302-EE-00-2609
RERUN TOWER VENT CONDENSER
DP (S/T) : 18.0/3.5FV kg/cm**2g
DT (S/T) : -29/100*C/ 65 °C
Rated Duty: 0.168 MMKCAL/HR
TEMA Type: BEM

302-EE-00-2608A/B
RERUN TOWER CONDENSER
DP (S/T) : 3.5 kg/cm**2g/FV/10.5 kg/cm**2g
DT (S/T) : 190 °C/ 65 °C
Rated Duty: 18.307 MMKCAL/HR
TEMA Type: HELD-AJ21S (NOTE 5)

302-VV-HW-2608
RERUN TOWER REFLUX DRUM
DP : 3.5FV kg/cm**2g
DT : 65°C/
Inside Diam. x Len.(T/T):2600 mm x 7800 mm

NOTES:
1. FOR LEGEND, SYMBOLS, GENERAL NOTES AND ENGINEERING DESIGN NOTES SEE DWG. NO. 8957-79-41-000-11011 THRU 8957-79-41-000-11014. ALL TAG NUMBERS FOR INSTRUMENTS WILL BE PRECEDED BY UNIT NUMBER "302" UNLESS OTHERWISE SPECIFIED.
2. DELETED.
3. ELEVATION IS BASED ON PSH (MINIMUM) PUMP NPSH REQUIREMENT.
4. MINIMUM FLOW LINE.
5. ELEVATED ABOVE REFLUX DRUM 302-VV-HW-2608.
6. SYMMETRICAL PIPING.
7. LOCATE PUSH BUTTON 15 METERS FROM PUMP AT SAFE LOCATION.
8. PUSH BUTTON IN THE FIELD OR DCS ACTIVATES INTERLOCK WHICH CLOSES ISOLATION VALVE AND SHUTS DOWN ALL ASSOCIATED PUMPS. VALVE LOCATED IN THE FIRE ZONE SHALL BE FIRE SAFE WITH FIRE PROOF ACTUATOR. POWER AND CONTROL CABLES IN FIREZONE SHALL BE FIREPROOFED.
9. MOTOR OF PUMP SHALL BE AUTOMATICALLY STOPPED WHEN MOV IS LESS THAN 80% OPEN AND CANNOT BE RESTARTED UNTIL THE MOV IS FULLY OPENED.
10. FOR SAMPLE CONNECTION DETAILS REFER P&ID NO. 8957-79-41-300-11876.
11. DISSIMILAR TYPE CHECK VALVE.
12. HAND SWITCH TO SELECT THE MODE OF OPERATION FOR LEVEL CONTROL.
13. GLOBE VALVE TO BE CONSIDERED WITH POSITION LOCK ARRENGEMENT AND TO BE LOCATED AT GRADE.
14. FOR CONTROL VALVE VENT AND DRAIN DETAILS REFER P&ID NO. 8957-79-41-300-11874.

Note: Tube Side of Exchanger (2608 A/B) shall be Included is chemical cleaning and passivation markup.

DETAIL "A"

MOV TAG NO.	INTERLOCK
MOV-22101	ESD-2608
MOV-22102	ESD-2609

ALL OTHER INSTRUMENTS TAG NUMBER SHOULD BE SAME AS MOV TAG NUMBER

DETAIL "B"

ALL OTHER INSTRUMENTS TAG NUMBER SHOULD BE SAME AS XV TAG NUMBER

302-PA-CF-2604A/B
RERUN TOWER REFLUX PUMPS
Rated Flow: 114.9 m**3/hr
Diff. Pres: 4.48 kg/cm**2
DP: 10.5kg/cm**2g
DT : 70 °C

302-PA-CF-2605A/B
PGH SECOND STAGE REACTOR FEED PUMP
Rated Flow: 110.5 m**3/hr
Diff. Pres: 37.20 kg/cm**2
DP: 53.0 kg/cm**2g
DT : 70 °C

REV.	DATE	REVISION	DRN	BY	CHKD	APPD.
3	26.09.25	ISSUED FOR HAZOP	RS	GS	KK	MS
2	04.07.25	REVISED AS MARKED AND PMS INCORP.	AN	GS	KK	MS

ENGINEERS INDIA LIMITED (A Govt. of India Undertaking)

SCALE	JOB NO.	DEPT.	SECTN.	UNIT	DWG. No.	REV.
S	B957	79	41	302	11221	3

BINA PETROCHEMICAL AND REFINERY EXPANSION PROJECT (BPREP)
ETHYLENE CRACKER & ASSOCIATED UNITS
BINA, MADHYA PRADESH, INDIA

BHARAT PETROLEUM CORPORATION LIMITED
BINA REFINERY

REV	ISSUE DATE	DESCRIPTION	CAD	PROC ENG	LPE	PDM	PM	CLIENT
3	03/07/2025	REVISED FOR BEP	NAH	AS	SC	SKG VK	SA	
2	01/12/2025	FOR BEP	NAH	AS	SC	SKG VK	SA	
1	10/21/2024	PRELIMINARY	NAH	AS	SC	SKG VK	SA	

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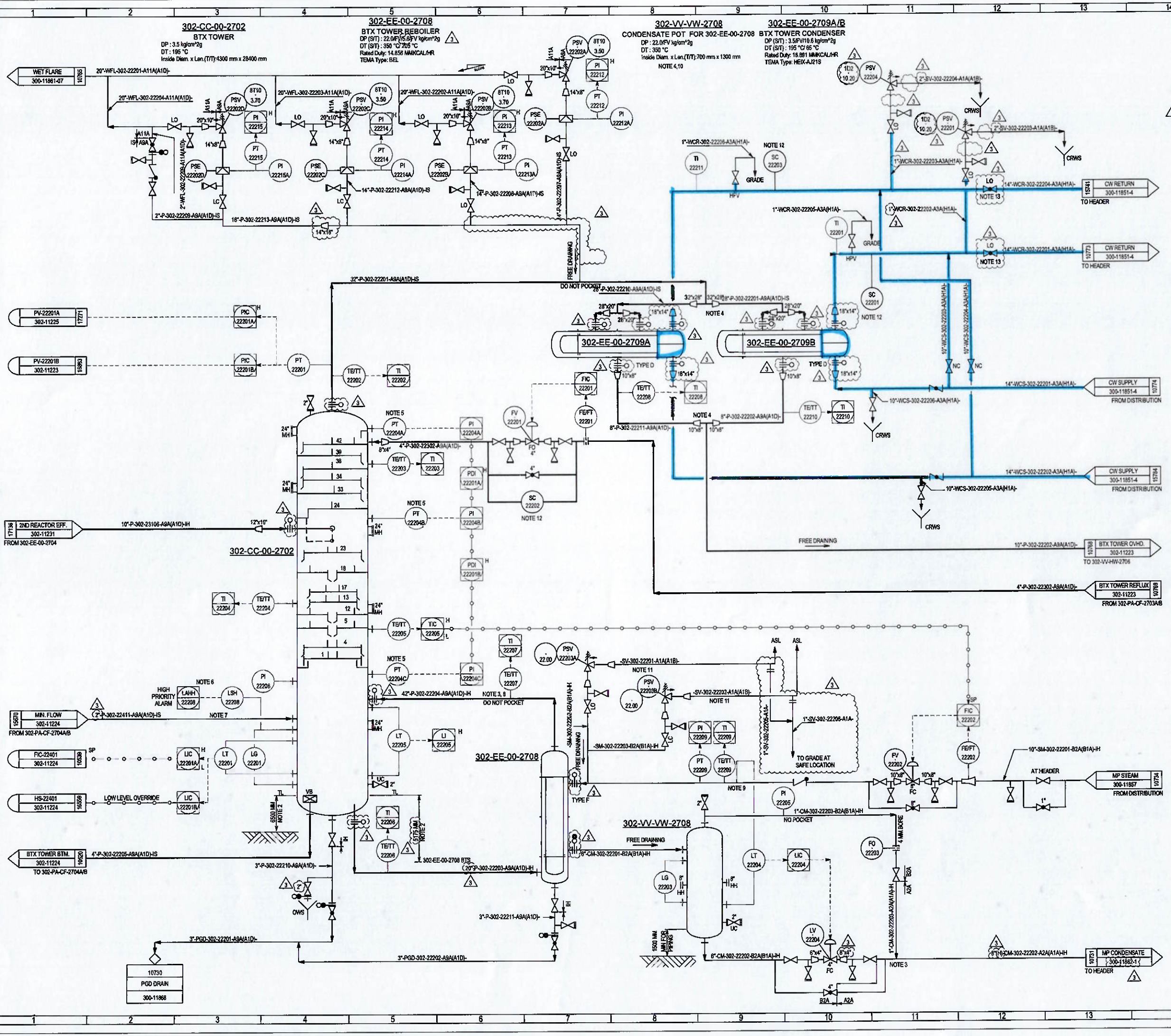
PIPING AND INSTRUMENTATION DIAGRAM
PGH UNIT
RERUN TOWER REFLUX DRUM

SCALE: | DWG. No: 363136-302-11221 | REV. 1



NOTES:

1. FOR LEGEND, SYMBOLS, GENERAL NOTES AND ENGINEERING DESIGN NOTES SEE DWG. NO. B957-79-41-000-1011 THRU B957-79-41-000-1014. ALL TAG NUMBERS FOR INSTRUMENTS WILL BE PRECEDED BY UNIT NUMBER "302" UNLESS OTHERWISE SPECIFIED.
2. ELEVATION IS BASED ON PRELIMINARY PUMP NPSH REQUIREMENT AND/OR REBOILER THERMOSIPHON REQUIREMENT.
3. TWO PHASE FLOW ANCHOR SECURELY.
4. SYMMETRICAL PIPING.
5. LOCATE PRESSURE TRANSMITTER ABOVE THE TAPPING AND ALL IMPULSE LINE TO BE SELF DRAINING INTO THE VESSEL.
6. ULTRASONIC OR TUNING FORK LEVEL SWITCH AT TOP OF STAND PIPE.
7. MANUAL FLOW LINE.
8. ENGINEERING TO ENSURE CLOSE COUPLE CONNECTION FROM REBOILER OUTLET TO COLUMN INLET.
9. IMPULSE POINT TO BE CONNECTED TO TOP OF STEAM SUPPLY LINE TO 302-EE-00-2708.
10. 302-EE-00-2709A/B TO BE ELEVATED ABOVE 302-VV-HW-2706.
11. 10 MM WEEP HOLE SHALL BE PROVIDED AT LOW POINT WITH HYDROPIPE CONNECTION TO SAFE LOCATION.
12. FOR SAMPLE CONNECTION DETAILS REFER P&ID NO. B957-79-41-300-11878.
13. GLOBE VALVE TO BE CONSIDERED WITH POSITION LOCK ARRENGENMENT AND TO BE LOCATED AT GRADE.
14. FOR CONTROL VALVE VENT AND DRAIN DETAILS REFER P&ID NO. B957-79-41-303-11874.

Note: Tube Side of exchanger (2709 A/B) shall be included in chemical cleaning and passivation markup.

REV	DATE	REVISION	DRN	BY	CHKD	APPD.
3	29.09.25	ISSUED FOR HAZOP	RS	GS	KK	MS
2	04.07.25	REVISED AS MARKED AND PMS INCORP.	AN	GS	KK	MS

ENGINEERS INDIA LIMITED (A Govt. of India Undertaking)

SCALE	JOB NO.	DEPT.	SECTN.	UNIT	DWG. No.	REV.
	B957	79	41	302	11222	3

BINA PETROCHEMICAL AND REFINERY EXPANSION PROJECT (BPREP)
ETHYLENE CRACKER & ASSOCIATED UNITS
BINA, MADHYA PRADESH, INDIA

BHARAT PETROLEUM CORPORATION LIMITED
BINA REFINERY

REV	ISSUE DATE	DESCRIPTION	CAD	PROC ENG	L/E	POM	PM	CLIENT
3	03/07/2025	REVISED FOR BEP	NAN	AS	SC	SKG/VK	SA	
2	31/13/2025	FOR BEP	NAN	AS	SC	SKG/VK	SA	
1	10/21/2024	PRELIMINARY	NAN	AS	SC	SKG/VK	SA	

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PIPING AND INSTRUMENTATION DIAGRAM
PGH UNIT
BTX TOWER

SCALE: | DWG. No. 363136-302-11222 | REV. 1

302-VV-HW-2706
BTX TOWER REFLUX DRUM

DP : 3.5/FV kg/cm^2
DT : /65 °C
Inside Diam. x Len.(T/T):1800 mm x 5400 mm

302-EE-00-2711
C6-C8 PRODUCT COOLER
DP (S/T) : 15.5/12.0 kg/cm^2g
DT (S/T) : 55 °C/ 65 °C
Rated Duty: 0.216 MMKCAL/HR
TEMA Type: AES

NOTES:

1. FOR LEGEND, SYMBOLS, GENERAL NOTES AND ENGINEERING DESIGN NOTES SEE DWG. NO. B957-79-41-300-1011 THRU B957-79-41-300-1014. ALL TAG NUMBERS FOR INSTRUMENTS WILL BE PRECEDED BY UNIT NUMBER "302" UNLESS OTHERWISE SPECIFIED
2. ELEVATION IS BASED ON PRELIMINARY PUMP NPSH REQUIREMENT.
3. MOTOR OF PUMP SHALL BE AUTOMATICALLY STOPPED WHEN MOV IS LESS THAN 80% OPEN AND CANNOT BE RESTARTED UNTIL THE MOV IS FULLY OPENED.
4. MINIMUM FLOW LINE SIZE TO BE DETERMINED BY DEC.
5. LOCATE PUSH BUTTON 15 METERS FROM PUMP AT SAFE LOCATION.
6. PUSH BUTTON IN THE FIELD OR DCS ACTIVATES INTERLOCK WHICH CLOSES ISOLATION VALVE AND SHUTS DOWN ALL ASSOCIATED PUMPS. VALVE LOCATED IN THE FIRE ZONE SHALL BE FIRE SAFE WITH FIRE PROOF ACTUATOR. POWER AND CONTROL CABLES IN FIREZONE SHALL BE FIREPROOFED.
7. 302-EE-00-2709A/B TO BE ELEVATED ABOVE 302-VV-HW-2706.
8. FOR SAMPLE CONNECTION DETAILS REFER P&ID NO. B957-79-41-300-11878.
9. FOR CONTROL VALVE VENT AND DRAIN DETAILS REFER P&ID NO. B957-79-41-300-11874.

BTX TOWER OVHD 302-11222 (10798) FROM 302-EE-00-2709 A/B — 10"-P-302-22202-A9A(A1D)- — FREE DRAINING

BTX TOWER REFLUX 302-11222 (10799) TO 302-CC-00-2702 — 4"-P-302-22302-A9A(A1D)-

FV 22301 — FO — NOTE 4

MIN FLOW — 4"-P-302-22309-A9A(A1D)-

Pi 22311 — PT 22311 — FREE DRAINING — 3"-P-302-22310-A9A(A1D)- — BTX TOWER OVHD 302-11225 (16960) TO 302-LZ-00-2712

302-VV-HW-2706 — 24" MH — LG 22301 — LT 22302 — LIC 22302 — FIC 22302 — SP — FV 22302 — FC — FT 22302 — PI 22308 — PT 22308 — TI 22307 — TE/TT 22307

LC — VB — 11500 MM — NOTE 2 — 3"-P-302-22320-A9A(A1D)- — OWS

6"-P-302-22305-A9A(A1D)- — C6-C8 CUT 303-11311 (15076) TO BTX UNIT

3"-PGD-302-22301-A9A(A1D)- — MOV 22301 — SEE DETAIL "A" — 10767 PGD DRAIN 300-11868

FIC 22301 — FE/FT 22301 — PI 22309 — PT 22309 — 6"-P-302-22304-A9A(A1D)- — 10"-P-302-22301-A9A(A1D)-

6"-P-302-22303-A9A(A1D)- — 10"-P-302-22303-A9A(A1D)-

PI 22304 — PI 22303 — PI 22302 — PI 22301

302-PA-CF-2703A — 302-PA-CF-2703B

M — XL 22301 — HS 22301 C — ESD 2810 — OWS — 2"-PGD-302-22303-A9A(A1D)-

M — XL 22302 — HS 22302 C — ESD 2810 — OWS — 2"-PGD-302-22302-A9A(A1D)-

2"-PGD-302-22302-A9A(A1D)- — 10766 PGD DRAIN 300-11868

302-PA-CF-2703A/B
BTX TOWER REFLUX PRODUCT PUMP
Rated Flow: 180.2 m^3/hr
Diff. Pres: 8.93 kg/cm^2
DP: 15.5 kg/cm^2g
DT : 75 °C

PIC-22201 B 302-11222 (16863)

FV 22201B — FC — A9A A3A — 2"-G-302-22301-A3A(A1B)- — NITROGEN (302-11853-1) (16873) FROM HEADER

HS 223 A C — ZLH 223 B <80% — NOTE 5,6 — HS 223 B C — HS 223 C O — ZLL 223 C — ZLH 223 O — ESD 2810 — <80% — ESD 2810 — ZSH 223 B — ZSL 223 — ZSH 223 A — M — TSO — NOTE 3,6 — MOV 22301

ALL OTHER INSTRUMENTS TAG NUMBER SHOULD BE SAME AS MOV TAG NUMBER

DETAIL "A"

TO2 12.00 — PSV 22303 — 2"-SV-302-22301-A1A(A1B)- — CRWS

1"-WCR-302-22303-A1A(H1A)- — TI 22303 — SC 22301 — GRADE — HPV — LO — 2"-WCR-302-22302-A1A(H1A)- — 4"-WCR-302-22301-A3A(H1A)- — CW RETURN 300-11851-4 (10762) TO HEADER

4"-WCS-302-22302-A1A(H1A)- — NC — A1A A3A

302-EE-00-2711 — TYPE D — 4"-WCS-302-22301-A1A(H1A)- — CW SUPPLY 300-11851-4 (10763) FROM DISTRIBUTION

3"-WCS-302-22303-A1A(H1A)-

TI 22302 — TE/TT 22302 — 15.50 — PSV 22302A — A9A A11A — CRWS — -WFL-302-22303-A11A(A1D)- — WET FLARE 300-11861-07 (11677)

FQI 22303 — FI 22303 — PI 22310 — TI 22310 — FE/FT 22303 — PT 22310 — TE/TT 22310 — 15.50 — PSV 22302B — LO — LC — -WFL-302-22304-A11A(A1D)- — A11A A9A — 2"-P-302-22316-A9A(A1D)- — 8"-P-440-1231-A9A — BL — C6 -C8 HEART CUT (440-1112) (15975) TO BTX FEED TANK

-P-302-22315-A9A(A1D)- — NNF — 6"-P-302-22307-A9A(A1D)- — NNF — OFF SPEC PDT 303-11312 (15997) FROM BTX

6"-P-302-22306-A9A(A1D)- — 6"-P-303-31204-A9A(A1D)- — MIN. — NNF A9A — D9A — OFFSPEC C6-C8 CUT 302-11221 (19812) TO RAW PYGAS STORAGE

Note:
Tube Side of exchanger (EE-00-2711) shall be induded in chemical cleaning and passivation markup.

REV	DATE	REVISION	DRN	BY	CHKD	APPD.
3	26.09.25	ISSUED FOR HAZOP	RS	GS	KK	MS
2	04.07.25	REVISED AS MARKED AND PMS INCORP.	AN	GS	KK	MS

इंजीनियर्स इंडिया लिमिटेड ENGINEERS INDIA LIMITED (A Govt. of India Undertaking)

SCALE	JOB NO.	DEPT.	SECTN.	UNIT	DWG. No.	REV.
S	B957	79	41	302	11223	3

BINA PETROCHEMICAL AND REFINERY EXPANSION PROJECT (BPREP)
ETHYLENE CRACKER & ASSOCIATED UNITS
BINA, MADHYA PRADESH, INDIA

BHARAT PETROLEUM CORPORATION LIMITED
BINA REFINERY

REV	ISSUE DATE	DESCRIPTION	CAD	PROC ENG	LPE	POM	PM	CLIENT
3	03/07/2025	REVISED FOR BEP	NAN	AS	SC	SK/GVK	SA	
2	01/13/2025	FOR BEP	NAN	AS	SC	SK/GVK	SA	
1	10/21/2024	PRELIMINARY	NAN	AS	SC	SK/GVK	SA	

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PIPING AND INSTRUMENTATION DIAGRAM
PGH UNIT
BTX TOWER REFLUX DRUM

SCALE: — DWG. No: 363136-302-11223 — REV. 1

Page 1997 of 4391 : B957-TENDER_DOC-B957-300-16-43-MR-T-3001 : Rev. A

302-EE-00-2712
C9-180°C PRODUCT COOLER
DP (S/T) : 21.5/17.0 kg/cm^2g
DT (S/T) : 195 °C/ 65 °C
Rated Duty: 0.800 MMKCAL/HR
TEMA Type: AES

NOTES:
1. FOR LEGEND, SYMBOLS, GENERAL NOTES AND ENGINEERING DESIGN NOTES SEE DWG. NO. B957-79-41-000-A1011 THRU B957-79-41-000-A1014. ALL TAG NUMBERS FOR INSTRUMENTS WILL BE PRECEDED BY UNIT NUMBER "302" UNLESS OTHERWISE SPECIFIED.
2. MINIMUM FLOW LINE.
3. LOCATE PUSH BUTTON 15 METERS FROM PUMP AT SAFE LOCATION.
4. PUSH BUTTON IN THE FIELD OR DCS ACTIVATES INTERLOCK WHICH CLOSES ISOLATION VALVE AND SHUTS DOWN ALL ASSOCIATED PUMPS. VALVE LOCATED IN THE FIRE ZONE SHALL BE FIRE SAFE WITH FIRE PROOF ACTUATOR. POWER AND CONTROL CABLES IN FIREZONE SHALL BE FIREPROOFED.
5. MOTOR OF PUMP SHALL BE AUTOMATICALLY STOPPED WHEN MOV IS LESS THAN 90% OPEN AND CANNOT BE RESTARTED UNTIL THE MOV IS FULLY OPENED.
6. FOR SAMPLE CONNECTION DETAILS REFER P&ID NO. B957-79-41-300-11878.
7. FOR CONTROL VALVE VENT AND DRAIN DETAILS REFER P&ID NO. B957-79-41-300-11874.

Note:
Tube Side (EE-00-2712) shall be included in chemical cleaning and passivation markup

DETAIL "A"
ALL OTHER INSTRUMENTS TAG NUMBER SHOULD BE SAME AS MOV TAG NUMBER

302-PA-CF-2704A/B
BTX TOWER BOTTOM PUMPS
Rated Flow: 21.8 m^3/hr
Diff. Pres: 13.37 kg/cm^2
DP: 21.5 kg/cm^2g
DT : 210 °C

REV	DATE	REVISION	DRN	BY	CHKD	APPD
3	26.09.25	ISSUED FOR HAZOP	RS	GS	KK	MS
2	04.07.25	REVISED AS MARKED AND PMS INCORP.	AN	GS	KK	MS

इंजीनियर्स इंडिया लिमिटेड ENGINEERS INDIA LIMITED (A Govt. of India Undertaking)

SCALE	JOB NO.	DRFT.	SECTN.	UNIT	DWG. No.	REV.
	B957	79	41	302	11224	3

BINA PETROCHEMICAL AND REFINERY EXPANSION PROJECT (BPREP)
ETHYLENE CRACKER & ASSOCIATED UNITS
BINA, MADHYA PRADESH, INDIA

BHARAT PETROLEUM CORPORATION LIMITED
BINA REFINERY

REV	ISSUE DATE	DESCRIPTION	CAO	PROC ENG	PDM	PM	CLIENT
3	03/07/2025	REVISED FOR BEP	NAh	AS	SC	SKG/VK	SA
2	01/13/2025	FOR BEP	NAh	AS	SC	SKG/VK	SA
1	10/21/2024	PRELIMINARY	NAh	AS	SC	SKG/VK	SA

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PIPING AND INSTRUMENTATION DIAGRAM
PGH UNIT
BTX TOWER BOTTOMS PUMPS

SCALE: | DWG. No: 363136-302-11224 | REV. 1

Page 1998 of 4391 ; B957-TENDER_DOC-B957-300-16-43-MR-T-3001 ; Rev. A

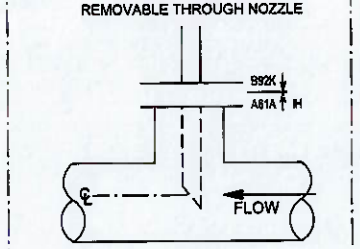
Note: Tube side of exchanger shall be induded in chemical cleaning and passivation Markup.

302-EE-00-2706
H2S STRIPPER CONDENSER
DP (S/T) : 8.5 (10.2) kg/cm^2g
DT (S/T) : 180 °C/ 65 °C
Rated Duty: 1.201 MMKCAL/HR
TEMA Type: AES
(NOTE 5)

302-VV-HW-2703
H2S STRIPPER REFLUX DRUM
DP : 6.5 kg/cm^2g
DT : 65 °C
Inside Diem. x Len.(T/T):1300 mm x 3900 mm

NOTES:
1. FOR LEGEND, SYMBOLS, GENERAL NOTES AND ENGINEERING DESIGN NOTES SEE DWG. NO. B957-79-41-(000-)1011 THRU B957-79-41-000-11014. ALL TAG NUMBERS FOR INSTRUMENTS WILL BE PRECEDED BY UNIT NUMBER "302" UNLESS OTHERWISE SPECIFIED.
2. ELEVATION IS BASED ON PRELIMINARY PUMP NPSH REQUIREMENT.
3. LOCATE LEVEL GAUGE READABLE FROM GLOBE VALVE.
4. TWO PHASE FLOW . ANCHOR SECURELY.
5. H2S STRIPPER CONDENSER IS ELEVATED ABOVE REFLUX DRUM.
6. MINIMUM FLOW LINE.
7. FOR SAMPLE CONNECTION DETAILS REFER P&ID NO. B957-79-41-300-11678.
8. GLOBE VALVE TO BE CONSIDERED WITH POSITION LOCK ARRENGENMENT AND TO BE LOCATED AT GRADE.
9. FOR CONTROL VALVE VENT AND DRAIN DETAILS REFER P&ID NO. B957-79-41-300-11674.

DETAIL "A"
INJECTION QUILL DETAILS BY DETAIL ENGINEERING CONTRACTOR
INJECTION QUILL TO BE REMOVABLE THROUGH NOZZLE



CORROSION INHB. 302-11234 — FROM 302-LZ-00-2710
STRIPPER OVHD 302-11231 — FROM 302-CC-00-2701
REFLUX 302-11231 — TO 302-CC-00-2701
CW RETURN 300-11851-4 — TO HEADER
CW SUPPLY 300-11851-4 — FROM DISTRIBUTION
LP OFF GAS 302-11218 — TO 300-VV-VI-2002
WET FLARE 300-11861-07
PGD DRAIN 300-11868

302-PA-CF-2701A/B
H2S STRIPPER REFLUX PUMPS
Relief Flow: 15.8 m^3/hr
Diff. Pres: 5.01 kg/cm^2
DP: 14.0 kg/cm^2g
DT : 70 °C

REV.	DATE	REVISION	DRN	BY	CHKD	APPD.
3	26.09.25	ISSUED FOR HAZOP.	RS	GS	KK	MS
2	04.07.25	REVISED AS MARKED AND PMS INCORP.	AN	GS	KK	MS

ENGINEERS INDIA LIMITED (A Govt. of India Undertaking)

SCALE	JOB NO.	DEPT.	SECTN.	UNIT	DWG. No.	REV.
	B957	79	41	302	11232	3

BINA PETROCHEMICAL AND REFINERY EXPANSION PROJECT (BPREP)
ETHYLENE CRACKER & ASSOCIATED UNITS
BINA, MADHYA PRADESH, INDIA

BHARAT PETROLEUM CORPORATION LIMITED
BINA REFINERY

REV	ISSUE DATE	DESCRIPTION	CAD	PROC ENG	LPE	PDM	PM	CLIENT
3	03/07/2026	REVISED FOR BEP	NAh	AS	SC	SKG/VK	SA	
2	01/13/2025	FOR BEP	NAh	AS	SC	SKG/VK	SA	
1	10/21/2024	PRELIMINARY	NAh	AS	SC	SKG/VK	SA	

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PIPING AND INSTRUMENTATION DIAGRAM
PGH UNIT
H2S STRIPPER REFLUX DRUM

SCALE: | DWG. No.: 363136-302-11232 | REV.: 1

300-EE-00-5001A/B/C/D

PROPYLENE REFRIGERENT CONDENSERS

DP (S/T) : 22.5 /18.5 kg/cm^2g

DT (S/T) : -29/120 °C/ 65 °C

Rated Duty: 147.161 MMKCAL/HR

TEMA Type: Helix-AEL

NOTES:

1. FOR LEGEND, SYMBOLS, GENERAL NOTES AND ENGINEERING DESIGN NOTES SEE DWG. NO. B957-79-41-000-11011 THRU B957-79-41-000-11014. ALL TAG NUMBERS FOR INSTRUMENTS WILL BE PRECEDED BY UNIT NUMBER "300" UNLESS OTHERWISE SPECIFIED.
2. LOCATE OUTLET HEADER FOR 300-EE-00-5001A-D BELOW EXCHANGERS.
3. LOCATE VALVE CONNECTION TO LIQUID DRAIN HEADER AT LOW POINT OF PIPING.
4. CONDENSERS INLET PLUS OUTLET PIPING SHALL HAVE EQUAL LENGTH FOR EQUAL FLOW THROUGH CONDENSERS.
5. FOR SAMPLE CONNECTION DETAILS REFER P&ID NO. B957-79-41-300-11878.
6. FUTURE CONNECTION FOR HOT VAPOUR BYPASS AS REQUESTED BY BPCL.
7. FOR CONTROL VALVE VENT AND DRAIN DETAILS REFER P&ID NO. B957-79-41-300-11874.

Note: Tube side of exchangers (EE-00-5001 A/B/C/D) shall be included in chemical cleaning and passivation mark up.

REV.	DATE	REVISION	DRN	BY	CHKD	APPD.
3	08.10.25	ISSUED FOR HAZOP.	PD	KM	KK	MS
2	04.07.25	REVISED AS MARKED AND PMS INCORP.	AK	KM	KK	MS

ENGINEERS INDIA LIMITED (A Govt. of India Undertaking)

SCALE	JOB NO.	DEPT.	SECTN.	UNIT	DWG. No.	REV.
	B957	79	41	300	11512	3

BINA PETROCHEMICAL AND REFINERY EXPANSION PROJECT (BPREP)
ETHYLENE CRACKER & ASSOCIATED UNITS
BINA, MADHYA PRADESH, INDIA

BHARAT PETROLEUM CORPORATION LIMITED
BINA REFINERY

REV	ISSUE DATE	DESCRIPTION	CAD	PROC ENG	LPE	POM	PM		CLIENT
1	03/07 2025	REVISED FOR BEP	NAH	OJK	SC	BKG/ VK	SA		
0	01/13 2025	FOR BEP	NAH	OJK	SC	BKG/ VK	SA		
Δ	10/21 2024	PRELIMINARY	NAH	OJK	SC	BKG/ VK	SA		

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PIPING AND INSTRUMENTATION DIAGRAM
ETHYLENE CRACKER UNIT (ECU)
PROPYLENE REFRIGERATION SYSTEM-
PROPYLENE REFRIGERANT CONDENSER

SCALE: | DWG. No: 363136-300-11512 | REV. 1

Page 2000 of 4391 : B957-TENDER_DOC-B957-300-16-43-MR-T-3001 : Rev. A

300-EE-00-8002
LP CONDENSATE COOLER
DP (S/T) : 13.0/15.5 kg/cm^2g
DT (S/T) : 120 °C/ 125 °C
Rated Duty: 6.776 MMKCAL/HR
TEMA Type: BEM

300-EE-00-8003
300-LZ-00-8002 FEED COOLER
DP (S/T) : 15.5/12.0 kg/cm^2g
DT (S/T) : 125 °C/ 65 °C
Rated Duty: 4.397 MMKCAL/HR
TEMA Type: BEM

300-EE-00-8001
LP CONDENSATE FLASH DRUM VENT CONDENSER
DP (S/T) : 10.0/13.0 kg/cm^2g
DT (S/T) : 125 °C/ 120 °C
Rated Duty: 6.970 MMKCAL/HR
TEMA Type: BEM

300-VV-VW-8001
LP CONDENSATE FLASH DRUM
DP : 3.5/FV kg/cm2(g)
DT : 150 °C
Inside Diam. x Len.(T/T): 3600 mm x 8000 mm 3

NOTES:

1. FOR LEGEND SYMBOLS, GENERAL NOTES AND ENGINEERING DESIGN NOTES SEE DWG. NO. B957-79-41-000-1101 THRU B957-79-41-000-11014. ALL TAG NUMBERS FOR INSTRUMENTS WILL BE PRECEDED BY UNIT NUMBER "300" UNLESS OTHERWISE SPECIFIED.
2. SAMPLE CONNECTION DETAILS AND RETURN LINES DESTINATION TO BE FINALIZED DURING DETAIL ENGINEERING
3. ELEVATION BASED UPON PRELIMINARY NPSH CALCULATION TO BE CONFIRMED DURING DETAIL DESIGN.
4. TWO PHSE FLOW. ANCHOR SECURELY.
5. 300-EE-00-8001 TO BE LOCATED ABOVE 300-VV-VW-8001.
6. PUMP 300-PA-CF-8002A/B TO BE PROVIDED WITH EMERGENCY POWER SUPPLY.
7. PIC ON VENT LINES TO ATMOSPHERE IS SET AT 0.4KG/CM2G TO REVENT OXYGEN INGRESS INTO THE CONDENSATE SYSTEM FEEDING THE DEAREATOR. 3
8. PUMP MINIMUM FLOW LINE SIZE WILL BE FINALIZED BASED ON PUMP VENDOR INPUT. 3
9. 10 MM WEEPHOLE SHALL BE PROVIDED AT LOW POINT AND CONDENSATE TO BE ROUTED TO LOW AT SAFE LOCATION.

POLISHED COND. 300-11811 12015 TO DEAERATOR
10"-CL-300-81409-A92K(A21A)-IH
12"-SL-300-8140(-A1A(A1B)-HS DO NOT POCKET
-SV-300-81401-A1A(A1B)- NOTE 9
-SV-300-8140(-A1A(A1B)-
4"-SL-300-81410-A1A(A1B)-HS NNF
-SV-300-81410-A1A(A1B)- NOTE 9
-SL-300-81403-A1A(A1B)-HS
8"-SL-300-8140(-A1A(A1B)-HS
PSV 81401A 3.50
PSV 81401B 3.50
PT 81404
PIC 81404
PV 81404
PT 81403
PI 81403
PI 81405
TI 81406
TE/TT 81406
TE/TT 81407
TI 81407
TE/TT 81408
TI 81408
300-EE-00-8001 NOTE 5
10"-CL-300-81408-A92K(A21A)-IH
8"-CL-300-81405-A1A(A1B)-HS
FREE DRAINING
4"-CL-300-81410-A1A(A1B)-HS
300-VV-VW-8001
4"-CM-300-81501-A2A(A1A)-HS NOTE 4
MP COND. 300-11815 12029 FROM 300-PA-CF-8003A/B
24"-CL-300-81401-A2A(A1A)-IH NOTE 4
LP COND. 300-11812 12030 FROM DISTRIBUTION
4"-CL-300-81101-A2A(A1A)-
CONDENSATE 300-11811 12006 FROM 300-LZ-00-8001 OVERFLOW
TI 81404
TE/TT 81404
TI 81405
TE/TT 81405
FI 81402
TI 81403
FE/FT 81402
TE/TT 81403
300-EE-00-8002
FV 81401
6"(H)-CL-300-81411-A2A(A1A)-IS MINIMUM FLOW NOTE 8
LIC 81401
LT 81401
LG 81402
MH 24"
FIC 81401
FE/FT 81401
POLISHED COND. 300-11818 12021 FROM 300-PA-CF-8004A/B
10"-CL-300-81604-A92K(A21A)-
12"-SV-300-81401-A3A(H1A)-
PSV 81402 12.00
CRWS
1"-WCR-300-81401-A3A(H1A)-
SC 81402
TI 81409
GRADE
TE/TT 81401
TI 81401
8"-CL-300-81404-A1A(A1B)-HS
3/4"-WCR-300-81402-A3A(H1A)-
CW RETURN 300-11851-2 12023
12"-WCR-300-81401-A3A(H1A)-
12"-WCS-300-81403-A3A(H1A)-
300-EE-00-8003
CW SUPPLY 300-11851-2 12024
12"-WCS-300-81401-A3A(H1A)-
10"-WCS-300-81403-A3A(H1A)-
TE/TT 81402
TI 81402
FI 81403
FE/FT 81403
AT 81401
AE 81401
AT 81401
TOC
LV 81401
PC 4"
SC 81401
LP CONDENSATE 300-11813 12025 TO 300-LZ-00-8002
8"-CL-300-81407-A1A(A1B)-HS
8"x4"
4"
OWS
3"
TL
6000 MM
NOTE 3
PI 81401
PI 81406
PI 81402
PI 81407
1"
3/4"
300-PA-CF-8002A NOTE 6
300-PA-CF-8002B NOTE 6
M
XL 81401
XL 81402

300-PA-CF-8002A/B
LP CONDENSATE PUMPS
Rated Flow: 197.8 m^3/hr
Diff. Press: 3.17 kg/cm^2
DP: 15.5 kg/cm^2g
DT : 125 °C

REV.	DATE	REVISION	DRN	BY	CHKD	APPD.
3	16.10.25	REVISED AS MARKED & ISSUED FOR HAZOP. AN	MK	NS	MS	
2	04.07.25	REVISED AS MARKED AND PMS INCORP.	AK	MK	NS	MS

इंजीनियर्स इंडिया लिमिटेड ENGINEERS INDIA LIMITED (A Govt. of India Undertaking)

SCALE	JOB NO.	DEPT.	SECTN.	UNIT	DWG. No.	REV.
	B957	79	41	300	11814	2

BINA PETROCHEMICAL AND REFINERY EXPANSION PROJECT (BPREP)
ETHYLENE CRACKER & ASSOCIATED UNITS
BINA, MADHYA PRADESH, INDIA

BHARAT PETROLEUM CORPORATION LIMITED
BINA REFINERY

REV	ISSUE DATE	DESCRIPTION	CAD	PROJ ENG	LPE	PDM	PM	CLIENT
1	03/07/2025	REVISED FOR BEP	PT	SC	SC	SKG VK	SA	
1	01/13/2025	FOR BEP	NAh	SC	SC	SKG VK	SA	
1	10/21/2024	PRELIMINARY	NAh	SC	SC	SKG VK	SA	

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PIPING AND INSTRUMENTATION DIAGRAM
ETHYLENE CRACKER UNIT
LOW PRESSURE CONDENSATE FLASH DRUM

SCALE | DWG. NO. 363136-300-11814 | REV. 1

NOTES:

1. FOR LEGEND, SYMBOLS, GENERAL NOTES AND ENGINEERING DESIGN NOTES SEE DWG. NO B957-79-41-000-11011 THRU B957-79-41-000-11014. ALL TAG NUMBERS FOR INSTRUMENTS WILL BE PRECEDED BY UNIT NUMBER "300" UNLESS OTHERWISE SPECIFIED.
2. IN CASE CONDENSATE IS HYDROCARBON CONTAMINATED, CONDENSATE WILL BE SENT TO SUSPECT CONDENSATE COLLECTION SYSTEM.
3. HIGH INTEGRITY CONDUCTIVITY ANALYZER.
4. TWO OUT OF THREE LOW LOW PRESSURE SIGNAL WILL CAUSE SHUTDOWN. DEVIATION OF ANY ONE SIGNAL FROM OTHERS WILL CAUSE ALARM.
5. ARRANGEMENT SHOWN HERE IS TO REPRESENT MINIMUM INSTRUMENTATION REQUIRED AT BATTERY LIMIT. COOLING WATER LINE SIZE, DISTRIBUTION PIPE SPEC ETC. TO BE SHOWN DURING DETAIL ENGINEERING.
6. MAXIMUM SUSPECT CONDENSATE EXPORT WILL BE CONTROLLING OF SURFACE CONDENSATE F LOW FROM CGC AND PRC TURBINE.
7. FOR DISTRIBUTION OF INTERMEDIATE LEVEL COOLING WATER REFER P&ID 300-11851.
8. COOLING WATER FLOW METER SHALL BE INSTALLED ABOVE GROUND ONLY.
9. SAMPLE CONNECTION DETAILS AND RETURN LINES DESTINATION TO BE FINALIZED DURING DETAIL ENGINEERING

12411 SURFACE COND. 300-11511 FROM KT-2001

6"-CL-300-82006-A1A(A1A)-

SC 81101

NOTE 9

AE 82002 — AT 82002 — COND. AI 82002 H

NOTE 2

HV 82002B — FC — HIC 82002B

SEE DETAIL "A"

6"-CL-300-82002003-A1A-

NOTE 2

HV 82002A — FC — HIC 82002A

12413 SURFACE COND. 300-11512 FROM KT-2001

8"-CL-300-82009-A1A(A1A)-

SC 81102

NOTE 9

AE 82004 — AT 82004 — COND. AI 82004 H

NOTE 2

HV 82004B — FC — HIC 82004B

SEE DETAIL "A"

16"-CL-300-82002005-A1A-HNF

NOTE 2

HV 82004A — FC — HIC 82004A

SURFACE COND. 300-11815 12070

10"-CL-300-43596-A1A(A1A)-

TO 300-TT-00-8001 CONDENSATE SURGE TANK

FQI 82003 — FI 82003 — TI 82005 — PI 82005

TI 82006 — PI 82006 — FE/FT 82003 — TE/TT 82005 — PT 82005

HNF

10"(H)-CL-441-1302-A1A-H

SUSPECT COND. 441-1113 12466

TO OSBL

BL

10"-CL-300-82002-A1A(A1A)- NOTE 6

19674 SUSPECT COND. 300-11813

PI 82003 L A,B,C — EDS 001

2oo3

PY 82003 LL A,B,C — NOTE 4

PT 82003 A/B/C

FI 82001 H L — FQI 82001

FE/FT 82001

TI 82003 H L

TE/TT 82003

12"-BCS-300-82001-A3A(-)-

19666 BCW SUPPLY 300-11852

A3A A91A

CW SUPPLY 441-1111 12448

FROM OSBL

BL

156"-WCS-300-82001-A91A(H1A)-

Pi 82001 — TI 82001

B — S NOTE 8 — NOTE 5 — B

156"-WCS-300-82001-A91A(H1A)- 12449 CW SUPPLY 300-11851-1

TO DISTRIBUTION

PI 82004 H L — FI 82002 — FQI 82002 — TI 82004 H L

PI 82002 — TI 82002 — PT 82004

FE/FT 82002

TE/TT 82004

CW RETURN 441-1111 12450

TO OSBL

BL

156"-WCR-300-82001-A91A(H1A)-

B — S NOTE 8 — NOTE 5 — B

156"-WCR-300-82001-A91A(H1A)- CW RETURN 300-11851-1 12451

FROM DISTRIBUTION

REV	DATE	REVISION	DRN	BY	CHKD	APPD.
3	09.10.25	REVISED AS MARKED & ISSUED FOR HAZOP	AK	MV	MK	NS
2	04.07.25	REVISED AS MARKED AND PMS INCORP.	AK	MK	NS	MS

ENGINEERS INDIA LIMITED (A Govt. of India Undertaking)

अनुमाप SCALE	कार्य संख्या JOB NO.	विभाग DEPT.	अनुभाग SECTN.	इकाई UNIT	प्रलेख संख्या DWG. No.	पंजी REV.
	B957	79	41	300	11820	3

BINA PETROCHEMICAL AND REFINERY EXPANSION PROJECT (BPREP)
ETHYLENE CRACKER & ASSOCIATED UNITS
BINA, MADHYA PRADESH, INDIA

BHARAT PETROLEUM CORPORATION LIMITED
BINA REFINERY

REV	ISSUE DATE	DESCRIPTION	CAO	PROJ ENG	LPE	PDM	PM	CLIENT
3	03/07/2025	REVISED FOR BEP	PT	SC	SC	SKG/MK	SA	
2	01/13/2025	FOR BEP	NAh	SC	SC	SKG/MK	SA	
1	11/21/2024	PRELIMINARY	NAh	SC	SC	SKG/MK	SA	

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PIPING AND INSTRUMENTATION DIAGRAM
ETHYLENE CRACKER UNIT
SURFACE CONDENSATE NETWORK AND COOLING WATER B/L INSTRUMENTATION

SCALE: — DWG. No: 363136-300-11820 — REV. 1

Page 2002 of 4391 : B957-TENDER_DOC-B957-300-16-43-MR-T-3001 : Rev. A

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GENERAL NOTES:-

A. ALL INSTRUMENTS TAGS TO BE PREFIXED BY UNIT NO. 300.
B. FOR LEGEND, SYMBOLS, GENERAL NOTES & ENGINEERING DESIGN NOTES SEE DWG NO. 363136-000-11911 THROUGH 11014.

300-PA-CF-1302 A/B/C
300-PA-CF-7001
300-PA-CF-2712
BPR-4
BPR-2
-WCS-300- 82606-A3A-
-WCR-300- 82606-A3A-
-WCS-300- 82615-A3A-
-WCR-300- 82615-A3A-
-WCS-300- 82616-A3A-
-WCR-300- 82616-A3A-
TI 82603
FI 85602
TT 82603
PI 82603
FT 85602
TE 82603
TI 82604
PT 82603
PI 82604
16"-WCR-300- 82607-A3A-
6"x12"
12"x16"
M
FE-82602
B/L
3/4"
19/34
CW RETURN
441-1111
EMERGENCY
-WCS-300- 82614-A3A-
12"-WCR-300- 82613-A3A-
TI 82602
FI 82601
TT 82602
PI 82602
FT 82601
TE 82602
TI 82601
PT 82602
PI 82601
16"-WCS-300- 82607-A3A-
6"x12"
12"x16"
M
FE-82601
B/L
3/4"
19/35
CW SUPPLY
441-1111
EMERGENCY
300-PA-CF-2001 A/B/C
-WCS-300- 82604-A3A-
-WCR-300- 82604-A3A-
12"-WCS-300- 82613-A3A-
-WCS-300- 82617-A3A-
-WCR-300- 82617-A3A-
300-PA-CF-2010
10"-WCR-300- 82612-A3A-
10"-WCS-300- 82612-A3A-
300-PA-CF-8003 A/B
-WCS-300- 82608-A3A-
-WCR-300- 82608-A3A-
8"-WCS-300- 82603-A3A-
8"-WCR-300- 82603-A3A-
300-KA-CF-2001
300-PA-CF-8002 A/B
-WCS-300- 82609-A3A-
-WCR-300- 82609-A3A-
BPR-5A
8"x12"
8"x12"
BPR-6
-WCR-300- 82618-A3A-
-WCS-300- 82618-A3A-
300-PA-CF-4210
BPR-7A
BPR-6A
300-PA-CF-8005 A/B
-WCS-300- 82610-A3A-
-WCR-300- 82610-A3A-
10"-WCR-300- 82601-A3A-
12"-WCS-300- 82601-A3A-
300-PA-CF-8004 A/B
-WCS-300- 82611-A3A-
-WCR-300- 82611-A3A-
8"-WCS-300- 82602-A3A-
8"-WCR-300- 82602-A3A-
300-KA-CF-6001
300-KA-CF-6001

REV.	DATE	REVISIONS	DRN	BY	CHKD	APPD.
A	27.05.25	ISSUED FOR COMMENT	RS	MV	GS	KK

इंजीनियर्स इंडिया लिमिटेड (भारत सरकार का उपक्रम) ENGINEERS INDIA LIMITED (A Govt. of India Undertaking)

भारत पैट्रोलियम कॉर्पोरेशन लिमिटेड
BHARAT PETROLEUM CORPORATION LTD.
BINA PETROCHEMICAL AND REFINERY EXPANSION PROJECT (BPREP)

पाइपिंग एण्ड इंस्ट्रूमैन्टेशन डायाग्राम
PIPING AND INSTRUMENTATION DIAGRAM
EMERGENCY COOLING WATER

अनुमाप SCALE	कार्य संख्या JOB NO.	विभाग DEPT.	अनुभाग SECTN.	इकाई UNIT	आरेख संख्या DWG No.	संशो REV.
NTS	B957	79	41	300	11826	A

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GENERAL NOTES:

A. FOR STANDARD SYMBOLS & NOMENCLATURE REFER DWG. NO. 36136-000-11011 THRU 36136-000-11014.

B. ALL INSTRUMENTS TAG NO. ARE TO BE PREFIXED WITH "300".

NOTES:

1. 4" STUB WITH ISOLATION VALVE AT THE LOWEST POINT IN ALL DEAD END OF COOLING WATER HEADER SHALL BE PROVIDED FOR FLUSHING.
2. DOTTED LINES (------) DEPICTED HERE ARE SHOWN IN PROCESS P&ID's. SCHEME/DISTRIBUTION OF THE SAME SHALL BE FOLLOWED AS GIVEN IN RESPECTIVE PROCESS P&ID's.
3. THIS DRAWING IS BASED ON ECU EQUIPMENT LAYOUT DRAWING NO. 8957-300-16-43-00001/00002 REV-D.
4. FOR COOLING WATER LINES GREATER THAN EQUAL TO 42" MANWAY CAN BE PROVIDED EVERY 100 M (APPROX) IN HORIZONTAL LINES ONLY. IN BETWEEN VENT CAN ALSO BE PROVIDED FOR PROPER VENTILATION.
5. ROG TIE-IN POINT.
6. TO PGHU.
7. TO BTX.

