

**APPENDIX 2. Power Plant Documents**

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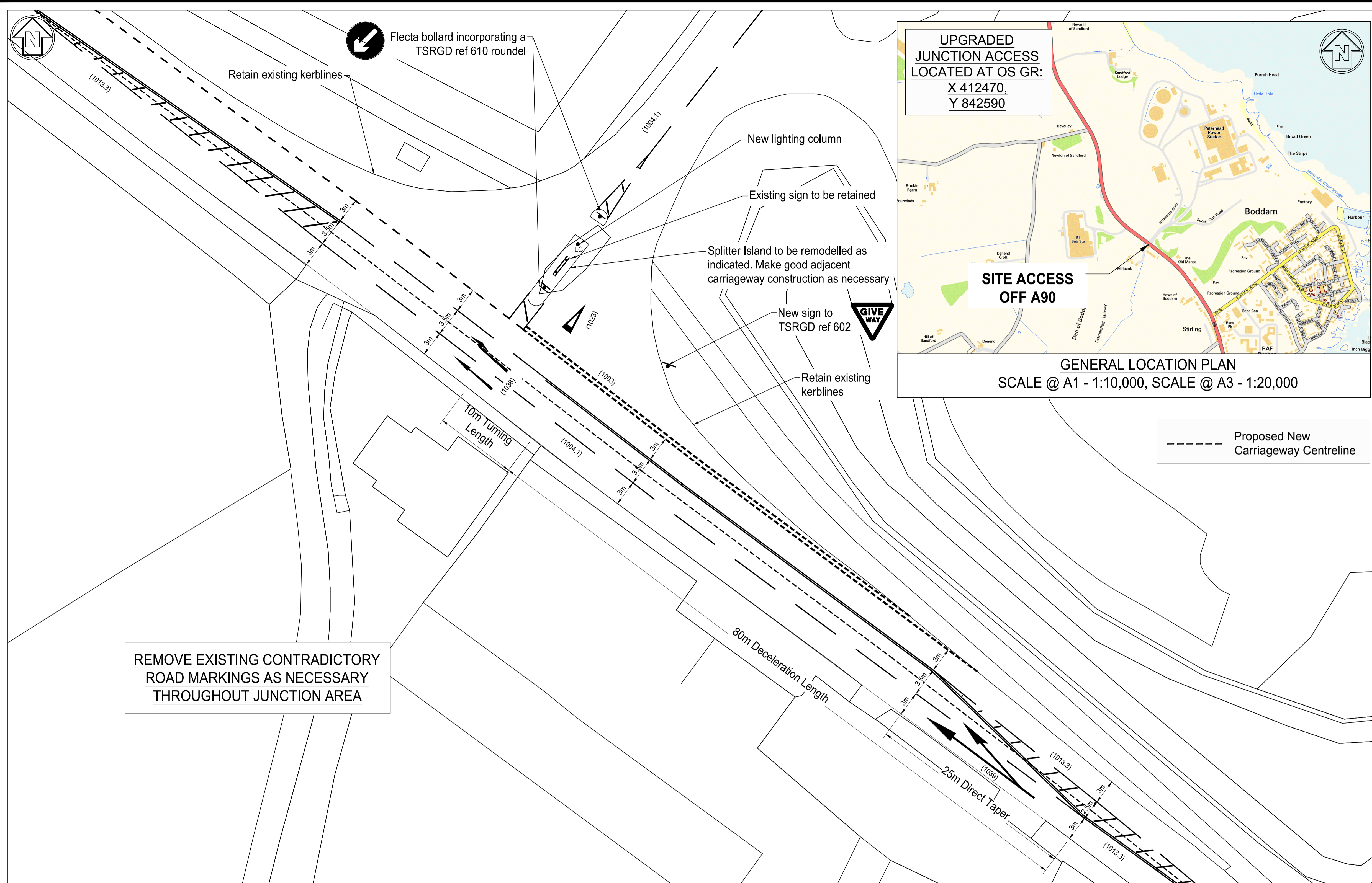
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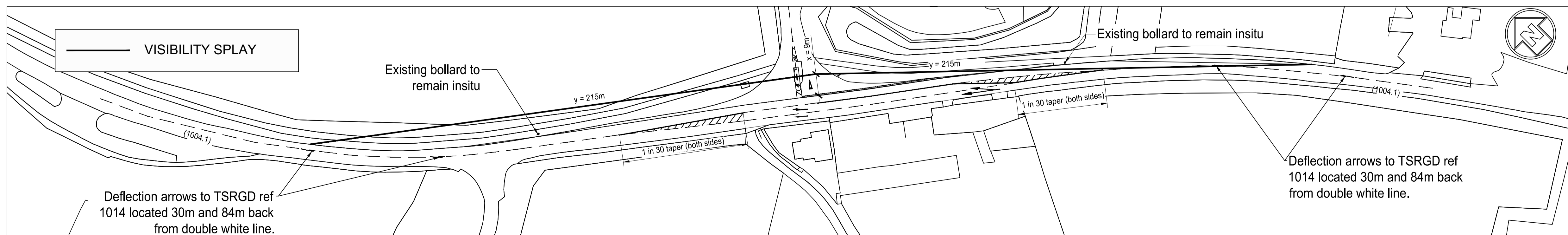
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001	DISTRIBUTION,	
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Note 1. The Process Description and the Heat and Material Balance documents do not include the impact of the Gas Turbine Upgrades and they will be updated in the Detailed Design phase to reflect the amended scope.

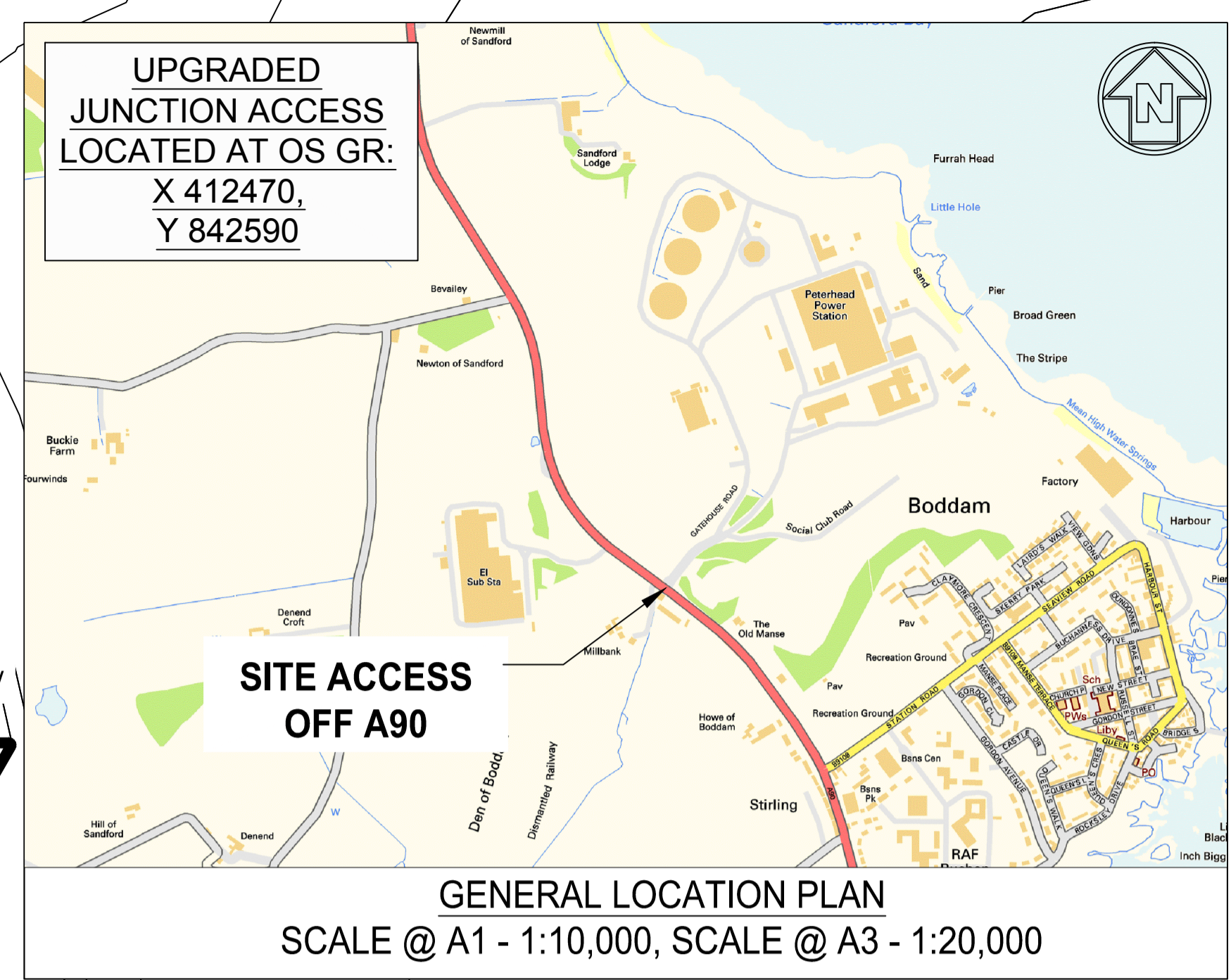




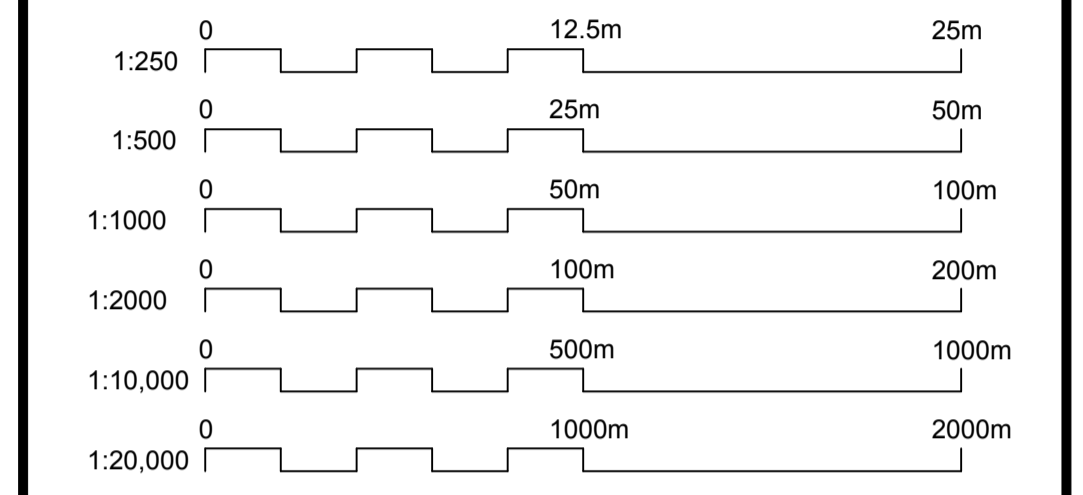
GENERAL ARRANGEMENT PLAN  
Scale @ A1 - 1:250, SCALE @ A3 - 1:500



VISIBILITY SPLAYS  
SCALE @ A1 - 1:1,000, SCALE @ A3 - 1:2,000



- Notes
- GENERAL
1. ALL DIMENSIONS ARE IN METRES UNLESS NOTED OTHERWISE.
  2. ALL LEVELS ARE IN METRES ABOVE ORDNANCE DATUM.
  3. BASE MAPPING REPRODUCED FROM OS DIGITAL DATA BY PERMISSION OF ORDNANCE SURVEY ON BEHALF OF THE CONTROLLER OF HER MAJESTY'S STATIONERY OFFICE CROWN COPYRIGHT 2015. ALL RIGHTS RESERVED. MOTT MACDONALD LICENCE NUMBER 100026791.
  4. ALL ROAD MARKINGS AND SIGNS TO TRAFFIC SIGNS REGULATIONS AND GENERAL DIRECTIONS (TSRGD) 2002 INDICATED THUS:- (1003)



Reference drawings and documents

Rev	Date	Drawn	Description	Ch'k'd	App'd

Client



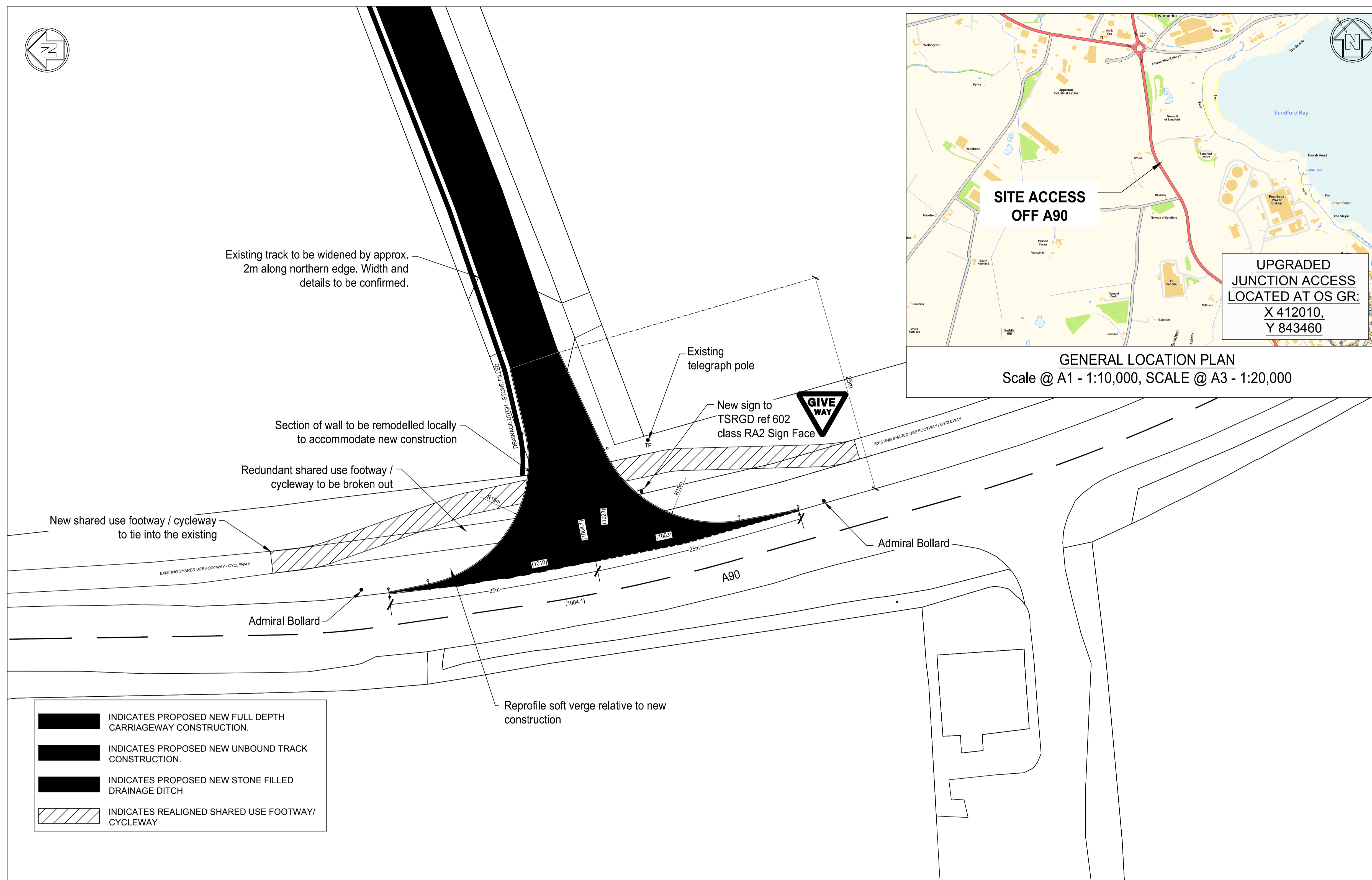
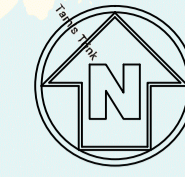
Shell UK Limited  
1 Allens Farm Road  
Nigg  
Aberdeen, AB12 3FY  
United Kingdom

Title  
**Peterhead CCS  
A90 Main Site Access  
Proposed New Layout  
- General Arrangement Plan**

Designed	Eng check		
Drawn	Coordination		
Dwg check	Approved		
Scale at A1 As Shown	Status	Rev	K01

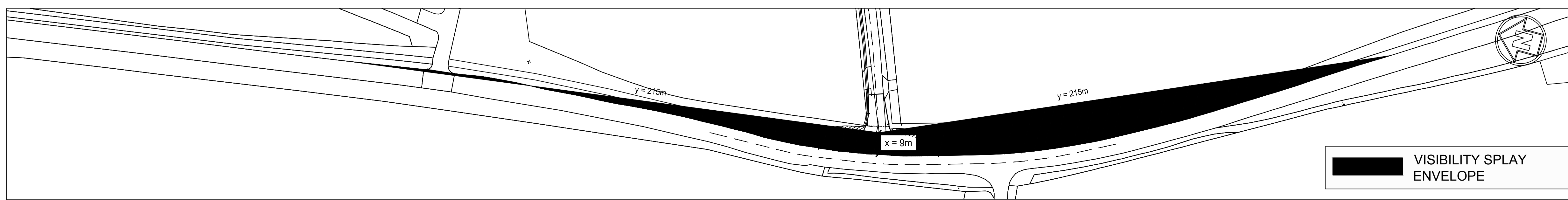
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**PCCS-01-MM-CX-4018-0001**



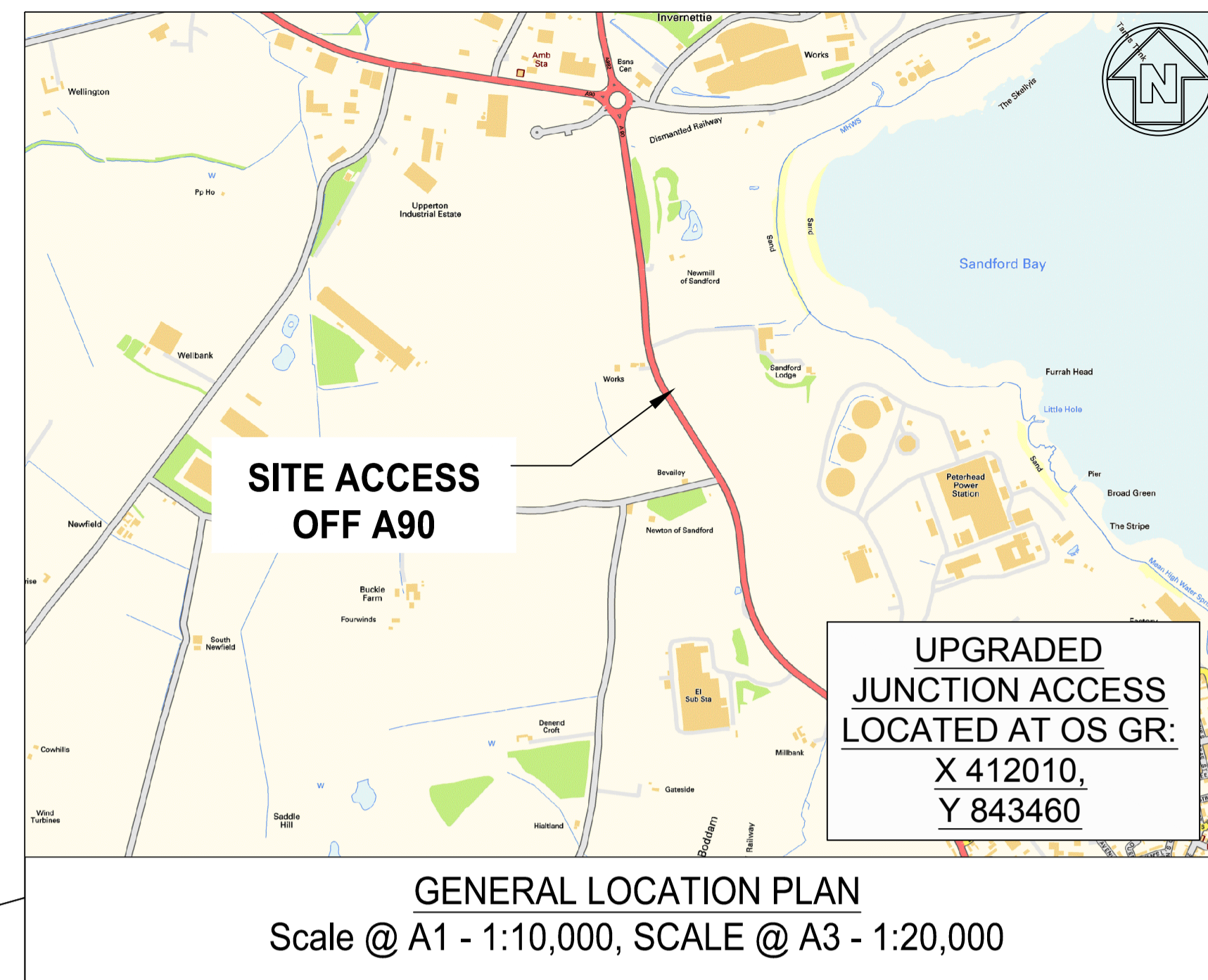


- INDICATES PROPOSED NEW FULL DEPTH CARRIAGEWAY CONSTRUCTION.
- INDICATES PROPOSED NEW UNBOUND TRACK CONSTRUCTION.
- INDICATES PROPOSED NEW STONE FILLED DRAINAGE DITCH
- INDICATES REALIGNED SHARED USE FOOTWAY/ CYCLEWAY

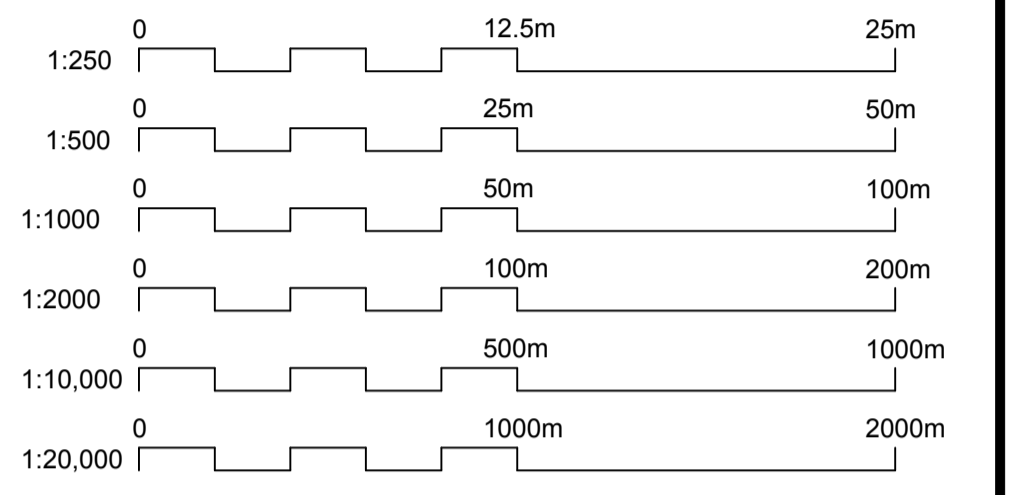
**GENERAL ARRANGEMENT PLAN**  
Scale @ A1 - 1:250, SCALE @ A3 - 1:500



**VISIBILITY SPLAYS**  
Scale @ A1 - 1:1,000, SCALE @ A3 - 1:2,000



- Notes**
- GENERAL**
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  - ALL ROAD MARKINGS AND SIGNS TO TRAFFIC SIGNS REGULATIONS AND GENERAL DIRECTIONS (TSRGD) 2002 INDICATED THUS:- (1003).
  - ADMIRAL BOLLARDS; REUSE EXISTING OR PROVIDE NEW AS APPROPRIATE.



Reference drawings and documents

Rev	Date	Drawn	Description	Ch'k'd	App'd

**Client**

Shell UK Limited  
1 Allens Farm Road  
Nigg  
Aberdeen, AB12 3FY  
United Kingdom

**Title**

Peterhead CCS  
A90 Sanford Access  
Proposed New Layout  
- General Arrangement Plan

Designed	Eng check		
Drawn	Coordination		
Dwg check	Approved		

Scale at A1 As Shown      Status      Rev      **K01**

Drawing Number      **PCCS-01-MM-CX-4018-0002**





**EQUIPMENT LIST (POWER PLANT)**

<i>ENGINEER REFERENCE</i>					Rev.	Page
					K01	1 of 8
<i>CLIENT REFERENCE</i>						
Project Code	Area/Facility Code	Originator	Discipline	Doc Type	Sequential No	
PCCS	01	TC	AA	4322	00001	

**EQUIPMENT LIST (POWER PLANT)**

Rev	Date DD/MM/YY	STATUS	WRITTEN BY (name & sign)	CHECKED BY (name & sign)	APPROVED BY (name & sign)
DOCUMENT REVISIONS					



## CONTENTS / NOTES / HOLDS

### CONTENTS

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2	CONTENTS / NOTES / HOLDS
3	VESSELS / DRUMS
4	TANKS
5	PUMPS
6	TURBINES
7	HEAT EXCHANGERS
8	MISCELLANEOUS- EXHAUST FLUE GAS DUCTING, PACKAGE ITEMS, ETC

### TYPE OF MODIFICATION

DEL	ISSUED NEW EQUIPMENT THAT IS NO LONGER REQUIRED
EMR	EXISTING - MODIFIED AND REUSED
NN	NEW EQUIPMENT ON NEW PLOT SPACE
NR	NEW EQUIPMENT ON EXISTING PLOT VACATED BY REDUNDANT EQUIPMENT

### HOLDS

### MATERIAL CODES

CS	CARBON STEEL
SS	STAINLESS STEEL
AL	ALUMINIUM
TI	TITANIUM

### NOTES

1	ALL DATA SHOWN IS FOR THE MAXIMUM DESIGN LOAD CASE WITH NO EXTRACTION TO CCP.
2	DELETED
3	NUMBER OF PUMPS TO BE FINALISED BY VENDOR.
4	INDICATIVE ONLY. STEAM TURBINE VENDOR TO CONFIRM.
5	TO BE CONFIRMED BY VENDOR.
6	TO BE DEFINED BY VENDOR.
7	DELETED
8	TOTAL VOLUME DOES NOT INCLUDE VOLUME OF HEAD.
9	APPLIES TO FUEL GAS.
10	APPLIES TO FUEL OIL.
11	SCR CATALYST NOT PRESSURE CONTAINING.
12	SPECIFIED FLOWRATE AND POWERS (REQUIRED AND INSTALLED) ARE PER PUMP IN OPERATION.
13	MAXIMUM CAPACITY IS RATED CAPACITY.
14	POWER STATED IS THE PROCESS ABSORBED POWER.
15	POWER STATED IS MOTOR RATED POWER.
16	FINAL TIE IN TO PROCESS LINE WILL HAVE A HIGHER DESIGN TEMPERATURE.
17	THIS IS NORMAL FLOW (CASE 3) ACCORDING TO THE HEAT AND MATERIAL BALANCE REV A01
18	THIS IS MAXIMUM FLOW (CASE 7) ACCORDING TO THE HEAT AND MATERIAL BALANCE REV A01
19	TWO MOCs ARE STATED (DENOTED BY "CASING/IMPELLER") FOR CASES IN WHICH IMPELLER AND CASING HAVE DIFFERENT MOC, OTHERWISE ONE MOC IS STATED.
20	PUMP DETAILS TO BE CONFIRMED BY EPC CONTRACTOR FOLLOWING ANALYSIS AND OPTIMISATION OF CONDENSATE DRAIN REQUIREMENTS.

### ABBREVIATIONS

CA	CORROSION ALLOWANCE
FV	FULL VACUUM
HTC	HEAT TRANSFER COEFFICIENT
HV	HALF VACUUM
M	MOTOR
VFD	VARIABLE FREQUENCY DRIVE

### VESSELS / DRUMS

TAG	PFD NO.	SERVICE	QTY	TYPE OF MOD.	VESSEL ORIENTATION	VACUUM TYPE	TOTAL VOL. m <sup>3</sup> NOTE 8	DIMENSIONS	DESIGN COND.		TYPE OF INTERNALS	MOC		REMARKS	STATUS
								ID x TT (m)	(barg)	(°C)		INTERNALS	SHELL		
00QFQ10 BB010	007	INSTRUMENT AIR BUFFER VESSEL	1	NR	VERTICAL	-	29.1	2.30 x 7.00	10	-5/85	-	-	316/316L SS		NEW UNIT
00QHE10 BB010	006	BLOWDOWN DRUM	1	NR	VERTICAL	HV	1.1	0.75 x 2.50	3.5	-5/180	DIP TUBES	CS	CS + 3MM CA		NEW UNIT
00QLA10 BB010	006	DEAERATOR	1	NR	HORIZONTAL	FV	NOTE 6	NOTE 6	7.0	-5/240	NOTE 5	NOTE 5	NOTE 5	VERTICAL MASS TRANSFER SECTION	NEW UNIT
00QLA10 BB020	006	FLASH DRUM	1	NR	VERTICAL	FV	1.95	0.95 x 2.75	19	-5/230	INLET HOOD	CS	CS +3MM CA		NEW UNIT
10LCL10 BB010	008	BLOCK 1 START UP/ SHUTDOWN FLASH TANK	1	NR	VERTICAL	FV	5.65	1.50 x 3.20	7.0	-5/465	-	-	CrMo	VESEL SIZE BASED ON 13LCL01 AND TO BE REVIEWED AND OPTIMISED BY EPC CONTRACTOR; MOC MAY POTENTIALLY BE CS + 3MM CA IF VESSEL IS NOT SUBJECT TO GRAPHITISATION DUE TO CONSTANT USE - EPC CONTRACTOR TO CONFIRM	NEW UNIT
13LCM03 BB010	008	BLOCK 2 CLEAN DRAINS VESSEL	1	NR	VERTICAL	FV	5.65	1.50 x 3.20	7.0	-5/530	-	-	CrMo	VESEL SIZE BASED ON 13LCL01 AND TO BE REVIEWED AND OPTIMISED BY EPC CONTRACTOR; MOC MAY POTENTIALLY BE CS + 3MM CA IF VESSEL IS NOT SUBJECT TO GRAPHITISATION DUE TO CONSTANT USE - EPC CONTRACTOR TO EVALUATE	NEW UNIT
20LCM10 BB010	008	BLOCK 2 START UP/ SHUTDOWN FLASH TANK	1	NR	VERTICAL	FV	5.65	1.50 x 3.20	7.0	-5/530	-	-	CrMo	VESEL SIZE BASED ON 13LCL01 AND TO BE REVIEWED AND OPTIMISED BY EPC CONTRACTOR; MOC MAY POTENTIALLY BE CS + 3MM CA IF VESSEL IS NOT SUBJECT TO GRAPHITISATION DUE TO CONSTANT USE - EPC CONTRACTOR TO EVALUATE	NEW UNIT



## TANKS

TAG	PFD NO.	SERVICE	QTY	TYPE OF MOD.	TYPE	VOL. m <sup>3</sup> NOTE 8	DIMENSIONS		DESIGN COND.		TYPE OF INTERNALS	MOC		REMARK	STATUS
							ID x TT (m)		(barg)	(°C)		INTERNAL	SHELL		
00EGF10 BB010	006	FUEL OIL DAY TANK	1	NR	VERTICAL CYLINDRICAL	17.2	2.5 x 3.5		-4.2 mbarg / 3.75 mbarg	-5 / 85	DIP TUBES	NOTE 6	NOTE 6		NEW UNIT
13QCJ10 BB010	001	AQUEOUS AMMONIA TANK	1	NN	HORIZONTAL	76.0	3.2 x 9.4		FV / 4.5	-5 / 85	-	CS	CS + 1.6 MM CA		NEW UNIT

### PUMPS

TAG	PFD NO.	SERVICE	QTY	TYPE OF MOD.	TYPE OF PUMP	DRIVERS	DIFF. HEAD (m)	DISCH. PRESS. (barg)	DIFF. PRESSURE (bar)	VAPOUR PRESS. (bara) (AT PUMPING TEMP.)	DENSITY (kg/m <sup>3</sup> ) (AT PUMPING TEMP.)	VISCOSITY (cP) (AT PUMPING TEMP.)	CAPACITY		ESTIMATED REQUIRED POWER (kW) (NOTE 12 & 14)	RATED POWER (kW) (NOTE 12 & 15)	MOC (NOTE 19)	REMARKS	STATUS
													NORMAL (m <sup>3</sup> /h) (NOTE 12)	MAXIMUM (m <sup>3</sup> /h) (NOTE 12 & 13)					
00EGC10 AP010; AP020	006	FUEL OIL PUMPS	2	NR	CENTRIFUGAL	M	28.4	2.4	2.4	0.05	855	10.000	2.3	2.6	0.2	2.2	CS		NEW UNIT
00GHC10 AP010; AP020	006	DEMIN WATER MAKE-UP PUMPS	2	NR	CENTRIFUGAL	M	36.3	6.8	3.6	0.017	1000	1.130	12.4	13.7	3.75	5.5	316/316L SS		NEW UNIT
00PAB10 AP010; AP020; AP030	002	COOLING WATER BOOSTER PUMPS	3	NN	CENTRIFUGAL	M	43.7	4.8	4.4	0.017	1025.6	1.600	9910	10901.5	1564	1800.0	25Cr	3 X 50% CAPACITY	NEW UNIT
00QLA10 AP010; AP020	006	BOILER FEED WATER PUMPS	2 (NOTE 3)	NR	CENTRIFUGAL	M	300	32.2	26.7	6.000	908.3	0.170	13.8 (25.1 STARTUP)	27.6	39.4	56.0	13Cr	2 X 100% CAPACITY	NEW UNIT
10LCL10 AP010; AP020	008	SEGREGATED STEAM GENERATOR DRAINS RETURN PUMP	2	NR	CENTRIFUGAL	M	32.9 (NOTE 20)	3.4 (NOTE 20)	3.1 (NOTE 20)	1.0 (NOTE 20)	958 (NOTE 20)	0.28 (NOTE 20)	104.5 (NOTE 20)	115.0 (NOTE 20)	15.2 (NOTE 20)	18.0 (NOTE 20)	CS	PUMP SIZING TO BE REVIEWED AND OPTIMISED BY EPC CONTRACTOR	NEW UNIT
13LCM03 AP010; AP020	008	SEGREGATED CLEAN DRAINS RETURN PUMP (HRSG 13)	2	NR	CENTRIFUGAL	M	15.2 (NOTE 20)	2.7 (NOTE 20)	1.4 (NOTE 20)	1.0 (NOTE 20)	958 (NOTE 20)	0.28 (NOTE 20)	115 (NOTE 20)	126.5 (NOTE 20)	9.2 (NOTE 20)	18.0 (NOTE 20)	CS	PUMP SIZING TO BE REVIEWED AND OPTIMISED BY EPC CONTRACTOR	NEW UNIT
20LCM10 AP010; AP020	008	CLEAN DRAINS RETURN PUMP (ST20 AREA)	2	NR	CENTRIFUGAL	M	15.2 (NOTE 20)	2.7 (NOTE 20)	1.4 (NOTE 20)	1.0 (NOTE 20)	958 (NOTE 20)	0.28 (NOTE 20)	115 (NOTE 20)	126.5 (NOTE 20)	9.2 (NOTE 20)	18.0 (NOTE 20)	CS	PUMP SIZING TO BE REVIEWED AND OPTIMISED BY EPC CONTRACTOR	NEW UNIT
20LCB10 AP010; AP020	004	CONDENSATE EXTRACTION PUMPS	2	NR	CENTRIFUGAL	VFD	247.0 (NOTE 5)	24.21 (NOTE 5)	NOTE 6	0.029	998.4 (NOTE 5)	0.905 (NOTE 5)	372 (NOTE 17)	561.9 (NOTE 18)	NOTE 6	NOTE 6	CS/13Cr	BY STEAM TURBINE VENDOR	NEW UNIT



## TURBINES

TAG	PFD NO.	SERVICE	QTY	TYPE OF MOD.	STAGE	STREAM FLOWRATE, in (kg/hr)	STREAM FLOWRATE, out (kg/hr)	INLET PRESSURE, bara	OUTLET PRESSURE, bara	TURBINE TYPE	POWER (kW)	SPECIFICATIONS	REMARK
20MA10	004	STEAM TURBINE GENERATOR (NOTE 1)	1	NR	HP	291024 (NOTE 4)	283644 (NOTE 4)	107.2 (NOTE 4)	33.8 (NOTE 4)	REHEAT CONDENSING STEAM TURBINE	23036 (NOTE 4)	COMBINE HP/IP CASING WITH TWO OF DOUBLE FLOW LP STAGES	STEAM TURBINE VENDOR SCOPE.
					IP	338364 (NOTE 4)	342700 (NOTE 4)	32.5 (NOTE 4)	5.7 (NOTE 4)	REHEAT CONDENSING STEAM TURBINE	44749 (NOTE 4)		STEAM TURBINE VENDOR SCOPE. EXTRACTION LINE FROM IP/LP CROSSOVER TO CCP.
					LP	375480 (NOTE 4)	378000 (NOTE 4)	6.24 (NOTE 4)	0.05 (NOTE 4)	REHEAT CONDENSING STEAM TURBINE	26132 (NOTE 4)		

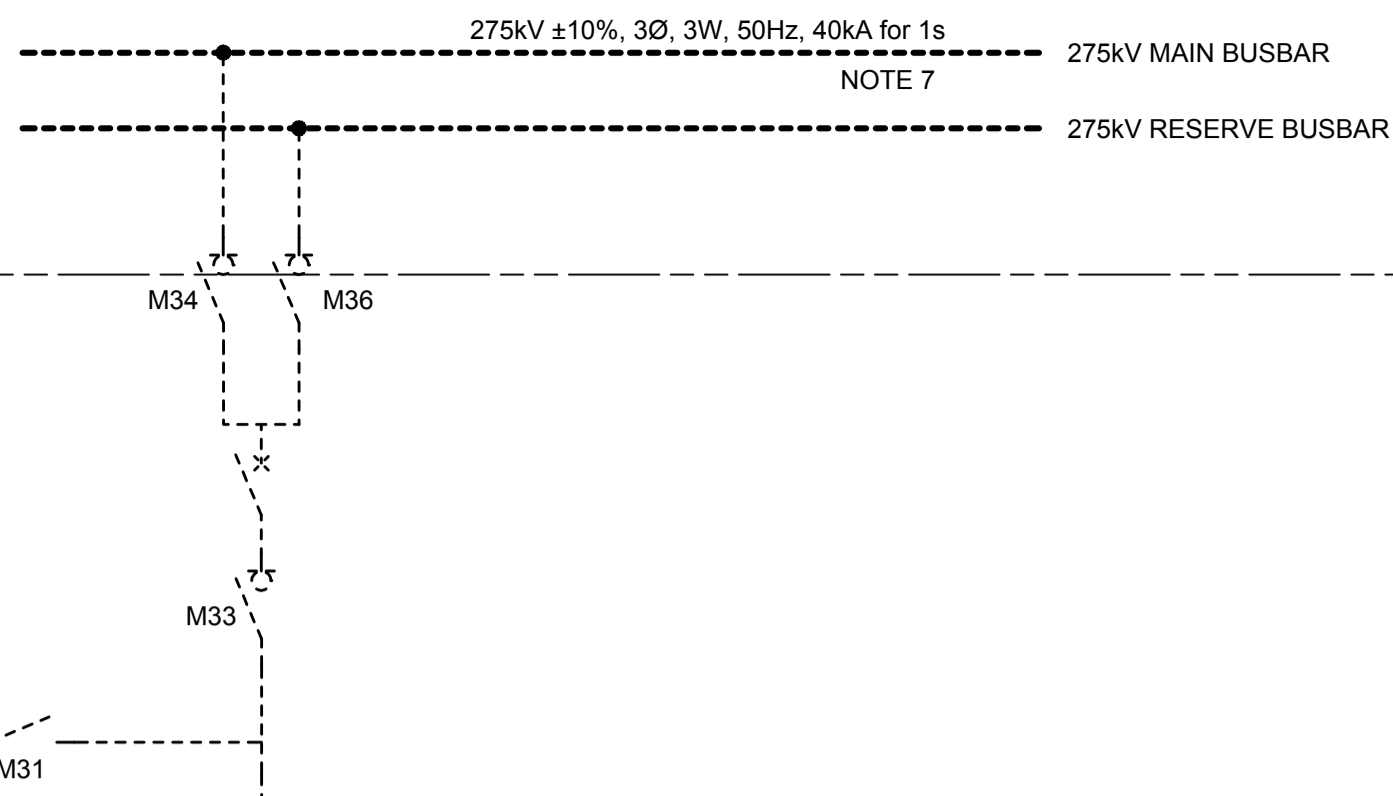
### HEAT EXCHANGERS

TAG	PFD NO.	SERVICE	QTY	TYPE OF MOD.	PARALLEL/SERIES	SERVICE		TYPE OF H/X	TEMA Class	TOTAL BARE OUTSIDE SURFACE AREA (m <sup>2</sup> )	OVERALL HTC (W/m <sup>2</sup> .K)	HOT SIDE DESIGN COND.			COLD SIDE DESIGN COND.			RATED DUTY (kW)	REMARKS	STATUS
						HOT SIDE	COLD SIDE					(barg)	(°C)	MOC	(barg)	(°C)	MOC			
00QLA10 AC010; AC040	006	CONDENSATE HEAT RECOVERY EXCHANGER	2	NR	N/A	FLASH DRUM CONDENSATE	BOILER FEED WATER	SHELL & TUBE	BEU	18.1	1056	19.0	-5 / 230	CS	43	-5 / 230	CS	300		NEW UNIT
00QLA10 AC020	006	CONDENSATE TRIM COOLER	1	NN	N/A	FLASH DRUM CONDENSATE	AIR	AIR COOLER	N/A	4 (NOTE 5)	410 (BARE) (NOTE 5)	19.0	-5 / 230	CS	N/A	N/A	6Mo	171		NEW UNIT
00QLA10 AC030	006	GLAND STEAM SUPERHEATER	1	NR	N/A	ELECTRIC ELEMENT	STEAM	ELECTRIC HEATER	-	NOTE 6	NOTE 6	N/A	N/A	NOTE 6	19	-5 / 310	CS	127	127 KW= STARTUP LOAD 5.5 KW = NORMAL LOAD	NEW UNIT

### MISCELLANEOUS

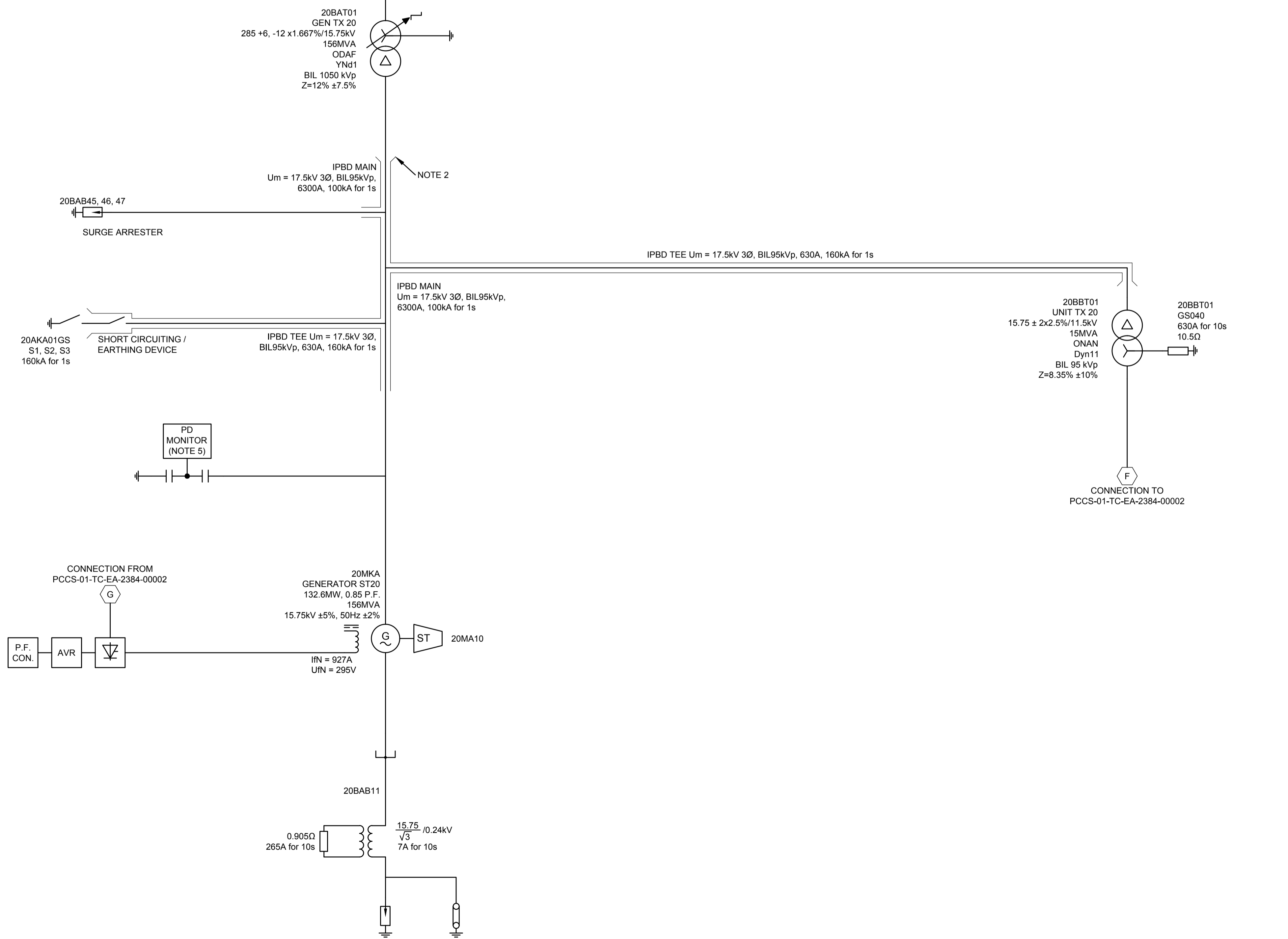
TAG	PFD NO.	SERVICE	QTY	TYPE OF MOD.	Type of Equipment	DESIGN COND.		MOC	REMARK	STATUS
						(barg)	(°C)			
00AXE10 AN010/ 020	007	INSTRUMENT AIR COMPRESSOR PACKAGE	2	NR	VENDOR PACKAGE	10	-5 / 85	NOTE 6		NEW UNIT
00EGF10 BB020	006	FUEL OIL DAY TANK BUND	1	NR	BUND	N/A	-5 / 85	CONCRETE		NEW UNIT
00QCD10	006	AUXILIARY BOILER PHOSPHATE DOSING PACKAGE	1	NR	VENDOR PACKAGE	27	-5 / 85 NOTE 16	NOTE 6	DESIGN PRESSURE ACCORDING TO ESTIMATED BFW PUMPS DESIGN PRESSURE	NEW UNIT
00QFQ10 /20	007	INSTRUMENT AIR DRYER PACKAGE	2	NR	VENDOR PACKAGE	10	-5 / 85	NOTE 6		NEW UNIT
00QH10	006	AUXILIARY BOILER SYSTEM PACKAGE	1	NR	BOILER	27 NOTE 5	-5 / 270 NOTE 5	NOTE 6		NEW UNIT
00QLA20	006	AUXILIARY BOILER CHEMICAL TREATMENT PACKAGE	1	NR	VENDOR PACKAGE	43	-5 / 85 NOTE 16	NOTE 6	DESIGN PRESSURE ACCORDING TO ESTIMATED BFW PUMPS DESIGN PRESSURE	NEW UNIT
00SFT10	006	AUXILIARY BOILER FUEL GAS/ FUEL OIL CONDITIONING PACKAGE	2	NR	SKID	39 NOTE 9 / 6.0 NOTE 10	-5 / 85	NOTE 6	FUEL GAS SKID TO INCLUDE GAS FILTER, FLOW METER, PRESSURE LETDOWN AND GAS CONDITIONING	NEW UNIT
13QCJ10 BB020	001	AMMONIA UNLOADING BAY AND BUND	1	NN	BUND	N/A	-5 / 85	CONCRETE		NEW UNIT
13QCJ10 BB030	001	AMMONIA AREA SUMP	1	NN	SUMP	N/A	-5 / 85	CONCRETE		NEW UNIT
13QCJ20	001	AMMONIA TRANSFER AND FLOW CONTROL UNIT	-	NN	VENDOR PACKAGE	9 NOTE 5	-5 / 150 NOTE 5	NOTE 6		NEW UNIT
13RLJ10	004	SCR CATALYST AND SUPPORT STRUCTURE	1	NR	VENDOR PACKAGE	- NOTE 11	-5/440 NOTE 5	NOTE 6		NEW UNIT

PETERHEAD 275kV SUBSTATION



BOUNDARY OF OWNERSHIP - GRID COMPANY  
BOUNDARY OF OWNERSHIP - CARBON CAPTURE PLANT

PETERHEAD POWER STATION



NOTES

- FOR DETAILS OF SUB-DISTRIBUTION AND CONNECTED LOADS REFER TO DOCUMENT PCCS-01-TC-EA-2384-00002
- GENERATOR SHORT-CIRCUIT TESTING FACILITY WILL BE LOCATED ON IPBD AT THIS LOCATION.
- EXISTING CIRCUIT BREAKER M30 (EX UNIT-2 SERVICE).
- EXISTING CABLES AND CABLE-SEALING ENDS (EX UNIT-2 SERVICE).
- CAPACITIVE-COUPLED DEVICE.
- ALL TAGS TO BE CONFIRMED BY EPC CONTRACTOR DURING DETAILED DESIGN.
- SHE TRANSMISSION PLC SHALL CONFIRM THE 275kV BUSBAR SHORT CIRCUIT RATING DURING DETAILED DESIGN.

