
- Fiber Optic Cable

CUSTOMER: NATIONAL ALUMINIUM COMPANY LIMITED
BHUBANESWAR, ODISHA

CONSULTANT: M. N. DASTUR & COMPANY (P) LTD
CONSULTING ENGINEERS, KOLKATA

PROJECT: INSTALLATION OF STEAM AND POWER PLANT FOR 5th STREAM
ALUMINA REFINERY EXPANSION AT DAMANJODI, ODISHA
UNDER PHASE-3 EXPANSION OF M&R COMPLEX

BHARAT HEAVY ELECTRICALS LTD. HYDERABAD		DRN	NAME	SIGN.	DATE	NO OF VAR.
CHD		SUJATHA			04.05.21	N.A.-
APPD.		Anand			04.05.21	N.A.-
DEPT. PI & SD	UNTOOL. DIMS. GR	SCALE	WEIGHT (Kg)	REF. TO ASSY. DRG.	ITEM NO.	NO OF ITEMS
CODE 450	450	NTS	N.A.	-N.A.-	-N.A.-	-N.A.-
TITLE PLC Configuration Diagram						REV. CARD CODE DRAWING NO. Annexure [348]
N.A.						00
SHT. No 01						NO. OF SHT. 01

NATIONAL ALUMINIUM COMPANY LIMITED
M & R COMPLEX, DAMANJODI
QUALITY CONTROL DEPARTMENT
MISCELLANEOUS REQUISITION CUM ANALYSIS REPORT

DATE: 17.02.2021.

PART-A: ANALYSIS REQUISITION:

Ref. No

1. SAMPLE IDENTIFICATION: **FILTER WATER from PROJECT**
2. DATE OF SAMPLING : 12.02.2021.
3. TO BE ANALYSED FOR : As reported below,
4. SPECIAL REQUEST IF ANY:

(Signature of the Requisitee)

(Signature of Area In charge)

PART-B: ANALYSIS REPORT

	Parameters	Unit	Analysis Result
01	pH		7.19
02	Turbidity	NTU	3.53
03	Total Dissolved Solids	mg/l	58
04	Total Suspended Solids	mg/l	18
05	Conductivity @ 20°C	Micro mho/cm	65
06	Sodium (as CaCO ₃)	mg/l	Not Traceable
07	Iron (as Fe)	mg/l	0.21
08	Total Hardness (as CaCO ₃)	mg/l	34
09	Ca Hardness (as CaCO ₃)	mg/l	20
10	Mg Hardness (as CaCO ₃)	mg/l	14
11	Sulphate (as SO ₄)	mg/l	2.23
12	Total Alkalinity(as CaCO ₃)	mg/l	25
13	Chloride (as CaCO ₃)	mg/l	3.55
14	Silica (as SiO ₂)	mg/l	4.32

Analysed by *S.N.S.D.*

Area I/C

18/02/2021
 Br.(Mrs). Ashwini Senapati
 Senior Manager (Lab)
 Quality Control Laboratory

Authorised Signatory
 HOD(Lab)

19/2/21
V. KRISHNA KUMARI
 Dy. General Manager (Chem.)

F/QC/03/03
 01/06/2007

COPY TO:
 GM(PROJECT)/ Office copy