No.	DATE	REVISIONS	DRN	CHKD	APPD.
B	21.03.25	RE-ISSUED FOR COMMENTS	SM	GS	KK	MS
A	02.01.25	ISSUED FOR COMMENTS	PP	GS	KK	MS

इंजिनियर्स इंडिया लिमिटेड (भारत सरकार का उपक्रम) — ENGINEERS INDIA LIMITED (A Govt. of India Undertaking)

भारत पैट्रोलियम कॉर्पोरेशन लिमिटेड
BHARAT PETROLEUM CORPORATION LTD.
BINA PETROCHEMICAL AND REFINERY EXPENSION PROJECT (BPREP)

पाइपिंग एण्ड इंस्ट्रूमेन्टेशन डायाग्राम
PIPING AND INSTRUMENT DIAGRAM
ETHYLENE CRACKER UNITS
COOLING WATER DISTRIBUTION (SHT. 3 OF 4)

SCALE	JOB NO.	DEPT.	SECTN.	UNIT	DWG. No.	REV.
NTS	B957	79	41	300	11851	A

EIL-0241-502-REV-0-A — DISTRIBUTION CODE

Page 2004 of 4391 ; B957-TENDER_DOC-B957-300-16-43-MR-T-3001 ; Rev. A

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10"-WCS-300-85140-A3A
6"-WCS-300-85137-A3A
28"-WCS-300-85136-A3A
16"-WCR-300-15403-A3A
300-EE-00-1404 A
16"-WCS-300-15404-A3A
16"-WCR-300-15401-A3A
300-EE-00-1404 B
16"-WCS-300-15402-A3A
4"(H)-WCR-300-85121-A3A
4"(H)-WCS-300-85121-A3A
300-KA-CF-2401
12"(H)-WCR-300-85123-A3A
12"(H)-WCS-300-85123-A3A
REJECT GAS COMPRESSOR
42"-WCR-301-11401-A3A
301-EE-00-1602
42"-WCS-301-11401-A3A
20"-WCR-300-85104-A3A
20"-WCS-300-85104-A3A
6"-WCR-300-25702-A3A
300-EE-00-2401
6"-WCS-300-25701-A3A
6"-WCR-304-42104-A3A
WAO UNIT
6"-WCS-304-40201-A3A
6"-WCR-300-26101-A3A
300-EE-00-2405
6"-WCS-300-26101-A3A
20"x8"
42"-WCR-300-85113-A3A
42"-WCS-300-85113-A3A
10"-WCR-300-24001-A3A
10"-WCS-300-24001-A3A
300-EE-00-2302
16"-WCR-300-22201-A3A
300-EE-00-2501
16"-WCS-300-22201-A3A
16"x28"
28"-WCR-300-85102-A3A
28"x36"
28"-WCS-300-85102-A3A
(SHT. 3 OF 4)
(SHT. 1 OF 4)
300-LZ-00-1181
16"(H)-WCR-300-85122-A3A
16"(H)-WCS-300-85122-A3A
24"-WCR-300-85103-A3A
24"-WCS-300-85103-A3A
300-EE-00-1301A
300-EE-00-1301B
300-EE-00-1301C
300-EE-00-1301D
300-EE-00-1302A
300-EE-00-1302B
300-EE-00-1405
300-EE-00-2101
6"-WCR-300-15302-A3A
6"-WCS-300-15301-A3A
3"-WCR-300-24302-A3A
3"-WCS-300-24301-A3A
16"-WCR-300-85105-A3A
16"x20"
16"-WCS-300-85105-A3A
10"-WCS-300-85139-A3A
12"x24"
10"-WCR-300-81401-A3A
10"-WCS-300-81401-A3A
300-EE-00-8003
66"-WCR-300-15006-A91A
66"-WCS-300-15101-A91A
8"-WCR-300-13202-A3A
300-EE-00-1182
8"-WCS-300-13203-A3A
10"-WCR-300-113101-A3A
300-EE-00-1181
10"-WCS-300-113101-A3A
8"-WCS-300-85138-A3A

GENERAL NOTES:

A. FOR STANDARD SYMBOLS & NOMENCLATURE REFER DWG. NO. 36136-000-11011 THRU 36136-000-11014.
B. ALL INSTRUMENTS TAG NO. ARE TO BE PREFIXED WITH "300".

NOTES:

1. 4" STUB WITH ISOLATION VALVE AT THE LOWEST POINT IN ALL DEAD END OF COOLING WATER HEADER SHALL BE PROVIDED FOR FLUSHING.
2. DOTTED LINES (------) DEPICTED HERE ARE SHOWN IN PROCESS P&ID's. SCHEME/DISTRIBUTION OF THE SAME SHALL BE FOLLOWED AS GIVEN IN RESPECTIVE PROCESS P&ID's.
3. THIS DRAWING IS BASED ON ECU EQUIPMENT LAYOUT DRAWING NO. 8957-300-16-43-00001/00002 REV-D.
4. FOR COOLING WATER LINES GREATER THAN EQUAL TO 42" MANWAY CAN BE PROVIDED EVERY 100 M (APPROX) IN HORIZONTAL LINES ONLY. IN BETWEEN VENT CAN ALSO BE PROVIDED FOR PROPER VENTILATION.

No.	DATE	REVISIONS	DRN	BY	CHKD	APPD.
B	20.03.25	RE-ISSUED FOR COMMENTS	SM	GS	KK	MS
A	02.01.25	ISSUED FOR COMMENTS	PP	GS	KK	MS

इंजीनियर्स इंडिया लिमिटेड (भारत सरकार का उपक्रम)
ENGINEERS INDIA LIMITED (A Govt. of India Undertaking)

भारत पैट्रोलियम कॉर्पोरेशन लिमिटेड
BHARAT PETROLEUM CORPORATION LTD.
BINA PETROCHEMICAL AND REFINERY EXPANSION PROJECT (BPREP)

पाइपिंग एण्ड इंस्ट्रूमेन्टेशन डायाग्राम
PIPING AND INSTRUMENT DIAGRAM
ETHYLENE CRACKER UNITS
COOLING WATER DISTRIBUTION (SHT. 2 OF 4)

जनुमाप SCALE	कार्य संख्या JOB NO.	विभाग DEPT.	अनुभाग SECTN.	इकाई UNIT	आरेख संख्या DWG. No.	रेवी. REV.
NTS	B957	79	41	300	11851	A

EIL-0241-302-REV-0-A
DISTRIBUTION CODE

Page 2005 of 4391 ; B957-TENDER_DOC-B957-300-16-43-MR-T-3001 ; Rev. A

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GENERAL NOTES:

A. FOR STANDARD SYMBOLS & NOMENCLATURE REFER DWG. NO. 36136-000-11011 THRU 36136-000-11014.

B. ALL INSTRUMENTS TAG NO. ARE TO BE PREFIXED WITH "300".

NOTES:

1. 4" STUB WITH ISOLATION VALVE AT THE LOWEST POINT IN ALL DEAD END OF COOLING WATER HEADER SHALL BE PROVIDED FOR FLUSHING.
2. DOTTED LINES (------) DEPICTED HERE ARE SHOWN IN PROCESS P&ID's. SCHEME/DISTRIBUTION OF THE SAME SHALL BE FOLLOWED AS GIVEN IN RESPECTIVE PROCESS P&ID's.
3. THIS DRAWING IS BASED ON ECU EQUIPMENT LAYOUT DRAWING NO. B957-300-16-43-00001/0002 REV-D.
4. FOR COOLING WATER LINES GREATER THAN EQUAL TO 42" MANWAY CAN BE PROVIDED EVERY 100 M (APPROX) IN HORIZONTAL LINES ONLY. IN BETWEEN VENT CAN ALSO BE PROVIDED FOR PROPER VENTILATION.

No.	DATE	REVISIONS	DRN	CHKD	APPD.
B	20.03.25	RE-ISSUED FOR COMMENTS	SM	GS	KK	MS
A	02.01.25	ISSUED FOR COMMENTS	PP	GS	KK	MS

संख्या | तिथि | संशोधन | ड्रॉन द्वारा | जाँच | स्वीकृत

इंजिनियर्स इंडिया लिमिटेड (भारत सरकार का उपक्रम)

ENGINEERS INDIA LIMITED (A Govt. of India Undertaking)

भारत पैट्रोलियम कॉर्पोरेशन लिमिटेड
BHARAT PETROLEUM CORPORATION LTD.
BINA PETROCHEMICAL AND REFINERY EXPENSION PROJECT (BPREP)

पाइपिंग एण्ड इंस्ट्रूमेन्टेशन डायग्राम
PIPING AND INSTRUMENT DIAGRAM
ETHYLENE CRACKER UNITS
COOLING WATER DISTRIBUTION (SHT. 1 OF 4)

अनुमाप SCALE	कार्य संख्या JOB NO.	विभाग DEPT.	अनुभाग SECTN.	इकाई UNIT	ऊरेख संख्या DWG. No.	संशो. REV.
∽	B957	79	41	300	11851	A

EIL-0241-502-REV-0-A DISTRIBUTION CODE

Page 2006 of 4391 : B957-TENDER DOC-B957-300-16-43-MR-T-3001 : Rev. A

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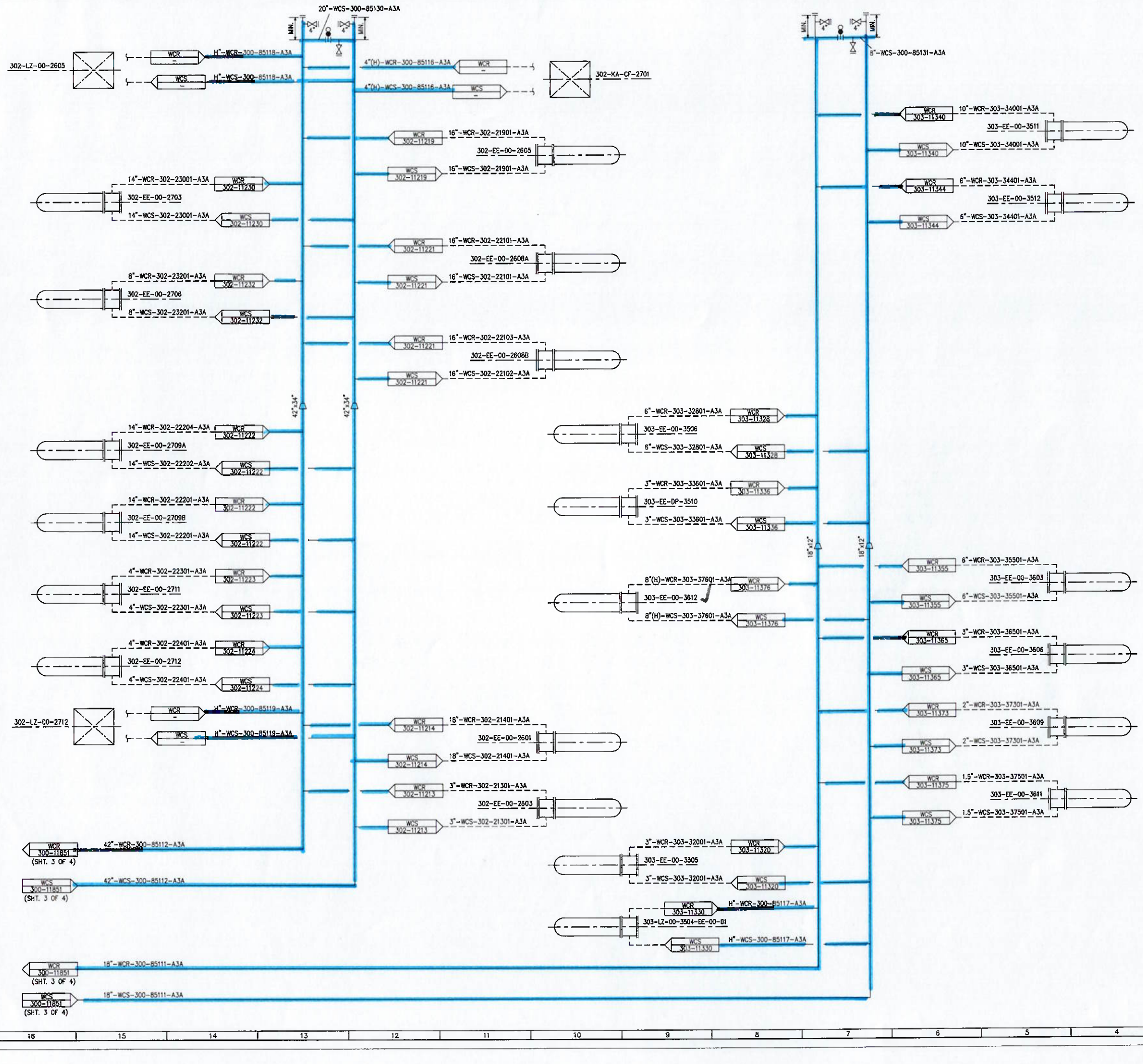

GENERAL NOTES:

A. FOR STANDARD SYMBOLS & NOMENCLATURE REFER DWG. NO. 36136-000-11011 THRU 36136-000-11014.

B. ALL INSTRUMENTS TAG NO. ARE TO BE PREFIXED WITH "300".

NOTES:

1. 4" STUB WITH ISOLATION VALVE AT THE LOWEST POINT IN ALL DEAD END OF COOLING WATER HEADER SHALL BE PROVIDED FOR FLUSHING.
2. DOTTED LINES (------) DEPICTED HERE ARE SHOWN IN PROCESS P&ID's. SCHEME/DISTRIBUTION OF THE SAME SHALL BE FOLLOWED AS GIVEN IN RESPECTIVE PROCESS P&ID's.
3. THIS DRAWING IS BASED ON ECU EQUIPMENT LAYOUT DRAWING NO. B957-300-16-43-00001/00002 REV.D
4. FOR COOLING WATER LINES GREATER THAN EQUAL TO 42" MANWAY CAN BE PROVIDED EVERY 100 M (APPROX) IN HORIZONTAL LINES ONLY. IN BETWEEN VENT CAN ALSO BE PROVIDED FOR PROPER VENTILATION.

No.	DATE	REVISIONS	DRN	CHKD	APPD.
B	21.03.25	RE-ISSUED FOR COMMENTS	SM	GS	KK	MS
A	02.01.25	ISSUED FOR COMMENTS	PP	GS	KK	MS

इंजिनियर्स इंडिया लिमिटेड (भारत सरकार का उपक्रम)
ENGINEERS INDIA LIMITED (A Govt. of India Undertaking)

भारत पैट्रोलियम कॉर्पोरेशन लिमिटेड
BHARAT PETROLEUM CORPORATION LTD.
BINA PETROCHEMICAL AND REFINERY EXPENSION PROJECT (BPREP)

पाइपिंग एण्ड इंस्ट्रूमैन्टेशन डायाग्राम
PIPING AND INSTRUMENT DIAGRAM
ETHYLENE CRACKER UNITS
COOLING WATER DISTRIBUTION (SHT. 4 OF 4)

जनुमाप SCALE	कार्य संख्या JOB NO.	विभाग DEPT.	उनुभाग SECTN.	इकाई UNIT	ड्राइंग संख्या DWG. No.	संशो. REV.
NTS	B957	79	41	300	11851	D

EIL-0241-502-REV-0-A

DISTRIBUTION CODE

Page 2007 of 4391 ; B957-TENDER_DOC-B957-300-16-43-MR-T-3001 ; Rev. A

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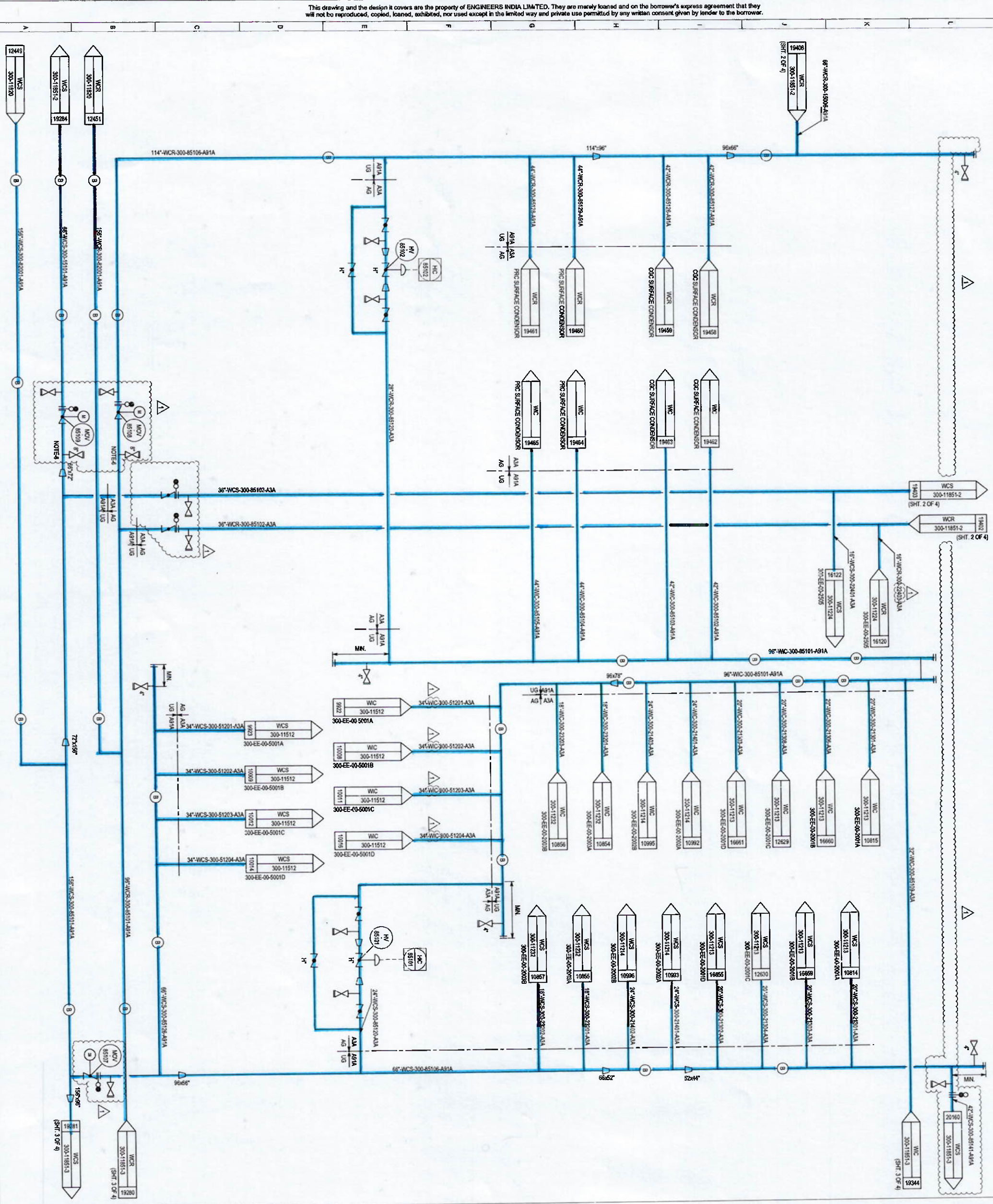

GENERAL NOTES:-

A. FOR LEGEND, SYMBOLS, GENERAL NOTES AND ENGINEERING DESIGN NOTES SEE DWG. NO. 8957-7764-1-000-11011 THRU 8957-7764-1-000-11014.
ALL TAG NUMBERS FOR INSTRUMENTS WILL BE PREFIXED BY UNIT NUMBER '300' UNLESS OTHERWISE SPECIFIED.

NOTES

1. 4" STUB WITH ISOLATION VALVE AT THE LOWEST POINT IN ALL DEAD END OF COOLING WATER HEADER SHALL BE PROVIDED FOR FLUSHING.
2. (DELETED)
3. THIS DRAWING IS BASED ON ECU EQUIPMENT LAYOUT DRAWING NO. 8957-300-1-43-30001/0002 REV-0.
4. FOR COOLING WATER LINES GREATER THAN EQUAL TO 42" MANWAY CAN BE PROVIDED EVERY 100 M(APPROX) IN HORIZONTAL LINES ONLY. IN BETWEEN VENT CAN ALSO BE PROVIDED FOR PROPER VENTILATION.
5. DELETED
6. ART - AIR RELEASE VENT

REV.	DATE	REVISIONS	DRN	BY	CHKD	APPD.
1	09.10.25	ISSUED FOR HAZOP	RS	GS	KK	MS
0	02.01.25	ISSUED FOR ENGG.	S.K.L	GS	KK	MS
B	20.03.25	ISSUED FOR COMMENTS	SM	GS	KK	MS
A	02.01.25	ISSUED FOR COMMENTS	PP	GS	KK	MS

इंजीनियर्स इंडिया लिमिटेड (भारत सरकार का उपक्रम) ENGINEERS INDIA LIMITED (A Govt. of India Undertaking)

भारत पैट्रोलियम कॉर्पोरेशन लिमिटेड
BHARAT PETROLEUM CORPORATION LTD.
BINA PETROCHEMICAL AND REFINERY EXPANSION PROJECT (BPREP)

पाइपिंग एण्ड इंस्ट्रूमेन्टेशन डायाग्राम
PIPING AND INSTRUMENTATION DIAGRAM
ETHYLENE CRACKER UNITS
COOLING WATER DISTRIBUTION (SHT. 1 OF 4)

जूनिट/SCALE	कार्य संख्या/JOB NO.	विभाग/DEPT.	जूनिट/SEGTN.	इकाई/UNIT	ड्राइंग संख्या/DWG. No.	रेव./REV.
S	B957	79	41	300	11851-1	1

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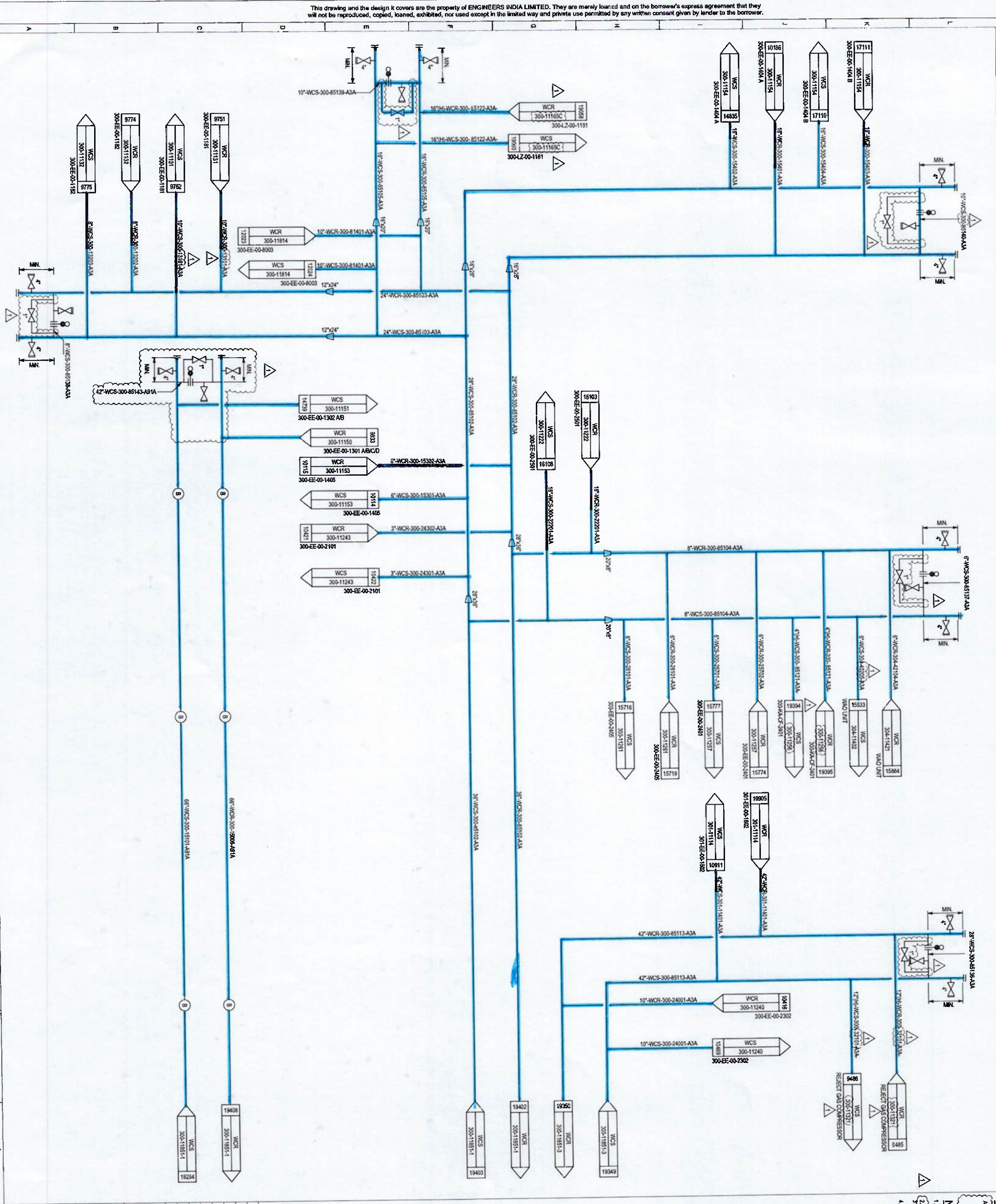

GENERAL NOTES:

A. FOR LEGEND, SYMBOLS, GENERAL NOTES AND ENGINEERING DESIGN NOTES SEE DWG. NO. B957-79-41-000-11011 THRU B957-79-41-000-11014.
ALL TAG NUMBERS FOR INSTRUMENTS WILL BE PREFIXED BY UNIT NUMBER 300' UNLESS OTHERWISE SPECIFIED.

NOTES:

1. 4" STUB WITH ISOLATION VALVE AT THE LOWEST POINT IN ALL DEAD END OF COOLING WATER HEADER SHALL BE PROVIDED FOR FLUSHING.
2. DELETED.
3. THIS DRAWING IS BASED ON EQU EQUIPMENT LAYOUT DRAWING NO.B957-300-16-43-00001/00002 REV-0.
4. FOR COOLING WATER LINES GREATER THAN EQUAL TO 42" MANWAY CAN BE PROVIDED EVERY 100 M (APPROX) IN HORIZONTAL LINES ONLY. IN BETWEEN VENT CAN ALSO BE PROVIDED FOR PROPER VENTILATION.

REV.	DATE	REVISIONS	DRN	BY	CHK'D	APP'D.
1	08.10.25	ISSUED FOR HAZOP	RS	GS	KK	MS
0	30.04.25	ISSUED FOR ENGG.	S.K.L	GS	KK	MS
B	21.02.25	ISSUED FOR COMMENT	SM	GS	KK	MS
A	02.01.25	ISSUED FOR COMMENT	PP	GS	KK	MS

इंजीनियर्स इंडिया लिमिटेड ENGINEERS INDIA LIMITED (A Govt. of India Undertaking)

भारत पैट्रोलियम कॉर्पोरेशन लिमिटेड
BHARAT PETROLEUM CORPORATION LTD.
BINA PETROCHEMICAL AND REFINERY
EXPANSION PROJECT (BPREP)

पाइपिंग एण्ड इंस्ट्रूमेन्टेशन डायाग्राम
PIPING AND INSTRUMENTATION DIAGRAM
ETHYLENE CRACKER UNITS
COOLING WATER DISTRIBUTION (SHT 2 OF 4)

जॉब संख्या JOB NO.	विभाग DEPT.	अनुभाग SECTN.	इकाई UNIT	ड्राइंग संख्या DWG. No.	रेव. REV.
B957	79	41	300	11851-2	1

अनुमाप SCALE

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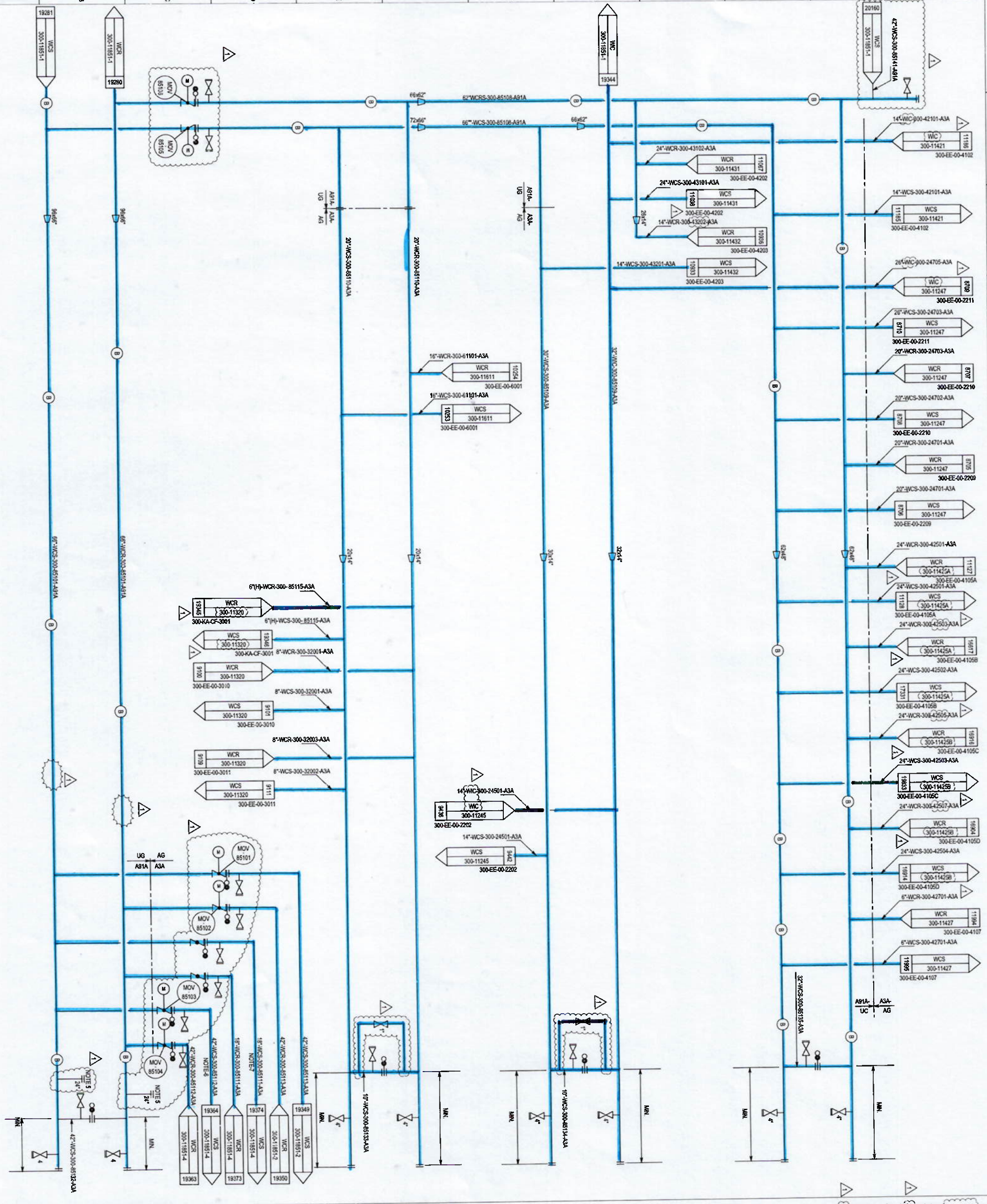

GENERAL NOTES:

A. FOR LEGEND, SYMBOLS, GENERAL NOTES AND ENGINEERING DESIGN NOTES SEE DWG. NO. B957-79-41-000-11011 THRU B957-79-41-000-11014.
ALL TAG NUMBERS FOR INSTRUMENTS WILL BE PRECEDED BY UNIT NUMBER '300' UNLESS OTHERWISE SPECIFIED.

NOTES:

1. 4" STUB WITH ISOLATION VALVE AT THE LOWEST POINT IN ALL DEAD END OF COOLING WATER HEADER SHALL BE PROVIDED FOR FLUSHING.
2. DELETED
3. THIS DRAWING IS BASED ON ECU EQUIPMENT LAYOUT DRAWING NO.B957-300-16-43-00001/00002 REV-0.
4. FOR COOLING WATER LINES GREATER THAN EQUAL TO 42" MANWAY CAN BE PROVIDED EVERY 100 M (APPROX) IN HORIZONTAL LINES ONLY. IN BETWEEN VENT CAN ALSO BE PROVIDED FOR PROPER VENTILATION.
5. TO PGHU
6. TO BTX
7. TO BTX
8. DELETED

REV.	DATE	REVISIONS	DRN	BY	CHKD	APPD.
1	06.10.25	ISSUED FOR HAZOP	RS	GS	KK	MS
0	30.04.25	ISSUED FOR ENGG.	S.K.L	GS	KK	MS
B	21.03.25	ISSUED FOR COMMENT	SM	GS	KK	MS
A	02.01.25	ISSUED FOR COMMENT	PP	GS	KK	MS

ENGINEERS INDIA LIMITED (A Govt. of India Undertaking)

भारत पैट्रोलियम कॉर्पोरेशन लिमिटेड
BHARAT PETROLEUM CORPORATION LTD.
BINA PETROCHEMICAL AND REFINERY EXPANSION PROJECT (BPREP)

पाइपिंग एण्ड इंस्ट्रूमेन्टेशन डायग्राम
PIPING AND INSTRUMENTATION DIAGRAM
ETHYLENE CRACKER UNITS
COOLING WATER DISTRIBUTION (SHT. 3 OF 4)

जॉब संख्या SCALE	JOB NO.	विभाग DEPT.	उपखण्ड SECTN.	इकाई UNIT	ड्राइंग संख्या DWG. No.	शीट REV.
S	B957	79	41	300	11851-3	1

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20"-WCS-300-85130-A3A

WCR 302-11233 19358 — (H)-WCR-300-85118-A3A- — 302-LZ-00-2605

WCS 302-11233 19356 — (H)-WCS-300-85118-A3A- — 302-LZ-00-2605

4"(H)-WCR-300-85116-A3A- — WCR 302-11227 19365 — 302-KA-CF-2701

4"(H)-WCS-300-85116-A3A- — WCS 302-11227 19366 — 302-KA-CF-2701

14"-WCR-302-23001-A3A — WCR 302-11230 10744 — 302-EE-00-2703

14"-WCS-302-23001-A3A — WCS 302-11230 10743 — 302-EE-00-2703

16"-WCR-302-21901-A3A — WCR 302-11219 11869 — 302-EE-00-2605

16"-WCS-302-21901-A3A — WCS 302-11219 11870 — 302-EE-00-2605

8"-WCR-302-23201-A3A — WCR 302-11232 10083 — 302-EE-00-2706

8"-WCS-302-23201-A3A — WCS 302-11232 10666 — 302-EE-00-2706

16"-WCR-302-22101-A3A — WCR 302-11221 11519 — 302-EE-00-2608A

16"-WCS-302-22101-A3A — WCS 302-11221 11517 — 302-EE-00-2608A

16"-WCR-302-22103-A3A — WCR 302-11221 11518 — 302-EE-00-2608B

16"-WCS-302-22102-A3A — WCS 302-11221 11516 — 302-EE-00-2608B

42"-WCR-300-85112-A3A — WCR 300-11851-3 19363

42"-WCS-300-85112-A3A — WCS 300-11851-3 19364

18"-WCR-300-85111-A3A — WCR 300-11851-3 19373

18"-WCS-300-85111-A3A — WCS 300-11851-3 19374

42"-34"

14"-WCR-302-22204-A3A — WCR 302-11222 15741 — 302-EE-00-2709A

14"-WCS-302-22202-A3A — WCS 302-11222 15784 — 302-EE-00-2709A

14"-WCR-302-22201-A3A — WCR 302-11222 10773 — 302-EE-00-2709B

14"-WCS-302-22201-A3A — WCS 302-11222 10774 — 302-EE-00-2709B

4"-WCR-302-22301-A3A — WCR 302-11223 10762 — 302-EE-00-2711

4"-WCS-302-22301-A3A — WCS 302-11223 10763 — 302-EE-00-2711

4"-WCR-302-22401-A3A — WCR 302-11224 10511 — 302-EE-00-2712

4"-WCS-302-22401-A3A — WCS 302-11224 10512 — 302-EE-00-2712

(H)-WCR-300-85119-A3A- — WCR 302-11225 10361 — 302-LZ-00-2712

(H)-WCS-300-85119-A3A- — WCS 302-11225 10362 — 302-LZ-00-2712

18"-WCR-302-21401-A3A — WCR 302-11214 10970 — 302-EE-00-2601

18"-WCS-302-21401-A3A — WCS 302-11214 10971 — 302-EE-00-2601

3"-WCR-302-21301-A3A — WCR 302-11213 11183 — 302-EE-00-2603

3"-WCS-302-21301-A3A — WCS 302-11213 11182 — 302-EE-00-2603

8"-WCS-300-85131-A3A

10"-WCR-303-34001-A3A — WCR 303-11340 16053 — 303-EE-00-3511

10"-WCS-303-34001-A3A — WCS 303-11340 16054 — 303-EE-00-3511

6"-WCR-303-34401-A3A — WCR 303-11344 16042 — 303-EE-00-3512

6"-WCS-303-34401-A3A — WCS 303-11344 16043 — 303-EE-00-3512

6"-WCR-303-32801-A3A — WCR 303-11328 15113 — 303-EE-00-3508

6"-WCS-303-32801-A3A — WCS 303-11328 15114 — 303-EE-00-3508

3"-WCR-303-33601-A3A — WCR 303-11336 15886 — 303-EE-DP-3510

3"-WCS-303-33601-A3A — WCS 303-11336 15892 — 303-EE-DP-3510

18"-12"

6"-WCR-303-35501-A3A — WCR 303-11355 16333 — 303-EE-00-3603

8"-WCR-303-37601-A3A — WCR 303-11376 16774 — 303-EE-00-3612

6"-WCS-303-35501-A3A — WCS 303-11355 16334 — 303-EE-00-3503

8"-WCS-303-37601-A3A — WCS 303-11376 16775 — 303-EE-00-3612

3"-WCR-303-36501-A3A — WCR 303-11365 16352 — 303-EE-00-3606

3"-WCS-303-36501-A3A — WCS 303-11365 16353 — 303-EE-00-3606

2"-WCR-303-37301-A3A — WCR 303-11373 16402 — 303-EE-00-3609

2"-WCS-303-37301-A3A — WCS 303-11373 16403 — 303-EE-00-3609

1-1/2"-WCR-303-37501-A3A — WCR 303-11375 16420 — 303-EE-DP-3611

1-1/2"-WCS-303-37501-A3A — WCS 303-11375 16421 — 303-EE-DP-3611

3"-WCR-303-32001-A3A — WCR 303-11320 15797 — 303-EE-00-3505

3"-WCS-303-32001-A3A — WCS 303-11320 15798 — 303-EE-00-3505

(H)-WCR-300-85117-A3A- — WCR 303-11330 16383 — 303-LZ-00-3504

(H)-WCS-300-85117-A3A- — WCS 303-11330 16384 — 303-LZ-00-3504

GENERAL NOTES:

A. FOR LEGEND, SYMBOLS, GENERAL NOTES AND ENGINEERING DESIGN NOTES SEE DWG. NO. B957-79-41-000-11011 THRU B957-79-41-000-11014.
ALL TAG NUMBERS FOR INSTRUMENTS WILL BE PRECEDED BY UNIT NUMBER "300" UNLESS OTHERWISE SPECIFIED.

NOTES:

1. 4" STUB WITH ISOLATION VALVE AT THE LOWEST POINT IN ALL DEAD END OF COOLING WATER HEADER SHALL BE PROVIDED FOR FLUSHING.
2. DELETED.
3. THIS DRAWING IS BASED ON ECU EQUIPMENT LAYOUT DRAWING NO.B957-300-18-43-00001/00002 REV-0.
4. FOR COOLING WATER LINES GREATER THAN EQUAL TO 42" MANWAY CAN BE PROVIDED EVERY 100 M (APPROX) IN HORIZONTAL LINES ONLY. IN BETWEEN VENT CAN. ALSO BE PROVIDED FOR PROPER VENTILATION.

REV.	DATE	REVISIONS	DRN	BY	CHKD	APPD.
1	08.10.25	ISSUED FOR HAZOP	RS	GS	KK	MS
0	30.04.25	ISSUED FOR ENGG.	S.K.L	GS	KK	MS
B	21.03.25	ISSUED FOR COMMENT	SM	GS	KK	MS
A	02.01.25	ISSUED FOR COMMENT	PP	GS	KK	MS

इंजीनियर्स इंडिया लिमिटेड ENGINEERS INDIA LIMITED (A Govt. of India Undertaking)

भारत पैट्रोलियम कॉर्पोरेशन लिमिटेड
BHARAT PETROLEUM CORPORATION LTD.
BINA PETROCHEMICAL AND REFINERY EXPANSION PROJECT (BPREP)

पाइपिंग एण्ड इंस्ट्रूमेन्टेशन डायाग्राम
PIPING AND INSTRUMENTATION DIAGRAM
ETHYLENE CRACKER UNITS
COOLING WATER DISTRIBUTION (SHT. 4 OF 4)

अनुमाप SCALE	कार्य संख्या JOB NO.	विभाग DEPT.	अनुभाग SECTN.	इकाई UNIT	आरेख संख्या DWG. No.	संशो REV.
NTS	B957	79	41	300	11851-4	1

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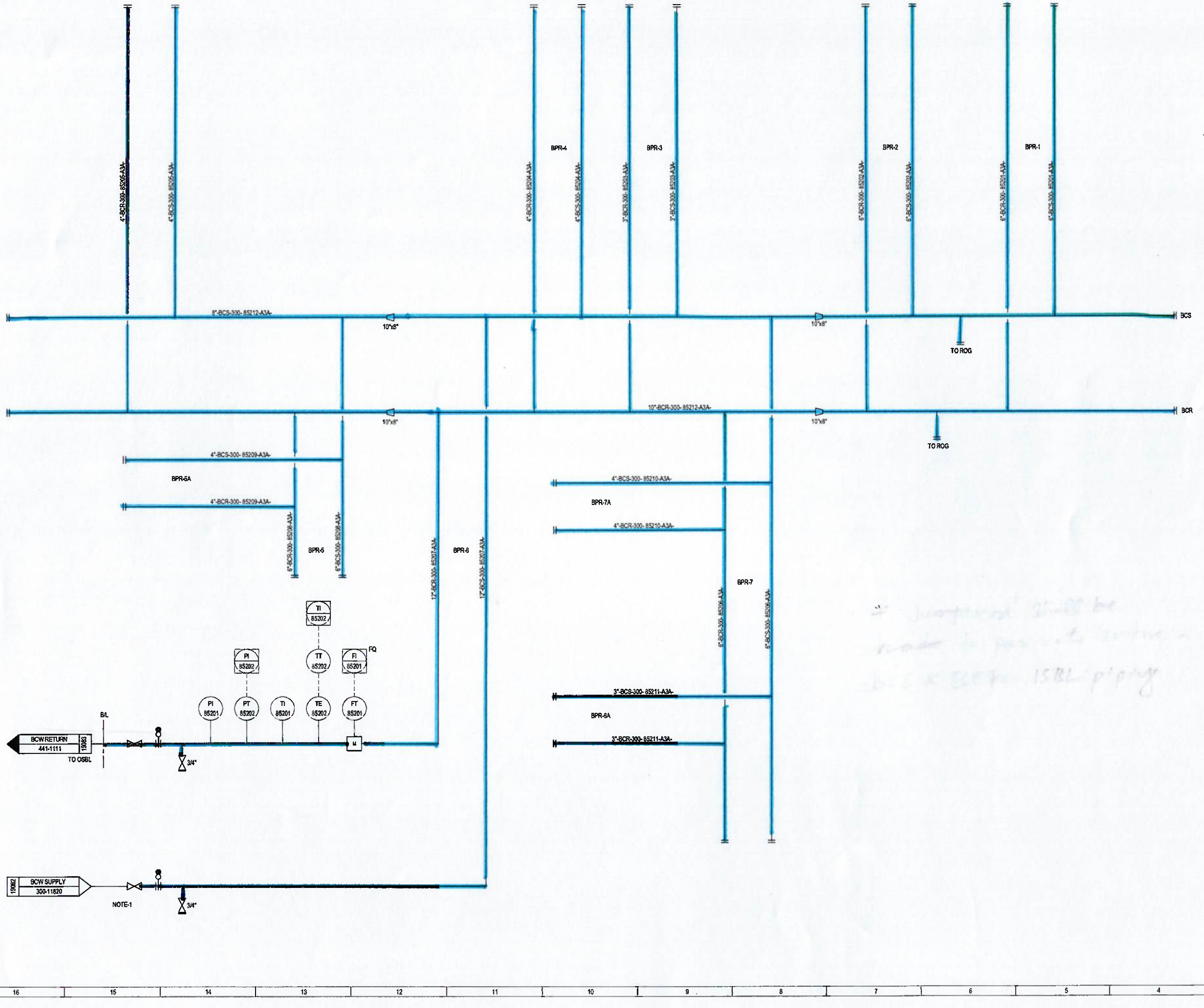

GENERAL NOTES:-

A. ALL INSTRUMENTS TAGS TO BE PREFIXED BY UNIT NO. 300.
B. FOR LEGEND, SYMBOLS, GENERAL NOTES & ENGINEERING DESIGN NOTES SEE DWG NO. 363136-000-11011 THROUGH 11014.

NOTES

1. BCW SUPPLY TAPPING TO BE TAKEN FROM 156"-WCS-300-82001-A91A.

Note:
Jumpovers shall be provided to passivate BCS & BCR ISBL piping

REV.	DATE	REVISIONS	DRN	BY	CHKD	APPD.
A	27.05.25	ISSUED FOR COMMENT	RS	MV	GS	KK

इंजीनियर्स इंडिया लिमिटेड (भारत सरकार का उपक्रम) ENGINEERS INDIA LIMITED (A Govt. of India Undertaking)

भारत पैट्रोलियम कॉर्पोरेशन लिमिटेड
BHARAT PETROLEUM CORPORATION LTD.
BINA PETROCHEMICAL AND REFINERY EXPANSION PROJECT (BPREP)

पाइपिंग एण्ड इंस्ट्रूमैन्टेशन डायाग्राम
PIPING AND INSTRUMENTATION DIAGRAM
BEARING COOLING WATER

अनुमाप SCALE	कार्य संख्या JOB NO.	विभाग DEPT.	अनुभाग SECTN.	इकाई UNIT	ड्राईंग संख्या DWG. No.	संशो. REV.
NTS	B957	79	41	300	11852	A

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300-YS-00-1111
VHP STEAM DESUPERHEATER FOR 300-FF-00-1111
DP 126.7 kg/cm^2g
DT 540 °C

300-WL-00-1111
VHP STEAM VENT SILENCER FOR 300-FF-00-1111
DP 128.76 KG/CM^2G
DT 540 °C

NOTES:

1. FOR LEGEND, SYMBOLS, GENERAL NOTES AND ENGINEERING DESIGN NOTES SEE DWG NO 363136-000-11011 THRU 363136-000-11014
   ALL INSTRUMENT TAG NUMBERS LOCATED ON THIS DRAWING SHALL HAVE THE PREFIX 300
2. THERE ARE TWO FLUE GAS TEMPERATURE MEASUREMENTS AT THE SAME LOCATION ON OPPOSITE OF THE HEATER
3. PROVIDE 10 MM WEEP HOLE ON LOW POINT
4. PROVIDE SMD SIGNAL ALARMS FOR THERMOCOUPLES
5. DESUPERHEATER ORIENTATION BY VENDOR DURING DETAIL ENGINEERING PHASE
6. TWO OUT OF THREE HIGH HIGH TEMPERATURE TRIP SIGNALS WILL CAUSE HEATER SHUTDOWN AND ANY ONE WILL ALARM. DEVIATION OF ONE SIGNAL FROM OTHERS WILL ALARM
7. PROVIDE LOCAL READOUT OF STEAM DRUM LI-21001 READABLE FROM HV-21009 AND FV-21057
8. LOW-LOW FLOW TRIP TO BE BYPASSED DURING START-UP
9. TWO OUT OF THREE LOW-LOW FLOW TRIP SIGNALS WILL CAUSE HEATER SHUTDOWN AND ANY ONE WILL ALARM.DEVIATION OF ONE SIGNAL FROM OTHER WILL ALARM
10. THROAT AREA OF THE VENTURI METER ON VHP HEADER MUST BE AT LEAST EQUAL TO THE SAFETY VALVE INLET
11. PROVIDE MECHANICAL MINIMUM STOP TO PREVENT DRY RUN
12. LOCATE FLOW ELEMENT IN A VERTICAL RUN OF PIPE OR PROVIDE UPSTREAM AND DOWNSTREAM LOW POINT DRAINS
13. PROVIDE TWO TEMPERATURE ELEMENTS IN EACH OF THE THERMOWELLS. THREE TEMPERATURE ELEMENTS ARE USED FOR SHUTDOWN SYSTEM AND THE FOURTH FOR DESUPERHEATER TEMPERATURE CONTROL
14. PROVISION FOR CHEMICAL CLEANING LOCATION TO BE DECIDED DURING DETAIL ENGINEERING. INSTALL WELD CAP AFTER CLEANING
15. 1 1/2" FLANGED CONNECTION FOR FLUE GAS MEASUREMENT DEVICE BY VENDOR

SHUTDOWN BYPASS SWITCH — HS 21057 — ESD 1111 — XA 21057

VHP 300-11116 9972 — 10"-SVH-300-21001-G58A-IH — NO POCKETS — TO HEADER

BFW 300-11116 9963 — 6"-WB-300-21001-F1A-IH — FROM HEADER

PHOSPHATE INJECT 300-11165A 10716 — 1-1/2"-C-300-16501-F21B- — FROM 300-LZ-00-1183

300-FF-00-1111 CONTINUED ON DWG 300-11121A

BFW PREHEAT COIL — BFW PREHEAT COIL 2 — SCR — FP COILS — AIG — UPPER STEAM SUPERHEAT COIL — LOWER STEAM SUPERHEAT COIL

LOCATE BELOW BFW COIL — LOCATE ABOVE USSH COIL — LOCATE ABOVE LSSH COIL — LOCATE BELOW LSSH COIL

CONTINUED ON DWG 300-11121D

300-YS-00-1111 (NOTE 5)

6"-WB-300-21002-F1AS-IH — BFW 300-11121I 16913 — TO 300-VV-HW-1111

8"-SVH-300-21004-F1AS-IH — DO NOT POCKET — VHP STEAM 300-11121I 16812 — FROM 300-VV-HW-1111

10"-SVH-300-21001-G58AS-IH

8"-SVH-300-21005-G58AS-IH — FREE DRAINING

8"-SVH-300-21006-G58AS-IH

300-WL-00-1111 — -V-300-21001-B54A-IS — TO GRADE AT SAFE LOCATION — 11542

18"-SV-300-21004-B54A-IS

14"x4" 14"-SV-300-21003-B54A-IS

LIC-21001 300-11121I 15314

BINA PETROCHEMICAL AND REFINERY EXPANSION PROJECT (BPREP)
ETHYLENE CRACKER & ASSOCIATED UNITS
BINA, MADHYA PRADESH, INDIA

BHARAT PETROLEUM CORPORATION LIMITED
BINA REFINERY

REV	ISSUE DATE	DESCRIPTION	CAD	PROC ENG	UPE	PDM	PM	CLIENT
1	01/01/2022	FOR BEP	NAN	PPP	SC	SKG /VK	SA	
0	10/21/2024	PRELIMINARY	NAN	PPP	SC	SKG /VK	SA	

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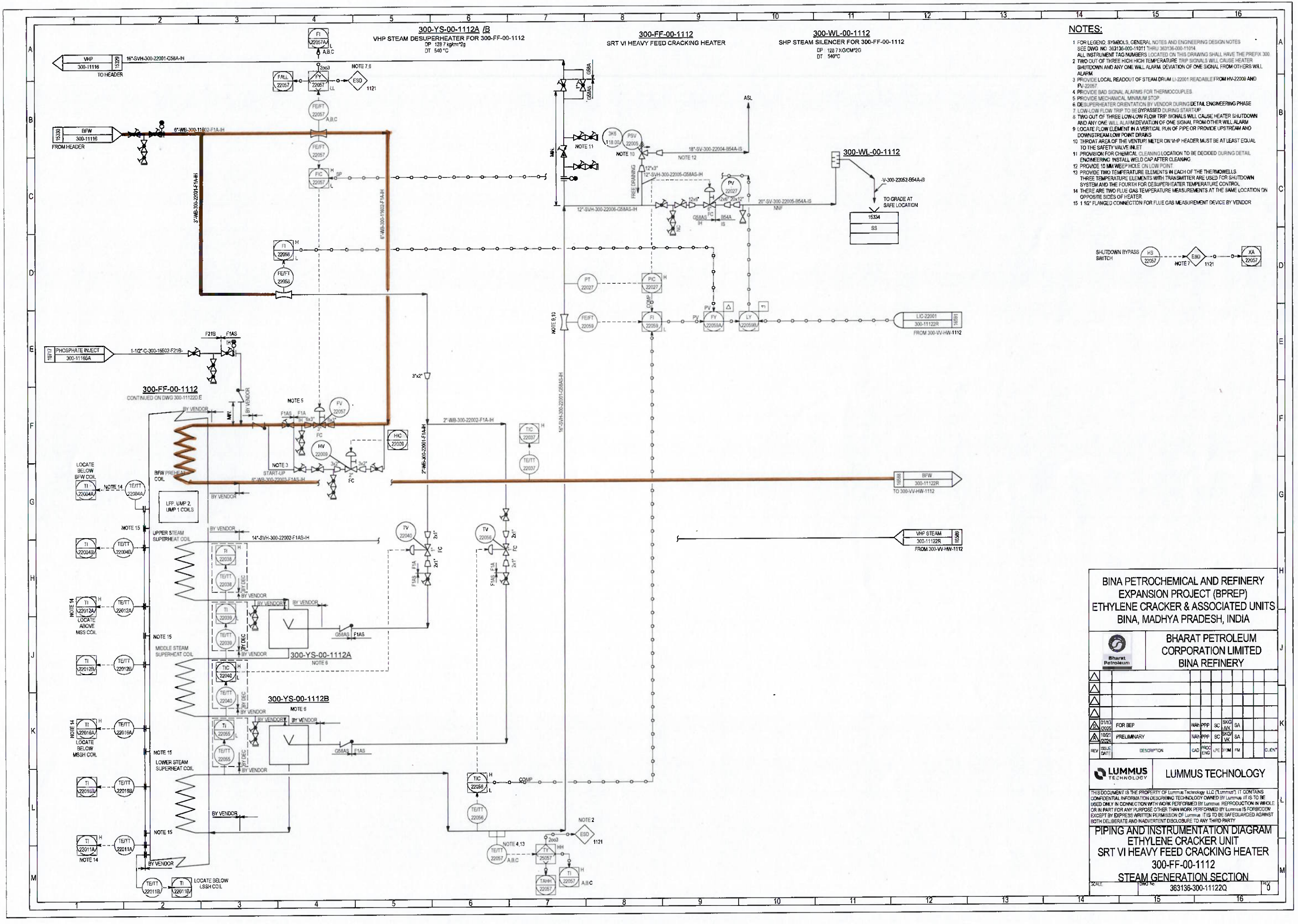
PIPING AND INSTRUMENTATION DIAGRAM
ETHYLENE CRACKER UNIT
SRT VI GAS CRACKING HEATER
300-FF-00-1111 STEAM GENERATION SEC.