LEGEND

NC	NORMALLY CLOSED
NO	NORMALLY OPEN
	DC EXCITATION
	ISOLATED PHASE BUS DUCT WITH FLEXIBLE CONNECTION TO EQUIPMENT
---	INDICATES EXISTING EQUIPMENT
—	INDICATES NEW EQUIPMENT FOR THE CCS PROJECT

REFERENCE DOCUMENTS

PCCS-00-TC-EA-7770-63001	ELECTRICAL STANDARD GRAPHIC SYMBOLS
PCCS-01-TC-EA-2384-00002	UNIT 20 HV ONE LINE DIAGRAM
PCCS-01-TC-EA-2580-00001	UNIT 20 GENERATOR PROTECTION AND METERING DIAGRAM
PCCS-01-TC-EA-4329-00001	ELECTRICAL LOAD SUMMARY (POWER STATION)

HOLDS

Rev	Date	Revision Object	Written by	Checked by	Approved by

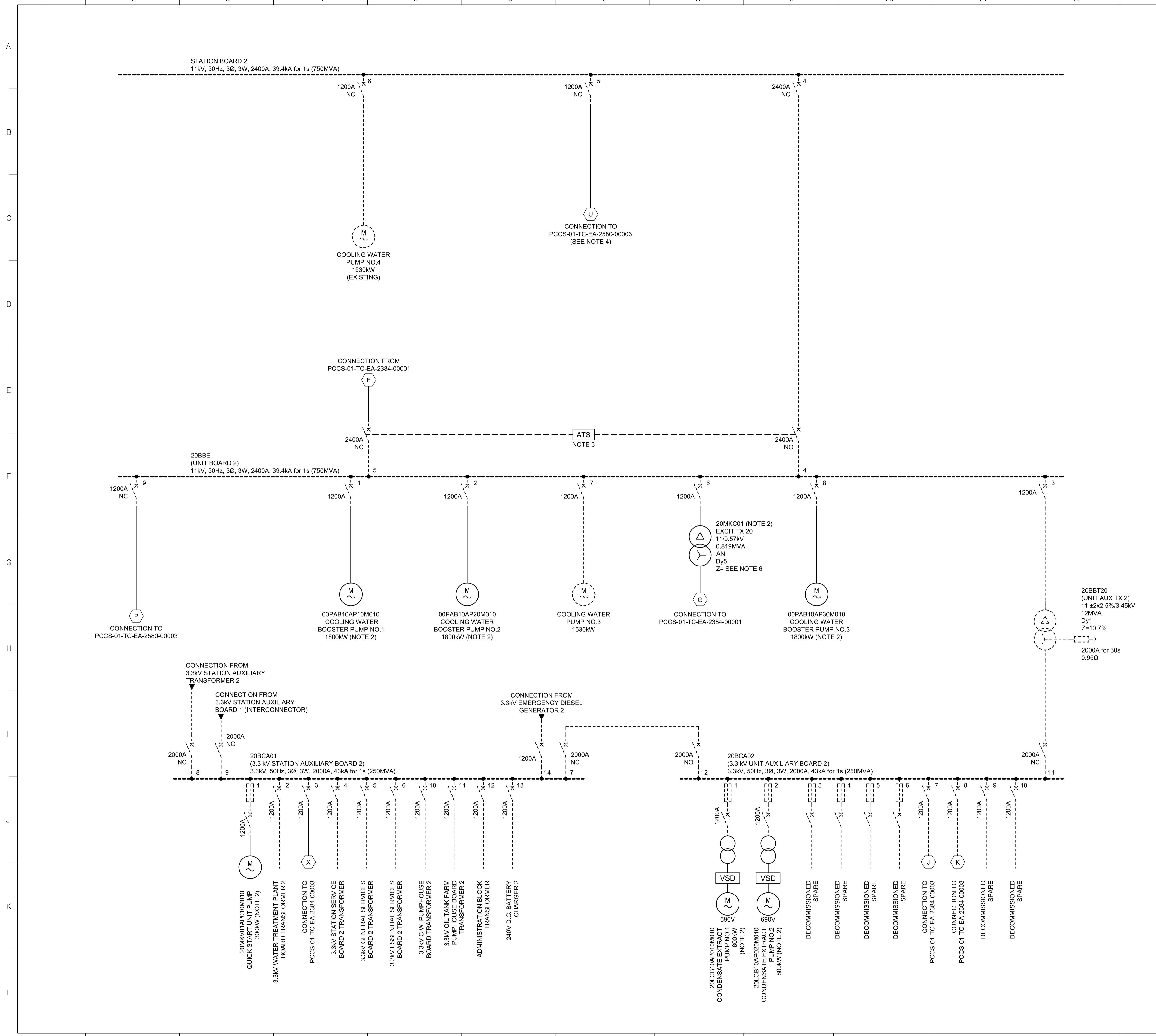


PETERHEAD  
CCS (ONSHORE)

UNIT 20 GENERATOR  
ONE LINE DIAGRAM

DOC. CLASS: IFT	SCALE: NTS	SHEET: 1/1
CLIENT Doc. Ref. PCCS-01-TC-EA-2384-00001	REVISION K01	FORMAT A1





### NOTES

- FOR DETAILS OF UNIT TRANSFORMER AND GENERATOR REFER TO DOCUMENT PCCS-01-TC-EA-2384-00001.
- NEW LOAD CONNECTED TO AN EXISTING PANEL, MODIFIED TO SUIT NEW LOAD RATING.
- AUTOMATIC TRANSFER SCHEME, WITH MOMENTARY PARALLELING OF SUPPLIES, TO BE ADDED TO EXISTING UNIT BOARD 2. THIS SCHEME SHALL BE A RAPID-ACTING MICROPROCESSOR BASED DIFFERENTIAL CURRENT SCHEME.
- EXISTING MOTOR STARTER FOR STARTING/STANDBY B.F.P 2B CONVERTED IN TO TRANSFORMER FEEDER TO 20BHA10.
- ALL TAGS TO BE CONFIRMED BY EPC CONTRACTOR DURING DETAILED DESIGN.
- VENDOR TO CONFIRM IMPEDANCE RATING OF TRANSFORMER DURING DETAILED DESIGN.

### LEGEND

NC	NORMALLY CLOSED
NO	NORMALLY OPEN
-----	INDICATES EXISTING EQUIPMENT
————	INDICATES NEW EQUIPMENT FOR THE CCS PROJECT

### REFERENCE DOCUMENTS

PCCS-00-TC-EA-7770-63001	ELECTRICAL STANDARD GRAPHIC SYMBOLS
PCCS-01-TC-EA-2384-00001	UNIT 20 GENERATOR ONE LINE DIAGRAM
PCCS-01-TC-EA-2384-00003	UNIT 20 LV ONE LINE DIAGRAM
PCCS-01-TC-EA-2580-00002	UNIT 20 HV PROTECTION AND METERING DIAGRAM
PCCS-01-TC-EA-4329-00001	ELECTRICAL LOAD SUMMARY (POWER STATION)

### HOLDS

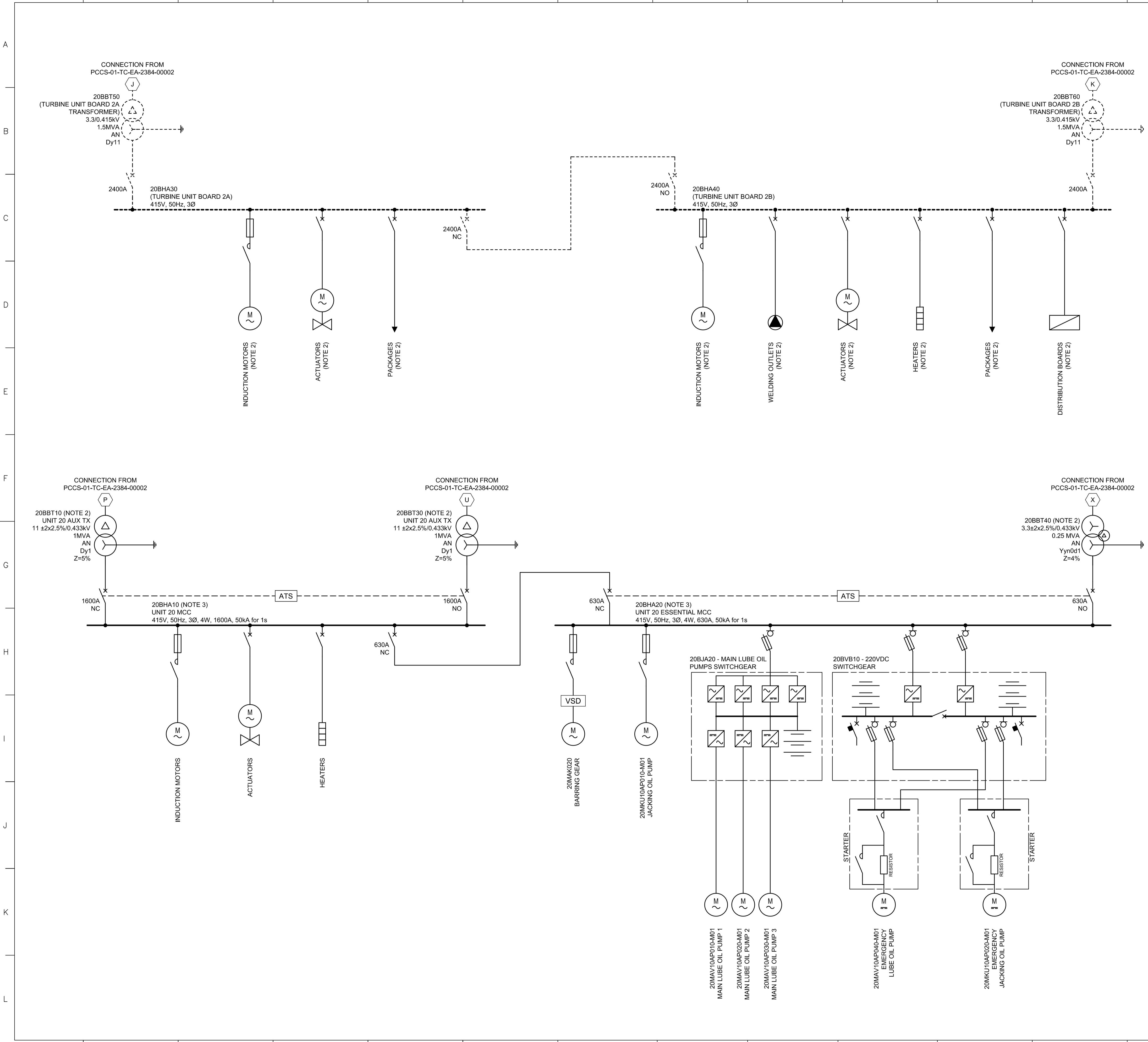

Rev	Date	Revision Object	Written by	Checked by	Approved by

**PETERHEAD CCS (ONSHORE)**

**UNIT 20 HV ONE LINE DIAGRAM**

DOC. CLASS: IFT	SCALE: NTS	SHEET: 1/1	
CLIENT Doc. Ref:	PCCS-01-TC-EA-2384-00002	REVISION	FORMAT
		K01	A1

LAST REV DATE: \_\_\_\_\_



**NOTES**

- FOR DETAILS OF UNIT TRANSFORMER AND GENERATOR REFER TO DOCUMENT PCCS-01-TC-EA-2384-00001.
- NEW LOAD CONNECTED TO AN EXISTING PANEL, MODIFIED TO SUIT NEW LOAD RATING.
- NORMAL OPERATION OF BOARD '20BHA20' IS FED FROM '20BHA10' VIA THE INTERCONNECTOR. IN EMERGENCY OPERATION BOARD '20BHA20' IS FED FROM EMERGENCY DIESEL GENERATOR CONNECTED BOARD '20BCA01' ONLY AND THE INTERCONNECT TO BOARD '20BHA10' IS DISCONNECTED.

**LEGEND**

NC  
NO

NORMALLY CLOSED  
NORMALLY OPEN

(M)  
~

ACTUATOR (MOTOR OPERATED VALVE)

INDICATES EXISTING EQUIPMENT  
INDICATES NEW EQUIPMENT FOR THE CCS PROJECT

**REFERENCE DOCUMENTS**

PCCS-00-TC-EA-7770-63001	ELECTRICAL STANDARD GRAPHIC SYMBOLS
PCCS-01-TC-EA-2384-00002	UNIT 20 HV ONE LINE DIAGRAM
PCCS-01-TC-EA-2580-00003	UNIT 20 LV PROTECTION AND METERING DIAGRAMS
PCCS-01-TC-EA-4329-00001	ELECTRICAL LOAD SUMMARY (POWER STATION)

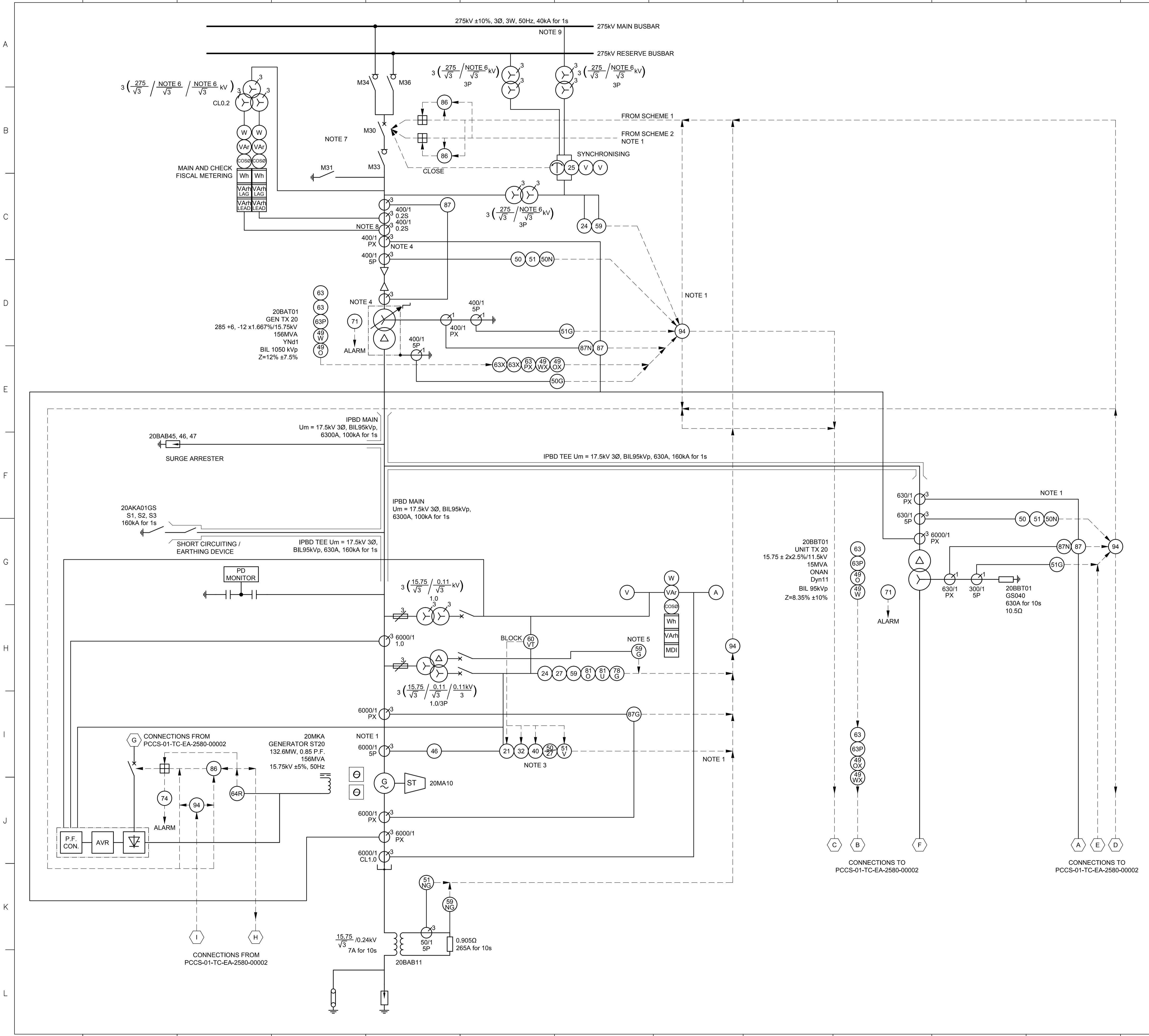
Rev	Date	Revision Object	Written by	Checked by	Approved by



PETERHEAD  
CCS (ONSHORE)

**UNIT 20 LV  
ONE LINE DIAGRAM**

DOC. CLASS: IFT	SCALE: NTS	SHEET: 1/1
CLIENT Doc. Ref. PCCS-01-TC-EA-2384-00003	REVISION K01	FORMAT A1



**NOTES**

- TWO INDEPENDENT IDENTICAL PROTECTION SCHEMES SHALL BE PROVIDED. EACH PROTECTION SCHEME SHALL HAVE ITS OWN CURRENT TRANSFORMERS. FOR CLARITY ONLY ONE SCHEME IS SHOWN ON THIS DRAWING (THIS NOTE DOES NOT APPLY TO TRANSFORMER PROTECTIONS 63, 49 - INITIATORS ARE NOT DUPLICATED).
- REMOVED.
- REVERSE POWER (32) TRIP OUTPUT IS DIRECT TO CIRCUIT BREAKER TRIP CIRCUIT, NOT VIA 86.
- CTs FOR DIFFERENTIAL PROTECTION OF GENERATOR (20MKA), GENERATOR TRANSFORMER (20BAT01) AND UNIT TRANSFORMER (20BBT01) SHALL BE PROVIDED BY STG VENDOR. THE CTs AT THE 275KV SIDE OF GENERATOR TRANSFORMER (20BAT01) SHALL BE SUPPLIED FREE ISSUE TO 275KV SWITCHGEAR.
- 59G TUNED TO THIRD HARMONIC TO ACHIEVE 100% STATOR EARTH-FAULT PROTECTION. THE VENDOR MAY OFFER A DIFFERENT SCHEME.
- THE VT RATED SECONDARY VOLTAGE WILL BE SPECIFIED DURING DETAILED DESIGN.
- NATIONAL GRID STANDARDS APPLY FOR PROTECTION DETAILS OF 275KV CIRCUIT BREAKER.
- CTs FOR 275KV CABLE DIFFERENTIAL PROTECTION SHALL BE PROVIDED BY THE 275KV SWITCHGEAR CONTRACTOR AND SHALL BE SUPPLIED FREE ISSUE TO STG VENDOR.
- SHE TRANSMISSION PLC SHALL CONFIRM THE 275KV BUSBAR SHORT CIRCUIT RATING DURING DETAILED DESIGN.

**REFERENCE DOCUMENTS**

PCCS-00-TC-EA-7770-63001	ELECTRICAL STANDARD GRAPHIC SYMBOLS
PCCS-01-TC-EA-2384-00001	UNIT 20 KEY SINGLE LINE DIAGRAM
PCCS-01-TC-EA-2580-00002	UNIT 20 HV PROTECTION AND METERING DIAGRAM

**HOLDS**

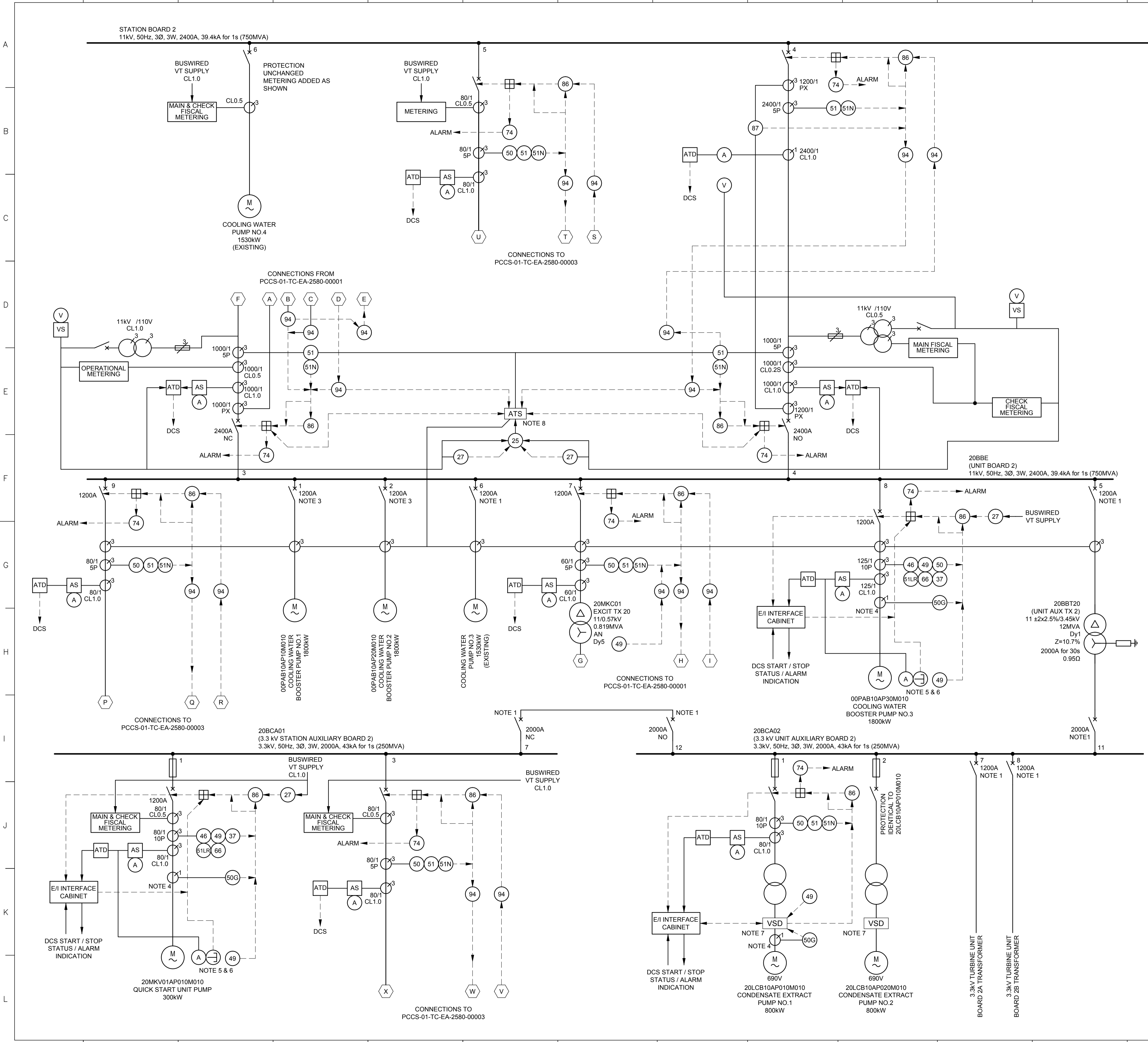
Rev	Date	Revision Object	Written by	Checked by	Approved by



**PETERHEAD  
CCS (ONSHORE)**

**UNIT 20 GENERATOR  
PROTECTION AND METERING DIAGRAM**

DOC. CLASS: IFT	SCALE: NTS	SHEET: 1/1
CLIENT Doc. Ref: PCCS-01-TC-EA-2580-00001	REVISION: K01	FORMAT: A1



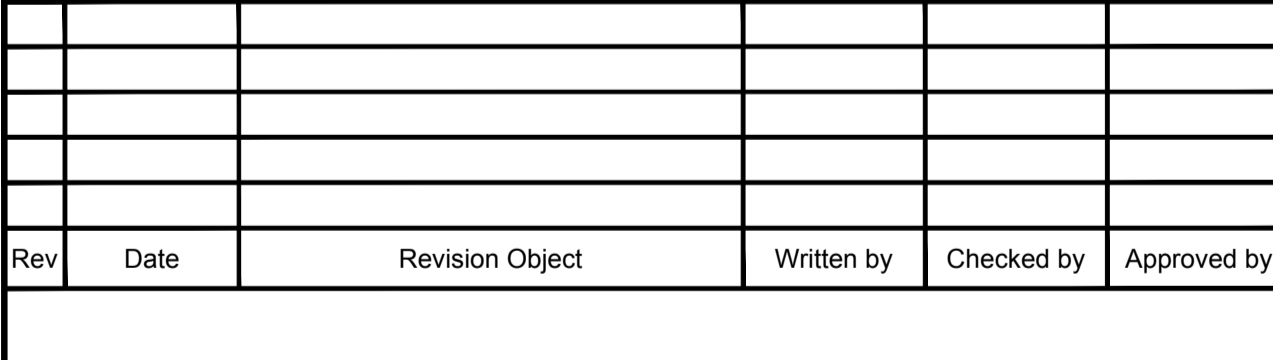
- ### NOTES
- EXISTING PROTECTION AND METERING IS UNCHANGED ALTHOUGH PROTECTION SETTINGS SHALL BE ADJUSTED AS NECESSARY.
  - PROTECTION CO-ORDINATION SHALL BE UNDERTAKEN FOR THE NORMAL CONNECTION AND INFEEED FROM STATION BOARD 2 AND WHERE PERFORMANCE IS INADEQUATE, CONSIDERATION SHALL BE GIVEN TO USING A SECOND SETTING GROUP (MULTIFUNCTION RELAYS ONLY) TO ACHIEVE DISCRIMINATION.
  - SEE PROTECTION FOR COOLING WATER BOOSTER PUMP NO.3.
  - CORE-BALANCE CURRENT TRANSFORMER.
  - MOTOR EQUIPPED WITH ANTI-CONDENSATION HEATER (NOT SHOWN).
  - (49) WINDING RESISTANCE TEMPERATURE DETECTOR TO SUIT APPLICATION.
  - VSD INCORPORATES MOTOR AND VSD PROTECTION.
  - RAPID ACTING DIFFERENTIAL-CURRENT BASED SCHEME.

### LEGEND

NC	NORMALLY CLOSED
NO	NORMALLY OPEN



Rev	Date	Revision Object	Written by	Checked by	Approved by

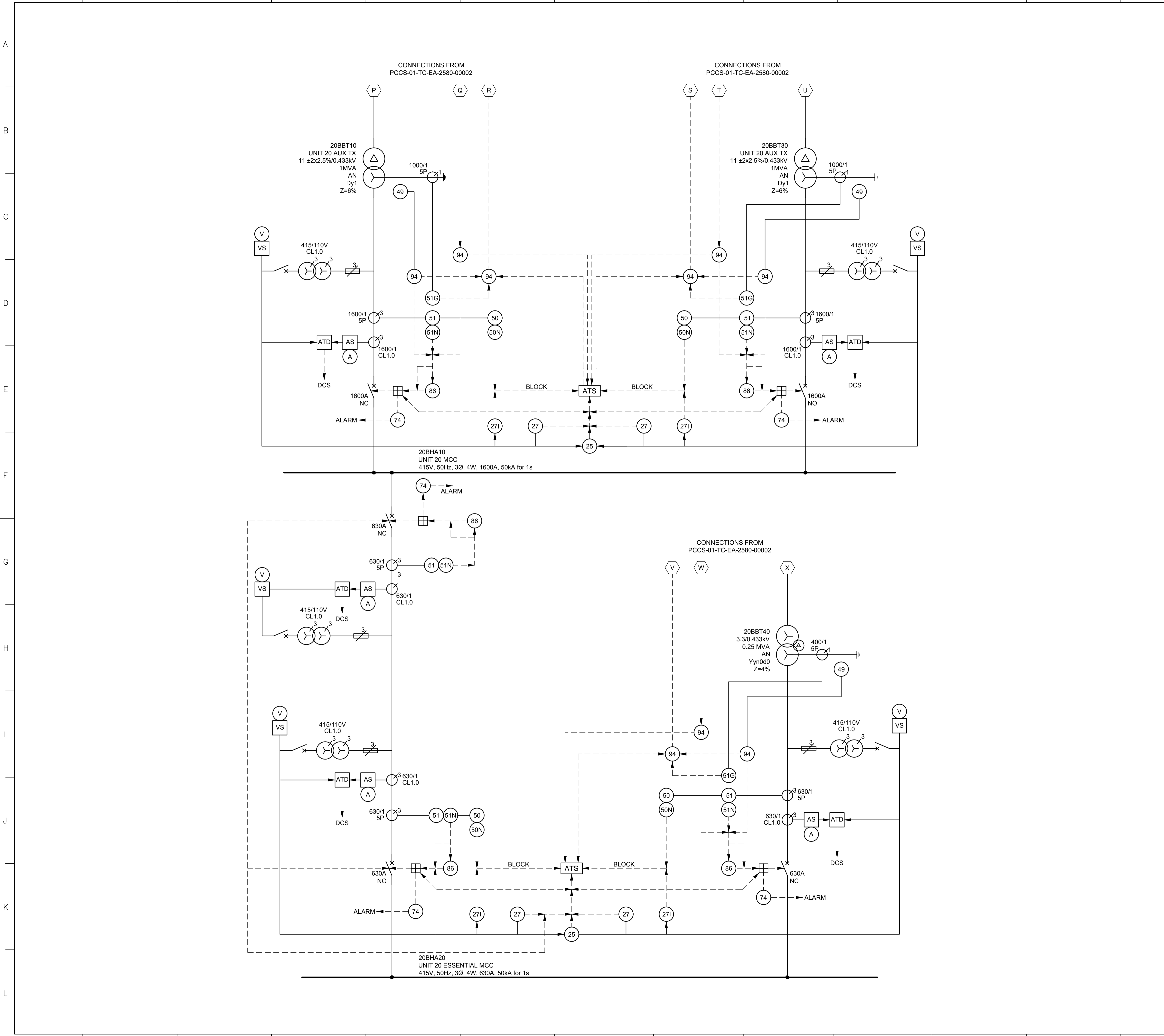


## PETERHEAD CCS (ONSHORE)

### UNIT 20 HV PROTECTION AND METERING DIAGRAM

DOC. CLASS: IFT	SCALE: NTS	SHEET: 1/1
CLIENT Doc. Ref:	PCCS-01-TC-EA-2580-00002	REVISION K01
		FORMAT A1





**NOTES**

1. PROTECTION CO-ORDINATION SHALL BE UNDERTAKEN FOR THE NORMAL CONNECTION AND INFED FROM 20BBT01. DISCRIMINATION AND OPERATING TIMES SHALL BE CHECKED FOR INFED FROM STATION BOARD 2 AND WHERE PERFORMANCE IS INADEQUATE, CONSIDERATION SHALL BE GIVEN TO USING A SECOND SETTING GROUP (MULTIFUNCTION RELAYS ONLY) TO ACHIEVE DISCRIMINATION.

**LEGEND**

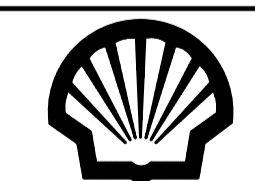
NC  
NO

NORMALLY CLOSED  
NORMALLY OPEN

**REFERENCE DOCUMENTS**

PCCS-00-TC-EA-7770-63001	ELECTRICAL STANDARD GRAPHIC SYMBOLS
PCCS-01-TC-EA-2384-00001	UNIT 20 KEY ONE LINE DIAGRAM
PCCS-01-TC-EA-2580-00002	UNIT 20 HV PROTECTION AND METERING DIAGRAM
PCCS-01-TC-EA-4329-00001	ELECTRICAL LOAD SUMMARY (POWER STATION)

Rev	Date	Revision Object	Written by	Checked by	Approved by



PETERHEAD  
CCS (ONSHORE)

**UNIT 20  
LV PROTECTION AND METERING DIAGRAM**

DOC. CLASS: IFT	SCALE: NTS	SHEET: 1/1
CLIENT Doc. Ref: PCCS-01-TC-EA-2580-00003	REVISION K01	FORMAT A1

LAST REV DATE:



**ELECTRICAL LOAD SUMMARY**

<i>ENGINEER REFERENCE</i>					Rev.	Page
					<b>K01</b>	1 of 13
<i>CLIENT REFERENCE</i>						
Project Code	Area/Facility Code	Originator	Discipline	Doc Type	Sequential No	
<b>PCCS</b>	<b>01</b>	<b>TC</b>	<b>EA</b>	<b>4329</b>	<b>00001</b>	

**ELECTRICAL LOAD SUMMARY  
 (POWER STATION)**

Rev	Date DD/MM/YY	STATUS	WRITTEN BY (name & sign)	CHECKED BY (name & sign)	APPROVED BY (name & sign)
DOCUMENT REVISIONS					

## REFERENCE DOCUMENTS

- 1 Process Equipment List For The Power Plant PCCS-01-TC-AA-4322-00001.
- 2 Unit 20 Key One line Diagram PCCS-01-TC-EA-2384-00001
- 3 Unit 20 Single Line Diagram PCCS-01-TC-EA-2384-00002

## DEFINITIONS

### Absorbed loads:

For pumps, shaft load on duty point;

For instrumentation, computers, communication, air conditioning, required load during full operation of plant;

For lighting during dark hours;

For workshops, the average total load in normal full operation;

### Consumed loads:

E-"Continuous" "C"; all loads that may continuously be required for normal operation, including lighting and workshops

F-"Intermittent" "I"; the load required for intermediate operation i.e; pumping, storage, loading etc

G-"Stand-by" "S"; loads required in emergencies only, such as fire-water pumps or those of normally not running electrically driven units in stand-by for normally running steam-driven ones (e.g charge pumps, boiler feed pumps).

## NOTES

- 1 EPC Contractor shall confirm the equipment tags during detail design
- 2 EPC Contractor shall confirm the electrical load data during detail design
- 3 Spare Pumps, e.g the "B" pump of an A-B combination, are not to be considered as a "stand by" pump
- 4 Diversity factors x, y and z shall be defined for each separate case, subject to Principal's approval.  
x = 100%  
y = 30%  
z = 10%
- 5 This Load summary only includes new process equipment and the equipment supplied by DOOSAN
- 6 220V DC Circuits may be allocated to existing DC switchboards within power station
- 7 The MOV Distribution Board is supplied from the C.W Pumphouse switchboard, which is not connected to unit 20 auxiliary distribution.
- 8 Power factor calculation for required capacitor is purely for information

Project Name	PETERHEAD CCS (ONSHORE)			
Client/Company	SHELL U.K. LTD			
Company Project No.	PCCS			Rev
Company Document No.	PCCS-01-TC-EA-4329-00001			K01



### 11kV UNIT BOARD 2 - 20BBE

EQUIPMENT		ABSORBED LOAD	EQUIPMENT RATING	LOAD FACTOR = A/B	EFFICIENCY (pu) at load factor C	POWER FACTOR at load factor C	LOAD DUTY	CONSUMED LOAD						REMARKS
Equipment No.	DESCRIPTION							(kW = A/D) (kVAr = kW.tan φ)		Intermittent		Stand-by		
								Continuous	E	F	G			
		A	B	C	D	cos φ	C/I/S	kW	kVAr	kW	kVAr	kW	kVAr	
1	20BHA10							370.37	277.18	65.81	21.88	0.00	0.00	
2	20BCA20							1453.78	699.74	152.88	99.72	308.93	200.59	
6	00PAB10AP10-M01	1452.00	1800.00	0.81	0.97	0.88	C	1504.66	812.13					PROCESS
7	00PAB10AP20-M01	1452.00	1800.00	0.81	0.97	0.88	C	1504.66	812.13					PROCESS
8	00PAB10AP30-M01	0.00	1800.00	0.00	0.97	0.88	C	0.00	0.00					PROCESS
9	20MKC01	273.50	-	-	0.75	0.71	C	364.67	361.69					CALCULATED FROM GEN DATA
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Maximum normal running plant load:		kW;	kVAr;	kVA	TOTAL	5198.14	2962.88	218.69	121.61	308.93	200.59	Power factor without compensation (cos φ):	0.87
[x(%)E + y(%)F]		5264	2999	6058								Peak Load	
Peak load		kW;	kVAr;	kVA	kVA (= √kW <sup>2</sup> + kVAr <sup>2</sup> )	5983.26			250.23		368.34	Power factor with compensation (cos φ <sub>1</sub> ):	0.95
[x(%)E + y(%)F + z(%)G]		5295	3019	6095								NOTE 8	
												Required capacitor [= kW (tanφ - tanφ <sub>1</sub> ):]	1279 kvar

Project Name	PETERHEAD CCS (ONSHORE)			
Client/Company	SHELL U.K. LTD			
Company Project No.	PCCS			
Company Document No.	PCCS-01-TC-EA-4329-00001			Rev <b>K01</b>

### 3.3kV UNIT AUXILIARY BOARD 2 - 20BCA02

EQUIPMENT		ABSORBED LOAD A kW	EQUIPMENT RATING B kW	LOAD FACTOR C = A/B in decimals	EFFICIENCY D (pu) at load factor C in decimals	POWER FACTOR at load factor C cos φ	LOAD DUTY C/I/S	CONSUMED LOAD (kW = A/D) (kVAr = kW.tg φ)						REMARKS
EQUIPMENT NO.	DESCRIPTION							Continuous E		Intermittent F		Stand-by G		
								kW	kVAr	kW	kVAr	kW	kVAr	
1	20BCA01							108.07	70.37	31.83	24.70	308.93	200.59	
2	20BHA30							330.43	204.78	0.00	0.00	0.00	0.00	
3	20BHA40							230.76	139.85	121.05	75.02	0.00	0.00	
4	20LCB10AP010-M01	750.00	800.00	0.94	0.96	0.94	C	784.52	284.74					DOOSAN
5	20LCB10AP020-M01	0.00	800.00	0.00	0.96	0.94	C	0.00	0.00					DOOSAN
7														
8														
9														
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Maximum normal running plant load:		kW;	kVAr;	kVA	TOTAL	1453.78	699.74	152.88	99.72	308.93	200.59	Peak Load	
[x(%)E + y(%)F]		1500	730	1668								Power factor without compensation (cos φ):	
Peak load		kW;	kVAr;	kVA	kVA(= √kW <sup>2</sup> + kVAr <sup>2</sup> )	1613.42	182.53	368.34	Power factor with compensation (cos φ <sub>1</sub> ):		0.95	NOTE 8	
[x(%)E + y(%)F + z(%)G]		1531	750	1704					Required capacitor [= kW (tanφ - tanφ <sub>1</sub> )]:		247 kvar		

Project Name	PETERHEAD CCS (ONSHORE)		
Client/Company	SHELL U.K. LTD		
Company Project No.	PCCS		
Company Document No.	PCCS-01-TC-EA-4329-00001		
			Rev <b>K01</b>

### 3.3kV STATION AUXILIARY BOARD 2 - 20BCA01

EQUIPMENT NO.	EQUIPMENT DESCRIPTION	ABSORBED LOAD A kW	EQUIPMENT RATING B kW	LOAD FACTOR = A/B C in decimals	EFFICIENCY (pu) at load factor C D in decimals	POWER FACTOR at load factor C cos φ	LOAD DUTY C/I/S	CONSUMED LOAD (kW = A/D) (kVAr = kW.tg φ)						REMARKS
								Continuous E		Intermittent F		Stand-by G		
								kW	kVAr	kW	kVAr	kW	kVAr	
1	20BHA20							108.07	70.37	31.83	24.70	20.04	13.99	
2	20MKV01AP010-M01	260.00	300.00	0.87	0.90	0.84	S					288.89	186.60	DOOSAN
3														
4														
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<b>Maximum normal running plant load:</b>		kW;	kVAr;	kVA	TOTAL	108.07	70.37	31.83	24.70	308.93	200.59	Power factor without compensation (cos φ):	0.84
[x(%)E + y(%)F]		118	78	141									NOTE 8
<b>Peak load</b>		kW;	kVAr;	kVA	kVA (= √kW <sup>2</sup> + kVAr <sup>2</sup> )	128.96		40.29		368.34		Power factor with compensation (cos φ <sub>i</sub> ):	0.95
[x(%)E + y(%)F + z(%)G]		149	98	178								Required capacitor [= kW (tanφ - tanφ <sub>i</sub> ):]	49 kvar
Project Name	PETERHEAD CCS (ONSHORE)												
Client/Company	SHELL U.K. LTD												
Company Project No.	PCCS												
Company Document No.	PCCS-01-TC-EA-4329-00001												
												Rev	K01