SCALE: — DWG No: 363136-300-11121H — REV: 0



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300-YS-00-1113A/B
VHP STEAM DESUPERHEATER FOR 300-FF-00-1113
DP : 128.7 kg/cm^2g
DT : 540 °C

300-FF-00-1113
SRT VI HEAVY FEED CRACKING HEATER

300-WL-00-1113
SHP STEAM SILENCER FOR 300-FF-00-1113
DP : 128.7 KG/CM^2G
DT : 540°C

NOTES:

1. FOR LEGEND, SYMBOLS, GENERAL NOTES AND ENGINEERING DESIGN NOTES SEE DWG. NO. 363136-000-11011 THRU 363136-000-11014. ALL INSTRUMENT TAG NUMBERS LOCATED ON THIS DRAWING SHALL HAVE THE PREFIX 300.
2. TWO OUT OF THREE HIGH HIGH TEMPERATURE TRIP SIGNALS WILL CAUSE HEATER SHUTDOWN AND ANY ONE WILL ALARM. DEVIATION OF ONE SIGNAL FROM OTHERS WILL ALARM.
3. PROVIDE LOCAL READOUT OF STEAM DRUM LI-23001 READABLE FROM HV-23009 AND FV-23057.
4. PROVIDE BAD SIGNAL ALARMS FOR THERMOCOUPLES.
5. PROVIDE MECHANICAL MINIMUM STOP.
6. DESUPERHEATER ORIENTATION BY VENDOR DURING DETAIL ENGINEERING PHASE.
7. LOW-LOW FLOW TRIP TO BE BYPASSED DURING START-UP.
8. TWO OUT OF THREE LOW-LOW FLOW TRIP SIGNALS WILL CAUSE HEATER SHUTDOWN AND ANY ONE WILL ALARM.DEVIATION OF ONE SIGNAL FROM OTHER WILL ALARM.
9. LOCATE FLOW ELEMENT IN A VERTICAL RUN OF PIPE OR PROVIDE UPSTREAM AND DOWNSTREAM LOW POINT DRAINS.
10. THROAT AREA OF THE VENTURI METER ON VHP HEADER MUST BE AT LEAST EQUAL TO THE SAFETY VALVE INLET.
11. PROVISION FOR CHEMICAL CLEANING LOCATION TO BE DECIDED DURING DETAIL ENGINEERING, INSTALL WELD CAP AFTER CLEANING.
12. PROVIDE 10 MM WEEP HOLE ON LOW POINT.
13. PROVIDE TWO TEMPERATURE ELEMENTS IN EACH OF THE THERMOWELLS. THREE TEMPERATURE ELEMENTS WITH TRANSMITTER ARE USED FOR SHUTDOWN SYSTEM AND THE FOURTH FOR DESUPERHEATER TEMPERATURE CONTROL.
14. THERE ARE TWO FLUE GAS TEMPERATURE MEASUREMENTS AT THE SAME LOCATION ON OPPOSITE SIDES OF HEATER.
15. 1 1/2" FLANGED CONNECTION FOR FLUE GAS MEASUREMENT DEVICE BY VENDOR.

SHUTDOWN BYPASS SWITCH — HS 23057 — ESD 1131 NOTE 7 — XA 23057

VHP 300-11117 16585 — 16"-SVH-300-23001-G58A-IH — TO HEADER

BFW 300-11117 16584 — 6"-WB-300-11701-F1A-IH — FROM HEADER

3"-WB-300-23001-F1A-IH

6"-WB-300-11602-F1A-IH

FALL 23057 — FV 23057 — 2oo3 — NOTE 7,8 — ESD 1131

FE/FT 23057 A,B,C

FIC 23057 H SP L

FI 23058 H L — FE/FT 23058

PT 23027 — PIC 23027 H — COMP

FE/FT 23059 — FI 23059 H L — PV — FY 23059A — LY 23059B — LIC-23001 300-11123R 17960 — FROM 300-VV-HW-1112

NOTE 9,10

16"-SVH-300-23001-G58AS-IH

G58A — G58AS

ASL

3K8 118.00 — PSV 23005 — NOTE 11 — NOTE 10 — 18x6" — 16"-SV-300-23004-B54A-IS — NOTE 12

MIN — 12x3" FREE DRAINING

12"-SVH-300-23005-G58AS-IH

PV 23027 — 18x6" 20x12" — 20"-SV-300-23005-B54A-IS NNF

12"-SVH-300-23006-G58AS-IH — G58AS IH — FC — B54A IS — NC

300-WL-00-1113 — -V-300-23052-B54A-IS — TO GRADE AT SAFE LOCATION — 17961 SS

PHOSPHATE INJECT. 300-11165B 10721 — 1-1/2"-C-300-16503-F21B- — F21B — F1AS

300-FF-00-1113 CONTINUED ON DWG 300-11123D,E

BY VENDOR — MIN — BY VENDOR — NOTE 5 — FV 23057 — F1AS F1A — 6x3" 8x3" — FC

HIC 23009 — HV 23009 — NOTE 3 START-UP — 3x2" — 6"-WB-300-23003-F1AS-IH

3"x2"

2"-WB-300-23002-F1A-IH

TIC 23037 H — TE/TT 23037

2"-WB-300-23001-F1A-IH

LOCATE BELOW BFW COIL — TI 23004A — NOTE 14 — TE/TT 23004A

BFW PREHEAT COIL

LFP, UMP 2, UMP 1 COILS

BFW 300-11123R 17962 — TO 300-VV-HW-1112

NOTE 15 — UPPER STEAM SUPERHEAT COIL — 14"-SVH-300-23002-F1AS-IH

TV 23040 — 2x1" 1" FC 2x1" — F1AS F1A

TV 23056 — 2x1" FC 2x1" — F1AS F1A

TI 23038 H — TE/TT 23038 — BY DEC — BY VENDOR

TI 23039 L — TE/TT 23039 — BY DEC — BY VENDOR — BY VENDOR — BY VENDOR — G58AS F1AS

NOTE 14 — TI 23012A H — TE/TT 23012A — LOCATE ABOVE MSS COIL

NOTE 15 — MIDDLE STEAM SUPERHEAT COIL — 300-YS-00-1113A NOTE 6

TI 23012B — TE/TT 23012B

TIC 23040 H L — TE/TT 23040 — BY DEC — BY VENDOR — 300-YS-00-1113B NOTE 6

NOTE 14 — TI 23016A H — TE/TT 23016A — LOCATE BELOW MSSH COIL

TI 23055 L — TE/TT 23055 — BY DEC — BY VENDOR — BY VENDOR — BY VENDOR — G58AS F1AS

NOTE 15 — LOWER STEAM SUPERHEAT COIL

TI 23016B — TE/TT 23016B

TIC 23056 H L — COMP — TE/TT 23056

BY VENDOR

NOTE 15

NOTE 14 — TI 23011A H — TE/TT 23011A

NOTE 2 — ESD 1131 — 2oo3 — NOTE 4,13 — TE/TT 23057 A,B,C — TY 25057 HH — TAHH 23057 — TI 23057 H A,B,C

BY VENDOR — TE/TT 23011B — TI 23011B — LOCATE BELOW LSSH COIL

VHP STEAM 300-11123R 17962 — FROM 300-VV-HW-1112

BINA PETROCHEMICAL AND REFINERY EXPANSION PROJECT (BPREP)
ETHYLENE CRACKER & ASSOCIATED UNITS
BINA, MADHYA PRADESH, INDIA

BHARAT PETROLEUM CORPORATION LIMITED
BINA REFINERY

REV	ISSUE DATE	DESCRIPTION	CAD	PROC ENG	LPE	PDM	PM	CLIENT
1	01/13 2025	FOR BEP	NAH	PPP	SC	SKG /VK	SA	

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PIPING AND INSTRUMENTATION DIAGRAM
ETHYLENE CRACKER UNIT
SRT VI HEAVY FEED CRACKING HEATER
300-FF-00-1113
STEAM GENERATION SECTION

SCALE: — DWG. No: 363136-300-11123Q — REV. 0

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300-YS-00-1114A/B
VHP STEAM DESUPERHEATER FOR 300-FF-00-1114
DP : 128.7 kg/cm^2g
DT : 540 °C

300-FF-00-1114
SRT VI HEAVY FEED CRACKING HEATER

300-WL-00-1114
SHP STEAM SILENCER FOR 300-FF-00-1114
DP : 128.7 KG/CM^2G
DT : 540°C

NOTES:

1. FOR LEGEND, SYMBOLS, GENERAL NOTES AND ENGINEERING DESIGN NOTES SEE DWG. NO. 363136-000-11011 THRU 363136-000-11014. ALL INSTRUMENT TAG NUMBERS LOCATED ON THIS DRAWING SHALL HAVE THE PREFIX 300.
2. TWO OUT OF THREE HIGH HIGH TEMPERATURE TRIP SIGNALS WILL CAUSE HEATER SHUTDOWN AND ANY ONE WILL ALARM. DEVIATION OF ONE SIGNAL FROM OTHERS WILL ALARM.
3. PROVIDE LOCAL READOUT OF STEAM DRUM LI-24001 READABLE FROM HV-24006 AND FV-24057.
4. PROVIDE BAD SIGNAL ALARMS FOR THERMOCOUPLES.
5. PROVIDE MECHANICAL MINIMUM STOP.
6. DESUPERHEATER ORIENTATION BY VENDOR DURING DETAIL ENGINEERING PHASE.
7. LOW-LOW FLOW TRIP TO BE BYPASSED DURING START-UP.
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10. THROAT AREA OF THE VENTURI METER ON VHP HEADER MUST BE AT LEAST EQUAL TO THE SAFETY VALVE INLET.
11. PROVISION FOR CHEMICAL CLEANING LOCATION TO BE DECIDED DURING DETAIL ENGINEERING, INSTALL WELD CAP AFTER CLEANING.
12. PROVIDE 10 MM WEEP HOLE ON LOW POINT.
13. PROVIDE TWO TEMPERATURE ELEMENTS IN EACH OF THE THERMOWELLS. THREE TEMPERATURE ELEMENTS WITH TRANSMITTER ARE USED FOR SHUTDOWN SYSTEM AND THE FOURTH FOR DESUPERHEATER TEMPERATURE CONTROL.
14. THERE ARE TWO FLUE GAS TEMPERATURE MEASUREMENTS AT THE SAME LOCATION ON OPPOSITE SIDES OF HEATER.
15. 1 1/2" FLANGED CONNECTION FOR FLUE GAS MEASUREMENT DEVICE BY VENDOR.

SHUTDOWN BYPASS SWITCH — HS 24057 — ESD NOTE 7 1141 — XA 24057

BINA PETROCHEMICAL AND REFINERY EXPANSION PROJECT (BPREP)
ETHYLENE CRACKER & ASSOCIATED UNITS
BINA, MADHYA PRADESH, INDIA

BHARAT PETROLEUM CORPORATION LIMITED
BINA REFINERY

REV	ISSUE DATE	DESCRIPTION	CAD	PROC ENG	LPE	PDM	PM		CLIENT
1	01/13/2025	FOR BEP	NAh	PPP	SC	SKG /VK	SA		

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PIPING AND INSTRUMENTATION DIAGRAM
ETHYLENE CRACKER UNIT
SRT VI HEAVY FEED CRACKING HEATER
300-FF-00-1114
STEAM GENERATION SECTION

SCALE: | DWG. No: 363136-300-11124Q | REV: 0

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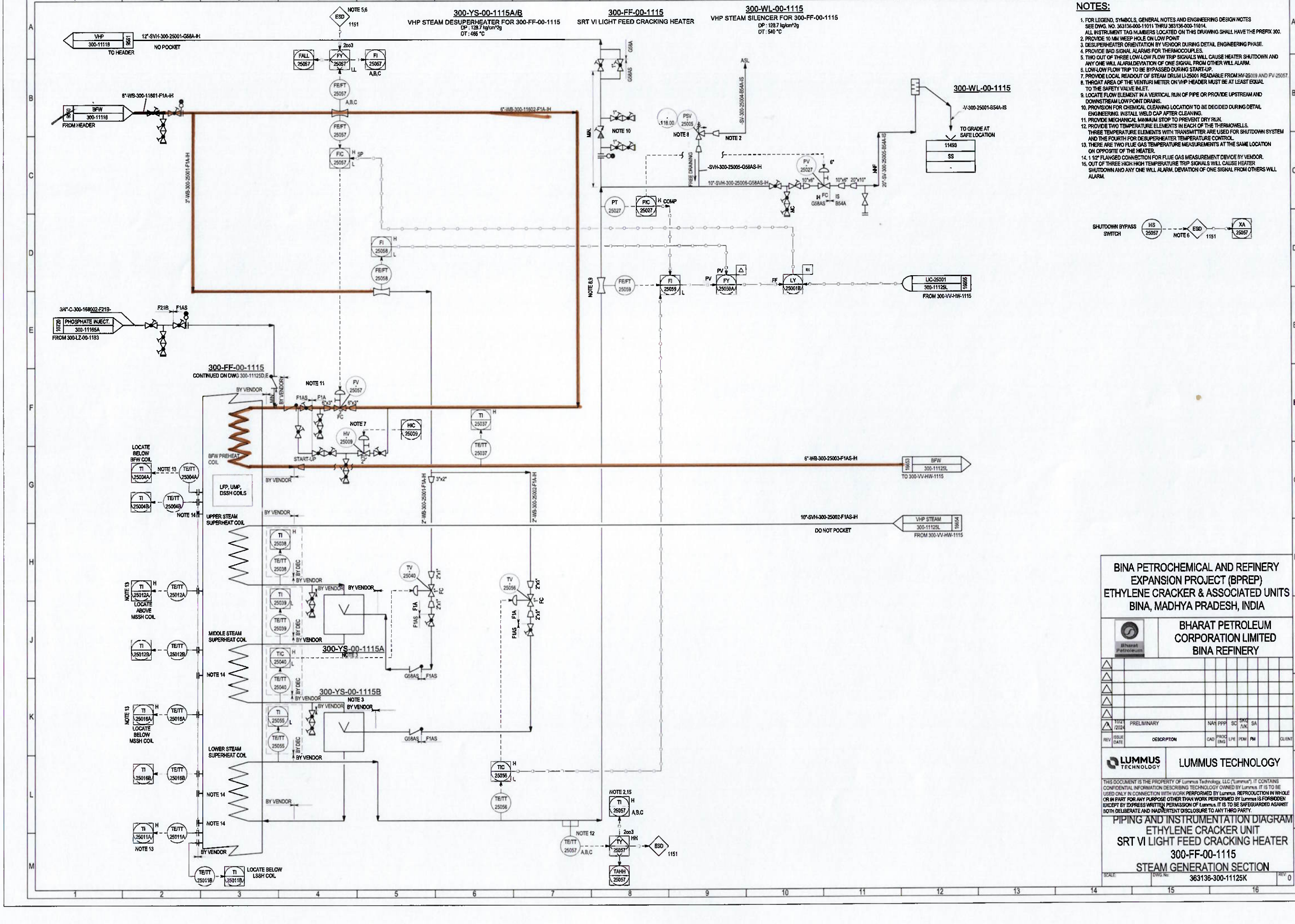

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300-YS-00-1116A/B
VHP STEAM DESUPERHEATER FOR 300-FF-00-1116
DP : 128.7 kg/cm^2g
DT : 485 °C

300-FF-00-1116
SRT VI LIGHT FEED CRACKING HEATER

300-WL-00-1116
VHP STEAM SILENCER FOR 300-FF-00-1116
DP : 128.7 kg/cm^2g
DT : 540 °C

NOTES:

1. FOR LEGEND, SYMBOLS, GENERAL NOTES AND ENGINEERING DESIGN NOTES SEE DWG. NO. 363136-000-11011 THRU 363136-000-11014. ALL INSTRUMENT TAG NUMBERS LOCATED ON THIS DRAWING SHALL HAVE THE PREFIX 300.
2. PROVIDE 10 MM WEEP HOLE ON LOW POINT
3. DESUPERHEATER ORIENTATION BY VENDOR DURING DETAIL ENGINEERING PHASE.
4. PROVIDE BAD SIGNAL ALARMS FOR THERMOCOUPLES.
5. TWO OUT OF THREE LOW-LOW FLOW TRIP SIGNALS WILL CAUSE HEATER SHUTDOWN AND ANY ONE WILL ALARM.DEVIATION OF ONE SIGNAL FROM OTHER WILL ALARM.
6. LOW-LOW FLOW TRIP TO BE BYPASSED DURING START-UP.
7. PROVIDE LOCAL READOUT OF STEAM DRUM LI-26001 READABLE FROM HV-26009 AND FV-26057.
8. THROAT AREA OF THE VENTURI METER ON VHP HEADER MUST BE AT LEAST EQUAL TO THE SAFETY VALVE INLET.
9. LOCATE FLOW ELEMENT IN A VERTICAL RUN OF PIPE OR PROVIDE UPSTREAM AND DOWNSTREAM LOW POINT DRAINS.
10. PROVISION FOR CHEMICAL CLEANING LOCATION TO BE DECIDED DURING DETAIL ENGINEERING. INSTALL WELD CAP AFTER CLEANING.
11. PROVIDE MECHANICAL MINIMUM STOP TO PREVENT DRY RUN.
12. PROVIDE TWO TEMPERATURE ELEMENTS IN EACH OF THE THERMOWELLS. THREE TEMPERATURE ELEMENTS WITH TRANSMITTER ARE USED FOR SHUTDOWN SYSTEM AND THE FOURTH FOR DESUPERHEATER TEMPERATURE CONTROL.
13. THERE ARE TWO FLUE GAS TEMPERATURE MEASUREMENTS AT THE SAME LOCATION ON OPPOSITE OF THE HEATER.
14. 1 1/2" FLANGED CONNECTION FOR FLUE GAS MEASUREMENT DEVICE BY VENDOR.
15. OUT OF THREE HIGH HIGH TEMPERATURE TRIP SIGNALS WILL CAUSE HEATER SHUTDOWN AND ANY ONE WILL ALARM. DEVIATION OF ONE SIGNAL FROM OTHERS WILL ALARM.

SHUTDOWN BYPASS SWITCH — HS 26057 — NOTE 8 — ESD 1151 — XA 26057

BINA PETROCHEMICAL AND REFINERY EXPANSION PROJECT (BPREP)
ETHYLENE CRACKER & ASSOCIATED UNITS
BINA, MADHYA PRADESH, INDIA

BHARAT PETROLEUM CORPORATION LIMITED
BINA REFINERY

REV	ISSUE DATE	DESCRIPTION	CAD	PROC ENG	LPE	PDM	PM		CLIENT
1	01/12/2025	FOR BEP	NAH	PPP	SC	SKG /VK	SA		

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PIPING AND INSTRUMENTATION DIAGRAM
ETHYLENE CRACKER UNIT
SRT VI LIGHT FEED CRACKING HEATER
300-FF-00-1116
STEAM GENERATION SECTION

SCALE: | DWG. No: 363136-300-11126K | REV. 0

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300-YS-00-1117A/B
VHP STEAM DESUPERHEATER FOR 300-FF-00-1117
DP : 129.7 kg/cm^2g
DT : 465 °C

300-FF-00-1117
SRT VI LIGHT FEED CRACKING HEATER

300-WL-00-1117
VHP STEAM SILENCER FOR 300-FF-00-1117
DP : 128.7 kg/cm^2g
DT : 540 °C

NOTES:

1. FOR LEGEND, SYMBOLS, GENERAL NOTES AND ENGINEERING DESIGN NOTES SEE DWG. NO. 363136-000-11011 THRU 363136-000-11014. ALL INSTRUMENT TAG NUMBERS LOCATED ON THIS DRAWING SHALL HAVE THE PREFIX 300.
2. PROVIDE 10 MM VEEP HOLE ON LOW POINT
3. DESUPERHEATER ORIENTATION BY VENDOR DURING DETAIL ENGINEERING PHASE.
4. PROVIDE BAD SIGNAL ALARMS FOR THERMOCOUPLES.
5. TWO OUT OF THREE LOW-LOW FLOW TRIP SIGNALS WILL CAUSE HEATER SHUTDOWN AND ANY ONE WILL ALARM.DEVIATION OF ONE SIGNAL FROM OTHER WILL ALARM.
6. LOW-LOW FLOW TRIP TO BE BYPASSED DURING START-UP.
7. PROVIDE LOCAL READOUT OF STEAM DRUM LI-27001 READABLE FROM HV-27009 AND FV-27057.
8. THROAT AREA OF THE VENTURI METER ON VHP HEADER MUST BE AT LEAST EQUAL TO THE SAFETY VALVE INLET.
9. LOCATE FLOW ELEMENT IN A VERTICAL RUN OF PIPE OR PROVIDE UPSTREAM AND DOWNSTREAM LOW POINT DRAINS.
10. PROVISION FOR CHEMICAL CLEANING LOCATION TO BE DECIDED DURING DETAIL ENGINEERING. INSTALL WELD CAP AFTER CLEANING.
11. PROVIDE MECHANICAL MINIMUM STOP TO PREVENT DRY RUN.
12. PROVIDE TWO TEMPERATURE ELEMENTS IN EACH OF THE THERMOWELLS. THREE TEMPERATURE ELEMENTS WITH TRANSMITTER ARE USED FOR SHUTDOWN SYSTEM AND THE FOURTH FOR DESUPERHEATER TEMPERATURE CONTROL.
13. THERE ARE TWO FLUE GAS TEMPERATURE MEASUREMENTS AT THE SAME LOCATION ON OPPOSITE OF THE HEATER.
14. 1 1/2" FLANGED CONNECTION FOR FLUE GAS MEASUREMENT DEVICE BY VENDOR.
15. OUT OF THREE HIGH HIGH TEMPERATURE TRIP SIGNALS WILL CAUSE HEATER SHUTDOWN AND ANY ONE WILL ALARM, DEVIATION OF ONE SIGNAL FROM OTHERS WILL ALARM.

SHUTDOWN BYPASS SWITCH — HS 27057 — NOTE 6 — ESD 1151 — XA 27057

BINA PETROCHEMICAL AND REFINERY EXPANSION PROJECT (BPREP)
ETHYLENE CRACKER & ASSOCIATED UNITS
BINA, MADHYA PRADESH, INDIA

BHARAT PETROLEUM CORPORATION LIMITED
BINA REFINERY

REV	ISSUE DATE	DESCRIPTION	CAD	PROC ENG	LPE	PDM	PM	CLIENT
0	01/12/2022	FOR BEP	NAH	PPP	SC	SKC /VK	SA	

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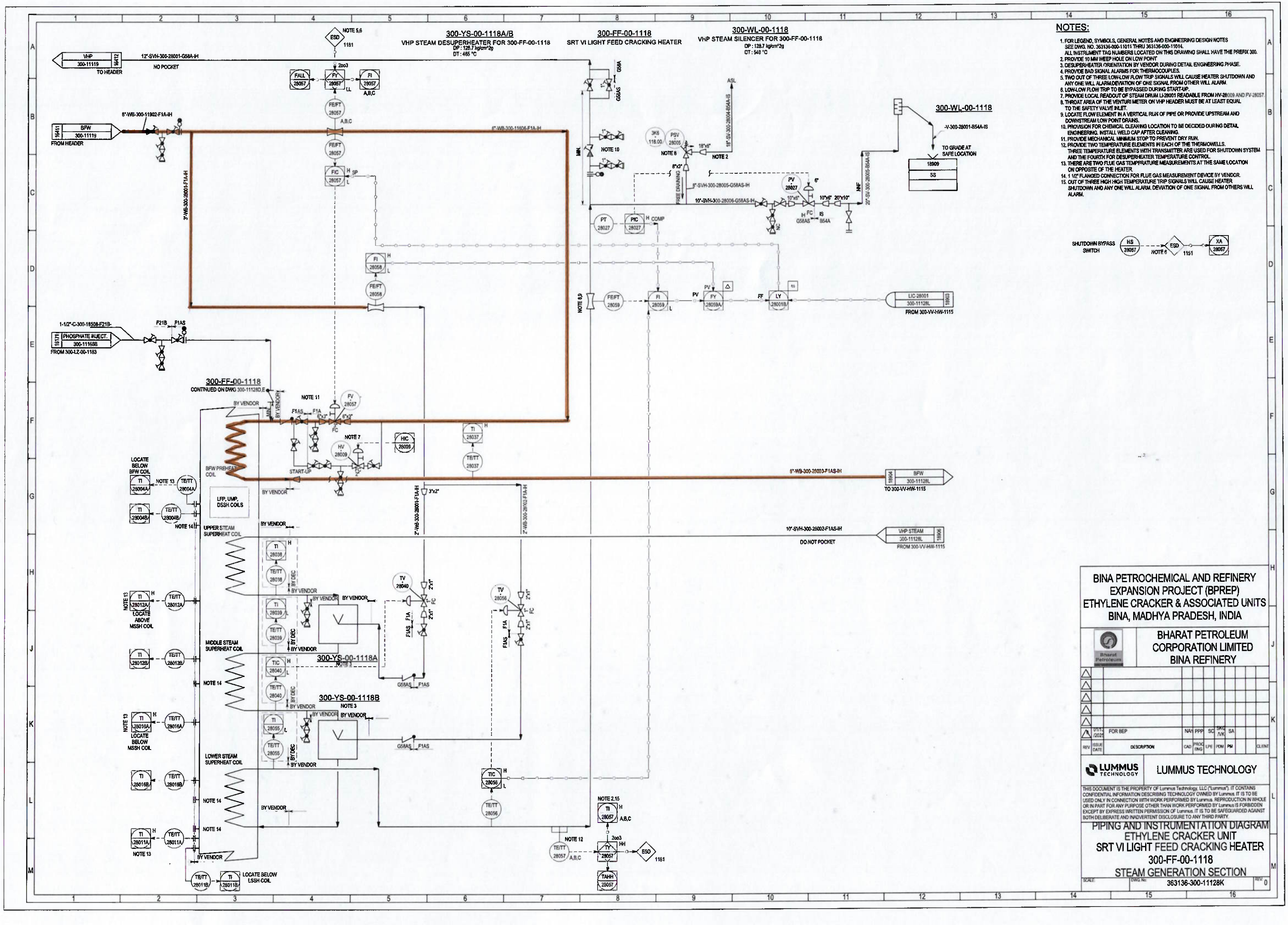
PIPING AND INSTRUMENTATION DIAGRAM
ETHYLENE CRACKER UNIT
SRT VI LIGHT FEED CRACKING HEATER
300-FF-00-1117
STEAM GENERATION SECTION

SCALE: | DWG. No. 363136-300-11127K | REV. 0

Page 2019 of 4391 : B957-TENDER_DOC-B957-300-16-43-MR-T-3001 : Rev. A



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300-VV-VW-1184
VHP STEAM CONTINUOUS BLOWDOWN DRUM

DP : 22.0kg/FV/cm^2g
DT : 230 °C
Inside Diam. x Len.(T/T) 1200 mm x 4,800 mm

300-EE-00-1181
CONTINUOUS BLOWDOWN COOLER
DP (S/T) : 22/19.0 kg/cm^2g
DT (S/T) : 230 °C, 65 °C
Rated Duty: 4,476 MMKCAL/HR
TEMA Type: Helix-AES

NOTES:

1. FOR LEGEND, SYMBOLS, GENERAL NOTES AND ENGINEERING DESIGN NOTES SEE DWG. NO. 363136-000-11911 THRU 363136-000-11914. ALL INSTRUMENT TAG NUMBERS LOCATED ON THIS DRAWING SHALL HAVE THE PREFIX 300.
2. ELEVATION IS FIXED TO PREVENT FLASHING AT INLET TO 300-EE-00-1181. TO BE CONFIRMED BY DETAILED ENGINEERING CONTRACTOR.
3. TWO PHASE FLOW. ANCHOR SECURELY.
4. TIE-IN POINT FOR FUTURE ROG UNIT.
5. PROVIDE 10 MM WEEP HOLE ON LOW POINT WITH HARD PIPE CONNECTION. (2)

MP STEAM 300-11857 9742 — 6"-SM-300-13103-B2A(B1A)-HH — TO HEADER (2)

CONTINUOUS BD 300-11116 9744 — 8"-BD-300-11901-B2A(B1A)-HH — NOTE 3 — NO POCKETS
FROM 300-VV-HW-1111 THRU 300-VV-HW-1118

BFW 300-11859-1 19305 — 3"-WB-300-81140-B2A(D1A)-HH
FROM 300-PA-CF-8001A-C

CW RETURN 300-11851-2 9751 — 10"-WCR-300-13101-A3A(H1A)- — TO HEADER (2)

WASH WATER 300-11218 11048 — 3"-WW-300-13102-B2A(B1A)- — TO 300-CC-00-2101 (2)

CW SUPPLY 300-11851-2 9752 — 10"-WCS-300-13101-A3A(H1A)- — FROM DISTRIBUTITON (2)

WASH WATER 305-11517 11944 — 2"-WW-300-13103-B2A(B1A)- — TO 305-CC-00-5601

WASH WATER 300-11220 16033 — 2"-WW-300-13113-B2A(B1A)- — TO 300-CC-2501

WASH WATER 305-11511 12119 — 2"-WW-300-13101-B2A(B1A)- — TO 305-CC-00-5501

WASH WATER 300-11258 17117 — 2"-WW-300-13133-B2A(B1A)- — TO 300-CC-00-2401

WASTE WATER 5754 — TO TREATMENT

REV.	DATE	REVISION	DRN	BY	CHKD	APPD.
2	30.09.25	REVISED AS MARKED &ISSUED FOR HAZOP	AN	GS	PD/NS	MS

ENGINEERS INDIA LIMITED (A Govt. of India Undertaking)

अनुक्रम SCALE	कार्य संख्या JOB NO.	विभाग DEPT.	अनुभाग SECTN.	इकाई UNIT	प्रारेख संख्या DWG. No.	संशो REV.
	B957	79	41	300	11131	2

BINA PETROCHEMICAL AND REFINERY EXPANSION PROJECT (BPREP)
ETHYLENE CRACKER & ASSOCIATED UNITS
BINA, MADHYA PRADESH, INDIA

BHARAT PETROLEUM CORPORATION LIMITED
BINA REFINERY

REV	ISSUE DATE	DESCRIPTION	CAD	PROJ ENG	PE	PDM	PM	CLIENT
3	03/07/2025	REVISED FOR BEP	NS	PPP	SC	SK/C VK	SA	
2	01/13/2025	FOR BEP	NAh	PPP	SC	SK/C VK	SA	
1	10/21/2024	PRELIMINARY	NAh	PPP	SC	SK/C VK	SA	

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PIPING AND INSTRUMENTATION DIAGRAM
ETHYLENE CRACKER UNIT
CRACKING HEATERS CONTINUOUS BLOWDOWN SYSTEM

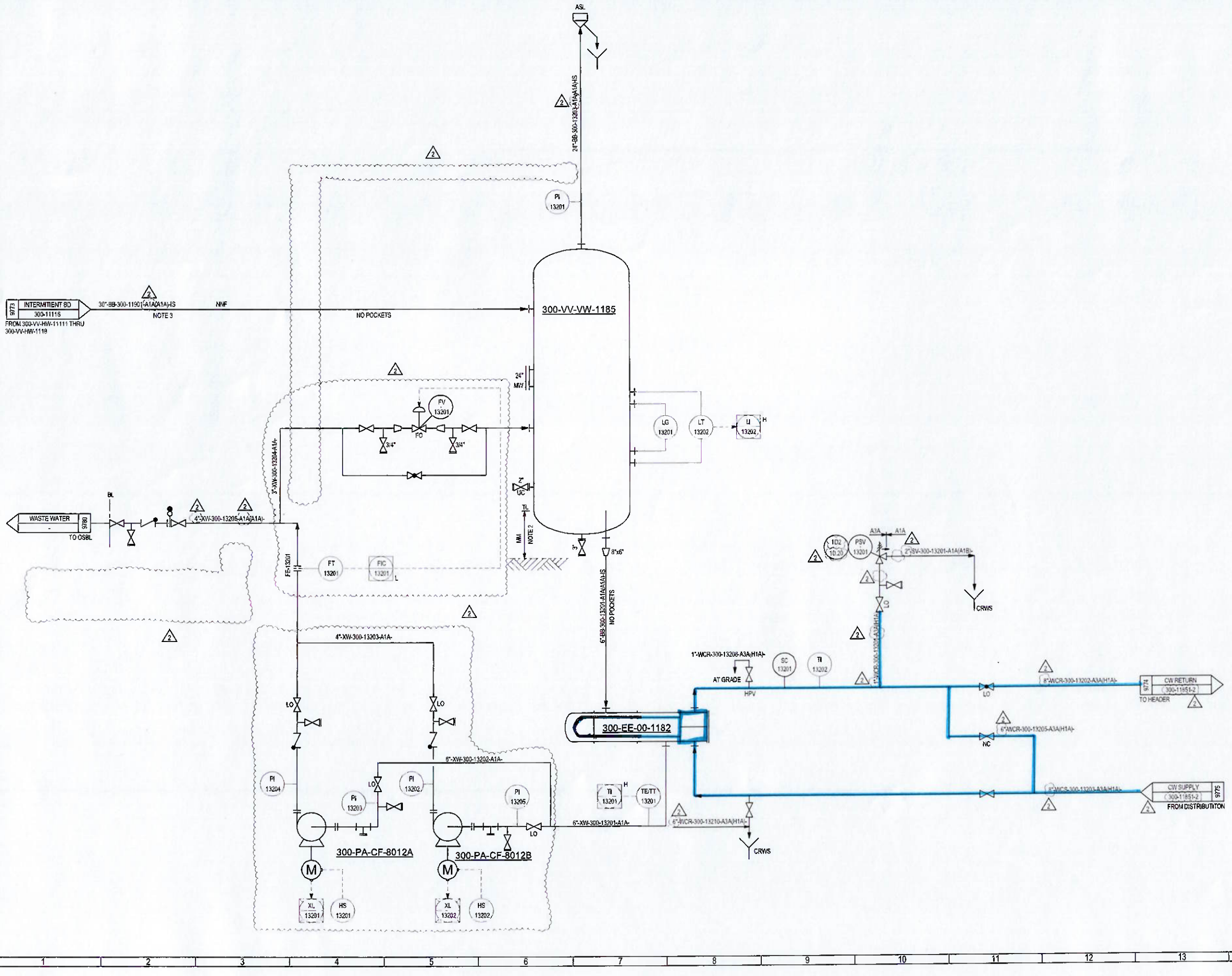
SCALE | DWG. No. 363136-300-11131 | REV. 1

Page 2021 of 4391 : B957-TENDER_DOC-B957-300-16-43-MR-T-3001 : Rev. A

300-VV-VW-1185
VHP STEAM INTERMITTENT BLOWDOWN DRUM
DP : 3.5 kg.F/cm^2g
DT : 150 °C
Inside Diam. x Len.(T/T): 2800 mm x 5700 mm

300-EE-00-1182
INTERMITTENT BLOWDOWN COOLER
DP (S.T) : 8.5/10.2 kg.cm^2g
DT (S.T) : 150 °C/ 65 °C
Rated Duty: 2.805 MMKCAL/HR
TEMA Type: Helix-AES

NOTES:
1. FOR LEGEND, SYMBOLS, GENERAL NOTES AND ENGINEERING DESIGN NOTES SEE DWG. NO. 363136-000-11011 THRU 363136-000-11014.
   ALL INSTRUMENT TAG NUMBERS LOCATED ON THIS DRAWING SHALL HAVE THE PREFIX 300
2. ELEVATION IS FIXED TO PREVENT FLASHING AT INLET TO 300-EE-00-1182, TO BE CONFIRMED BY DETAILED ENGINEERING CONTRACTOR.
3. TWO PHASE FLOW. ANCHOR SECURELY.



REV.	DATE	REVISION	DRN	BY	CHKD	APPD.
2	30.09.25	REVISED AS MARKED & ISSUED FOR HAZOP	AN	GS	PD/NS	MS

इंजीनियर्स इंडिया लिमिटेड ENGINEERS INDIA LIMITED (A Govt. of India Undertaking)

SCALE	JOB NO.	DEPT.	SECTN.	UNIT	DWG. No.	REV.
	B957	79	41	300	11132	2

BINA PETROCHEMICAL AND REFINERY EXPANSION PROJECT (BPREP)
ETHYLENE CRACKER & ASSOCIATED UNITS
BINA, MADHYA PRADESH, INDIA

BHARAT PETROLEUM CORPORATION LIMITED
BINA REFINERY

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2	01/13/2025	FOR BEP	NAh	PPP	SC	SKG/VK	SA	
1	10/21/2024	PRELIMINARY	NAh	PPP	SC	SKG/VK	SA	

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PIPING AND INSTRUMENTATION DIAGRAM
ETHYLENE CRACKER UNIT
CRACKING HEATER INTERMITTENT BLOWDOWN SYSTEM

SCALE	DWG. No.	REV.
	363136-300-11132	1

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300-EE-00-1301A/B/C/D

QUENCH WATER COOLER NO. 1

DP (S/T) : 5.5/20.0 kg.cm^2g
DT (S/T) : 120 C/ 65 °C
Rated Duty: 147.900 MKCAL/HR
TEMA Type: HELIX-AES

NOTES:

1. FOR LEGEND, SYMBOLS, GENERAL NOTES AND ENGINEERING DESIGN NOTES SEE DWG. NO. B957-70-41-000-11011 THRU B957-70-41-000-11014. ALL TAG NUMBERS FOR INSTRUMENTS WILL BE PRECEDED BY UNIT NUMBER "300" UNLESS OTHERWISE SPECIFIED.
2. BYPASS LINE TO BE SIZED FOR 50% OF COOLING WATER FLOW TO EXCHANGER 300-EE-00-1302A/B.
3. ADMINISTRATIVE PROCEDURES MUST BE USED TO ENSURE THAT EXCHANGERS ARE PROPERLY DRAINED AND VENTED IF ISOLATED FOR MAINTENANCE OR TURNDOWN OPERATION.
4. PIPING LAYOUT TO PROVIDE EQUAL FLOW DISTRIBUTION.
5. FOR REMOVAL OF EXCESS WATER AT START UP OR IN EVENT OF PLANT TOTAL POWER FAILURE (BLACKOUT CONDITION) WHERE DILUTION STEAM IS STILL SUPPLIED TO CRACKING HEATERS BUT PW STRIPPER FEED PUMPS ARE NOT IN SERVICE, FLOW BASIS IS 70 TPH.

QUENCH WATER 300-11144 9832 TO 300-CC-00-1301 — 20"-WQ-300-15022-B9A(B1D)-HS

QUENCH WATER 300-11149 9838 FROM DISTRIBUTION — 48"-WQ-300-14910-B9A(B1D)-HS

CW RETURN 300-11851-1 9833 TO DISTRIBUTION — 72"-WCR-300-15006-A3A(H1A)-

300-EE-00-1301A | 300-EE-00-1301B | 300-EE-00-1301C | 300-EE-00-1301D

PSV 15001 / 15002 / 15003 / 15004 — SC 15001 / 15002 / 15003 / 15004 — TI 15001 / 15002 / 15003 / 15004 — TE/TT 15009 / 15010 / 15011 / 15012 — TI 15009 / 15010 / 15011 / 15012

HIC 15002 — HV 15002 — 48"-WCS-300-15107-A3A(H1A)- — COOLING WATER 300-11151 14740 FROM DISTRIBUTION

60"-WC-300-15105-A3A(H1A)- — COOLING WATER 300-11151 14741 FROM 300-EE-00-1302A/B

HIC 15001 — HV 15001 — 6"-WQ-300-15025-B9A(B1D)- — QUENCH WATER 15950 TO OSBL WWTP

24"-WQ-300-15023-B9A(B1D)- — QUENCH WATER 300-11151 14742 TO 300-EE-00-1302A/B

QUENCH WATER 300-11144 9840 TO 300-CC-00-1301 — 36"-WQ-300-15009-B9A(B1D)-

REV.	DATE	REVISION	DRN	BY	CHKD	APPD.
2	04.07.25	REVISED AS MARKED AND PMS INCORP.	AN	GS	PD/NS	MS

ENGINEERS INDIA LIMITED (A Govt. of India Undertaking)

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NTS	B957	79	41	300	11150	2

BINA PETROCHEMICAL AND REFINERY EXPANSION PROJECT (BPREP)
ETHYLENE CRACKER & ASSOCIATED UNITS
BINA, MADHYA PRADESH, INDIA

BHARAT PETROLEUM CORPORATION LIMITED
BINA REFINERY

REV.	ISSUE DATE	DESCRIPTION	CAD	PROJ ENG	LPE	PDM	PM	CLIENT
1	03/07/2025	REVISED FOR BEP	NAh	PKJ	SC		SA	
0	01/13/2025	FOR BEP	NAh	PKJ	SC	SKG VK	SA	
0	10/21/2024	PRELIMINARY	NAh	PKJ	SC	SKG VK	SA	

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PIPING AND INSTRUMENTATION DIAGRAM
ETHYLENE CRACKER UNIT (ECU)
QUENCH WATER COOLER NO 1

SCALE | DWG. No. 363136-300-11150 | REV. 1

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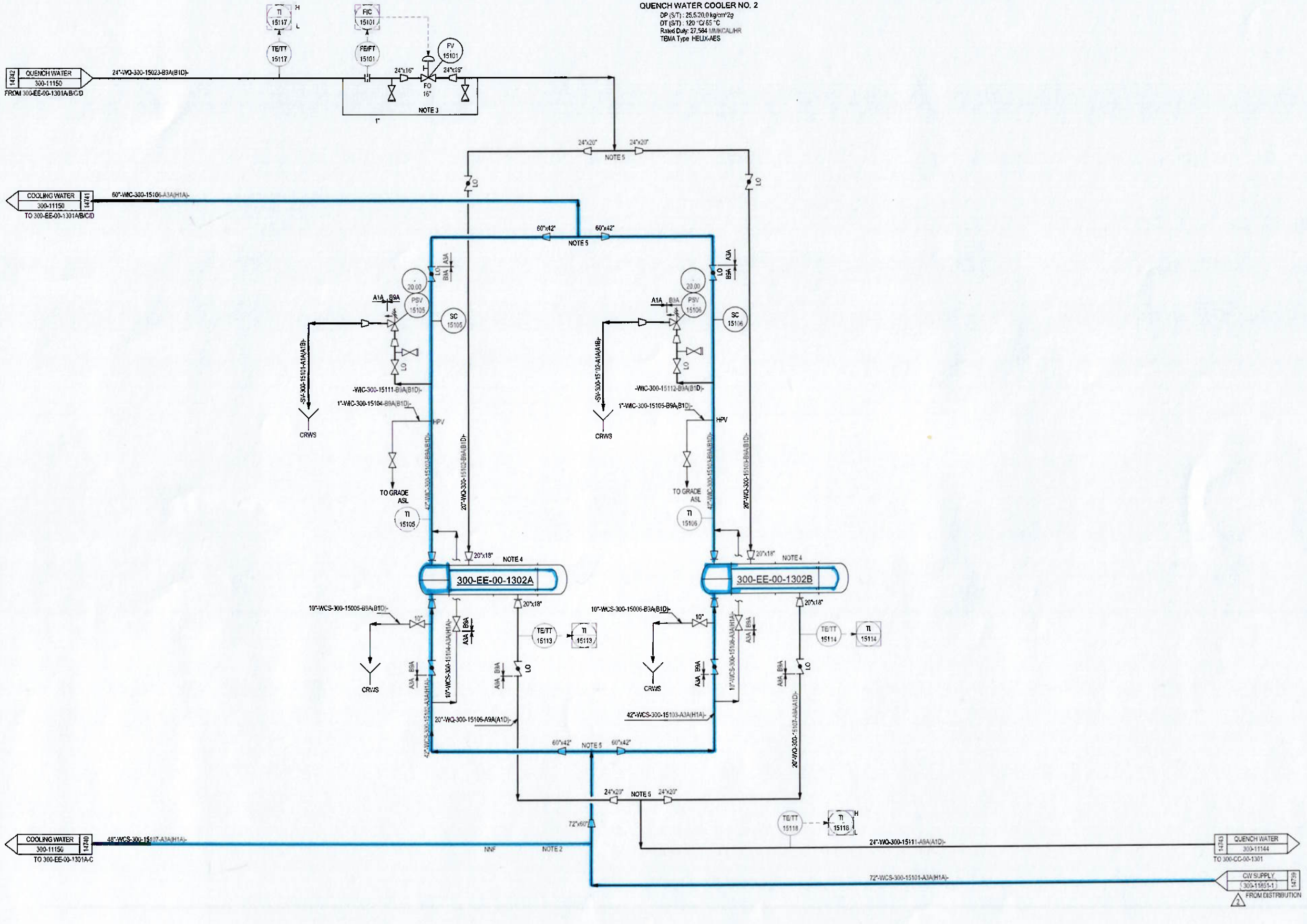
300-EE-00-1302A/B

QUENCH WATER COOLER NO. 2

DP (S/T) : 25.5/20.0 kg/cm^2g
DT (S/T) : 120 °C/ 65 °C
Rated Duty: 27,584 MM/KCAL/HR
TEMA Type :HELIX-AES



NOTES:

1. FOR LEGEND, SYMBOLS, GENERAL NOTES AND ENGINEERING DESIGN NOTES SEE DWG. NO. B957-79-41-000-11011 THRU B957-79-41-000-11014.
   ALL TAG NUMBERS FOR INSTRUMENTS WILL BE PRECEDED BY UNIT NUMBER "300" UNLESS OTHERWISE SPECIFIED.
2. BYPASS LINE TO BE SIZED FOR 50% OF COOLING WATER FLOW TO EXCHANGER 300-EE-00-1301A/B.
3. 1" DIAMETER BYPASS TO PROTECT AGAINST THERMAL EXPANSION.
4. ADMINISTRATIVE PROCEDURES MUST BE USED TO ENSURE THAT EXCHANGERS ARE PROPERLY DRAINED AND VENTED IF ISOLATED FOR MAINTENANCE OR TURNDOWN OPERATION.
5. SYMMETRICAL PIPING.

REV.	DATE	REVISION	DRN	BY	CHKD	APPD.
2	04.07.25	REVISED AS MARKED AND PMS INCORP.	AN	GS	PD/NS	MS

ENGINEERS INDIA LIMITED (A Govt. of India Undertaking)

SCALE	JOB NO.	DEPT.	SECTN.	UNIT	DWG. No.	REV.
	B957	79	41	300	11151	2

BINA PETROCHEMICAL AND REFINERY EXPANSION PROJECT (BPREP)
ETHYLENE CRACKER & ASSOCIATED UNITS
BINA, MADHYA PRADESH, INDIA

BHARAT PETROLEUM CORPORATION LIMITED
BINA REFINERY

REV.	ISSUE DATE	DESCRIPTION	CAD	PROJ ENG	LPE	PDM	PM	CLIENT
3	03/07/2025	REVISED FOR BEP	NAH	PKJ	SC		SA	
2	01/13/2025	FOR BEP	NAH	PKJ	SC	SKG/VK	SA	
1	10/21/2024	PRELIMINARY	NAH	PKJ	SC	SKG/VK	SA	

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PIPING AND INSTRUMENTATION DIAGRAM
ETHYLENE CRACKER UNIT (ECU)
QUENCH WATER COOLER NO 2

SCALE	DWG. No.	REV.
	363136-300-11151	1

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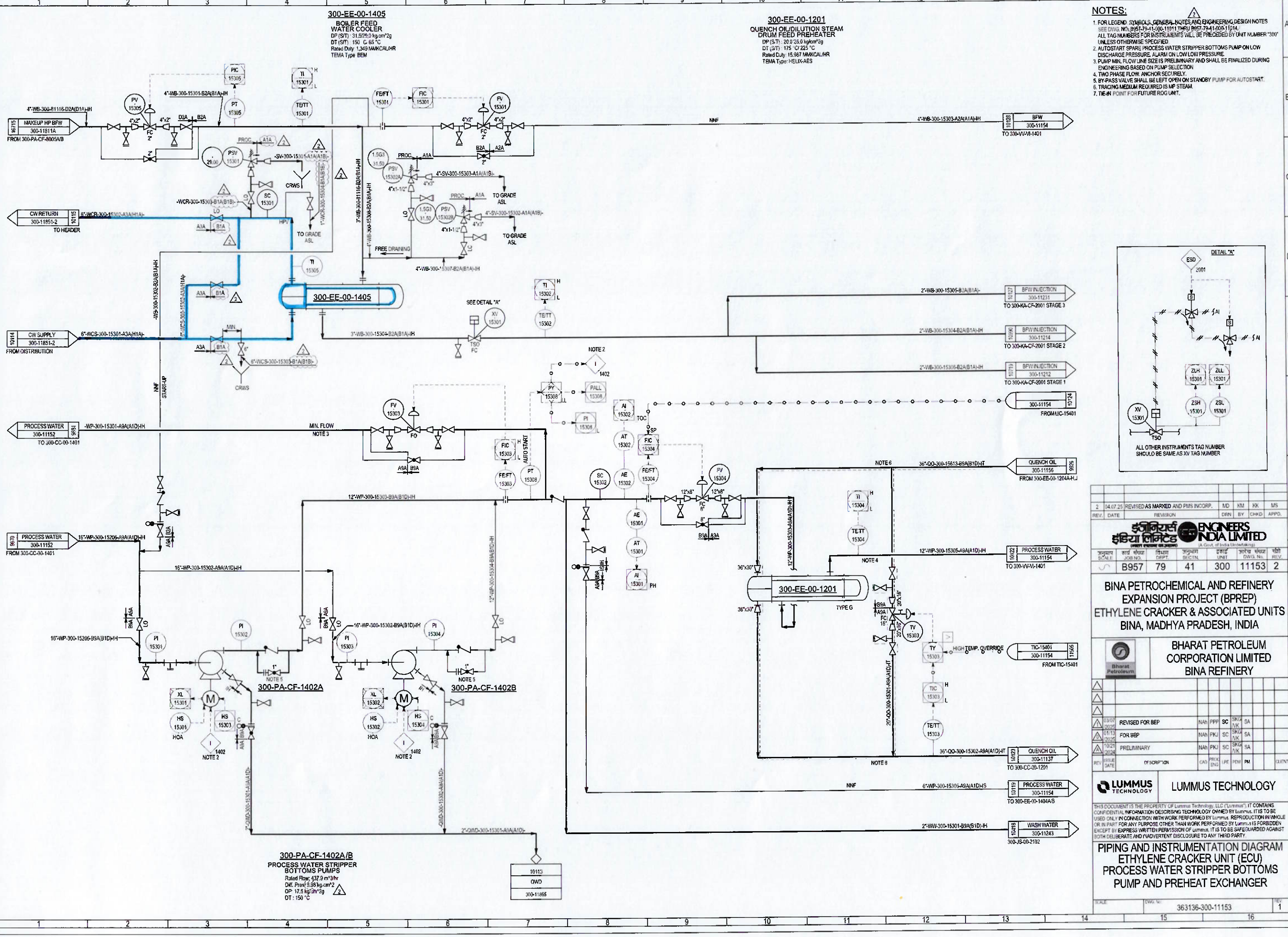

Page 2025 of 4391 : B957-TENDER_DOC-B957-300-16-43-MR-T-3001 : Rev. A

300-EE-00-1404A/B
DILUTION STEAM BLOWDOWN COOLER
DP (S/T) 10.0(FV)/10.6 kg/cm^2g
DT (S/T) : 185 °C/ 65 °C
Rated Duty 6.234 MMKCAL/HR
TEMA Type. HELIX-AES

300-VV-VI-1401
DILUTION STEAM DRUM
DP : 9.0 (FV) kg/cm^2g
DT 185 °C
Inside Diam. x Len.(T/T) 6300 mm x 8200 mm

300-EE-00-1402A/B
DILUTION STEAM/MP STEAM EXCHANGER
DP (S/T) : 22.0(FV)/10.0(FV) kg/cm^2g
DT (S/T) : 359 °C/ 265 °C
Rated Duty 105.853 MMKCAL/HR
TEMA Type: BEL

300-VV-VW-1403
CONDENSATE POT FOR 300-EE-00-1402A/B
DP : 22.0(FV) kg.cm^2g
DT : 350 °C
Inside Diam. x Len.(T-T) 1200 mm x 2300 mm

NOTES:

1. FOR LEGEND, SYMBOLS, GENERAL NOTES AND ENGINEERING DESIGN NOTES SEE DWG.NO. B957-73-41-000-11111 THRU B957-73-41-000-11014.
2. ALL TAG NUMBERS FOR INSTRUMENTS WILL BE PRECEDED BY UNIT NUMBER "300" UNLESS OTHERWISE SPECIFIED.
3. IMPULSE POINT TO BE CONNECTED TO TOP OF STEAM SUPPLY LINE AND HIGHER THAN TOP OF TUBE SHEET OF 300-EE-00-1402A/B C.
4. TWO PHASE FLOW, ANCHOR SECURELY.
5. ELEVATION BASED ON PRELIMINARY REBOILER CALCULATION. TO BE CONFIRMED DURING DETAIL DESIGN.
6. THE TAKE OFF FOR AI-15401 SHALL BE TOP OR SIDE OF PIPING.
7. LOCATE CONTROL VALVE AT GRADE.
8. SYMMETRICAL PIPING.
9. 10MM WEEP HOLE SHALL BE PROVIDED IN LOW POINT DRAIN.
10. SAMPLE CONNECTION DETAILS, AND RETURN LINE DESTINATION TO BE DEVELOPED BY DETAILS ENGINEERING CONTRACTOR. (DEC)
11. LOCATE THE EXCHANGER INLET HEADERS BELOW NLL OF DILUTION STEAM DRUM.
12. ONE OPERATING AND ONE SPARE IN NORMAL OPERATION. BOTH SHELLS IN OPERATION TO PROCESS HIGHER BLOWDOWN RATES WHEN ONE SHELL OF 300-EE-00-1402A/B IS OUT FOR MAINTENANCE/ CLEANING.

REV.	DATE	REVISION	DRN	BY	CHKD	APPD.
2	04.07.25	REVISED AS MARKED AND PMS INCOR	MD	KM	KK	MS

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अनुरूपण SCALE	कार्य संख्या JOB NO.	विभाग DEPT.	अनुभाग SECTN.	इकाई UNIT	दस्तावेज संख्या DWG. No.	संशोधन REV.
	B957	79	41	300	11154	2

BINA PETROCHEMICAL AND REFINERY EXPANSION PROJECT (BPREP)
ETHYLENE CRACKER & ASSOCIATED UNITS
BINA, MADHYA PRADESH, INDIA

BHARAT PETROLEUM CORPORATION LIMITED
BINA REFINERY

REV	ISSUE DATE	DESCRIPTION	CAD	PROC ENG	PF	PDM	PM	CLIENT
3	03/07/2025	REVISED FOR BEP	NAh	PPP	SC	SKG VK	SA	
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PIPING AND INSTRUMENTATION DIAGRAM
ETHYLENE CRACKER UNIT (ECU)
DILUTION STEAM DRUM &
PREHEAT EXCHANGERS

SCALE | DWG. No. 363136-300-11154 | REV. 1

Page 2026 of 4391 : B957-TENDER_DOC-B957-300-16-43-MR-T-3001 : Rev. A

300-VV-VW-1202
QUENCH OIL DRAIN DRUM VENT SEAL POT
DP : 3.5 kg/cm^2g
DT : 225 C
Inside Diam. x Len.(T/T) 600 mm x 1500 mm

300-VV-HW-1201
QUENCH OIL DRAIN DRUM
DP : 3.5 (FV) kg/cm^2g
DT : 225 C
Inside Diam. x Len.(T/T) 2000 mm x 6000 mm

300-JA-00-1201
QUENCH OIL POT EJECTOR

NOTES:

1. FOR LEGEND, SYMBOLS, GENERAL NOTES AND ENGINEERING DESIGN NOTES SEE DWG. NO. B957-79-41-000-11011 THRU B957-79-41-000-11114.
   ALL TAG NUMBERS FOR INSTRUMENTS WILL BE PRECEDED BY UNIT NUMBER "300" UNLESS OTHERWISE SPECIFIED.
2. TRACING MEDIUM REQUIRED MP STEAM.
3. HIGH LEVEL START PUMP 300-PA-CF-1204 AND LOW LEVEL STOP PUMP 300-PA-CF-1204.
4. 300-JA-00-1201 DETAILS AND LINE SIZE BY OEC.
5. TWO PHASE FLOW. ANCHOR SECURELY. DO NOT POCKET.
6. ALL QUENCH OIL DRAIN LINE TO 300-VV-HW-1201 TO BE LOCATED IN TRENCH.
7. PCV-15801 TO BE LOCATED ABOVE 300-VV-HW-1201.
8. LG TO BE READABLE FROM GLOBE VALVE.
9. BY PASS VALVE SHALL BE LEFT OPEN FOR AUTOSTART.
10. ALL QUENCH DRAIN LINE TO BE OF MINIMUM 2" SIZE.
11. LINE SIZES TO BE DETERMINED BY DETAILED ENGINEERING CONTRACTOR BASED ON VENDOR RECOMMENDATION.
12. TIE-IN POINT FOR FUTURE LP STEAM GENERATOR.
13. BFW/BFW MAY CONSIDER 45° ENTRY HYDROJET/MP STEAM CONNECTIONS AT RELEVANT LOCATION ON THE QO HEADER FOR PROPER CLEANING DUE TO CONGEALING NATURE OF THE PROCESS FLUID.

300-VV-VW-1202

300-VV-HW-1201

300-PA-CF-1204A

300-PA-CF-1204B

300-JA-00-1201

300-PA-CF-1204A/B
QUENCH OIL DRAIN PUMP
Rated Flow: 40.0 m^3/hr
Diff. Pres. 11.53 kg/cm^2
DP: 17.5 kg/cm^2g
DT: 225 C

REV.	DATE	REVISION	DRN.	BY	CHK'D	APP'D.
2	04.07.25	REVISED AS MARKED AND PMS INCORP.	M/D	ASD	KK	MS

ENGINEERS INDIA LIMITED (A Govt. of India Undertaking)

SCALE	JOB NO.	DEPT.	SECTN.	UNIT	DWG. No.	REV.
	B957	79	41	300	11158	2

BINA PETROCHEMICAL AND REFINERY EXPANSION PROJECT (BPREP)
ETHYLENE CRACKER & ASSOCIATED UNITS
BINA, MADHYA PRADESH, INDIA

BHARAT PETROLEUM CORPORATION LIMITED
BINA REFINERY

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2	01/13/2025	FOR BEP	NAh	PKJ	SC	SKC/VK	SA	
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PIPING AND INSTRUMENTATION DIAGRAM
ETHYLENE CRACKER UNIT (ECU)
QUENCH OIL DRAIN DRUM

SCALE | DWG. No. 363136-300-11158 | REV. 1

Page 2027 of 4391 : B957-TENDER_DOC-B957-300-16-43-MR-T-3001 : Rev. A

300-LZ-00-1301-VV-VW-11
AMINE INJECTION DRUM
(PART OF 300-LZ-00-1301)

300-LZ-00-1301
AMINE INJECTION PACKAGE

NOTES:

1. FOR LEGEND SYMBOLS, GENERAL NOTES AND ENGINEERING DESIGN NOTES SEE DWG. NO. B957-79-41-00A-11011 THRU B957-79-41-00A-11014. ALL TAG NUMBERS FOR INSTRUMENTS WILL BE PRECEDED BY UNIT NUMBER "300" UNLESS OTHERWISE SPECIFIED.
2. EQUIPMENT, PIPING AND INSTRUMENTATION SHOWN INSIDE THE VENDOR PACKAGE REFLECT THE DESIGN CONCEPT. DEC TO REVISE DEPICTION TO CONFIRM WITH ACTUAL VENDOR DATA.
3. FOR TRUCK CONNECTION, TO LOAD DRAIN MATERIAL.
4. PSV TO BE PROVIDED TO EACH HEAD.
5. LOCATE GLOBE VALVE IN VIEW OF LEVEL INST.

WET FLARE
300-11851-01
17128
-WFL-300-16401-A11A(A1D)-

NITROGEN
300-11853-2
19706
2"-IG-300-16401-A3A(A1B)-

A11A PROC.
PSV 164
LO
PCV 164
A11A A61A
A3A A61A

FILL CONNECTION
LOCATE AT GRADE
-C-300-16402-A61A(A1WR)-

300-LZ-00-1301
NOTE 2

PI 164
M
NOTE 5
300-LZ-00-1301-VV-VW-11
LG 164
NOTE 5
CALIBRATED
UC
24" MH
LT 164
LI 164
H
L
OWS

300-LZ-00-1301-PA-RP-11A
300-LZ-00-1301-PA-RP-11B
NOTE 4
PI 164
PSV 164
XL 16401
XL 16402
1-1/2"-C-300-16406-A61A(A1WR)-
2"-C-300-16409-A61A(A1WR)-
1-1/2"-C-300-16404-A61A(A1WR)-
NOTE 3
1-1/2"-C-300-16405-A61A(A1WR)-

AMINE INJECTION
300-11144
17390
TO 300-PA-CF-1302A-C
1-1/2"-C-300-16401-A61A(A1WR)-

AMINE INJECTION
300-11147
17256
TO 300-CC-00-1401
1-1/2"-C-300-16403-A61A(A1WR)-

AMINE INJECTION
300-11152
17071
TO 300-PA-CF-1402A/B
1-1/2"-C-300-16405-A61A(A1WR)-

300-LZ-00-1301-PA-RP-11A/B
AMINE INJECTION PUMPS
(PART OF 300-LZ-00-1301)

REV.	DATE	REVISION	DRN.	BY	CHKD	APPD.
3	04.07.25	REVISED AS MARKED AND PMS INCORP.	MD	KM	KK	MS

इंजीनियर्स इंडिया लिमिटेड ENGINEERS INDIA LIMITED
(A Govt. of India Undertaking)

SCALE	JOB NO.	DEPT.	SECTN.	UNIT	DWG. No.	REV.
	B957	79	41	300	11164	3

BINA PETROCHEMICAL AND REFINERY
EXPANSION PROJECT (BPREP)
ETHYLENE CRACKER & ASSOCIATED UNITS
BINA, MADHYA PRADESH, INDIA

BHARAT PETROLEUM CORPORATION LIMITED
BINA REFINERY

REV.	DATE	DESCRIPTION	CAD	PROJ. ENG	LPE	PDM	PM	CLIENT
3	03/18/2025	REVISED FOR BEP	NS	HN	SC	SKG VK	SA	
2	03/07/2025	REVISED FOR BEP	NAh	PPP	SC	SKG VK	SA	
1	01/13/2025	FOR BEP	NAh	PKJ	SC	SKG VK	SA	
0	10/21/2024	PRELIMINARY	NAh	PKJ	SC	SKG VK	SA	

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PIPING AND INSTRUMENTATION DIAGRAM
ETHYLENE CRACKER UNIT (ECU)
AMINE INJECTION SYSTEM

SCALE	DWG. No.	REV.
	363136-300-11164	2

Page 2028 of 4391 : B957-TENDER_DOC-B957-300-16-43-MR-T-3001 : Rev. A

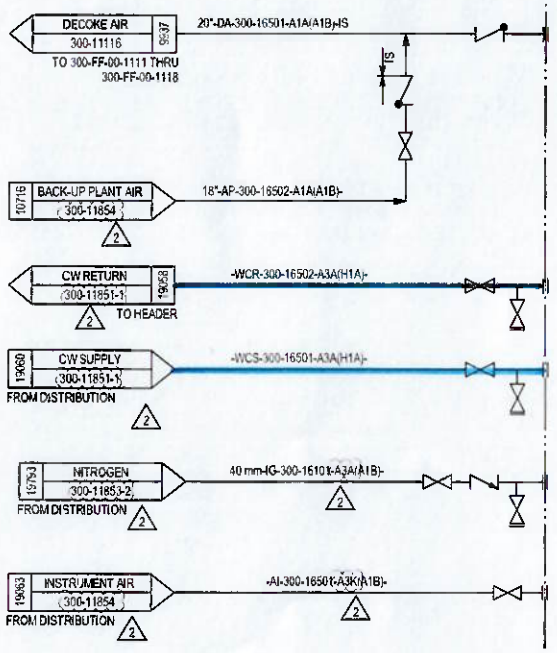
300-LZ-00-1181
DECOKING AIR COMPRESSOR PACKAGE

NOTES:

1. FOR LEGEND, SYMBOLS, GENERAL NOTES AND ENGINEERING DESIGN NOTES SEE DWG. NO. B-57-79-41-000-11011 THRU B-57-79-41-000-11014. 2
   ALL TAG NUMBERS FOR INSTRUMENTS WILL BE PRECEDED BY UNIT NUMBER "300" UNLESS OTHERWISE SPECIFIED.
2. PACKAGE DETAILS TO BE DEVELOPED BY DETAILED ENGINEERING CONTRACTOR BASED ON VENDOR INPUT.

BY VENDOR

300-LZ-00-1181



Note: Chemical Cleaning shall be in Package Vendors Scope.

REV.	DATE	REVISION	DRN	BY	CHK'D	APPD.
2	04.07.25	REVISED AS MARKED AND PMS INCORP.	AK	GS	PD/NS	MS

ENGINEERS INDIA LIMITED

SCALE	JOB NO.	DEPT.	SECTN.	UNIT	DWG. No.	REV.
	B957	79	41	300	11165C	2

BINA PETROCHEMICAL AND REFINERY EXPANSION PROJECT (BPREP)
ETHYLENE CRACKER & ASSOCIATED UNITS
BINA, MADHYA PRADESH, INDIA

BHARAT PETROLEUM CORPORATION LIMITED
BINA REFINERY

REV	ISSUE DATE	DESCRIPTION	CAD	PROC ENG	LPE	PDM	PM		CLIENT
1	03/07/2025	REVISED FOR BEP	SK	HN	SC	SKG/VK	SA		
0	01/13/2025	FOR BEP	NAh	HN	SC	SKG/VK	SA		

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PIPING AND INSTRUMENTATION DIAGRAM
ETHYLENE CRACKER UNIT (ECU)
DECOKING AIR COMPRESSOR

SCALE | DWG. No. 363136-300-11165C | REV. 1

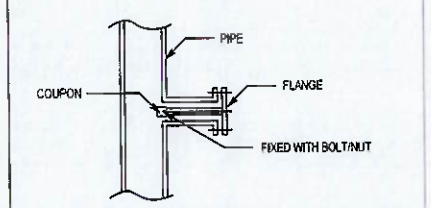
Page 2029 of 4391 : B957-TENDER_DOC-B957-300-16-43-MR-T-3001 : Rev. A

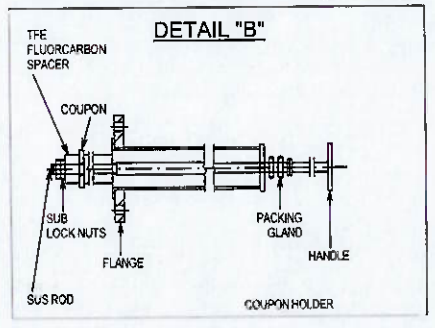
300-VV-VW-2501
CONDENSATE POT
FOR 300-EE-00-2503A/B
DP : 7.0 (FV) kg/cm**2g
DT : 240 °C
Inside Diam. x Len.(T/T) 800 mm x 1400 mm

300-CC-00-2502
MEA REGENERATOR
DP : 4.5 (FV) kg/cm**2g
DT 150 °C
Inside Diam. x Len.(T/T) 3400 mm x 32200 mm

300-EE-00-2503C/B
MEA REGENERATOR REBOILER
DP (ST) : 7.0(FV) 5.5 kg/cm**2g
DT (ST) : 240 °C/150 °C
Rated Duty: 25.7 KJ MMKCAL/HR
TEMA Type: AEL
NOTE 1

NOTES:
1. FOR LEGEND, SYMBOLS, GENERAL NOTES AND ENGINEERING DESIGN NOTES SEE DWG NO. B957-79-41-000-11011 THRU B957-79-41-000-11014. ALL TAG NUMBERS FOR INSTRUMENTS WILL BE PRECEDED BY UNIT NUMBER "300" UNLESS OTHERWISE SPECIFIED.
2. ELEVATION IS BASED ON PRELIMINARY PUMP NPSH REQUIREMENT AND OR REBOILER THERMOSIPHON REQUIREMENT.
3. 2 OPERATING & 2 STAND-BY CONSIDERING 1 OPERATING FROM 2503A/B & 1 OPERATING FROM 2503C/D.
4. IMPULSE LINE TO BE CONNECTED TO HIGH POINT AT TOP OF STEAM SUPPLY LINE TO 300-EE-2502A/B.
5. PROVIDE 10 MM WEEP HOLE AT LOW POINT.
6. TWO PHASE FLOW, ANCHOR SECURELY.
7. CORROSION PROBE COUPON, ISOLATION VALVE TO BE FULL BORED.
8. MINIMUM FLOW LINE SIZE TO BE DETERMINED BY DEC.
9. ULTRASONIC OR TUNING FORK LEVEL SWITCH TO BE LOCATED AT TOP OF STAND PIPE.

DETAIL "A"


DETAIL "B"


REV.	DATE	REVISION	DRN	BY	CHKD	APPD
2	04.07.25	REVISED AS MARKED AND PMS INCORP.	AK	PD	KK	MS

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अनुमाप SCALE	कार्य संख्या JOB NO.	विभाग DEPT.	अनुभाग SECTN.	इकाई UNIT	प्रलेख संख्या DWG. No.	रीवी REV.
	B957	79	41	300	11221	2

BINA PETROCHEMICAL AND REFINERY
EXPANSION PROJECT (BPREP)
ETHYLENE CRACKER & ASSOCIATED UNITS
BINA, MADHYA PRADESH, INDIA

Bharat Petroleum
BHARAT PETROLEUM CORPORATION LIMITED
BINA REFINERY

REV.	DATE	DESCRIPTION	CAD	PROJ ENG	LPE	PDM	PM	CLIENT
3	03/07/2025	REVISED FOR BEP	NAN	RR	SC	SKG VK	SA	
2	01/15/2025	FOR BEP	NAN	PKJ	SC	SKG VK	SA	
1	10/21/2024	PRELIMINARY	NAN	PKJ	SC	SKG VK	SA	

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PIPING AND INSTRUMENTATION DIAGRAM
ETHYLENE CRACKER UNIT (ECU)
MEA REGENERATOR

SCALE | DWG. No. 363136-300-11221 | REV. 1

300-EE-00-2501
MEA REGENERATOR CONDENSER

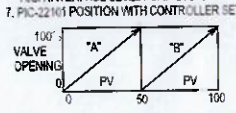
DP (S/T) 8.5(FV) 10.6 kg/cm^2g
DT (S/T) 150 °C/55 °C
Rated Duty 13.220 MMKCAL/HR
TEMA Type AES

300-VV-VW-2503
MEA REGENERATOR REFLUX DRUM

DP 4.5 (FV) kg/cm2g
DT 70 °C
Inside Diam. x Len.(T/T) 2400 mm x 3700 mm

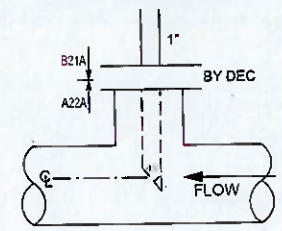
NOTES:

1. FOR LEGEND, SYMBOLS, GENERAL NOTES AND ENGINEERING DESIGN NOTES SEE DWG. NO. B957-79-41-000-11011 THRU B957-79-41-000-11014.
   ALL TAG NUMBERS FOR INSTRUMENTS WILL BE PRECEDED BY UNIT NUMBER "300," UNLESS OTHERWISE SPECIFIED.
2. ELEVATION IS BASED ON PRELIMINARY PUMP NPSH REQUIREMENT TO BE CONFIRMED BY DEC.
3. TWO PHASE FLOW ANCHOR SECURELY.
4. MINIMUM FLOW LINE SIZE TO BE DETERMINED BY DEC.
5. SAMPLE CONNECTION DETAILS AND RETURN LINE DESTINATION TO BE DEVELOPED BY DETAIL ENGINEERING CONTRACTOR (DEC).
6. LOW INTERFACE LEVEL PUMP START.
   HIGH INTERFACE LEVEL PUMP STOP.
7. PIC-22101 POSITION WITH CONTROLLER SETTING.



8. TIE-IN POINT FOR FUTURE ROG UNIT.

DETAIL "A"
INJECTION QUILL TO BE REMOVABLE THROUGH NOZZLE



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2	04.07.25	REVISED AS MARKED AND PMS INCORP.	AK	GS	PD/NS	MS

ENGINEERS INDIA LIMITED (A Govt. of India Undertaking)

SCALE	JOB NO.	DEPT.	SECTN.	UNIT	DWG. No.	REV.
	B957	79	41	300	11222	2

BINA PETROCHEMICAL AND REFINERY EXPANSION PROJECT (BPREP)
ETHYLENE CRACKER & ASSOCIATED UNITS
BINA, MADHYA PRADESH, INDIA

BHARAT PETROLEUM CORPORATION LIMITED
BINA REFINERY

REV.	ISSUE DATE	DESCRIPTION	CAD	PROJ ENG	PF	PDM	PM	CLIENT
3	03/07/2025	REVISED FOR BEP	NAH	RR	SC	SK/G VK	SA	
2	01/13/2025	FOR BEP	NAH	PKJ	SC	SK/G VK	SA	
1	10/21/2024	PRELIMINARY	NAH	PKJ	SC	SK/G VK	SA	

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LUMMUS TECHNOLOGY

PIPING AND INSTRUMENTATION DIAGRAM
ETHYLENE CRACKER UNIT (ECU)
MEA REGENERATOR OVERHEAD SYSTEM

SCALE | DWG. No. 363136-300-11222 | REV. 1

300-EE-00-2505
LEAN MEA COOLER
DP (S/T) : 25/19.5 kg/cm^2g
DT (S/T) : 110 °C/65 °C
Rated Duty : 10.328 MMKCAL/HR
TEMA Type: HELIX-AES

300-EE-00-2504A/B
LEAN MEA/ RICH MEA EXCHANGER
DP (S/T) : 25/19.5 kg/cm^2g
DT (S/T) : 155 °C/ 105 °C
Rated Duty : 11.288 MMKCAL/HR
TEMA Type: HELIX-AES
NOTE 5

NOTES:
1. FOR LEGEND, SYMBOLS, GENERAL NOTES AND ENGINEERING DESIGN NOTES SEE DWG. NO. 8957-73-41-000-11011 THRU 8975-79-41-000-11314.
ALL TAG NUMBERS FOR INSTRUMENTS WILL BE PRECEDED BY UNIT NUMBER "300" UNLESS OTHERWISE SPECIFIED.
2. FORCING VALVE.
3. MINIMUM FLOW LINE SIZE TO BE DETERMINED BY DEC.
4. SPARE PUMP AUTOSTART ON LOW DISCHARGE PRESSURE, ALARM ON LOW LOW PRESSURE.
5. ONE OPERATING, ONE SPARE.
6. BYPASS VALVES ON STANDBY PUMP TO BE LEFT OPEN FOR AUTO START.
7. LOCATE CONTROL VALVE CLOSE TO 300-CC-00-2502.

DETAIL "A"
INJECTION QUILL TO BE REMOVABLE THROUGH NOZZLE

300-PA-CF-2507A/B
RICH MEA PUMPS
Rated Flow: 282+84.6 (MCF, HOLD) m^3/hr
Diff. Pres. 1.37 kg/cm^2
DP: 11.0 kg/cm^2g
DT : 80 °C

300-PA-CF-2502A/B
LEAN MEA PUMPS
Rated Flow: 302.6 m^3/hr
Diff. Pres. 16.18 kg/cm^2
DP: 25.0 kg/cm^2g
DT : 165 °C

REV.	DATE	REVISION	DRN	BY	CHKD	APPD.
2	04.07.25	REVISED AS MARKED AND PMS INCORP.	AK	GS	PD/NS	MS
1	03/07/2025	REVISED FOR BEP	NAh	RR	SC	SK/G NK SA
0	01/13/2025	FOR BEP	NAh	PKJ	SC	SK/G NK SA
0	11/21/2024	PRELIMINARY	NAh	PKJ	SC	SK/G NK SA

ENGINEERS INDIA LIMITED (A Govt. of India Undertaking)

SCALE	JOB NO.	DEPT.	SECTN.	UNIT	DWG. No.	REV.
	B957	79	41	300	11224	2

BINA PETROCHEMICAL AND REFINERY EXPANSION PROJECT (BPREP)
ETHYLENE CRACKER & ASSOCIATED UNITS
BINA, MADHYA PRADESH, INDIA

BHARAT PETROLEUM CORPORATION LIMITED
BINA REFINERY

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PIPING AND INSTRUMENTATION DIAGRAM
ETHYLENE CRACKER UNIT (ECU)
LEAN MEA COOLER & PUMPS

SCALE | DWG. No. 363136-300-11224 | REV. 1

300-GN-00-2501A/B
LEAN MEA PRE- FILTER
DP : 25.0 kg/cm^2g
DT : 100 °C
Rated Flow: 40676 kg/hr
TYPE : CARTRIDGE FILTER

300-GN-00-2502
LEAN MEA ACTIVATED CABON FILTER
DP : 25.0 kg/cm^2g
DT : 100 °C
Rated Flow: 40676 kg/hr
TYPE : BY VENDOR

300-GN-00-2503A/B
LEAN MEA POST- FILTER
DP : 25.0 kg/cm^2g
DT : 100 °C
Rated Flow: 40676 kg/hr
TYPE : CARTRIDGE FILTER

NOTES:

1. FOR LEGEND, SYMBOLS, GENERAL NOTES AND ENGINEERING DESIGN NOTES SEE DWG. NO. B957-79-41-000-11011 THRU B957-79-41-000-11014.
   ALL TAG NUMBERS FOR INSTRUMENTS WILL BE PRECEDED BY UNIT NUMBER "300" UNLESS OTHERWISE SPECIFIED.
2. NO AUTOMATIC CLEANING IS REQUIRED.BACKWASH FACILITY IS REQUIRED.
3. BACK FLUSH CONNECTION & ASSOCIATED ARRANGEMENT TO BE FINALIZED BY DEC BASED ON ACTIVATED CARBON FILTER VENDOR RECOMMENDATIONS.
4. LOCATE GLOBE VALVE WITHIN VIEW OF FI-22502 AND PI-22504.
5. BACK WASH PROVISION TO BE PROVIDED BY DEC, BASED ON VENDOR REQUIREMENT.
6. SAMPLE CONNECTION DETAILS AND RETURN LINE DESTINATION TO BE DEVELOPED BY DETAIL ENGINEERING CONTRACTOR (DEC).

REV.	DATE	REVISION	DRN	BY	CHKD	APPD.
2	04.07.25	REVISED AS MARKED AND PMS INCORP.	AK	GS	PD/NS	MS

इंजीनियर्स इंडिया लिमिटेड ENGINEERS INDIA LIMITED (A Govt. of India Undertaking)

अनुमाप SCALE	कार्य संख्या JOB NO.	विभाग DEPT.	अनुभाग SECTN.	इकाई UNIT	आरेख संख्या DWG. No.	संशो. REV.
	B957	79	41	300	11225	2

BINA PETROCHEMICAL AND REFINERY EXPANSION PROJECT (BPREP)
ETHYLENE CRACKER & ASSOCIATED UNITS
BINA, MADHYA PRADESH, INDIA

Bharat Petroleum
BHARAT PETROLEUM CORPORATION LIMITED
BINA REFINERY

REV.	ISSUE DATE	DESCRIPTION	CAD	PROC ENG	PE	PDM	PM	CLIENT
3	03/07/2025	REVISED FOR BEP	NAH	RR	SC	SK&VK	SA	
2	01/13/2025	FOR BEP	NAH	PKJ	SC	SK&VK	SA	
1	10/21/2024	PRELIMINARY	NAH	PKJ	SC	SK&VK	SA	

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PIPING AND INSTRUMENTATION DIAGRAM
ETHYLENE CRACKER UNIT (ECU)
LEAN MEA FILTER

SCALE | DWG. NO. 363136-300-11225 | REV. 1

300-TT-00-2501
MEA STORAGE TANK
DP : 300mm H2O< 1000mm H2O (VAC)
DT : 65 °C
Inside Diam. x Len.(T.T):7200 mm x 11000 mm

NOTE 4, 5

NOTES:

1. FOR LEGEND, SYMBOLS, GENERAL NOTES AND ENGINEERING DESIGN NOTES SEE DWG. NO. B957-79-41-000-11011 THRU B957-79-41-000-11014, ALL TAG NUMBERS FOR INSTRUMENTS WILL BE PRECEDED BY UNIT NUMBER "300" UNLESS OTHERWISE SPECIFIED.
2. SECONDARY CONTAINMENT DYKE WITH A COLLECTION SUMP.
3. PVSV, EMERGENCY RELIEF HATCH TO BE SIZED AND SUPPLIED BY TANK VENDOR.
4. LOCATE SAFETY SHOWER AND EYE WASH NEAR MEA TANK.
5. LOCATE WITHIN A PAVED AREA WITH CONTAINMENT WALL.
6. SAMPLE CONNECTION DETAILS AND RETURN LINE DESTINATION TO BE DEVELOPED BY DETAIL ENGINEERING CONTRACTOR (DEC).
7. INITIAL MEA FILL FROM TRUCK.
8. MINIMUM FLOW LINE SIZE TO BE DETERMINED BY DEC.
9. MANHOLE EQUIPPED WITH EMERGENCY HATCH COVER.
10. SET PRESSURE IS 100 MM H2O(G), 50 MM H2O VAC.
11. SET PRESSURE IS 250 MM H2O(G).
12. LEVEL INDICATION AT GRADE.
13. PCV-22601 SHALL BE LOCATED AT MINIMUM DISTANCE FROM TANK. SET PRESSURE 100 MM H2O (G).

NITROGEN 16135 300-11853-1 FROM HEADER
2"-IG-300-22601-A3(A1B)-
A1A A61A
NOTE 13
PCV 22601
FC
2"-IG-300-22601-A61A(A1WR)-
PI 22606
PT 22601
PI 22601
LAHH 22601
LI 22602
LI 22602A
NOTE 3
NOTE 10
PVRV 22601
LT 22602
RADAR
ESD 2501
LI 22601
LI 22601A
NOTE 12
LT 22601
RADAR
EMERGENCY HATCH
EV 22604
NOTE 11
NOTE 3,9
MH 24"
GH 6"
PI 22609
PT 22609
READABLE
FI 22603
FE/FT 22603
ZLH 22601
ZSL 22601
ZSH 22601
SC 22601
XV 22601
FC TSO
NOTE 6
2"-WDM-300-22601-A92K(A21A)-
BL
A92K
A61A
PI 22608
DM WATER 16130 FROM OSBL
3"-LA-300-22601-A61A(A1WR)-
MIN. FLOW NOTE 8
TE/TT 22601
TI 22601
300-TT-00-2501
TRUCK UNLOADING NOTE 7
3"-LA-300-22610-A61A(A1WR)-
NNF
2"-MED-300-22601-A61A(A1WR)-
24" MH
2" UC
OWS
16134 MEA DRAIN
2"-MED-300-22602-A61A(A1WR)-
300 MM
NOTE 2
NC
LO
OWS
16136 MEA DRAIN 300-11863
MEA 16131 300-11227 FROM 300-PA-CF-2504
2"-LA-300-22701-A61A(A1WR)-
NNF
3"-LA-300-22602-A61A(A1WR)-
SC 22602
NOTE 6
3"-LA-300-22603-A61A(A1WR)-
-LA-300-22605-A61A(A1WR)-
PI 22607
PT 22607
FO 22604
PI 22603
MEA MAKEUP 16132 300-11221 TO 300-CC-00-2502
2"-LA-300-22604-A61A(A1WR)-
NNF
2"-LA-300-22604-A61A(A1WR)-
1"
PI 22602
300-PA-CF-2503
M
XL 22601
2"-MED-300-22603-A61A(A1WR)-
16133 MEA DRAIN 300-11863
OWS

300-PA-CF-2503
MEA MAKEUP PUMPS
Rated Flow: 5.0 m^3/hr
Diff. Pres. 4.89 kg/cm^2
DR: 9.5 kg/cm^3
DT : 70 °C
NOTE 5

REV.	DATE	REVISION	DRN	BY	CHKD	APPD.
2	04.07.25	REVISED AS MARKED AND PMS INCORP.	AK	GS	PD/NS	MS

इंजीनियर्स इंडिया लिमिटेड ENGINEERS INDIA LIMITED (A Govt. of India Undertaking)

अनुमान SCALE	कार्य संख्या JOB NO.	शिक्षा DEPT.	अनुभाग SECTN.	इकाई UNIT	आरेख संख्या DWG. No.	संशो REV.
	B957	79	41	300	11226	2

BINA PETROCHEMICAL AND REFINERY EXPANSION PROJECT (BPREP)
ETHYLENE CRACKER & ASSOCIATED UNITS
BINA, MADHYA PRADESH, INDIA

BHARAT PETROLEUM CORPORATION LIMITED
BINA REFINERY

REV.	DATE	DESCRIPTION	CAD	PROC ENG	LPE	PDM	PM	CLIENT
3	03/07/2025	REVISED FOR BEP	NAN	RR	SC	SK/GVK	SA	
2	01/13/2025	FOR BEP	NAN	PKJ	SC	SK/GVK	SA	
1	10/21/2024	PRELIMINARY	NAN	PKJ	SC	SK/GVK	SA	

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PIPING AND INSTRUMENTATION DIAGRAM
ETHYLENE CRACKER UNIT (ECU)
MEA STORAGE TANK AND MAKE-UP PUMP

SCALE | DWG. NO. 363136-300-11226 | REV. 1

300-VV-HW-2505

MEA DRAIN DRUM

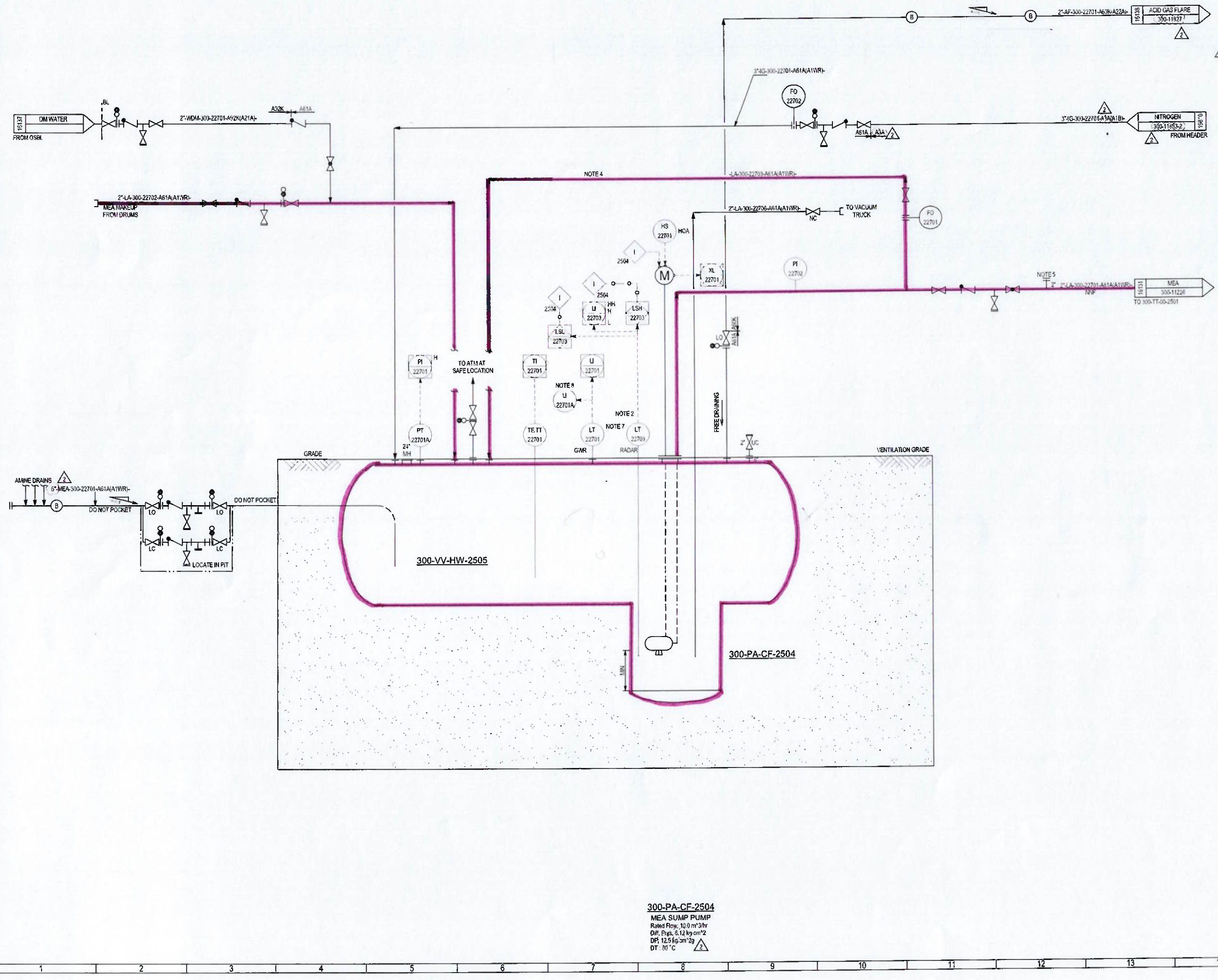
DP : 3.5 (FV) kg/cm^2g

DT : 150 °C

Inside Diam. x Len.(T/T): 3200 mm/1000 mm:8100 mm x 600 mm

NOTES:

1. FOR LEGEND, SYMBOLS, GENERAL NOTES AND ENGINEERING DESIGN NOTES SEE DWG. NO. B957-79-41-00-11311 THRU B957-79-41-00-11314. ALL TAG NUMBERS FOR INSTRUMENTS WILL BE PRECEDED BY UNIT NUMBER "300" UNLESS OTHERWISE SPECIFIED.
2. PUMP START AT HIGH LEVEL, PUMP STOP AT LOW LEVEL. ALARM ON HIGH HIGH LEVEL.
3. ALL LINE SIZE BASED ON PRELIMINARY EVALUATIONS OF HYDRAULIC CONFIGURATION AND MUST BE RECALCULATED BY DEC WHEN PLOT PLAN AND EQUIPMENT DETAILS ARE FINALIZED.
4. MINIMUM FLOW LINE SIZE TO BE DETERMINED BY DEC.
5. STUB CONNECTION FOR DE-INVENTORING DRAIN DRUM IN CASE OF UNAVAILABILITY OF VACCUM TRUCK.
6. DELETED.
7. ONE LT TO BE RADAR TYPE FOR INTERLOCK AND OTHER LT TO BE GWR TYPE FOR INDICATION.
8. LEVEL INDICATION AT GRADE.
9. CATHODIC PROTECTION TO BE PROVIDED FOR AMINE CLOSE BLOWDOWN DRUM.



300-PA-CF-2504

MEA SUMP PUMP

Rated Flow, 10.0 m^3/hr

Diff. Pres. 6.12 kg/cm^2

DP: 12.5 kg/cm^2g

DT : 80 °C

REV.	DATE	REVISION	DRN	BY	CHKD	APPD.
2	04.07.25	REVISED AS MARKED AND PMS INCORP.	AK	ASD	NS	MS

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SCALE	JOB NO.	DEPT.	SECTN.	UNIT	DWG. No.	REV.
	B957	79	41	300	11227	2

BINA PETROCHEMICAL AND REFINERY EXPANSION PROJECT (BPREP)
ETHYLENE CRACKER & ASSOCIATED UNITS
BINA, MADHYA PRADESH, INDIA

BHARAT PETROLEUM CORPORATION LIMITED
BINA REFINERY

REV.	ISSUE DATE	DESCRIPTION	CAD	PROJ ENG	LPE	PDM	PM	CLIENT
3	03/07/2025	REVISED FOR BEP	NAN	RR	SC	SKC VK	SA	
2	01/13/2025	FOR BEP	NAN	PKJ	SC	SKC VK	SA	
1	10/21/2024	PRELIMINARY	NAN	PKJ	SC	SKC VK	SA	

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PIPING AND INSTRUMENTATION DIAGRAM
ETHYLENE CRACKER UNIT (ECU)
MEA DRAIN DRUM

SCALE	DWG. No.	REV.
	363136-300-11227	1

Page 2035 of 4391 : B957-TENDER_DOC-B957-300-16-43-MR-T-3001 : Rev. A

300-CC-00-2503
GASOLINE/MEA
CONTACTOR/STRIPPER

DP : 8.0 kg-m^2g
DT : 100 °C
Inside Diam. x Len.(T-T): 1500 mm/4200 mm:600 mm x 34400 mm

NOTES:
1. FOR LEGEND, SYMBOLS, GENERAL NOTES AND ENGINEERING DESIGN NOTES SEE DWG. NO. B957-79-41-000-11011 THRU B-975-79-41-000-11014.
   ALL TAG NUMBERS FOR INSTRUMENTS WILL BE PRECEDED BY UNIT NUMBER "300" UNLESS OTHERWISE SPECIFIED.
2. CONNECTION AT TOP OF PIPING.
3. LOCATE THE GLOBE VALVE IN VIEW OF LG-22807

REV.	DATE	REVISION	DRN	BY	CHKD	APPD.
2	04.07.25	REVISED AS MARKED AND PMS INCORP.	AK	GS	PD/NS	MS

ENGINEERS INDIA LIMITED (A Govt. of India Undertaking)

अनुमाप SCALE	कार्य संख्या JOB NO.	विभाग DEPT.	अनुभाग SECTN.	इकाई UNIT	आरेख संख्या DWG. No.	संशो. REV.
	B957	79	41	300	11228	2

BINA PETROCHEMICAL AND REFINERY EXPANSION PROJECT (BPREP)
ETHYLENE CRACKER & ASSOCIATED UNITS
BINA, MADHYA PRADESH, INDIA

BHARAT PETROLEUM CORPORATION LIMITED
BINA REFINERY

REV	ISSUE DATE	DESCRIPTION	CAD	PROC ENG	LPE	PDM	PM	CLIENT
3	03.07.2025	REVISED FOR BEP	NAN	HN	SC	SKG/VK	SA	
2	01.13.2025	FOR BEP	NAN	HN	SC	SKG/VK	SA	
1	*10.21.2024	PRELIMINARY	NAN	HN	SC	SKG/VK	SA	

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PIPING AND INSTRUMENTATION DIAGRAM
UNIT 16- NAPHTHA CRACKER UNIT
GASOLINE AMINE CONTACTOR

SCALE | DWG. NO. 363136-300-11228 | REV. 1

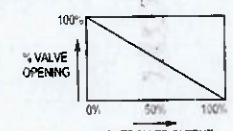
Page 2036 of 4391 : B957-TENDER_DOC-B957-300-16-43-MR-T-3001 : Rev. A

300-VV-HI-2506
GASOLINE/ MEA SEPARATOR
DP : 8.0 kg/cm^2g
DT : 100 °C
Inside Diam. x Len.(T/T) : x BY VENDOR

300-VV-HI-2507
GASOLINE/ MEA CONTACTOR BOTTOMS SEPARATOR
DP : 8.0 kg/cm^2g
DT : 100 °C
Inside Diam. x Len.(T/T) : x BY VENDOR

NOTES:

1. FOR LEGEND, SYMBOLS, GENERAL NOTES AND ENGINEERING DESIGN NOTES SEE SEE DWG. NO. B957-79-41-000-11011 THRU B957-79-41-000-11014.
   ALL TAG NUMBERS FOR INSTRUMENTS WILL BE PRECEDED BY UNIT NUMBER "300" UNLESS OTHERWISE SPECIFIED.
2. ELEVATIONS BASED ON PRELIMINARY PUMPINPSH REQUIREMENT. TO BE CONFIRMED BY DEC.
3. CONTROL VALVE LV-22901 IS OPENED WHEN INTERFACE LEVEL IS LOW AND CLOSED WHEN INERFACE LEVEL IS HIGH.