### 415V UNIT 20 TURBINE MCC - 20BHA10

EQUIPMENT NO.	EQUIPMENT DESCRIPTION	ABSORBED LOAD kW	EQUIPMENT RATING kW	LOAD FACTOR = A/B in decimals	EFFICIENCY (pu) at load factor C in decimals	POWER FACTOR at load factor C cos φ	LOAD DUTY C/I/S	CONSUMED LOAD (kW = A/D) (kVAr = kW.tg φ)						REMARKS
								Continuous		Intermittent		Stand-by		
								kW	kVAr	kW	kVAr	kW	kVAr	
1	20BJA30							0.00	0.00	61.47	20.79	0.00	0.00	
2														
3														
4														
5	20MAW10AP010-M01	36.00	45.00	0.80	0.94	0.79	C	38.30	29.72					DOOSAN
6	20MAW10AP020-M01	0.00	45.00	0.00	0.94	0.79	C	0.00	0.00					DOOSAN
7	20MAQ10AN010-M01	3.60	4.00	0.90	0.88	0.80	C	4.09	3.07					DOOSAN
8	20MAQ10AN020-M01	0.00	4.00	0.00	0.88	0.80	C	0.00	0.00					DOOSAN
9	MAX01AP010-MO1	17.60	22.00	0.80	0.93	0.80	C	18.92	14.19					DOOSAN
10	MAX01AP020-MO1	0.00	22.00	0.00	0.93	0.80	C	0.00	0.00					DOOSAN
11	20MAV10AN010	0.88	1.10	0.80	0.84	0.78	C	1.05	0.84					DOOSAN
12	20MAV10AN020	0.00	1.10	0.00	0.84	0.78	C	0.00	0.00					DOOSAN
13														
14														
15	20MKU10-M01	8.80	11.00	0.80	0.91	0.79	C	9.67	7.50					DOOSAN
16	20MAJ10AP010-M01	108.00	132.00	0.82	0.95	0.80	C	113.68	85.26					DOOSAN
17	20MAJ10AP020-M01	108.00	132.00	0.82	0.95	0.80	C	113.68	85.26					DOOSAN
18	20MAJ10AP030-M01	0.00	132.00	0.00	0.95	0.80	C	0.00	0.00					DOOSAN
19	20MAG10AP010-M01	36.00	45.00	0.80	0.94	0.79	C	38.30	29.72					DOOSAN
20	20MAG10AP020-M01	0.00	45.00	0.00	0.94	0.79	C	0.00	0.00					DOOSAN
21														
22														
23	20MAW20	4.00	5.00	0.80	0.92	0.97	I			4.35	1.09			DOOSAN
24	20MKY	9.60	12.00	0.80	0.92	0.80	C	10.43	7.83					DOOSAN
25	20MAV10AN20	0.75	1.10	0.68	0.84	0.85	C	0.89	0.55					DOOSAN
26	20MAV20AN30	0.00	1.10	0.00	0.84	0.85	C	0.00	0.00					DOOSAN
27	20MAL10AN40	2.75	3.00	0.92	0.87	0.85	C	3.15	1.95					DOOSAN
28	20MAL20AN50	0.00	3.00	0.00	0.87	0.85	C	0.00	0.00					DOOSAN
29	20MKV10AP010-M01	12.00	15.00	0.80	0.92	0.85	C	13.07	8.10					DOOSAN
30	20MKV10AP020-M01	0.00	15.00	0.00	0.92	0.85	C	0.00	0.00					DOOSAN
31	20MAY010	1.50	2.00	0.75	0.86	0.85	C	1.74	1.08					DOOSAN
32	20MAY020	2.75	3.00	0.92	0.87	0.85	C	3.15	1.95					DOOSAN
33	20MKW20AP010-M01	0.20	0.25	0.80	0.84	0.85	C	0.24	0.15					DOOSAN
34	20MAV10AP040-M01	0.00	15.00	0.00	0.92	0.85	C	0.00	0.00					DOOSAN
35	20MKY04	0.00	0.50	0.00	0.00	0.00	C	0.00	0.00					DOOSAN
36	20MKY03	0.00	0.50	0.00	0.00	0.00	C	0.00	0.00					DOOSAN
37	20MKY05	0.00	0.50	0.00	0.00	0.00	C	0.00	0.00					DOOSAN
38	20MKC01	0.00	-	-	0.75	0.71	C	0.00	0.00					CALCULATED FROM GEN DATA
39														
40														
41														
42														
43														DOOSAN

<b>Maximum normal running plant load:</b>		kW	kVAr	kVA	TOTAL	370.37	277.18	65.81	21.88	0.00	0.00	Peak Load
[x(%)E + y(%)F]		390	284	482								Power factor without compensation (cos φ):
<b>Peak load</b>		kW	kVAr	kVA	kVA (= √kW <sup>2</sup> + kVAr <sup>2</sup> )	462.60	69.36	0.00	Power factor with compensation (cos φ <sub>1</sub> ):		0.95	
[x(%)E + y(%)F + z(%)G]		390	284	482					NOTE 8		Required capacitor [= kW (tanφ - tanφ <sub>1</sub> ):]	156 kvar

Project Name	PETERHEAD CCS (ONSHORE)		
Client/Company	SHELL U.K. LTD		
Company Project No.	PCCS		
Company Document No.	PCCS-01-TC-EA-4329-00001		
			Rev <b>K01</b>



### 415V LUBRICATION OIL PURIFIER PANEL - 20BJA30

EQUIPMENT NO.	EQUIPMENT DESCRIPTION	ABSORBED LOAD	EQUIPMENT RATING	LOAD FACTOR = A/B	EFFICIENCY (pu) at load factor C	POWER FACTOR at load factor C	LOAD DUTY	(kW = A/D) (kVAr = kW.tg φ) CONSUMED LOAD						REMARKS
								Continuous		Intermittent		Stand-by		
								A	B	C	D	E	F	
		kW	kVAr	kW	kVAr	kW	kVAr							
1	20MAV10AT010-M01	8.80	11.00	0.80	0.91	0.79	I			9.67	7.50			DOOSAN
2	20MAV10AT020-M01	48.00	55.00	0.87	0.94	0.97	I			51.06	12.80			DOOSAN
3	20MAV10AP060-M01	0.60	0.75	0.80	0.82	0.83	I			0.73	0.49			DOOSAN
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<b>Maximum normal running plant load:</b> (Est. x%E + y%F)		kW;	kVAr;	kVA					Peak Load						
		18	6	19	TOTAL				0.00	0.00	61.47	20.79	0.00	0.00	Power factor without compensation (cos φ): 0.95
<b>Peak load:</b> (Est. x%E + y%F + z%G)		kW;	kVAr;	kVA									Power factor with compensation (cos φ <sub>i</sub> ): 0.95		
		18	6	19	$kVA (= \sqrt{kW^2 + kVAr^2})$								NOTE 8		
														Required capacitor [= kW (tanφ - tanφ <sub>i</sub> )]: 0 kvar	
Project Name		PETERHEAD CCS (ONSHORE)													
Client/Company		SHELL U.K. LTD													
Company Project No.		PCCS													
Company Document No.		PCCS-01-TC-EA-4329-00001													
												Rev K01			

### 415V UNIT 20 ESSENTIAL TURBINE MCC - 20BHA20

EQUIPMENT NO.	EQUIPMENT DESCRIPTION	ABSORBED LOAD A kW	EQUIPMENT RATING B kW	LOAD FACTOR = A/B C in decimals	EFFICIENCY (pu) at load factor C D in decimals	POWER FACTOR at load factor C cos φ	LOAD DUTY C/I/S	(kW = A/D) (kVAr = kW.tg φ)						REMARKS
								CONSUMED LOAD		CONSUMED LOAD		CONSUMED LOAD		
								Continuous E kW	kVAr E	Intermittent F kW	kVAr F	Stand-by G kW	kVAr G	
1	20BVB10							5.96	0.00	0.00	0.00			DOOSAN
2	20BJA20							54.35	40.76	0.00	0.00	0.00	0.00	
3														
4	20MKU10AP010-M01									31.83	24.70			DOOSAN
5	20BTA10											20.04	13.99	DOOSAN
6	20BTA20											0.00	0.00	DOOSAN
7	20MAK020							47.77	29.61					ELECTRICAL ESTIMATE
8														
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<b>Maximum normal running plant load:</b>																<b>Peak Load</b>			
[x(%)E + y(%)F]				kW;	kVAr;	kVA											Power factor without compensation (cos φ): 0.83		
				118	78	141													
<b>Peak load</b>																		Power factor with compensation (cos φ <sub>1</sub> ): 0.95	
[x(%)E + y(%)F + z(%)G]				kW;	kVAr;	kVA											NOTE 8		
				120	79	143	kVA (= √kW <sup>2</sup> + kVAr <sup>2</sup> )		128.96		40.29		24.44				Required capacitor [= kW (tanφ - tanφ <sub>1</sub> )]: 40 kvar		
<b>Project Name</b>				<b>PETERHEAD CCS (ONSHORE)</b>															
<b>Client/Company</b>				<b>SHELL U.K. LTD</b>															
<b>Company Project No.</b>				<b>PCCS</b>															
<b>Company Document No.</b>				<b>PCCS-01-TC-EA-4329-00001</b>															
																<b>Rev</b>			
																<b>K01</b>			

### 415V MAIN LUBRICATION OIL PUMP SWITCHGEAR - 20BJA20

EQUIPMENT		ABSORBED LOAD	EQUIPMENT RATING	LOAD FACTOR = A/B	EFFICIENCY (pu) at load factor C	POWER FACTOR at load factor C	LOAD DUTY	CONSUMED LOAD						REMARKS
EQUIPMENT NO.	DESCRIPTION							(kW = A/D) (kVAr = kW.tg φ)		Intermittent		Stand-by		
								Continuous	E	F	G			
		kW	kVAr	kW	kVAr	kW	kVAr	kW	kVAr					
1	20MAV10AP010-M01	25.00	30.00	0.83	0.92	0.80	C	27.17	20.38					DOOSAN
2	20MAV10AP020-M01	25.00	30.00	0.83	0.92	0.80	C	27.17	20.38					DOOSAN
3	20MAV10AP030-M01	0.00	30.00	0.00	0.92	0.80	C	0.00	0.00					DOOSAN
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<b>Maximum normal running plant load:</b> (Est. x%E + y%F)		kW;	kVAr;	kVA	TOTAL	54.35	40.76	0.00	0.00	0.00	0.00	Power factor without compensation (cos φ):	Peak Load 0.80	
		54	41	68										
<b>Peak load</b> (Est. x%E + y%F + z%G)		kW;	kVAr;	kVA	kVA (= $\sqrt{kW^2 + kVAr^2}$ )	67.93		0.00		0.00		Power factor with compensation (cos φ <sub>1</sub> ):	0.95	
		54	41	68										
												NOTE 8 Required capacitor [= kW (tanφ - tanφ <sub>1</sub> )]: 23 kvar		
Project Name		PETERHEAD CCS (ONSHORE)												
Client/Company		SHELL U.K. LTD												
Company Project No.		PCCS												
Company Document No.		PCCS-01-TC-EA-4329-00001											Rev <b>K01</b>	

## 220V DC SWITCHGEAR - 20BVB10

EQUIPMENT		ABSORBED LOAD A kW	EQUIPMENT RATING B kW	LOAD FACTOR = A/B C in decimals	EFFICIENCY (pu) at load factor C D in decimals	POWER FACTOR at load factor C cos φ	LOAD DUTY C/I/S	CONSUMED LOAD (kW = A/D) (kVAr = kW.tg φ)						REMARKS	
EQUIPMENT NO.	DESCRIPTION							Continuous E		Intermittent F		Stand-by G			
								kW	kVAr	kW	kVAr	kW	kVAr		
1	20MAV10AP040-M01	EMERGENCY LUBRICATION OIL PUMP	12.00	15.00	0.80	0.91	1.00	S					13.19	0.00	DOOSAN
2	20BYA10	GENERATOR PROTECTION A	0.75	0.75	1.00	0.91	1.00	C	0.82	0.00					DOOSAN
3	20BYA20	GENERATOR PROTECTION B	0.75	0.75	1.00	0.91	1.00	C	0.82	0.00					DOOSAN
4	10MKY10EG010	MEASURING AND SYNCHRONIZATION	0.75	0.75	1.00	0.91	1.00	C	0.82	0.00					DOOSAN
5	20MKC	STATIC EXCITATION SET - BATTERY VOLTAGE	0.35	0.35	1.00	0.91	1.00	C	0.38	0.00					DOOSAN
6	20MKY	TURBINE CONTROL SYSTEM	1.00	1.00	1.00	0.91	1.00	C	1.10	0.00					DOOSAN
7	20MKU10AP020-M01	EMERGENCY JACKING OIL PUMP	50.00	55.00	0.91	0.94	1.00	S					53.08	0.00	DOOSAN
8	02MKY01	GENERATOR TRANSFORMER PROTECTION A	0.50	0.50	1.00	1.00	1.00	C	0.50	0.00					DOOSAN
9	20MKY02	GENERATOR TRANSFORMER PROTECTION B	0.50	0.50	1.00	1.00	1.00	C	0.50	0.00					DOOSAN
10	20MKY040	UNIT & EXCITATION TRANSFORMERS PROTECTION A	0.50	0.50	1.00	1.00	1.00	C	0.50	0.00					DOOSAN
11	20MKY050	UNIT & EXCITATION TRANSFORMERS PROTECTION B	0.50	0.50	1.00	1.00	1.00	C	0.50	0.00					DOOSAN
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<b>Maximum normal running plant load:</b> (Est. x%E + y%F)		kW; 6	kVAr; 0	kVA 6	TOTAL	5.96	0.00	0.00	0.00	66.27	0.00	Required capacitor [= kW (tanφ - tanφ <sub>i</sub> )]:	Peak Load 1.00
<b>Peak load</b> (Est. x%E + y%F + z%G)		kW; 13	kVAr; 0	kVA 13		kVA (= √kW <sup>2</sup> + kVAr <sup>2</sup> )	5.96	0.00	66.27	Power factor with compensation (cos φ <sub>i</sub> ):	NOTE 8	0.95	Required capacitor [= kW (tanφ - tanφ <sub>i</sub> )]:
Project Name		PETERHEAD CCS (ONSHORE)											
Client/Company		SHELL U.K. LTD											
Company Project No.		PCCS											
Company Document No.		PCCS-01-TC-EA-4329-00001											
												Rev	K01

### 415V TURBINE UNIT BOARD 2A - 20BHA30

EQUIPMENT		ABSORBED LOAD A kW	EQUIPMENT RATING B kW	LOAD FACTOR = A/B C in decimals	EFFICIENCY (pu) at load factor C D in decimals	POWER FACTOR at load factor C cos φ	LOAD DUTY C/I/S	CONSUMED LOAD (kW = A/D) (kVAr = kW.tg φ)						REMARKS
EQUIPMENT NO.	DESCRIPTION							Continuous E		Intermittent F		Stand-by G		
								kW	kVAr	kW	kVAr	kW	kVAr	
1	00QLA10AP010-M01	39.40	55.00	0.72	0.94	0.85	C	41.83	25.92					PROCESS
2	00QLA20	0.20	0.25	0.80	0.84	0.85	C	0.24	0.15					PROCESS
3	00QH10	88.00	110.00	0.80	0.95	0.85	C	92.63	57.41					PROCESS
4	13QCJ20	40.00	45.00	0.89	0.91	0.85	C	43.96	27.24					PROCESS
5	00QFQ10AT010	5.00	7.50	0.67	0.95	0.85	C	5.26	3.26					PROCESS
6	00AXE10AN010	74.00	90.00	0.82	0.95	0.85	C	77.89	48.27					PROCESS
7	00EGC10AP010-M01	0.20	2.20	0.09	0.90	0.85	C	0.22	0.14					PROCESS
8	00GHC10AP010-M01	3.75	5.50	0.68	0.85	0.85	C	4.41	2.73					PROCESS
9	00QLA20	0.10	0.25	0.40	0.95	0.85	C	0.11	0.07					PROCESS
10	00SFT10	0.50	0.75	0.67	0.95	0.85	C	0.53	0.33					PROCESS
11	13LCM03AP010-M01	60.00	75.00	0.80	0.95	0.85	C	63.36	39.27					PROCESS
12	13LCM03AP020-M01	0.00	75.00	0.00	0.95	0.80	C	0.00	0.00					PROCESS
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Maximum normal running plant load:		kW;	kVAr;	kVA	TOTAL	330.43	204.78	0.00	0.00	0.00	0.00	Power factor without compensation (cos φ):	Peak Load 0.85	
[x(%)E + y(%)F]		330	205	389										
Peak load		kW;	kVAr;	kVA	kVA (= √kW <sup>2</sup> + kVAr <sup>2</sup> )	388.75		0.00		0.00		Power factor with compensation (cos φ <sub>1</sub> ):	NOTE 8 0.95	
[x(%)E + y(%)F + z(%)G]		330	205	389										
													Required capacitor [= kW (tanφ - tanφ <sub>1</sub> )]:	96 kvar
Project Name		PETERHEAD CCS (ONSHORE)												
Client/Company		SHELL U.K. LTD												
Company Project No.		PCCS												
Company Document No.		PCCS-01-TC-EA-4329-00001												
												Rev	K01	



### 415V TURBINE UNIT BOARD 2B - 20BHA40

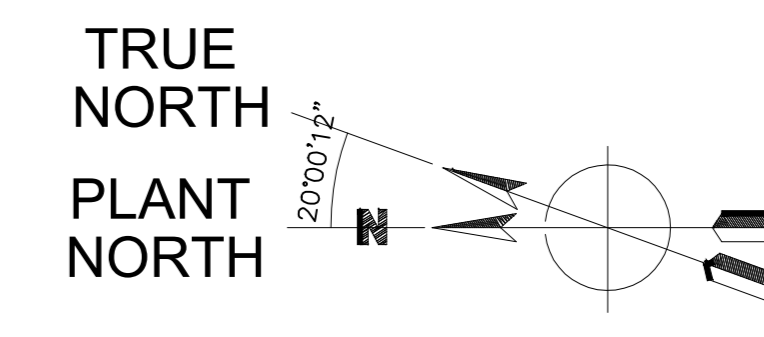
EQUIPMENT NO.	EQUIPMENT DESCRIPTION	ABSORBED LOAD A kW	EQUIPMENT RATING B kW	LOAD FACTOR = A/B C in decimals	EFFICIENCY (pu) at load factor C D in decimals	POWER FACTOR at load factor C cos φ	LOAD DUTY C/I/S	(kW = A/D) (kVAr = kW.tg φ)						REMARKS
								Continuous E		Intermittent F		Stand-by G		
								kW	kVAr	kW	kVAr	kW	kVAr	
1	00QLA10AP020-M01	0.00	55.00	0.00	0.88	0.85	C	0.00	0.00					PROCESS
2	00QCD20	0.20	0.25	0.80	0.84	0.85	C	0.24	0.15					PROCESS
3	00AXE10AN010	0.00	90.00	0.00	0.95	0.85	C	0.00	0.00					PROCESS
4	00QFQ10AT020	0.00	7.50	0.00	0.90	0.85	C	0.00	0.00					PROCESS
5	00EGC10AP020-M01	0.00	1.10	0.00	0.90	0.85	C	0.00	0.00					PROCESS
6	00GHC10AP020-M01	0.00	3.80	0.00	0.95	0.85	C	0.00	0.00					PROCESS
7	00QLA10AC030	115.00	132.00	0.87	0.96	0.86	C	119.79	71.08					PROCESS
8	13BJA10	45.00	50.00	0.90	0.95	0.85	C	47.37	29.36					PROCESS
9	13SEA10	20.00	45.00	0.44	0.95	0.85	I			21.05	13.05			PROCESS
10	10LCL10AP010-M01	60.00	75.00	0.80	0.95	0.85	C	63.36	39.27					PROCESS
11	10LCL10AP010-M01	0.00	75.00	0.00	0.95	0.85	C	0.00	0.00					PROCESS
12	20BJA10	95.00	100.00	0.95	0.95	0.85	I			100.00	61.97			PROCESS
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<b>Maximum normal running plant load:</b>																<b>Peak Load</b>	
[x(%)E + y(%)F]	kW;	kVAr;	kVA			TOTAL		230.76	139.85	121.05	75.02	0.00	0.00	Power factor without compensation (cos φ):		0.85	
[x(%)E + y(%)F + z(%)G]	kW;	kVAr;	kVA			kVA (= √kW <sup>2</sup> + kVAr <sup>2</sup> )		269.83		142.41		0.00		Power factor with compensation (cos φ <sub>1</sub> ):		0.95	
														NOTE 8			
														Required capacitor [= kW (tanφ - tanφ <sub>1</sub> ):]		75 kvar	
Project Name				PETERHEAD CCS (ONSHORE)													
Client/Company				SHELL U.K. LTD													
Company Project No.				PCCS													
Company Document No.				PCCS-01-TC-EA-4329-00001													
														Rev		K01	

### 415V C.W PUMPHOUSE BOARD

EQUIPMENT NO.	EQUIPMENT DESCRIPTION	ABSORBED LOAD A kW	EQUIPMENT RATING B kW	LOAD FACTOR = A/B C in decimals	EFFICIENCY (pu) at load factor C D in decimals	POWER FACTOR at load factor C cos φ	LOAD DUTY C/I/S	CONSUMED LOAD kVAr = kW.tg φ						REMARKS
								(kW = A/D) (kVAr = kW.tg φ)		Intermittent		Stand-by		
								Continuous E	Intermittent F	Stand-by G	Continuous E	Intermittent F	Stand-by G	
1	00PYA10GW010	10.00	15.00	0.67	0.92	0.85	i			10.89	6.75			CONTROL AND INSTRUMENTATION - NOTE 7
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<b>Maximum normal running plant load:</b>		kW;	kVAr;	kVA	TOTAL	0.00	0.00	10.89	6.75	0.00	0.00	Power factor without compensation (cos φ):	Peak Load
[x(%)E + y(%)F]		3	2	4									0.85
<b>Peak load</b>		kW;	kVAr;	kVA	kVA (= √kW <sup>2</sup> + kVAr <sup>2</sup> )	0.00	12.82	0.00	NOTE 8	Required capacitor [= kW (tanφ - tanφ <sub>i</sub> )]:	1 kvar	Power factor with compensation (cos φ <sub>i</sub> ):	0.95
[x(%)E + y(%)F + z(%)G]		3	2	4									0.95
Project Name	PETERHEAD CCS (ONSHORE)												
Client/Company	SHELL U.K. LTD												
Company Project No.	PCCS												
Company Document No.	PCCS-01-TC-EA-4329-00001												
												Rev	K01



NOTES

- THIS DRAWING IS CONCEPTUAL AND SHOWS THE EXTENSION OF THE EXISTING MAIN EARTH GRID FOR THE NEW POWER STATION EQUIPMENT.
- EXOTHERMIC WELDS SHALL BE USED FOR UNDERGROUND CONNECTION OF EARTH CONDUCTORS.
- QUANTITY AND LOCATION OF EARTHRODS AND EARTH BARS TO BE CONFIRMED DURING DETAILED DESIGN.
- TIE IN TO EXISTING UNDERGROUND EARTHING SYSTEM USING SPECIAL CONNECTORS BETWEEN NEW COPPER AND EXISTING ALUMINIUM CONDUCTORS (WHERE APPLICABLE). LOCATION OF EXISTING EARTHING SYSTEM AND THEREFORE TIE INS TO BE VERIFIED DURING DETAILED DESIGN. DISCONNECTION PITS SHALL BE PROVIDED AT ALL TIE IN POINTS.
- UNDERGROUND EARTHING CABLE SHALL FOLLOW THE SAME ROUTE AS THE COOLING WATER INTAKE PIPELINE.
- THE EXISTING EARTH NETWORK FOR UNIT 2 IN THE STEAM TURBINE HALL SHALL BE EXTENDED TO MEET THE REQUIREMENTS OF THE NEW UNIT 20 STEAM TURBINE GENERATOR.
- THE EXISTING EARTH NETWORK IN THE LV SWITCHROOMS SHALL BE EXTENDED TO MEET THE REQUIREMENTS OF THE NEW MCC'S.

LEGEND

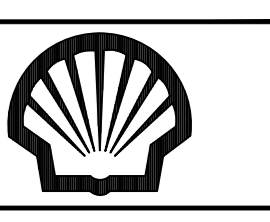
- BURIED, BARE 120mm² COPPER EARTH CONDUCTOR
- EARTH ROD
- DISCONNECT PIT

REFERENCE DOCUMENTS

- PCCS-00-TC-MP-4024-00002 PLOT PLAN OVERALL CCCC PROJECT AREA PLAN
- PCCS-02-TC-EA-8809-00001 OVERALL EARTHING LAYOUT DRAWING (CCCC)

HOLDS

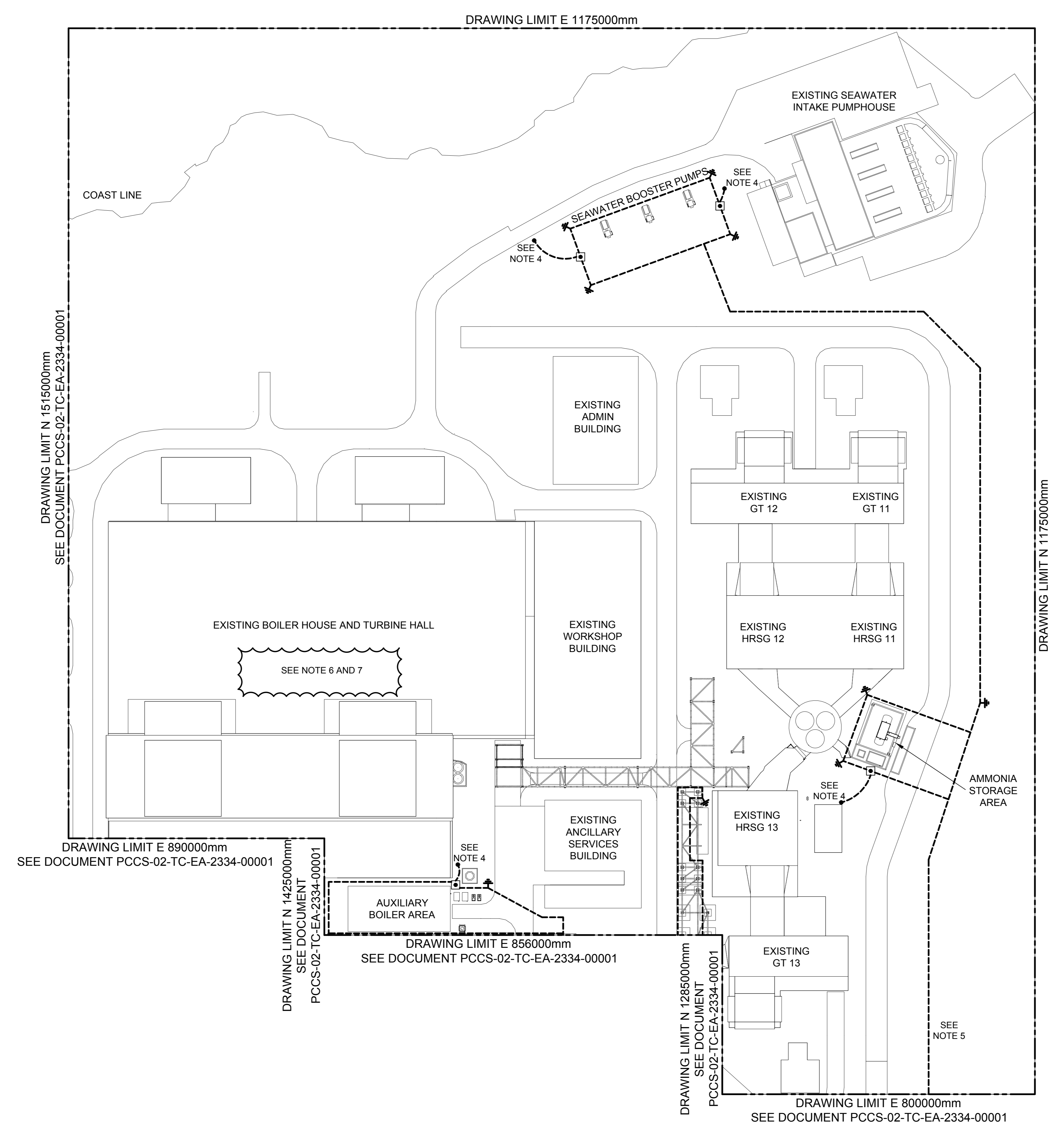
Rev	Date	Revision Object	Written by	Checked by	Approved by



PETERHEAD  
CCS (ONSHORE)

OVERALL EARTHING  
LAYOUT DRAWING (POWER STATION)

DOC. CLASS:	SCALE: 1:750	SHEET: 1/1
CLIENT Doc Ref:	PCCS-01-TC-EA-8809-00001	REVISION FORMAT
		K01 A0





ENGINEER REFERENCE					Rev.	Page
Project	Unit No	Doc. Type	Code	Serial No	K01	1 OF 7
CLIENT REFERENCE						
Project Code	Area/Facility Code	Originator	Discipline	Doc Type	Sequential No	
PCCS	01	TC	IN	6604	00001	

**ESD CAUSE AND EFFECTS  
 PETERHEAD POWER STATION**

Rev	Date DD/MM/YY	STATUS	WRITTEN BY (name & sign)	CHECKED BY (name & sign)	APPROVED BY (name & sign)
DOCUMENT REVISIONS					

51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 Rev

CAUSE						EFFECT					
UX	OTHER UX LOGIC	P&ID	NOTES	SERVICE DESCRIPTION	VERRIDE TAG No	ACTION	SIL	SERVICE DESCRIPTION	NOTES	UX	P&ID
						R01					
						CLOSE		AQUEOUS AMMONIA BALANCING VALVE	2	UX-0252	PCCS-01-TC-PX-2365-00001-001
						CLOSE		AQUEOUS AMMONIA LOADING VALVE	2	UX-0253	PCCS-01-TC-PX-2365-00001-001
						STOP		AMMONIA TRANSFER AND FLOW PUMPS	1	UX-0255	PCCS-01-TC-PX-2365-00001-001

UX	OTHER UX LOGIC	P&ID	NOTES	SERVICE DESCRIPTION	VERRIDE TAG No	TAG No.	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90														
UX-0208		PCCS-01-TC-PX-2365-00001-001		AQUEOUS AMMONIA TANK 13QCJ10 HIGH HIGH LEVEL		13QCJ10CL101		X	X																																																			
UX-0209		PCCS-01-TC-PX-2365-00001-001		AQUEOUS AMMONIA TANK 13QCJ10 LOW LOW LEVEL		13QCJ10CL101					X																																																	
UX-0212		PCCS-01-TC-PX-2365-00001-001	2	13QCJ10AA191 LIMIT SWITCH CLOSED (NOT OPEN)		13QCJ10AA191-XC08		X	X																																																			
UX-0214		PCCS-01-TC-PX-2365-00001-001	2	13QCJ11AA191 LIMIT SWITCH CLOSED (NOT OPEN)		13QCJ11AA191-XC08		X	X																																																			

**GENERAL NOTE**  
- REFER TO P&ID PCCS-01-TC-PX-2365-00001-001.

**SPECIFIC NOTE**  
1. AMMONIA TANK LOW LOW LEVEL SIGNAL TO AMMONIA TRANSFER AND CONTROL PACKAGE UNIT TO STOP THE PUMPS.  
2. IF EITHER XV13QCJ10AA191 OR XV13QCJ11192 ARE CLOSED, THEN TRIP OTHER VALVE CLOSED. INCLUDE 10 SEC TIME DELAY TO PERMIT STARTUP.

**SPECIFIC HOLD**

**CONTROL SYSTEM ACTIONS**  
X: PERFORM ACTION SHOWN  
&: VOTING FUNCTION (REFER TO NOTES FOR DETAILS).  
T: TIMED FUNCTION  
I: INTERLOCK FUNCTION  
INT: INTERTRIP



51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 Rev

**GENERAL**  
 - REFER TO P&IDs: PCCS-01-TC-PX-2365-00004-001.

**SPECIFIC NOTES**  
 1. GT13 TRIPPED VIA EXISTING ESD SIGNAL AND PROCEDURE AFTER 60S.  
 2. 2oo3 VOTING  
 3. SIEMENS TO UPGRADE ESD SYSTEM WITH EXISTING ESD LOGICS.  
 4. ESD VALVE SUPPLIED BY STEAM TURBINE PACKAGE VENDOR.  
 5. DETAILS OF SIGNAL FROM HRSG SYSTEM TO BE ADDED (HAZOP R-074)

**SPECIFIC HOLD**  
 1

**CONTROL SYSTEM ACTIONS**  
 X: PERFORM ACTION SHOWN  
 &: VOTING FUNCTION (REFER TO NOTES FOR DETAILS).  
 T: TIMED FUNCTION  
 I: INTERLOCK FUNCTION  
 INT: INTERTRIP

EFFECT					ACTION	SIL	SERVICE DESCRIPTION	NOTES	UX	P&ID
					K01					
					INT		GAS TURBINE GT13 INTERTRIP SHT 5	3	UX-0352	
					INT		STEAM TURBINE ST.20 INTERTRIP SHEET 4		UX-0353	
					CLOSE		HP STEAM INLET VALVE	4	UX-0356	PACKAGE P&ID
					CLOSE		HP STEAM INLET VALVE	4	UX-0357	PACKAGE P&ID
					CLOSE		IP STEAM INLET VALVE	4	UX-0359	PACKAGE P&ID
					CLOSE		IP STEAM INLET VALVE	4	UX-0360	PACKAGE P&ID
					CLOSE		LP STEAM INLET VALVE	4	UX-0362	PACKAGE P&ID
					CLOSE		LP STEAM INLET VALVE	4	UX-0363	PACKAGE P&ID

**CAUSE**

UX	OTHER UX LOGIC	P&ID	NOTES	SERVICE DESCRIPTION	SIL	OVERRIDE TAG No	TAG No.	51	52	53	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90						
12	UX-0312	PCCS-01-TC-PX-2365-00004-001	1, 2	HP STEAM LOW LOW TEMPERATURE			13LBA51CT101	12																																												
13	UX-0313	PCCS-01-TC-PX-2365-00004-001		HP STEAM LOW LOW TEMPERATURE			13LBA51CT102	13																																												
14	UX-0314	PCCS-01-TC-PX-2365-00004-001	1, 2	HP STEAM LOW LOW TEMPERATURE			13LBA51CT103	14																																												
15	UX-0315	PCCS-01-TC-PX-2365-00004-001		HP STEAM LOW LOW TEMPERATURE			13LBA52CT101	15																																												
16	UX-0316	PCCS-01-TC-PX-2365-00004-001	1, 2	HP STEAM LOW LOW TEMPERATURE			13LBA52CT102	16																																												
17	UX-0317	PCCS-01-TC-PX-2365-00004-001		HP STEAM LOW LOW TEMPERATURE			13LBA52CT103	17																																												
18	UX-0318	PACKAGE P&ID		HP DRUM LEVEL MAX 3 (EXISTING SIGNAL)				18	X	X		X	X																																							
19	UX-0319	PACKAGE P&ID		IP DRUM LEVEL MAX 3 (EXISTING SIGNAL)				19	X	X					X	X																																				
20	UX-0320	PACKAGE P&ID		LP DRUM LEVEL MAX 3 (EXISTING SIGNAL)				20	X	X								X	X																																	
22	UX-0321	PACKAGE P&ID		HP DRUM LEVEL MIN3 (EXISTING SIGNAL)				22	X																																											
23	UX-0322	PACKAGE P&ID		IP DRUM LEVEL MIN3 (EXISTING SIGNAL)				23	X																																											
24		PACKAGE P&ID		LP DRUM LEVEL MIN3 (EXISTING SIGNAL)				24	X																																											
26	UX-0326		5	HRSG STEAM TEMPERATURE LOW LOW				26	X	X		X	X		X	X		X	X																																	



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Service Description					
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CAUSE					
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Other UX Logic					
P&ID					
Notes					
Service Description					
SIL					
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**GENERAL NOTES**  
**SPECIFIC NOTES**  
 1. STEAM TURBINE PACKAGE VENDOR TRIPS TO BE DEVELOPED BY VENDOR AND EPC CONTRACTOR DURING DETAILED ENGINEERING.  
 2. EXISTING GT 13 TRIP SIGNAL TO BE IMPLEMENTED IN THE UPGRADED ESD SYSTEM.  
 3. INTER TRIP SIGNAL TO CCP TO STOP K1001A/B FAN AND TRIP A3100A CO2 COMPRESSOR, REFER TO C&E PCCS-02-TC-IN-6604-00001 SH2.  
 4. PACKAGE VENDOR TRIPS TO BE DEVELOPED BY VENDOR & EPC CONTRACTOR DURING DETAILED ENGINEERING

**GENERAL HOLDS**

**SPECIFIC HOLDS**

**CONTROL SYSTEM ACTIONS**  
 X: PERFORM ACTION SHOWN  
 &: VOTING FUNCTION (REFER TO NOTES FOR DETAILS).  
 T: TIMED FUNCTION  
 I: INTERLOCK FUNCTION  
 INT: INTERTRIP

TAG No.	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90		
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2		X		X		X																																				
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7	UX-0507		NOTE 4	4	FAULT IN THE 275KV CONNECTION (breaker trip)							X		X		X																										
8	UX-0508		NOTE 4	4	FAULT ON THE GT 13 GENERATOR TRANSFORMER							X		X		X																										
9	UX-0509		NOTE 4	4	FAULT ON THE ST 20 GENERATOR TRANSFORMER							X		X		X																										
10	UX-0510		NOTE 4	4	FAILURE OF ALL 132KV SUPPLIES							X		X		X																										
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**SHELL U.K. LTD**  
**PETERHEAD, SCOTLAND**  
**PETERHEAD CCS (ONSHORE)**

TITLE: INSTRUMENT CAUSE AND EFFECT DIAGRAM LOAD REJECTION  
 SCALE: NTS SHEET 5 OF 7

CLIENT REFERENCE: PCCS-01-TC-IN-6604-00001

CAUSE					EFFECT	ACTION	SIL	SERVICE DESCRIPTION	NOTES	UX	P&ID	TAG No.	ROW
UX	OTHER UX LOGIC	P&ID	NOTES	SERVICE DESCRIPTION	SIL	OVERVERRIDE TAG No							
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**GENERAL NOTES**  
- REFER TO P&ID: PCCS-01-TC-PX-2365-00017-001, PCCS-01-TC-PX-2365-00027-001, PCCS-01-TC-PX-2365-00028-001 AND PCCS-01-TC-PX-2365-00031-001.

**SPECIFIC NOTES**  
1. AUXILIARY BOILER PACKAGE VENDOR TRIPS TO BE DEVELOPED BY VENDOR AND EPC CONTRACTOR DURING DETAILED ENGINEERING.  
2. GLAND STEAM SUPERHEATER WILL INCLUDE TRIPS. REFER TO VENDOR C&E.

**SPECIFIC HOLDS**

**CONTROL SYSTEM ACTIONS**  
X: PERFORM ACTION SHOWN  
\*: VOTING FUNCTION (REFER TO NOTES FOR DETAILS).  
T: TRIP FUNCTION  
I: INTERLOCK FUNCTION  
INT: INTERTRIP

SHELL U.K. LTD  
PETERHEAD, SCOTLAND  
PETERHEAD CCS (ONSHORE)

TITLE  
INSTRUMENT  
CAUSE AND EFFECT DIAGRAM  
AUXILIARY BOILER

SCALE: NTS SHEET 6 OF 7

CLIENT REFERENCE: PCCS-01-TC-IN-6604-00001

CAUSE						EFFECT					
UX	OTHER UX LOGIC	P&ID	NOTES	SERVICE DESCRIPTION	OVERRIDE TAG No	ACTION	SIL	SERVICE DESCRIPTION	NOTES	UX	P&ID
						TAG No.					
						51					
						52	K01	BL1 STARTUP/ SHUTDOWN FLASH TANK VALVE		UX-0752	PCCS-01-TC-PX-2365-00039-001
						53	10LCL20AA191				
						54	10CLC10AP010	SEGREGATED STEAM GENERATOR DRAINS PUMP		UX-0754	PCCS-01-TC-PX-2365-00039-001
						55	10CLC10AP020	SEGREGATED STEAM GENERATOR DRAINS PUMP		UX-0755	PCCS-01-TC-PX-2365-00039-001
						56					
						57	13LCM13AA191	CLEAN DRAINS VASSEL VALVE		UX-0757	PCCS-01-TC-PX-2365-00041-001
						58					
						59	13LCM03AP010	SEGREGATED STEAM GENERATOR DRAINS PUMP		UX-0759	PCCS-01-TC-PX-2365-00041-001
						60	13LCM03AP020	SEGREGATED STEAM GENERATOR DRAINS PUMP		UX-0760	PCCS-01-TC-PX-2365-00041-001
						61					
						62	20LCM10AA191	BL2 STARTUP/ SHUTDOWN FLASH TANK VALVE		UX-0762	PCCS-01-TC-PX-2365-00042-001
						63					
						64	20LCM10AP010	SEGREGATED STEAM GENERATOR DRAINS PUMP		UX-0764	PCCS-01-TC-PX-2365-00042-001
						65	20LCM10AP020	SEGREGATED STEAM GENERATOR DRAINS PUMP		UX-0765	PCCS-01-TC-PX-2365-00042-001
						66					
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**GENERAL NOTE**  
- REFER TO P&IDs PCCS-01-TC-PX-2365-00039-001, PCCS-01-TC-PX-2365-00041-001 AND PCCS-01-TC-PX-2365-00042-001

**SPECIFIC NOTE**

**SPECIFIC HOLD**

**CONTROL SYSTEM ACTIONS**  
X: PERFORM ACTION SHOWN  
&: VOTING FUNCTION (REFER TO NOTES FOR DETAILS).  
T: TIMED FUNCTION  
I: INTERLOCK FUNCTION  
INT: INTERTRIP

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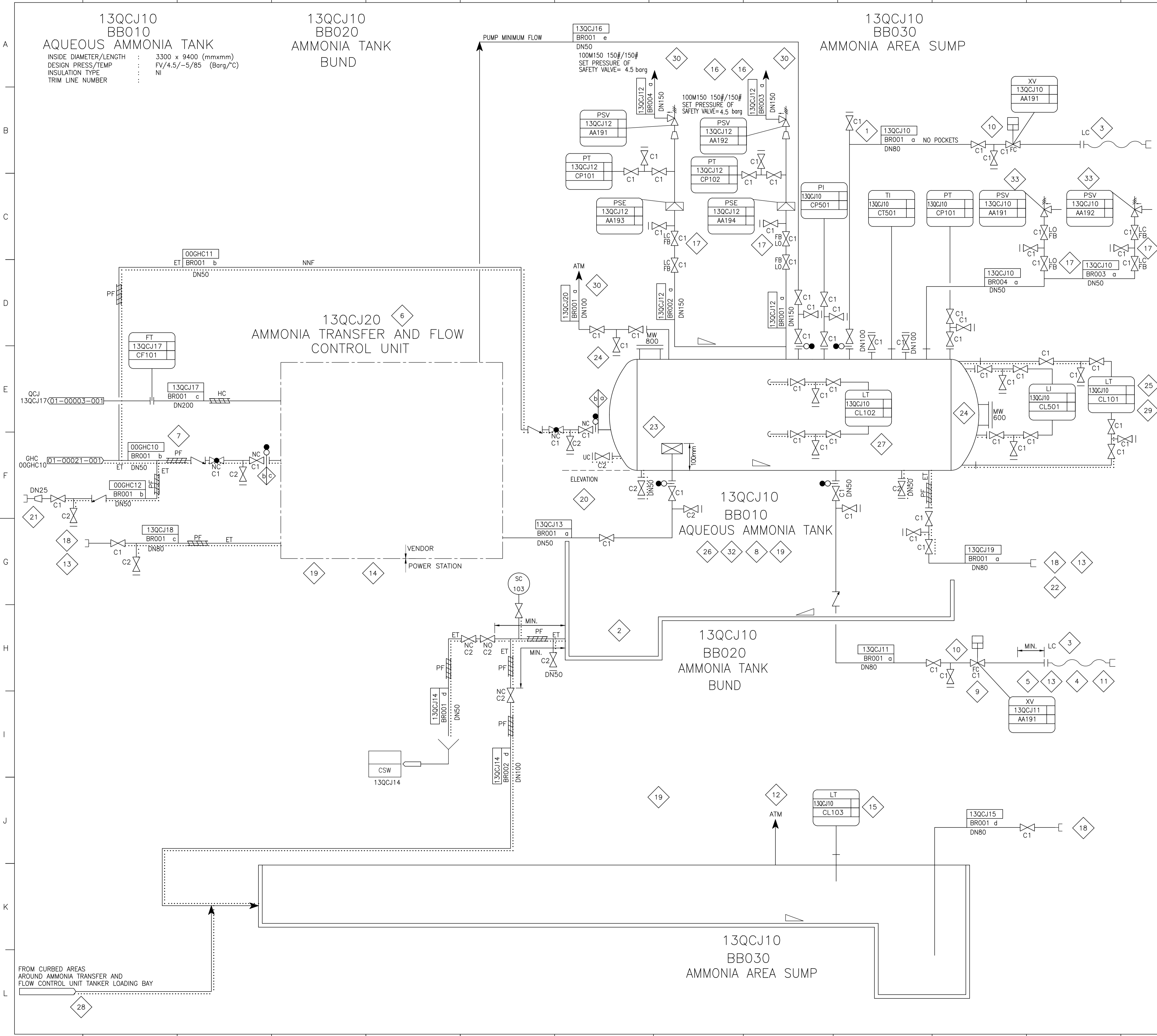
**SHELL U.K. LTD**  
**PETERHEAD, SCOTLAND**  
**PETERHEAD CCS (ONSHORE)**

TITLE  
INSTRUMENT  
CAUSE AND EFFECT DIAGRAM  
CLEAN DRAINS SYSTEM

SCALE: NTS SHEET 7 OF 7

CLIENT REFERENCE PCCS-01-TC-IN-6604-00001





- GENERAL NOTES**
- FOR STANDARD SYMBOLS AND NOMENCLATURE SEE DRAWINGS PCCS-00-TC-PX-2365-00002-001 TO PCCS-00-TC-PX-2365-00008-001.
  - ALL VENTS AND DRAINS TO BE DN20 UNLESS OTHERWISE INDICATED.
  - 
  - FOR INTERLOCKS, REFER TO CAUSE AND EFFECT DIAGRAM; DOCUMENT NUMBER PCCS-01-TC-IN-6604-00001.
  - EPC CONTRACTOR TO RECONFIRM AND FINALISE LINE SIZES DURING DETAILED DESIGN.
  - EPC CONTRACTOR TO RECONFIRM AND FINALISE EQUIPMENT DETAILS/ELEVATIONS DURING DETAILED DESIGN.
  - DETAILS OF OPEN DRAIN (UNDERGROUND SYSTEM) TO BE DEVELOPED DURING EPC PHASE.
  - ALARMS AND ESD SET POINTS TO BE PROVIDED BY EPC CONTRACTOR.