4. PROVIDE MINIMUM STOP FOR FV-22901 FOR MAINTAINING PUMP MINIMUM CIRCULATION

LIC-22906 300-11228 16424
FV-22902 300-11224 16305
RICH AMINE 300-11228 16423 FROM 300-CC-00-2503
ACID GAS FLARE 300-11827 16260
EQUALIZING LINE 300-11228 16536 TO/FROM 300-CC-00-2503
WASH GASOLINE 300-11228 16533 FROM 300-CC-00-2503
RICH AMINE 300-11221 16541 TO 300-CC-00-2502
PSV DISCHARGE 300-11221 16443 TO 300-CC-00-2502
RICH AMINE 300-11224 16561 TO 300-PA-CF-2507A/B
SPENT GASOLINE 300-11144 16538 TO 300-CC-00-1301
WASH GASOLINE 300-11228 16535 TO 300-CC-00-2503
16434 MEA DRAIN 300-11863
17206 MEA DRAIN 300-11863
17209 CBD 300-11866-2

300-PA-CF-2506A
300-PA-CF-2506B

300-PA-CF-2506A/B
WASH GASOLINE CIRCULATION PUMP
Rated Flow: 85.4 m^3/hr
Diff. Pres. 2.65 kg/cm^2
DP: 13.5 kg/cm^2g
DT: 80 °C

REV.	DATE	REVISION	DRN	BY	CHKD	APPD.
2	04.07.25	REVISED AS MARKED AND PMS INCORP.	AK	GS	PD/NS	MS

इंजीनियर्स इंडिया लिमिटेड ENGINEERS INDIA LIMITED (A Govt. of India Undertaking)

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	B957	79	41	300	11229	2

BINA PETROCHEMICAL AND REFINERY EXPANSION PROJECT (BPREP)
ETHYLENE CRACKER & ASSOCIATED UNITS
BINA, MADHYA PRADESH, INDIA

BHARAT PETROLEUM CORPORATION LIMITED
BINA REFINERY

REV.	ISSUE DATE	DESCRIPTION	ORIG	PROC ENG	LPE	PDM	PM	CLIENT
3	03/07/2025	REVISED FOR BEP	NAH	RR	SC	SKG VK	SA	
2	01/12/2025	FOR BEP	NAH	PKJ	SC	SKG VK	SA	
1		PRELIMINARY	NAH	PKJ	SC	SKG VK	SA	

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PIPING AND INSTRUMENTATION DIAGRAM
ETHYLENE UNIT-16 NAPHTHA CRACKER UNIT GASOLINE AMINE SEPARATOR

SCALE | DWG. No. 363136-300-11229 | REV. 1

300-EE-00-2301
REGENRATION FEED EFFLUENT EXCHANGER
DP (S/T) 7.5/7.5 kg/cm²g
DT (S/T) 290 C/ 255 °C
Rated Duty: 8.038 MMKCAL/HR
TEMA Type BES

300-EE-00-2302
REGENRATION GAS COOLER
DP (S/T) 7.5/6.6 kg/cm²g
DT (S/T) 95 C/ 45 C
Rated Duty: 2.137 MMKCAL/HR
TEMA Type AES

300-VV-VI-2301
REGENERATION GAS KO DRUM
DP 7.5 kg/cm²g
DT 95 C
Inside Diam. x Len.(T/T) 3000 mm x 3600 mm

NOTES:
1. FOR LEGEND, SYMBOLS, GENERAL NOTES AND ENGINEERING DESIGN NOTES SEE DWG. NO. 8957-79-41-000-11013 THRU 8957-79-41-000-11014. ALL TAG NUMBERS FOR INSTRUMENTS WILL BE PRECEDED BY UNIT NUMBER "300" UNLESS OTHERWISE SPECIFIED.
2. TWO PHASE FLOW. ANCHOR SECURELY.
3. LINE SIZE BY DETAIL ENGINEERING CONTRACTOR.
4. BLIND AFTER DRYOUT.
5. FINAL CONFIGURATION OF DRYOUT SYSTEM TO BE CONFIRMED BY DEC.
6. TIE-IN POINT FOR FUTURE ROU UNIT.
7. SAMPLE CONNECTION DETAILS AND RETURN LINE DESTINATION TO BE DEVELOPED BY DEC.

REV.	DATE	REVISION	DRN	BY	CHKD	APPD.
2	04.07.25	REVISED AS MARKED AND PMS INCORP.	AK	GS	PD/NS	MS

SCALE	JOB NO.	DRPT.	SECTN.	UNIT	DWG. No.	REV.
	B957	79	41	300	11240	2

BINA PETROCHEMICAL AND REFINERY EXPANSION PROJECT (BPREP)
ETHYLENE CRACKER & ASSOCIATED UNITS
BINA, MADHYA PRADESH, INDIA

BHARAT PETROLEUM CORPORATION LIMITED
BINA REFINERY

REV.	ISSUE DATE	DESCRIPTION	CKD	PROJ. ENGR.	LPT	PDM	PM	CLIENT
3	03/07/2025	REVISED FOR BEP	NAN	RR	SC	SK/VK	SA	
2	01/13/2025	FOR BEP	NAN	PKJ	SC	SK/VK	SA	
1	10/21/2024	PRELIMINARY	NAN	PKJ	SC	SK/VK	SA	

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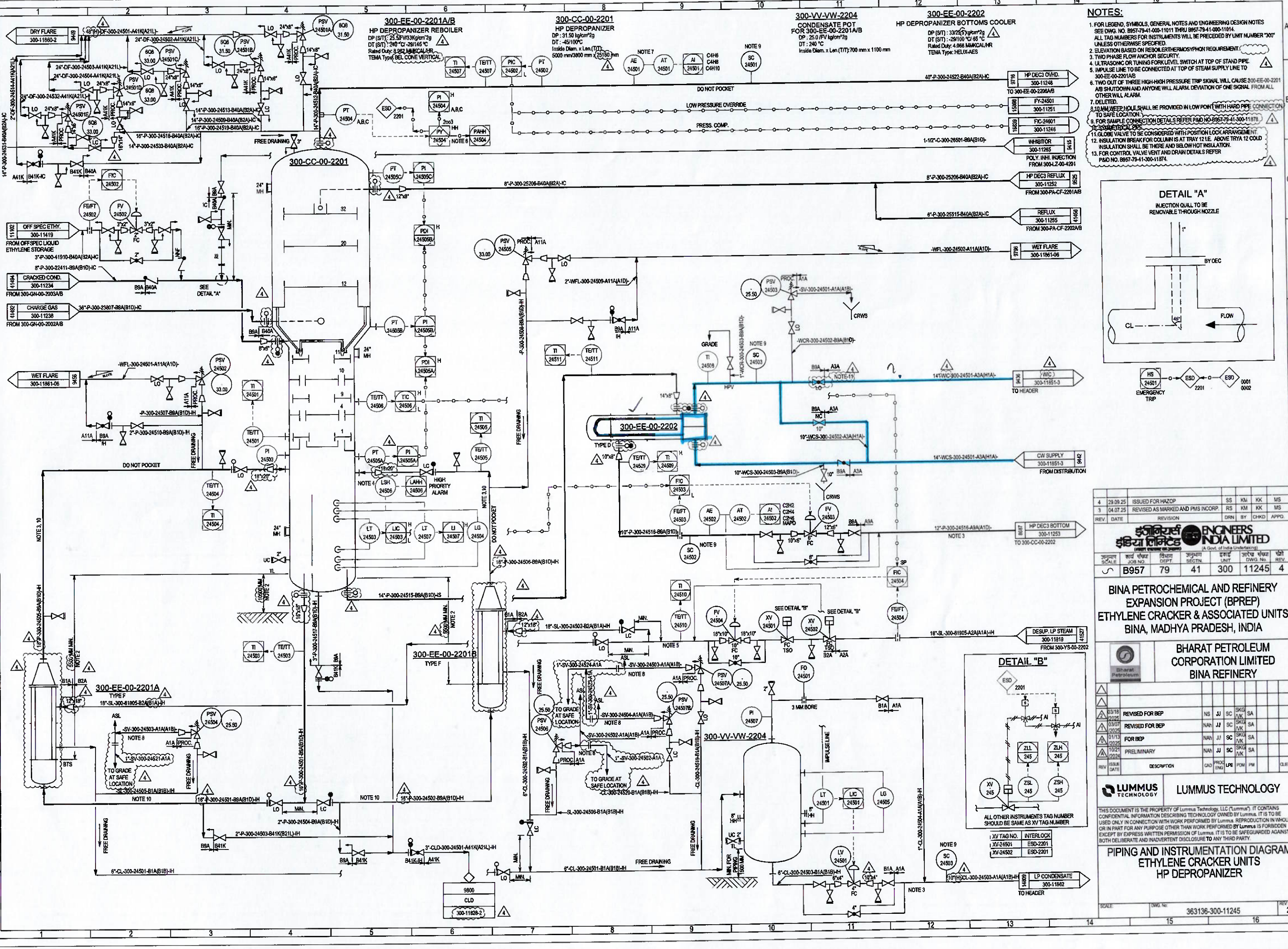
PIPING AND INSTRUMENTATION DIAGRAM
ETHYLENE CRACKER UNIT (SCU)
REGENERATION GAS KO DRUM

DWG. No. 363136-300-11240 REV. 1



REV.	DATE	REVISION	DRN.	BY	CHKD	APPD.
4	29.09.25	ISSUED FOR HAZOP	SS	KM	KK	MS
3	04.07.25	REVISED AS MARKED AND PMS INCORP.	RS	KM	KK	MS

ENGINEERS INDIA LIMITED (A Govt. of India Undertaking)

SCALE	JOB NO.	DEPT.	SECTN.	UNIT	DWG. No	REV.
	B957	79	41	300	11245	4

BINA PETROCHEMICAL AND REFINERY EXPANSION PROJECT (BPREP)
ETHYLENE CRACKER & ASSOCIATED UNITS
BINA, MADHYA PRADESH, INDIA

BHARAT PETROLEUM CORPORATION LIMITED
BINA REFINERY

REV	ISSUE DATE	DESCRIPTION	CAD	PROJ. ENG.	LPE	PDM	PM	CLIENT
3	03/18/2025	REVISED FOR BEP	NS	JJ	SC	SKG/VK	SA	
2	03/07/2025	REVISED FOR BEP	NAH	JJ	SC	SKG/VK	SA	
1	01/13/2025	FOR BEP	NAH	JJ	SC	SKG/VK	SA	
0	10/21/2024	PRELIMINARY	NAH	JJ	SC	SKG/VK	SA	

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PIPING AND INSTRUMENTATION DIAGRAM
ETHYLENE CRACKER UNITS
HP DEPROPANIZER

SCALE:	DWG. No:	REV.
	363136-300-11245	2

300-EE-00-2209
ACETYLENE CONVERTER INTERCOOLER NO.1
DP (S/T) : 31.5/24.5 kg/cm^2g
DT (S/T) : 170 °C/ 65 °C
Rated Duty: 19.230 MMKCAL/HR
TEMA Type: AXS

300-EE-00-2210
ACETYLENE CONVERTER INTERCOOLER NO.2
DP (S/T) : 31.5/24.5 kg/cm^2g
DT (S/T) : 170 °C/ 65 °C
Rated Duty: 17.832 MMKCAL/HR
TEMA Type: AXS

300-EE-00-2211
ACETYLENE CONVERTER AFTERCOOLER
DP (S/T) : 31.5 /24.5 kg/cm^2g
DT (S/T) : 150 °C/ 65 °C
Rated Duty: 15.578 MMKCAL/HR
TEMA Type: AJ21L

NOTES:
1. FOR LEGEND, SYMBOLS, GENERAL NOTES AND ENGINEERING DESIGN NOTES SEE DWG. NO. B957-79-41-000-11011 THRU B957-79-41-000-11014.
   ALL TAG NUMBERS FOR INSTRUMENTS WILL BE PRECEDED BY UNIT NUMBER "300" UNLESS OTHERWISE SPECIFIED.
2. ANALYZER SAMPLE RETURN TO 300-AA-AN-2002 INLET VIA COMMON HEADER BASED ON ANALYZER HOUSE LOCATION, TO BE DEVELOPED BY DEC.
3. FOR SAMPLE CONNECTION DETAIL'S REFER P&ID NO. B957-79-41-300-11876.
4. GLOBE VALVE TO BE CONSIDERED WITH POSITION LOCK ARRANGEMENT.
5. FOR CONTROL VALVE VENT AND DRAIN REFER P&ID NO. B957-79-41-300-11874.

REV.	DATE	REVISION	DRN	BY	CHKD	APPD.
3	13.10.25	ISSUED FOR HAZOP.	AN	KM	KK	MS
2	04.07.25	REVISED AS MARKED AND PMS INCORP.	RS	KM	KK	MS

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JOB NO.	DEPT.	SECTN.	UNIT	DWG. No.	REV.
B957	79	41	300	11247	3

BINA PETROCHEMICAL AND REFINERY EXPANSION PROJECT (BPREP)
ETHYLENE CRACKER & ASSOCIATED UNITS
BINA, MADHYA PRADESH, INDIA

BHARAT PETROLEUM CORPORATION LIMITED
BINA REFINERY

REV	ISSUE DATE	DESCRIPTION	CAD	PROC ENG	LPE	PDM	PM	CLIENT
3	03/07/2025	REVISED FOR BEP	NAh	JJ	SC	SKG/VK	SA	
2	01/13/2025	FOR BEP	NAh	JJ	SC	SKG/VK	SA	
1	10/21/2024	PRELIMINARY	NAh	JJ	SC	SKG/VK	SA	

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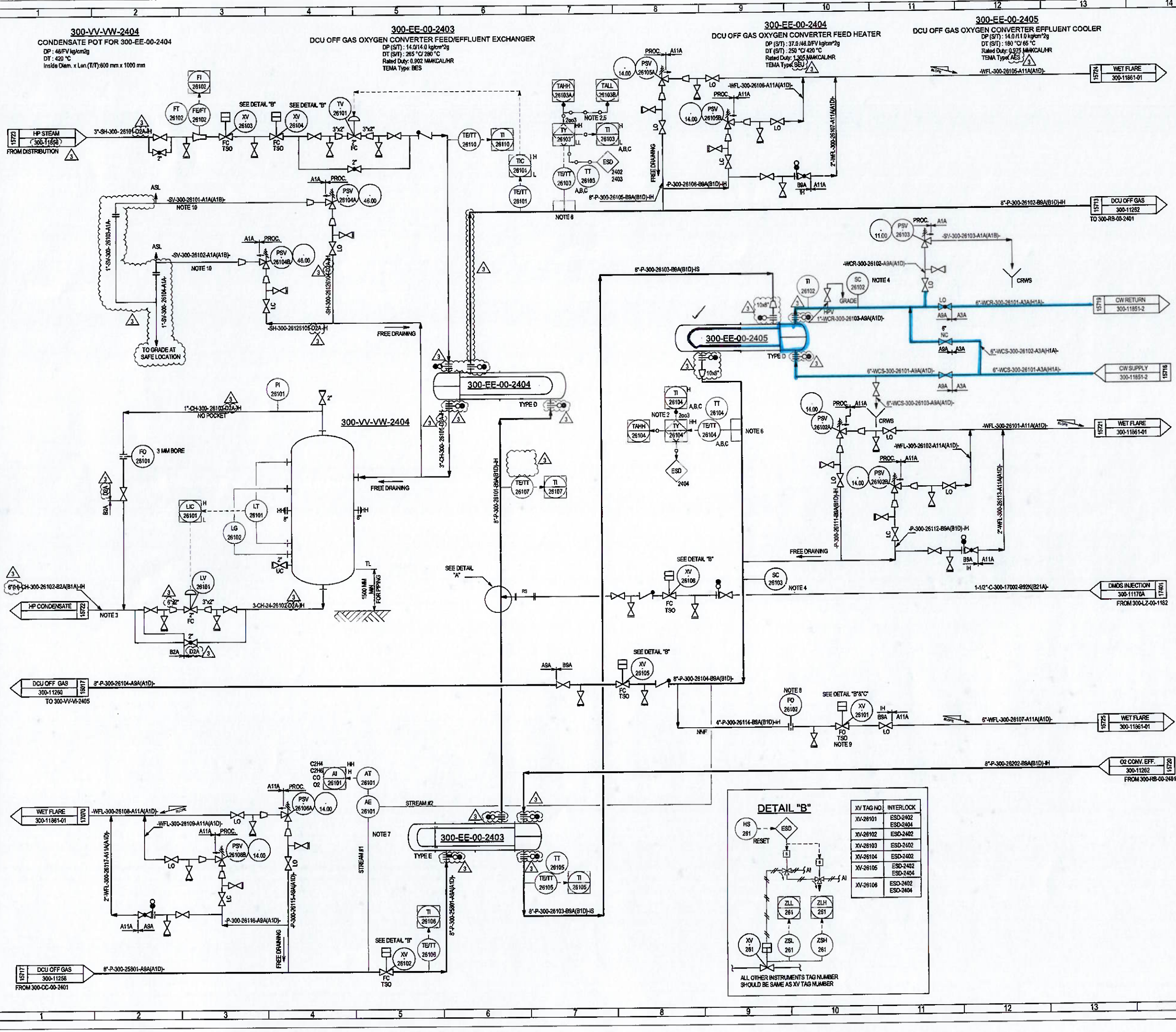
PIPING AND INSTRUMENTATION DIAGRAM
ETHYLENE CRACKER UNIT
ACETYLENE CONVERTER COOLERS

SCALE: | DWG. No. 363136-300-11247 | REV. 1



NOTES:

1. FOR LEGEND, SYMBOLS, GENERAL NOTES AND ENGINEERING DESIGN NOTES SEE DWG. NO. 9957-79-41-300-11011 THRU 9957-79-41-300-11014. ALL TAG NUMBERS FOR INSTRUMENTS WILL BE PRECEDED BY UNIT NUMBER "300" UNLESS OTHERWISE SPECIFIED.
2. TWO OUT OF THREE HIGH HIGH TEMPERATURE TRIP SIGNAL WILL ACTIVATE 300-Z-2701 AND ANYONE WILL ALARM. DEVIATION OF ONE SIGNAL FROM ALL OTHERS WILL ALARM.
3. TWO PHASE FLOW, ANHOR SECURELY.
4. FOR SAMPLE CONNECTION DETAILS REFER P&ID 9957-79-41-300-11978.
5. TWO OUT OF THREE LOW-LOW TEMPERATURE TRIP SIGNAL WILL ACTIVATE 300-Z-2703 AND ANYONE WILL ALARM. DEVIATION OF ONE SIGNAL FROM ALL OTHER WILL ALARM.
6. TRANSMITTERS TO HAVE INDIVIDUAL TAPPINGS.
7. ANALYZER SAMPLE RETURN TO BE ROUTED TO WET FLARE, DETAIL TO BE DEVELOPED DURING DETAILED ENGINEERING.
8. THE FLOW ORIFICE (300-FO-26102) IN THE EMERGENCY VENT LINE TO BE SIZED TO DEPRESSURIZE THE CONVERTER SYSTEM BETWEEN THE CONVERTER FEED AND EFFLUENT XVS TO 50% OF THE NORMAL OPERATING PRESSURE (4.5 KG/CM2G) IN 1.0 MINUTES.
9. EMERGENCY VENT VALVE 300-XV-26101 WILL OPEN AFTER A SHUTDOWN TO DEPRESSURE SYSTEM TO A PRESSURE OF 4.5 KG/CM2G IN 1.0 MINUTES (REFER TO NOTE 8) AND WILL REMAIN OPEN UNTIL NITROGEN SWEEP VALVES 300-XV-26203 & 300-XV-26201 (300-RB-00-2401) AS SELECTED BY REACTOR MODE SELECTOR SWITCH 300-HS-26203 CLOSED BY OPERATOR INDICATING CONVERTER HAS BEEN PURGED, COOLED AND DEPRESSURED. THE EMERGENCY VENT VALVE WILL BE CLOSED AFTER NITROGEN SWEEP VALVE SHUTS (CONFIRMED BY CLOSED POSITION SWITCH) TO PREVENT BACK FLOW FROM FLARE HEADER BY PRESSURE SWITCH PAL-26205 A/B/C (2-O-O-3 VOTING) WHEN PRESSURE DROPS TO 2.0 KG/CM2G (SET SLIGHTLY ABOVE MAXIMUM FLARE BACKPRESSURE OF 1.7 KG/CM2G). THE EMERGENCY VENT VALVE WILL REMAIN CLOSED UNTIL ANOTHER TOTAL SHUTDOWN TAKES PLACE (UNLESS REOPENED BY THE OPERATOR). WHEN THE SYSTEM IS REPRESSURIZED (PRESSURE SWITCH PAL-26205 A/B/C) OPENS, THE EMERGENCY DEPRESSURING INTERLOCK WILL BE REACTIVATED ALLOWING THE EMERGENCY VENT VALVES AND NITROGEN SWEEP VALVE TO OPEN IN THE EVENT THE INTERLOCK IS TRIPPED AGAIN.
10. 10 MM WEEP HOLE SHALL BE PROVIDED IN LOW POINT, WITH HARD CONNECTION AT SAFE LOCATION.
11. FOR CONTROL VALVE VENT AND DRAIN REFER P&ID 9957-79-41-300-11974.

REV.	DATE	REVISION	DRN	BY	CHKD	APPD.
3	29.09.25	REVISED AS MARKED & ISSUED FOR HAZOP, SP	KM	KK	MS	
2	04.07.25	REVISED AS MARKED AND PMS INCORP.	MD	KM	KK	MS

इंजीनियर्स इंडिया लिमिटेड ENGINEERS INDIA LIMITED (A Govt. of India Undertaking)

SCALE	JOB NO.	DEPT.	SECTN.	UNIT	DWG. No.	REV.
	B957	79	41	300	11261	2

BINA PETROCHEMICAL AND REFINERY EXPANSION PROJECT (BPREP)
ETHYLENE CRACKER & ASSOCIATED UNITS
BINA, MADHYA PRADESH, INDIA

BHARAT PETROLEUM CORPORATION LIMITED
BINA REFINERY

REV	ISSUE DATE	DESCRIPTION	CAD	PROJ. ENG	LPE	PDM	PM		CLIENT
3	03/07/2025	REVISED FOR BEP	NAh	RR	SC	SKG/VK	SA		
2	01/13/2025	FOR BEP	NAh	JJ	SC	SKG/VK	SA		
1	10/21/2024	PRELIMINARY	NAh	JJ	SC	SKG/VK	SA		

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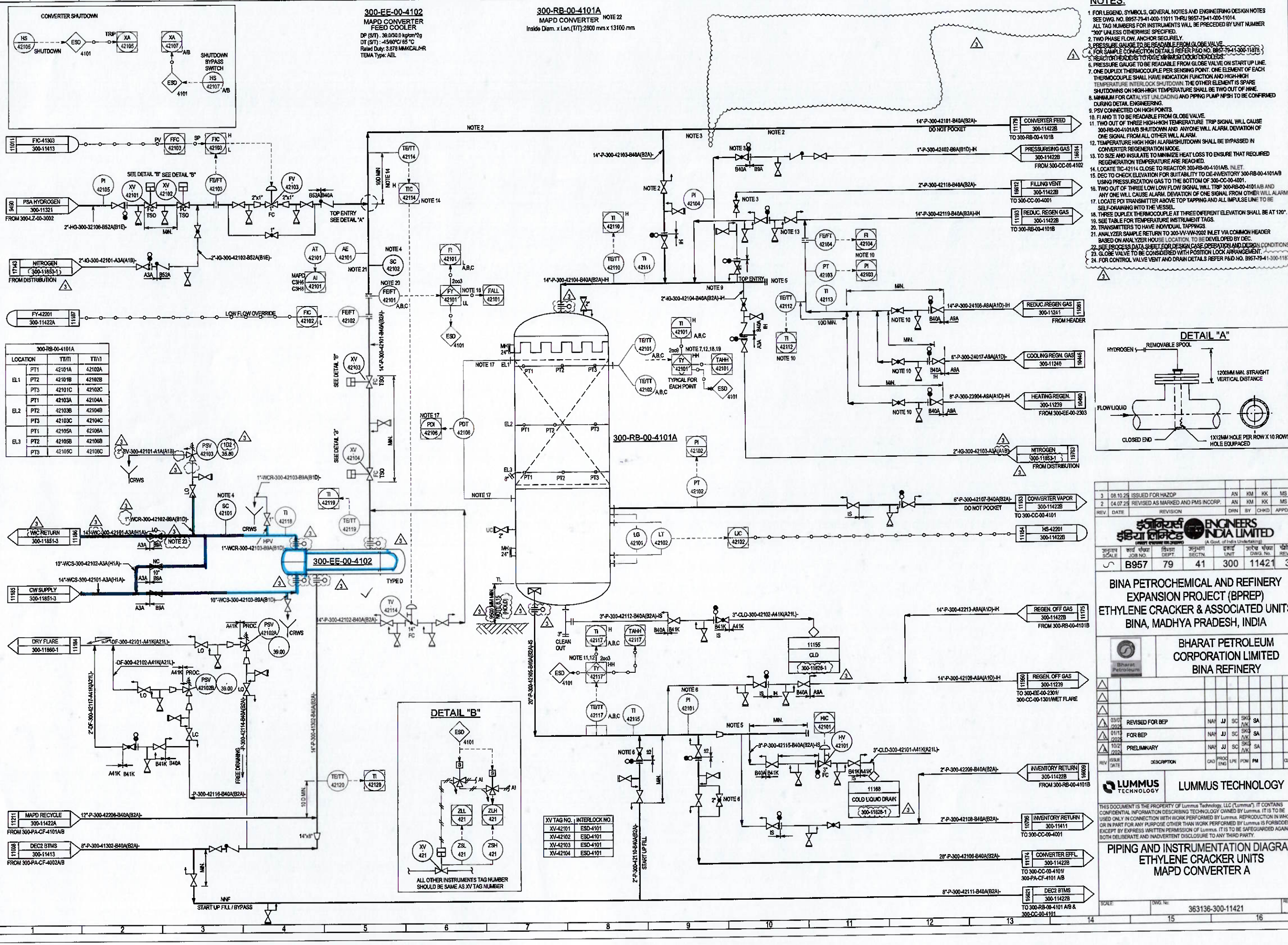
PIPING AND INSTRUMENTATION DIAGRAM
ETHYLENE CRACKER UNITS
DCU OFFGAS OXYGEN CONVERTER
FEED/EFFLUENT EXCHANGERS

SCALE: | DWG. No: 363136-300-11261 | REV: 1

Page 2041 of 4391 ; B957-TENDER_DOC-B957-300-16-43-MR-T-3001 ; Rev. A



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300-EE-00-4105A/B

PROPYLENE FRACTIONATOR CONDENSER

DP (S/T) : 24.521.0 kg/cm^2g
DT (S/T) : -29/65 °C/ 65 °C
Rated Duty: 86.211 MM KCAL/HR
TEMA Type: HELIX-AEL

NOTES:

1. FOR LEGEND, SYMBOLS, GENERAL NOTES AND ENGINEERING DESIGN NOTES SEE DWG. NO. 363136-000-11011 THRU 363136-000-11014. ALL TAG NUMBERS FOR INSTRUMENTS WILL BE PRECEDED BY UNIT NUMBER 300 UNLESS OTHERWISE SPECIFIED.
2. ALL PROCESS AND CW PIPING TO AND FROM 300-EE-00-4105A/B TO BE ARRANGED TO PROVIDE EQUAL FLOW DISTRIBUTION.
3. TWO PHASE FLOW ANCHOR SECURELY.
4. LOCATE OUTLET HEADER FOR 300-EE-00-4105A/B BELOW EXCHANGERS.
5. PROPYLENE FRACTIONATOR CONDENSERS ARE LOCATED NEAR GRADE LEVEL.
6. PROVIDE MIN MECHANICAL STOP CORRESPONDING TO TUBE SIDE VELOCITY OF 1M/SEC.
7. CONDENSER OUTLETS TO BE COMBINED IN COMMON AT GRADE BEFORE GOING TO HIGHER ELEVATION.
8. INDIVIDUAL HC CONTROL FOR COLLING WATER FLOW RATE NEEDS TO BE SET INITIALLY WITH THE HELP OF INDIVIDUAL BIAS (BY DEC) TO COUNTER UNBALANCED HYDRAULICS OF THE SYSTEM BASED ON PROCESS OUTLET TEMPERATURE PC CONROL OUTPUT WILL BE APPLICABLE ON ALL CONDENSERS SIMULTANEOUSLY AND AS PER INDIVIDUAL BIAS CONTROL.
9. FOR SAMPLE CONNECTION DETAILS REFER P&ID NO. B957-79-41-300-11678 (DEC).
10. ADMINISTRATIVE PROCEDURE REQUIRED TO ENSURE 300-EE-00-4105A/B PROPERLY ISOLATED,VENTED AND DRAINED TO ENSURE OVERPRESSURE PROTECTION WHEN NOT IN SERVICE.
11. FUTURE CONNECTION FOR HOT VAPOR BY-PASS.

REV.	DATE	REVISION	DRN	BY	CHKD	APPD.
3	08.10.25	ISSUED FOR HAZOP	AN	KM	KK	MS
2	04.07.25	REVISED AS MARKED AND PMS INCORP.	AN	KM	KK	MS

ENGINEERS INDIA LIMITED (A Govt. of India Undertaking)

JOB NO.	DEPT.	SECTN.	UNIT	DWG. No.	REV.
B957	79	41	300	11425	3

BINA PETROCHEMICAL AND REFINERY EXPANSION PROJECT (BPREP)
ETHYLENE CRACKER & ASSOCIATED UNITS
BINA, MADHYA PRADESH, INDIA

BHARAT PETROLEUM CORPORATION LIMITED
BINA REFINERY

REV	ISSUE DATE	DESCRIPTION	CAD	PROC ENG	LPE	PDM	PM		CLIENT
3	03/07/2025	REVISED FOR BEP	NAH	JJ	SC	SKG/AK	SA		
2	01/11/2024	FOR BEP	NAH	JJ	SC	SKG/AK	SA		
1	10/23/2024	PRELIMINARY	NAH	JJ	SC	SKG/AK	SA		

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PIPING AND INSTRUMENTATION DIAGRAM
ETHYLENE CRACKER UNIT (ECU)
PROPYLENE FRACTIONATOR CONDENSER
(SHEET 1 OF 2)

SCALE: | DWG. No: 363136-300-11425A | REV. 1

300-EE-00-4105C/D
PROPYLENE FRACTIONATOR CONDENSER

DP (S/T) : 24.5/21.0 kg/cm^2g
DT (S/T) : -29/85°C/ 65 °C
Rated Duty: 86.211 MMKCAL/HR
TEMA Type: HELIX-AEL

NOTES:

1. FOR LEGEND, SYMBOLS, GENERAL NOTES AND ENGINEERING DESIGN NOTES SEE DWG. NO. B957-79-41-000-11011 THRU B957-79-41-000-11014. ALL TAG NUMBERS FOR INSTRUMENTS WILL BE PRECEDED BY UNIT NUMBER 300 UNLESS OTHERWISE SPECIFIED.
2. ALL PROCESS AND CW PIPING TO AND FROM 300-EE-00-4105C/D TO BE ARRANGED TO PROVIDE EQUAL FLOW DISTRIBUTION.
3. TWO PHASE FLOW ANCHOR SECURELY.
4. LOCATE OUTLET HEADER FOR 300-EE-00-4105C/D BELOW EXCHANGERS.
5. PROPYLENE FRACTIONATOR CONDENSERS ARE LOCATED NEAR GRADE LEVEL.
6. PROVIDE MIN MECHANICAL STOP CORRESPONDING TO TUBE SIDE VELOCITY OF 1M/SEC.
7. CONSIDER OUTLETS TO BE COMBINED IN COMMON AT GRADE BEFORE GOING TO HIGHER ELEVATION.
8. INDIVIDUAL HC CONTROL VALVE FOR COLLING WATER FLOW RATE NEEDS TO BE SET INITIALLY WITH THE HELP OF INDIVIDUAL BIAS (BY DEC) TO COUNTER UNBALANCED HYDRAULICS OF THE SYSTEM BASED ON PROCESS OUTLET TEMPERATURE PC CONTROL OUTPUT WILL BE APPLICABLE ON ALL CONDENSERS SIMULTANEOUSLY AND AS PER INDIVIDUAL BIAS CONTROL.
9. FOR SAMPLE CONNECTION DETAILS REFER P&ID NO. B957-79-41-300-11878.
10. ADMINISTRATIVE PROCEDURE REQUIRED TO ENSURE 300-EE-00-4105C/D PROPERLY ISOLATED,VENTED AND DRAINED TO ENSURE OVERPRESSURE PROTECTION WHEN NOT IN SERVICE.

REV	DATE	REVISION	DRN	BY	CHKD	APPD.
3	08.10.25	REVISED AS MARKED& ISSUED FOR HAZOP	AN	KM	KK	MS
2	04.07.25	REVISED AS MARKED AND PMS INCORP	AN	KM	KK	MS

ENGINEERS INDIA LIMITED (A Govt. of India Undertaking)

SCALE	JOB NO.	DEPT	SECTN.	UNIT	DWG. No.	REV.
	B957	79	41	300	11425B	3

BINA PETROCHEMICAL AND REFINERY EXPANSION PROJECT (BPREP)
ETHYLENE CRACKER & ASSOCIATED UNITS
BINA, MADHYA PRADESH, INDIA

BHARAT PETROLEUM CORPORATION LIMITED
BINA REFINERY

REV	ISSUE DATE	DESCRIPTION	CAD	PROC ENG	LPE	PDM	PM		CLIENT
3	03/07/2025	REVISED FOR BEP	NAH	JJ	SC	SKG/VK	SA		
2	01/11/2024	FOR BEP	NAH	JJ	SC	SKG/VK	SA		
1	10/21/2024	PRELIMINARY	NAH	JJ	SC	SKG/VK	SA		

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PIPING AND INSTRUMENTATION DIAGRAM
ETHYLENE CRACKER UNIT (ECU)
PROPYLENE FRACTIONATOR CONDENSER
(SHEET 2 OF 2)

SCALE: | DWG. No: 363136-300-11425B | REV. 1

NOTES:

1. FOR LEGEND, SYMBOLS, GENERAL NOTES AND ENGINEERING DESIGN NOTES SEE DWG. NO. B957-79-41-000-11011 THRU B957-79-41-000-11014. ALL TAG NUMBERS FOR INSTRUMENTS WILL BE PRECEDED BY UNIT NUMBER "300" UNLESS OTHERWISE SPECIFIED.
2. PUMP VENT FLOW LINE SIZE WILL BE DETERMINED DURING DETAIL ENGINEERING.
3. FOR SAMPLE CONNECTION DETAILS REFER P&ID NO. B957-79-41-300-11878.
4. GLOBE VALVE TO BE CONSIDERED WITH POSITION LOCK ARRANGEMENT.
5. FOR CONTROL VALVE VENT AND DRAIN DETAILS REFER P&ID NO. B957-79-41-300-11874.

300-EE-00-4107
PROPYLENE TREATER FEED COOLER
DP (S/T) : 60.5/47.0 kg/cm**2g
DT (S/T) : 0 °C/ 65 °C
Rated Duty: 0.810 MMKCAL/HR
TEMA Type: AEM

MIN.FLOW 300-11426 11983 TO 300-VV-HW-4101
8"-P-300-42706-B9A(B1D)-
FIC 42701 L
FV 42701
FO
B9A D9A
NOTE 2
FE/FT 42701
NOTE 3 SC 42701
PT 42705
PI 42705
8"-P-300-42701-D9A(D1D)-
TI 42702
TE/TT 42702
300-EE-00-4107
TYPE D
TI 42701
8"x8"
8"x6"
PROC. A1A
1D2 / 47.00
PSV 42701
2"-GV-300-42701-A1A(A1B)-
CRWS
1"-WCR-300-42702-B9A(B1D)-
GRADE
NOTE 3 SC 42702
NOTE 4
1"-WCR-300-24502-B9A(B1D)-
HPV
8"-WCR-300-42701-A3A(H1A)-
LO B9A A3A
CW RETURN 300-11851-3 11994
NC 6" B9A A3A
6"-WCS-300-42702-A3A(H1A)-
6"-WCS-300-42701-A3A(H1A)-
CW SUPPLY 300-11851-3 11995
6"-WCS-300-42703-A3A(H1A)-
CRWS
8"-P-300-42709-D9A(D1D)-
PROPYLENE PROD. 300-11428A 11982 TO 300-VD-00-4101A/B
TE/TT 42703
TI 42703
8"-P-300-42705-D9A(D1D)-
VENT 300-11426 11984 TO 300-VV-HW-4101
-P-300-42703-B9A(B1D)-
DO NOT POCKET
NNF
NOTE 2
PROPYLENE PROD. 300-11423 11466 FROM 300-CC-00-4101
10"-P-300-42302-D9A(D1D)-
-P-300-42704-B9A(B1D)-
DO NOT POCKET
10"-P-300-42710-D9A(D1D)-
-P-300-42708-B9A(B1D)-
PI 42704
PI 42703
PI 42702
PI 42701
300-PA-CF-4104A
300-PA-CF-4104B
2"-P-300-42708-D9A(D1D)-
2"-P-300-42707-D9A(D1D)-
D4HK
A4HK
XL 42701
HS 42701 C
XL 42702
HS 42702 C
ESD 4106
2"-CLD-300-42701-A4K(A2L)-
11992 CLD 300-11828-1

300-PA-CF-4104A /B
PROPYLENE PRODUCT PUMPS
Rated Flow: 136.8 m**3/hr
Diff. Pres: 23.91(H) kg/cm2
DP: 60.5 kg/cm**2g
DT : -29/85 °C

REV.	DATE	REVISION	DRN	BY	CHKD	APPD.
3	26.09.25	ISSUED FOR HAZOP	SS	KM	KK	MS
2	04.07.25	REVISED AS MARKED AND PMS INCORP	AN	KM	KK	MS

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SCALE	JOB NO.	DEPT.	SECTN.	UNIT	DWG. No.	REV.
NTS	B957	79	41	300	11427	3

BINA PETROCHEMICAL AND REFINERY EXPANSION PROJECT (BPREP)
ETHYLENE CRACKER & ASSOCIATED UNITS
BINA, MADHYA PRADESH, INDIA

BHARAT PETROLEUM CORPORATION LIMITED
BINA REFINERY

REV	ISSUE DATE	DESCRIPTION	CAD	PROC ENG	LPE	PDM	PM	CLIENT
3	03/07/2025	REVISED FOR BEP	NAH	JJ	SC	SKG/VK	SA	
2	01/11/2025	FOR BEP	NAH	JJ	SC	SKG/VK	SA	
1	10/2/2024	PRELIMINARY	NAH	JJ	SC	SKG/VK	SA	

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PIPING AND INSTRUMENTATION DIAGRAM
ETHYLENE CRACKER UNITS
PROPYLENE PRODUCT PUMPS

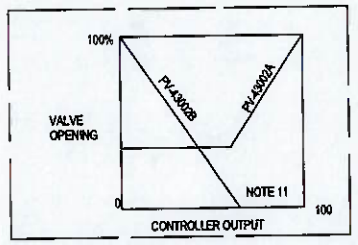
SCALE: | DWG. No: 363136-300-11427 | REV. 1

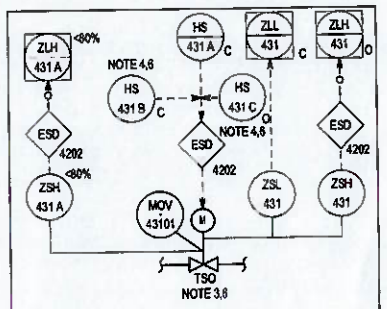
NOTE 7 300-EE-00-4202
DEBUTANIZER CONDENSER
DP (S/T) : 8.5/10.6 kg/cm^2g
DT (S/T) : 140 °C/ 85 °C
Rated Duty: 10.242 MMKCAL/HR
TEMA Type: HELIX-AEM

300-VV-HW-4202
DEBUTANIZER REFLUX DRUM
DP : 6.5 kg/cm^2g
DT : 85 °C
Inside Diam. x Len (T/T):2600 mm x 7800 mm

NOTES:

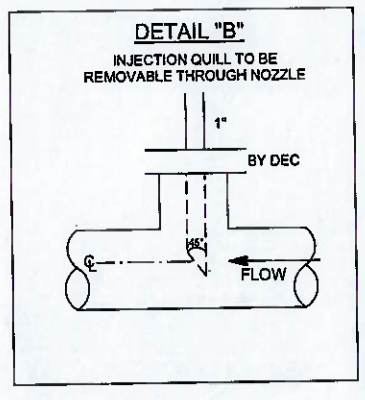
1. FOR LEGEND, SYMBOLS, GENERAL NOTES AND ENGINEERING DESIGN NOTES SEE DWG. NO. 9957-79-41-000-11011 THRU 9957-79-41-000-11014. ALL TAG NUMBERS FOR INSTRUMENTS WILL BE PRECEDED BY UNIT NUMBER "300" UNLESS OTHERWISE SPECIFIED.
2. ELEVATIONS BASED ON PRELIMINARY NPSH CALC.
3. MOTOR OF PUMP SHALL BE AUTOMATICALLY STOPPED WHEN MOV IS LESS THAN 90% OPEN AND CANNOT BE RESTARTED UNTIL THE MOV IS FULLY OPENED.
4. LOCATE PUSH BUTTON 15M FROM PUMP AT SAFE LOCATION.
5. PUMP VENT LINE SIZE WILL BE BASED ON PUMP VRNDOR INPUT.
6. PUSH BUTTON IN THE FIELD OR CONTROL ROOM ACTIVATES INTERLOCK WHICH CLOSES ISOLATION VALVE AND SHUTS DOWN ALL ASSOCIATED PUMPS. VALVE LOCATED IN THE FIRE ZONE SHALL BE FIRE SAFE WITH FIRE PROOF ACTUATOR. POWER AND CONTROL CABLES IN FIREZONE SHALL BE FIREPROOFED.
7. 300-EE-00-4202 LOCATED AT GRADE.
8. FOR SHARE CONNECTION DETAILS REFER P&ID NO 9957-79-41-300-11878.
9. PROVIDE MIN. MECHANICAL STOP CORRESPONDING TO TUBE SIDE VELOCITY OF 1.3M/SEC.
10. ANALYZER SAMPLE RETURN TO 300-VV-VW-2002 INLET VIA COMMON HEADER BASED ON ANALYZER HOUSE LOCATION, TO BE DEVELOPED BY DEC.
11. THE CONTROL OUTPUT/VALVE POSITION PIVOT POINT FOR THE MINIMUM STOP IS TO BE DETERMINED DURING DETAIL ENGINEERING.
12. FOR CONTROL VALVE VENT AND DRAIN REFER P&ID NO. 9957-79-41-300-11874.





ALL OTHER INSTRUMENTS TAG NUMBER SHOULD BE SAME AS MOV TAG NUMBER

DETAIL "A"



DETAIL "B"
INJECTION QUILL TO BE REMOVABLE THROUGH NOZZLE

REV	DATE	REVISION	DRN	SY	CHKD	APPD.
3	30.09.25	ISSUED FOR HAZOP	AK	KM	KK	MS
2	04.07.25	REVISED AS MARKED AND PMS INCORP.	MD	KM	KK	MS

ENGINEERS INDIA LIMITED (A Govt. of India Undertaking)

SCALE	JOB NO	DEPT	SECTN	UNIT	DWG. No.	REV.
	B957	79	41	300	11431	3

BINA PETROCHEMICAL AND REFINERY EXPANSION PROJECT (BPREP)
ETHYLENE CRACKER & ASSOCIATED UNITS
BINA, MADHYA PRADESH, INDIA

BHARAT PETROLEUM CORPORATION LIMITED
BINA REFINERY

REV	ISSUE DATE	DESCRIPTION	CAD	PROC ENG	LPE	POM	PM	CLIENT
1	03/07/2025	REVISED FOR BEP	NAN	PKJ	SC	SKG/VK	SA	
0	01/13/2025	FOR BEP	NAN	PKJ	SC	SKG/VK	SA	
A	10/21/2024	PRELIMINARY	NAN	PKJ	SC	SKG/VK	SA	

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PIPING AND INSTRUMENTATION DIAGRAM
ETHYLENE CRACKER UNITS
DEBUTANIZER OVERHEAD SYSTEM

SCALE:	DWG. No.	REV.
	363136-300-11431	1

Page 2046 of 4391 : B957-TENDER_DOC-B957-300-16-43-MR-T-3001 : Rev. A

Page 2047 of 4391 ; B957-TENDER_DOC-B957-300-16-43-MR-T-3001 ; Rev. A

BIJA PETROCHEMICAL AND REFINERY
EXPANSION PROJECT (BPREP)
ETHYLENE CRACKER & ASSOCIATED UNITS
BIJA, MADHYA PRADESH, INDIA

BHARAT PETROLEUM CORPORATION LIMITED
BIJA REFINERY

LUMMUS TECHNOLOGY

PIPING AND INSTRUMENTATION DIAGRAM
ETHYLENE CRACKER UNITS
PYROLYSIS GASOLINE COOLER

363136-300-11432

300-EE-00-4203
PYROLYSIS GASOLINE COOLER
DT (SD) : 21.5/172 kg/cm²g
DT (SD) : 140 °C/ 65 °C
Rated Duty: 4.649 MMKCAL/HR
TEMA Type: HELIX-AES

300-PA-CF-4203A/B
DEBUTANIZER BOTTOMS PUMPS
Rated Flow: 112.8 m³/hr
Diff. Press: 3.09 kg/cm²2
DP: 11.5 kg/cm²2g
DT : 153 °C

NOTES:
1 FOR LEGEND, SYMBOLS, GENERAL NOTES AND ENGINEERING DESIGN NOTES SEE DWG. NO. B957-79-41-000-11011 THRU B957-79-41-000-11014.
2. ALL TAG NUMBERS FOR INSTRUMENTS WILL BE PREFIXED BY UNIT NUMBER "300". UNLESS OTHERWISE SPECIFIED.
3. LOCATE PUSH BUTTON (SM) FROM PUMP AT SAFE LOCATION.
4. MOTOR OF PUMP SHALL BE AUTOMATICALLY STOPPED WHEN MOV IS LESS THAN 90% OPEN AND CANNOT BE RESTARTED UNTIL THE MOV IS FULLY OPENED.
5. PUMP VENT AND MINIMUM FLOW LINE SIZE WILL BE BASED ON PUMP VENDOR INPUT.
6. TRIEM POINT FOR RFMT RECOVERY.
7. FOR SAMPLE CONNECTION DETAILS REFER P&ID B957-78-41-300-11018
8. GLOBE VALVE TO BE CONSIDERED WITH POSITION LOCK MAINTAINED.
9. FOR CONTROL VALVE VENT AND DRAIN DETAILS REFER P&ID NO. B957-78-41-300-1027

DETAIL "A"
ALL OTHER INSTRUMENTS TAG NUMBER SHOULD BE SAME AS MOV TAG NUMBER

DETAIL "B"
INJECTION OULL TO BE REMOVABLE THROUGH NOZZLE

DETAIL "C"
ALL OTHER INSTRUMENTS TAG NUMBER SHOULD BE SAME AS XV TAG NUMBER

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4	03/07/2025	REVISED FOR BEP	NAK	PKJ	SC	SKG/AK	SA	
3	01/13/2025	FOR BEP	NAK	PKJ	SC	SKG/AK	SA	
2	10/21/2024	PRELIMINARY	NAK	PKJ	SC	SKG/AK	SA	
1								

REV	DATE	REVISION	DWN	BY	CHKD	APPD
3	30.09.25	ISSUED FOR HAZOP	AK	KM	KK	MS
2	04.07.25	REVISED AS MARKED AND PMS INCORP.	MD	KM	KK	MS

Joyant SCALE	Text Hight JOB NO.	Joint Depth SHEET NO.	Text Hight UNIT	Joint Depth DWG. No.	REV
3	11432	300	41	79	B957

VENDOR DATA REQUIREMENTS
FOR
ELECTRICAL TRACING SYSTEM

Rev. No.	Date	Purpose	Prepared by	Checked by	Approved by
A	26-FEB-2026	ISSUED WITH TENDER	SK	RSR	RSR

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VENDOR DATA REQUIREMENTS

The following drawings/documents marked "✔" shall be furnished by the bidder.