- NOTES:**
- VAPOUR BALANCING CONNECTION DURING TANKER UNLOADING.
  - SAMPLE TO BE TAKEN TO DETERMINE CONTENTS.
  - FILLING POINTS TO BE LOCKED CLOSED. SITE PROCEDURE TO CONTROL TANK FILLING TO BE DEVELOPED IN EPC.
  - AMMONIA UNLOADING PUMP LOCATED WITH ROAD TANKER.
  - LOCATE SAFETY SHOWER/EYEWASH UNIT AT TANKER UNLOADING BAY (TOWNS WATER WILL BE TIED IN TO THIS LOCATION).
  - AMMONIA TRANSFER AND FLOW CONTROL UNIT SUPPLIED BY VENDOR, AND TO INCLUDE DISTRIBUTION MANIFOLD.
  - DEMNERALISED WATER CONNECTION FOR OFFLINE BLOWDOWN REMOVAL IN VAPORIZER.
  - AQUEOUS AMMONIA TANK TO BE DESIGNED FOR FULL VACUUM.
  - VALVE WILL CLOSE ON HIGH HIGH LEVEL IN AQUEOUS AMMONIA TANK.
  - VALVES TO BE PROVIDED WITH LIMIT SWITCHES.
  - UNLOADING OPERATION TO BE CONTROLLED FROM LOCAL STATION WITH ROAD TANKER ACCESS.
  - VENT TO ATMOSPHERE AT SAFE LOCATION DURING DETAILED DESIGN A VAPOUR SCRUBING SYSTEM SHALL BE SELECTED.
  - EMERGENCY BREAKAWAY COUPLING.
  - VENDOR TO CONSIDER AS AN OPTION HOT FLUE GAS FOR AMMONIA VAPORISATION, INSTEAD OF AN ELECTRICAL HEATER. HEATING METHOD BY VENDOR.
  - GUIDE WAVE RADAR INSTRUMENT.
  - WEEP HOLE TO BE PROVIDED AT LOW POINT OF DISCHARGE PIPING.
  - MECHANICAL INTERLOCK REQUIRED.
  - RESIDUE SENT TO WWTP OR TO OFFSITE DISPOSAL (ROAD ACCESS REQUIRED) VIA VACUUM TANKER.
  - AMMONIA GAS DETECTION/MONITORING TO BE PROVIDED IN THE PROCESS AREA WITH LOCAL ALARM.
  - ELEVATION ACCORDING TO 13QCJ20, AMMONIA TRANSFER AND FLOW CONTROL UNIT VENDOR REQUIREMENTS.
  - FOR CONNECTION OF FLEXIBLE HOSE FOR WASHING OPERATIONS.
  - WASH-OUT CONNECTION OPPOSITE TO PUMP OFF-TAKE.
  - OFF-SET OF OFF-TAKE CONNECTION TO PREVENT PUMPS FROM TAKING SLUDGE.
  - MW TO BE LOCATED AT OPPOSITE SIDES ON THE VESSEL.
  - AN ALARM THAT MATCHES THE DELIVERY TIME OF THE AQUEOUS AMMONIA SOLUTION TO BE PROVIDED.
  - ALL DRAINS POINTS TO BE LOCATED WITHIN BUND / KERBED AREA.
  - LOCAL LEVEL INDICATION TO BE PROVIDED AT TANKER LOADING POINT.
  - DESIGN TO BE FINALISED BY EPC CONTRACTOR.
  - LOCAL KLAXON ALARM TO BE PROVIDED ON HIGH LEVEL.
  - VENTS TO BE ROUTED TO THE AMMONIA AREA SUMP.
  - SAFETY SHOWER DRAINS TO BE DIRECTED TO THE AMMONIA AREA SUMP.
  - LEVEL INSTRUMENTS LOWER CONNECTION SHOULD BE LOCATED AT LEAST 100 mm OVER THE VESSEL BOTTOM.
  - TO BE PROVIDED BY THE AMMONIA TRANSFER AND FLOW CONTROL UNIT VENDOR.

QCJ AMMONIA STORAGE AND FEED FOR HRSG CATALYTIC CONVERTER DISTRIBUTION SYSTEMS AFTER TREATMENT (DEMNERALIZATION)

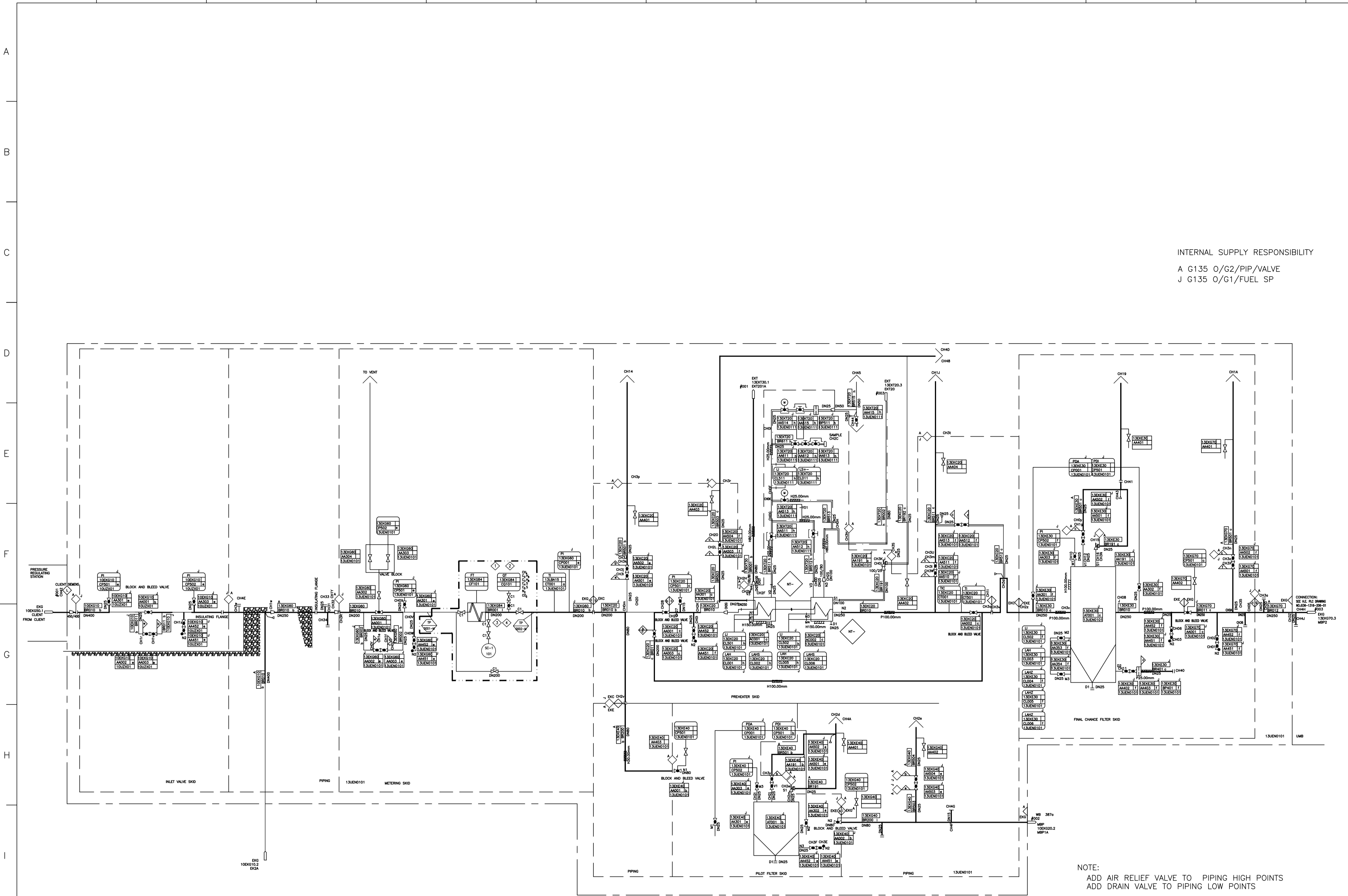
HOLDS:

REFERENCE DRAWINGS			
DRAWING NUMBER	CLIENT	TITLE	
PCCS-01-TC-PX-2365-00021-001		DEMNERALISED WATER DISTRIBUTION SYSTEM	
PCCS-01-TC-PX-2365-00003-001		HEAT RECOVERY STEAM GENERATOR EXHAUST GAS SYSTEM	

Rev	Date	Revision Object	Written by	Checked by	Approved by


  
**PETERHEAD CCS (ONSHORE)**  
**PETERHEAD CCS PROJECT**  
**PIPING AND INSTRUMENTATION DIAGRAM**  
**AQUEOUS AMMONIA UNLOADING, STORAGE AND TRANSFER**

DOC. CLASS:	SCALE: NTS	SHEET: 1/1
CLIENT Doc. Ref:	PCCS-01-TC-PX-2365-00001-001	REVISION FORMAT
		K01 A1



INTERNAL SUPPLY RESPONSIBILITY  
 A G135 O/G2/PIP/VALVE  
 J G135 O/G1/FUEL SP

NOTE:  
 ADD AIR RELIEF VALVE TO PIPING HIGH POINTS  
 ADD DRAIN VALVE TO PIPING LOW POINTS

- GENERAL NOTES:
- FOR STANDARD SYMBOLS AND NOMENCLATURE SEE DRAWINGS PCCS-00-TC-PX-2365-00002-001 TO PCCS-00-TC-PX-2365-00008-001.
  - ALL VENTS AND DRAINS TO BE DN20 UNLESS OTHERWISE INDICATED.
  - 
  - FOR INTERLOCKS, REFER TO CAUSE AND EFFECT DIAGRAM; DOCUMENT NUMBER PCCS-01-TC-IN-6604-00001.
  - EPC CONTRACTOR TO RECONFIRM AND FINALISE LINE SIZES DURING DETAILED DESIGN.
  - EPC CONTRACTOR TO RECONFIRM AND FINALISE EQUIPMENT DETAILS/ELEVATIONS DURING DETAILED DESIGN.
  - DETAILS OF OPEN DRAIN (UNDERGROUND SYSTEM) TO BE DEVELOPED DURING EPC PHASE.
  - ALARMS AND ESD SET POINTS TO BE PROVIDED BY EPC CONTRACTOR.

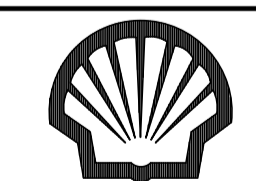
- NOTES:
- FLOW MEASUREMENT INPUT TO GREEN ENERGY METERING SYSTEM.
  - GLC ANALYSER TO DETERMINE CALORIFIC VALUE OF FUEL GAS AS WELL AS COMPOSITION.
  - EXACT TIE-IN LOCATION TO BE DEFINED BY PIPING AND LAYOUT.
  - ANALYSER LOCATION AND SAMPLE LOOP RETURN DOWNSTREAM OF LETDOWN.

- EKC HEATING SYSTEM  
 EKE MECH. CLEANING, SCRUBBING  
 EKG PIPING SYSTEM  
 EKT HEATING MEDIUM SYSTEM
- UEN STRUC.F.TRANS., CONV.,GASEOUS FUELS  
 UZX SPECIAL STRUC. (PLANT SPECIFIC)

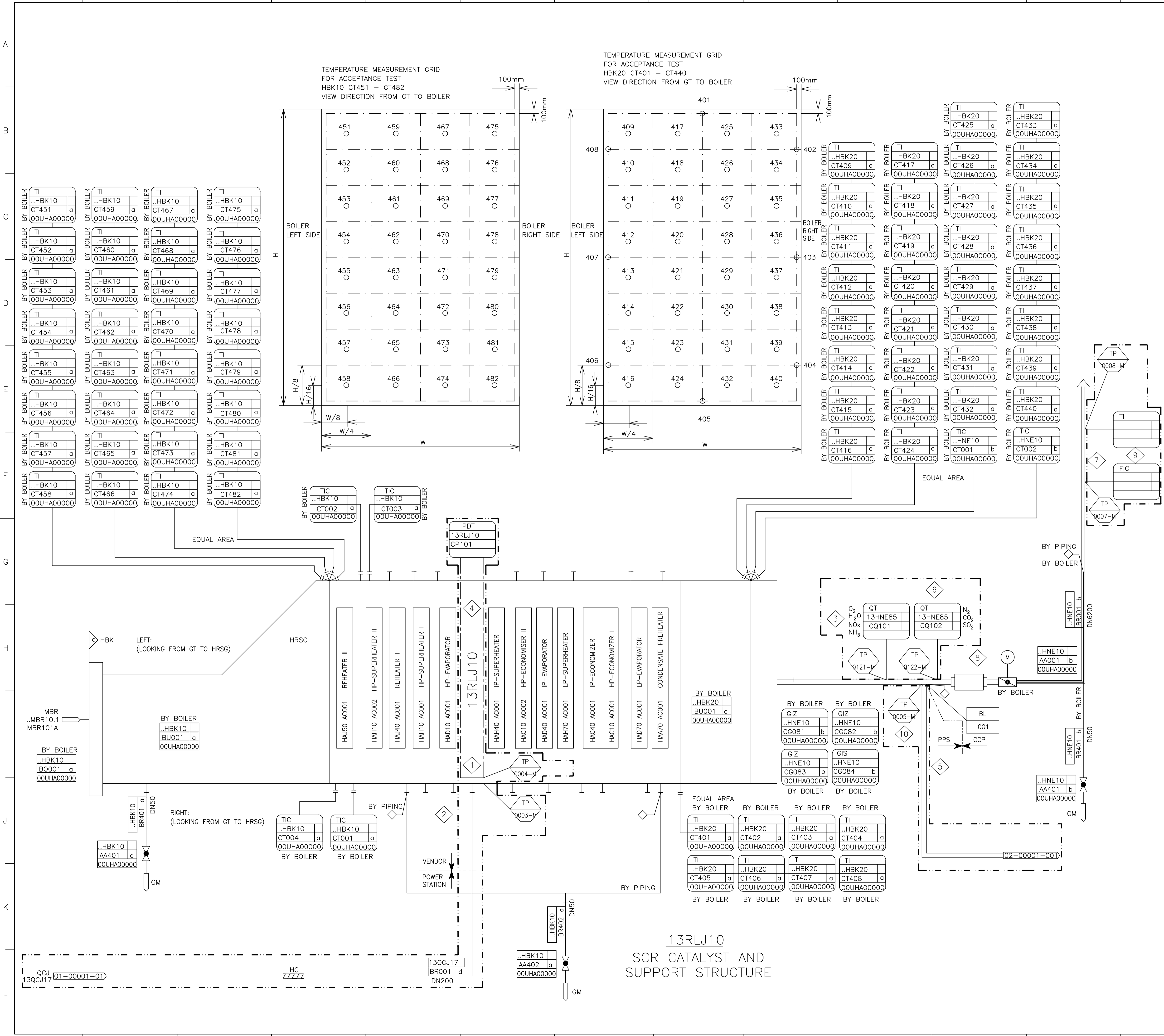
HOLDS:

REFERENCE DRAWINGS				
DRAWING NUMBER	TITLE			
BA1B	300	250	39	l
				k
				j
1.4435/A312TP316L	300	50	39	i
API5LGRB/A106GRB	900	265	95 (-1)	h
1.4435/A312TP316L	600	250	39	g
API5GRB/A106GRB	600	250	39	f
API5LGRB/A106GRB	600	50	39	e
				d
API5LGRB/A106GRB	300	250	39	c
API5LGRB/A106GRB	300	50	39	b
				a
WERKSTOFF DER ROHRLEITUNG	ANSI-KLASSE	ZUL. BETRIEBS-TEMPERATUR	ZUL. BETRIEBS-UEBERDRUCK	AUSLEGUNGS-ABSCHNITT
PIPING MATERIAL	ANSI-CLASS	MAX. ALLOWABLE WORKING TEMP. t zul IN °C	MAX. ALLOWABLE WORKING PRESS. P e,zul IN barg	DESIGN SECTION

Rev	Date	Revision Object	Written by	Checked by	Approved by

  
**PETERHEAD CCS (ONSHORE)**  
**PETERHEAD CCS PROJECT**  
**PIPING AND INSTRUMENTATION DIAGRAM**  
**SUPPLY OF GASEOUS FUEL METERING, PREHEATER FINAL CHANCE FILTER-GT13**

DOC. CLASS:	SCALE: NTS	SHEET: 1/1
CLIENT Doc. Ref:	PCCS-01-TC-PX-2365-00002-001	REVISION FORMAT
		K01 A1

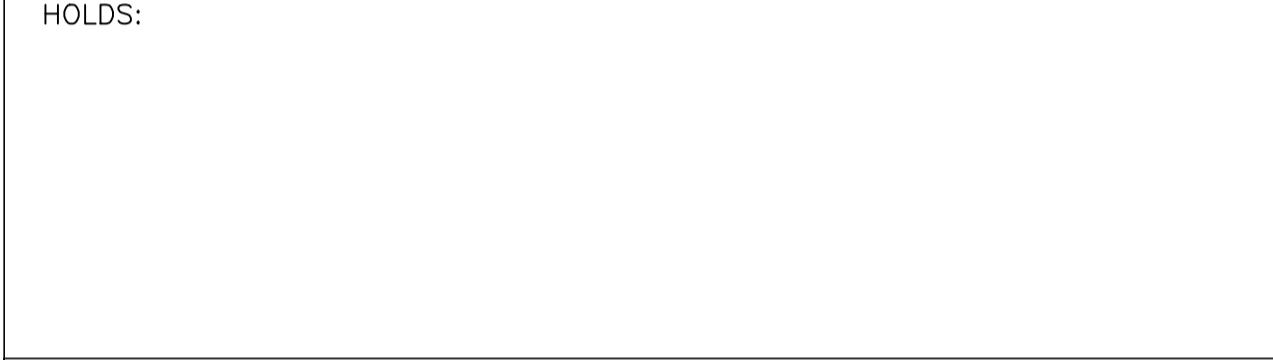


GENERAL NOTES:  
 1. FOR STANDARD SYMBOLS AND NOMENCLATURE SEE DRAWINGS PCCS-00-TC-PX-2365-00002-001 TO PCCS-00-TC-PX-2365-00008-001.  
 2. ALL VENTS AND DRAINS TO BE DN20 UNLESS OTHERWISE INDICATED.  
 3.  
 4. FOR INTERLOCKS, REFER TO CAUSE AND EFFECT DIAGRAM; DOCUMENT NUMBER PCCS-01-TC-IN-6604-0001.  
 5. EPC CONTRACTOR TO RECONFIRM AND FINALISE LINE SIZES DURING DETAILED DESIGN.  
 6. EPC CONTRACTOR TO RECONFIRM AND FINALISE EQUIPMENT DETAILS/ELEVATIONS DURING DETAILED DESIGN.  
 7. DETAILS OF OPEN DRAIN (UNDERGROUND SYSTEM) TO BE DEVELOPED DURING EPC PHASE.  
 8. ALARMS AND ESD SET POINTS TO BE PROVIDED BY EPC CONTRACTOR.

NOTES:  
 1. NEW SCR UNIT TO BE POSITIONED IN HRSG SPACE ALLOCATED FOR FUTURE NOX REMOVAL CATALYST.  
 2. VENDOR PACKAGE (13QCJ20) TO INCLUDE DISTRIBUTION MANIFOLD.  
 3. CONTINUOUS EMISSIONS MONITORING SYSTEM.  
 4. PROVISION FOR REMOVAL OF NEW CATALYST BED.  
 5. SIDE CONNECTION TO EXISTING DUCTING, UNDER CCP SCOPE.  
 6. THIS NEW ANALYSER REPLACES THE OLD ONE IN ORDER TO MEASURE NOX LEVEL AND EXCESS OF AMMONIA.  
 7. THE SIGNALS FROM THESE FC AND TC CONTROLLERS ARE THE CONTROL INPUTS TO THE CCP INLET BLOWER DUTY.  
 8. EXISTING SILENCER.  
 9. THESE INSTRUMENTS ARE WITHIN THE CCP SCOPE AND ARE SHOWN AND TAGGED ON DRAWING PCCS-02-TC-PX-2365-00001-001.  
 10. TIE-IN LOCATION AND EXTENT OF REPLACEMENT OF EXISTING DUCTING TO BE DEFINED BY PIPING AND LAYOUT.  
 11. WILL NOT HAVE A PIPING MATERIAL SPECIFICATION AS THIS IS DUCTING.  
 12. NUMBER OF ANALYSERS TO BE SPECIFIED BY ANALYSER VENDOR.

NOTE:  
 - DRAIN AND VENTS MAY BE CHANGED DUE TO PIPING LAYOUT THIS P&I DIAGRAM IS VALID FOR THE BOILER SYSTEM 13 ONLY  
 - THE FIRST TWO NUMBERS TO DIGIST OF THE IDENTIFICATION CODES HAVE TO BE CHANGED ACCORDINGLY  
 - DESIGN SECTION ARE ONLY RELATED TO PRESSURE DESIGN  
 - EXHAUST GAS AVERAGE TEMPERATURE MAX. AT DUCT INLET=605 33/64C  
 - TEMPERATURE GRADING WITHIN THE DUCT SPECIFIED BY BOILER SUPPLIER

GM PROCESS DRAINAGE SYSTEM  
 HBK STEAM GENERATOR INTERIOR  
 HN FLUE GAS EXHAUST  
 HNE SMOKE STACK SYSTEM  
 MBR EXHAUST GAS SYSTEM  
 QU SAMPLING SYSTEMS  
 QCJ AMMONIA STORAGE AND FEED FOR HRSG CATALYTIC CONVERTER  
 RLJ CATALYTIC TREATMENT  
 UHA STEAM GENERATOR ENCLOSURE



REFERENCE DRAWINGS

DRAWING NUMBER	TITLE
PCCS-01-TC-PX-2365-00001-001	AMMONIA UNLOADING STORAGE & TRANSFER
PCCS-02-TC-PX-2365-00001-001	BOOSTER FAN-FLUE GAS SYSTEM

AJOA	150	150	9	d
11	11	120	0.05	c
			0.05/-0.015	b
			0.07/-0.05	a

WERKSTOFF DER ROHRLEITUNG	ANSI-KLASSE	ZUL. BETRIEBS-TEMPERATUR MAX. ALLOWABLE WORKING TEMP. t <sub>zul</sub> IN °C	ZUL. BETRIEBS-UEBERDRUCK MAX. ALLOWABLE WORKING PRESS. P <sub>e,zul</sub> IN bar	AUSLEGUNGS-ABSCHNITT DESIGN SECTION
ANSI-CLASS				

Rev	Date	Revision Object	Written by	Checked by	Approved by

**PETERHEAD CCS (ONSHORE)**

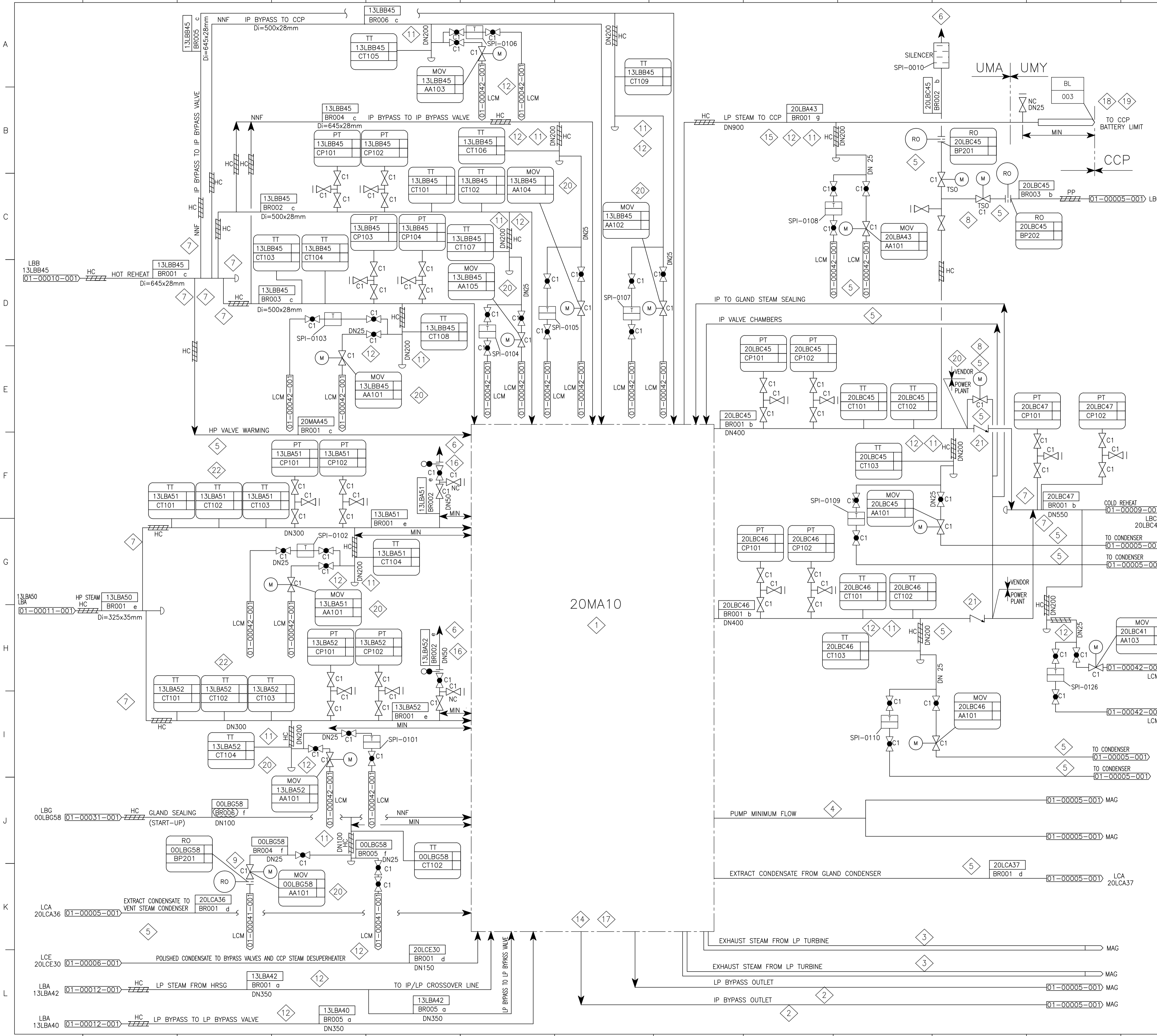
**PETERHEAD CCS PROJECT**

**PIPING AND INSTRUMENTATION DIAGRAM**

**HEAT RECOVERY STEAM GENERATOR EXHAUST GAS SYSTEM**

DOC. CLASS:	SCALE: NTS	SHEET: 1/1
CLIENT Doc. Ref: PCCS-01-TC-PX-2365-00003-001	REVISION: K01	FORMAT: A1





- GENERAL NOTES:
- FOR STANDARD SYMBOLS AND NOMENCLATURE SEE DRAWINGS PCCS-00-TC-PX-2365-00001-001 TO PCCS-00-TC-PX-2365-00008-001.
  - ALL VENTS AND DRAINS TO BE DN20 UNLESS OTHERWISE INDICATED.
  - FOR INTERLOCKS, REFER TO CAUSE AND EFFECT DIAGRAM; DOCUMENT NUMBER PCCS-01-TC-IN-6604-00001.
  - EPC CONTRACTOR TO RECONFIRM AND FINALISE LINE SIZES DURING DETAILED DESIGN.
  - EPC CONTRACTOR TO RECONFIRM AND FINALISE EQUIPMENT DETAILS/ELEVATIONS DURING DETAILED DESIGN.
  - DETAILS OF OPEN DRAIN (UNDERGROUND SYSTEM) TO BE DEVELOPED DURING EPC PHASE.
  - ALARMS AND ESD SET POINTS TO BE PROVIDED BY EPC CONTRACTOR.

- NOTES:
- STEAM TURBINE, 20MA10, IS A VENDOR PACKAGE. VENDOR WILL SUPPLY DETAILED DRAWING OF PACKAGE.
  - PIPING FROM BYPASS VALVE TO EXISTING LP EXHAUST STEAM DUCTING-TURBINE VENDOR SUPPLY.
  - EXISTING LP EXHAUST STEAM DUCTING.
  - CONDENSATE EXTRACT PUMP MINIMUM FLOW PIPING TO EXISTING MAIN CONDENSERS-TURBINE VENDOR SUPPLY.
  - TURBINE VENDOR SUPPLY.
  - VENT TO ATMOSPHERE AT SAFE LOCATION.
  - TOP OF PIPE CONNECTION.
  - VALVE ARRANGEMENT SUBJECT TO VENDOR START-UP REQUIREMENTS.
  - BLOCK VALVE NORMALLY OPEN FOR MAINTAINING GLAND STEAM START-UP LINE WARM.
  - REQUIREMENT FOR ISOLATION VALVES AT STEAM TURBINE BOUNDARY LIMITS.
  - LOW POINT DRAIN.
  - NUMBER OF STEAM TRAP DRAINS TO BE FINALISED BY EPC CONTRACTOR.
  - INSTRUMENTATION REQUIREMENTS TO BE FINALISED BY STEAM TURBINE VENDOR.
  - NUMBER OF VENTS AND DRAINS FROM NEW STEAM TURBINE BY VENDOR.
  - LP DESUPERHEATER WITHIN TURBINE VENDOR SCOPE.
  - REQUIREMENT FOR SILENCERS TO BE DEFINED BY EPC CONTRACTOR BASED ON THE IMPACT OF THE NOISE FROM THE VENT ON PERSONNEL.
  - TURBINE ATMOSPHERIC RELIEF AND EMERGENCY RELIEF TRIP DEVICES TO BE PROVIDED BY TURBINE VENDOR.
  - EPC CONTRACTOR SHALL ASSESS THE REQUIREMENTS FOR STEAM TRAPS AND CONDENSATE DRAINS THROUGH THE PIPE BRIDGE.
  - EPC CONTRACTOR SHALL ASSESS THE WINTERISATION REQUIREMENTS THROUGH THE PIPE BRIDGE.
  - A DISCREPANCY ALARM SHALL BE IMPLEMENTED ON THE DCS.
  - CHECK VALVES TO BE ASSISTED TYPE.
  - TRIPS ASSOCIATED WITH TT-13LBA51 CT101-3 AND TT-13LBA52 CT101-3 ALSO PERFORM AS STEAM TURBINE START-UP PERMISSIVES.

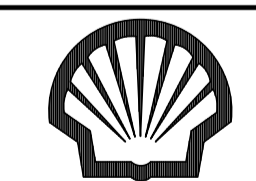
- LBB HOT REHEAT PIPING SYSTEM  
 LBG AUXILIARY STEAM PIPING SYSTEM  
 LBA MAIN STEAM PIPING SYSTEM  
 LBC COLD REHEAT PIPING SYSTEM  
 LCM CLEAN DRAIN SYSTEM  
 LCA MAIN CONDENSATE PIPING SYSTEM  
 LCE CONDENSATE DESUPERHEATING SPRAY SYSTEM  
 MAA HP TURBINE  
 MAG CONDENSING SYSTEM  
 MAW SEALING, HEATING AND COOLING SYSTEM  
 UMA STEAM TURBINE BUILDING ENCLOSURE, STEAM GENERATOR BUILDING (BOILER HOUSE)

HOLDS:

REFERENCE DRAWINGS		
DRAWING NUMBER	CLIENT	TITLE
	PCCS-01-TC-PX-2365-00011-001	HP MAIN STEAM
	PCCS-01-TC-PX-2365-00012-001	LP MAIN STEAM/AUXILIARY STEAM SYSTEM TO FEEDWATER TANK & 20MA20
	PCCS-01-TC-PX-2365-00010-001	REHEATING HOT REHEAT SYSTEM
	PCCS-01-TC-PX-2365-00005-001	CONDENSATE AND FEED FLOW DIAGRAM (UNIT 2)
	PCCS-01-TC-PX-2365-00031-001	AUXILIARY STEAM SYSTEM
	PCCS-01-TC-PX-2365-00006-001	MAIN CONDENSATE SUPPLY
	PCCS-01-TC-PX-2365-00009-001	REHEATING COLD REHEAT SYSTEM

AA1A	150	160	5	g
BA1A	300	310	19	f
GRIA	2500	545	165	e
BA1A	300	66	35	d
ERIA	900	545	50	c
DA1A	600	405	50	b
BA1A	300	265	12	a

Rev	Date	Revision Object	Written by	Checked by	Approved by



**PETERHEAD CCS (ONSHORE)**

**PETERHEAD CCS PROJECT**

**PIPING AND INSTRUMENTATION DIAGRAM**

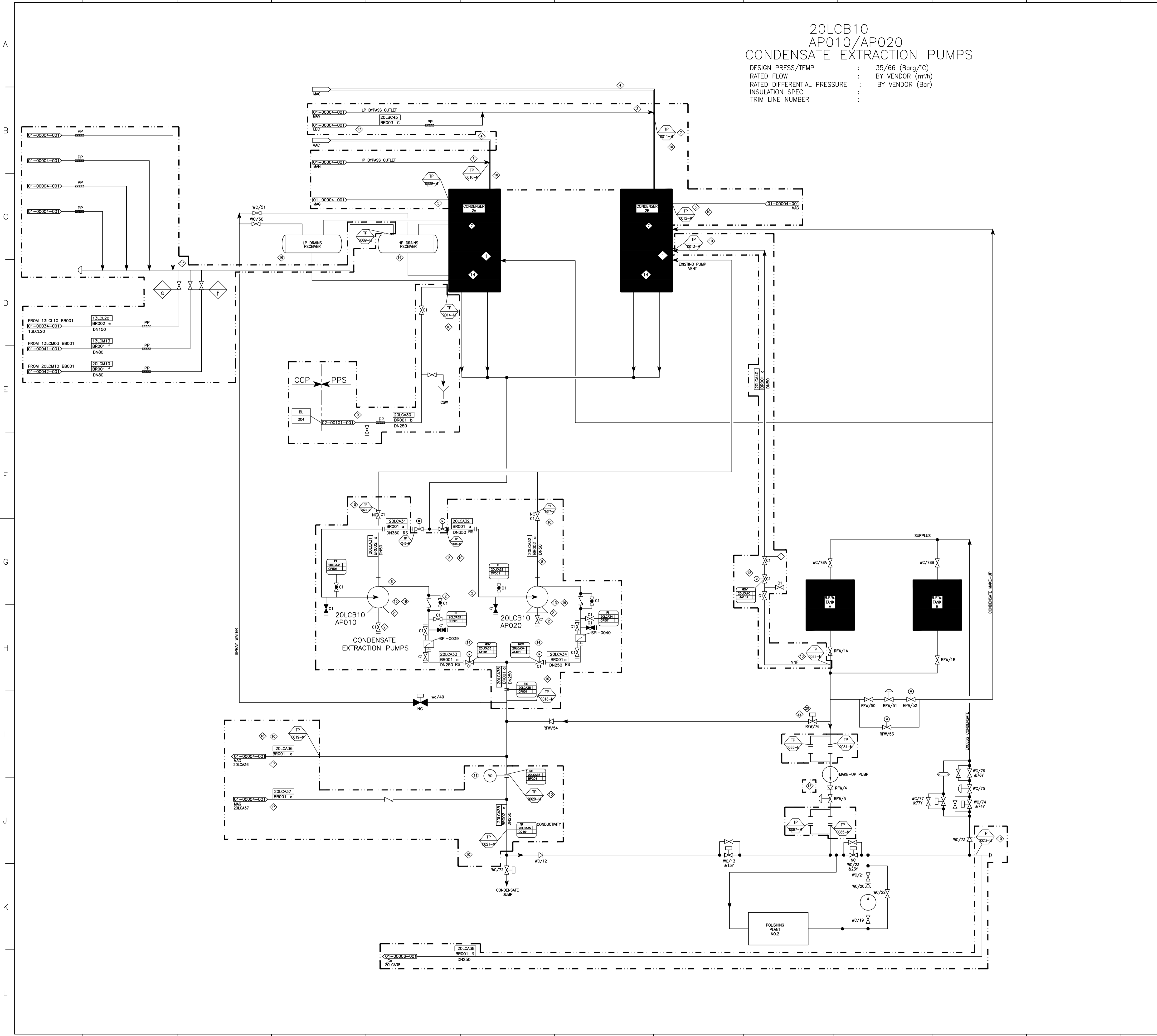
**NEW STEAM TURBINE HP/IP/LP CASING**

DOC. CLASS:	SCALE: NTS	SHEET: 1/1
CLIENT Doc. Ref:	PCCS-01-TC-PX-2365-00004-001	REVISION FORMAT
	K01	A1

LAST REV DATE:

20LCB10  
AP010/AP020  
CONDENSATE EXTRACTION PUMPS

DESIGN PRESS/TEMP : 35/66 (Barg/°C)  
 RATED FLOW : BY VENDOR (m³/h)  
 RATED DIFFERENTIAL PRESSURE : BY VENDOR (Bar)  
 INSULATION SPEC :  
 TRIM LINE NUMBER :



- GENERAL NOTES:
- FOR STANDARD SYMBOLS AND NOMENCLATURE SEE DRAWINGS PCCS-00-TC-PX-2365-00001-001 TO PCCS-00-TC-PX-2365-00008-001.
  - ALL VENTS AND DRAINS TO BE DN20 UNLESS OTHERWISE INDICATED.
  - 
  - FOR INTERLOCKS, REFER TO CAUSE AND EFFECT DIAGRAM; DOCUMENT NUMBER PCCS-01-TC-IN-6604-00001.
  - EPC CONTRACTOR TO RECONFIRM AND FINALISE LINE SIZES DURING DETAILED DESIGN.
  - EPC CONTRACTOR TO RECONFIRM AND FINALISE EQUIPMENT DETAILS/ELEVATIONS DURING DETAILED DESIGN.
  - DETAILS OF OPEN DRAIN (UNDERGROUND SYSTEM) TO BE DEVELOPED DURING EPC PHASE.
  - ALARMS AND ESD SET POINTS TO BE PROVIDED BY CONTRACTOR.
- NOTES:
- MAIN CONDENSER SURFACE AREA REDUCED BY ISOLATING TUBES.
  - STAND BY PUMP TO BE AUTOSTART.
  - PIPING FROM BYPASS VALVE TO EXISTING LP EXHAUST STEAM DUCTING-TURBINE VENDOR SUPPLY.
  - EXISTING CONDENSER NECK.
  - CONDENSATE EXTRACT PUMP MINIMUM FLOW PIPING TO EXISTING MAIN CONDENSERS - TURBINE VENDOR SUPPLY.
  - EXISTING AIR EXTRACTION/ VACUUM SYSTEM TO BE RE-USED.
  - NEW VARIABLE SPEED DRIVEN PUMPS TO REPLACE EXISTING PUMPS.
  - TWO-PHASE FLOW, PROVIDE ADEQUATE SUPPORT.
  - EXACT TIE-IN LOCATION TO BE DEFINED BY PIPING AND LAYOUT.
  - EXISTING RESTRICTION ORIFICE TO BE REPLACED.
  - FILLING LINE FOR START-UP USE.
  - CONDENSATE EXTRACTION PUMPS TO BE SIZED BY STEAM TURBINE VENDOR.
  - EXISTING INSTRUMENTATION TO BE REPLACED. EPC CONTRACTOR TO EVALUATE STATUS OF EXISTING INSTRUMENTS PRIOR TO REPLACEMENT.
  - SEE DEMOLITION DRAWING PCCS-01-TC-PX-2365-00057-001. PUMP NOT REQUIRED TO BE OPERATED.
  - STEAM TURBINE VENDOR SHALL CONFIRM THE REQUIREMENT OF THESE VESSELS.
  - TURBINE VENDOR SUPPLY.
  - LINE TO BE SIZED FOR THE REQUIRED FLOW RATE OF THE VENT STEAM CONDENSER, GLAND STEAM CONDENSER AND CONDENSATE EXTRACTION PUMPS MINIMUM FLOW PROTECTION.
  - START-UP REQUIREMENTS OF THE PUMPS SHALL BE DEFINED BY THE STEAM TURBINE VENDOR AND EPC CONTRACTOR.
  - VALVE SHALL BE PROVIDED WITH A DISCREPANCY ALARM.
  - CONTROL LOGIC TO BE PROVIDED TO SHARE LOAD BETWEEN PUMPS.
  - RFW/76 SHALL BE MADE ACTUATED VALVE AND SHALL OPEN WHEN THE CONDENSATE EXTRACTION PUMPS 20LCB10AP010/020 TRIPS. WHEN THE PUMPS ARE IN OPERATION THE VALVE SHALL BE KEPT CLOSED.

LCA MAIN CONDENSATE PIPING SYSTEM  
 MAC LP TURBINE  
 MAG CONDENSING SYSTEM  
 MAN TURBINE BYPASS STATION  
 MAW SEALING, HEATING & COOLING STEAM SYSTEM

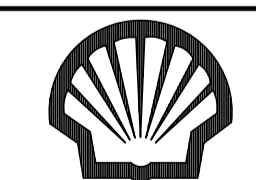
HOLDS:

PIPING MATERIAL	PRESSURE NOMINAL	MAX ALLOWABLE WORKING TEMP (°C)	MAX ALLOWABLE WORKING PRESS (barg)	DESIGN SECTION
BJ0A	300	66	35	g
AA1A	150	180	9.5	f
AA1A	150	180	6	e
AA1A	150	66	5	d
AA1A	150	405	5	c
AA1A	150	160	11	b
BA1A	300	66	35	a

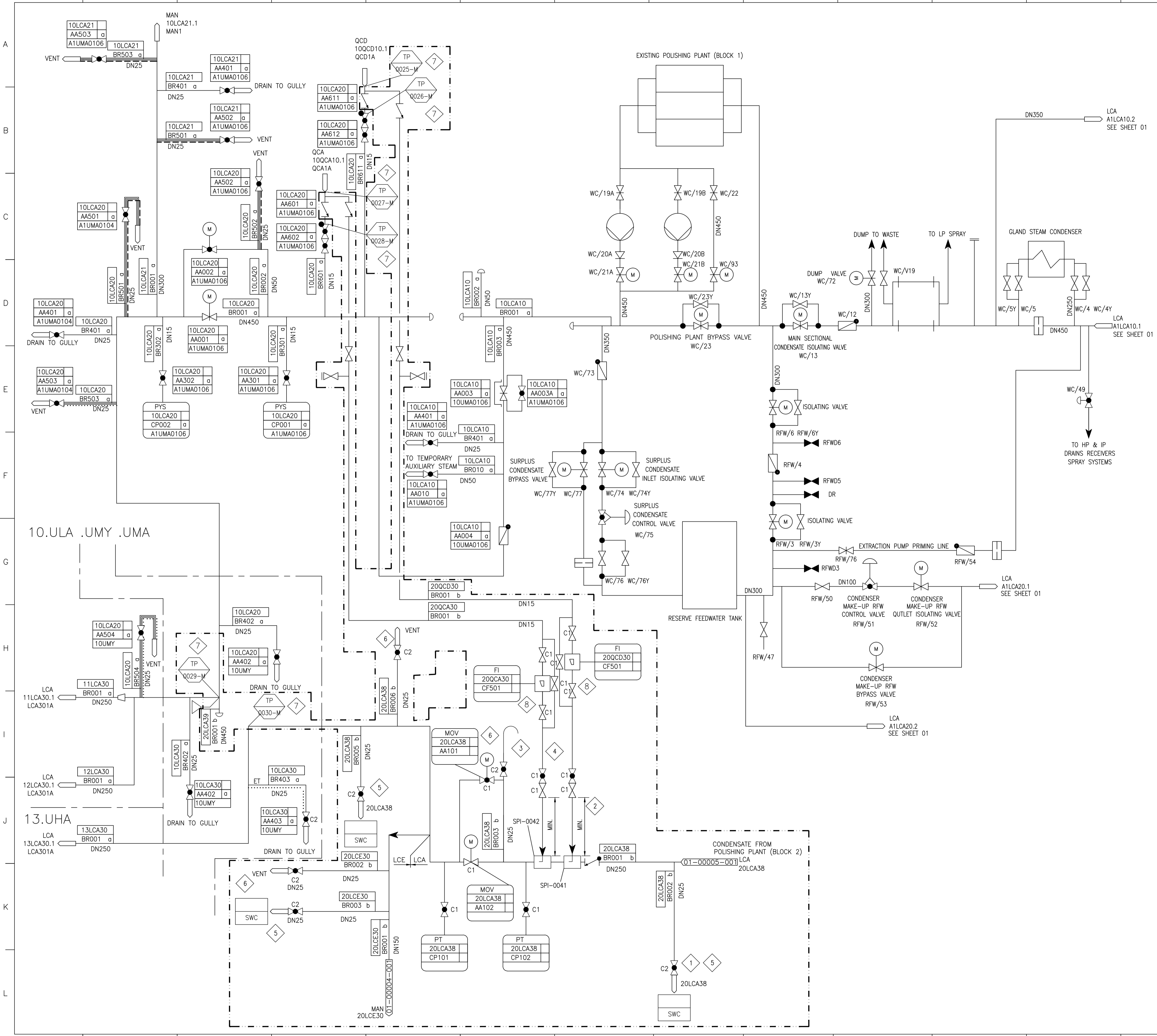
REFERENCE DRAWINGS

DRAWING NUMBER	TITLE
PCCS-01-TC-PX-2365-00004-001	CLIENT
PCCS-01-TC-PX-2365-00004-001	NEW STEAM TURBINE HP/IP/LP CASING
PCCS-01-TC-PX-2365-00006-001	MAIN CONDENSATE SUPPLY

Rev	Date	Revision Object	Written by	Checked by	Approved by

  
**PETERHEAD CCS (ONSHORE)**  
**PETERHEAD CCS PROJECT**  
**PIPING AND INSTRUMENTATION DIAGRAM**  
**CONDENSATE AND FEED FLOW (BLOCK 2)**

DOC. CLASS:	SCALE: NTS	SHEET: 1/1
CLIENT Doc. Ref.	PCCS-01-TC-PX-2365-00005-001	REVISION FORMAT
		K01 A1



GENERAL NOTES:

- FOR STANDARD SYMBOLS AND NOMENCLATURE SEE DRAWINGS PCCS-00-TC-PX-2365-00001-001 TO PCCS-00-TC-PX-2365-00008-001.
- ALL VENTS AND DRAINS TO BE DN20 UNLESS OTHERWISE INDICATED.
- FOR INTERLOCKS, REFER TO CAUSE AND EFFECT DIAGRAM; DOCUMENT NUMBER PCCS-01-TC-IN-6604-00001.
- EPC CONTRACTOR TO RECONFIRM AND FINALISE LINE SIZES DURING DETAILED DESIGN.
- EPC CONTRACTOR TO RECONFIRM AND FINALISE EQUIPMENT DETAILS/ELEVATIONS DURING DETAILED DESIGN.
- DETAILS OF OPEN DRAIN (UNDERGROUND SYSTEM) TO BE DEVELOPED DURING EPC PHASE.
- ALARMS AND ESD SET POINTS TO BE PROVIDED BY EPC.

NOTES:

- LOW POINT DRAIN.
- PHOSPHATE INJECTION.
- VENT CONNECTION.
- CHEMICALS INJECTION.
- NUMBER OF DRAINS AND LOCATIONS TO BE FINALISED BY EPC CONTRACTOR.
- NUMBER OF VENTS AND LOCATIONS TO BE FINALISED BY EPC CONTRACTOR.
- EXACT TIE-IN LOCATION TO BE DEFINED BY PIPING AND LAYOUT.
- ROTAMETER TO BE VISIBLE FROM CONTROL VALVE.

LCA MAIN CONDENSATE PIPING SYSTEM  
 LCE CONDENSATE DESUPERHEATING SPRAY  
 MAN TURBINE BYPASS STATION  
 QCA COMMON FILLING EQUIPMENT FOR LIQ. CHEMICAL PRODUCT  
 QCD PHOSPHATE SUPPLY AND DISTRIBUTION  
 UHA STRUCTURE FOR HRSG/HRSG HOUSING  
 ULA STRUCTURE FOR FEEDWATER SYSTEM  
 UMA STEAM TURBINE BUILDING/ST OUTDOOR AREA  
 UMY PIPE BRIDGE CABLE RACK STRUCTURE

HOLDS:

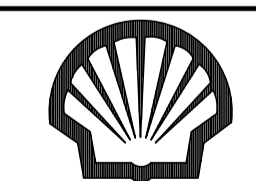
BJ0A	300	66	35	b
A106B	300	66	35	a

PIPING MATERIAL	PRESSURE NOMINAL	MAX. ALLOWABLE WORKING TEMPERATURE °C	MAX. ALLOWABLE WORKING PRESSURE bar	DESIGN SECTION

REFERENCE DRAWINGS

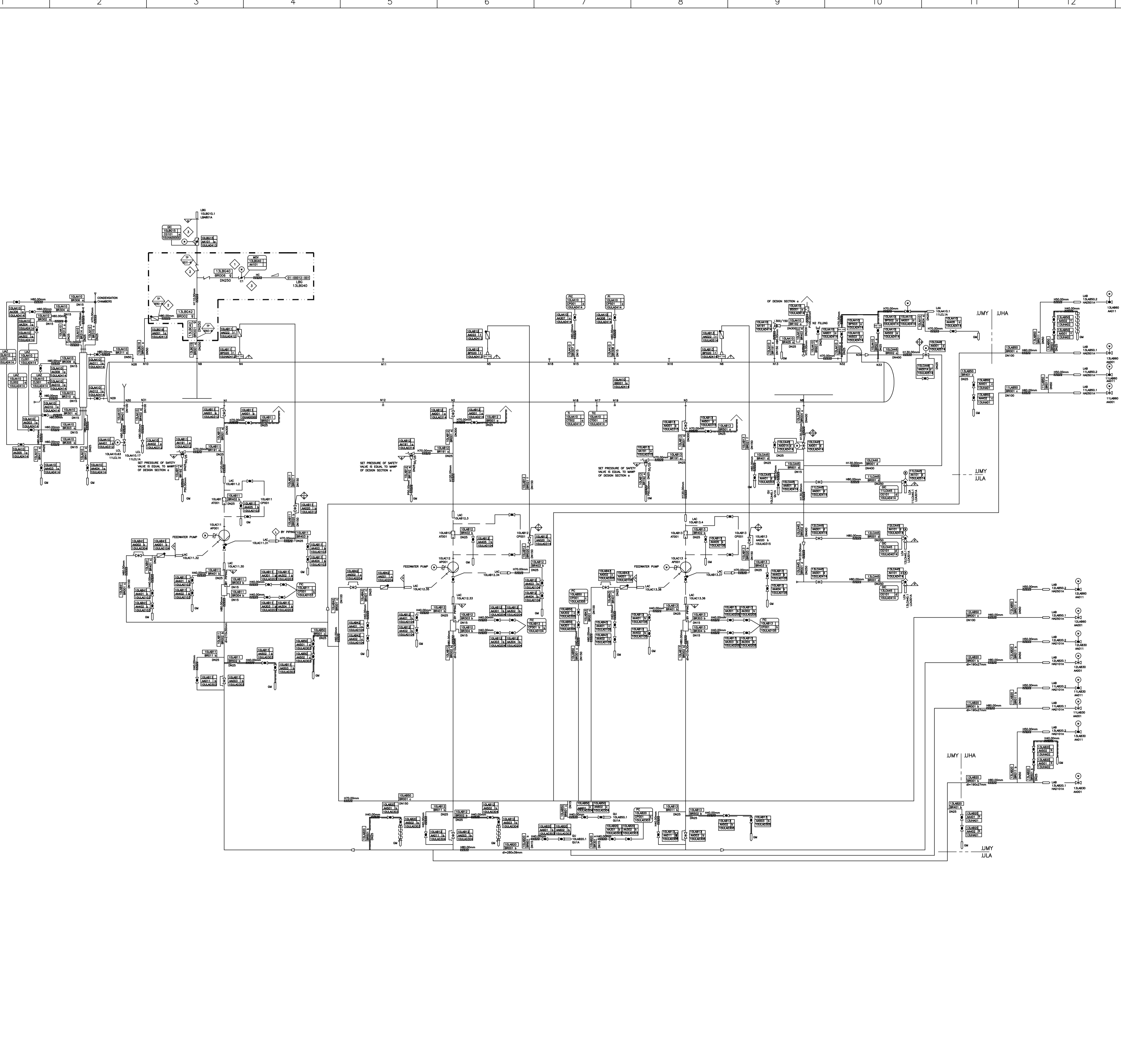
DRAWING NUMBER	CLIENT	TITLE
	PCCS-01-TC-PX-2365-00005-001	CONDENSATE AND FEED FLOW (UNIT 2)
	PCCS-01-TC-PX-2365-00004-001	NEW STEAM TURBINE HP/IP/LP CASING
	PCCS-01-TC-PX-2365-00014-001	IP-LP BYPASS SYSTEM

Rev	Date	Revision Object	Written by	Checked by	Approved by

  
**PETERHEAD CCS (ONSHORE)**  
**PETERHEAD CCS PROJECT**  
**PIPING AND INSTRUMENTATION DIAGRAM**  
**MAIN CONDENSATE SUPPLY**

DOC. CLASS:	SCALE: NTS	SHEET: 1/1
CLIENT Doc. Ref:	PCCS-01-TC-PX-2365-00006-001	REVISION FORMAT
		K01 A1





- GENERAL NOTES:
- FOR STANDARD SYMBOLS AND NOMENCLATURE SEE DRAWINGS PCCS-00-TC-PX-2365-00001-001 TO PCCS-00-TC-PX-2365-00008-001.
  - ALL VENTS AND DRAINS TO BE DN20 UNLESS OTHERWISE INDICATED.
  - FOR INTERLOCKS, REFER TO CAUSE AND EFFECT DIAGRAM; DOCUMENT NUMBER PCCS-01-TC-IN-6604-00001.
  - EPC CONTRACTOR TO RECONFIRM AND FINALISE LINE SIZES DURING DETAILED DESIGN.
  - EPC CONTRACTOR TO RECONFIRM AND FINALISE EQUIPMENT DETAILS/ELEVATIONS DURING DETAILED DESIGN.
  - DETAILS OF OPEN DRAIN (UNDERGROUND SYSTEM) TO BE DEVELOPED DURING EPC PHASE.
  - ALARMS AND ESD SET POINTS TO BE PROVIDED BY EPC.
  - EPC TO CONFIRM INSULATION TYPE. ALL STEAM AND CONDENSATE LINES ARE TO BE INSULATED. ACCESSIBLE LINES BY THE OPERATORS SHALL BE STATED AS PP.

- NOTES:
- LP STEAM TO FEED WATER TANK FROM HRSG13 DURING BLOCK 1 SHUTDOWN.
  - EXACT TIE-IN LOCATION TO BE DEFINED BY PIPING AND LAYOUT.
  - MOV VALVE SHALL BE KEPT OPEN ALL THE TIME EXCEPT FOR MAINTENANCE.

NOTE: - DRAINS AND VENTS MAY BE CHANGED DUE TO PIPING LAYOUT

- GM PLANT DRAINAGE SYSTEM
- LAA STORAGE, DEAERATION (INCL.FEEDW.TANK)
- LAB FEEDW.PIPING SYST.(EXCL.FEEDW.PUMP..)
- LAC FEEDWATER PUMP SYSTEM
- LBG AUXILIARY STEAM PIPING SYSTEM
- LCA MAIN CONDENSATE PIPING SYSTEM
- QU SAMPLING SYSTEM

- UHA STEAM GEN.BUILDING
- ULA FEEDWATER PUMP HOUSE
- JMY PIPING BRIDGE

HOLDS:

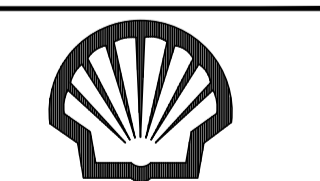
BA1A	300	265	12 (+FV)	g
A106C	300	192	25	f
A106B	150	192	3	e
A106B	300	200	35	d
A106C	600	192	95	c
A106C	2500	192	260	b
A106B	150	250	12 /-1	a

WERKSTOFF DER ROHRLEITUNG	ANSI-KLASSE	ZUL. BETRIEBS-TEMPERATUR MAX. ALLOWABLE WORKING TEMP. t <sub>zul</sub> IN °C	ZUL. BETRIEBS-UEBERDRUCK MAX. ALLOWABLE WORKING PRESS. P <sub>e,zul</sub> IN barg	AUSLEGUNGS-ABSCHNITT DESIGN SECTION
ANSI-CLASS				

REFERENCE DRAWINGS

DRAWING NUMBER	TITLE
CLIENT	TITLE
PCCS-01-TC-PX-2365-00012-001	LP MAIN STEAM/AUXILIARY STEAM SYSTEM TO FEEDWATER TANK & ST20

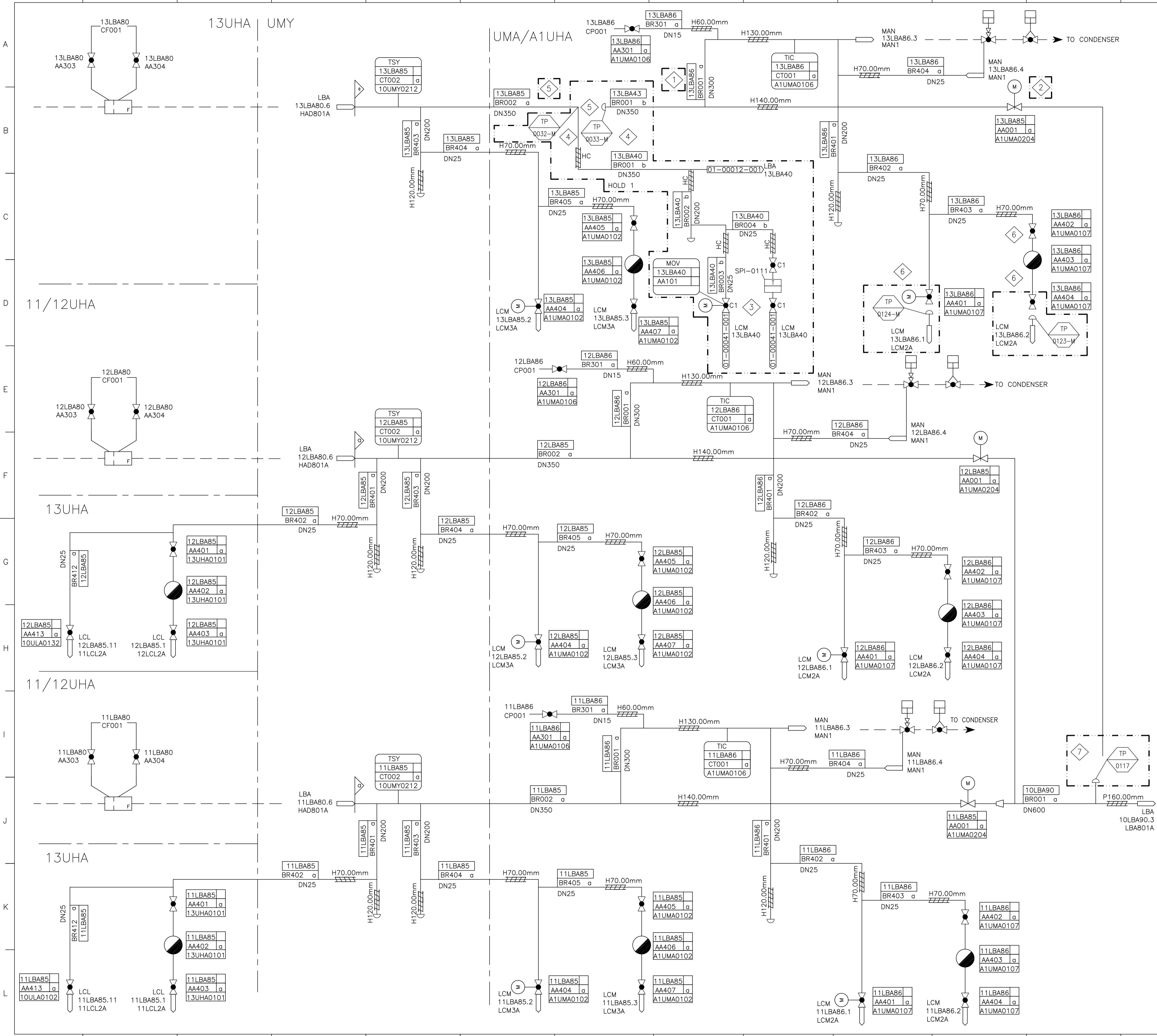
Rev	Date	Revision Object	Written by	Checked by	Approved by



**PETERHEAD  
CCS (ONSHORE)**

**PETERHEAD CCS PROJECT  
PIPING AND INSTRUMENTATION DIAGRAM  
FEEDWATER SYSTEM, FEEDWATER TANK WITH DEAERATION, HP/IP FEEDWATER SUPPLY**

DOC. CLASS:	SCALE: NTS	SHEET: 1/1
CLIENT Doc. Ref:	PCCS-01-TC-PX-2365-00007-001	REVISION FORMAT
		K01 A1



- GENERAL NOTES:
- FOR STANDARD SYMBOLS AND NOMENCLATURE SEE DRAWINGS PCCS-00-TC-PX-2365-00001-001 TO PCCS-00-TC-PX-2365-00008-001.
  - ALL VENTS AND DRAINS TO BE DN20 UNLESS OTHERWISE INDICATED.
  - 
  - FOR INTERLOCKS, REFER TO CAUSE AND EFFECT DIAGRAM; DOCUMENT NUMBER PCCS-01-TC-IN-6604-00001.
  - EPC CONTRACTOR TO RECONFIRM AND FINALISE LINE SIZES DURING DETAILED DESIGN.
  - EPC CONTRACTOR TO RECONFIRM AND FINALISE EQUIPMENT DETAILS/ELEVATIONS DURING DETAILED DESIGN.
  - DETAILS OF OPEN DRAIN (UNDERGROUND SYSTEM) TO BE DEVELOPED DURING EPC PHASE.
  - ALARMS AND ESD SET POINTS TO BE PROVIDED BY EPC.

- NOTES:
- LINE 13LBA86 BR001 TO BE ISOLATED UPSTREAM OF UNIT 1 MAIN CONDENSER.
  - VALVES TO BE CLOSED.
  - NUMBER OF STEAM TRAP DRAINS TO BE FINALISED BY EPC CONTRACTOR.
  - EXACT TIE-IN LOCATION TO BE DEFINED BY PIPING AND LAYOUT.
  - SUPPORTS AND STRESS ANALYSIS SHALL BE CONDUCTED ON THESE LINES TO VERIFY THE COMPATIBILITY OF THE DIFFERENT DESIGN TEMPERATURE.
  - VALVES TO BE REMOVED AND CONNECTIONS FLANGED.
  - REMOVAL OF EXISTING PIPE OR CAPPING INPLACE TO BE CONFIRMED BY EPC CONTRACTOR.

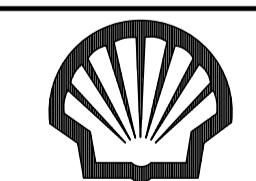
- HAD80 LP EVAPORATOR SYSTEM  
 LBA MAIN STEAM PIPING SYSTEM  
 LBG AUXILIARY STEAM PIPING SYSTEM  
 LCM CLEAN DRAINS SYSTEM  
 LCL STEAM GENERATOR DRAINS SYSTEM  
 MAC LP STEAM TURBINE  
 MAN TURBINE BYPASS SYSTEM  
 UMA STEAM TURBINE BUILDING  
 UMY BRIDGE STRUCTURE  
 ULA FEEDWATER PUMP HOUSE  
 A1UHA EXISTING BOILER HOUSE

HOLDS:

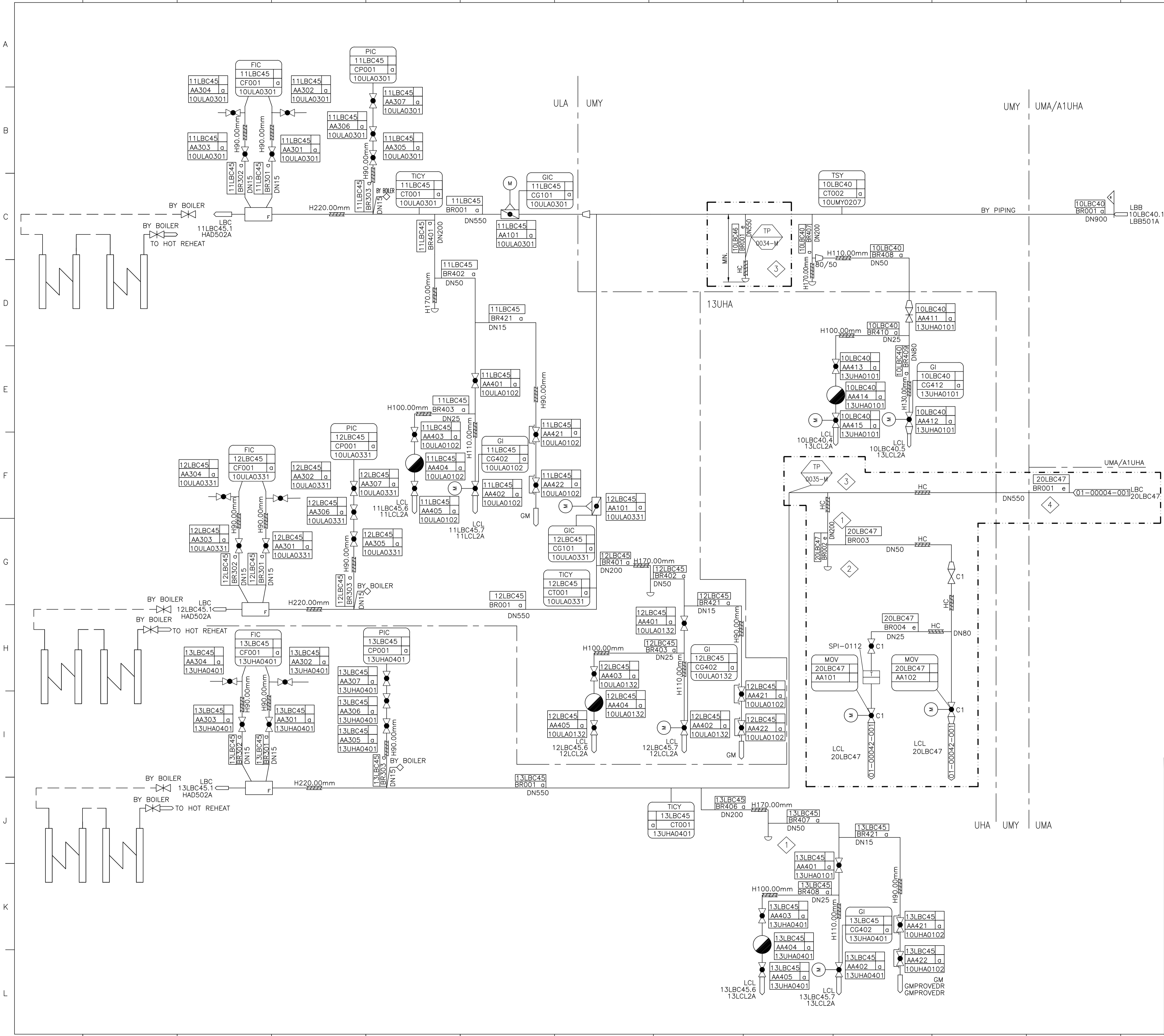
REFERENCE DRAWINGS	
CLIENT	TITLE
PCCS-01-TC-PX-2365-00012-001	LP MAIN STEAM/AUXILIARY STEAM SYSTEM TO FEEDWATER TANK & ST13
PCCS-01-TC-PX-2365-00014-001	IP-LP-BYPASS SYSTEM

BA1A	300	265	12	b
A106B	300	250	12	a
WERKSTOFF DER ROHRLEITUNG	ANSI-KLASSE	ZUL. BETRIEBS-TEMPERATUR MAX. ALLOWABLE WORKING TEMP. t <sub>zul</sub> IN °C	ZUL. BETRIEBS-UEBERDRUCK MAX. ALLOWABLE WORKING PRESS. P <sub>e,zul</sub> IN barg	AUSLEGUNGS-ABSCHNITT DESIGN SECTION

Rev	Date	Revision Object	Written by	Checked by	Approved by

  
**PETERHEAD CCS (ONSHORE)**  
**PETERHEAD CCS PROJECT**  
**PIPING AND INSTRUMENTATION DIAGRAM**  
**LP MAIN STEAM / AUXILIARY STEAM SYSTEM**

DOC. CLASS:	SCALE: NTS	SHEET: 1/1
CLIENT Doc. Ref:	PCCS-01-TC-PX-2365-00008-001	REVISION FORMAT
		K01 A1



GENERAL NOTES:

- FOR STANDARD SYMBOLS AND NOMENCLATURE SEE DRAWINGS PCCS-00-TC-PX-2365-00001-001 TO PCCS-00-TC-PX-2365-00008-001.
- ALL VENTS AND DRAINS TO BE DN20 UNLESS OTHERWISE INDICATED.
- FOR INTERLOCKS, REFER TO CAUSE AND EFFECT DIAGRAM; DOCUMENT NUMBER PCCS-01-TC-IN-6604-00001.
- EPC CONTRACTOR TO RECONFIRM AND FINALISE LINE SIZES DURING DETAILED DESIGN.
- EPC CONTRACTOR TO RECONFIRM AND FINALISE EQUIPMENT DETAILS/ELEVATIONS DURING DETAILED DESIGN.
- DETAILS OF OPEN DRAIN (UNDERGROUND SYSTEM) TO BE DEVELOPED DURING EPC PHASE.
- ALARMS AND ESD SET POINTS TO BE PROVIDED BY EPC.

NOTES:

- LOW POINT DRAIN.
- NUMBER OF STEAM TRAP DRAINS TO BE FINALISED BY EPC CONTRACTOR.
- EXACT TIE-IN LOCATION TO BE DEFINED BY PIPING AND LAYOUT.
- TURBINE ATMOSPHERIC RELIEF AND EMERGENCY RELIEF TRIP DEVICES TO BE PROVIDED BY TURBINE VENDOR.

NOTE: -- DRAINS AND VENTS MAY BE CHANGED DUE TO PIPING LAYOUT.

GM PLANT DRAINAGE SYSTEM  
HAD50 IP-EVAPORATOR SYSTEM  
LBB HOT REHEAT PIPING SYSTEM  
LBC COLD REHEAT PIPING SYSTEM  
LCL STEAM GENERATOR DRAINS SYSTEM  
LCM CLEAN DRAINS SYSTEM  
MAN IP+LP-BYPASS SYSTEM

A1UHA EXISTING BOILER HOUSE  
ULA FEEDWATER PUMP HOUSE  
UMA STEAM TURBINE BUILDING  
UHA BOILER HOUSE  
UMY BRIDGE STRUCTURE

HOLDS:


DA1A	600	410	50	e
A106C	300	410	7	d
A335 P22	1500	545	50	c
A335P91	900	545	50	b
A106C	600	410	50	a

WERKSTOFF DER ROHRLEITUNG	ANSI-KLASSE	MAX ALLOWABLE WORKING TEMP $t_{zul}$ IN °C	MAX ALLOWABLE WORKING PRESS $P_{e,zul}$ IN bar	AUSLEGUNGS-ABSCHNITT DESIGN SECTION
PIPING MATERIAL	ANSI-CLASS			

REFERENCE DRAWINGS

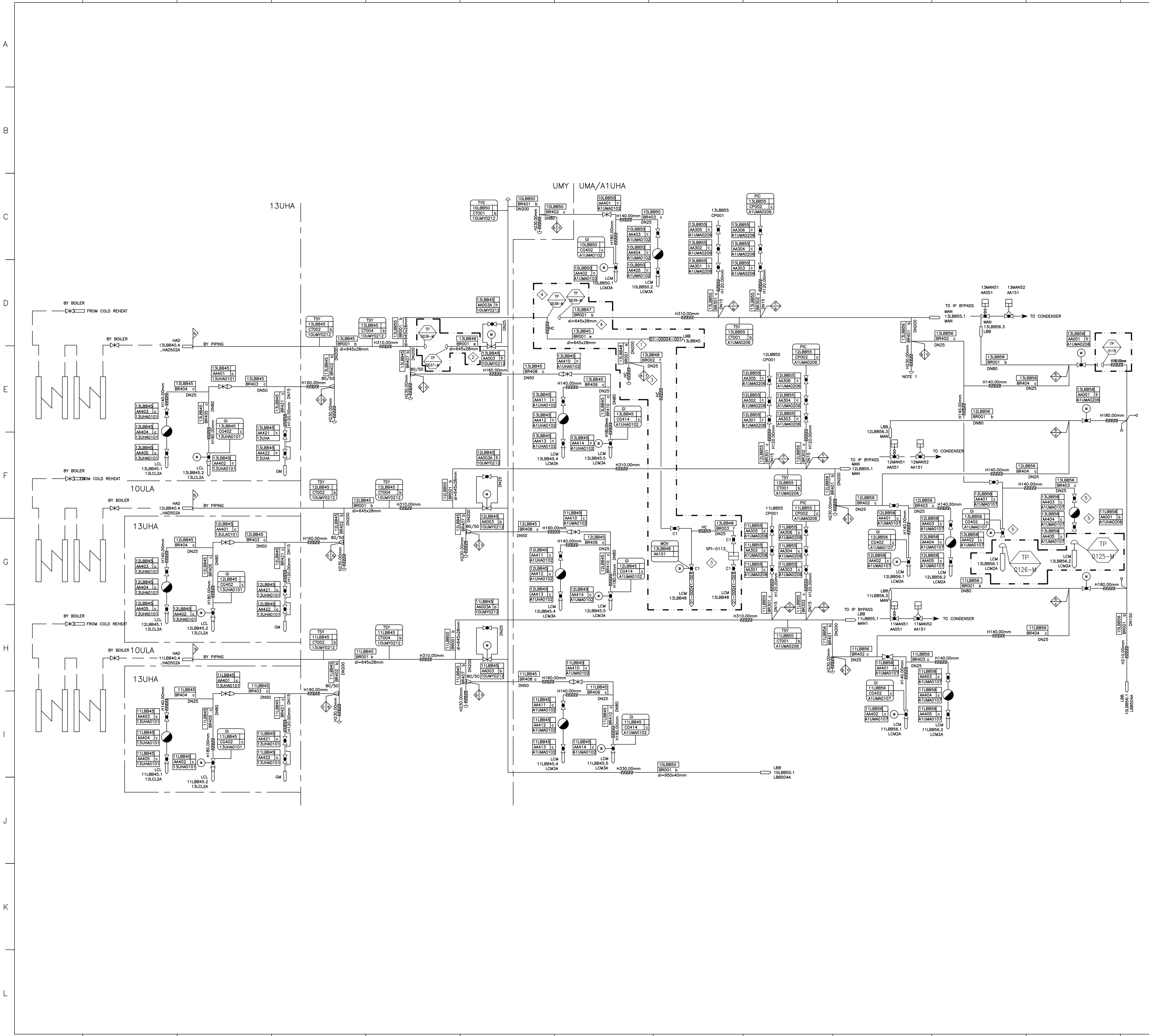
DRAWING NUMBER	CLIENT	TITLE
	PCCS-01-TC-PX-2365-00004-001	NEW STEAM TURBINE HP/IP/LP CASING

Rev	Date	Revision Object	Written by	Checked by	Approved by

  
**PETERHEAD CCS (ONSHORE)**  
**PETERHEAD CCS PROJECT**  
**PIPING AND INSTRUMENTATION DIAGRAM**  
**REHEATING COLD REHEAT SYSTEM**

DOC. CLASS:	SCALE: NTS	SHEET: 1/1
CLIENT Doc. Ref:	PCCS-01-TC-PX-2365-00009-001	REVISION FORMAT
	K01	A1





- GENERAL NOTES:
- FOR STANDARD SYMBOLS AND NOMENCLATURE SEE DRAWINGS PCCS-00-TC-PX-2365-00001-001 TO PCCS-00-TC-PX-2365-00008-001.
  - ALL VENTS AND DRAINS TO BE DN20 UNLESS OTHERWISE INDICATED.
  - FOR INTERLOCKS, REFER TO CAUSE AND EFFECT DIAGRAM; DOCUMENT NUMBER PCCS-01-TC-IN-6604-00001.
  - EPC CONTRACTOR TO RECONFIRM AND FINALISE LINE SIZES DURING DETAILED DESIGN.
  - EPC CONTRACTOR TO RECONFIRM AND FINALISE EQUIPMENT DETAILS/ELEVATIONS DURING DETAILED DESIGN.
  - DETAILS OF OPEN DRAIN (UNDERGROUND SYSTEM) TO BE DEVELOPED DURING EPC PHASE.
  - ALARMS AND ESD SET POINTS TO BE PROVIDED BY EPC CONTRACTOR.

- NOTES:
- LOW POINT DRAIN.
  - VALVE TO BE CLOSED, NOT IN USE.
  - NUMBER OF STEAM TRAP DRAINS TO BE FINALISED BY EPC CONTRACTOR.
  - EXACT TIE-IN LOCATION TO BE DEFINED BY PIPING AND LAYOUT.
  - VALVES TO BE REMOVED AND CONNECTIONS FLANGED.
  - LINE 13LBB56 BRO03 TO BE ISOLATED UPSTREAM OF UNIT 1 MAIN CONDENSER.

- GM PLANT DRAINAGE SYSTEM  
HAD50 IP EVAPORATOR SYSTEM  
LBB HOT REHEAT PIPING SYSTEM  
LBC COLD REHEAT PIPING SYSTEM  
LCL STEAM GENERATOR DRAINS SYSTEM  
LCM CLEAN DRAINS SYSTEM  
MAN IP+LP-BYPASS SYSTEM  
A1UHA EXISTING BOILER HOUSE  
ULA FEEDWATER PUMP HOUSE  
UMA STEAM TURBINE BUILDING  
UHA BOILER HOUSE  
UMY BRIDGE STRUCTURE

HOLDS:

DRAWING NUMBER	CLIENT	TITLE
PCCS-01-TC-PX-2365-00004-001		NEW STEAM TURBINE HP/IP/LP CASING

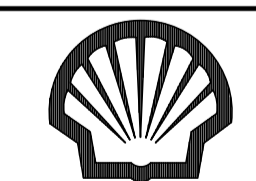
REFERENCE DRAWINGS

ER	QTY	REV	DATE	BY	CHKD	APPD
ER1A	900	545	50			f
ER1A	900	545	50			e
A106C	300	410	7			d
A335 P22	1500	545	50			c
A335 P91	900	545	50			b
A106C	600	410	50			a

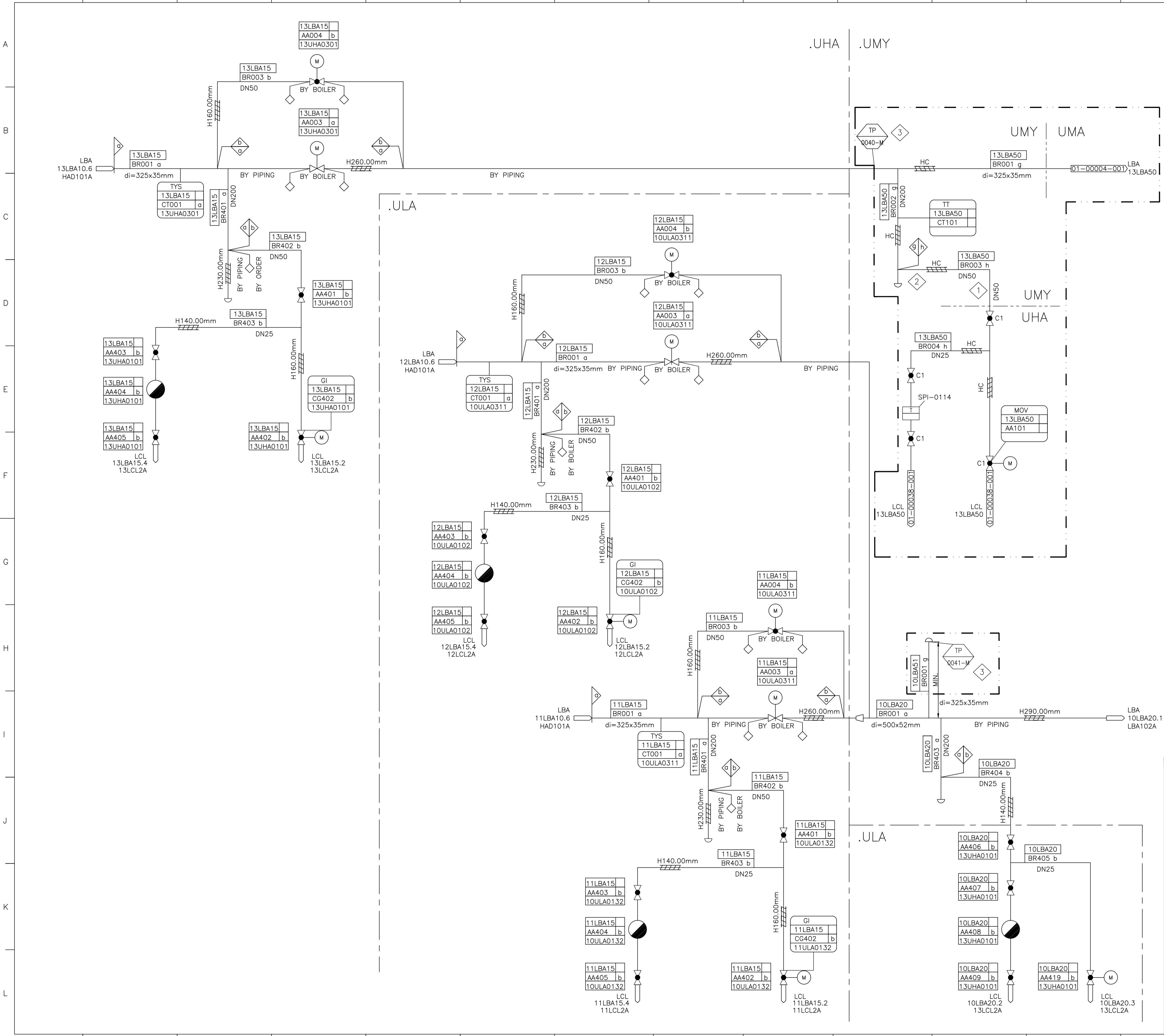
  

WERKSTOFF DER ROHRLEITUNG	ANSI-KLASSE	ZUL. BETRIEBS-TEMPERATUR MAX. ALLOWABLE WORKING TEMP. t <sub>zul</sub> in °C	ZUL. BETRIEBS-UEBERDRUCK MAX. ALLOWABLE WORKING PRESS. P <sub>e,zul</sub> IN barg	AUSLEGUNGS-ABSCHNITT DESIGN SECTION
ANSI-CLASS				

Rev	Date	Revision Object	Written by	Checked by	Approved by

  
**PETERHEAD CCS (ONSHORE)**  
**PETERHEAD CCS PROJECT**  
**PIPING AND INSTRUMENTATION DIAGRAM**  
**REHEATING HOT REHEAT SYSTEM**

DOC. CLASS:	SCALE: NTS	SHEET: 1/1
CLIENT Doc. Ref:	PCCS-01-TC-PX-2365-00010-001	REVISION FORMAT
	K01	A1



GENERAL NOTES:

- FOR STANDARD SYMBOLS AND NOMENCLATURE SEE DRAWINGS PCCS-00-TC-PX-2365-00001-001 TO PCCS-00-TC-PX-2365-00008-001.
- ALL VENTS AND DRAINS TO BE DN20 UNLESS OTHERWISE INDICATED.
- FOR INTERLOCKS, REFER TO CAUSE AND EFFECT DIAGRAM; DOCUMENT NUMBER PCCS-01-TC-IN-6604-00001.
- EPC CONTRACTOR TO RECONFIRM AND FINALISE LINE SIZES DURING DETAILED DESIGN.
- EPC CONTRACTOR TO RECONFIRM AND FINALISE EQUIPMENT DETAILS/ELEVATIONS DURING DETAILED DESIGN.
- DETAILS OF OPEN DRAIN (UNDERGROUND SYSTEM) TO BE DEVELOPED DURING EPC PHASE.
- ALARMS AND ESD SET POINTS TO BE PROVIDED BY EPC CONTRACTOR.

NOTES:

- LOW POINT DRAIN.
- NUMBER OF STEAM TRAP DRAINS TO BE FINALISED BY EPC CONTRACTOR.
- EXACT TIE-IN LOCATION TO BE DEFINED BY PIPING AND LAYOUT.

HAD10 HP EVAPORATOR SYSTEM  
 LBA MAIN STEAM PIPING SYSTEM  
 LCM EXISTING CLEAN DRAIN SYSTEM  
 LCL STEAM GENERATOR DRAINS SYSTEM

UHA STEAM GENERATOR BUILDING  
 UMA STEAM TURBINE BUILDING  
 UMY PIPING BRIDGE  
 ULA FEED WATER PUMP HOUSE

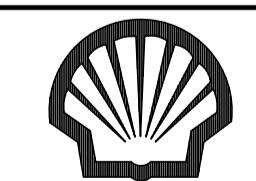
HOLDS:

REFERENCE DRAWINGS		
DRAWING NUMBER	CLIENT	TITLE
	PCCS-01-TC-PX-2365-00004-001	NEW STEAM TURBINE HP/IP/LP CASING

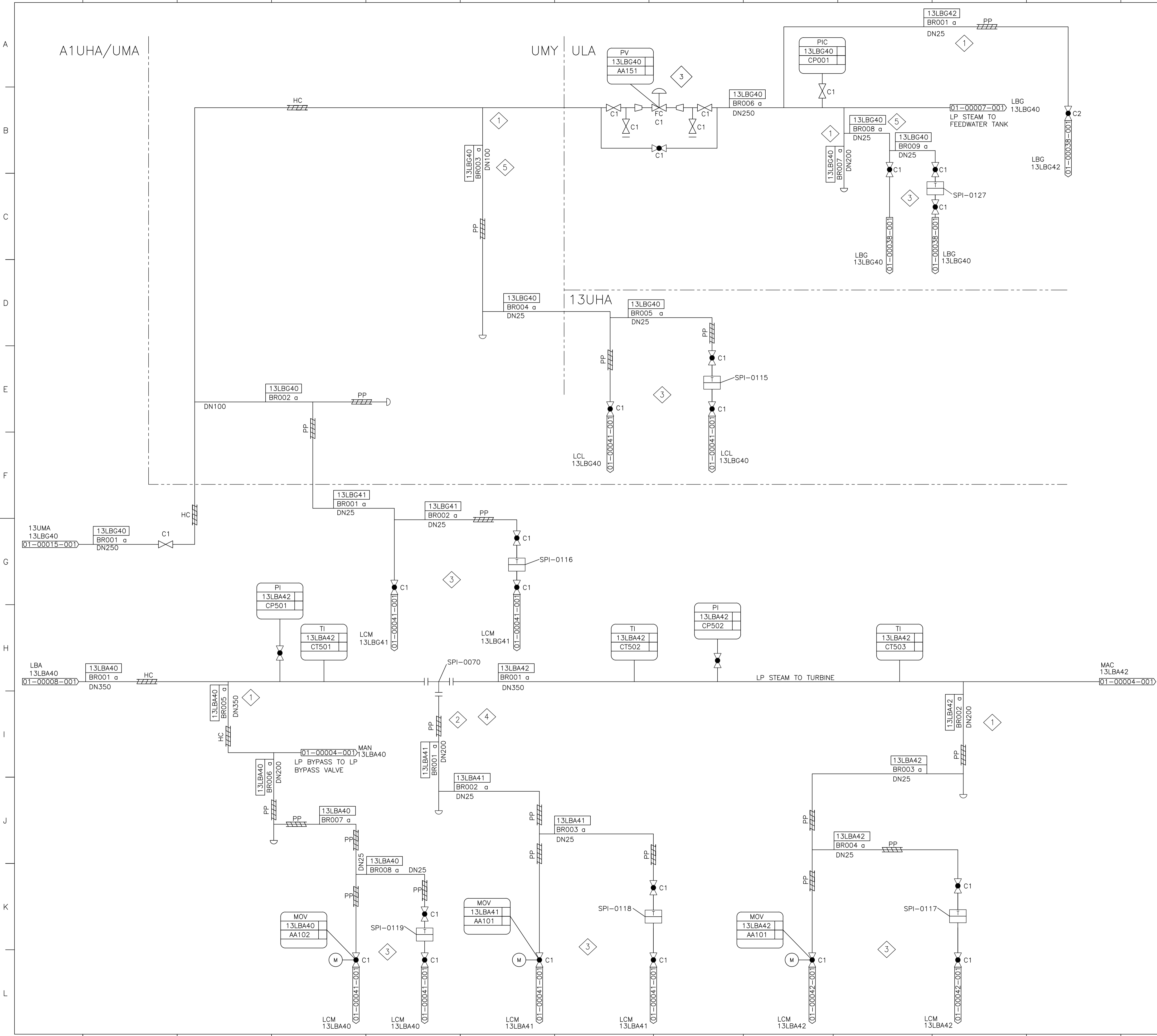
GR	1	2	3	4	5
GR1A	4500	545	165		h
GR1A	2500	545	165		g
A335 P22	600	530	30		f
HF660		545	177.4		e
A335 P22	4500	545	177.4		d
A335 P91	2500	545	177.4		c
A335 P22	4500	545	165		b
A335 P91	2500	545	165		a

WERKSTOFF DER ROHRLEITUNG	ANSI-KLASSE	ZUL. BETRIEBS-TEMPERATUR MAX. ALLOWABLE WORKING TEMP. t <sub>zul</sub> IN °C	ZUL. BETRIEBS-UEBERDRUCK MAX. ALLOWABLE WORKING PRESS. P <sub>e,zul</sub> IN bar	AUSLEGUNGS-ABSCHNITT DESIGN SECTION
ANSI-CLASS				

Rev	Date	Revision Object	Written by	Checked by	Approved by

  
**PETERHEAD CCS (ONSHORE)**  
**PETERHEAD CCS PROJECT**  
**PIPING AND INSTRUMENTATION DIAGRAM**  
**HP MAIN STEAM**

DOC. CLASS:	SCALE: NTS	SHEET: 1/1
CLIENT Doc. Ref:	PCCS-01-TC-PX-2365-00011-001	REVISION FORMAT
		K01 A1



**GENERAL NOTES**

- FOR STANDARD SYMBOLS AND NOMENCLATURE SEE DRAWINGS PCCS-00-TC-PX-2365-00001-001 TO PCCS-00-TC-PX-2365-00008-001.
- ALL VENTS AND DRAINS TO BE DN20 UNLESS OTHERWISE INDICATED.
- FOR INTERLOCKS, REFER TO CAUSE AND EFFECT DIAGRAM; DOCUMENT NUMBER PCCS-01-TC-IN-6604-00001.
- EPC CONTRACTOR TO RECONFIRM AND FINALISE LINE SIZES DURING DETAILED DESIGN.
- EPC CONTRACTOR TO RECONFIRM AND FINALISE EQUIPMENT DETAILS/ELEVATIONS DURING DETAILED DESIGN.
- DETAILS OF OPEN DRAIN (UNDERGROUND SYSTEM) TO BE DEVELOPED DURING EPC PHASE.
- ALARMS AND ESD SET POINTS TO BE PROVIDED BY CONTRACTOR.
- EPC TO CONFIRM INSULATION TYPE. ALL STEAM AND CONDENSATE LINES ARE TO BE INSULATED. ACCESSIBLE LINES BY THE OPERATORS SHALL BE STATED AS PP.