ELECTRICAL SURFACE HEATING SYSTEM

S. NO.	DESCRIPTION	WITH BID	POST ORDER			REMARKS
			FOR REVIEW	FOR RECORD	WITH DATA BOOK (FINAL)	
1.	Schedule of Vendor Documents		✔			
2.	Confirmation of Technical Compliance	✔				
3.	Data Sheets (Duly filled-in)	✔	✔		✔	
4.	Dimensional Drawings : G.A. drawings of LDP		✔		✔	
5.	Dimensional Drawings : G.A. drawing of accessories			✔	✔	
6.	Dimensional Drawings : Cross-sectional view of surface heating cable			✔	✔	
7.	Dimensional Drawings : Cross-sectional view of accessories			✔	✔	
8.	Heat loss calculations		✔		✔	
9.	Electrical surface heating tape selection calculations		✔		✔	
10.	Power cable sizing, voltage drop calculations		✔		✔	
11.	Single line diagram(s) of LDP(s)		✔		✔	
12.	Circuit wise load list				✔	
13.	Block one line distribution diagram indicating each LDP, feeding source, LDP load & location, circuits	✔	✔		✔	
14.	Wiring diagrams : LDP wiring diagrams			✔	✔	
15.	Wiring diagrams : Inter connection drawings			✔	✔	
16.	Cable schedule			✔	✔	
17.	Cable, Lighting, Earthing & Equipment layouts of LDP rooms (if applicable) OR outdoor Kiosk layout		✔		✔	
18.	Cable layout of LDPs in plant/ Unit (if applicable)		✔		✔	
19.	Earthing layout of LDPs in plant/ Unit (if applicable)		✔		✔	
20.	Inspection & Test Plan (ITP) -For review by Inspection Dept.		✔		✔	*Refer Note-'*'*
21.	Type Test Certificate (For similar LDPs, Heat tracing Cables)	✔			✔	
22.	CPRI test, CCE/ DGMS/ DGFASLI approval certificates & BIS license for equipment for hazardous area application	✔			✔	
23.	List of Recommended Spares	✔			✔	

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S. NO.	DESCRIPTION	WITH BID	POST ORDER			REMARKS
			FOR REVIEW	FOR RECORD	WITH DATA BOOK (FINAL)	
24.	List of Commissioning Spares	✔		✔	✔	
25.	List of Mandatory Spares	✔	✔		✔	
26.	Field testing and commissioning proceedure		✔		✔	
27.	Data Books/ Manuals : Installation Manual				✔	
28.	Data Books/ Manuals : Operating/ Maintenance Manual				✔	
29.	Data Books/ Manuals : Catalogues/ Brochures	✔			✔	
30.	Equipment storage procedure at site				✔	

Notes :

1. "TICK" denotes applicability.
2. Post order, drawing / document review shall commence only after approval of Document Control Index (DCI).
3. All post order documents shall be submitted / approved through EIL eDMS portal.
4. Final documentation shall be submitted in hard copy (Six prints) and soft (two CDs/DVDs) in addition to submission through EIL eDMS.
5. Refer - 6-78-0001: Specification for quality management system from Bidders.
6. Refer - 6-78-0002: Specification for documentation requirements from Contractors.
7. Refer - 6-78-0003: Specification for documentation requirement from Suppliers.
8. All drawings & documents shall be submitted in A4 or A3 paper sizes. Documents in higher paper size shall be submitted in exceptional circumstances or as indicated in the MR/Tender.
9. Post order- The schedule of drawing / data submission shall be mutually agreed between EIL & the bidder / contractor / supplier during finalization of Document Control Index (DCI).
10. "@" indicates submission of documents to Inspection Agency.
11. Bill of Material shall form part of the respective drawing.
12. '*' indicates the following:

a. Equipments whose ITP is attached with Contract -ITP for respective equipment shall be followed. Therefore, no ITP is to be furnished for review for those equipments.

b. Equipments whose ITP is not attached with Contract-Manufacturer's ITP shall be submitted by Packager/ Vendor/Contractor to respective Regional Procurement Office (RPO) near to manufacturer's works for approval by EIL Inspection.

13. All technical details and documents furnished with bids shall be treated as data for engineering. These shall however be subject to Purchasers review after order placement and bidder shall comply to MR/Tender requirements without any cost & time implication to EIL/Owner.

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Project Overall Project Management as MPMC and PMC/EPCM Services for Ethylene Cracker Unit and U&O for BPREP **Client** BPCL

Unit Bulk Procurement **Location** **Job No.** B957 **Unit No.** 000

PURCHASER'S DATA

A.	**Site Conditions**		
1.	Maximum Ambient Temperature	°C	48
2.	Minimum Ambient Temperature	°C	1.1
3.	Design Ambient Temperature	°C	45
4.	Relative Humidity	%	86
5.	Altitude Above MSL	m	<1000
6.	Environment		Hot, humid & corrosive
B.	**HEATING AND PROCESS SYSTEM PARAMETERS (Refer else where in the tender document)**		
C.	**ELECTRICAL SYSTEM PARAMETERS**		
1.	Input volt.		415 V+/- ± 10%TPN
2.	Frequency		50 Hz +/- ± 5%
3.	System fault level		65kA,1sec with MCCB
4.	System earthing		Solidly Earthed
5.	Utilization voltage for heater tape		240 V+/- ± 10% % ,1 Phase
D.	**ELECTRICAL EQUIPMENT DATA**		
	Local Distribution Panels (LDP's)		
1.	Installation		Outdoor
2.	Enclosure		IP55, FLP, Pedestal mtd. Outdoor
3.	Painting		Shade 632 of IS-5
4.	Cable Entry		Bottom
5.	Incomer with rating		MCCB
	Metering, Protection , Indication, Alarm outfits		
1.	Ammeter with Sel. Switch		Yes
2.	Indicating lamps		Yes
3.	Voltmeter with Sel. Switch		Yes
4.	Auxillary tip contact (Applicable for MCCB feeder)		As applicable
	Optional accessories : (in each feeder)		
1.	Contactor (where switch rating of thermostat contact is inadequate		Yes
2.	Ammeter		Yes
3.	ON/OFF Indicating lamps		Yes
4.	Aux. Contactor (for power supply monitoring)		Yes
5.	Cable lugs & glands		Required
E.	**Cabling**		
1.	Power cables		Refer note
2.	Control cables		Refer note
3.	Method of laying		Overhead / Trench
4.	Type of tray		Hot dipped galvanised
1.0	**HEATER TAPE : (The particulars shall be furnished seperately for each type of heater tape offere**		
A.	Type		Catalogue no.
B.	Max. withstand temperature during any plant operation/ shutdown		°C
C.	T- Rating	°C	

Rev. No.	Date	Purpose	Prepared By	Reviewed By	Approved By
B	31-JAN-2025	ISSUED WITH MR	KANUGUTTA SUMITH	RASHMI SINGH RATHAUR	RASHMI SINGH RATHAUR
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Project Overall Project Management as MPMC and PMC/EPCM Services for Ethylene Cracker Unit and U&O for BPREP **Client** BPCL

Unit Bulk Procurement **Location** **Job No.** B957 **Unit No.** 000

D.	Thermal output at 240V AC	°C	
E.	Max. allowable circuit lenth	m	
F.	In rush current at 240 V	Amp, at start-up condition (for self regulating tapes only)	
G.	Voltage available at the end of allowable circuit length	V	
H.	Tolerance of heater output		

1.1 The following test/ approval certificates shall be furnished , alongwith filled in datasheet with the offer, for all electrical equipment to installed in hazardous area (including heat tracer tape and accessories). Relevant particulars shall be filled-up in the following table:-

Equipment	Heater tape	Thermostat	Junction box	Connectors	Glands	Ipd (FLP)	Others
Explosion protection class (as applicable)							
Type reference No. / Cat. No.							
Ref No. & date of CMRI/ other test certificates of recognised test authority							
Ref No. & date of CCE approval certificate							
Ref No. & date of DGFASLI approval certificate							
Ref No. & date of DGMS approval certificate							
BIS Licence No. & date							

1.2 Selection criteria for heat tracer tape:

Sr. No.	Type of Heat tracer tape and power rating	T-rating	Method of classification as per IEEE 515	
			Product classification approach	System approach
1				

1.3 LDP wise start-up load current (Considering switching at minimum ambient temperature)

S.No.	LDP Number	Start-up load current (Amperes)
1		

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Unit Bulk Procurement **Location** **Job No.** B957 **Unit No.** 000

2.0 Typical format for MTO for heater tape (to be filled in by contractor)

Sl. No.	Line NO.	Heat loss/ M (W/m)	Heater tape type	Heater tape output at & minimum ambient	Heater tape length per metre of pipe (m)	Quantities for heater tape for					
						Pipes (m)	Valves incl. mating flange	Flanges excluding valves	Strainers, etc	Support	Total heater tape (m)
1											

Eil Notes

1 4 core, XLPE insulated, FRLS type, armoured, Aluminium (for 25 sqmm & above) / copper (upto 16 sqmm)

2 2.5 sq.mm (minimum), XLPE insulated, FRLS type, armoured, copper, paired, individual and overall shielded

3 Irrespective of Area Classification (hazardous area/ safe area), all PDB/LDP shall be Flameproof type, suitable for Zone-2, Temperature Class-T3. Gas group suitability shall be IIC or IIA/IIB as per area classification layout.

4 Contacts of incomer auxiliary trip contact of MCCB and auxiliary contacts of contactor for each outgoing feeder shall be wired in series & a net alarm contact shall be made available in each PDB/LDP for remote wiring. Communication cable shall be laid by others for taking the monitoring signals from each PDB/LDP to control room. Necessary ports for MODBUS TCP/IP protocol, controllers etc. as required for taking signals to Control room from PDB/LDPs shall be in the scope of contractor as defined elsewhere in the MR/tender.

5 Each outgoing feeder of PDB/LDP shall have RCCB.

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Project	Overall Project Management as MPMC and PMC/EPCM Services for Ethylene Cracker Unit and U&O for BPREP		**Client**	BPCL	
Unit	Bulk Procurement	**Location**	**Job No.**	B957	**Unit No.** 000

PURCHASER'S DATA

A.	**Site Conditions**		
1.	Maximum Ambient Temperature	°C	48
2.	Minimum Ambient Temperature	°C	1.1
3.	Design Ambient Temperature	°C	45
4.	Relative Humidity	%	86
5.	Altitude Above MSL	mm	<1000
6.	Environment		Hot, humid & corrosive
B.	**Technical particulars**		
1.	System Voltage		
	Nominal		415 V
	Highest		500 V
	Voltage grade		650/1100V
2.	Frequency	Hz	50 +/- 5 %
3.	Conductor material		
	HV Power cable		Not Applicable
	MV Power cable		Copper & Aluminium
	MV control cable		Not Applicable
4.	Installation under DGMS jurisdiction (See Note)		No
5.	Applicable spec.		EIL spec 6-51-0051
6.	Insulation		XLPE
7.	PVC compound type		As per specification 6-51-0051
8.	Type of conductor		Stranded
9.	Conductor class		As per IS
10.	Types of cable		As per spec.
11.	Armour		
	Type		As per spec
	Size of armour		As per spec
12.	Type of drum		Steel

MANUFACTURER'S DATA

A.	**Technical particulars**		
1.	Name of manufacturer		
2.	MR/PR item no.		
3.	Cable type/ code		
4.	Conductor material		
5	Conductor semiconducting screen (HV cables)		
	Material		
	Thickness	mm	
6.	Insulation		
	Type of compound		
	Thickness	mm	
7.	Insulation semiconducting screen (HV cables)		
	Material		

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B	30-JAN-2025	ISSUED WITH MR	SONALI KANU	KANUGUTTA SUMITH	RASHMI SINGH RATHAUR
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Project Overall Project Management as MPMC and PMC/EPCM Services for Ethylene Cracker Unit and U&O for BPREP

Client BPCL

Unit Bulk Procurement **Location** **Job No.** B957 **Unit No.** 000

	Thickness	mm	
8.	Copper tape		
	Thickness	mm	
9.	Inner sheath		
	Type of compound		
	Thickness	mm	
10.	Nominal dia under armour	mm	
11.	Calculated dia under armour	mm	
12.	Armour		
	Material		
	Type		
	Size		
13.	Nominal dia under outersheath	mm	
14.	Calculated dia under outersheath	mm	
15.	Outersheath		
	Type of compound		
	Thickness	mm	
16.	Nominal outer dia of cable	mm	
17.	Tolerance on outer dia	%	
18.	Weight of cable per km	kg	
19.	Maximum drum length	mtr.	
20.	Maximum DC resistance of conductor at 20 °C		
21.	AC resistance at 90 °C		
22.	Reactance of cable at 50 Hz		
23.	Capacitance of cable		
24.	Zero sequence impedance of cable		
25.	Capacitive charging current per km		

Notes

1

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B	30-JAN-2025	ISSUED WITH MR	SONALI KANU	KANUGUTTA SUMITH	RASHMI SINGH RATHAUR
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इंजीनियर्स इंडिया लिमिटेड ENGINEERS INDIA LIMITED (A Govt. of India Undertaking)

COMMUNICATION & FIRE ALARM CABLES DATA SHEET

Document No. B957-000-16-50-DS-5201
Rev. No. A

Project	Overall Project Management as MPMC and PMC/EPCM Services for Ethylene Cracker Unit and U&O for BPREP		**Client**	BPCL	
Unit	Common	**Location**	**Job No.**	B957	**Unit No.** 000

PURCHASER'S DATA

A.	**Site Conditions**		
1.	Maximum Ambient Temperature	°C	48
2.	Minimum Ambient Temperature	°C	1.1
3.	Design Ambient Temperature	°C	45
4.	Relative Humidity	%	86
5.	Altitude Above MSL	m	<1000
6.	Environment		Hot, humid & corrosive
B.	**Technical particulars**		
1.	Cable Type/Code		control & fire alarm cables
2.	Embossing Details		Sequential marking/Metre
3.	Details of Color Coding		Refer 6-51-0052
4.	Details of Pairing		Refer 6-51-0052
5.	Standard Drum Length		Refer Specification

MANUFACTURER'S DATA

A.	**Twisted Pair Unshielded Cables**		
1.	Name of Manufacturer		
2.	Material Specifications		
	Conductor dia.	mm	
	Insulation Thickness	mm	
	Inner Sheath Thickness	mm	
	Outer Sheath Thickness	mm	
3.	Performance Data		
	Rated Voltage	V	
	Max. Resistance at 20°C	ohms	
	Max. Core-Core Capacitance	nF	
	Max. Inductance	mH	
	Nominal Impedance	ohms	
4.	Technical Particulars		
	Approx. overall diameter	mm	
	Approx. dia. over armour	mm	
	Approx. dia. under armour	mm	
	Armour Galvanised Steel wire thickness		
	Minimum outer sheath thickness	mm	
B.	**Twisted Pair Shielded Cables**		
1.	Name of Manufacturer		
2.	Material Specifications		
	Conductor dia.	mm	
	Insulation Thickness	mm	
	Inner Sheath Thickness	mm	
	Outer Sheath Thickness	mm	
3.	Performance Data		
	Rated Voltage	V	
	Max. Resistance at 20°C	ohms	
	Max. Core-Core Capacitance	nF	

Rev. No.	Date	Purpose	Prepared By	Reviewed By	Approved By
A	17-OCT-2024	ISSUED WITH MR	KANUGUTTA SUMITH	RASHMI SINGH RATHAUR	RASHMI SINGH RATHAUR

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Project Overall Project Management as MPMC and PMC/EPCM Services for Ethylene Cracker Unit and U&O for BPREP **Client** BPCL

Unit Common **Location** **Job No.** B957 **Unit No.** 000

	Max. Core-Screen Capacitance	nF	
	Maximum Inductance	mH	
	Nominal Impedance	ohms	
4.	Shielding Data		
	Material of Shielding		
	Minimum Thickness	mm	
	Coverage and Overlap		
5.	Drain Wire for Overall Sheath		
	Drain Wire Material		
	Area of Cross Section	mm sq	
	No. of Strands		
	Diameter	mm	
6.	Technical Particulars		
	Conductor Size	mm sq	
	Approx. overall diameter	mm	
	Approx. dia. over armour	mm	
	Approx. dia. under armour	mm	
	Armour Galvanised Steel wire thickness		
	Minimum outer sheath thickness	mm	

Eil Notes

Rev. No.	Date	Purpose	Prepared By	Reviewed By	Approved By
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B957-300-16-50-01012

PLANT NORTH
TRUE NORTH
26°37'30"
PREVAILING WIND DIRECTION

BATTERY LIMIT FLARE / ETHYLENE

N 50477.000

HS-01 HS-02 HS-03 HS-04 HS-05 HS-06

MAIN PIPE RACK

DEFERRED ROG (180M X 60M)

SRR-101 (54M X 33M)
SRR-102 (54M X 33M)
SIS-101 (104M X 34M)
SIS-102 (98M X 34M)

BPR-1 BPR-2 BPR-3 BPR-4 BPR-5 BPR-6 BPR-7 BPR-7A BPR-8 BPR-6A

TS-1 TS-2 TS-3 TS-4 TS-5 TS-6 TS-7 TS-8 TS-10 TS-11 TS-12 TS-13 TS-14 TS-15 TS-16 TS-17

HYDROGEN PSA UNIT
DRYER & REACTOR HEATER
DEMETHANIZER
COLD BOX
PGH 1ST STAGE
PGH 2ND STAGE
GASOLINE FRACTIONATOR
QUENCH TOWER
DECOKING AIR-COMPRESSOR
STEAM DRUM BLOWDOWN SYSTEM
STEAM CKING SYSTEM
ACETYLENE CONVERTER
MAPD
CGC
PRC

BATTERY LIMIT PIPINGS OTHER THAN FLARE/CW & INSTRUMENTATION

BATTERY LIMIT ELECTRICAL

FOR CONTINUATION, REFER OVERALL CABLE LAYOUT

ACCESS WAY

E 47256.75

N 50137.000

HOLD:–

1. BILL OF MATERIAL

LEGEND:–

- 300mm WIDE CABLE TRAYS
- 750mm WIDE CABLE TRAYS
- RCC TRENCH SIZE AS INDICATED
- FLP TYPE 63A, 415V WELDING RECEPTACLE Ex-d(IIA/IIB) T3
- FLP PUSH BUTTON STATION Ex-d(IIA/IIB) T3
- 100 DIA GI PIPE

REF. DWG. NO.	REFERENCE DRAWING TITLE
B957-300-16-43-00001, R-0	EQUIPMENT LAYOUT ECU UNIT
B957-300-16-43-00002, R-0	EQUIPMENT LAYOUT ECU UNIT
B957-300-16-50-01013, R-0	CABLE LAYOUT ECU UNIT
6-51-0082	EIL ELECTRICAL SPECIFICATIONS
7-51-0303, 0306, 0307, 0314	EIL ELECTRICAL STANDARD
7-51-0315, 0323	EIL ELECTRICAL STANDARD

NOTES:–

1. ALL DIMENSIONS ARE IN MM UNLESS OTHERWISE STATED.
2. FOR GENERAL NOTES OF CABLING REFER DRG. NO. B957-999-16-50-4100.
3. EIL INSTALLATION SPECIFICATIONS & STANDARDS MENTIONED IN THE REFERENCE OF THIS DRAWING SHALL BE REFERRED WITH THIS DRAWING BEFORE STARTING THE WORK.
4. ALL CABLE TRENCHES INSIDE UNIT BATTERY LIMIT SHALL BE FILLED WITH SAND AFTER LAYING OF CABLES TO AVOID ANY INGRESS OF HAZARDOUS GASES.
5. REFER STRUCTURAL DRAWINGS FOR EXACT LOCATION/ ELEVATION OF ELECT. CABLE TRAY SUPPORTS.
6. FOR LOCATION OF LIGHTING/ DMG. LIGHTING/ POWER PANELS REFER LIGHTING LAYOUT DWG. NO. B957-300-16-50-02013/ 02014/ 2015.
7. FOR CABLES/ TRAY FROM OVERHEAD CABLE TRAYS UP TO MOTORS REFER EIL ELECT. STD. NO. 7-51-0323.
8. UNLESS NOTED OTHERWISE ALL CABLE TRAYS SHALL BE 750mm WIDE.
9. FOR CABLE LAYOUT OF SUB STATION, SRR, COMP. SHED & VENDOR PACKAGES, REFER CABLE LAYOUT OF RESPECTIVE BUILDING/ SHED & VENDOR PACKAGES.
10. CABLE TRENCH SHOWN PRESENTLY MAY BE CONVERTED TO OVERHEAD CABLE TRAY IN FUTURE, IF ANY OVER HEAD STRUCTURE AVAILABLE.

BILL OF MATERIAL
(BY COMPOSITE WORKS CONTRACTOR)
(TENDER NO.- B957-********)**
(SOR NO.- B957-********)**

TENDER ITEM NO.	DESCRIPTION	UNIT	QTY.
01(E.3050.10.60 TO 64) 02(E.3050.10.60 TO 64)	INSTALLATION OF FLP TYPE 63A, 415V SOCKETS	NOS.	00
01(E.3040.20.350	STRUCTURAL STEEL	KGS.	00
01(E.3040.20.510	150 MM WIDE SLOTTED CHANNEL CABLE TRAY	MTR.	00
01(E.3040.20.210	300 MM WIDE CABLE TRAY	MTR.	00
01(E.3040.20.220	750 MM WIDE CABLE TRAY	MTR.	00
01(E.3040.20.240	HORIZONTAL BEND-300 MM	NOS.	00
01(E.3040.20.450	HORIZONTAL BEND-750 MM	NOS.	00
01(E.3040.20.460	VERTICAL BEND OUTSIDE -300MM	NOS.	00
01(E.3040.20.470	VERTICAL BEND OUTSIDE -750MM	NOS.	00
01(E.3040.20.580	VERTICAL BEND INSIDE -300MM	NOS.	00
01(E.3050.10.20	VERTICAL BEND INSIDE -750MM	NOS.	00
01(E.3050.10.60	50# GI SLEEVE	MTR.	00
01(E.3070.10.20	100# GI SLEEVE	MTR.	00
01(E.3070.10.40	150# GI SLEEVE	MTR.	00
01(E.3070.10.60	FINE RIVER SAND	CUM.	00
01(E.3070.20.20	BRICK	SQM.	00

BILL OF MATERIAL
(BY CIVIL STRL. & UG PIPING -1 ECU)
(TENDER NO.- B957-300-81-41-CI-T-8121-0)
(SOR NO.- B957-300-16-50-CI-SOR-8121-0)

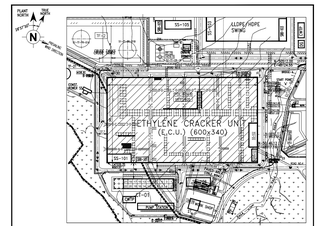
TENDER ITEM NO.	DESCRIPTION	UNIT	QTY.
01(E.2070.10.20	50# GI SLEEVE	MTR.	00
01(E.2070.10.50	100# GI SLEEVE	MTR.	00
01(E.2070.10.70	150# GI SLEEVE	MTR.	00

BILL OF MATERIAL
(BY ECU - CIVIL STRL. & UG PIPING -2)
(TENDER NO.- B957-300-81-41-CI-T-8122-0)
(SOR NO.- B957-300-16-50-CI-SOR-8122-0)

TENDER ITEM NO.	DESCRIPTION	UNIT	QTY.
01(E.2070.10.20	50# GI SLEEVE	MTR.	00
01(E.2070.10.50	100# GI SLEEVE	MTR.	00
01(E.2070.10.70	150# GI SLEEVE	MTR.	00

BILL OF MATERIAL
(BY ECU - CIVIL STRL. & UG PIPING -3)
(TENDER NO.- B957-300-81-41-CI-T-8123-0)
(SOR NO.- B957-300-16-50-CI-SOR-8123-0)

TENDER ITEM NO.	DESCRIPTION	UNIT	QTY.
01(E.2070.10.20	50# GI SLEEVE	MTR.	00
01(E.2070.10.50	100# GI SLEEVE	MTR.	00
01(E.2070.10.70	150# GI SLEEVE	MTR.	00



KEY-PLAN

PLOT SIZE-600Mx340M		
UNIT DESCRIPTION	CAPACITY	LICENSOR
ECU	1200 KTPA	LUMMUS

REV.	DATE	DESCRIPTION	BY	CHKD	APPD	PEM
A	30/08/2025	ISSUED FOR COMMENTS	SKC	SK	RSR	

इंजीनियर्स इंडिया लिमिटेड ENGINEERS INDIA LIMITED (A Govt. of India Undertaking)

भारत पेट्रोलियम कॉर्पोरेशन लिमिटेड
BHARAT PETROLEUM CORPORATION LTD.

बीना पेट्रोरसायनिकल एवं रिफाइनरी विस्तार परियोजना (बी.पी.आर.ई.पी.) बीना, मध्य प्रदेश

BINA PETROCHEMICAL AND REFINERY EXPANSION PROJECT (B.P.R.E.P.) BINA, MADHYA PRADESH

केबल अरेंजमेंट
इथिलीन क्रैकर यूनिट

CABLE LAYOUT
ETHYLENE CRACKER UNIT
(SHEET OF SHEET)

SCALE	JOB NO.	UNIT	DIVN.	DEPT.	DWG. NO.	REV.
1:700	B957	300	16	50	01012	A

3-1641-0500 REV.5 / 06.12.2024 A0-1189 x 841

DWG.NO.

प्रस्तुत आरेख एवं इसमें दिया गया डिजाइन, इंजीनियर्स इंडिया लिमिटेड की संपत्ति है। ये मात्र उधार दिए गए हैं और उपभोक्ता से यह अपेक्षा की जाती है कि वह इसे गोपनीय रखेगा और यह इसका उपयोग केवल उस उद्देश्य के लिए करेगा जिसके लिए इसे उधार दिया गया है। इसे पुनरुत्पादित किया जाएगा और न ही यह उधार देने वाले द्वारा आपत्ति को लिखित रूप में दी गई अनुमति के बिना प्रयोग किए जाएंगे, न प्रकाशित किए जाएंगे और न ही सौंपे और किसी प्रयोग के अलावा इसका इस्तेमाल किया जाएगा।

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SCOPE OF WORK & JOB SPECIFICATION (ELECTRICAL)

ELECTRICAL HEAT TRACING SYSTEM

PROJECT : **OVERALL PROJECT MANAGEMENT AS MPMC AND PMC/EPCM SERVICES FOR ETHYLENE CRACKER UNIT AND U&O FOR BPREP**

CLIENT : M/s BPCL-BINA REFINERY

CONSULTANT : ENGINEERS INDIA LIMITED

JOB NO. : B957

Rev. No.	Date	Purpose	Prepared by	Checked by	Approved by
B	22.04.2026	REVISED AND RE-ISSUED WITH TENDER	SKANU	SK	RSR
A	26.02.2026	ISSUED WITH TENDER	SK	RSR	RSR

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1. INTRODUCTION

1.1 The intent of this specification is to define the requirements for the supply of equipment and materials, installation, testing and commissioning of Electrical Heat Tracing system of BPREP Project of M/s BPCL.

1.2 The work shall be carried out in the best workmanship-like manner, in conformity with these specifications, approved drawings and the instructions of the Owner and Engineer-in-Charge.

1.3 The contract scope shall include clearing of temporary constructions, waste materials and loose earth, which might get collected in and nearby the work site consequent to the execution of work under this contract.

2. SPECIFICATIONS & STANDARDS

2.1 The work shall be carried out in conformity with attached EIL specifications and standards.

2.2 In case of any contradiction between various referred standards/ specifications / data sheets/ documents and statutory regulations, most stringent shall govern. Owner's decision in this regard shall be binding & final. It is Contractor's responsibility to bring the same to the notification of EIL.

3. SITE CONDITIONS

The equipment offered and the installation shall be suitable for continuous operation under the following site conditions:

Ambient temp	:	Max. 48ºC, Min. 1.1ºC
Minimum temp. for Heat Tracers	:	1.1ºC
Applicable temp. for Heat Tracers	:	Maintenance temp, operating temp, design temp, exposure temp as per line List/ equipment list attached elsewhere
Design temperature for Other Electrical equipment	:	45ºC
Max relative humidity	:	86%
Altitude	:	Less than 1000m above MSL
Atmosphere	:	Humid & highly corrosive as found in Refineries & Petrochemical Plants

4. SYSTEM CONDITIONS

4.1 415V, 50Hz TPN power supply feeders of adequate rating shall be available in the Owner's switchboard in the Owner's substation for feeding heat tracing system flameproof Power distribution boards (PDBs) / flameproof Load distribution panels (LDPs).

Complete power distribution from owner's substation to 415V PDB / LDP onward including power cables, control cables, heat tracers/ tape, JBs, RTDs, Multi circuit temperature controller, cabling, termination, earthing, FO/CAT-6 cable, necessary connectors etc. is included in Contractor's scope and shall be included in SOR items. Temperature controller provided in LDP shall be connected with central monitoring system (to be located in SRR) through FO/CAT-6 cable for monitoring purpose.

Exact power distribution scheme from substation/ feeders onwards shall be finalized By Contractor in consultation with Owner/EIL during detail engineering based on actual heat tracing load and location of heat tracing PDBs/ LDPs & Owners substation.

4.2 Bidder shall furnish load requirements, details, quantity and rating of LDP and PDB required for feeding the electric heat tracers in the bid. Bidder shall also indicate in the offer, rating & quantity of the owner's feeder(s) required for feeding the offered heat tracing system.

4.3 Bidder shall supply, install & terminate all power & control cables from owner's substation to respective distribution boards (PDBs/ LDPs) and from distribution boards to the user points as per attached cable routing drawing no. B957-300-16-50-01013. Contractor shall use the owner's cable route wherever available;

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wherever owner's cable route is not available, complete cabling system including trench, cable trays etc. shall be in the scope of the Bidder.

4.4 Bidder shall provide necessary outdoor located flameproof Power Distribution Boards (PDBs) and flameproof, Ex'd' type Load Distribution Panels (LDPs) for receiving & distributing power for the system.

4.5 Bidder shall supply & lay the cables between the owner's substation and PDB/ LDP, between PDB & LDP, and between the LDPs & heat tracing loads. Contractor shall also supply & lay the communication cables between controllers in LDP to central monitoring system in SRR.

The cable route shall be decided during detail Engineering based on the number and location of the Heat tracing panels. Any additional cable tray/ buried trench required for routing the Heat tracing / power cables / control cables/ FO/ CAT-6 cables shall be in the scope of the bidder. Refer Cable layout attached with the tender. It may be noted that this layout is for only estimation purpose any change in the cable route due to site constraint shall be taken care by Contractor without any time and cost implication to owner

5. AREA CLASSIFICATION

5.1 The plant area has mixed areas i.e., Safe Areas, Zone 1 & 2, Gas group IIA/IIB/IIC temperature class T3 areas, as shown in the area classification drawing attached elsewhere in the tender. All equipment, heat tracer and associated accessories/ components, LDPs, PDBs etc. related to electric heat tracing shall be suitable for minimum Zone-2, Gas Group IIA/IIB, Temp. Class T3 for areas indicated as Gas Group IIA/IIB in the area classification drawing. For areas which is indicated as Gas Group IIC (in the area classification layout), the complete heat tracing system shall be suitable for minimum Zone-2, Gas Group IIC, Temp. Class T3.

5.2 All equipment, heat tracer and associated accessories/ components, LDPs, PDBs etc. related to electric heat tracing shall be suitable for minimum Zone-2, Gas Group IIA/IIB/IIC, Temp. Class T3. Exact classification, gas group shall be as defined elsewhere.

5.3 The Power distribution boards (PDBs) / Load distribution panels (LDPs) shall be located at a suitable location as per site conditions and as per directions of engineer-in-charge/ EIL.

5.4 The Power distribution boards (PDBs) & Load distribution panels (LDPs) shall be flameproof type suitable for Zone-2, Temp class T3 irrespective of the area classification layout attached. PDBs & LDPs shall be suitable for Gas Group IIA/IIB or IIC as per area classification layout attached with tender.

5.5 The hazardous area equipment shall have test certificates issued by recognized independent test house (CIMFR/BASEEFA/LCIE/UL/FM or equivalent). All indigenous equipment shall conform to Indian standards and shall be certified by Indian testing agencies. All equipment (indigenous & imported) shall also have valid statutory approvals (CCOE/PESO). All indigenous flameproof equipment shall have valid BIS license and marking as required by statutory authorities.

6. ENGINEERING AND JOB SPECIFIC REQUIREMENTS

6.1 Various equipment (to be supplied by Contractor) covered in this Package, shall be in compliance with the requirements defined in equipment datasheets and specifications attached/referred. Besides these, the requirements as defined in respective clauses for individual equipment, referred elsewhere in this document shall also be considered/ complied with.

6.2 Contractor shall ensure that all electrical equipment shall comply with the site and system conditions, ratings and other technical requirement specified elsewhere with the documents attached with the package.

6.3 CONTRACTOR shall use this specification, datasheet and OWNER/ Consultant's standard specifications for various equipment. For equipment, where OWNER/Consultant standard specifications are not available, have not been attached, CONTRACTOR shall use their own specification, developed based on project specific requirement and good engineering practices prevalent in petroleum industry, so as to ensure satisfactory operation and maintenance conditions.

6.4 CONTRACTOR shall note that data sheets for some of the equipment are not enclosed separately. Equipment data sheets for such equipment shall be prepared by the CONTRACTOR based on relevant codes and specifications and the data sheet shall contain all technical data and information which is essential for the purpose of review and technical acceptability, detailed engineering, installation, testing, repair and maintenance, replacement, etc. of the equipment.

6.5 All equipment shall be subjected to routine and acceptance tests as per applicable specifications

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6.6 **Scope of Engineering:**

i) Heat loss calculations & tracer selection

ii) Voltage drop calculations and sizing of all power and control cables

iii) Finalization of optimizing location of PDBs and LDPs considering Owner's substation & heat tracing loads.

iv) Calculations of no. of circuits and length of tracers required

v) Preparation of electrical single line diagram showing distribution and circuit-wise load details

vi) Scheme for connecting the controllers in LDPs to central monitoring system (by others)

vii) Preparation of cable schedules, earthing schedules of equipment

viii) Preparation of cable tray/ trench layout drawing

ix) Preparation of bill of materials for heat tracing, earthing and cabling.

x) Location of PDBs & LDPs in the unit battery limit

xi) Any other document for completion of heat tracing system

7. EQUIPMENT SIZING AND SELECTION CRITERIA

7.1 ELECTRICAL DESIGN BASIS

Details indicated in this specification and attached Engineering design basis, standard specification shall form the basis for basic design and developing detailed design and engineering for electrical heat tracing system.

7.2 EQUIPMENT SIZING

i) The fault level for various voltage levels of Electrical system for this complex shall be limited and provided as under. Accordingly, the associated electrical equipment shall be selected suitable for same: 50 kA (RMS) (1sec.) for 415V

8. SCOPE OF WORK

Bidder's scope shall include design, engineering, supply, installation, testing & commissioning of the complete electrical heat tracing system inclusive of trace heaters with all accessories e.g., End connectors, T-Connectors, Thermostats, splice connectors & junction boxes etc. as per EIL specification 6-51-0095 for pipelines / flanges / valves /instruments / impulse lines, supports, etc., as per the list of lines, list of equipment & other documents attached elsewhere in the MR. For the maintenance temperature, operating temperature, design temperature, steam flush out temperature, insulation thickness and other technical particulars required for the heat tracing design calculations, refer other documents enclosed elsewhere in the package.

- Design & engineering of the complete electric heat tracing system described in this document and package shall be done by "Heat Tracers" vendor.
- Supervision of installation, testing & commissioning of the complete electric heat tracing system shall be done by "Heat Tracers" vendor.

8.1 Scope of Supply

Bidder shall supply all items / equipment required for completion of work except those specifically mentioned in Cl. 8.4 below. The equipment and materials in Bidder's scope shall include but not be limited to the following:

i) Required quantity & rating of Outdoor flameproof & weatherproof Power distribution boards (PDB)/Load distribution panels (LDPs) with adequate no. of outgoing circuits for receiving 415V TPN incoming & distributing power to the electrical heat tracing system.

ii) Trace Heaters with all accessories e.g. End Connectors, T-Connectors, power connector, RTD, Multiple circuit temperature controllers, Junction boxes etc.

iii) Central monitoring system with server, HMI at SRR. All hardware including interconnecting cables along with furniture for HMI shall be in scope of the contractor.

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iv) Based on location of LDPs and SRR, complete communication cables (FO/ Cat-6 cable), HDPE duct, connectors, end terminations kits and cabling system etc.

v) 1.1 kV Cu/Al conductor, XLPE insulated, FRLS Power & Control Cables from Substation to PDB/ LDP, PDB to LDP and from LDP to the user points as required. Control cables shall be XLPE insulated, twisted pair individual & overall shielded type, with 2.5mm2 copper conductor.

vi) Double compression Nickel plated brass cable glands & crimp type heavy duty tinned copper lugs.

vii) Flameproof & weatherproof Junction box for heat tracing system, as required.

viii) Cable trays (on pipe racks/ sleepers where customer cable routes are not available) and tray covers including cable tray supports/foundations and RCC cable trenches/ trenching work (wherever required.

ix) Cable identification tags, GI saddles, saddle bars and associated accessories.

x) Complete materials for earthing such as GI earthing strip, wire ropes & earth plates etc.

xi) GI pipes, structural steel, MS frames, supports, canopies, brackets, anchor fasteners etc.

xii) Any other material (not covered under Owner's supply at Cl.8.5) and though not specifically mentioned above but required for completion of the work as per specifications, drawings and instruction of Engineer-in-charge.

8.2 **Installation Testing & Commissioning**

Installation, connection, testing and commissioning of all equipment and materials connected with Heat Tracing system supplied by Bidder and free issued by Owner are included in the scope of this package.

8.3 **Other Miscellaneous works**

Other Miscellaneous works in Bidder's scope includes the following:

i) Repairing of all civil works damaged during installation of electrical facilities and civil works connected with installation, testing & commissioning of the heat tracing system.

ii) Scope of work under this contract shall be inclusive of civil works necessary for the installation of equipment, materials and making good of the same after completion of work including foundation for outdoor located PDB/LDPs etc.

iii) Obtaining clearance for energizing the complete electrical facilities covered under this tender and approval of installation / drawings from Central Electricity Authority.

iv) Supply and installation of all other accessories including structural works not specifically mentioned herein but nevertheless necessary for completion of job.

v) Engineering and preparation of specifications and drawings for electrical equipment and installation required by the owner for approval.

vi) Preparation of field testing & commissioning procedure as required.

vii) The scope shall also include handling, transportation of equipment/ material from stores/ warehouse to the place of installation and supply of commissioning spares wherever required.

8.4 Co-ordination with other contractors/agencies

It is the responsibility of the contractor to co-ordinate & provide all necessary assistance to other contractors/agencies involved in the complex for proper & timely execution of the works

8.5 **Supply by Owner**

The following items shall be in owner's scope of supply (Free Issue):

i) 415V feeders in Owner’s substation.

ii) Owner’s Cable trays in S/S, trays & RCC trenches as shown in cable layout drawings

iii) Plant main earthing grid as shown in earthing drawings

9. SPECIAL REQUIREMENTS

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9.1 The equipment & system shall confirm to the attached EIL specifications & standards with modifications as per this specification.

9.2 The Heat tracing system shall also confirm to following Indian Standards & IEC.

IEC/IEEE 60079-30-1&2: : Explosive atmospheres - Electrical resistance trace heating

Part-1: General & testing requirements

Part-2: Application guide for design, installation and maintenance

9.3 The location, routing & details of lines/equipment/ instrument impulse line etc. to be electrically heat traced shall be as per other documents as attached elsewhere in the tender.

9.4 The maintenance temperature for electrically traced lines/ equipment shall be as indicated in other documents i.e., line list/equipment list attached elsewhere in tender. Ambient temperature as per site conditions mentioned above shall be considered for heat loss calculation & selection/ sizing of heat tracer.

9.5 The electrical heat tracers shall be low watt density, “Self-Limiting Self Regulating” type conforming to BS-6351. Mineral insulated (MI) cables shall only be used if the required temperatures are beyond the capabilities of Self-regulating heaters, and shall only be used with the approval of the Owner/EIL.

9.6 The selection of electrical heat tracers and approach classification shall be as per EIL Standard Specification (6-51-0095). Double insulation technique as mentioned in Sr. no. 3.1.2 (f) of Specification 6-51-0095 shall not be utilized for any case.

9.7 Heat loss calculation, tracer selection calculations, design and engineering of the electrical heat tracing system shall be carried out by selected heat tracer supplier Parent / Indian subsidiary.

9.8 Special glands/precautions shall be taken for sealing the entry portions of heat tracer cables as per the tracer manufacturer recommendation.

9.9 PDBs / LDPs shall be installed outdoor unit area.

9.10 PDB / LDP shall be provided for receiving power from substation & distributing power to the User Points. The PDB shall have 1 no. TPN MCCB as Incomers and required no. of TPN outgoing MCCBs. The MCCB shall be complete with O/L, S/C & E/F protection. The LDP shall have 1 no. TPN MCCB (Short circuit, over load, earth fault releases) as incomer and DP MCB with RCCB and power contactor in the outgoing feeders. 3 Nos. ON type LED indicating lamps shall be provided for incomer & each outgoing feeder of the PDB / LDP.

All MCCBs shall be microprocessor based and shall be with shunt trip. Shunt trip shall be suitable for 240V AC. LOTO Facility shall be provided in PDB/LDP.

9.11 The PDB/ LDP shall have voltmeter & ammeter with selector switches at incomer.

9.12 The flameproof PDB shall generally confirm to EIL spec 6-51-0007 and the flameproof LDP shall generally confirm to EIL spec 6-51-0008.

9.13 The incoming cable size for PDBs / LDPs shall be worked out by Bidder and shall be subjected to review by owner/ EIL during detail engineering. The PDBs / LDPs shall be suitable for terminating finalized cable size. In case JBs are required for terminating of incoming cables, the same shall be provided along with the PDBs / LDPs by Bidder without any time and cost implication to owner.

9.14 All outdoor equipment including PDB / LDPs shall be provided with FRP canopy.

9.15 Joints shall not be provided in power & control cables.

9.16 All power cables up to 16 mm^2 shall have copper conductor and all cables equal to or above 25 mm^2 shall be with either Copper or Aluminum conductor. All control cables shall be of size 2.5 sq.mm. and shall have copper conductor and shall be twisted pair overall and individual shielded type. Multi stranded cable to be used instead of single strand. Recommended limiting size of multi core cable is 300 sq mm.

9.17 RTD input is required for control and monitoring purpose of Electrical Heat Tracing system.

9.18 Multi circuit temperature controllers (provided in LDP) shall have facility to connect required numbers of RTDs which shall be connected to Central monitoring system (supplied by others). Temperature controller shall have below monitoring and alarm facility as a minimum: -

i) Low Temperature Alarm

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ii) High temperature Alarm

iii) Circuit on / off indication

iv) RTD or Sensor failure alarm

v) Ground fault alarm

vi) Current and temperature values

vii) Communications failure alarm

viii) Self-diagnostic feature (watchdog)

ix) Shall have communication capability through FO cable/Modbus TCP/IP

These are in addition to monitoring & alarm facility included in standard specification 6-51-0095.

9.19 Controllers shall be of selected Heat Tracer manufacturer make and sourced from the manufacturer country of origin. Controllers shall be connected preferably in ring topology to central monitoring system with server through FO/CAT-6 cable. All data available in LDPs shall be available at central monitoring system.

9.20 The HMI and servers shall be industrial type and supplied with latest configuration & latest version of Microsoft windows and all software provided shall be suitable for the same. Servers shall be capable for storage of more than 1 year data of all connected LDPs including 20% margin capacity.

9.21 HMI shall have provision for communicating all data to owner DCS on Modbus TCP/IP through FO cable.

9.22 Data mapping format for integration of complete data of central monitory system/ HMI with owner's DCS shall be provided to Heat Tracing Contractor post order and completely filled data mapping format shall be furnished by heat tracing Contractor detailed engineering. Any assistance and co-ordination with DCS Contractor/ other Bidder shall be provided by heat tracing Contractor.

9.23 FIBRE OPTIC CABLES

i) The fibre-optic cable shall be with a minimum of 2 spare fibres. Procedure of data transmission, error control and recovery shall be as per acceptable standards.

ii) All lengths shall be joint free single continuous lengths. Coating and the color of the fibre shall not react with the surrounding jelly. Outer sheath shall be flame retardant low smoke (FRLS) type of "Grey" colour.

iii) Fibre-optic data highway cable shall be suitable for water-submergence duty and high temperature withstand as per the routing requirements in the plant. All lengths shall be joint-free continuous lengths.

iv) Optical fibres shall be coated with UV cured double acrylate resin. It should not have any reaction with cladding or core material.

v) The coatings shall be in various colours in order to facilitate fibre identification. Fibre colours shall correspond to latest revision of IEC publication 60793-2 and 60304. The colours shall correspond reasonably with standard colours and shall readily be identifiable and shall be durable. The colours should have good colour fast properties also in the presence of other materials during the lifetime of cable. The coating and the colour shall not react with the surrounding jelly.

vi) The fibre optic cable shall be protected against damages from termite, rodent, fire, chemicals (such as oil & natural gas, LPG and other petroleum products), moisture and water over the life time of the cable.

vii) Moisture barrier – Polymer coated aluminium tape placed longitudinally over the cable core. The tape shall form a close fit around the cable core with a sealed overlap of 6mm minimum. The thickness of each polymer layer shall be 0.04 mm minimum. The thickness of fully annealed aluminium foil shall be 0.15 mm minimum.

viii) The armouring of the optical fibre cable shall be of corrugated steel (electrolytically chrome plated low carbon steel) tape both side coated with ethylene acrylic copolymer, applied longitudinally with minimum overlap of 6mm. The thickness of the steel tape shall be 0.15 mm minimum. The thickness of each polymer layer shall be minimum 0.04 mm minimum.

ix) The cable shall have sufficient strength to withstand a load of value T = 9.81×W newtons, where W = mass of 1 km in kg. The load shall not produce total strain exceeding 0.25% in the fibre.

x) The termination enclosures of the optical fibre cable should be dust tight (No dust ingress) and protected against immersion in water (suitable for continuous immersion in water) and should be complete with all

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accessories including splice cassettes splice protection and all other accessories including accessories for electrical continuity of metallic layers of optical fibre cable and OFC preparation kit along with instruction sheet.

xi) All fibres (including spare fibres) of a cable shall be terminated in the termination enclosure by pigtails. Subsequent connection shall be by patch chords. Supply and erection of termination enclosure, LIU, splices, pigtail, patch chord connection etc. is in vendor's scope. OTDR analysis/report shall form part of the testing activities of the OFC network.

xii) HDPE duct of "Grey colour" shall be supplied for fibre optic cable routing, shall be permanently solid lubricated/ with spiral groove, UV-protected, fire retardant (Class V2 as per UL-94 and with limited oxygen index of 21 or higher as per ASTM D2863), of 40 mm outer diameter (+5.0/-0.0 mm) minimum thickness 3.7 mm, suitable to withstand load of 6 kg/m2.

xiii) All HDPE ducts shall be supplied along with accessories such as push fit coupler, bend and elbow, end plug, simple plug, sonic head, etc. required for blowing cable into HDPE duct by compressed air technology.

xiv) Vendor shall furnish past track record for the selected make of the HDPE duct during drawing review stage. Make of HDPE duct shall be approved by Owner during drawing approval stage

9.24 Testing of cables & FLP Junction boxes shall be as per attached EIL Inspection Test plan 6- 81-1051, 6-81-1052 & 6-81-1061 respectively.

9.25 Supports for cable trays shall be provided at every 3000mm.

9.26 RCCB with 30mA rating shall be provided in outgoing single-phase circuits for human safety. Earth fault protection shall be provided in outgoing three phase circuits in PDB.

9.27 All TPN power cables for Electrical heat tracing loads shall be 4-Core of suitable size. 3 ½ core cable for TPN loads are not acceptable.

9.28 Refer clause 3.1.2 (g) of 6-510095, table for heat tracer selection stands revised as below:

Maintenance temperature	**Operating (Continuous power ON)**	**Exposure/ Intermittent Power OFF**	**Tracer type**	**Approach (Product/ system)**
<=121	<=121	<=250	Self-Regulating	Product
From 121 to 150	From 121 to 150	<=250	Self-Regulating	Product/Stabilised (Refer c, d & e)
From 151 to 200	From 151 to 200	<=250	Self-Regulating / Power Limiting	Product/Stabilised (Refer c, d & e)
>200	>200	Any	Mineral Insulation/ constant wattage	Controlled

For controlled approach, redundant RTD shall be provided so as to ensure that T3 rating is compiled even in case of failure of one RTD.

9.29 Refer Cl. No. 3.1.11 of EIL Spec. 6-51-0095 and note that maximum steam flushing temperature for periodic steam cleaning of piping & other equipment shall be considered (as per other documents attached with package) for intermittent exposure under power-off condition and offered electric heat tracer shall be suitable for the same.

Contractor shall submit the approval from statutory authority from country of origin indicating the exposure temperature rating of offered tracer.

9.30 Heat tracers shall also be suitable for the complete operating temperature range mentioned in the line list.

9.31 Tracer shall be sized for -10% voltage drop up to tracer JB.

9.32 The PDB / LDP shall have IP-55 degree of protection for outdoor use having separate external enclosure and shall be provided with transparent glass / acrylic windows for viewing the meters & indicating lamps.

9.33 Refer to clause no. 3.1.14 of 6-51-0095, please note that RTD shall be provided for each circuit irrespective of the design load of the circuit.

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9.34 Sizing of earthing strips shall be suitable for maximum fault current and for duration of 1 seconds. Maximum fault current shall be 65KA.

9.35 Bidder shall note that bill of material if any furnished with the offer will be retained for information and records only. All materials and components as required to meet package specifications and functional requirement shall be included in the Bidder's scope without any cost and time implication to the owner.

9.36 Bidder is informed that the detailed offers from the equipment manufacturer and assumptions/ clarifications for the electrical heat tracing system is not required to be furnished in the Bidder's proposal at bidding stage. If any such details are furnished by the Bidder in their proposal, these shall not be reviewed or taken cognizance of at the bidding stage. These details shall be treated as preliminary and for reference and record purpose only and shall not be contractually binding.

10. STATUTORY APPROVAL

10.1 The submission of application on behalf of the Owner to CEA or Electrical Inspector along with copies of required certificates complete in all respects shall be done by the contractor well ahead of time so that the actual commissioning of equipment and electrical system are not delayed for want of approval by the Inspector. The Contractor shall arrange the actual inspection of work by the Electrical Inspector and necessary coordination and liaison work in this respect shall be the responsibility of the contractor.

10.2 The Inspection and acceptance of the work as above shall not absolve the Contractor from any of his responsibilities under this contract.

10.3 Any other statutory approval of works required for the electrical installation is also included in the contractor's scope.

11. INSPECTION, TESTING AND COMMISSIONING

11.1 Site inspection, testing and commissioning of electrical installation shall be carried out as per relevant local standards & practices.

11.2 All the equipment installed by the Bidder shall be tested and commissioned.

12. DRAWING

12.1 Construction shall be carried out as per drawings/ specifications issued/ approved by the engineer-in-charge during the course of execution of work.

12.2 After the job completion, Bidder shall prepare 'AS-BUILT' drawings. Final certified 'AS- BUILT' drawings shall be submitted by the Bidder to owner in bound volumes & in soft copies/CDs.