**NOTES:**

- LOW POINT DRAIN.
- LOCATE FILTER NEAR TO 20MA10.
- NUMBER OF STEAM TRAP DRAINS TO BE FINALISED BY EPC CONTRACTOR.
- FILTER SPARING AND BYPASS REQUIREMENT TO BE DEFINED BY STEAM TURBINE VENDOR.
- MULTIPLE DRIP DRAIN LEGS ARE REQUIRED TO AVOID WATER HAMMER ON THE LINE.

**GM** PROCESS DRAINAGE SYSTEM  
**LBA** MAIN STEAM PIPING SYSTEM  
**LBG** AUXILIARY STEAM PIPING SYSTEM  
**LCL** STEAM GENERATOR DRAINS SYSTEM  
**LCM** CLEAN DRAINS SYSTEM  
**MAC** LP STEAM TURBINE  
**MAN** IP+LP-BYPASS SYSTEM

**A1UHA** EXISTING BOILER HOUSE  
**UHA** BOILER HOUSE  
**ULA** FEEDWATER PUMP HOUSE  
**UMA** STEAM TURBINE BUILDING  
**UMY** BRIDGE STRUCTURE

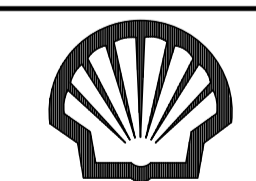
**HOLDS:**

REFERENCE DRAWINGS				
DRAWING NUMBER	CLIENT	TITLE		
	PCCS-01-TC-PX-2365-00007-001	FEEDWATER SYSTEM, FEEDWATER TANK WITH DEAERATION, HP/IP FEEDWATER SUPPLY		
	PCCS-01-TC-PX-2365-00008-001	LP MAIN STEAM/AUXILIARY STEAM SYSTEM		
	PCCS-01-TC-PX-2365-00004-001	NEW STEAM TURBINE HP/IP/LP CASING		

BA1A	300	265	12	a
PIPING MATERIAL	ANSI-CLASS	MAX. ALLOWABLE WORKING TEMPERATURE, °C	MAX. ALLOWABLE WORKING PRESSURE, bar	DESIGN SECTION

Rev	Date	Revision Object	Written by	Checked by	Approved by



**PETERHEAD CCS (ONSHORE)**

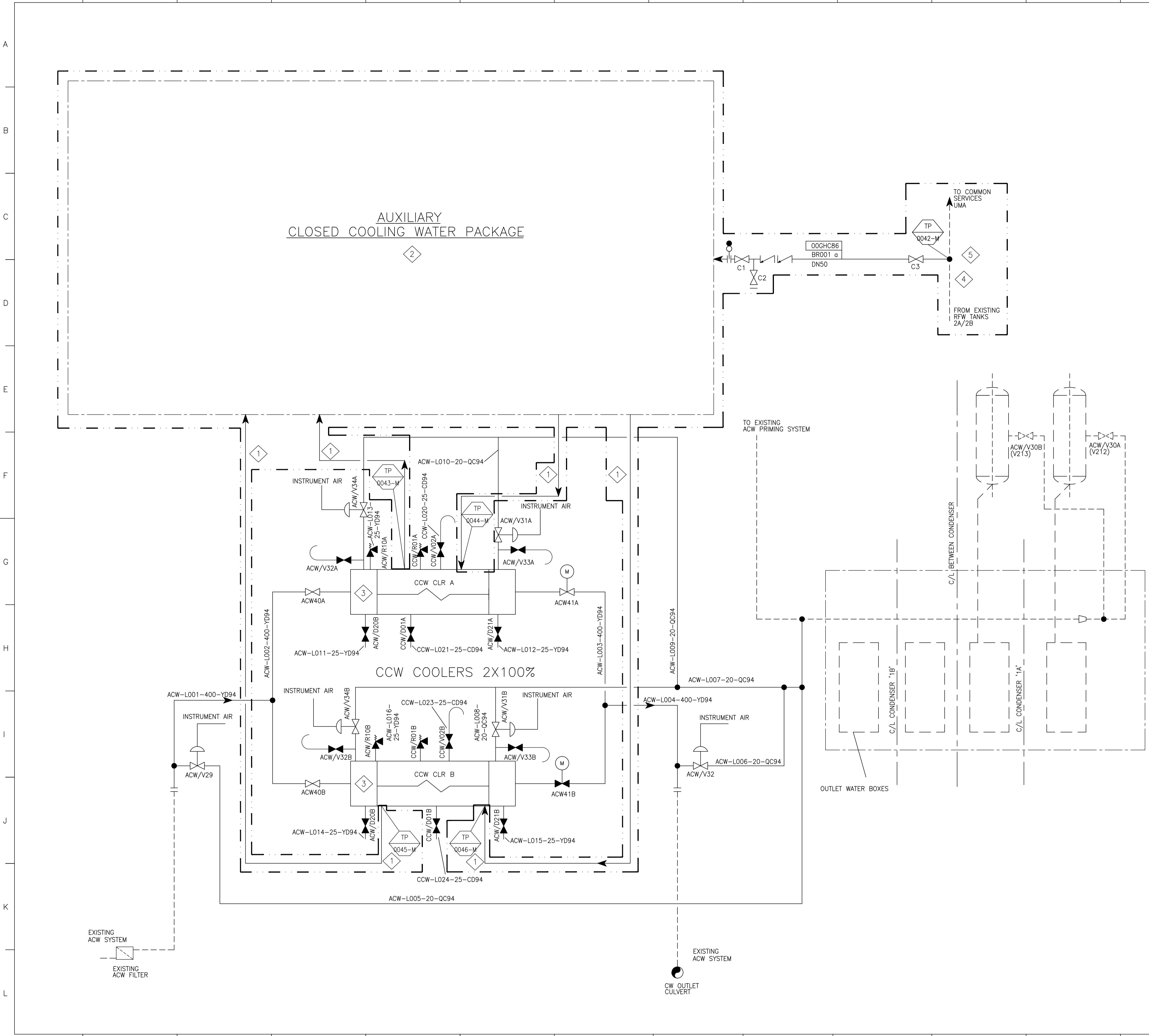
**PETERHEAD CCS PROJECT**

**PIPING AND INSTRUMENTATION DIAGRAM**

**LP MAIN STEAM/AUXILIARY STEAM SYSTEM TO FEEDWATER TANK & 20MA10**

DOC. CLASS:	SCALE: NTS	SHEET: 1/1
CLIENT Doc. Ref:	PCCS-01-TC-PX-2365-00012-001	REVISION FORMAT
		K01 A1





- GENERAL NOTES:
- FOR STANDARD SYMBOLS AND NOMENCLATURE SEE DRAWINGS PCCS-00-TC-PX-2365-00002-001 TO PCCS-00-TC-PX-2365-00008-001.
  - ALL VENTS AND DRAINS TO BE DN20 UNLESS OTHERWISE INDICATED.
  - 
  - FOR INTERLOCKS, REFER TO CAUSE AND EFFECT DIAGRAM; DOCUMENT NUMBER PCCS-01-TC-IN-6604-00001.
  - EPC CONTRACTOR TO RECONFIRM AND FINALISE LINE SIZES DURING DETAILED DESIGN.
  - EPC CONTRACTOR TO RECONFIRM AND FINALISE EQUIPMENT DETAILS/ELEVATIONS DURING DETAILED DESIGN.
  - DETAILS OF OPEN DRAIN (UNDERGROUND SYSTEM) TO BE DEVELOPED DURING EPC PHASE.
  - ALARMS AND ESD SET POINTS TO BE PROVIDED BY EPC CONTRACTOR.

- NOTES:
- STEAM TURBINE VENDOR TO SUPPLY CLOSED COOLING WATER PIPING TO/FROM AUXILIARY COOLERS FROM/TO AUXILIARY CLOSED COOLING WATER PACKAGE WITH ASSOCIATED VALVES.
  - VENDOR PACKAGE PROVIDED BY STEAM TURBINE VENDOR.
  - EXISTING AUXILIARY COOLING WATER COOLERS RE-USED. SEAWATER COOLING LINES RETAINED.
  - CONNECTION FOR EXISTING DEMIN WATER PIPING TO CLOSED COOLING WATER PACKAGE MAKE-UP.
  - EXACT LOCATION OF TIE-IN TO BE DEFINED BY PIPING AND LAYOUT.

GHC DISTRIBUTION SYSTEMS AFTER TREATMENT (DEMINERALISED WATER)  
 UMA EXISTING TURBINE BUILDING

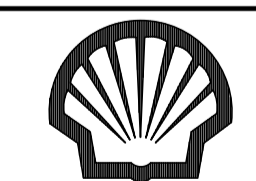
HOLDS:

AJ0A	150	50	9.0	α
PIPING MATERIAL	PRESSURE NOMINAL	MAX. ALLOWABLE WORKING TEMPERATURE °C	MAX. ALLOWABLE WORKING PRESSURE bar	DESIGN SECTION

REFERENCE DRAWINGS

DRAWING NUMBER	TITLE

Rev	Date	Revision Object	Written by	Checked by	Approved by



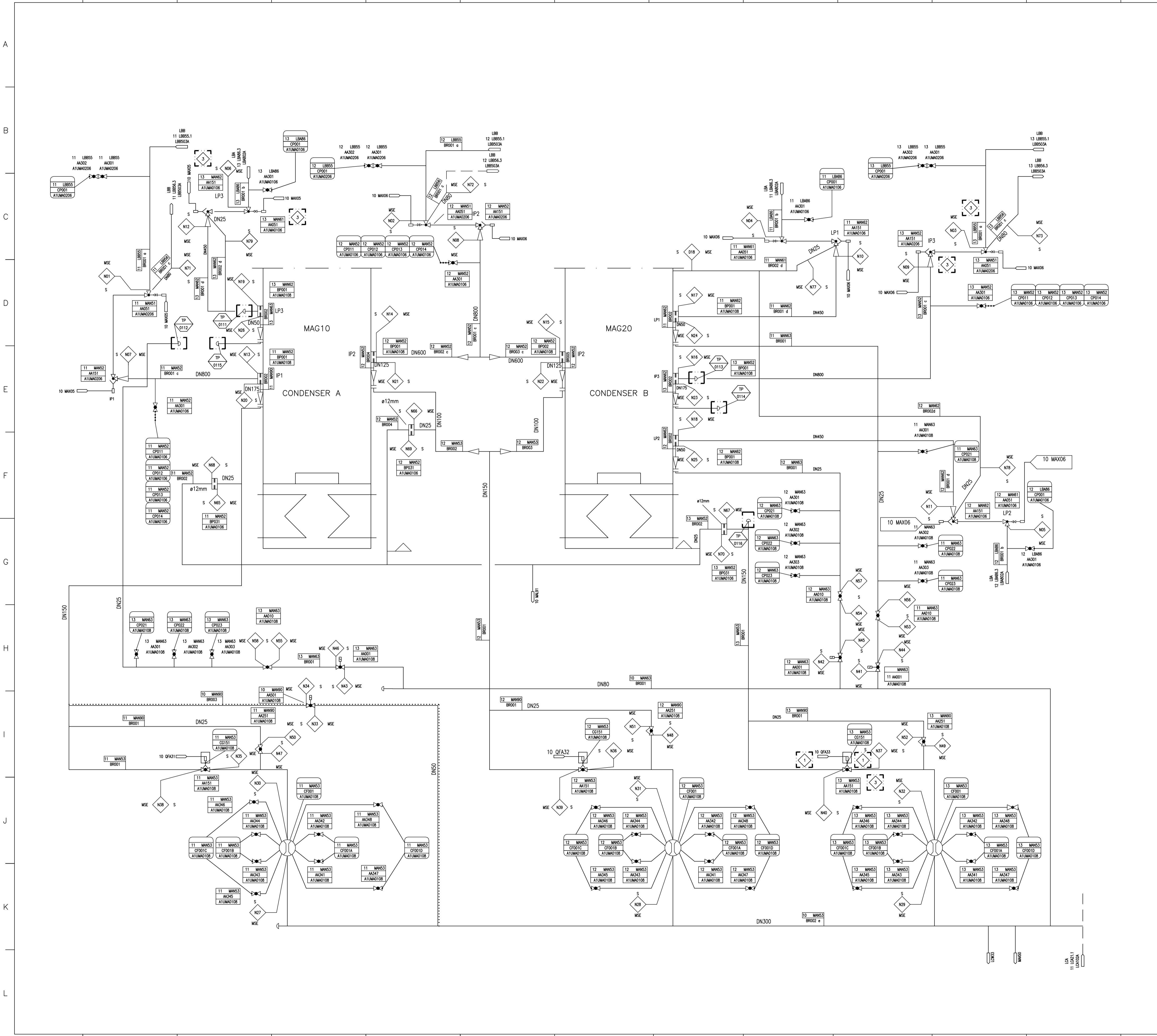
**PETERHEAD CCS (ONSHORE)**

**PETERHEAD CCS PROJECT**

**PIPING AND INSTRUMENTATION DIAGRAM**

**AUXILIARY CLOSED COOLING WATER SYSTEM**

DOC. CLASS:	SCALE: NTS	SHEET: 1/1
CLIENT Doc. Ref:	PCCS-01-TC-PX-2365-00013-001	REVISION FORMAT
		K01 A1



- GENERAL NOTES:
- FOR STANDARD SYMBOLS AND NOMENCLATURE SEE DRAWINGS PCCS-00-TC-PX-2365-00001-001 TO PCCS-00-TC-PX-2365-00008-001.
  - ALL VENTS AND DRAINS TO BE DN20 UNLESS OTHERWISE INDICATED.
  - FOR INTERLOCKS, REFER TO CAUSE AND EFFECT DIAGRAM; DOCUMENT NUMBER PCCS-01-TC-IN-6604-00001.
  - EPC CONTRACTOR TO RECONFIRM AND FINALISE LINE SIZES DURING DETAILED DESIGN.
  - EPC CONTRACTOR TO RECONFIRM AND FINALISE EQUIPMENT DETAILS/ELEVATIONS DURING DETAILED DESIGN.
  - DETAILS OF OPEN DRAIN (UNDERGROUND SYSTEM) TO BE DEVELOPED DURING EPC PHASE.
  - ALARMS AND ESD SET POINTS TO BE PROVIDED BY EPC.

- NOTES
- VALVE TO BE DISCONNECTED AND ISOLATED IN CLOSED POSITION.
  - VALVE TO BE CLOSED.
  - HYDRAULIC OIL CONTROL LINES SHALL BE ISOLATED.

MAG CONDENSATION SYSTEM  
MAL TURBINE DRAIN SYSTEM  
MAN IP-LP-BYPASS SYSTEM  
MAX STEUERÖL ZENTRALEINHEIT  
LBA LP MAIN STEAM SYSTEM  
LWB HOT REHEAT SYSTEM  
LCW SEALING WATER SYSTEM  
QFA AIR CONTROL SYSTEM

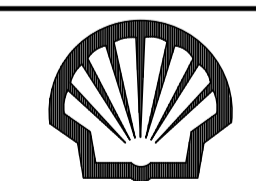
HOLDS

A106B	300	66	35	e
A106B	150	250	7	d
A335P22	600	545	28	c
A106B	300	250	12	b
A335P91	900	545	50	a

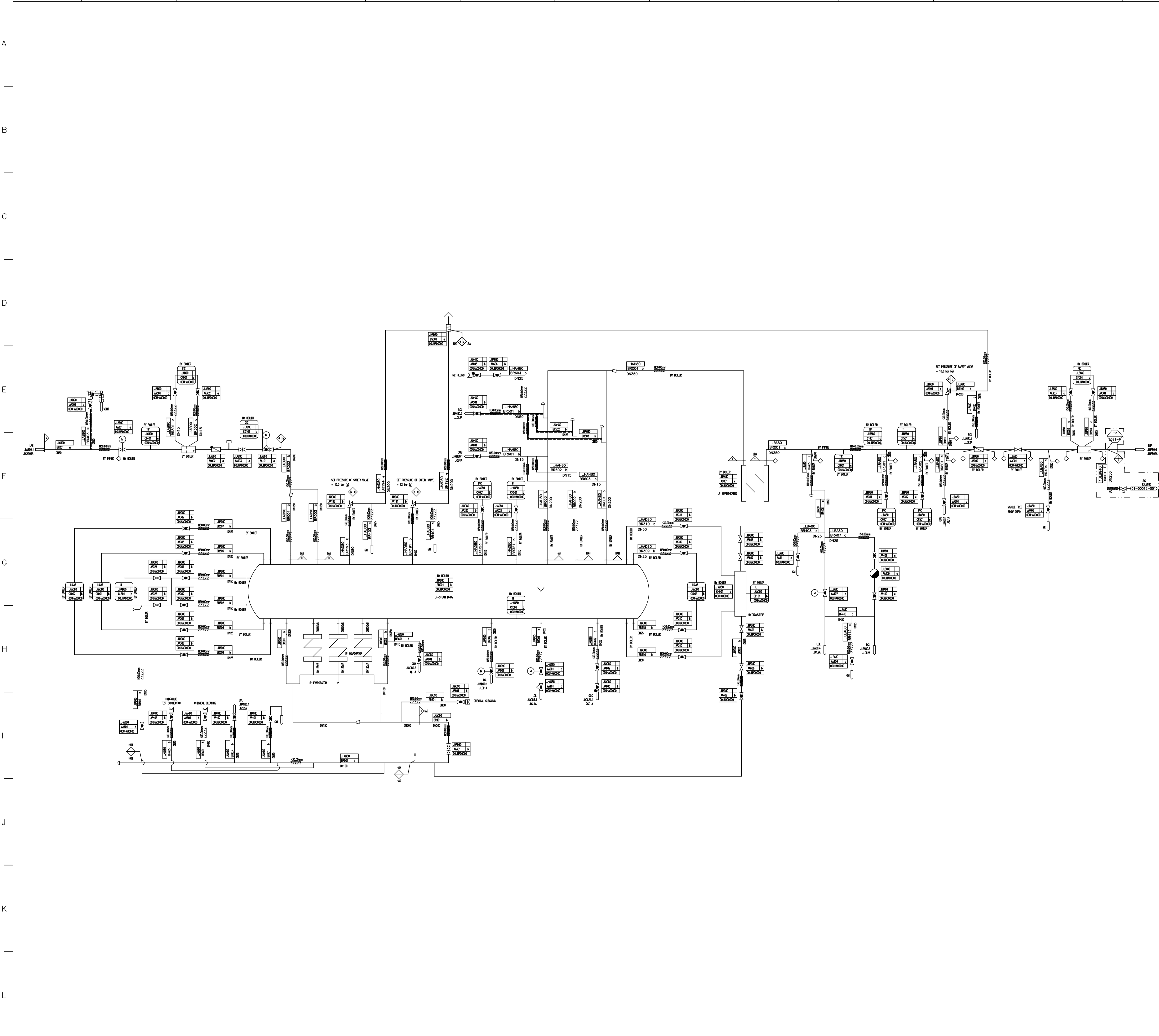
WERKSTOFF DER ROHREITUNG PIPING MATERIAL	ANSI-KLASSE PRESSURE NOMINAL	ZUL. BETRIEBS-TEMPERATUR MAX. ALLOWABLE WORKING TEMP. t <sub>zul</sub> IN °C	ZUL. BETRIEBS-UEBERDRUCK MAX. ALLOWABLE WORKING PRESS. P <sub>e,zul</sub> IN bar	AUSLEGUNGS-ABSCHNITT DESIGN SECTION
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REFERENCE DRAWINGS	
DRAWING NUMBER	TITLE
CLIENT	
PCCS-01-TC-PX-2365-00006-001	MAIN CONDENSATE SUPPLY P&ID

Rev	Date	Revision Object	Written by	Checked by	Approved by

  
**PETERHEAD CCS (ONSHORE)**  
**PETERHEAD CCS PROJECT**  
**PIPING AND INSTRUMENTATION DIAGRAM**  
**BLOCK 2 ISOLATIONS AT BLOCK 1 CONDENSER**

DOC. CLASS:	SCALE: NTS	SHEET: 1/1
CLIENT Doc. Ref:	PCCS-01-TC-PX-2365-00014-001	REVISION FORMAT
	K01	A1



- GENERAL NOTES:
- FOR STANDARD SYMBOLS AND NOMENCLATURE SEE DRAWINGS PCCS-00-TC-PX-2365-00001-001 TO PCCS-00-TC-PX-2365-00008-001.
  - ALL VENTS AND DRAINS TO BE DN20 UNLESS OTHERWISE INDICATED.
  - FOR INTERLOCKS, REFER TO CAUSE AND EFFECT DIAGRAM; DOCUMENT NUMBER PCCS-01-TC-IN-6604-00001.
  - EPC CONTRACTOR TO RECONFIRM AND FINALISE LINE SIZES DURING DETAILED DESIGN.
  - EPC CONTRACTOR TO RECONFIRM AND FINALISE EQUIPMENT DETAILS/ELEVATIONS DURING DETAILED DESIGN.
  - DETAILS OF OPEN DRAIN (UNDERGROUND SYSTEM) TO BE DEVELOPED DURING EPC PHASE.
  - ALARMS AND ESD SET POINTS TO BE PROVIDED BY EPC CONTRACTOR.

- NOTES:
- EPC TO CONFIRM INSULATION TYPE. ALL STEAM AND CONDENSATE LINES TO BE INSULATED ACCESSIBLE LINES BY THE OPERATORS SHALL BE STATED AS PP.
- NOTE: - DRAINS AND VENTS MAY BE CHANGED DUE TO PIPING LAYOUT  
 - THIS P&ID DIAGRAM IS VALID FOR THE BOILER SYSTEMS 11,12 AND 13 ONLY THE FIRST TWO DIGITS OF THE IDENTIFICATIONS CODES HAVE TO BE CHANGED ACCORDINGLY  
 - DESIGN DATA MARKED WITH \* IS SPECIFIED BY SIEMENS ALL OTHER DATA BY BOILER SUPPLIER


GM	PLANT DRAINAGE SYSTEM
HAD	EVAPORATOR-SYSTEM
HAH	HP SUPERHEATER SYSTEM
HAN	PRESSURE SYST.DRAIN.A.VENTING SYST.
LAB	FEED WATER PIPING SYSTEM
LBG	AUXILIARY STEAM PIPING SYSTEM
LBAB0	LP-MAIN STEAM PIPING SYSTEM
LCL	STEAM GENERATOR DRAINS SYSTEM
QCC	DOSING SYSTEM FOR TRISODIUM PHOSPHATE
QU	SAMPLING SYSTEM
UHA	STEAM GENERATOR BUILDING
UMY	BRIDGE STRUCTURE

HOLDS:

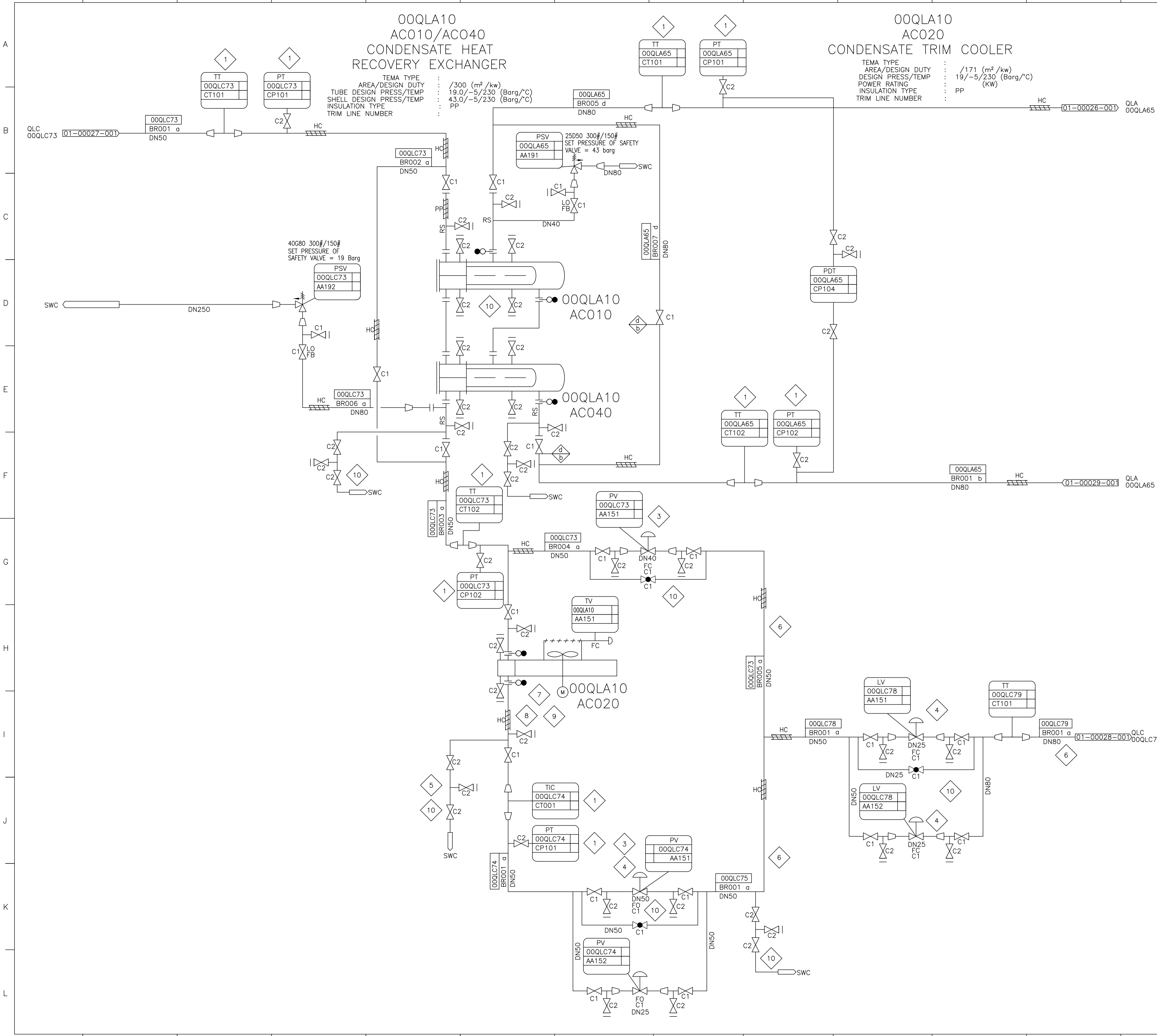
Reference Drawings	Title
Drawing Number	

Reference Drawings	Title			
Drawing Number				
BA1A	300	265	12	f
A106-B	150	195	5	e
A106-B	150	265	5	d
A106-B	300	250	12	c
A106-B	150	195	12	b
A106-B	300	245	35	a
PIPING MATERIAL	ANSI CLASS	MAX. ALLOWABLE WORKING TEMPERATURE (°C)	MAX. ALLOWABLE WORKING PRESSURE (barg)	DESIGN SECTION

Rev	Date	Revision Object	Written by	Checked by	Approved by

  
**PETERHEAD CCS (ONSHORE)**  
**PETERHEAD CCS PROJECT**  
**PIPING AND INSTRUMENTATION DIAGRAM**  
 HRSG LP-SYSTEM HEAT RECOVERY STEAM GENERATOR LP-SYSTEM (NATURAL CIRCULATION) - BLOCK 13

DOC. CLASS:	SCALE: NTS	SHEET: 1/1
CLIENT Doc. Ref:	PCCS-01-TC-PX-2365-00015-001	REVISION K01
		FORMAT A1



GENERAL NOTES:  
 1. FOR STANDARD SYMBOLS AND NOMENCLATURE SEE DRAWINGS PCCS-00-TC-PX-2365-00001-001 TO PCCS-00-TC-PX-2365-00008-001.  
 2. ALL VENTS AND DRAINS TO BE DN20 UNLESS OTHERWISE INDICATED.  
 4. FOR INTERLOCKS, REFER TO CAUSE AND EFFECT DIAGRAM; DOCUMENT NUMBER PCCS-01-TC-IN-6604-00001.  
 5. EPC CONTRACTOR TO RECONFIRM AND FINALISE LINE SIZES DURING DETAILED DESIGN.  
 6. EPC CONTRACTOR TO RECONFIRM AND FINALISE EQUIPMENT DETAILS/ELEVATIONS DURING DETAILED DESIGN.  
 7. DETAILS OF OPEN DRAIN (UNDERGROUND SYSTEM) TO BE DEVELOPED DURING EPC PHASE.  
 8. ALARMS AND ESD SET POINTS TO BE PROVIDED BY EPC CONTRACTOR.

NOTES:  
 1. INSTRUMENT TO HAVE LOCAL INDICATION AS WELL AS TRANSMISSION TO DCS.  
 2. FLOW INDICATION TO BE VISIBLE FROM CONTROL VALVE.  
 3. REVERSE ACTING VALVE.  
 4. MINIMUM STOP TO BE PROVIDED TO PREVENT AIR COOLER 00QLA10 AC020 FROM FREEZING.  
 5. DRAIN VALVE TO BE LOCATED IN AUXILIARY BOILER HOUSE.  
 6. TWO PHASE FLOW. PROVIDE ADEQUATE SUPPORT.  
 7. STEAM HEATING COILS FOR WINTERISATION SHOULD BE CONSIDERED DURING DETAILED DESIGN (EPC PHASE.)  
 8. CONDENSATE TRIM COOLER TO BE DRAINED WHEN NOT IN SERVICE.  
 9. AIR COOLER HEAT EXCHANGER SHALL BE DESIGNED FOR TWO PHASE FLOW.  
 10. PERSONAL PROTECTION INSULATION SHALL BE APPLIED TO THE OPERATIONAL AREAS OF EQUIPMENTS, INSTRUMENTS VENTS AND DRAINS.

QLA FEEDWATER SYSTEM  
 QLC CONDENSATE SYSTEM  
 SWC CLEAN STORM WATER

HOLDS:

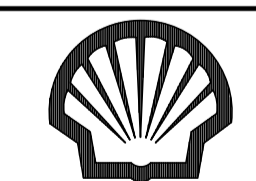
REFERENCE DRAWINGS

DRAWING NUMBER	CLIENT	TITLE
PCCS-01-TC-PX-2365-00026-001		AUXILIARY BOILER NO.1
PCCS-01-TC-PX-2365-00027-001		AUXILIARY BOILER CONDENSATE FLASH DRUM
PCCS-01-TC-PX-2365-00028-001		AUXILIARY DEAERATOR
PCCS-01-TC-PX-2365-00029-001		AUXILIARY BFW PUMPS

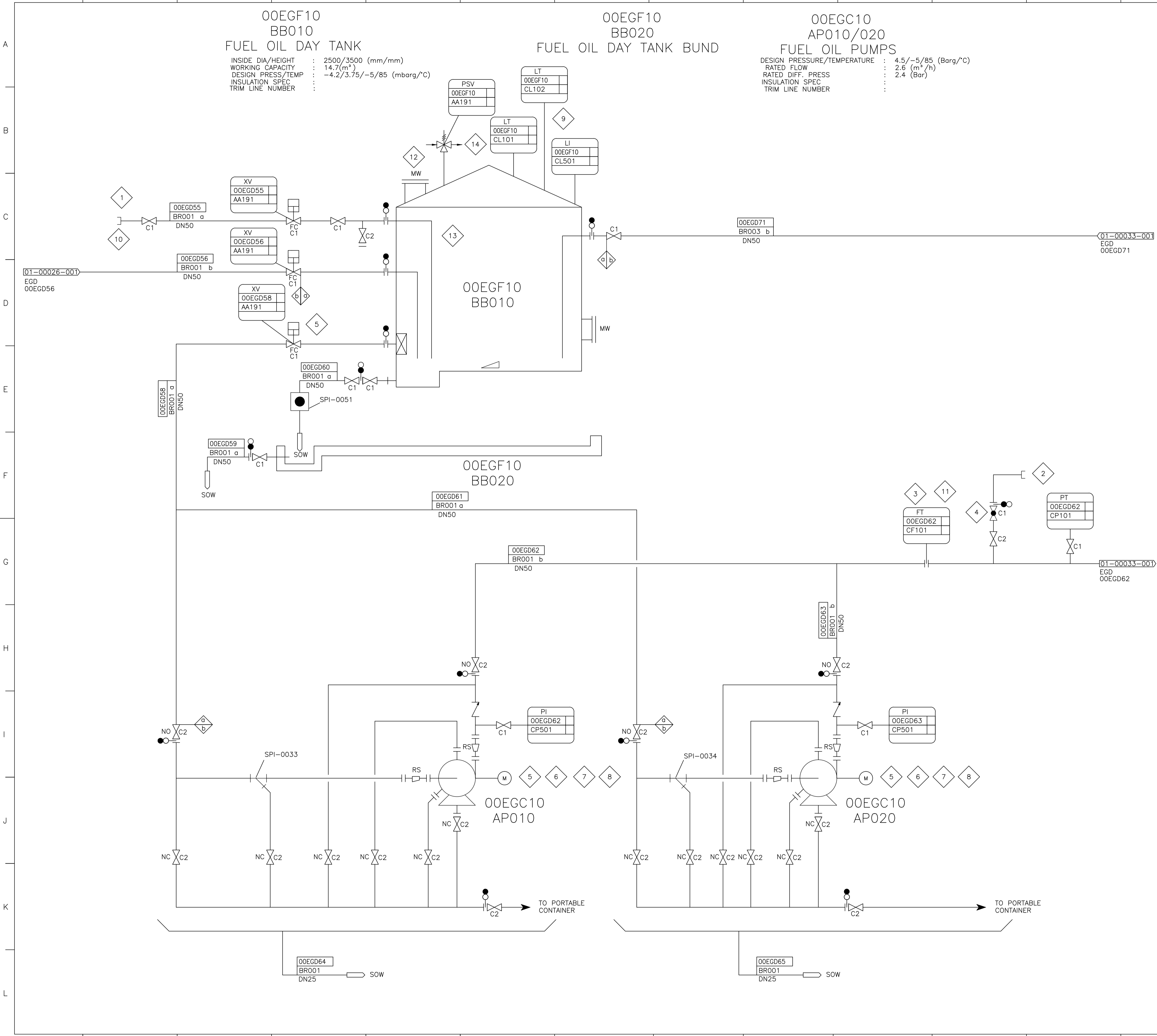
BA1A	300	230	43	d
AA1A	150	170	7	c
BA1A	300	190	43	b
BA1A	300	230	19(+FV)	a

PIPING MATERIAL	ANSI CLASS	MAX. ALLOWABLE WORKING TEMPERATURE (°C)	MAX. ALLOWABLE WORKING PRESSURE (barg)	DESIGN SECTION

Rev	Date	Revision Object	Written by	Checked by	Approved by

  
**PETERHEAD CCS (ONSHORE)**  
**PETERHEAD CCS PROJECT**  
**PIPING AND INSTRUMENTATION DIAGRAM**  
**AUXILIARY CONDENSATE HEAT RECOVERY EXCHANGER AND TRIM COOLER**

DOC. CLASS:	SCALE: NTS	SHEET: 1/1
CLIENT Doc. Ref:	PCCS-01-TC-PX-2365-00016-001	REVISION FORMAT K01 A1



00EGF10  
BB010  
FUEL OIL DAY TANK

INSIDE DIA/HEIGHT : 2500/3500 (mm/mm)  
WORKING CAPACITY : 14.7(m<sup>3</sup>)  
DESIGN PRESS/TEMP : -4.2/3.75/-5/85 (mbarg/°C)  
INSULATION SPEC :  
TRIM LINE NUMBER :

00EGF10  
BB020  
FUEL OIL DAY TANK BUND

00EGC10  
AP010/020  
FUEL OIL PUMPS

DESIGN PRESSURE/TEMPERATURE : 4.5/-5/85 (Barg/°C)  
RATED FLOW : 2.6 (m<sup>3</sup>/h)  
RATED DIFF. PRESS : 2.4 (Bar)  
INSULATION SPEC :  
TRIM LINE NUMBER :

- GENERAL NOTES:
- FOR STANDARD SYMBOLS AND NOMENCLATURE SEE DRAWINGS PCCS-00-TC-PX-2365-00001-001 TO PCCS-00-TC-PX-2365-00008-001.
  - ALL VENTS AND DRAINS TO BE DN20 UNLESS OTHERWISE INDICATED.
  - 
  - FOR INTERLOCKS, REFER TO CAUSE AND EFFECT DIAGRAM; DOCUMENT NUMBER PCCS-01-TC-IN-6604-00001.
  - EPC CONTRACTOR TO RECONFIRM AND FINALISE LINE SIZES DURING DETAILED DESIGN.
  - EPC CONTRACTOR TO RECONFIRM AND FINALISE EQUIPMENT DETAILS/ELEVATIONS DURING DETAILED DESIGN.
  - DETAILS OF OPEN DRAIN (UNDERGROUND SYSTEM) TO BE DEVELOPED DURING EPC PHASE.
  - ALARMS AND ESD SET POINTS TO BE PROVIDED BY EPC CONTRACTOR.

- NOTES:
- FOR FILLING FUEL OIL DAY TANK FROM ROAD TANKER.
  - UNLOADING CONNECTION TO ROAD TANKER.
  - FLOW TRANSMITTER TO INCLUDE LOCAL FLOW INDICATION.
  - FLOW INDICATION SHALL BE VISIBLE FROM GLOBE VALVE.
  - PUMP START-UP/RUNNING PERMISSIVE SHALL BE INTERLOCKED WITH XV OPEN POSITION INDICATION.
  - PUMPS TO INCLUDE AUTO START-UP.
  - DESIGN PUMP FOR END OF CURVE OPERATION.
  - ELEVATE PUMPS TO ALLOW GRAVITY DRAINAGE.
  - PROVIDE LOCAL LEVEL INDICATION BACK TO LOADING POINT.
  - PROVIDE LOADING/UNLOADING BAY WITH PROTECTION MEASURES TO PREVENT DIESEL RELEASE TO SEA.
  - LOW FLOW ALARM TO BE PROVIDED.
  - DUAL PURPOSE VENT; EMERGENCY VENT AND MANWAY. TO BE PROVIDED BY TANK VENDOR.
  - PROVIDE A 10MM ORIFICE AT ELBOW AS SIPHON BREAK.
  - PROVIDE KLAXON ALARM ON HIGH LIQUID LEVEL.
- EGC SUPPLY OF LIQUID FUELS-PUMP SYSTEM  
EGD SUPPLY OF LIQUID FUELS-PIPING SYSTEM  
EGF SUPPLY OF LIQUID FUELS-INTERMEDIATE STORAGE

HOLDS:

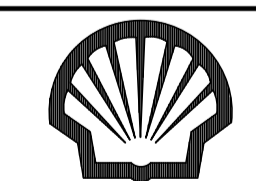
DRAWING NUMBER		TITLE	
PCCS-01-TC-PX-2365-00026-001		AUXILIARY BOILER NO.1	
PCCS-01-TC-PX-2365-00033-001		FUEL GAS/FUEL OIL CONDITIONING PACKAGE	

REFERENCE DRAWINGS

DRAWING NUMBER		TITLE	
PCCS-01-TC-PX-2365-00026-001		AUXILIARY BOILER NO.1	
PCCS-01-TC-PX-2365-00033-001		FUEL GAS/FUEL OIL CONDITIONING PACKAGE	

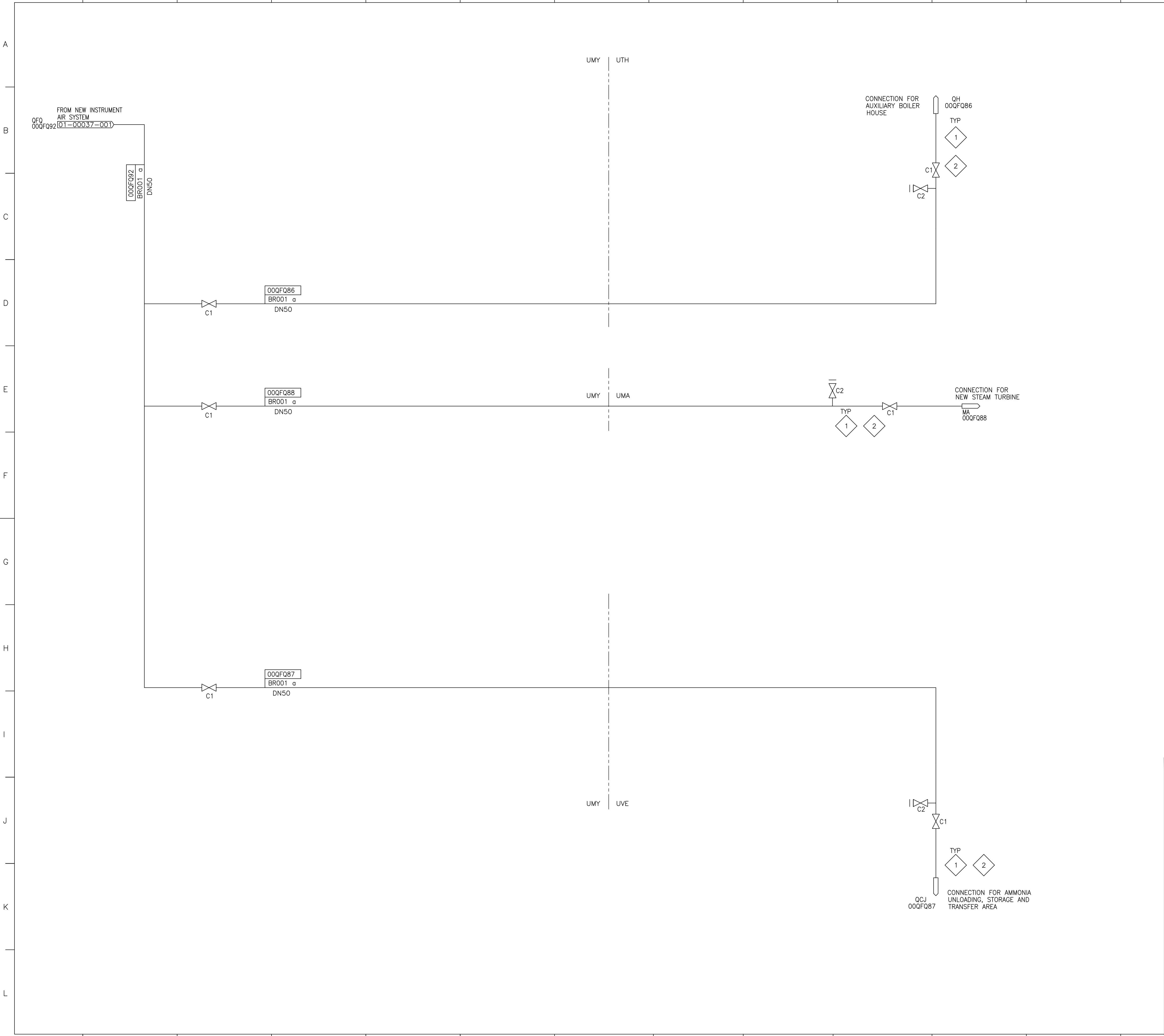
AA1B	150	85	4.5	b
AA1B	150	85	3.5	a

PIPING MATERIAL	ANSI CLASS	MAX. ALLOWABLE WORKING TEMPERATURE (°C)	MAX. ALLOWABLE WORKING PRESSURE (barg)	DESIGN SECTION

  
**PETERHEAD CCS (ONSHORE)**  
**PETERHEAD CCS PROJECT**  
**PIPING AND INSTRUMENTATION DIAGRAM**  
**FUEL OIL DAY TANK AND FUEL OIL PUMPS**

DOC. CLASS:	SCALE: NTS	SHEET: 1/1
CLIENT Doc. Ref:	PCCS-01-TC-PX-2365-00017-001	REVISION FORMAT
		K01 A1
LAST REV DATE:		





GENERAL NOTES

- FOR STANDARD SYMBOLS AND NOMENCLATURE SEE DRAWINGS PCCS-00-TC-PX-2365-00002-001 TO PCCS-00-TC-PX-2365-00008-001.
- ALL VENTS AND DRAINS TO BE DN20 UNLESS OTHERWISE INDICATED.
- 
- FOR INTERLOCKS, REFER TO CAUSE AND EFFECT DIAGRAM; DOCUMENT NUMBER PCCS-01-TC-IN-6604-00001.
- EPC CONTRACTOR TO RECONFIRM AND FINALISE LINE SIZES DURING DETAILED DESIGN.
- EPC CONTRACTOR TO RECONFIRM AND FINALISE EQUIPMENT DETAILS/ELEVATIONS DURING DETAILED DESIGN.
- DETAILS OF OPEN DRAIN (UNDERGROUND SYSTEM) TO BE DEVELOPED DURING EPC PHASE.
- ALARMS AND ESD SET POINTS TO BE PROVIDED BY EPC CONTRACTOR.

NOTES:

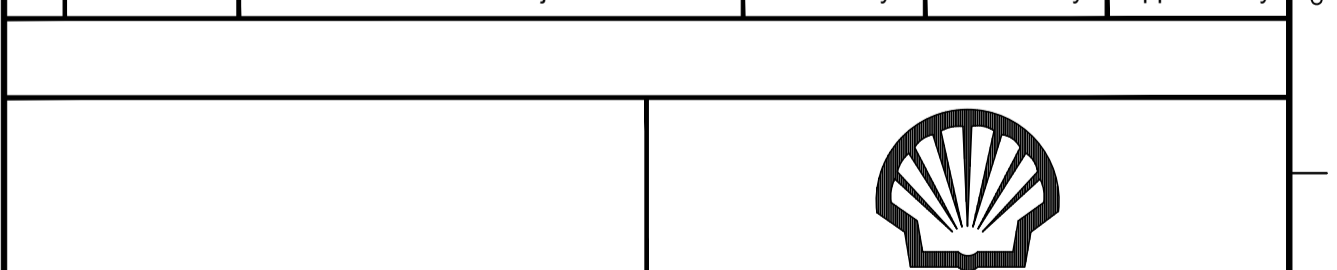
- TYPICAL ARRANGEMENT FOR CONNECTION.
- NUMBER OF CONNECTIONS TO BE FINALISED BY EPC CONTRACTOR.

QCJ AMMONIA STORAGE AND FEED FOR HRSG CATALYTIC CONVERTER  
 QFQ CONTROL AIR SUPPLY SYSTEM FOR MAIN GROUP 'Q' (AUXILIARY SYSTEMS)  
 QH AUXILIARY STEAM GENERATING SYSTEM  
 UMY PIPE BRIDGE  
 UTH AUXILIARY STEAM GENERATOR BUILDING  
 UVE STRUCTURE FOR AMMONIA UNLOADING AND STORAGE  
 UMA STEAM TURBINE BUILDING  
 UHA STRUCTURE FOR HRSG/HRSG HOUSING

HOLDS:

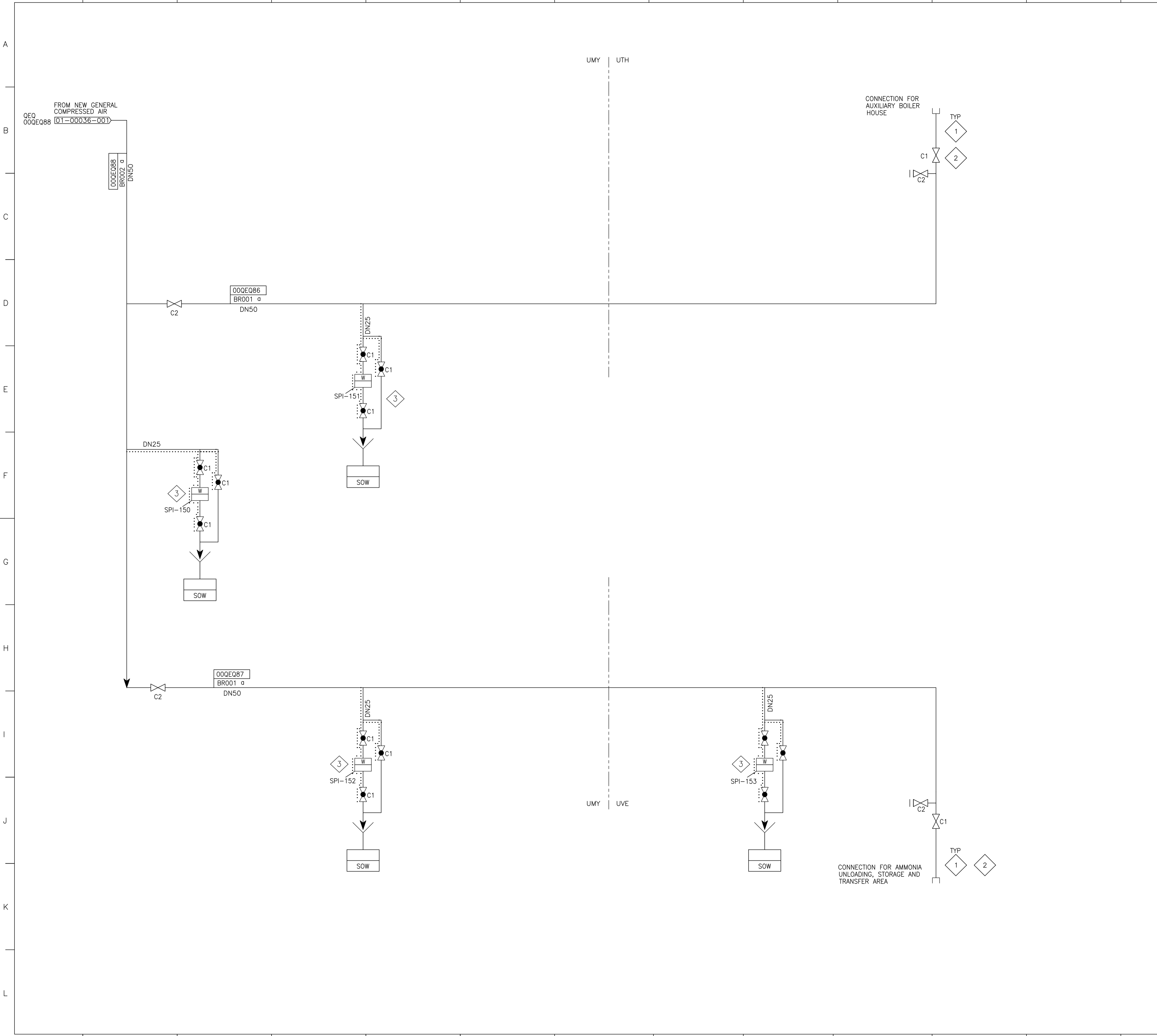
ADDA	150	85	10	a
PIPING MATERIAL	ANSI CLASS	MAX. ALLOWABLE WORKING TEMPERATURE (°C)	MAX. ALLOWABLE WORKING PRESSURE (barg)	DESIGN SECTION


Rev	Date	Revision Object	Written by	Checked by	Approved by



**PETERHEAD CCS (ONSHORE)**  
**PETERHEAD CCS PROJECT**  
**PIPING AND INSTRUMENTATION DIAGRAM**  
**INSTRUMENT AIR DISTRIBUTION TO NEW PPS FACILITIES**

DOC. CLASS:	SCALE: NTS	SHEET: 1/1
CLIENT Doc. Ref:	PCCS-01-TC-PX-2365-00019-001	REVISION FORMAT
		K01 A1



GENERAL NOTES

- FOR STANDARD SYMBOLS AND NOMENCLATURE SEE DRAWINGS PCCS-00-TC-PX-2365-0002-001 TO PCCS-00-TC-PX-2365-00008-001.
- ALL VENTS AND DRAINS TO BE DN20 UNLESS OTHERWISE INDICATED.
- 
- FOR INTERLOCKS, REFER TO CAUSE AND EFFECT DIAGRAM; DOCUMENT NUMBER ON HOLD.
- EPC CONTRACTOR TO RECONFIRM AND FINALISE LINE SIZES DURING DETAILED DESIGN.
- EPC CONTRACTOR TO RECONFIRM AND FINALISE EQUIPMENT DETAILS/ELEVATIONS DURING DETAILED DESIGN.
- DETAILS OF OPEN DRAIN (UNDERGROUND SYSTEM) TO BE DEVELOPED DURING EPC PHASE.
- ALARMS AND ESD SET POINTS TO BE PROVIDED BY EPC.

NOTES:

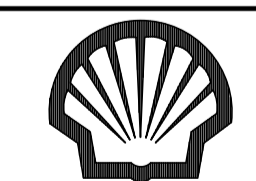
- TYPICAL ARRANGEMENT FOR CONNECTION.
- NUMBER OF CONNECTIONS TO BE FINALISED BY EPC CONTRACTOR.
- NUMBER OF WATER TRAPS AND LOCATIONS SHALL BE FINALISED BY THE EPC CONTRACTOR.

QCJ AMMONIA STORAGE AND FEED FOR HRSG CATALYTIC CONVERTER  
 QEQ COMPRESSED AIR AND CARRIER AIR SUPPLY SYSTEM FOR MAIN GROUP 'Q' (AUXILIARY SYSTEMS)  
 QH AUXILIARY STEAM GENERATING SYSTEM  
 UMY PIPE BRIDGE  
 UTH AUXILIARY STEAM GENERATOR BUILDING  
 UVE STRUCTURE FOR AMMONIA UNLOADING AND STORAGE

HOLDS:

AA1B	150	85	10	a
PIPING MATERIAL	ANSI CLASS	MAX. ALLOWABLE WORKING TEMPERATURE (°C)	MAX. ALLOWABLE WORKING PRESSURE (barg)	DESIGN SECTION

Rev	Date	Revision Object	Written by	Checked by	Approved by



**PETERHEAD CCS (ONSHORE)**

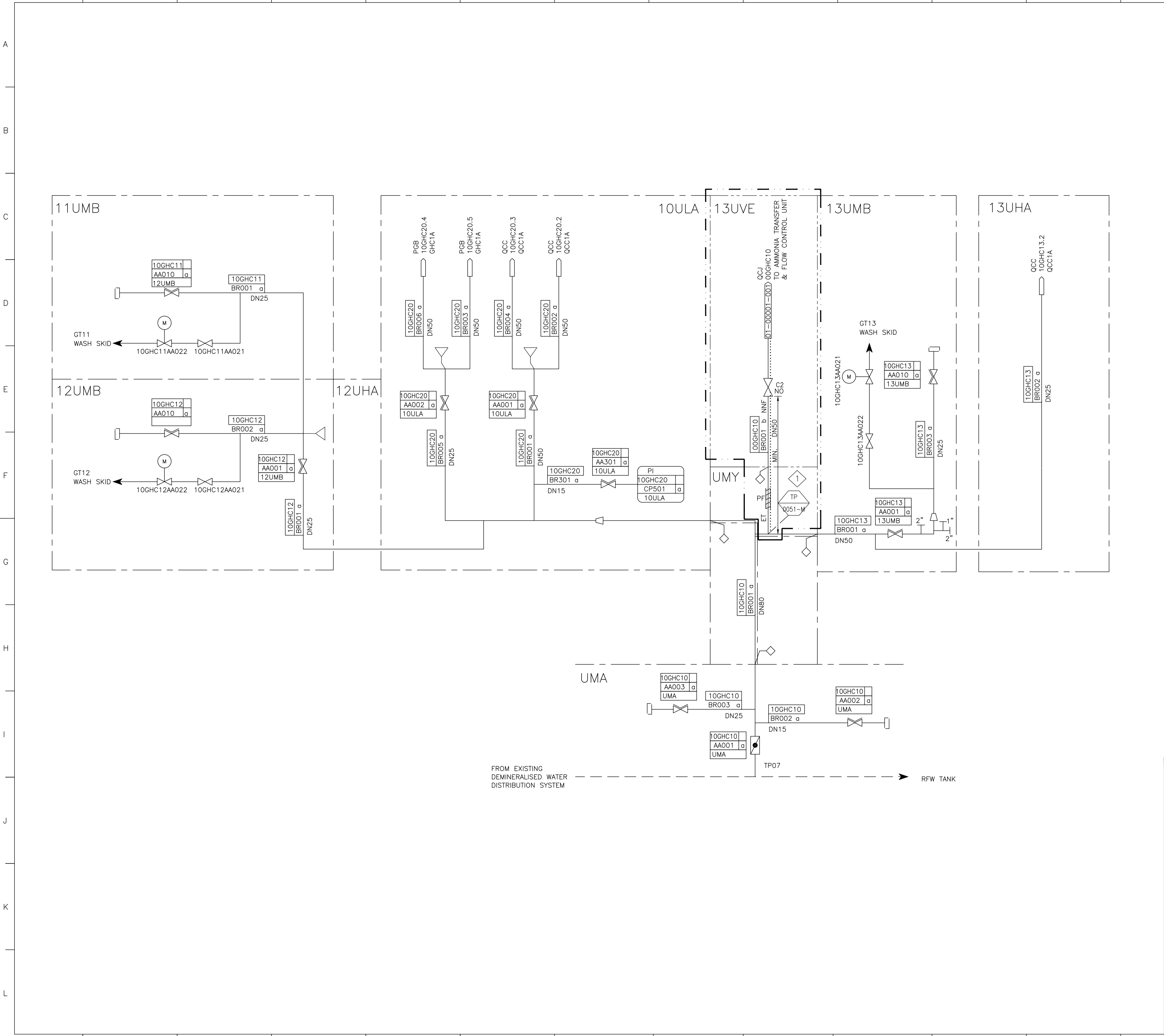
**PETERHEAD CCS PROJECT**

**PIPING AND INSTRUMENTATION DIAGRAM**

**GENERAL COMPRESSED AIR DISTRIBUTION TO NEW PPS FACILITIES**

DOC. CLASS:	SCALE: NTS	SHEET: 1/1
CLIENT Doc. Ref:	PCCS-01-TC-PX-2365-00020-001	REVISION FORMAT
		K01 A1
		LAST REV DATE:





- GENERAL NOTES:
- FOR STANDARD SYMBOLS AND NOMENCLATURE SEE DRAWINGS  
PCCS-00-TC-PX-2365-00002-001 TO PCCS-00-TC-PX-2365-00008-001.
  - ALL VENTS AND DRAINS TO BE DN20 UNLESS OTHERWISE INDICATED.
  - 
  - FOR INTERLOCKS, REFER TO CAUSE AND EFFECT DIAGRAM; DOCUMENT NUMBER ON HOLD.
  - EPC CONTRACTOR TO RECONFIRM AND FINALISE LINE SIZES DURING DETAILED DESIGN.
  - EPC CONTRACTOR TO RECONFIRM AND FINALISE EQUIPMENT DETAILS/ELEVATIONS DURING DETAILED DESIGN.
  - DETAILS OF OPEN DRAIN (UNDERGROUND SYSTEM) TO BE DEVELOPED DURING EPC PHASE.
  - ALARMS AND ESD SET POINTS TO BE PROVIDED BY EPC.

- NOTES:
- EXACT TIE-IN LOCATION TO BE DEFINED BY PIPING AND LAYOUT.

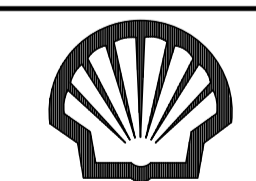
GHC DEMINERALIZED WATER DISTRIBUTION SYSTEM  
 PGB CLOSED COOLING WATER SYSTEM  
 QCJ AMMONIA STORAGE AND FEED FOR HRSG CATALYTIC CONVERTER  
 QCC DOSING SYSTEM FOR TRISODIUM-PHOSHATE

UVE STRUCTURE FOR AMMONIA UNLOADING AND STORAGE  
 ULA FEEDWATER PUMP HOUSE, FOUNDATION  
 UMB GAS TURBINE BUILDING, FOUNDATION  
 UHA BOILER HOUSE, FOUNDATION  
 UMA EXISTING STEAM TURBINE BUILDING  
 UMY PIPING BRIDGE

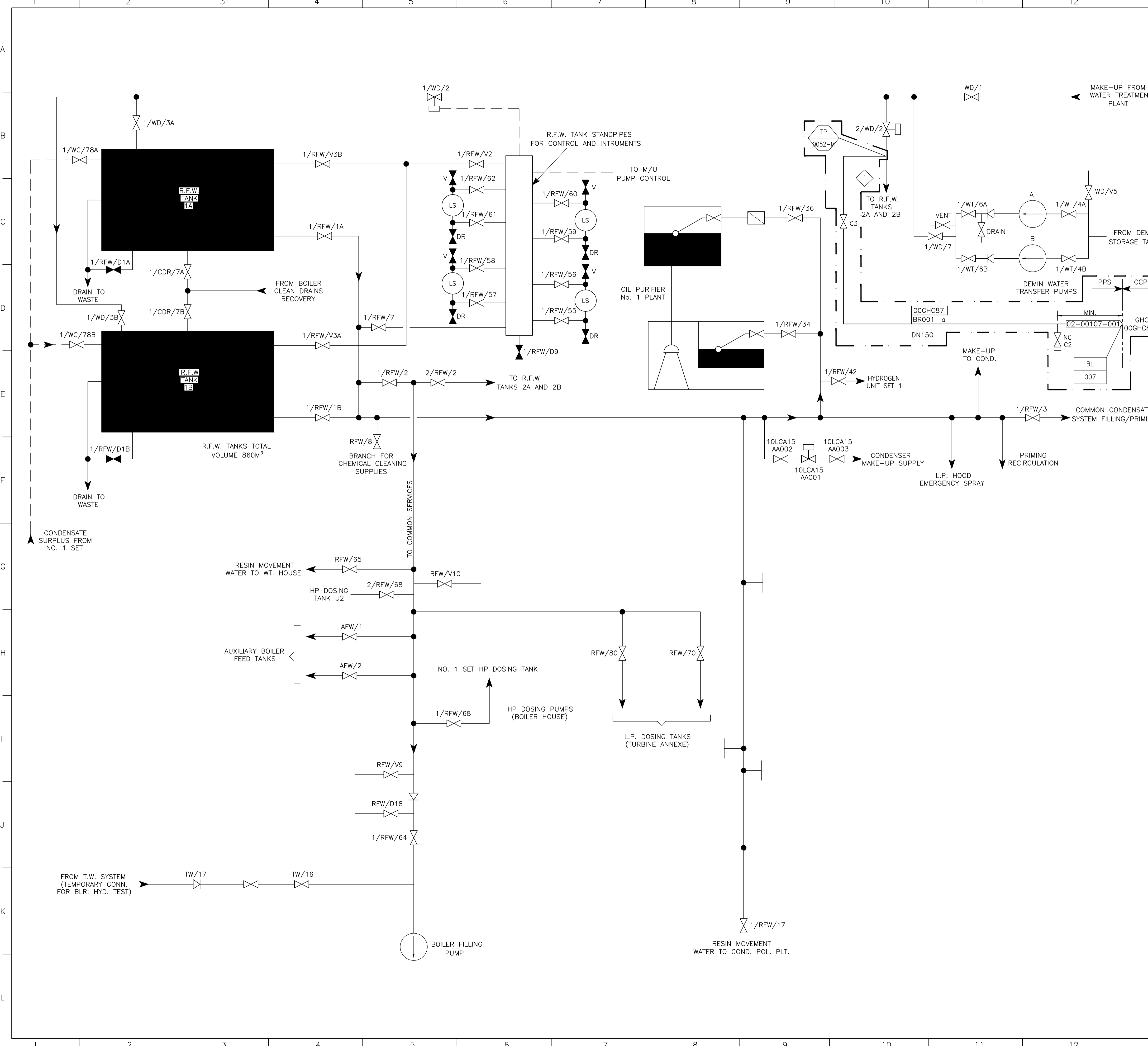
HOLDS

REFERENCE DRAWINGS				
DRAWING NUMBER	TITLE			
CLIENT		TITLE		
PCCS-01-TC-PX-2365-00001-001		AMMONIA UNLOADING, STORAGE & TRANSFER		
AJOA	150	50	10	b
A312TP316	150	50	10	a
WERKSTOFF DER ROHREITUNG	ANSI-KLASSE	ZUL. BETRIEBS-TEMPERATUR MAX. ALLOWABLE WORKING TEMP. t <sub>zul</sub> IN °C	ZUL. BETRIEBS-UEBERDRUCK MAX. ALLOWABLE WORKING PRESS. P <sub>e,zul</sub> IN bar	AUSLEGUNGS-ABSCHNITT DESIGN SECTION
PIPING MATERIAL	PRESSURE NOMINAL			

Rev	Date	Revision Object	Written by	Checked by	Approved by

  
**PETERHEAD CCS (ONSHORE)**  
**PETERHEAD CCS PROJECT**  
**PIPING AND INSTRUMENTATION DIAGRAM**  
**DEMINERALISED WATER DISTRIBUTION SYSTEM**

DOC. CLASS:	SCALE: NTS	SHEET: 1/1
CLIENT Doc. Ref:	PCCS-01-TC-PX-2365-00021-001	REVISION FORMAT K01 A1



- GENERAL NOTES:
- FOR STANDARD SYMBOLS AND NOMENCLATURE SEE DRAWINGS PCCS-00-TC-PX-2365-00002-001 TO PCCS-00-TC-PX-2365-00008-001.
  - ALL VENTS AND DRAINS TO BE DN20 UNLESS OTHERWISE INDICATED.
  - 
  - FOR INTERLOCKS, REFER TO CAUSE AND EFFECT DIAGRAM; DOCUMENT NUMBER ON HOLD.
  - EPC CONTRACTOR TO RECONFIRM AND FINALISE LINE SIZES DURING DETAILED DESIGN.
  - EPC CONTRACTOR TO RECONFIRM AND FINALISE EQUIPMENT DETAILS/ELEVATIONS DURING DETAILED DESIGN.
  - DETAILS OF OPEN DRAIN (UNDERGROUND SYSTEM) TO BE DEVELOPED DURING EPC PHASE.
  - ALARMS AND ESD SET POINTS TO BE PROVIDED BY EPC.


- NOTES:
- EXACT TIE-IN LOCATION TO BE DEFINED BY PIPING AND LAYOUT.

GHC DISTRIBUTION SYSTEMS AFTER TREATMENT (DEMINERALISATION)

HOLDS:

REFERENCE DRAWINGS				
DRAWING NUMBER	TITLE			
	CLIENT	TITLE		
	PCCS-02-TC-PX-2365-00107-001	DEMIN WATER DISTRIBUTION		
AJOA	150	85	9	α
PIPING MATERIAL	ANSI CLASS	MAX. ALLOWABLE WORKING TEMPERATURE (°C)	MAX. ALLOWABLE WORKING PRESSURE (barg)	DESIGN SECTION

Rev	Date	Revision Object	Written by	Checked by	Approved by

  
**PETERHEAD CCS (ONSHORE)**  
**PETERHEAD CCS PROJECT**  
**PIPING AND INSTRUMENTATION DIAGRAM**  
**DEMINERALISED WATER AND RFW SYSTEM**

DOC. CLASS:	SCALE: NTS	SHEET: 1/1
CLIENT Doc. Ref:	PCCS-01-TC-PX-2365-00022-001	REVISION FORMAT
		K01 A1
LAST REV DATE:		

00PAB10 AP010/2020/030  
COOLING WATER BOOSTER PUMPS

DESIGN PRESSURE/TEMPERATURE : 9/85 (Barg/°C)  
RATED FLOW : 10901 m<sup>3</sup>/h  
RATED DIFF. PRESSURE : 4.4 bar  
INSULATION SPEC : NI  
TRIM LINE NUMBER :

- GENERAL NOTES:
- FOR STANDARD SYMBOLS AND NOMENCLATURE SEE DRAWINGS PCCS-00-TC-PX-2365-0002-001 TO PCCS-00-TC-PX-2365-0008-001.
  - ALL VENTS AND DRAINS TO BE DN20 UNLESS OTHERWISE INDICATED.
  - 
  - FOR INTERLOCKS, REFER TO CAUSE AND EFFECT DIAGRAM; DOCUMENT NUMBER ON HOLD.
  - EPC CONTRACTOR TO RECONFIRM AND FINALISE LINE SIZES DURING DETAILED DESIGN.
  - EPC CONTRACTOR TO RECONFIRM AND FINALISE EQUIPMENT DETAILS/ELEVATIONS DURING DETAILED DESIGN.
  - DETAILS OF OPEN DRAIN (UNDERGROUND SYSTEM) TO BE DEVELOPED DURING EPC PHASE.
  - ALARMS AND ESD SET POINTS TO BE PROVIDED BY EPC.

- NOTES:
- HEAT TRACING AND INSULATION TO BE PROVIDED AS PER EXISTING LINE 10GKB10-BR001.
  - EXACT LOCATION OF TIE-IN TO BE DEFINED BY PIPING AND LAYOUT.
  - SELF DRAINING SAFETY SHOWER.
  - ELECTRICAL TRACING SHALL BE OF THE TEMPERATURE SELF-LIMITING TYPE TO PREVENT PERSONAL INJURE BY HOT WATER.
  - SAFETY SHOWER TO BE PROVIDED WITH USAGE ALARM REPORTING TO THE CONTROL ROOM.
  - BLOCK VALVES TO BE PROVIDED WITH INTEGRAL LIMIT SWITCHES.

GKB POTABLE WATER DISTRIBUTION SYSTEM  
PBB CIRCULATING WATER DEBRIS FILTER  
PCH CLEANING SYSTEM HEAT EXCHANGER  
  
UVE STRUCTURE FOR AMMONIA UNLOADING AND STORAGE  
UHA BOILER HOUSE  
ULA FEED WATER PUMP HOUSE  
UMA EXISTING STEAM TURBINE BUILDING  
UMB GAS TURBINE BUILDING  
UMY PIPING BRIDGE

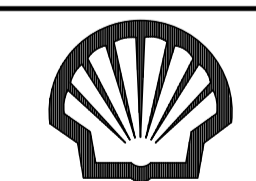
HOLDS:

AP0A	150	50	10	b
A312P316	150	40	10	a
WERKSTOFF DER ROHRLEITUNG PIPING MATERIAL	NENNDRUCKSTUFE PRESSURE NOMINAL	ZUL. BETRIEBS-TEMPERATUR MAX. ALLOWABLE WORKING TEMP. t <sub>zul</sub> IN °C	ZUL. BETRIEBS-UEBERDRUCK MAX. ALLOWABLE WORKING PRESS. P <sub>e,zul</sub> IN bara	AUSLEGUNGS-ABSCHNITT DESIGN SECTION

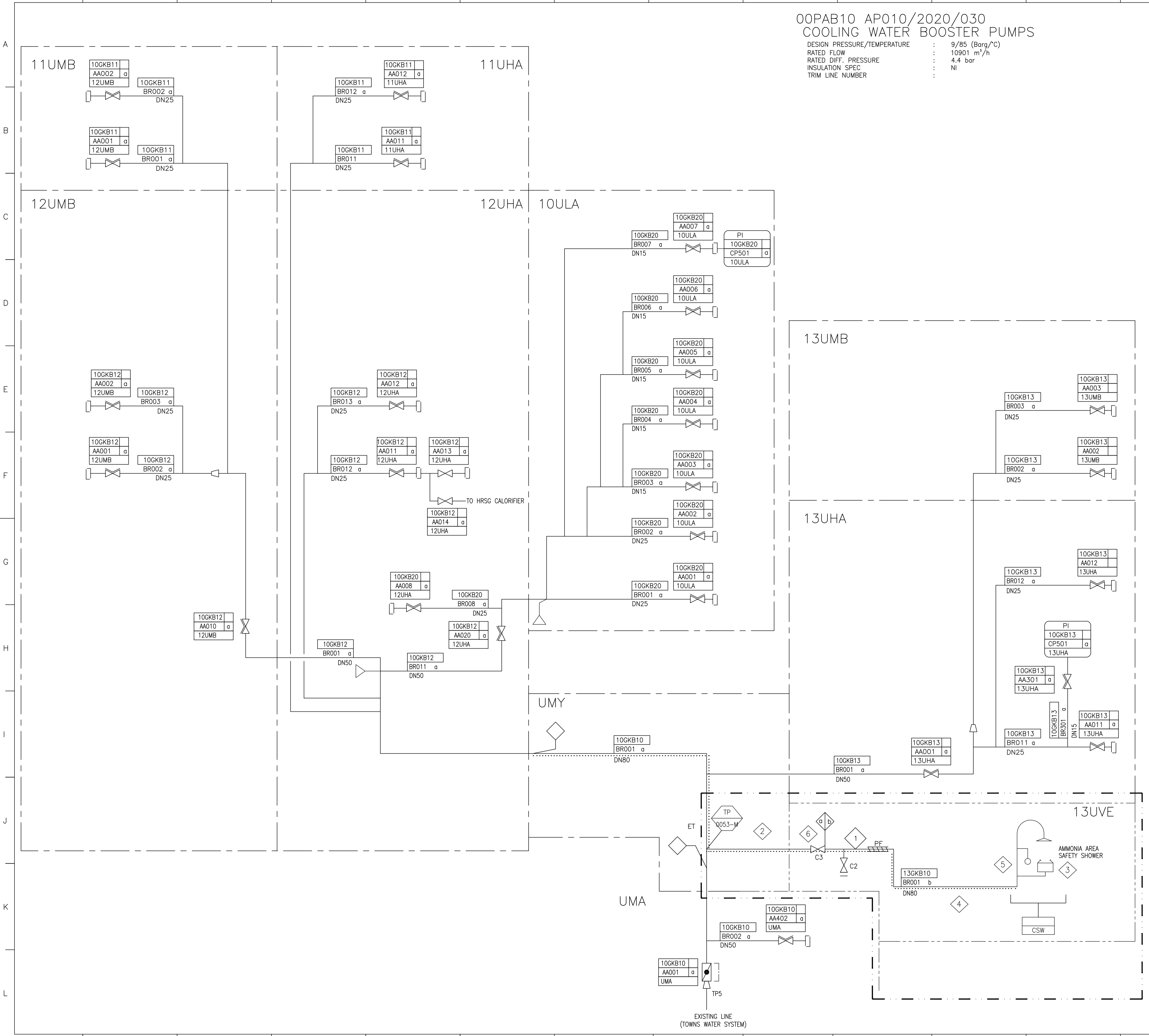
REFERENCE DRAWINGS

DRAWING NUMBER	TITLE

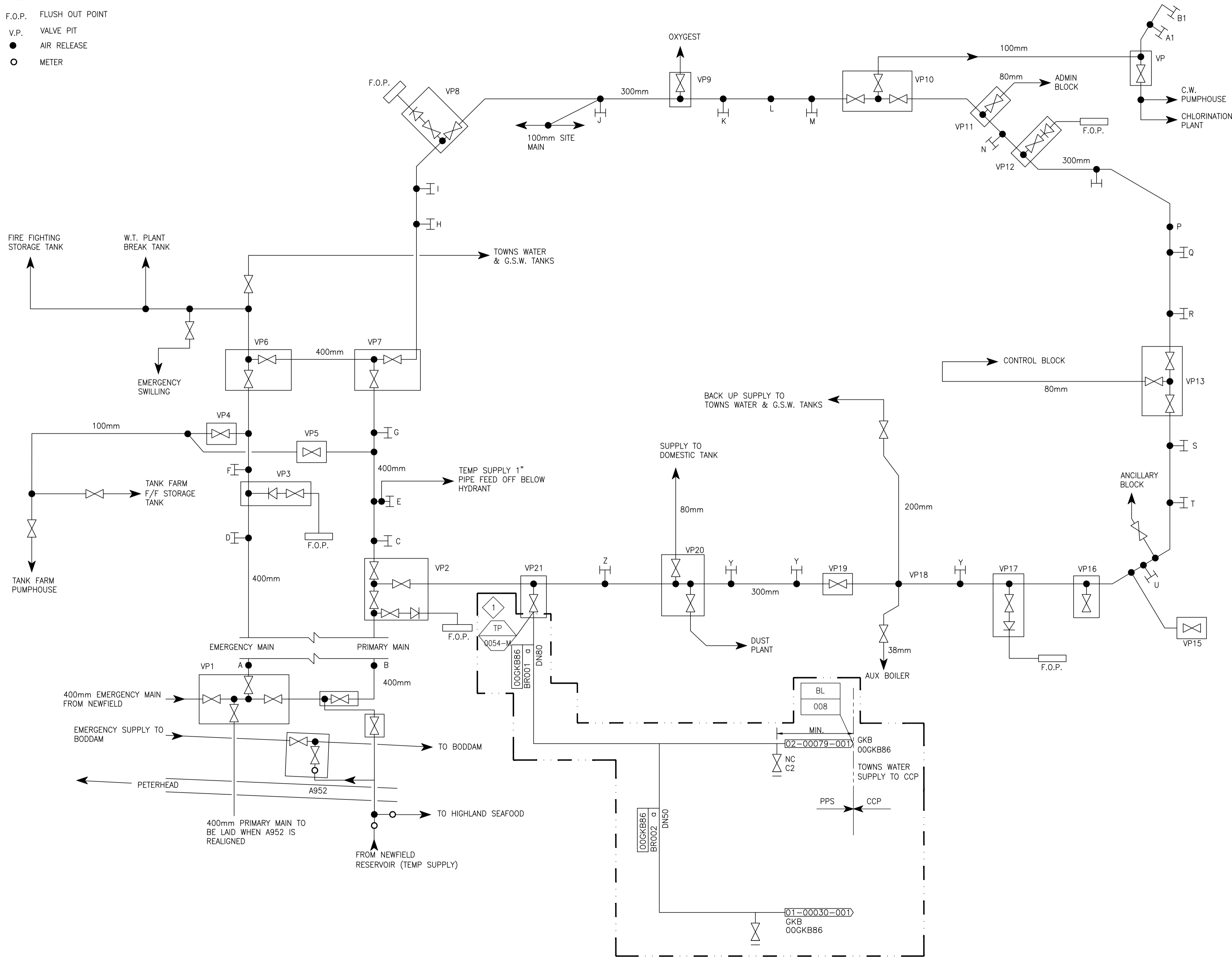
Rev	Date	Revision Object	Written by	Checked by	Approved by

  
**PETERHEAD CCS (ONSHORE)**  
**PETERHEAD CCS PROJECT**  
**PIPING AND INSTRUMENTATION DIAGRAM**  
**POTABLE WATER DISTRIBUTION SYSTEM**

DOC. CLASS:	SCALE: NTS	SHEET: 1/1
CLIENT Doc. Ref:	PCCS-01-TC-PX-2365-00023-001	REVISION FORMAT K01 A1



- | FIRE HYDRANT
- F.O.P. FLUSH OUT POINT
- V.P. VALVE PIT
- AIR RELEASE
- METER



- GENERAL NOTES:
1. FOR STANDARD SYMBOLS AND NOMENCLATURE SEE DRAWINGS PCCS-00-TC-PX-2365-00002-001 TO PCCS-00-TC-PX-2365-00008-001.
  2. ALL VENTS AND DRAINS TO BE DN20 UNLESS OTHERWISE INDICATED.
  - 3.
  4. FOR INTERLOCKS, REFER TO CAUSE AND EFFECT DIAGRAM; DOCUMENT NUMBER ON HOLD.
  5. EPC CONTRACTOR TO RECONFIRM AND FINALISE LINE SIZES DURING DETAILED DESIGN.
  6. EPC CONTRACTOR TO RECONFIRM AND FINALISE EQUIPMENT DETAILS/ELEVATIONS DURING DETAILED DESIGN.
  7. DETAILS OF OPEN DRAIN (UNDERGROUND SYSTEM) TO BE DEVELOPED DURING EPC PHASE.
  8. ALARMS AND ESD SET POINTS TO BE PROVIDED BY EPC.

- NOTES:
1. EXACT TIE-IN LOCATION TO BE DEFINED BY PIPING AND LAYOUT.

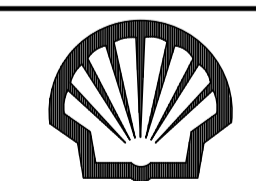
GKB POTABLE WATER DISTRIBUTION SYSTEM

HOLDS:

APQA	PN10	85	7	a
PIPING MATERIAL	PRESSURE NOMINAL	DESIGN TEMPERATURE (°C)	DESIGN PRESSURE (barg)	DESIGN SECTION

REFERENCE DRAWINGS	
DRAWING NUMBER	TITLE
CLIENT	
PCCS-02-TC-PX-2365-00079-001	TOWNS WATER BREAK TANK AND PUMP

Rev	Date	Revision Object	Written by	Checked by	Approved by



**PETERHEAD CCS (ONSHORE)**

**PETERHEAD CCS PROJECT**

**PIPING AND INSTRUMENTATION DIAGRAM**

**TOWNS WATER RING MAIN**

DOC. CLASS:	SCALE: NTS	SHEET: 1/1
CLIENT Doc. Ref:	PCCS-01-TC-PX-2365-00024-001	REVISION FORMAT
		K01 A1

OOPAB10 AP010/020/030  
 COOLING WATER BOOSTER PUMPS  
 DESIGN PRESSURE/TEMPERATURE : 9/85 (Barg/°C)  
 RATED FLOW : 10901 m<sup>3</sup>/h  
 RATED DIFF. PRESSURE : 4.4 bar  
 INSULATION SPEC : NI  
 TRIM LINE NUMBER :

- GENERAL NOTES:
- FOR STANDARD SYMBOLS AND NOMENCLATURE SEE DRAWINGS PCCS-00-TC-PX-2365-00002-001 TO PCCS-00-TC-PX-2365-00008-001.
  - ALL VENTS AND DRAINS TO BE DN20 UNLESS OTHERWISE INDICATED.
  - 
  - FOR INTERLOCKS, REFER TO CAUSE AND EFFECT DIAGRAM; DOCUMENT NUMBER PCCS-01-TC-IN-6604-00001.
  - EPC CONTRACTOR TO RECONFIRM AND FINALISE LINE SIZES DURING DETAILED DESIGN.
  - EPC CONTRACTOR TO RECONFIRM AND FINALISE EQUIPMENT DETAILS/ELEVATIONS DURING DETAILED DESIGN.
  - DETAILS OF OPEN DRAIN (UNDERGROUND SYSTEM) TO BE DEVELOPED DURING EPC PHASE.
  - ALARMS AND ESD SET POINTS TO BE PROVIDED BY EPC CONTRACTOR.

- NOTES:
- DELETED.
  - DELETED.
  - DELETED.
  - DELETED.
  - DELETED.
  - DELETED.
  - DELETED.
  - DELETED.
  - DELETED.
  - DELETED.
  - DELETED.
  - DELETED.
  - DELETED.
  - SPRING ASSISTED NON-SLAM CHECK VALVE TYPE.
  - STRAP-ON TYPE ULTRASONIC FLOW METER.
  - DELETED.
  - INTERLOCK LOGIC SHALL PREVENT PUMP START-UP IF ANY BLOCK VALVE IS IN CLOSED POSITION AND STOP PUMP IF ANY BLOCK VALVE IS CLOSED WHILE THE PUMP IS RUNNING.
  - MINIMUM FLOW PROTECTION SHALL BE IMPLEMENTED THROUGH THE POWER CONSUMPTION READINGS IN THE CCM.
  - TIE-IN LOCATION TO BE CONFIRMED BY PIPING AND LAYOUT.
  - CULVERT#2 SIDE OF OUTFALL TO BE EXTENDED TO INSTALL NEW CACP SEA WATER DISCHARGE PIPING.
  - PUMPS MCC CABINETS SHALL INCLUDE REVERSE ROTATION DETECTION.
  - COOLING WATER BOOSTER PUMPS SHALL BE CAPABLE OF END OF CURVE OPERATION.
  - MANWAYS SHALL BE PROVIDED FOR PIPING INSPECTION. LOCATIONS AND NUMBERS TO BE FINALISED DURING THE EPC PHASE.
  - A MINIMUM STOP LIMIT SHALL BE IMPLEMENTED ON THE DCS TO AVOID THE TOTAL CLOSING WHILE THE BOOSTER PUMPS ARE IN OPERATION.
  - VALVE TO FAIL OPEN IN CASE OF SPINDLE FAILURE.
  - VALVE SHALL BE INSTALLED ON A FREE DRAWING PIPELINE.
  - COOLING WATER BOOSTER PUMPS TO BE TRIPPED OFF IN CASE OF MAIN COOLING WATER PUMPS FAILURE.
  - THE VALVE SHALL BE CLOSED AFTER THE BOOSTER PUMPS ARE TRIPPED OFF TO AVOID A TOTAL DRAINING OF THE WATER LINE. THE CLOSING TIME SHALL BE DETERMINED DURING THE EPC PHASE (DETAILED DESIGN).

PAB CIRCULATING (MAIN COOLING) WATER PIPING AND CULVERT SYSTEM.

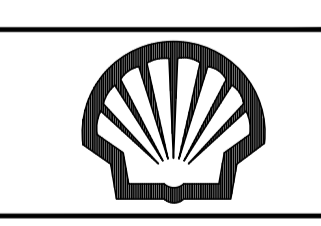
HOLDS:

REFERENCE DRAWINGS				
DRAWING NUMBER	CLIENT	TITLE		
	PCCS-02-TC-PX-2365-00073-001	BACK WASH FILTER		
	PCCS-02-TC-PX-2365-00074-001	CLOSED LOOP COOLER		

ATOA	150	85	9.0	b
ATOA	150	85	5	a
PIPING MATERIAL	PRESSURE NOMINAL	MAX. ALLOWABLE WORKING TEMPERATURE (°C)	MAX. ALLOWABLE WORKING PRESSURE (barg)	DESIGN SECTION

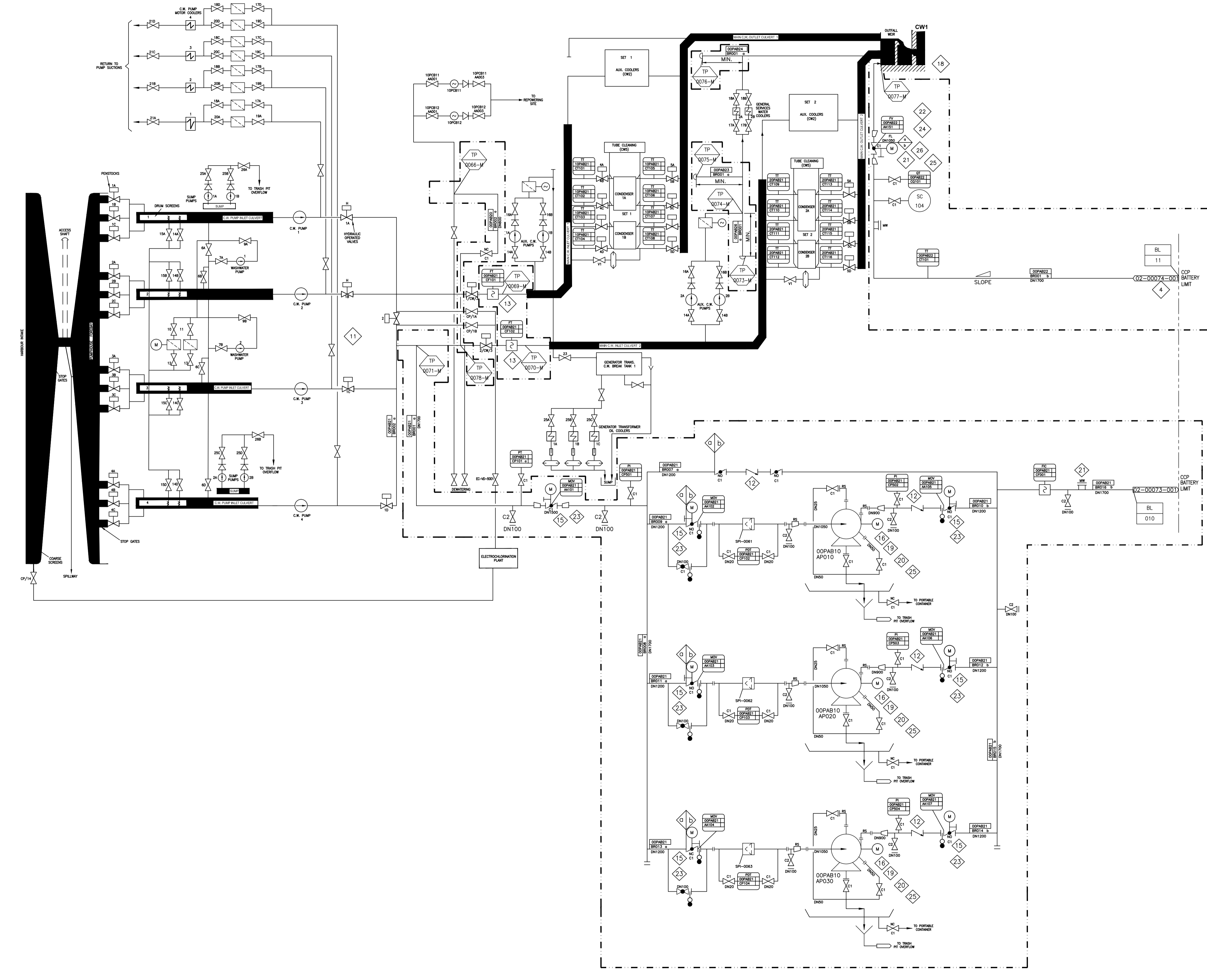
Rev	Date	Revision Object	Written by	Checked by	Approved by

PETERHEAD CCS (ONSHORE)				
PETERHEAD CCS PROJECT				
PIPING AND INSTRUMENTATION DIAGRAM				
MAIN AND AUXILIARY COOLING WATER SYSTEM				
DOC. CLASS:	SCALE: NTS	SHEET: 1/1		
CLIENT Doc. Ref:	PCCS-01-TC-PX-2365-00025-001	REVISION	FORMAT	
		K01	A1	

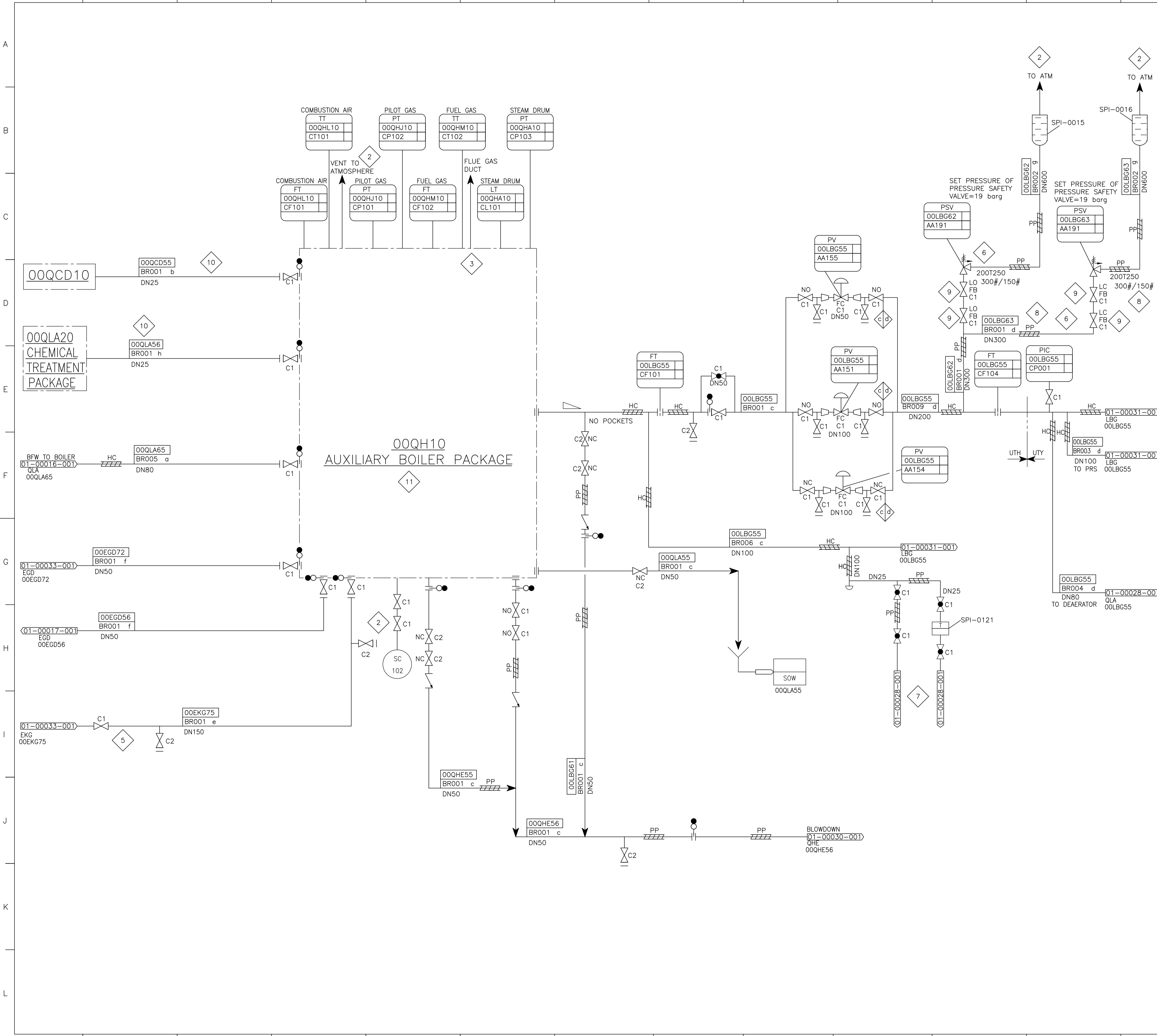


PETERHEAD CCS (ONSHORE)  
 PETERHEAD CCS PROJECT  
 PIPING AND INSTRUMENTATION DIAGRAM  
 MAIN AND AUXILIARY COOLING WATER SYSTEM

DOC. CLASS:	SCALE: NTS	SHEET: 1/1		
CLIENT Doc. Ref:	PCCS-01-TC-PX-2365-00025-001	REVISION	FORMAT	
		K01	A1	







- GENERAL NOTES:
- FOR STANDARD SYMBOLS AND NOMENCLATURE SEE DRAWINGS PCCS-00-TC-PX-2365-00001-001 TO PCCS-00-TC-PX-2365-00008-001.
  - ALL VENTS AND DRAINS TO BE DN20 UNLESS OTHERWISE INDICATED.
  - 
  - FOR INTERLOCKS, REFER TO CAUSE AND EFFECT DIAGRAM; DOCUMENT NUMBER PCCS-01-TC-IN-6604-00001.
  - EPC CONTRACTOR TO RECONFIRM AND FINALISE LINE SIZES DURING DETAILED DESIGN.
  - EPC CONTRACTOR TO RECONFIRM AND FINALISE EQUIPMENT DETAILS/ELEVATIONS DURING DETAILED DESIGN.
  - DETAILS OF OPEN DRAIN (UNDERGROUND SYSTEM) TO BE DEVELOPED DURING EPC PHASE.
  - ALARMS AND ESD SET POINTS TO BE PROVIDED BY EPC.