12.3 Bidder shall submit equipment manufacturer's drawing for supply items for the review of Engineer-in-Charge and the approval in writing of the Engineer-in-Charge shall be obtained before commencing manufacture. However, it is to be understood that the review of drawings shall not absolve the basic responsibility of Bidder to check total compliance to specifications included in tender document.

13. TRAINING

13.1 Training for complete Heat Tracing system at site for Owner engineers for minimum 10 days shall be provided.

14. MAKES OF EQUIPMENT AND MATERIALS (refer elsewhere in the Package)

15. Spares

15.1 Mandatory spares:

The following mandatory spares for electrical equipment shall be supplied by the contractor:

S. No.	Part Description	Quantity Required per equipment
1	RTD/Thermostat	1 No. of each Type
2	control fuses/ MCB	5 Nos. of each rating & type
3	Indicating lamps	10% or 2 nos. (min.) whichever is more
4	Indicating lamps covers	5 nos. of each colour
5	Contactor contacts	1 set for each rating and type

NOTES:

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a. The word 'TYPE' means the Make, Model no., Type, Range, Size/ Length, Rating, Material as applicable.

b. Wherever % age is identified, Bidder shall supply next rounded figure.

c. The terminology used under 'Part Description' is the commonly used name of the part and may vary from manufacturer to manufacturer.

d. Mandatory spares as indicated above do not cover commissioning spares.

e. Mandatory spares as indicated above do not cover two year O&M spares.

15.2 Erection/Commissioning Spares**:**

All erection/commissioning spares shall be included by the Bidder in the quoted price. The list of such items shall be furnished along with the offer.

15.3 Two Years Operation & Maintenance Spares**:**

Bidder shall provide list of spares required for two years of normal operation and maintenance for all electrical equipment along with unit prices.

15.4 Special Tools and Tackles**:**

All required special tools and tackles shall be included by the Bidder in the quoted price. The list of such items shall be furnished along with the offer.

16. LIST OF ATTACHMENTS

Sr. No.	Title	Document No.	Rev.
1.	Scope of Work & Job Specification-Electrical Heat Tracing System	B957-300-16-50-SP-9503	B
2.	Data Sheet for Electric Surface Heating system	B957-000-16-50-DS-4040	B
3.	Data Sheet – MV Cables	B957-000-16-50-DS-5102	B
4.	Data Sheet – Communication Cables	B957-000-16-50-DS-5201	A
5.	Vendor Data Requirement for Electric surface heating system	B957-300-16-50-VR-3001	A
6.	Vendor list	B957-300-16-50-VL-3001	B
7.	Specification for flameproof power distribution boards	6-51-0007	0
8.	Specification for flameproof lighting & power panels	6-51-0008	7
9.	Specification for Medium & High Voltage Cables & accessories	6-51-0051	9
10.	Specification for communication and fire alarm cables.	6-51-0052	7
11.	Specification for Hazardous Area Lighting Fixtures and Junction Boxes	6-51-0061	7
12.	Specification for electrical equipment installation	6-51-0081	5
13.	Specification for cable installation	6-51-0082	6
14.	Specification for earthing installation	6-51-0084	5
15.	Specification for field inspection, testing & commissioning of electrical installations.	6-51-0087	4
16.	Specification for electrics of package equipment	6-51-0093	6
17.	Standard Specification for Electric Surface Heating System	6-51-0095	5
18.	Design philosophy for electrical facilities	6-51-0099	7
19.	Specification for quality management system requirements from bidders	6-78-0001	3

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Sr. No.	Title	Document No.	Rev.
20.	Specification for documentation requirements from Contractors.	6-78-0002	3
21.	Specification for documentation requirements from suppliers	6-78-0003	3
22.	Inspection & Test Plan for flameproof lighting & Power Panels	6-81-1008	4
23.	Inspection & Test Plan for MV & HV Cables & Accessories.	6-81-1051	4
24.	Inspection & test plan for communication & fire alarm cables	6-81-1052	4
25.	Inspection & Test Plan for Hazardous Area Lighting Fixtures and Junction Boxes	6-81-1061	4
26.	Inspection and test plan for electrical heat tracer	6-81-1097	1
27.	Typical earth plate and fixing details.	7-51-0103	7
28.	Equipment earthing schedule	7-51-0116	9
29.	Typical installation of flame proof lighting / power panel	7-51-0225	6
30.	Typical section of RCC cable trench	7-51-0303	7
31.	Safety Measures for Electrical installations During Construction	7-51-0332	4
32.	Details for hot dip galvanized ladder type cable trays	7-51-0333	4
33.	Cable layout – ECU unit	B957-300-16-50-01012	A

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VENDOR LIST
(ELECTRICAL)

PROJECT : **OVERALL PROJECT MANAGEMENT AS MPMC AND PMC/EPCM SERVICES FOR ETHYLENE CRACKER UNIT AND U&O FOR BPREP.**

CLIENT : **M/s BPCL – BINA REFINERY**

CONSULTANT : **ENGINEERS INDIA LIMITED**

EIL JOB NO. : **B957**

Rev. No	Date	Purpose	Prepared by	Checked by	Approved by
B	22.04.2026	REVISED AND RE-ISSUED WITH TENDER	SKANU	SK	RSR
A	26.02.2026	ISSUED WITH TENDER	SK	RSR	RSR

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GENERAL NOTES- VENDOR LIST PREAMBLE

1.0 CONTRACTOR shall procure all the material / equipment forming permanent part of the unit / plant from OWNER / PMC approved vendors enclosed elsewhere in the bidding document. This shall include sub- ordered items / components also. The "Approved Vendors" shall be item specific.

2.0 CONTRACTOR to procure material from any of OWNER / PMC approved vendors. However, current validity, holiday status and range of approval as per EIL enlistment letter need to be verified by the CONTRACTOR with vendor before placement of order.

i. CONTRACTOR shall also verify the work load, stability and solvency status of the vendor prior to placement of order.
ii. Vendors on OWNER/PMC holiday list shall not be considered for ordering, which need to be verified by the CONTRACTOR prior to placement of order. CONTRACTOR shall comply with this requirement without any time or cost implication to Owner.
iii. In case any vendor is registered with EIL as an approved vendor subsequent to the issue of this bidding document, the same may also be considered by the CONTRACTOR with prior intimation to OWNER/PMC and obtain their concurrence prior to placement of order.
iv. Wherever job specification calls for requisite proven track record, the same shall be complied and necessary documents to be submitted for BPCL/EIL approval prior to ordering. Licensor approval is required wherever necessary.
v. Vendors on OWNER / PMC holiday list shall not be considered for ordering.

CONTRACTOR shall comply with this requirement without any time or cost implication to the OWNER. If a vendor is put on OWNER / PMC's holiday list subsequent to CONTRACTOR placing an order, it shall be CONTRACTOR's responsibility to ensure quality work and timely supply from the vendor.

3.0 Wherever the nos. of approved vendors are less than 3 (three) CONTRACTORS may consider additional vendors with prior approval of OWNER / PMC. "Approval status" documents / credentials to be furnished by the vendors in such cases the CONTRACTOR shall be solely responsible. OWNER / PMC's decision on approval shall be final and non- negotiable. Non-acceptance of a particular proposed vendor due to any reasons whatsoever shall not be a cause of schedule and cost implication. Delay in approval of additional vendor, if any, on account of non- submission of performance track record and other documents as per requirements is solely to contractor's account and no time and cost implication implication(s) shall be entertained on account of additional vendor approval

4.0 For items not covered in the vendor list (covered elsewhere in bidding document), the vendor shall be approved by OWNER/ PMC prior to placement of order by CONTRACTOR. CONTRACTOR shall list down the proposed suppliers/vendors for such items and submit the One Vendor details for OWNER/PMC's review / approval along with necessary documents/credentials. Non- acceptance of a particular proposed vendor due to any reasons whatsoever shall not be a cause of schedule and cost implication.

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5.0 CONTRACTOR shall make an independent assessment of capability of all the vendors for timely deliveries of material / equipment. Any delays in deliveries by vendor(s) shall not be a cause of schedule and cost implication.

6.0 At any stage of the project, if it comes to the notice of OWNER / PMC that CONTRACTOR has procured material / equipment, intentionally or unintentionally whatsoever, from an unapproved vendor and/or items not falling in approved range of vendor(s), the same shall be rejected forthwith and CONTRACTOR shall be liable to replace such material / plant / machinery without any schedule and cost implication to the OWNER.

7.0 The vendor list provided by Process Licensor in any of the Licensor documents shall be considered. If Vendor for any item is not covered in this vendor list but appearing anywhere in the Licensor process package, Licensor vendor list will be followed.
Sub- Vendor list given in the job specifications attached with the tender shall be considered for respective items if not covered in this vendor list.
In case of any Mandatory /Proprietary items appearing in this vendor list as well as in the Licensor's process package, the vendors as recommended by the Process Licensor shall be followed.

8.0 It is understood that in few cases, name of the Vendor changes due to change in their Company or Corporate shareholding, OWNER may accept such Vendors under its new name with prior approval and submission of requisite supporting document.
Any such approval shall however, not absolve the CONTRACTOR from any of his obligations under the contract; neither shall any such approval signify nominations or instruction to use such a vendor. All approved vendors are deemed to have been freely chosen by the CONTRACTOR at his own risk.

9.0 The approved vendors list for fabricated equipment (Vessels, Column, Heat Exchangers, Ejectors etc.) is for fabrication alone. Where mechanical design of the equipment is included in CONTRACTOR'S scope, CONTRACTOR shall himself be responsible for designing and obtaining approval / review of Mechanical design calculations as per codes/specifications specified elsewhere in the Bid/Contractor document from OWNER / PMC.

10.0 Proposal of any new vendor based on its successful PTR is permissible only as special case. In case no quote is received from the bid specified approved vendors, substantial proof such as regret letters / E-mails from vendors etc. to be submitted for the same as documentary evidence. However, OWNER/PMC decision shall be final and binding on the contractor for which commercial implication (if any) shall not be entertained by the OWNER.

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Sr No	Supplier Code	Supplier Name	Country	Holiday Description
Item Code : 13MA		**Description :** JUNCTION BOXES (FLAME PROOF)		
Approved Suppliers				
1	4245	FCG HI-TECH PRIVATE LIMITED	INDIA	
2	3706	PHOENIX MECANO INDIA PVT. LTD.	INDIA	
3	K173	KAYSONS TECHNO EQUIPMENTS PVT. LTD.	INDIA	
4	F024	FLEXPRO ELECTRICALS PVT LTD	INDIA	
5	3681	FCG POWER INDUSTRIES PVT LTD	INDIA	
6	G159	PEPPERL & FUCHS MANUFACTURING (INDIA) PRIVATE LIMITED	INDIA	
7	S158	SUDHIR SWITCHGEARS PVT LTD	INDIA	
8	B024	BALIGA LIGHTING EQUIPMENTS (P) LIMITED	INDIA	
9	4364	SAI INDUSTRIES	INDIA	
10	R175	R STAHL PVT LTD	INDIA	
11	F036	FLAMEPROOF EQUIPMENTS PVT.LTD	INDIA	

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Sr No	Supplier Code	Supplier Name	Country	Holiday Description
Item Code : 13MB		**Description :** LIGHTING & POWER PANELS (FLP)		
Approved Suppliers				
1	S158	SUDHIR SWITCHGEARS PVT LTD	INDIA	
2	K173	KAYSONS TECHNO EQUIPMENTS PVT. LTD.	INDIA	
3	F036	FLAMEPROOF EQUIPMENTS PVT.LTD	INDIA	
4	B024	BALIGA LIGHTING EQUIPMENTS (P) LIMITED	INDIA	
5	F024	FLEXPRO ELECTRICALS PVT LTD	INDIA	
6	3681	FCG POWER INDUSTRIES PVT LTD	INDIA	
7	3990	SHREYA EX-TECH PRIVATE LIMITED	INDIA	
8	3706	PHOENIX MECANO INDIA PVT. LTD.	INDIA	
9	4364	SAI INDUSTRIES	INDIA	
10	4245	FCG HI-TECH PRIVATE LIMITED	INDIA	

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Sr No	Supplier Code	Supplier Name	Country	Holiday Description
Item Code : 13MD		**Description :** FLAMEPROOF POWER DISTRIBUTION BOARD		
Approved Suppliers				
1	K173	KAYSONS TECHNO EQUIPMENTS PVT. LTD.	INDIA	
2	3681	FCG POWER INDUSTRIES PVT LTD	INDIA	
3	3706	PHOENIX MECANO INDIA PVT. LTD.	INDIA	
4	F024	FLEXPRO ELECTRICALS PVT LTD	INDIA	
5	F036	FLAMEPROOF EQUIPMENTS PVT.LTD	INDIA	
6	B024	BALIGA LIGHTING EQUIPMENTS (P) LIMITED	INDIA	
7	S158	SUDHIR SWITCHGEARS PVT LTD	INDIA	

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Sr No	Supplier Code	Supplier Name	Country	Holiday Description
Item Code : 13OB		**Description :** MV POWER CABLE - FIRE SURVIVAL		
Approved Suppliers				
1	3854	CHANDRESH CABLES LIMITED	INDIA	
2	H060	HAVELLS INDIA LTD	INDIA	
3	3765	THERMO CABLES LTD.	INDIA	
4	3602	Special Cables Pvt. Ltd.	INDIA	
5	3783	POLYCAB INDIA LIMITED	INDIA	
6	C145	CORDS CABLE INDUSTRIES LTD	INDIA	
7	3781	POLYCAB INDIA LIMITED	INDIA	
8	R203	LKB ENGINEERING PRIVATE LIMITED	INDIA	
9	3669	KEI INDUSTRIES LIMITED	INDIA	
10	4298	SHRIRAM TELELINK	INDIA	
11	4281	SBEE CABLES INDIA LIMITED	INDIA	
12	3722	POLYCAB INDIA LIMITED	INDIA	
13	S304	SUYOG ELECTRICALS LTD	INDIA	
14	D012	DELTON CABLES LIMITED	INDIA	
15	3814	RR KABEL LIMITED	INDIA	
16	U085	APAR INDUSTRIES LTD	INDIA	
17	A132	ASSOCIATED FLEXIBLES & WIRES [P] LTD	INDIA	

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Sr No	Supplier Code	Supplier Name	Country	Holiday Description
Item Code : 13OC		**Description :** CABLES-MEDIUM VOLTAGE-POWER-XLPE		
Approved Suppliers				
1	C145	CORDS CABLE INDUSTRIES LTD	INDIA	
2	S025	SRIRAM CABLES PVT LTD	INDIA	
3	3731	POLYCAB INDIA LIMITED	INDIA	
4	3732	POLYCAB INDIA LIMITED	INDIA	
5	3722	POLYCAB INDIA LIMITED	INDIA	
6	G156	GEMSCAB INDUSTRIES LTD	INDIA	
7	H060	HAVELLS INDIA LTD	INDIA	
8	R179	RAVIN CABLES LTD	INDIA	
9	R203	LKB ENGINEERING PRIVATE LIMITED	INDIA	
10	3969	SHIVPRIYA CABLES PRIVATE LIMITED	INDIA	
11	3854	CHANDRESH CABLES LIMITED	INDIA	
12	S304	SUYOG ELECTRICALS LTD	INDIA	
13	U085	APAR INDUSTRIES LTD	INDIA	
14	4137	INSUCON CABLES AND CONDUCTORS PRIVATE LIMITED	INDIA	
15	4351	UNIVERSAL CABLE MANUFACTURING COMPANY	INDIA	
16	4281	SBEE CABLES INDIA LIMITED	INDIA	
17	4104	ZENIUM CABLES LIMITED	INDIA	
18	4105	ULTRACAB (INDIA) LIMITED	INDIA	
19	3781	POLYCAB INDIA LIMITED	INDIA	
20	3783	POLYCAB INDIA LIMITED	INDIA	
21	3796	PARAMOUNT COMMUNICATIONS LTD	INDIA	
22	4055	DYNAMIC CABLES LIMITED	INDIA	
23	A132	ASSOCIATED FLEXIBLES & WIRES [P] LTD	INDIA	
24	T124	TORRENT ELECTRICALS LIMITED	INDIA	
25	U003	UNIVERSAL CABLES LTD	INDIA	
26	K082	KEI INDUSTRIES LIMITED	INDIA	
27	3602	Special Cables Pvt. Ltd.	INDIA	
28	4298	SHRIRAM TELELINK	INDIA	
29	3814	RR KABEL LIMITED	INDIA	
30	3669	KEI INDUSTRIES LIMITED	INDIA	
31	4234	LASER POWER & INFRA PRIVATE LIMITED	INDIA	
32	D012	DELTON CABLES LIMITED	INDIA	
33	4265	SVARN INFRATEL PRIVATE LIMITED	INDIA	
34	4264	SURAJ CABLES (INDIA) PRIVATE LIMITED	INDIA	
35	4263	TIRUPATI PLASTOMATICS PRIVATE LIMITED	INDIA	
36	4262	K C POWERTRACKS	INDIA	
37	4261	TORTEK INDIA PRIVATE LIMITED	INDIA	
38	4299	POLYVION CABLES PRIVATE LIMITED	INDIA	
39	K190A	KEC ASIAN CABLES LIMITED	INDIA	
40	4163	KLJ PARAFLEX INDIA LIMITED	INDIA	

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Sr No	Supplier Code	Supplier Name	Country	Holiday Description
Item Code : 13OC		**Description :** CABLES-MEDIUM VOLTAGE-POWER-XLPE		
41	4001	RAVI INDUSTRIES	INDIA	
42	3765	THERMO CABLES LTD.	INDIA	
On Holiday				
1	3770	CMI LIMITED	INDIA	Ground-XIII (Negative networth or Financial constraints)
2	F013	FINOLEX CABLES LTD.	INDIA	DORMANT (NOT TO BE CONSIDERED)
3	3647	GUPTA POWER INFRASTRUCTURE LIMITED	INDIA	Ground-XV (Banned due to poor performance)

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Sr No	Supplier Code	Supplier Name	Country	Holiday Description
Item Code : 13OD		**Description :** CABLES-CONTROL (UNPAIRED)-XLPE		
Approved Suppliers				
1	K190A	KEC ASIAN CABLES LIMITED	INDIA	
2	4163	KLJ PARAFLEX INDIA LIMITED	INDIA	
3	3752	APAR INDUSTRIES LTD	INDIA	
4	4261	TORTEK INDIA PRIVATE LIMITED	INDIA	
5	4262	K C POWERTRACKS	INDIA	
6	4264	SURAJ CABLES (INDIA) PRIVATE LIMITED	INDIA	
7	4265	SVARN INFRATEL PRIVATE LIMITED	INDIA	
8	4221	BONTON CABLES (INDIA) PRIVATE LIMITED	INDIA	
9	4234	LASER POWER & INFRA PRIVATE LIMITED	INDIA	
10	3669	KEI INDUSTRIES LIMITED	INDIA	
11	4297	GOYOLENE FIBRES (INDIA) PRIVATE LIMITED	INDIA	
12	4298	SHRIRAM TELELINK	INDIA	
13	3602	Special Cables Pvt. Ltd.	INDIA	
14	3814	RR KABEL LIMITED	INDIA	
15	3724	CORDS CABLE INDUSTRIESLTD.	INDIA	
16	C145	CORDS CABLE INDUSTRIES LTD	INDIA	
17	U003	UNIVERSAL CABLES LTD	INDIA	
18	R179	RAVIN CABLES LTD	INDIA	
19	S304	SUYOG ELECTRICALS LTD	INDIA	
20	R203	LKB ENGINEERING PRIVATE LIMITED	INDIA	
21	A132	ASSOCIATED FLEXIBLES & WIRES [P] LTD	INDIA	
22	E063	ELKAY TELELINKS LTD.-	INDIA	
23	D012	DELTON CABLES LIMITED	INDIA	
24	3722	POLYCAB INDIA LIMITED	INDIA	
25	G156	GEMSCAB INDUSTRIES LTD	INDIA	
26	H060	HAVELLS INDIA LTD	INDIA	
27	S025	SRIRAM CABLES PVT LTD	INDIA	
28	T124	TORRENT ELECTRICALS LIMITED	INDIA	
29	A034	ASSOCIATED CABLES PVT LTD	INDIA	
30	E169	ECKO CABLES PVT LTD	INDIA	
31	T212	THERMO CABLES LTD (FORM. T-150)	INDIA	
32	3854	CHANDRESH CABLES LIMITED	INDIA	
33	4137	INSUCON CABLES AND CONDUCTORS PRIVATE LIMITED	INDIA	
34	4351	UNIVERSAL CABLE MANUFACTURING COMPANY	INDIA	
35	4281	SBEE CABLES INDIA LIMITED	INDIA	
36	4105	ULTRACAB (INDIA) LIMITED	INDIA	
37	3783	POLYCAB INDIA LIMITED	INDIA	
38	3784	POLYCAB INDIA LIMITED	INDIA	
39	3796	PARAMOUNT COMMUNICATIONS LTD	INDIA	
40	3765	THERMO CABLES LTD.	INDIA	

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Sr No	Supplier Code	Supplier Name	Country	Holiday Description
Item Code : 13OD		**Description :** CABLES-CONTROL (UNPAIRED)-XLPE		
41	4001	RAVI INDUSTRIES	INDIA	
42	4299	POLYVION CABLES PRIVATE LIMITED	INDIA	
On Holiday				
1	N112	NORTH EASTERN CABLES PVT LTD	INDIA	DORMANT (NOT TO BE CONSIDERED)
2	I211	ICON CABLE LTD.	INDIA	DORMANT (NOT TO BE CONSIDERED)
3	F013	FINOLEX CABLES LTD.	INDIA	DORMANT (NOT TO BE CONSIDERED)
4	3872	GUPTA POWER INFRASTRUCTURE LIMITED	INDIA	Ground-XV (Banned due to poor performance)
5	S073	SCOT INNOVATION WIRES & CABLES PVT LTD	INDIA	DORMANT (NOT TO BE CONSIDERED)
6	C019	CMI LIMITED	INDIA	Ground-XIII (Negative networth or Financial constraints)

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Sr No	Supplier Code	Supplier Name	Country	Holiday Description
Item Code : 13OE		**Description :** CABLES-FIRE ALARM, COMMUNICATION AND CONTROL PAIRED		
Approved Suppliers				
1	C145	CORDS CABLE INDUSTRIES LTD	INDIA	
2	3724	CORDS CABLE INDUSTRIESLTD.	INDIA	
3	S304	SUYOG ELECTRICALS LTD	INDIA	
4	D012	DELTON CABLES LIMITED	INDIA	
5	E063	ELKAY TELELINKS LTD.-	INDIA	
6	3669	KEI INDUSTRIES LIMITED	INDIA	
7	T212	THERMO CABLES LTD (FORM. T-150)	INDIA	
On Holiday				
1	C019	CMI LIMITED	INDIA	Ground-XIII (Negative networth or Financial constraints)

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Sr No	Supplier Code	Supplier Name	Country	Holiday Description
Item Code : 13OI		**Description :** CABLES - FIRE ALARM, COMMUNICATION AND CONTROL PAIRED - FIRE SURVIVAL		
Approved Suppliers				
1	E063	ELKAY TELELINKS LTD.-	INDIA	
2	S304	SUYOG ELECTRICALS LTD	INDIA	

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Sr No	Supplier Code	Supplier Name	Country	Holiday Description
Item Code : 14AB		**Description :** AUXILIARY RELAYS		
Approved Suppliers				
1	3860	HITACHI ENERGY INDIA LIMITED	INDIA	
2	A392	GE VERNOVA T&D INDIA LIMITED	INDIA	
3	4339	C & S ELECTRIC LTD	INDIA	
4	3642	M/S JVS ELECTRONICS PVT LTD	INDIA	
On Holiday				
1	J001	JYOTI LIMITED	INDIA	HOLD ENQ/PO/BO- FIN.CONST/NEG. NET WORTH
2	J001	JYOTI LIMITED	INDIA	Ground-XIII (Negative networth or Financial constraints)

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Sr No	Supplier Code	Supplier Name	Country	Holiday Description
Item Code : 14BA		**Description :** BIMETAL RELAYS		
Approved Suppliers				
1	G147	GE INDIA INDUSTRIAL PVT LTD	INDIA	
2	L103	SCHNEIDER ELECTRIC INDIA PRIVATE LIMITED	INDIA	
3	4312	SIEMENS LIMITED	INDIA	
4	B002	BCH ELECTRIC LTD	INDIA	
5	3791	C & S ELECTRIC LTD	INDIA	
6	S450A	SCHNEIDER ELECTRIC INDIA P LTD-HYDERABAD	INDIA	
7	A200B	ABB INDIA LTD	INDIA	

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Sr No	Supplier Code	Supplier Name	Country	Holiday Description
Item Code : 14CA		**Description :** CABLE GLANDS (HAZARDOUS AREA)		
Approved Suppliers				
1	4187	SIGMA INDUSTRIES	INDIA	
2	S158	SUDHIR SWITCHGEARS PVT LTD	INDIA	
3	K173	KAYSONS TECHNO EQUIPMENTS PVT. LTD.	INDIA	
4	F036	FLAMEPROOF EQUIPMENTS PVT.LTD	INDIA	
5	F024	FLEXPRO ELECTRICALS PVT LTD	INDIA	
6	C195	COMET BRASS PRODUCTS	INDIA	
7	B024	BALIGA LIGHTING EQUIPMENTS (P) LIMITED	INDIA	
8	C205	COMET INDUSTRIES	INDIA	
9	3681	FCG POWER INDUSTRIES PVT LTD	INDIA	
10	4244	METALMECH ENGINEERING	INDIA	
11	27421	CMP PRODUCTS LIMITED	UNITED KINGDOM	
12	3704	METAL CRAFT INDUSTRIES	INDIA	
13	3890	AKSHAR BRASS INDUSTRIES	INDIA	
14	4364	SAI INDUSTRIES	INDIA	
15	4360	CLEON OPTOBIZ PRIVATE LIMITED	INDIA	
16	S375	STANDARD METAL INDUSTRIES	INDIA	
17	4245	FCG HI-TECH PRIVATE LIMITED	INDIA	

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Sr No	Supplier Code	Supplier Name	Country	Holiday Description
Item Code : 14CD		**Description :** CONTACTORS		
Approved Suppliers				
1	3791	C & S ELECTRIC LTD	INDIA	
2	4312	SIEMENS LIMITED	INDIA	
3	G147	GE INDIA INDUSTRIAL PVT LTD	INDIA	
4	L103	SCHNEIDER ELECTRIC INDIA PRIVATE LIMITED	INDIA	
5	A200B	ABB INDIA LTD	INDIA	
6	S450A	SCHNEIDER ELECTRIC INDIA P LTD-HYDERABAD	INDIA	
7	B002	BCH ELECTRIC LTD	INDIA	

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Sr No	Supplier Code	Supplier Name	Country	Holiday Description
Item Code : 14CF		**Description :** CONTROL SWITCHES / SELECTOR SWITCHES		
Approved Suppliers				
1	K143	KAYCEE INDUSTRIES LTD.	INDIA	
2	4312	SIEMENS LIMITED	INDIA	
3	R159	RELIABLE ELECTRONIC COMPONENTS PVT LTD	INDIA	
4	4012	TEKMEC SWITCHGEAR & CONTROLS	INDIA	
5	L103	SCHNEIDER ELECTRIC INDIA PRIVATE LIMITED	INDIA	
6	4002	P.P. INDUSTRIES	INDIA	
7	H142	HOTLINE SWITCHGEAR & CONTROLS	INDIA	
8	S373	SWITRON DEVICES	INDIA	

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Sr No	Supplier Code	Supplier Name	Country	Holiday Description
Item Code : 14FA		**Description :** FUSES		
Approved Suppliers				
1	4312	SIEMENS LIMITED	INDIA	
2	3790	C & S ELECTRIC LTD	INDIA	
3	L103	SCHNEIDER ELECTRIC INDIA PRIVATE LIMITED	INDIA	
4	G147	GE INDIA INDUSTRIAL PVT LTD	INDIA	
5	I013	NOVATEUR ELECTRICAL & DIGITAL SYSTEMS P	INDIA	
6	C194	EATON POWER QUALITY PRIVATE LIMITED	INDIA	

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Sr No	Supplier Code	Supplier Name	Country	Holiday Description
Item Code : 14HA		**Description :** HEAVY DUTY SWITCHES		
Approved Suppliers				
1	4312	SIEMENS LIMITED	INDIA	
2	L103	SCHNEIDER ELECTRIC INDIA PRIVATE LIMITED	INDIA	
3	3790	C & S ELECTRIC LTD	INDIA	

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Sr No	Supplier Code	Supplier Name	Country	Holiday Description
Item Code : 14HB		**Description :** ELECTRICAL HEAT TRACING SYSTEM		
Approved Suppliers				
1	27417	HEAT TRACE LIMITED	UNITED KINGDOM	
2	T207	THERMON INDIA PRIVATE LIMITED	INDIA	
3	T758	CHEMELEX LLC	UNITED STATES	
4	27487	CHROMALOX INC.	UNITED STATES	
5	3975	THERMOPADS PRIVATE LIMITED	INDIA	
6	27514	SSTENERGOMONTAZH LLC	RUSSIAN FEDERATION	
7	B726	BARTEC GMBH	GERMANY	
8	27561	ELTHERM GMBH	GERMANY	

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Sr No	Supplier Code	Supplier Name	Country	Holiday Description
Item Code : 14IA		**Description :** INSTRUMENT TRANSFORMERS CT & PT (MV)		
Approved Suppliers				
1	K149	KALPA ELECTRIKAL PVT LTD	INDIA	
2	N119	NARAYAN POWERTECH PVT LTD	INDIA	
3	P228	PRAGATI ELECTRICALS PVT LTD	INDIA	
4	P237	PRECISE ELECTRICALS	INDIA	
5	G135	GILBERT & MAXWELL ELECTRICALS PVT LTD	INDIA	
6	3789	PRAGATI ELECTRICALS PVT LTD	INDIA	
7	3901	NEWTEK ELECTRICALS	INDIA	
8	4160	RECO TRANSFORMERS PRIVATE LIMITED	INDIA	
9	S372	SILKAANS ELECTRICALS MFG.CO.PVT.LTD	INDIA	

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Sr No	Supplier Code	Supplier Name	Country	Holiday Description
Item Code : 14MA		**Description :** MCB		
Approved Suppliers				
1	S450	SCHNEIDER ELECTRIC INDIA PVT LTD	INDIA	
2	L071	LEGRAND (INDIA) PVT. LTD (FORM. M-006)	INDIA	
3	A372	ABB INDIA LTD	INDIA	
4	3888	POLYCAB INDIA LIMITED	INDIA	
5	3793	C & S ELECTRIC LTD	INDIA	
6	4312	SIEMENS LIMITED	INDIA	
7	3726	NOVATEUR ELECTRICAL & DIGITAL SYSTEMS PVT. LTD.	INDIA	
8	S393	STANDARD ELECTRICALS LTD	INDIA	
9	I168	INDIANA CURRENT CONTROL LTD	INDIA	
10	3824	HAVELLS INDIA LIMITED	INDIA	

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Sr No	Supplier Code	Supplier Name	Country	Holiday Description
Item Code : 14MB		**Description :** MCCB		
Approved Suppliers				
1	S450A	SCHNEIDER ELECTRIC INDIA P LTD-HYDERABAD	INDIA	
2	G147	GE INDIA INDUSTRIAL PVT LTD	INDIA	
3	A200B	ABB INDIA LTD	INDIA	
4	4312	SIEMENS LIMITED	INDIA	
On Holiday				
1	L001C	LARSEN & TOUBRO LTD-POWAI	INDIA	HOLD RFQ/PBO/PO DUE TO SHIFTING OF WORKS (EXCEPT NIT CASES)

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Sr No	Supplier Code	Supplier Name	Country	Holiday Description
Item Code : 14PB		**Description :** PUSH BUTTON AND INDICATING LAMPS		
Approved Suppliers				
1	4012	TEKMEC SWITCHGEAR & CONTROLS	INDIA	
2	4312	SIEMENS LIMITED	INDIA	
3	3791	C & S ELECTRIC LTD	INDIA	
4	4002	P.P. INDUSTRIES	INDIA	
5	H142	HOTLINE SWITCHGEAR & CONTROLS	INDIA	
6	T166	TEKNIC ELECTRIC (I) PVT. LTD.	INDIA	
7	E173	ESSEN DEINKI	INDIA	
8	P291	PRECIFINE PRODUCTS PVT. LTD.	INDIA	
9	B002	BCH ELECTRIC LTD	INDIA	
10	S365	SHRI TULSI SWITCHGEARS PVT LTD	INDIA	
11	S450A	SCHNEIDER ELECTRIC INDIA P LTD-HYDERABAD	INDIA	
On Holiday				
1	L001C	LARSEN & TOUBRO LTD-POWAI	INDIA	HOLD RFQ/PBO/PO DUE TO SHIFTING OF WORKS (EXCEPT NIT CASES)

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Sr No	Supplier Code	Supplier Name	Country	Holiday Description
Item Code : 14SA		**Description :** FUSE SWITCH COMBINATION		
Approved Suppliers				
1	4312	SIEMENS LIMITED	INDIA	
2	3790	C & S ELECTRIC LTD	INDIA	
3	3825	HAVELLS INDIA LIMITED	INDIA	
4	S393	STANDARD ELECTRICALS LTD	INDIA	
5	I013	NOVATEUR ELECTRICAL & DIGITAL SYSTEMS P	INDIA	
6	L103	SCHNEIDER ELECTRIC INDIA PRIVATE LIMITED	INDIA	
7	G147	GE INDIA INDUSTRIAL PVT LTD	INDIA	

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Sr No	Supplier Code	Supplier Name	Country	Holiday Description
Item Code : 14TA		**Description :** TIMERS		
Approved Suppliers				
1	4312	SIEMENS LIMITED	INDIA	
2	E151	ELECTRONIC AUTOMATION PVT LTD	INDIA	
3	B002	BCH ELECTRIC LTD	INDIA	

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Additional BPCL Vendor List for Electrical Items (Refer Notes as per Vendor List Preamble)

	SUPPLIER CODE	SUPPLIER NAME	COUNTRY	HOLIDAY DESCRIPTION
Item Code: 13BD Description: RELAY & CONTROL PANEL				
1	BPCL VC 120295	R.STAHL (P) LTD.	INDIA	
1	BPCL VC 120325	ABB INDIA LIMITED	INDIA	
Item Code: 13HC Description: BATTERIES-LEAD ACID (VRLA)				
2	BPCL VC 138626	IGA TECH INDUSTRIAL ELECTRONICS	INDIA	
2	BPCL VC 161946	CUMMINS SALES & SERVICE PVT LTD.	INDIA	
Item Code: 13HD Description: BATTERIES-NICKLE CADMIUM				
3	BPCL VC 312982	SUN BATTERY SHOPPE	INDIA	
Item Code: 13KA Description: TRANSFORMERS-POWER-ABOVE 5MVA				
4	BPCL VC 139893	EMCO LIMITED	INDIA	
4	BPCL VC 101407	RAYCHEM RPG PRIVATE LIMITED	INDIA	
Item Code: 13KB Description: TRANSFORMERS-DISTRIBUTION-UPTO 5MVA				
5	BPCL VC 139893	EMCO LIMITED	INDIA	
5	BPCL VC 100270	BHARAT BIJLEE LIMITED	INDIA	
Item Code: 13LA Description: LIGHTING FIXTURE & ACCESSORIES-HAZARDOUS				
6	BPCL VC 132472	PYROTECH ELECTRONICS PRIVATE LIMITED	INDIA	
6	BPCL VC 168748	WM ENERGY & LIGHTING PRIVATE LIMITED	INDIA	
6	BPCL VC 120295	R.STAHL (P) LTD.	INDIA	
6	BPCL VC 162049	INDUSTRIAL ELECTRO CONTROLS	INDIA	
Item Code: 13LD Description: HIGH MAST LIGHTING SYSTEM				
7	BPCL VC 171084	CONTRACTING SYNDICATE	INDIA	
7	BPCL VC 300456	CHASHMITA ENGINEERS PRIVATE LIMITED	INDIA	
Item Code: 13MA Description: JUNCTION BOXES (FLAME PROOF)				
8	BPCL VC 162049	INDUSTRIAL ELECTRO CONTROLS	INDIA	
Item Code: 13NC Description: EPABX SYSTEM				
9	BPCL VC 167774	ASCENT NETWORKS PRIVATE LTD	INDIA	

Item Code: 13PA Description: CAPACITORS-HIGH VOLTAGE				
10	BPCL VC 120325	ABB INDIA LIMITED	INDIA	
Item Code: 14BB Description: BUS DUCTS (MV)				
11	BPCL VC 333082	CASYON ENGINEERS AND CONSULTANTS	INDIA	
Item Code: 14CB Description: CABLE TERMINATION & JOINTING KIT				
12	BPCL VC 300990	TRANS ELECTRICALS (33 KV UE END only)	INDIA	
Item Code: 14HB Description: HEAT TRACERS				
13	BPCL VC 101407	RAYCHEM RPG PRIVATE LIMITED	INDIA	

वायरमेश डेमिस्टर्स के लिए सामान्य विनिर्देशन

GENERAL SPECIFICATION FOR WIRE MESH DEMISTERS

Rev. No.	Date	Purpose	Prepared by	Checked by	Standards Committee Convenor	Standards Bureau Chairman
					Approved by	
5	23.03.2026	REVISED & ISSUED AS STANDARD SPECIFICATION	HD	PG	AK	NK
4	31.12.2019	REVISED & ISSUED AS STANDARD SPECIFICATION	HD	PB	KJH	RKT
3	07.11.2013	REVISED & ISSUED AS STANDARD SPECIFICATION	HD	P.Goel /SKM	AP	SC
2	17.09.2008	REAFFIRMED & REISSUED AS STANDARD SPECIFICATION	VDY	HCN	AKG	VC

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Abbreviations:

ASME	:	American Society of Mechanical Engineers
AISI	:	American Iron and Steel Institute
AIA	:	Authorized Inspection Agency
TIG	:	Tungsten Insert Gas
GTAW	:	Gas Tungsten Arc Welding

Mass Transfer Mechanical & System Standards Committee

Convenor: Mr Arun Kumar

Members:
Mr Inder Kumar
Mr Pankaj Gandhi
Mr Jeevan Agrawal (Coordinator)
Mr. VinodKumar Yadav
Mr. Urmilesh Tiwari
Mr. Aasheesh Handa (Projects)
Mr. Prabhakar Choudhary (SMMS)
Mr. Avdhesh Agrawal (SCM)

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1.0 SCOPE

This specification covers the general requirements for design, fabrication, inspection and supply of knitted wiremesh assemblies (Demisters/ Mist Eliminators) in duly packed condition.

The demister assembly(ies) shall consist of wiremesh pad, top and bottom holding grids, major beams (if required), bolting/clamps/tie rods/J-bolts/spacer pipes and any other components which are essential to complete the demister assembly to be installed on supports welded inside the Columns/ Vessels.

2.0 REFERENCES

Following documents/standards/specifications in their latest edition shall form the basis of design, fabrication, inspection, testing and acceptance of the demister:

i	Demister data sheet	-	As per Material Requisition
ii	6-14-0009	-	Packing, Marking and Shipping Specifications for Trays and Tower Internals
iii	7-12-0036*/Licensor's standards	-	Details of Wire Mesh Demister Supports (as applicable)
iv	7-12-0001	-	Vessel Tolerances
v	ASME Sec. II	-	Material Specifications
vi	ASME Sec. VIII Div.1	-	Boiler and Pressure Vessel Code
vii	ASME Sec. IX	-	Welding Qualifications
viii	AISI	-	Material Specification for Wires, Spacer Rods etc.

(* Standard 7-12-0036 shall be used for reference only. Final design of demister supports shall be as per vendor design standards/calculations and shall be submitted to EIL for review prior to start of fabrication.)

3.0 MATERIAL

All the material used for fabrication & supply of Demister shall be new & of first quality and shall be duly supported with material test certificates.

4.0 DESIGN & FABRICATION

4.1 Basic details such as demister specification (surface area, voidage, and bulk density), material of construction, supporting arrangement, manhole size etc. shall be as per drawings/ specification furnished by EIL/ Licenser.

4.2 In the General Arrangement drawing, Demister Vendor shall indicate the following outside dimensions for square / rectangular demister and diameter for circular demister:

a) The oversized outside dimensions / diameter to take care of the tolerances/column ovality defined in applicable Code / EIL Standard 7-12-0001/ drawings for snug fitment. These dimensions /diameters shall be used for shop inspection of the demister mock up assembly.
b) The final fit-up dimensions / diameter.

4.3 Demister assembly shall be designed for a net upward thrust of 100 kg/m^2 (uniform) due to the vapour loadings. The assembly should also be able to withstand a concentrated live load of 60 kg at mid point of any of the demister sub-assembly/component.

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In addition to the above loading, demister shall be designed to withstand the additional pressure surges, if specified.

4.4 All demister sub-assemblies shall be sized to facilitate installation inside the column/vessel through the manhole. These shall rest on support ring/cleats welded inside vessel/column by others.

4.5 Tentative details of the support rings/cleats, mid span beams (wherever required) grid details & fixing arrangements shall be as given in the referenced documents listed in clause 2.0. Vendor is advised to follow the same for the design/fabrication in their scope of work. Vendor may, however, suggest any improvement in the design. Such suggestions will however be reviewed/ approved by EIL/Licenser/ Client and can be followed by the vendor only on written acceptance by EIL/Licenser/ Client.

4.6 All internal bolting shall be minimum M10 size and shall be compatible with Demister material. All bolting shall be provided with locknuts.

4.7 Welding

All welding shall be done by TIG/ GTAW Process only. Welding wherever required, is to be done by qualified and approved welders using the suitable fillers and fluxes recommended for materials used for the fabrication. Where TIG welding cannot be done at site due to access/Practical Constraints, Metal Arc welding may be carried out after taking approval from Engineer-In-Charge. Resistance welding is permitted for minor details where weld is a non-strength weld. Gas or Carbon arc welding shall not be used.

5.0 SPARES

5.1 Mandatory Spares

Following operational spares shall be supplied as Mandatory Spares:

Fasteners - bolts, nuts, clamps, spacer pipes, J-bolts etc.	-	10% (minimum 4 Nos. of each type/size)

5.2 Erection & commissioning Spares

In addition to Operational spares as indicated above, vendor shall also supply following Constructional spares as Erection and Commissioning spares:

Fasteners - bolts, nuts, clamps, spacer pipes, J-bolts etc.	-	10% (minimum 4 Nos. of each type/size)

6.0 INSPECTION AND TESTING

6.1 The material, fabrication and trial assembly shall be Inspected by the EIL/ Licenser/ Client and/or their AIA.

6.2 Complete demister assemblies (along with grids) and Beams etc. shall be assembled as floor mock-up & shall be offered for final inspection. Assembly shall be checked for oversized dimensions as per the approved drawing.

7.0 PACKING & FORWARDING

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The individual components shall be marked with proper item/part number as given in the drawings to facilitate identification at site. Demister shall be wrapped in polythene and supplied in polythene lined wooden cases as per either EIL std. specification or Vendor's proven standard, for damage free transportation. For all other requirements refer EIL Specification No. 6-14-0009.

8.0 GUARANTEE

Vendor shall guarantee the design, performance (i.e. separation efficiency and pressure drop), material, fabrication and workmanship for the demisters for the period as outlined in General Purchase Conditions.

9.0 DOCUMENTATION

Documents/drawings shall be furnished as per the `Vendor Data Requirement' enclosed with requisition / FEED document. All the drawings prepared by the vendor shall be on AUTOCAD.

10.0 AS BUILT DOCUMENTATION

Nos. and type of documents to be supplied as 'As-built' document shall be per 'Vendor Data Requirement' enclosed with requisition / feed document.

Shop changes made by Vendor after approval of drawings under Code-1 by EIL and deviations granted in deviation permits, if any, shall be marked in hard copy of drawings which shall then be stamped 'As-built' by the vendor. These 'As-built' drawings shall be reviewed and stamped by Authorized Inspector also. Vendor shall prepare scanned image files of all marked-up 'As-built' drawings. Vendor shall also incorporate the above changes in the native soft files of the drawings.

Authorized Inspector shall ensure/certify completeness of Vendor's Final/As-built documents before equipment dispatch.

In addition, vendor shall also incorporate site changes, if any, based on mismatch observed at site and resubmit the 'As-built' documents.

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प्रेशर वेसल्स के सामान्य विनिर्देश

GENERAL SPECIFICATION

FOR

PRESSURE VESSELS

Rev. No	Date	Purpose	Prepared by	Checked by	Standards Committee Convenor	Standards Bureau Chairman
					Approved by	
7	12.03.2024	REVISED AND REISSUED AS STD. SPEC.	PS	TKh	KA/NK	MN
6	28.08.2018	REVISED AND REISSUED AS STD. SPEC.	SK	TK	KJH	RKT
5	30.06.2010	REVISED AND REISSUED AS STD. SPEC.	KA	RKT	AKM/DM	N.DUARI
4	20.11.2009	REVISED & REISSUED AS STD. SPEC.	VB	RKG	AKM	N.DUARI
3	15.05.2000	REVISED AND REISSUED AS STD. SPECN.	RKT	AKM	CRMN	MI
2	15.12.1994	REVISED AND REISSUED AS STD. SPECN.	DD	AKM	VC	AS

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Abbreviations:

AI	:	Authorized Inspector
ASME	:	American Society of Mechanical Engineers
DNV	:	Det Norske Veritas
IBR	:	Indian Boiler Regulations
ISO	:	International Organisation for Standardisation
NB	:	Nominal Bore
PESO	:	Petroleum & Explosives Safety Organisation
PWHT	:	Post Weld Heat Treatment

Static Equipment Standards Committee

Convenor: Mr. Nalin Kumar

Members:
Mr. K. Anjaneyulu (Co-Convener)
Mr. Tarun Kumar (Emp. No. A328)
Mr. Tarun Khurana (Coordinator)
Mr. P V S Satyanarayana
Mr. Anish Trehan
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Mr. Prabhakar Choudhary (SMMS)
Mr. Avdhesh Agarwal (SCM-Inspection)

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1.0 SCOPE

1.1 This specification covers the general requirements for design, fabrication, workmanship, erection, inspection, testing and supply of unfired pressure vessels and is intended to supplement the minimum requirements of the applicable codes.

1.2 Supplementary specification indicating special or additional requirements shall form addenda to this specification and shall govern. Supplementary specification, when made addenda to this specification shall be referred to in the Material Requisition and / or Purchase Order. Following are the supplementary specifications:

a) 6-12-0002 Supplementary specification for carbon steel vessels.
b) 6-12-0003 Supplementary specification for low alloy steel vessels.
c) 6-12-0006 Supplementary specification for austenitic stainless steel vessels.
d) 6-12-0007 Supplementary specification for stainless steel clad vessels.
e) 6-12-0008 Supplementary specification for 3½ %Ni steel pressure vessels.

1.3 In case of conflict, the order of precedence shall be as follows:

a) Statutory Requirement
b) Engineering drawing
c) Specifications and standards
d) Codes

In general, the most stringent requirement out of the above shall govern. However, in such a case, vendor shall promptly refer the conflicts to client / EIL in writing to obtain client / EIL instruction before proceeding with manufacture. Decision of client / EIL shall be binding without any time and cost implication.

2.0 REFERENCES

2.1 Design Codes

The following codes in the edition and addenda referred to in the datasheet shall form the basis for design, fabrication, inspection, testing and acceptance of equipment:

(a) ASME Boiler and Pressure Vessel Code Section VIII Div. 1

(b) ASME Boiler and Pressure Vessel Code Section IX and Sec V.

(c) Indian Boiler Regulations- IBR (whenever applicable).

(d) The Static and Mobile Pressure Vessels (Unfired) Rules 2016 (whenever applicable).

2.2 Material Codes

Material to be used shall conform to:

(a) ASME Boiler and Pressure Vessel Code Sec. II.

(b) Indian Standard specification.

Other specifications of equivalent grade can be used only after written approval from EIL.

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2.3 Regulations

National laws and regulations together with any local by-laws for the country or state wherever the vessels are to be used must be complied with by the fabricator.

3.0 DESIGN

3.1 Design Pressure

3.1.1 Design pressure specified shall be at the top of vertical vessel or at the highest point of horizontal vessel.

3.1.2 The design pressure at any lower point shall be determined by adding the maximum operating liquid head and any pressure gradient within the vessel.

3.2 Corrosion Allowance

3.2.1 Corrosion allowance shall be added to both sides of tray support rings and other fixed internal non-pressure parts.

3.2.2 Removable internal parts (with the exception of trays) which are bolted or clamped in place, shall be provided with extra thickness equal to half the specified corrosion allowance on each surface exposed to vessel contents.

3.2.3 Full corrosion allowance shall be added to the throat thickness necessary for strength or sealing in case of fillet and seal welds on internal attachments.

3.3 During fabrication or shop/site hydro-test conditions in horizontal position, the supports for shell shall be so provided that combined stresses in any shell component (based on corroded thickness for site test) do not exceed the following:

(a) Tensile : 90% of ambient yield

(b) Compressive: Code allowable stress

3.4 All conical reducers shall be designed as tori conical type with knuckle radius at each end as minimum 10% of the adjoining diameter, unless otherwise specified in requisition. 100% radiography shall be carried out for all weld seams of tori cone.

3.5 Statutory Approvals

3.5.1 For vessels coming under the purview of Indian Boiler Regulations, it shall be vendor's responsibility to get approval from IBR authorities pertaining to design, drawings, material of construction, fabrication, inspection and testing etc.

3.5.2 For vessels coming under the purview of Static and Mobile Pressure Vessel rules, it shall be vendor's responsibility to get approval from Petroleum & Explosives Safety Organization (PESO) pertaining to design, drawings, material of construction, fabrication, inspection and testing etc.

3.6 Internals

3.6.1 For support beams, allowable deflection shall be limited to L/325 where L is the length of the beam.

3.6.2 For plates, allowable deflection shall be limited to T/2 where T is the corroded thickness of plate.

3.6.3 Allowable stress at design temperature shall be as per applicable Code.

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4.0 FABRICATION

4.1 Head/Dished Ends

4.1.1 Dished ends shall preferably be of seamless construction. However, dished ends with one chordal weld seam are acceptable. In such cases, the width of chordal plate shall not be less than one third of the blank diameter and chordal seam shall clear nozzle opening. Intermediate heat treatment, if considered necessary, shall be carried out by the fabricator.

4.1.2 Whenever a dished end is made of more than two plates, it must have a seamless crown plate. Whenever a nozzle or a manhole is positioned at the center of the dished end, the crown plate should be larger than the nozzle /manhole reinforcing pad.

4.1.3 Wherever hot forming and subsequent heat treatment is involved, adopted procedure shall not impair the mechanical properties of the material beyond the limits specified in respective material specification.

4.2 Nozzles, Manholes, Handholes and Attachments

4.2.1 Manhole cover shall be provided with a davit or hinge as per EIL standard and Handhole cover shall be provided with suitable lifting handles.

4.2.2 Inside edges of Manholes/Handholes shall be rounded off smooth with a minimum radius of 3mm.

4.2.3 All nozzles shall be set-in type, unless otherwise specified in requisition. Set on type nozzle for size 50 NB and below can be used with prior approval.

4.2.4 Reinforcing pads whenever required as per drawings or Code shall be of the same material or equivalent as the vessel component to which it is welded. All reinforcing pads shall be provided with two 1/8" (3 mm) NPT tapped holes located 180 apart for air soap solution test with a pressure of 1.25 kg/cm2 (g). This test shall also be required to be carried out for slip on flanges. Higher test pressures are not recommended because of accompanying risks and also because the soap bubbles have a chance to blow off. Tell-tale holes in the reinforcing pads shall be plugged with hard grease unless otherwise indicated after the hydro test of the vessel.

4.2.5 Wrapper plates, reinforcing pads, saddle plates or stiffeners of higher thickness than specified can be used provided there is no change in basic dimensions and with the approval from Inspection Agency. No separate deviation permit is required for the same.

4.3 Flanges

4.3.1 When tongue and groove or male and female faced flanges are used, groove or female face shall be in nozzle flange. However, when the nozzle is located in the bottom, the groove or female face shall be in the cover.

4.3.2 Dimensions of flanges shall be as per ASME B16.5 for sizes up to 600 mm NB (24" NB) and as per ASME B 16.47 series 'B' for sizes greater than 600 mm NB (24" NB).

4.4 Fasteners and Gaskets

4.4.1 All bolts/studs shall have ISO threading unless otherwise specified. Studs shall extend beyond nuts at least by 2 threads & studs shall be threaded to full length. Bolts/studs (to be tightened by hydraulic bolt tensioner) shall be longer than normal length by minimum 1 nut diameter.

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Hydraulic bolt tensioner shall be used for following bolt sizes and conditions and shall be supplied by vendor unless otherwise specified in the Requisition:

Nominal Bolt Size	Conditions
All Sizes	When specified by Process Licensor/Project specifications
50 mm and Over	All flange joints
38 mm and to 50 mm	Class 600 and above
	Hydrogen service (Partial Pressure of Hydrogen > 7 Kg/cm2g)
	Design Temperature above 370oC
	Inlet, outlet and quench nozzle flanges of reactors/separators (#)
25 mm to 38 mm	Design Temperature above 370oC
	Inlet, outlet and quench nozzle flanges of reactors/separators (#)

Applicable only for Hydrocracker/DHDT/DHDS/VGO-HDT Reactors and Hot & Cold Separators.

4.4.2 All internal bolts shall be provided with double nuts.

4.4.3 Threads on external bolting shall be lubricated with graphite grease for working temperature up to 200°C and with Molybdenum Di-sulphide for higher temperature.

4.4.4 In addition to stamping of the specifications & manufacturer's symbol as specified in ASME material specifications, size shall be clearly punch marked on one of the ends of the stud. Similarly, the nuts shall have the size punch marked on one of the faces. In case of tapped hole the size shall be punch marked near the hole without disturbing the gasket seating area. Further for all alloy/SS metallurgy bolts & nuts shall also be identified by distinct color marking at the stud end/bolt side face.

4.4.5 Gaskets shall conform to ASME B16.20 and ASME B 16.21.

4.5 Internals and Externals

4.5.1 All removable internals shall pass through the manhole.

4.5.2 Internal baffles, tray support beams or other internals spanning a chord or diameter of the vessel shall be provided with means to allow differential thermal expansion between the part and the vessel shell.

4.5.3 Internal pressure piping shall be seamless and of same specification as the external connected piping. However internal non-pressure piping can be either seamless or welded type.

4.5.4 Internal flanges for pressure piping shall be forged flanges. However internal flanges for non-pressure piping can be fabricated from plate.

4.5.5 Tray/seal pan support rings, downcomer bolting bars and all internals, beam supports welded to the vessel shall be supplied and welded by vessel fabricator in accordance with the details furnished by EIL.

4.5.6 The internal baskets, mesh screens, support grid, distributor/mixing trays, distributor pipes, outlet collector etc. of equipment shall be fitted at shop unless otherwise specified in requisition. Equipment shall be transported along with internals fitted. Temporary wedges (if required) shall be provided for supporting the internals which shall be removed by mechanical contractor at site under vendor's supervision unless otherwise specified. Additionally, manway panels shall be provided for mesh screens, support grids, distributor/mixing trays etc. to ensure accessibility for future inspection, loading/unloading of catalyst/inert balls etc.

In case the internals are to be supplied loose as per requisition, the internal baskets, mesh screens, support grid, distributor/mixing trays, distributor pipes, outlet collector etc. of equipment shall be trial fitted,

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then removed and crated for dispatch with vessel. These items should be tagged for field identification and installation.

4.5.7 All externals shall be supplied and welded by vessel fabricator in accordance with the details furnished by EIL.

4.5.8 Internal perforated plate inside the vessel shall be removable type unless specified otherwise and should be able to pass through nearest manhole.

4.5.9 Unless specified otherwise, Full support rings shall be provided below catalyst bed to support same.

4.6 Name Plate

Each vessel shall be supplied with EIL name plate and manufacturer name plate as per EIL Standards.

4.7 Welding

4.7.1 Flame cut edges shall be ground by the fabricator as required to remove slag, detrimental discoloration and non-uniformity of edges.

4.7.2 All pressure bearing butt welds shall be full penetration, double welded joints. When second side welding is not possible due to inaccessibility, single welded butt joints with root run by Tungsten Inert Gas Process (TIG) can be used to ensure full penetration. Backing strip can be used only after obtaining prior approval from EIL. For sub-zero temperatures, backing strips shall not be used.

4.7.3 Nozzles and Manways and their reinforcement pads shall be attached to vessel with full penetration welds.

4.7.4 Seams in supporting skirt shall be made with full penetration butt welds. Connections between skirt and vessel head shall be made with a smooth flat faced weld unless otherwise indicated in the engineering data sheet. Width of the weld at skirt end shall be equal to the skirt thickness and its height shall at least be twice its width.

4.7.5 All main weld seams shall be clear of nozzles, reinforcement pads, internals, tray support rings, cleats and stiffening rings by 50 mm minimum (weld edge to weld edge). In case the same is unavoidable following requirements shall apply:

a) Nozzles without reinforcing pad

i) Any weld seam having distance (weld edge to weld edge) to nozzles within 50 mm (but not fouling with weld seam) shall be fully radiographed and dye penetrant examined to a length equal to 100 mm on each side measured from nearest point to nozzle edge.

ii) Any weld seam fouling with nozzle opening shall be fully radiographed and dye penetrant examined to a length equal to 3 times of outside diameter of nozzle i.e. 1.5 times of outside diameter of nozzle on each side after installation of nozzles. Nozzle to vessel fillet weld shall be provided with smooth concave radius.

b) Nozzles with reinforcing pad

i) Any weld seam having distance (weld edge to weld edge) to reinforcing pad within 50 mm (but not fouling with weld seam) shall be fully radiographed and dye penetrant examined to a length equal to 100 mm on each side measured from nearest point to reinforcing pad edge.

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ii) Any weld seam not fouling with nozzle opening but coming under reinforcement pad shall be ground flush, fully radiographed and dye penetrant examined to a length equal to portion of weld seam below reinforcement pad + 100 mm on each side.

iii) Any weld seam fouling with nozzle opening shall be ground flush, fully radiographed and dye penetrant examined to a length equal to higher of 3 times of outside diameter of nozzle i.e. 1.5 times of outside diameter of nozzle on each side or length equal to portion of weld seam below reinforcement pad + 100 mm on each side.

In case other attachments like internals, tray support rings, cleats etc. is fouling with weld seam, the weld seam portion coming under the attachment plus 100 mm length on each side shall be ground flush, fully radiographed and dye penetrant examined before welding of any such attachment.

4.7.6 Vendor shall submit welding procedure specification and qualification record to purchaser's inspector or authorized representative for approval as per ASME Boiler and Pressure Vessels Code Section IX.

Previously qualified welding Procedure Qualification Record (PQR) under EIL, CEIL, Lloyds, DNV, TUV and Bureau Veritas shall also be acceptable.

4.7.7 Welding consumables shall be as per ASME Boiler and Pressure Vessel Code Sec. II Part C and shall be indicated in fabrication drawings.

4.7.8 Welding shall not commence unless the concerned procedures are approved.

4.7.9 Only welders who are qualified in the accepted procedure shall be employed for welding.

4.7.10 All internal/external attachments (nozzles, cleats etc.) with fillet welds to the vessel pressure components in case of Hydrogen service, cyclic service and vessels with design temperature (-)29oC and lower, vessels with design temperature 370oC and higher for carbon steel and 425oC and higher for low alloy steel shall be ground smooth and generous concave contour shall be provided.

4.7.11 Minimum shell course width shall be 1 meter. Maximum no. of longitudinal seams shall be as follows:

(a)	vessels up to 2 meter diameter	:	1 seam
(b)	vessels from 2 meter up to 4 meter diameter	:	2 seam
(c)	vessels from 4 meter up to 6 meter diameter	:	3 seam
(d)	vessels beyond 6 meter diameter	:	seam nos. can be proportionately decided

4.8 Post Weld Heat Treatment

4.8.1 Vessels shall be post weld heat treated when specified on the engineering drawings. In no case shall the post weld heat treatment performed be less than that specified in the code.

4.8.2 Vessels shall be post weld heat treated as a complete unit including skirt/support, wherever practicable.

4.8.3 All flange faces shall be suitably protected against oxidation during post weld heat treatment.

4.9 Tolerances

4.9.1 Tolerances shall be as per drawing/standard/code.

4.9.2 For dimensions not provided with tolerances, fabricator shall maintain dimensions as per good engineering practice.

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5.0 INSPECTION & TESTING

5.1 All vessels shall be offered for inspection to purchaser or his authorized inspector.

5.2 Inspectors shall have free access to all workshops of contractors or sub-contractors.

5.3 Inspection shall be carried out both during fabrication and before delivery and also for sub-ordered materials, if any. In addition to final inspection and certification by Inspector, Inspector's written approval shall be obtained by the manufacturer at all stages of fabrication including, but not limited to the following:

a) Raw material identification

b) Edge preparation for welding, including visual check for laminations.

c) Alignment of longitudinal seams.

d) Rolling tolerance on individual sections

e) Alignment of sections

f) Root pass clearing before welding.

g) Nozzle setting.

h) Dimensional check.

i) Radiographic / Ultrasonic Examination.

j) Dye penetrant examination/Magnetic particle examination.

k) Stress relieving.

l) Calibration records of measuring instruments.

m) Pressure Test (Hydrostatic/Pneumatic test).

n) Any other special test such as for leak, corrosion, hardness etc.

o) Surface preparation, primer and painting.

5.4 Radiography

5.4.1 The extent of radiography shall be as specified on the engineering drawings. In no case shall the radiographic examination be less than that specified in the code. However, spot radiography is the minimum requirement for all vessels.

5.4.2 When spot radiography is specified, the following requirements shall supplement the requirements specified in ASME Section VIII Division I:

Each category A or B pressure containing weld shall be spot radiographed in accordance with ASME Section-VIII Division-I, paragraph UW-52 as a minimum requirement. Each Spot radiograph shall be a minimum of six inches (150mm) in length and minimum one spot shall be selected in each circumferential & longitudinal seam. Additionally, at least one T-joint in each circumferential seam shall also be selected. Welds from each welding procedure, welded/welding operator shall be examined. DIA shall be consulted in marking the areas to be radiographed.

5.4.3 All nozzles fabricated from plate, irrespective of thickness of plate, shall be 100% radiographed. When Full radiography is specified due to Service requirement, 100% radiography shall be carried out of all butt welds including nozzle flange to nozzle neck, pipe to pipe and pipe to fitting.

5.4.4 Weld seams of formed ends shall be 100% radiographed after forming and heat treatment, if any.

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5.4.5 The specified radiography of welds may be performed before or after post weld heat treatment (PWHT). If performed before PWHT, an additional radiography or alternatively, ultrasonic examination shall be performed after PWHT.

5.4.6 The technique employed and the weld quality achieved shall meet the requirement of the code.

5.4.7 If vendor intends to carry out radiography by Computed Radiography technique, then demo should be carried out under AI to prove vendor's capability to produce acceptable images meeting the Code requirements.

5.4.8 In case Supplier want to perform UT in lieu of RT based on Code para UW 51 (a) (4), the same is acceptable for Carbon Steel and Low Alloy Steel materials subject to the following:

a) The thickness of weld is greater than 13 mm.

b) The joint is either Category A or Category B joint except shell to hemispherical dished end joint. (Category of joint as defined by Code).

c) Automated recordable UT machine incorporating TOFD and pulse echo probes or TOFD and Phased Array mounted on the same chassis that automatically traverses along the joints to be inspected and displaying both results simultaneously on a single screen may be considered in lieu of RT.

d) Calibration block of similar material & thickness shall be used. Calibration block shall have suitable notches to simulate longitudinal as well as transverse cracks on outside and inside surface. Setup should be capable of detecting defects on outside as well as inside while scanning from one surface only.

e) The system that is proposed to be deployed in lieu of radiography shall be submitted along with the track record prior to use for EIL review. The Supplier shall demonstrate successfully the capability of AUT machine and the defects evaluation in the same screen during the site visit of EIL representative. Based on which, the approval of the parties and their AUT system shall be given.

f) Qualified NDT persons shall be deployed to perform UT.

g) Acceptance criteria shall be as per Code para UW 51.

5.5 All nozzle to shell welds (Root and Final run) shall be examined by magnetic particle/ Dye- penetrant examination.

5.6 Hydrostatic Test

5.6.1 All necessary precautions shall be taken to guard against the risk of brittle fracture during hydrostatic test in the shop and at site. The temperature of testing medium shall be as per Code. Prior to hydrostatic test, all weld spatter, weld stubs, scale, dirt etc. shall be removed from vessel.

5.6.2 Hydrostatic test shall be conducted at pressures mentioned in engineering drawings after complete fabrication and post weld heat treatment, as applicable. After hydrostatic testing, Equipment shall be completely dried by passing hot air for sufficient time until no further increase in relative humidity of outgoing air is observed. Alternatively vacuum drying of the equipment is also acceptable.

5.6.3 Clean potable water shall be used for hydrotest. Sea water shall not be used.

5.6.4 During hydrotest, care shall be taken to avoid local stresses in shell from exceeding 90 % of the yield strength of the material at the temporary saddle supports.

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5.6.5 Vessels shall not be painted or coated either internally or externally prior to the hydrostatic pressure tested.

5.7 For all weld overlays used in hydrogen or H2S service with design temperature greater than 350oC, Hydrogen disbonding test shall be carried out. The test condition shall be representative of the actual design conditions and the procedure shall be submitted to Inspection Agency for approval. Rate of cooling shall be 100oC/hr (min.) unless specified otherwise in datasheets. Holding time shall be 48 hours unless specified otherwise in datasheets.

5.8 Vendor shall ensure that all alloy steel and stainless steel material are properly identified and finally check tested by a PMI analyzer before dispatch of equipment as per EIL Specification 6-81-0001.

6.0 SUPPLY

6.1 Surface Cleaning and Painting

6.1.1 Surface cleaning and painting shall be as per standard specification for shop and field painting (6-44-0004) or as per job specification as applicable. Paint system shall be selected as per the environments specified on engineering drawing.

6.1.2 All completed equipment shall be cleaned internally and externally to remove scale, dirt, sand, water and foreign matter.

6.1.3 All flanged faces and other machined surfaces shall be greased or protected with rust preventive coating.

6.1.4 Except for machined surfaces, all exterior surfaces of vessels and columns including skirts and integral supports shall be painted to prevent rust, corrosion or damage during transit and storage before erection and final painting.

6.2 Marking

In addition to General purchase conditions, the following requirements shall also be complied with:

6.2.1 All loose components such as studs, nuts, washers, gaskets etc. shall be packed in crates and shall be marked for the project, consignee, consigner, job number, item number, order number, gross and net weight, dimensions etc.

6.2.2 Additional indications such as North/East/South/West along with center of gravity shall be clearly marked with white paint.

6.2.3 Vessels which have been post weld heat treated or have an applied lining, e.g. lead, glass, rubber etc., shall have a suitable warning printed on the visible portion on the outside of vessel.

6.2.4 Specific marking with white paint for slinging shall be provided for all heavy lifts weighing 5 tons and above.

6.2.5 A copy of packing list shall accompany the material enclosed in a water tight envelope fastened inside a shell connection with an identifying arrow sign "Documents" applied with indelible paint.

6.2.6 If it is necessary to separate the unit into different parts for transportation all components and subassemblies shall be carefully identified and match marked to prevent any error in assembly.

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6.3 Packing and Shipment

In addition to General Purchase Conditions, the following requirement shall also be complied with:

6.3.1 Packing

a) Vessels, unless provided with their own steel saddles for entire protection, shall be provided with suitable wooden/steel saddles with steel ties and tension rods. The minimum height of the saddle shall correspond to the maximum projected length of the connected attachments, plus an additional clearance of 45mm. Saddles spacing shall depend on the length of the equipment.

b) Equipment shall be provided with suitable type and adequate number of supports to prevent any deformation during transportation and handling. These supports shall not be removed until the equipment is placed in position at job site.

c) All connections/protrusions shall be suitably protected. Flanges shall be provided with bolts on metal covers (minimum 5 mm thk) using at least four bolts. (Wiring on covers is not acceptable). For ocean shipment, flanged openings shall be additionally covered with heavy plastic bags taped to nozzle. All tell-tale holes shall be plugged with hard grease before dispatch. Tapped orifices shall have threaded plugs.

d) Fragile or machined components shall be especially protected against nature during handling and transit.

e) Pre-fabricated sections shall be protected by temporary stiffeners at each non-supported end. Edges of plates for section to be welded shall also be protected.

6.3.2 Shipment

All dispatches of equipment shall be done in accordance with the relevant terms of the Purchase Order.

7.0 GUARANTEE

Unless otherwise specified in General Purchase conditions regarding guarantee, the following shall govern:

7.1 Manufacturer shall guarantee that all materials used in the equipment are new and have been submitted to regular acceptance procedure and are free from any defect regarding quality, form and appearance.

7.2 Vessel(s) shall be guaranteed for design, raw materials and workmanship for a duration as defined in General Purchase Conditions. When design has been carried out by EIL, the word design shall be excluded from the guarantee clause. The manufacturer shall be completely responsible for any design work carried out by him. EIL's approval of his design will not relieve him of his responsibility to ensure satisfactory performance of such item.

7.3 Approval of work by EIL or release of vessels for shipment shall in no way release or relieve the manufacturer of any responsibility for carrying out all provisions of this specification.

8.0 SITE FABRICATION AND ERECTION

8.1 Where size or shape of vessel makes it impossible to ship it in one piece, the fabricator shall ship number of shop fabricated sections as defined in requisition. Assembly and testing shall be completed by vessel fabricator at site in horizontal position (for erection by others) in strict accordance with the provisions of applicable order/specification.

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8.2 Where size or shape of vessel makes it impossible to erect in single piece, the fabricator shall ship number of shop fabricated sections as defined in requisition. Erection, assembly and testing shall be completed by vessel fabricator at site in vertical position in strict accordance with the provisions of the applicable purchase order/specifications.

8.3 In either of the above two cases, the following additional requirements shall apply:

8.3.1 All pieces shall be shop fit up into sections and each section fit to the adjacent one by the fabricator and all pieces match marked thereafter.

8.3.2 Suitable erection lugs /tailing lugs and locating pins shall be provided by the fabricator to ensure proper fit up & handling of the equipment.

8.3.3 All radiographic requirements for welds completed in the shop shall be made by the fabricator before the part of section leaves the shop.

8.3.4 For equipment requiring PWHT, complete or local PWHT may be carried out at site.

8.4 All lifting lugs/trunnions and tailing lugs shall be designed with an impact factor of minimum 1.5 unless otherwise specified.

9.0 DATA FOLDER

Manufacturer shall complete requisite copies of data folder as required in purchase order. This folder shall contain the following information duly certified by Inspector:

a) Manufacturer's Code Certificate

b) Fabrication drawing of vessel showing 'As Built' dimensions and 'As Built' erection weight.

c) Material Test Certificates with their cast /heat and test numbers

d) Welding procedure qualification reports

e) Welder qualification reports

f) Radiographic results

g) Ultrasonic, Magnetic particle, Dye-penetrant test results (if applicable)

h) Hardness, corrosion and leak test records (if applicable)

i) Record charts showing complete heat treatment cycle (if applicable)

j) Production test coupon results (if applicable)

k) Charpy V notch test results (if applicable)

l) Record chart of pressure test (Hydrostatic and/or pneumatic)

m) Rubbing of name plate

n) Any other documentation as required in the purchase requisition/purchase order.

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कार्बन स्टील वैसल्स के पूरक विनिर्देश

SUPPLEMENTARY SPECIFICATION FOR CARBON STEEL VESSELS

Rev. No	Date	Purpose	Prepared by	Checked by	Standards Committee Convenor	Standards Bureau Chairman
					Approved by	
9	23.11.2023	REVISED AND REISSUED AS STD. SPEC.	PSV	TK	KA/NK	MN
8	26.06.2018	REAFFIRMED AND REISSUED AS STD. SPEC.	SK	TK	KJH	RKT
7	30.06.2010	REVISED AND REISSUED AS STD. SPEC.	KA	RKT	AKM/DM	N.DUARI
6	25.09.09	REVISED AND REISSUED AS STD. SPEC.	VB	RKG	AKM	N.DUARI
5	12.04.04	REVISED AND REISSUED AS STD. SPEC.	DNN	AKM	SSA	SKG

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Abbreviations:

ASME	:	American Society of Mechanical Engineers
BHN	:	Brinell Hardness Number
HAZ	:	Heat Affected Zone
LWN	:	Long Weld Neck
NB	:	Nominal Bore
PWHT	:	Post Weld Heat Treatment
UTS	:	Ultimate Tensile Strength

Static Equipment Standards Committee

Convenor: Mr. Nalin Kumar

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Mr. Tarun Kumar (Emp. No. A328)
Mr. Tarun Khurana (Coordinator)
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Mr. Ayush Mathur (Project)
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Mr. Avdhesh Agarwal (SCM- Inspection)

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4.0 FABRICATION 4

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1.0 SCOPE

This supplementary specification indicating additional requirements for fusion welded carbon steel vessels shall form addenda to General Specification for Pressure Vessels (6-12-0001) in its latest revision.

2.0 DESIGN

Reinforcement for nozzle openings shall be self reinforced type for equipment where nominal thickness of shell/head exceeds 50 mm. Nozzles of size up to 50 NB LWN can be used in place of self reinforced nozzles.

3.0 ELECTRODES

3.1 Electrodes conforming to following specification shall be used. In case of any deviation, prior approval from EIL shall be obtained.

S. No.	Material to be welded		Electrode Specification
1.	General Structure Welding	:	ASME IIC SFA 5.1 E-6013
2.	Pressure Parts		
a.	Steels with UTS upto 70,000 psi	:	ASME IIC SFA 5.1 E7016/ E7018
b.	Steels with UTS upto 80,000 psi	:	ASME IIC SFA 5.5 E8016-X/ E8018-XX depending upon the alloy element.
c.	Low temperature service		
	Below 0°C and upto (-) 46°C Steels to SA-516 / 516M, SA-537 / 537M, SA-333 / 333M Gr. 6 and SA-350 / 350M LF2	:	ASME IIC SFA 5.1 E 7016-1/ E7018-1

3.2 All electrodes and fluxes shall be properly baked/dried as per manufacturer's recommendation before use.

3.2.1 All bare electrodes and fluxes shall be selected as per ASME IIC .All weld metal shall have equal or better mechanical properties than the parent metal.

3.2.2 Only dry flux shall be used.

4.0 FABRICATION

4.1 Plate Forming

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4.1.1 Forming of shell plates and heads shall be carried out by machine, either hot or cold, in such a way so as to preserve the specified material properties and to produce a regular finish.

4.1.2 Magnetic particle/Dye penetrant examination shall be carried out on the outside and inside surfaces including edges of torispherical or elliptical heads in knuckle zone, after forming, for detection of cracks.

4.2 Edge Preparation

4.2.1 The preparation of edges to be welded shall be done by machining, chipping, grinding, cold shearing, Oxy- acetylene flame cutting or a combination of these.

4.2.2 Chipping shall be followed by grinding to a smooth and regular finish.

4.2.3 Oxy-acetylene flame cutting done in any circumstances, shall be followed by machining or grinding to eliminate any discolouration of material affected.

4.2.4 All welding edges shall be checked by Magnetic particle/Dye penetrant examination for detection of cracks, laminations or segregations.

4.2.5 No welding shall be carried out when ambient temperature is less than 10° Celsius unless preheating is carried out.

4.3 Heat Treatment

4.3.1 Heat treatment of formed parts shall be carried out as per following:

a. Cold formed dished ends or knuckles shall be stress relieved, unless otherwise specified in requisition.

b. Hot formed dished ends or similar parts, which have not been uniformly heated in the normalising range in the final stages of manufacture shall be normalised.

c. When the completed vessel involves post weld heat treatment, heat treatment recommended in (a) above shall not be applicable.

4.3.2 Vessels in Hydrogen/Amine/ Sour (Wet H_2S)/Cyclic/Caustic/HIC service shall be PWHT.

4.4 Production Weld Tests

Production Weld Tests shall be applicable for vessels over 50 mm nominal thickness. The following requirements shall apply:

a. Two production test plate coupons representative of one longitudinal and another circumferential seam shall be provided for each procedure, position and thickness in each vessel shell.

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b. One production test plate representative of the weld seams shall be provided for each procedure, position and thickness for welded dished ends/cones.

c. The production test plate shall be from material of the same heat and thickness as of shell/head/cone as applicable. During and after welding, the test plates shall be subjected to same heat treatment as and together with the course they represent. Extra coupons shall be preserved to take care of eventuality of retests.

d. The tests mentioned below shall be carried out as per methods of testing in governing codes:

i. One transverse tension test

ii. Two side bend tests with weld located in the centre of bend.

iii. Hardness test on production test coupon weld & HAZ (Hardness limitations shall comply with requirement of EIL Spec. 6-15-0091)

iv. Micro & macro examination of welds

v. Charpy V notch tests on weld and HAZ.

a. For low temperature service (0°C & colder) impact test temperature shall be lowest of minimum ambient temperature, design temperature and minimum design metal temperature.

b. For vessel over 50 mm nominal thickness used for warmer service, the test temperature shall be lower of 0°C or lowest ambient temperature of the site.

c. The acceptance criteria for energy absorption shall be as per Table A 2.15 of SA-20 / 20M. In case the acceptance criteria is not available in SA-20, then applicable design code shall be referred unless otherwise specified in requisition.

4.5 Hardness Survey

Hardness Limitation for Vessels, where PWHT is required shall comply with requirement of EIL Spec. 6-15-0091.

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निम्न मिश्र स्टील वैसल्स के पूरक विनिर्देश

SUPPLEMENTARY SPECIFICATION FOR LOW ALLOY STEEL VESSELS

Rev. No	Date	Purpose	Prepared by	Checked by	Standards Committee Convenor	Standards Bureau Chairman
					Approved by	
6	02.04.2024	ISSUED FOR WIDER CIRCULATION	SC	TKh	KA/NK	MN
5	28.08.2018	REVISED AND REISSUED AS STD. SPEC.	SK	TK	KJH	RKT
4	30.06.2010	REVISED AND REISSUED AS STD. SPEC.	KA	RKT	AKM/DM	N. DUARI
3	29.06.09	REAFFIRMED & REISSUED AS STD. SPECN.	VB	RKG	AKM	N. DUARI
2	23.03.04	REVISED & REISSUED AS STD. SPECN.	SCDD	DNN	SSA	SKG

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Abbreviations:

ASME	:	American Society of Mechanical Engineers
ASTM	:	American Society for Testing and Materials
BHN	:	Brinell Hardness Number
HAZ	:	Heat Affected Zone
HIC	:	Hydrogen Induced Cracking
LPG	:	Liquified Petroleum Gas
LWN	:	Long Weld Neck
NB	:	Nominal Bore
PWHT	:	Post Weld Heat Treatment

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1.0 SCOPE

This supplementary specification indicating additional requirements for fusion welded low alloy steel vessels (C-½Mo, 1Cr-½Mo, 1¼ Cr-½Mo, and 2¼ Cr-1Mo) shall form addenda to general specification for pressure vessels (6-12-0001) in its latest revision.

2.0 DESIGN

2.1 Reinforcement for nozzle openings shall be self-reinforced type for equipment where nominal thickness of shell/head exceeds 50 mm. Nozzles of size up to 50 NB LWN can be used in place of self-reinforced nozzles.

2.2 All flanges shall be of weld neck type irrespective of design condition, size and service.

3.0 MATERIALS

All external and internal attachments such as tray support rings, bolting bars, internal gussets, pipe/ladder/platform support clips, saddles, skirts, leg supports, lifting lugs etc. welded to vessel directly shall be of same material as that of shell.

4.0 WELDING AND WELDING CONSUMABLES

4.1 Welding of various materials shall be carried out using one or more of the following processes.

- Shielded Metal Arc Welding
- Gas Tungsten Arc Welding
- Submerged Arc Welding

Use of any other process shall be subject to EIL approval. All pressure bearing butt welds shall be full penetration double welded butt joints. Single welded full penetration joints may be provided when second side welding is not possible. Gas Tungsten Arc Welding shall be used for the root run of all the single welded butt joints. Backing strip joints may also be used with prior approval of EIL. Backing strip, if used, shall be removed.

4.2 Proper technique and welding procedure shall be adopted to prevent the risk of cracking of welds. All fitment and alignment clips (Bridge or C-clamps) shall be of same material as that of shell. Tack welding shall be avoided as far as possible.

4.3 Electrodes and fluxes shall be properly baked and dried as per manufacturer's recommendation before use.

4.4 The adopted welding procedure shall be such, that least amount of hydrogen is produced in the weld.

4.5 No welding shall be carried out when the ambient temperature is less than 15 C. Any welding once started should be completed in one operation as far as possible.

4.6 Welding Consumables

The manufacturer shall provide evidence that the deposited weld metal is suitable in all respects for the intended service and conform to the classification by conducting tests and/or obtaining test certificates of the batch supplied. The tests shall at least consist of chemical analysis and all weld tensile test as a minimum. The welding consumables proposed shall conform to one of the classifications listed in ASME SEC.II Part C unless specifically approved otherwise.

The welding consumables shall be selected such that for welds of similar metallurgy, the chemistry of weld shall match the chemical composition of the base material and the physical strength of weld shall

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be better or equal to the base material. Also, the corrosion properties of the filler material shall be in line with the base metal.

4.7 Hardness on base metal, welds and HAZ for all applicable materials, shall be taken and complied as per EIL spec. 6-15-0091.

5.0 FABRICATION

5.1 Dish heads and knuckles shall preferably be hot formed to prevent possible cracks during cold-forming, with intermediate checking of hardness. However, if vendor has past experience of cold forming, same is acceptable.

5.2 Magnetic particle examination shall be carried out on the formed knuckle surface (both inside and outside) of dished ends and toricones for detection of cracks.

5.3 The preparation of the edges shall be made by oxyacetylene flame cutting or by machining. Cold shearing is permitted for cutting to size up to a thickness of 10mm. Oxy acetylene flame cutting done in any circumstances shall be followed by machining or grinding to eliminate any discoloration of material affected.

5.4 Non-Destructive Test

5.4.1 All welding edges shall be checked by Magnetic Particle examination for detection of cracks, laminations or segregations.

5.4.2 The ultrasonic examination shall be carried out within 2t of material thickness (t) of all weld edges prior to welding as per ASTM A 578 with acceptance level-B.

5.4.3 External and internal surfaces of all welds shall be checked by Magnetic Particle examination after hydro-test for vessels having thickness above 50mm.

6.0 PRE AND POST WELD TREATMENT

6.1 Fabricator shall propose the preheat required for each type of weld including tack welds in the welding procedure specifications. The preheat requirements shall be established at the time of approval of welding procedure.

6.2 Preheating performed by using resistance or induction heating method shall be preferred. However, preheating by gas burners, using oxy-acetylene or LPG with neutral flame may be acceptable when permitted by the inspecting authority.

6.3 Pre heating shall extend uniformly to at least three times the thickness of the joint but not less than 50mm on both sides of the weld. Temperature indicating crayons shall be used for assessment of correct preheat temperature.

6.4 Post Heating

6.4.1 In case of P4 and P5 materials, if post-weld heat treatment is not carried out immediately after welding, the weld joint and adjacent portion of the joint at least 50mm on either side of weld shall be uniformly heated to 300°C. This temperature shall be maintained for a duration of 1 hr./inch (minimum 20 minutes) and then wrapped in asbestos or insulation before allowing it to cool to room temperature. Post weld heat treatment as applicable shall be carried out later on.

6.4.2 Post weld heating shall also be necessary for highly restrained joints or where heavy welding is carried out in a localized area for example full throat nozzle welding etc.

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6.5 Post Weld Heat Treatment

6.5.1 When PWHT is required as per code or specified in vessel design data, the procedure and scheme for PWHT shall be submitted to inspecting authority for review.

6.5.2 Heat treatment of formed parts shall be carried out as per following:

a) All cold formed dished ends or knuckles shall be stress relieved.

b) When hot forming of any part is carried out, the complete procedure including heat treatment shall be submitted to inspecting authority.

c) When any of the treatments referred to above involves a final treatment which coincides with the final post weld heat treatment of completed vessel, that part of earlier treatment may be omitted.

d) Vessels in Amine, sour, HIC, Hydrogen service, Caustic Service and cyclic services shall be stress relieved.

e) It shall be fabricator's responsibility to ensure that mechanical properties of material are not impaired during any cold / hot forming process and subsequent stress relieving heat treatment. Tests to demonstrate suitability of process shall be carried out by fabricator.

7.0 PRODUCTION WELD TESTS

Production weld tests shall be applicable for vessels over 25mm thickness. The following requirements shall apply:

a) Two production test plate coupons representative of one longitudinal and another circumferential seam shall be provided for each procedure, position and thickness in each vessel shell.

b) One production test plate representative of the weld seams shall be provided for each procedure, position and thickness for welded dished ends/cones.

c) The production test plate shall be from material of the same heat and thickness as of shell/head. During and after welding the test plates shall be subjected to same heat treatment as and together with the course they represent, extra coupons shall be preserved to take care of eventually of retests. The production test plate shall incorporate additional PWHT cycle in case the equipment closing seam is to be post weld heat treated.

d) The tests mentioned below shall be carried out as per methods of testing in governing codes:

i) One transverse tension test.

ii) Two side bend test with weld located in the center of bend.

iii) Hardness test on production test coupon weld & HAZ (Hardness limitations shall comply with requirement of EIL Spec. 6-15-0091).

iv) Micro and macro examination of welds. Microstructure shall be free from untampered martensite.

v) Charpy V notch tests on weld and HAZ.

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SUPPLEMENTARY SPECIFICATION FOR AUSTENITIC STAINLESS STEEL VESSELS

Rev. No	Date	Purpose	Prepared by	Checked by	Approved by: Standards Committee Convenor	Approved by: Standards Bureau Chairman
7	15.12.2023	REVISED AND REISSUED AS STD. SPEC.	MKP	TK	NK	MN
6	26.06.2018	REVISED AND REISSUED AS STD. SPEC.	SK	TK	KJH	RKT
5	30.06.2010	REVISED AND REISSUED AS STD. SPEC.	KA	RKT	AKM/DM	N.DUARI
4	25.09.09	REVISED AND REISSUED AS STD. SPEC	VB	RKG	AKM	N.DUARI
3	12.04.04	REVISED AND REISSUED AS STD. SPEC	DNN	AKM	SSA	SKG

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Abbreviations:

AISI	American Iron and Steel Institute
ASME	American Society of Mechanical Engineers
ASTM	American Society for Testing & Materials
AWS	American Welding Society
BHN	Brinell Hardness Number
HAZ	Heat Affected Zone
IGC	Inter Granular Corrosion
IS	Indian Standards
MIG	Metal Inert Gas
NB	Nominal Bore
TIG	Tungsten Inert Gas
PPM	Parts Per Million

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1.0 SCOPE

This supplementary specification indicating additional requirements for fusion welded austenitic stainless steel vessels shall form addenda to General Specification for Pressure Vessels (6-12-0001) in it's latest revision.

2.0 DESIGN

Reinforcement for nozzle openings shall be self-reinforced type for equipment where nominal thickness of shell/head exceeds 50 mm. Nozzles of size up to 50 NB LWN can be used in place of self-reinforced nozzles.

3.0 MATERIALS

3.1 Austenitic stainless steel plates for shell, head and other pressure parts shall be as specified in, but not limited to, the following: SA 240 Type 304, 304L, 321, 347, 316, 316L, 316Ti and 317.

3.2 Nozzle neck shall be seamless pipe in accordance with SA 312 or SA 376. However, nozzle neck above 100 mm NB size may be fabricated out of plate.

3.3 Stiffening rings, external lugs for platforms, ladders, insulation supports, pipe supports and other non-pressure parts welded to the vessel directly shall be of same material as of shell.

3.4 Insulation support ring angles and rods not welded to the shell shall be of SA 36/ IS 2062 Gr. E250 Quality A or better.

3.5 All internal parts shall be of same material as of shell.

3.6 Gaskets

For ring type joints, metal oval rings of A 182F type SS grade having hardness minimum 15 BHN less than that of flange face shall be used.

3.7 Unless otherwise specified in Material Requisition/Engineering drawing all 300 series materials shall be intergranular corrosion (IGC) tested as per ASTM A 262 Practice E. The bend test specimen shall be examined at a magnification of 200 x.

4.0 FABRICATION

4.1 Plate Forming

4.1.1 Forming of shell plates, heads and knuckles shall be carried out by machine, either hot or cold, in such a way so as to preserve the specified material properties and to produce a regular finish. If hot forming is carried out, subsequent solution annealing is required. Subsequently, micro etching test and IGC test as per ASTM A 262 Practice E unless specified otherwise in engineering drawing shall be carried out to ascertain suitability and effectiveness of solution annealing. The bend test specimen shall be examined at a magnification of 200 x.

4.1.2 Cold formed ends and knuckles shall be solution annealed if any of the following condition exists:

i) Specifically called for on Engineering Drawing.

ii) Hardness value after forming exceeds 235 BHN

iii) Nominal thickness of the plate is 16mm or above.

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4.1.3 If austenitic stainless steel is to be hot worked, it shall be heated in a neutral or an oxidising atmosphere in an oil, gas or electric furnace and shall not be allowed to come in direct contact with the flame.

4.1.4 Fit-up clips should invariably be attached only on outside portion of the equipment using approved procedures for such welding. Where clips are attached internally, these shall match the shell material. Any external attachment welded directly to shell shall match the shell material.

4.2 Plate Cutting and Edge Preparation

4.2.1 The permitted thermal cutting processes shall be plasma arc or oxy-gas flux injection in which flux is injected through oxygen cutting jet. The flux may be iron powder, Sodium Carbonate or powdered marble. Oxy-acetylene arc cutting by metal electrode shall not be permitted.

4.2.2 When thermal cutting is used, a machining or grinding allowance of 1.5 to 3.0 mm shall be provided to allow for removal of heat affected material.

4.2.3 All plate edges shall be checked by Dye Penetrant examination for detection of cracks, laminations or segregations after cutting and before carrying out further work upon them. Sheared edges shall be carefully examined for cracks.

4.3 Welding

4.3.1 As far as practicable, the welds shall be left unground so as to maintain maximum corrosion resistant surface but shall be cleaned free of weld slag, heat tint, scale and other such contaminants.

4.3.2 All welding shall be done by a metal arc process such as Manual metallic arc, Argon-arc or submerged arc welding.

4.3.3 For single side weld, root-run shall be made by TIG or MIG process and shall have inert gas shielding at the back of the weld.

4.3.4 The table below shows the acceptable consumables to be used for various base metals. Covered welding electrodes shall be in accordance with the specification AWS A5.4/ASME IIC SFA-5.4. Welding rods and bare electrodes used as filler metal shall be in accordance with the specification AWS A5.9/ASME IIC SFA-5.9.

Stainless Steels	Electrodes
Type AISI 304	E - 308
Type AISI 304L	E - 308L
Type AISI 304H	E - 308H
Type AISI 321 and 347	E - 347
Type AISI 316	E - 316L or E - 318
Type AISI 316L	E - 316L
Type AISI 316Ti	E - 318
Carbon Steel to Austenitic Stainless Steel	E - 309/ 309 Mo

4.3.5 Unless otherwise specified in Material Requisition/Engineering drawing, all consumables shall be procured with intergranular corrosion (IGC) tested as per ASTM A 262 Practice E. This shall be explicitly indicated in consumable batch test certificate.

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4.4 Pre and Post Weld Heat Treatment

4.4.1 For austenitic stainless steel, no preheat would be necessary but care shall be taken to maintain inter pass temperature of 100°C.

4.4.2 Whenever heat treatment on stainless steel is carried out, it shall be followed by Micro etching test and IGC test as per ASTM A 262 Practice E, unless specified otherwise, to ascertain suitability and effectiveness of solution annealing. The bend test specimen shall be examined at a magnification of 200 x.

4.5 Non-Destructive Test

4.5.1 All cold formed dished ends, cones, tori conical sections etc. shall be checked for surface cracks by dye penetrant method after heat treatment, if any, on the inside and outside.

4.5.2 Dye-penetrant examination shall be carried out for weld root, back chip and final run for detection of cracks.

4.5.3 Unless otherwise specified in Material Requisition/Engineering drawing, IGC test shall be carried out at HAZ and weld as per ASTM A 262 Practice E unless specified otherwise. The bend test specimen shall be examined at a magnification of 200 x.

4.6 Surface Cleaning

4.6.1 In order to obtain adequate corrosion resistance, the surface of stainless steel (both inside and outside) must be cleaned of oxides, scale and welding flux. This shall be done using stainless steel wire brushes.

4.6.2 All paint shall be removed from the vessel surface using suitable solvent and stainless steel brushes. The solvent shall not be harmful to the vessel and free from chlorides and fluorides.

4.6.3 All oil and grease shall be removed using hot clean water and suitable detergent. All traces of detergent shall be removed with several rinses of clean water.

4.6.4 After completion of fabrication and testing, all stainless steel surfaces (both inside and outside) shall be pickled and passivated in accordance with ASTM A 380. The pickling and passivation procedure shall be submitted to EIL for approval.

5.0 HYDROTEST

5.1 Clean fresh water shall be the primary hydrostatic test medium unless use of a different medium is approved by the purchaser. Hydrostatic testing of austenitic stainless steel vessels shall be done with potable quality water having chloride content less than 50 PPM.

5.2 If chloride content is greater than 50 PPM and up to a maximum of 150 PPM, a sufficient quantity of Sodium Nitrate shall be added to provide a test medium of 0.5% by weight Sodium Nitrate Solution. Water with a chloride content of greater than 150 PPM shall not be used for hydrotesting.

After hydrotesting, vessels shall be dried thoroughly using hot air, immediately after draining to prevent the possibility of evaporation and concentration of chlorides.

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क्लैड वैसल्स के पूरक विनिर्देश

SUPPLEMENTARY SPECIFICATION FOR CLAD VESSELS

Rev. No	Date	Purpose	Prepared by	Checked by	Standards Committee Convenor	Standards Bureau Chairman
					Approved by	
6	27.03.23	REVISED AND REISSUED AS STD. SPEC	NSK 27/03/23	TK 27/03/23	NK 29/3/23	SM 31/3/23
5	24.08.18	REAFFIRMED AND REISSUED AS STD. SPEC.	SK	TK	KJH	RKT
4	30.07.10	REVISED AND REISSUED AS STD. SPEC.	KA	RKT	AKM/DM	N.DUARI
3	20.11.09	REVISED AND REISSUED AS STD. SPEC.	VB	RKG	AKM	N.DUARI
2	15.04.04	REVISED AND REISSUED AS STD. SPEC.	DNN	AKM	SSA	SKG

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Abbreviations:

ASME	:	American Society of Mechanical Engineers
ASTM	:	American Society for Testing & Materials
AWS	:	American Welding Specification
GMAW:	:	Gas Metal Arc Welding
GTAW	:	Gas Tungsten Arc Welding
IGC	:	Intergranular Corrosion
NB	:	Nominal Bore
ppm	:	Parts Per Million
SAW	:	Submerged Arc Welding

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1.0 SCOPE

1.1 This supplementary specification covers the additional requirements to be followed in the manufacture of cladded steel vessels with carbon steel or low alloy steel base, clad with stainless steel or Monel. This is intended as an addenda to the General Specification for Pressure Vessels (6-12-0001)/ Supplementary Specification for C.S. Vessels (6-12-0002)/ Supplementary Specification for Low Alloy Steel Vessels (6-12-0003).

1.2 Any ambiguity or contradiction between various specifications and drawings shall be informed by fabricator to EIL and shall be resolved taking into account the following documents in the order of preference.

i) EIL Engineering Drawing/datasheets.
ii) This supplementary specification.
iii) Specifications 6-12-0001, 6-12-0002 and 6-12-0003.
iv) Vessel Design Code.

2.0 DESIGN

2.1 The design thickness, in accordance with the specified code, shall not include any material used for the corrosion resistant lining or the cladding material of the integrally clad plate. The minimum thickness of base plate shall be 5 mm.

2.2 Corrosion resistant alloy lining for shells and heads shall be integrally cladded to the base material.

2.3 Nozzles fabricated from integrally clad plates or from weld overlay construction are only permitted. Nozzles with loose liners are not permitted.

2.4 Nozzles of solid stainless steel construction on clad vessels are not permitted unless otherwise specified on the Engineering Drawing.

2.5 Flanges of nozzles and manways in clad portions of vessels shall be weld overlayed with the recommended alloy material and faced. The flange facing shall be made with weld metal overlay which is at least as thick as the vessels lining but not greater than twice the lining thickness. Weld metal overlay shall be made with minimum two passes (layers). The finish machined weld overlay shall exhibit undiluted weld metal composition at a depth of 2/3rd of the cladding thickness from the finished surface.

2.6 Necks of manways and nozzles greater than 150 mm NB shall be made from integrally clad plate. Nozzles 150 mm NB and below shall be of weld overlay construction.

3.0 MATERIALS

3.1 Clad steel plates used for the fabrication of vessels shall conform to SA 263 or SA 264 of ASME Boiler and Pressure Vessels Code Section II Part A and Standard Specification for Clad Plates (6-12-0015).

3.2 In the alloy clad portions of the vessel, all internal parts like support rings, beam seats supports and others shall be made of the alloy corresponding to the cladding in the vessel or as specified in the engineering data sheets.

4.0 FABRICATION

Cold working shall be preferred. If hot working is carried out, it should be followed by

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suitable heat treatment to ensure that the required material properties are achieved in the final product.

5.0 WELDING

5.1 Alloy weld deposit / restoration at weld seam location shall be made of at least two layers.

5.1.1 For weld cladding, appropriate welding consumables that will yield the compatible composition as that of clad material shall be used.

5.1.2 The recommended SMAW welding consumables for welding different clad plates shall be as listed below. However for achieving the undiluted composition at the desired depth of 2/3rd of the cladding thickness from finished surface, intermediate grinding or half bead technique shall be used. Alternatively low dilution processes such as pulsed Gas Metal Arc Welding (P-GMAW) or Electro-slag Welding process with appropriate welding consumables shall be used for achieving the correct dilution and composition requirement.

CLADDING	APPLIED LINING	BARRIER /FIRST LAYER	TOP LAYER
A 263	A 240 TYPE 405,410S	(2)	(8)
A 264	A 240 TYPE 304	(1)	(3)
A 264	A 240 TYPE 304L	(1)	(4)
A 264	A 240 TYPE 316	(2)	(5)
A 264	A 240 TYPE 316L	(2)	(6)
A 264	A 240 TYPE 321 & 347	(2)	(7)
A 265	B-127	(10)	(9)

	SPECIFICATION	ELECTRODE CLASSIFICATION
(1)	AWS A 5.4, ASME SFA 5.4	E 309L
(2)	AWS A 5.4, ASME SFA 5.4	E 309 MoL
(3)	AWS A 5.4, ASME SFA 5.4	E 308
(4)	AWS A 5.4, ASME SFA 5.4	E 308L
(5)	AWS A 5.4, ASME SFA 5.4	E 316
(6)	AWS A 5.4, ASME SFA 5.4	E 316L
(7)	AWS A 5.4, ASME SFA 5.4	E 347
(8)	AWS A 5.4, ASME SFA 5.4	E 410S / E 430/ E 309LMo/ E NiCrFe-2 /ENiCrFe-3
(9)	AWS A 5.11, ASME SFA	E Ni Cu7
(10)	AWS A 5.11, ASME SFA	ENi1

ENiCrFe-2/ENiCrFe-3/ENiCrMo-3 shall be as per AWS 5.11, ASME SFA 5.11.

5.1.3 Stainless steel Filler metals for GTAW, GMAW, SAW Process made in accordance with corresponding AWS/ASME SFA specification with the compositions similar to those listed above shall be used after approval.

5.1.4 For welding of clad piping components such as pipe to pipe/pipe fitting from single side where approach from clad side is not accessible, shall be done with a welding consumable matching the clad material followed by an intermediate layer of pure iron welding filler material and then by a welding consumable matching the base material.

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