- NOTES:
- TYPICAL CONNECTIONS FOR A SINGLE BOILER.
  - VENT TO ATMOSPHERE AT SAFE LOCATION, OUTSIDE OF AUXILIARY BOILER BUILDING.
  - VENDOR TO PROVIDE FLUE GAS DUCTING TO ATMOSPHERE AND NOX MONITORING OF POST COMBUSTION GASES.
  - VENDOR TO SUPPLY BOILER TO PROVIDE SUPERHEATED MP STEAM TO INCLUDE, BUT NOT LIMITED TO BOILER SYSTEM, BOILER FIRING CONTROL, OVERPRESSURE PROTECTION.
  - FUEL GAS PIPING TO BE PURGED WITH NITROGEN FOR AIR-FREEING AT START UP.
  - PERSONAL PROTECTION INSULATION SHALL BE PROVIDED UP TO THE LAST HAND OPERATED VALVE AS A MINIMUM.
  - NUMBER OF STEAM TRAP DRAINS TO BE FINALISED BY EPC CONTRACTOR.
  - TO BE PROVIDED WITH A 6mm HOLE AT ELBOW AND PIPE TO DRAIN TO SAFE LOCATION.
  - MECHANICAL INTERLOCK REQUIRED BETWEEN PSV'S TO ALLOW MAINTENANCE.
  - DOSING CONTROL BY VENDOR.
  - BOILER CONNECTIONS TO BE CONFIRMED BY VENDOR.
  - BOILER OVERPRESSURE PROTECTION BY AUXILIARY BOILER VENDOR.

- EGD PIPING SYSTEMS (SUPPLY OF LIQUID FUELS)  
 EKG PIPING SYSTEMS (SUPPLY OF GASEOUS FUELS)  
 LBG AUXILIARY STEAM PIPING SYSTEM  
 QCD PHOSPHATE SUPPLY AND DISTRIBUTION  
 QH AUXILIARY STEAM GENERATING SYSTEM  
 QHE BLOWDOWN SYSTEM, FLASH DRAIN SYSTEM  
 QLA FEEDWATER SYSTEM  
 QSA CENTRAL OIL SUPPLY AND DISTRIBUTION SYSTEM  
 UTH AUXILIARY STEAM GENERATOR BUILDING  
 UTY BRIDGE STRUCTURE

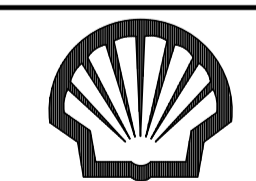
HOLDS:

DRAWING NUMBER		TITLE
PCCS-01-TC-PX-2365-00028-001		AUXILIARY DEAERATOR
PCCS-01-TC-PX-2365-00029-001		AUXILIARY BFW PUMPS
PCCS-01-TC-PX-2365-00031-001		AUXILIARY STEAM SYSTEM
PCCS-01-TC-PX-2365-00030-001		AUXILIARY BLOWDOWN DRUM
PCCS-01-TC-PX-2365-00033-001		FUEL GAS SKID

DRAWING NUMBER		CLIENT	TITLE
PCCS-01-TC-PX-2365-00028-001			AUXILIARY DEAERATOR
PCCS-01-TC-PX-2365-00029-001			AUXILIARY BFW PUMPS
PCCS-01-TC-PX-2365-00031-001			AUXILIARY STEAM SYSTEM
PCCS-01-TC-PX-2365-00030-001			AUXILIARY BLOWDOWN DRUM
PCCS-01-TC-PX-2365-00033-001			FUEL GAS SKID

BJOA	300	85	27	h
AA1A	150	250	3.5	g
AA1B	150	85	4.5	f
BA1B	300	50	3.5	e
BA1A	300	250	19 (+FV)	d
BA1A	300	270	27 (+FV)	c
BA1A	300	85	27	b
BA1A	300	230	43	a
PIPING MATERIAL	ANSI CLASS	MAX. ALLOWABLE WORKING TEMPERATURE (°C)	MAX. ALLOWABLE WORKING PRESSURE (barg)	DESIGN SECTION

Rev	Date	Revision Object	Written by	Checked by	Approved by



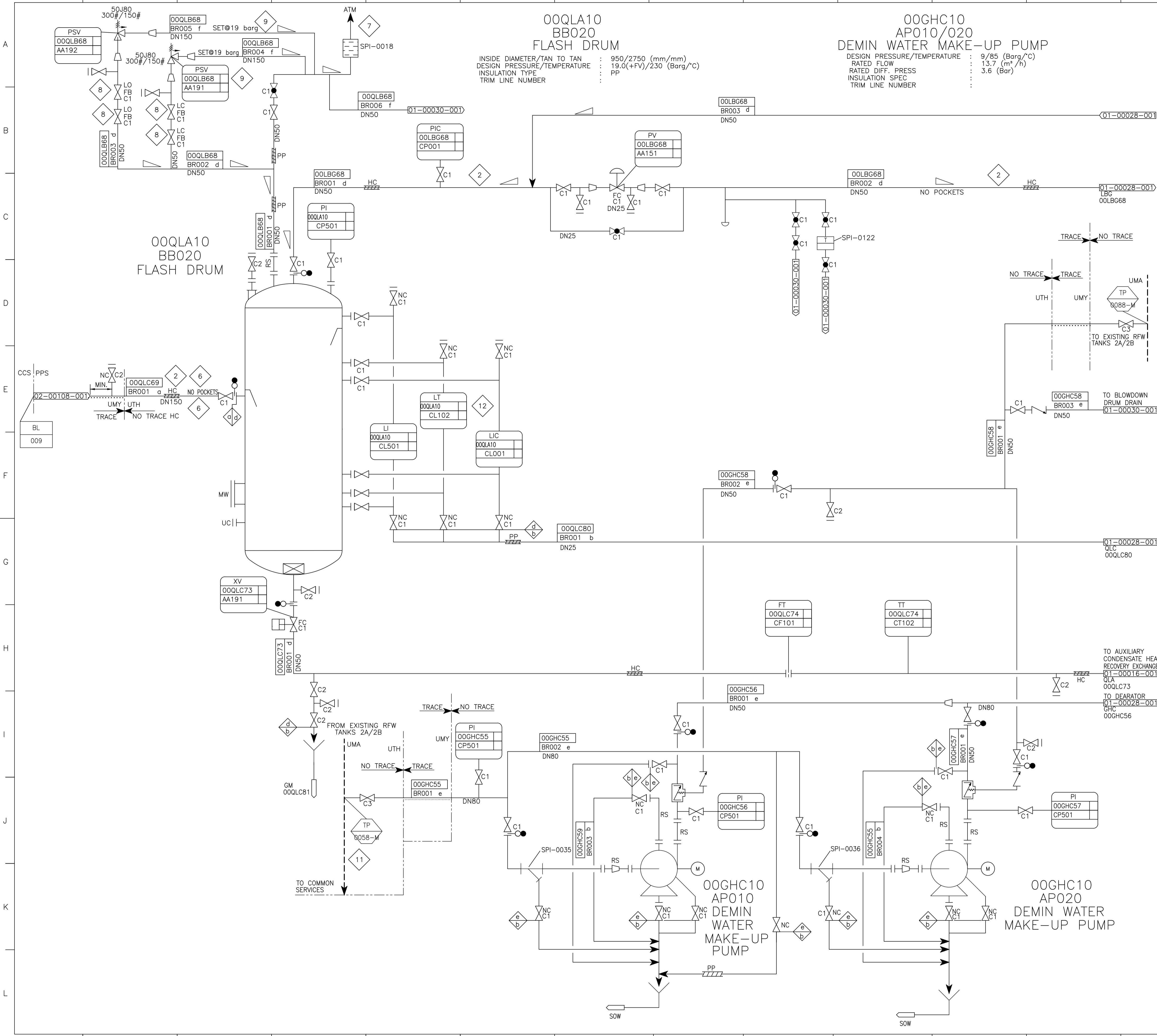
**PETERHEAD CCS (ONSHORE)**

**PETERHEAD CCS PROJECT**

**PIPING AND INSTRUMENTATION DIAGRAM**

**AUXILIARY BOILER PACKAGE**

DOC. CLASS:	SCALE: NTS	SHEET: 1/1
CLIENT Doc. Ref:	PCCS-01-TC-PX-2365-00026-001	REVISION K01 FORMAT A1



- GENERAL NOTES:
- FOR STANDARD SYMBOLS AND NOMENCLATURE SEE DRAWINGS PCCS-00-TC-PX-2365-00001-001 TO PCCS-00-TC-PX-2365-00008-001.
  - ALL VENTS AND DRAINS TO BE DN20 UNLESS OTHERWISE INDICATED.
  - FOR INTERLOCKS, REFER TO CAUSE AND EFFECT DIAGRAM; DOCUMENT PCCS-01-TC-IN-6604-00001.
  - EPC CONTRACTOR TO RECONFIRM AND FINALISE LINE SIZES DURING DETAILED DESIGN.
  - EPC CONTRACTOR TO RECONFIRM AND FINALISE EQUIPMENT DETAILS/ELEVATIONS DURING DETAILED DESIGN.
  - DETAILS OF OPEN DRAIN (UNDERGROUND SYSTEM) TO BE DEVELOPED DURING EPC PHASE.
  - ALARMS AND ESD SET POINTS TO BE PROVIDED BY EPC.

- NOTES:
- DELETED.
  - PROVIDE ADEQUATE SUPPORTS FOR TWO PHASE FLOW AND LIQUID FULL OPERATION.
  - ENSURE DRAIN SYSTEM IS DESIGNED FOR 100°C.
  - DELETED.
  - DELETED.
  - NOZZLE CONNECTION TO BE 300#.
  - VENT TO ATMOSPHERE AT SAFE LOCATION.
  - MECHANICAL INTERLOCK REQUIRED BETWEEN PSV ISOLATION VALVE TO ALLOW MAINTENANCE.
  - TO BE PROVIDED WITH A 6mm HOLE AT ELBOW AND PIPE TO DRAIN TO SAFE LOCATION.
  - TIE-IN LOCATIONS ARE SHOWN ON PIPING AND LAYOUT DRAWINGS.
  - DEMINERALISED WATER IS FOR MAKE-UP/START-UP.
  - PROVIDE PRE-ALARM BEFORE LOW LEVEL TRIP.

QLB	STEAM SYSTEM
LBG	AUXILIARY STEAM PIPING SYSTEM
QLC	CONDENSATE SYSTEM
QLA	FEEDWATER SYSTEM
GM	PROCESS DRAINAGE SYSTEM
UMA	STEAM TURBINE BUILDING/ST OUTDOOR AREA
UMY	BRIDGE STRUCTURE
UTH	AUXILIARY STEAM GENERATOR BUILDING

HOLDS:

DRAWING NUMBER	TITLE
PCCS-01-TC-PX-2365-00028-001	AUXILIARY DEAERATOR
PCCS-01-TC-PX-2365-00031-001	AUXILIARY STEAM SYSTEM
PCCS-02-TC-PX-2365-00108-001	MP STEAM AND CONDENSATE DISTRIBUTION
PCCS-01-TC-PX-2365-00016-001	AUXILIARY CONDENSATE HEAT RECOVERY EXCHANGER AND TRIM COOLER

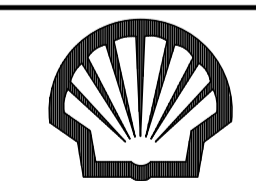
REFERENCE DRAWINGS

DRAWING NUMBER	CLIENT	TITLE
	PCCS-01-TC-PX-2365-00028-001	AUXILIARY DEAERATOR
	PCCS-01-TC-PX-2365-00031-001	AUXILIARY STEAM SYSTEM
	PCCS-02-TC-PX-2365-00108-001	MP STEAM AND CONDENSATE DISTRIBUTION
	PCCS-01-TC-PX-2365-00016-001	AUXILIARY CONDENSATE HEAT RECOVERY EXCHANGER AND TRIM COOLER

BA1A	150	85	9	e
AA1A	300	230	19(+FV)	d
AA1A	150	230	7	c
AA1A	150	150	3.5	b
BA1A	300	250	27(+FV)	a

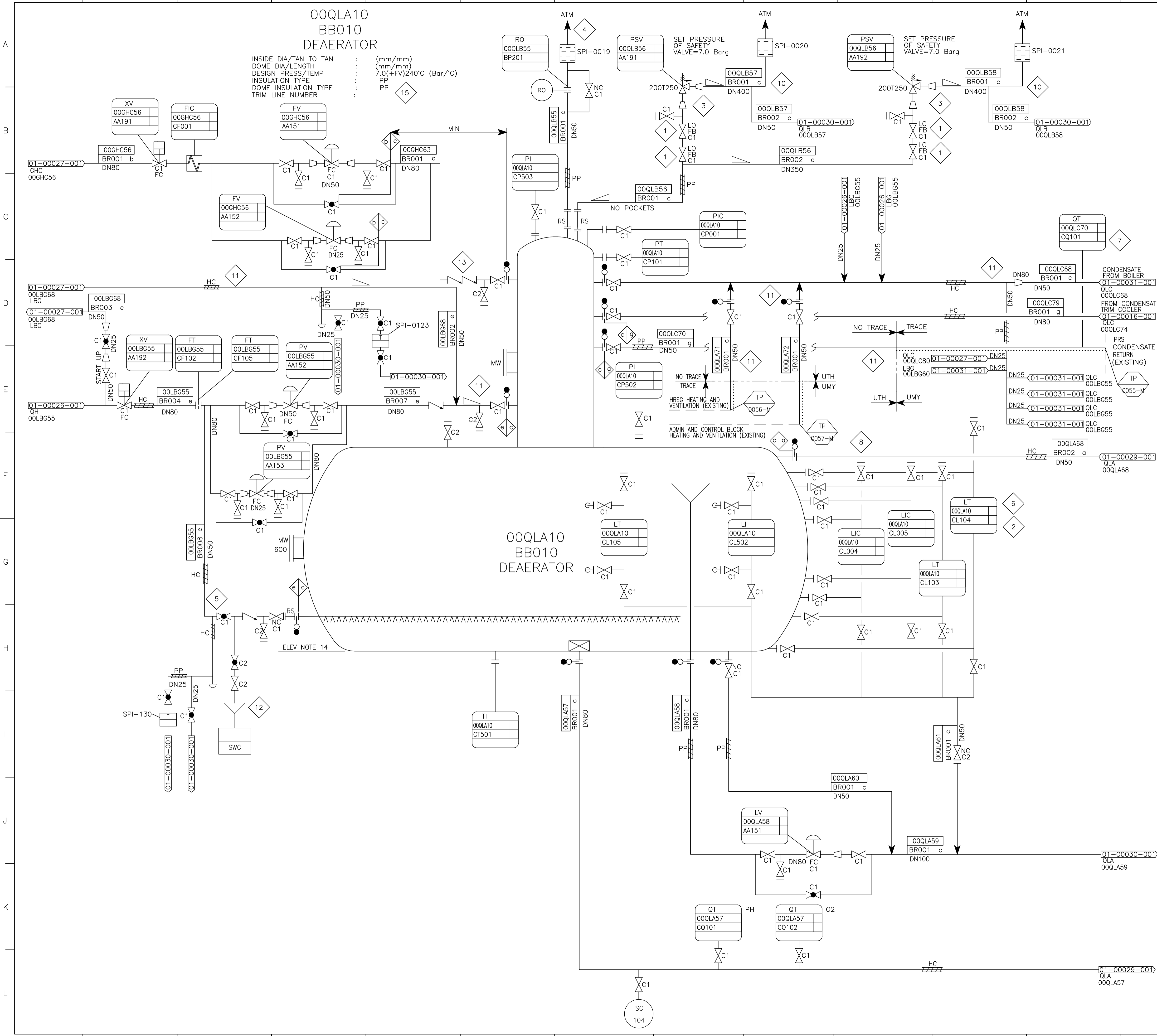
PIPING MATERIAL	ANSI CLASS	MAX. ALLOWABLE WORKING TEMPERATURE (°C)	MAX. ALLOWABLE WORKING PRESSURE (barg)	DESIGN SECTION

Rev	Date	Revision Object	Written by	Checked by	Approved by

  
**PETERHEAD CCS (ONSHORE)**  
**PETERHEAD CCS PROJECT**  
**PIPING AND INSTRUMENTATION DIAGRAM**  
**AUXILIARY BOILER CONDENSATE FLASH DRUM**

DOC. CLASS:	SCALE: NTS	SHEET: 1/1
CLIENT Doc. Ref:	PCCS-01-TC-PX-2365-00027-001	REVISION K01 FORMAT A1





00QLA10  
BB010  
DEAERATOR

INSIDE DIA/TAN TO TAN : (mm/mm)  
 DOME DIA/LENGTH : (mm/mm)  
 DESIGN PRESS/TEMP : 7.0(+FV)240°C (Bar/°C)  
 INSULATION TYPE : PP  
 DOME INSULATION TYPE : PP  
 TRIM LINE NUMBER : 15

- GENERAL NOTES:
- FOR STANDARD SYMBOLS AND NOMENCLATURE SEE DRAWINGS PCCS-00-TC-PX-2365-00001-001 TO PCCS-00-TC-PX-2365-00008-001.
  - ALL VENTS AND DRAINS TO BE DN20 UNLESS OTHERWISE INDICATED.
  - FOR INTERLOCKS, REFER TO CAUSE AND EFFECT DIAGRAM; DOCUMENT NUMBER PCCS-01-TC-IN-6604-00001.
  - EPC CONTRACTOR TO RECONFIRM AND FINALISE LINE SIZES DURING DETAILED DESIGN.
  - EPC CONTRACTOR TO RECONFIRM AND FINALISE EQUIPMENT DETAILS/ELEVATIONS DURING DETAILED DESIGN.
  - DETAILS OF OPEN DRAIN (UNDERGROUND SYSTEM) TO BE DEVELOPED DURING EPC PHASE.
  - ALARMS AND ESD SET POINTS TO BE PROVIDED BY EPC CONTRACTOR.

- NOTES:
- MECHANICAL INTERLOCK REQUIRED BETWEEN PSV ISOLATION VALVES TO ALLOW MAINTENANCE.
  - INCLUDE PRE TRIP LOW LEVEL ALARM ON LIC- 00QLA10 CL004.
  - DISCHARGE TO ATMOSPHERE AT SAFE LOCATION. PROVIDE WEEP HOLE AT THE BOTTOM OF THE TAIL PIPE.
  - VENT TO ATMOSPHERE AT SAFE LOCATION.
  - FOR THROTTLING.
  - INCLUDE A HIGH LEVEL ALARM ON THE LIC- 00QLA10 CL005.
  - CONDUCTIVITY ANALYSER, TO DETECT FUEL GAS LEAKAGE THROUGH PRS.
  - NOZZLE CONNECTION TO BE 300#.
  - TIE-IN LOCATIONS ARE SHOWN ON PIPING AND LAYOUT DRAWINGS.
  - TO BE PROVIDED WITH A 6mm HOLE AT ELBOW AND PIPE TO DRAIN TO SAFE LOCATION.
  - PROVIDE ADEQUATE SUPPORT FOR TWO PHASE AND LIQUID FILLED OPERATION.
  - LOW POINT DRAIN.
  - ONE CHECK VALVE TO BE OF DISSIMILAR TYPE.
  - ELEVATION TO BE CONFIRMED DURING EPC BASED ON PUMPS REQUIREMENTS.
  - EQUIPMENT DETAILS TO BE CONFIRMED BY VENDOR.

- GHC DISTRIBUTION SYSTEMS AFTER TREATMENT (DEMINERALIZED)  
 LBG AUXILIARY STEAM PIPING SYSTEM  
 QH AUXILIARY STEAM GENERATING PACKAGE  
 QLA FEEDWATER SYSTEM  
 QLB STEAM SYSTEM  
 QLC CONDENSATE SYSTEM  
 UMA STEAM TURBINE BUILDING/ST OUTDOOR AREA  
 UMY PIPE BRIDGE & CABLE RACK STRUCTURE  
 UTH AUXILIARY STEAM GENERATOR BUILDING

HOLDS:

0055-M	0056-M	0057-M
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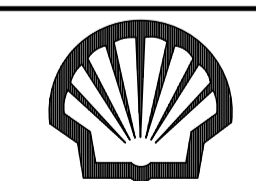
REFERENCE DRAWINGS

DRAWING NUMBER	CLIENT	TITLE
PCCS-01-TC-PX-2365-00027-001		AUXILIARY BOILER FLASH DRUM
PCCS-01-TC-PX-2365-00029-001		AUXILIARY BFW PUMPS
PCCS-01-TC-PX-2365-00026-001		AUXILIARY BOILER NO.1

BA1A	300	230	19	g
AA1A	150	150	3.5	f
BA1A	300	250	19 (+FV)	e
BA1A	300	150	27	d
AA1A	150	230	7 (+FV)	c
AJOA	150	85	9	b
BA1A	150	190	4.3	a

PIPING MATERIAL	ANSI CLASS	MAX. ALLOWABLE WORKING TEMPERATURE (°C)	MAX. ALLOWABLE WORKING PRESSURE (barg)	DESIGN SECTION

Rev	Date	Revision Object	Written by	Checked by	Approved by

  
**PETERHEAD CCS (ONSHORE)**  
**PETERHEAD CCS PROJECT**  
**PIPING AND INSTRUMENTATION DIAGRAM**  
**AUXILIARY BOILER DEAERATOR**

DOC. CLASS:	SCALE: NTS	SHEET: 1/1
CLIENT Doc. Ref:	PCCS-01-TC-PX-2365-00028-001	REVISION FORMAT
		K01 A1

00QLA10  
AP010/AP020  
BOILER FEED WATER PUMPS

DESIGN PRESS./TEMP. : 43/230 (Barg/°C)  
 RATED FLOW : 27.6 (m<sup>3</sup>/h)  
 RATED DIFF. PRESS : 26.7 (Bar)  
 INSULATION TYPE : PP  
 TRIM LINE NUMBER :

- GENERAL NOTES:
- FOR STANDARD SYMBOLS AND NOMENCLATURE SEE DRAWINGS PCCS-00-TC-PX-2365-00001-001 TO PCCS-00-TC-PX-2365-00008-001.
  - ALL VENTS AND DRAINS TO BE DN20 UNLESS OTHERWISE INDICATED.
  - FOR INTERLOCKS, REFER TO CAUSE AND EFFECT DIAGRAM; DOCUMENT NUMBER PCCS-01-TC-IN-6604-00001.
  - EPC CONTRACTOR TO RECONFIRM AND FINALISE LINE SIZES DURING DETAILED DESIGN.
  - EPC CONTRACTOR TO RECONFIRM AND FINALISE EQUIPMENT DETAILS/ELEVATIONS DURING DETAILED DESIGN.
  - DETAILS OF OPEN DRAIN (UNDERGROUND SYSTEM) TO BE DEVELOPED DURING EPC PHASE.
  - ALARMS AND ESD SET POINTS TO BE PROVIDED BY EPC CONTRACTOR.

- NOTES:
- PUMPS TO HAVE AUTOSTART FUNCTION.
  - WARM UP LINE TO CIRCULATE BACK THROUGH THE STAND-BY PUMP.
  - DRAIN CONNECTED AT THE LOWEST POINT.
  - AUTORECIRCULATION VALVE SUPPLIED BY PUMP VENDOR.

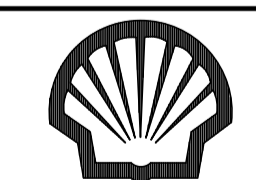
QLA FEEDWATER SYSTEM  
 SOW OILY WATER SEWER  
 QH AUXILIARY STEAM GENERATING SYSTEM

HOLDS:

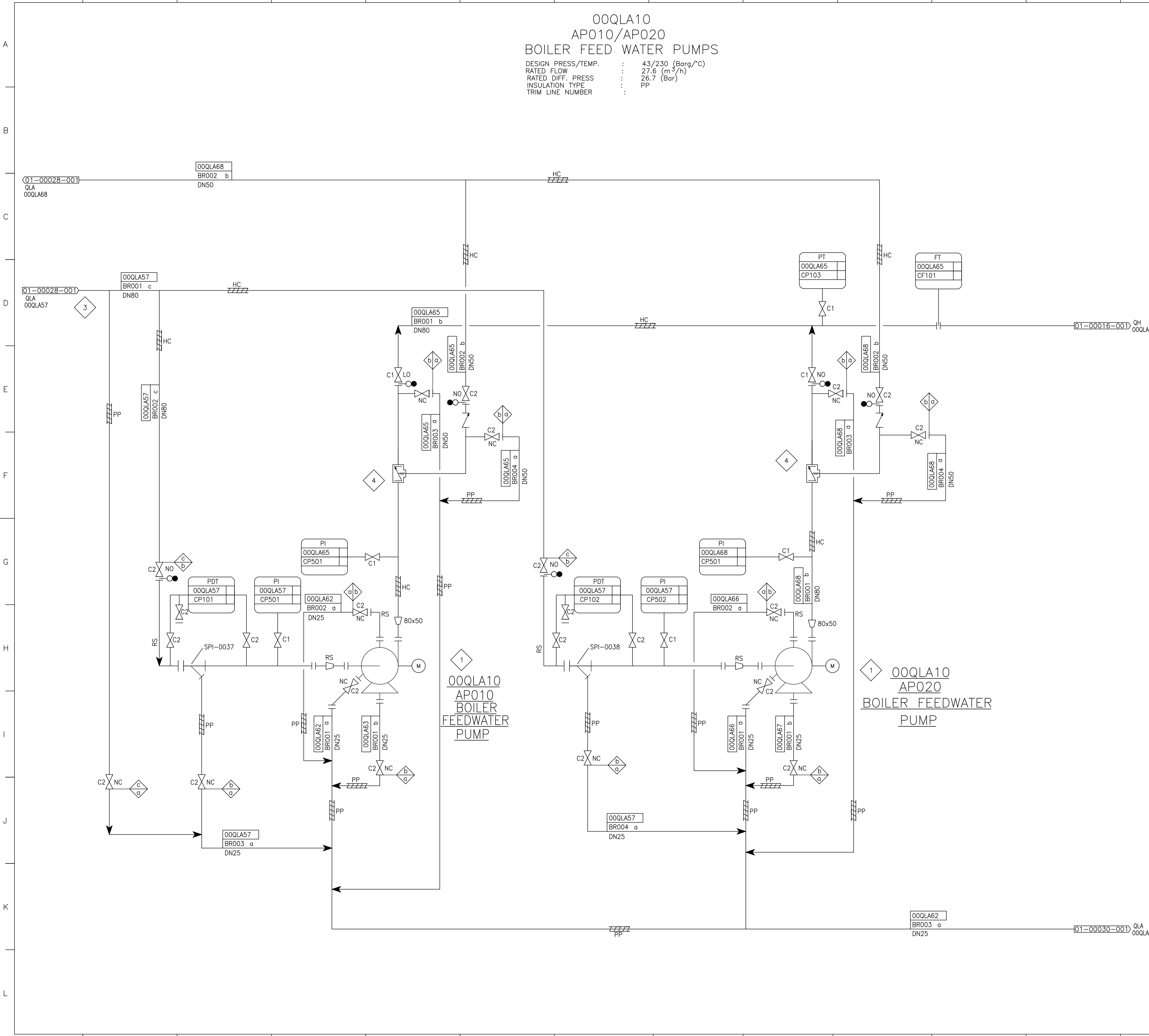
REFERENCE DRAWINGS				
DRAWING NUMBER	TITLE			
	CLIENT			
PCCS-01-TC-PX-2365-00028-001	AUXILIARY BOILER DEAERATOR			
PCCS-01-TC-PX-2365-00026-001	AUXILIARY PACKAGE BOILER			

AA1A	150	230	7.0	c
BA1A	300	190	43	b
AA1A	150	150	3.5	a
PIPING MATERIAL	ANSI CLASS	MAX. ALLOWABLE WORKING TEMPERATURE (°C)	MAX. ALLOWABLE WORKING PRESSURE (barg)	DESIGN SECTION

Rev	Date	Revision Object	Written by	Checked by	Approved by

  
**PETERHEAD CCS (ONSHORE)**  
**PETERHEAD CCS PROJECT**  
**PIPING AND INSTRUMENTATION DIAGRAM**  
**AUXILIARY BFW PUMPS**

DOC. CLASS:	SCALE: NTS	SHEET: 1/1
CLIENT Doc. Ref:	PCCS-01-TC-PX-2365-00029-001	REVISION FORMAT
		K01 A1



00QHE10  
BB010  
BLOW DOWN DRUM

INSIDE DIA/TAN TO TAN : 750/3000 (mm/mm)  
DESIGN PRESS/TEMP : 3.5(+HV)/180 (Barg/°C)  
INSULATION TYPE : PP  
TRIM LINE NUMBER :

- GENERAL NOTES:
- FOR STANDARD SYMBOLS AND NOMENCLATURE SEE DRAWINGS PCCS-00-TC-PX-2365-00001-001 TO PCCS-00-TC-PX-2365-00008-001.
  - ALL VENTS AND DRAINS TO BE DN20 UNLESS OTHERWISE INDICATED.
  - FOR INTERLOCKS, REFER TO CAUSE AND EFFECT DIAGRAM; DOCUMENT NUMBER PCCS-01-TC-IN-6604-00001.
  - EPC CONTRACTOR TO RECONFIRM AND FINALISE LINE SIZES DURING DETAILED DESIGN.
  - EPC CONTRACTOR TO RECONFIRM AND FINALISE EQUIPMENT DETAILS/ELEVATIONS DURING DETAILED DESIGN.
  - DETAILS OF OPEN DRAIN (UNDERGROUND SYSTEM) TO BE DEVELOPED DURING EPC PHASE.
  - ALARMS AND ESD SET POINTS TO BE PROVIDED BY CONTRACTOR.

- NOTES:
- XV-TRIGGERED OPEN ON HIGH TEMPERATURE ALARM (TT-00QHE69-CT101).
  - ANTI-SIPHON DEVICE REQUIRED.
  - 300# NOZZLE.
  - PROVIDE PERSONNEL PROTECTION INSULATION.
  - VENT TO ATMOSPHERE AT SAFE LOCATION OUTSIDE OF THE AUXILIARY BOILER HOUSE.
  - DESIGN FOR TWO PHASE FLOW.
  - MIXING DISTANCE TO BE DEFINED DURING DETAILED DESIGN (EPC PHASE).

GHC DISTRIBUTION SYSTEM AFTER TREATMENT  
GKB POTABLE WATER DISTRIBUTION SYSTEM  
QLA FEEDWATER SYSTEM  
QLB STEAM SYSTEM  
QH AUXILIARY STEAM GENERATING SYSTEM  
QHE BLOWDOWN SYSTEM, FLASH DRAIN SYSTEM

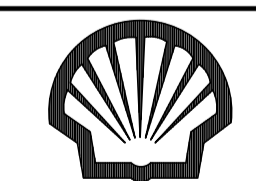
HOLDS:

REFERENCE DRAWINGS

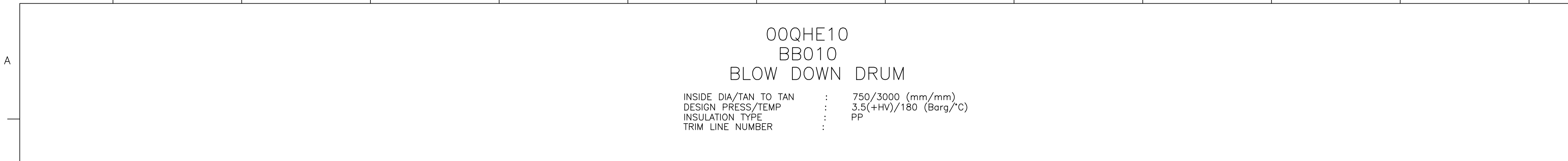
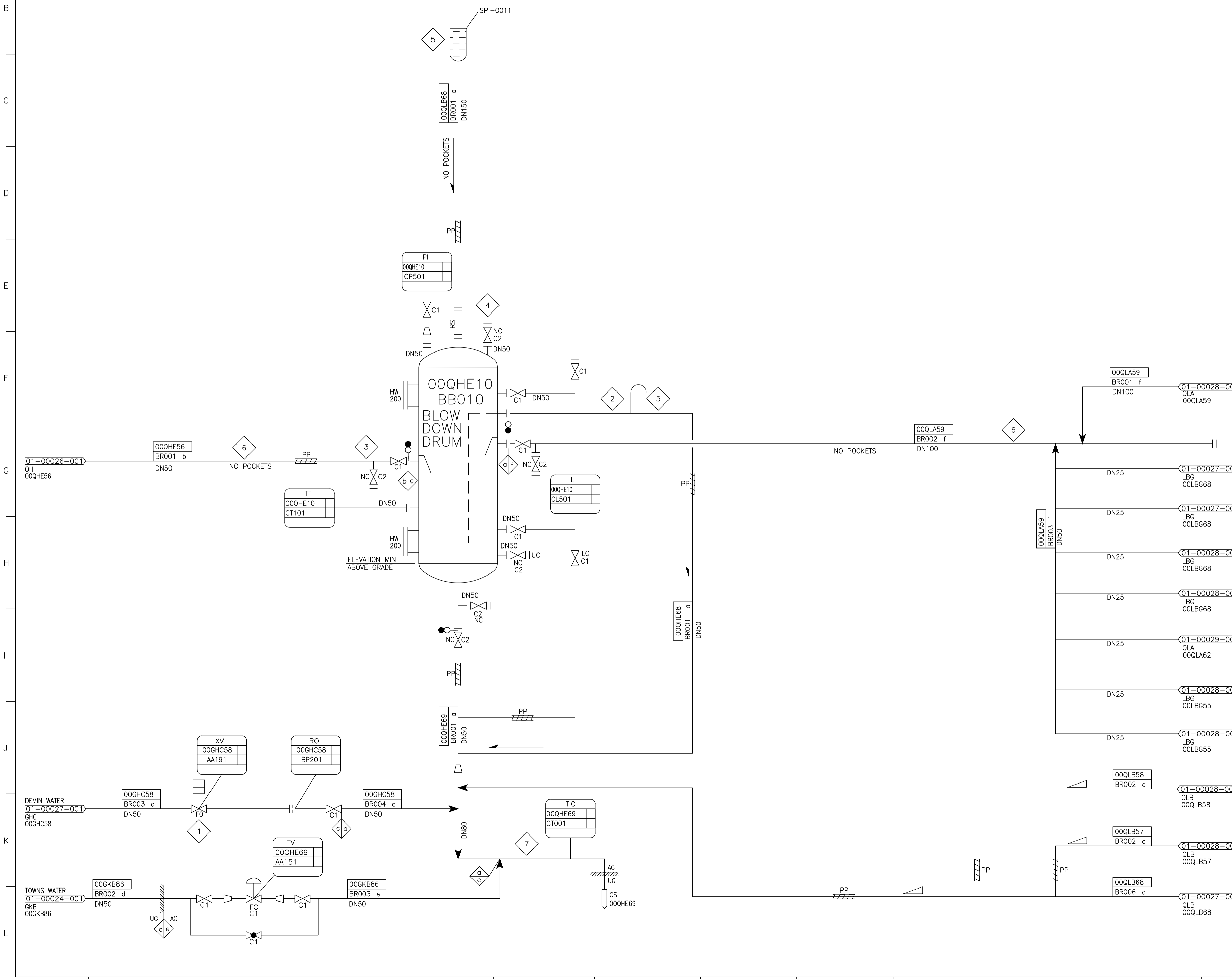
DRAWING NUMBER		TITLE	
CLIENT			
PCCS-01-TC-PX-2365-00026-001		AUXILIARY BOILER NO.1	

AA1A	150	230	7 (+FV)	f
AD0A	150	85	7	e
AP0A	PN10	85	7	d
AJ0A	150	50	9	c
BA1A	300	270	27	b
AA1A	150	150	3.5 (+HV)	a
PIPING MATERIAL	ANSI CLASS	MAX. ALLOWABLE WORKING TEMPERATURE (°C)	MAX. ALLOWABLE WORKING PRESSURE (borg)	DESIGN SECTION

Rev	Date	Revision Object	Written by	Checked by	Approved by

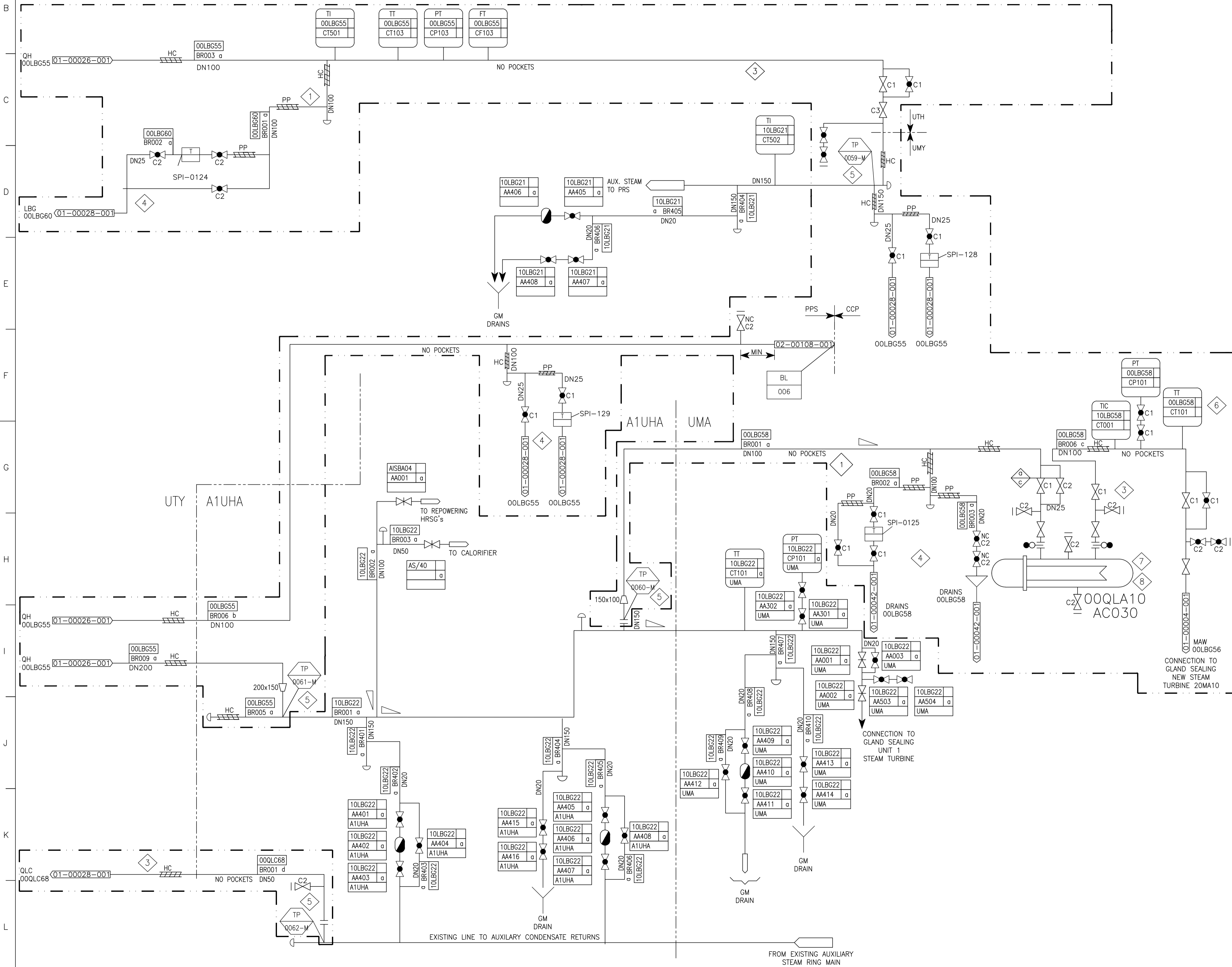
  
**PETERHEAD CCS (ONSHORE)**  
**PETERHEAD CCS PROJECT**  
**PIPING AND INSTRUMENTATION DIAGRAM**  
**AUXILIARY BOILER BLOWDOWN DRUM**

DOC. CLASS:	SCALE: NTS	SHEET: 1/1
CLIENT Doc. Ref:	PCCS-01-TC-PX-2365-00030-001	REVISION FORMAT
		K01 A1



00QLA10  
AC030  
GLAND STEAM SUPERHEATER

DESIGN DUTY : 115 (kW)  
DESIGN PRESS/TEMP : 19/310 (Barg/°C)  
INSULATION TYPE : PP  
TRIM LINE NUMBER :



- NOTES:
- LOW POINT DRAIN.
  - ENSURE THAT ALL STEAM BRANCHES TAKE OFF FROM THE TOP OF THE HEADER.
  - TWO PHASE FLOW, PROVIDE ADEQUATE SUPPORTS.
  - NUMBER OF STEAM TRAP DRAINS TO BE FINALISED BY EPC CONTRACTOR.
  - EXACT TIE-IN LOCATION TO BE DEFINED BY PIPING AND LAYOUT.
  - LOW TEMPERATURE ALARM TO BE PROVIDED.
  - VENT HEATER AFTER ISOLATION OR ISOLATE ELECTRICITY SUPPLY BEFORE VALVE ISOLATION.

- A1UHA EXISTING BOILER HOUSE  
GM PROCESS DRAINAGE SYSTEM  
LBG AUXILIARY STEAM PIPING SYSTEM  
MAW SEALING, HEATING AND COOLING STEAM SYSTEM  
QH AUXILIARY STEAM GENERATING SYSTEM  
QLA FEEDWATER SYSTEM  
QLC CONDENSATE SYSTEM  
UMA STEAM TURBINE BUILDING  
UMY BRIDGE STRUCTURE  
UTH AUXILIARY STEAM GENERATOR BUILDING

HOLDS:

DRAWING NUMBER	TITLE
PCCS-01-TC-PX-2365-00026-001	AUXILIARY BOILER NO.1
PCCS-01-TC-PX-2365-00027-001	AUXILIARY BOILER FLASH DRUM
PCCS-02-TC-PX-2365-00108-001	MP STEAM AND CONDENSATE DISTRIBUTION
PCCS-01-TC-PX-2365-00004-001	NEW STEAM TURBINE HP/IP/LP CASING

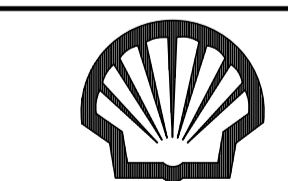
REFERENCE DRAWINGS

DRAWING NUMBER	TITLE
PCCS-01-TC-PX-2365-00026-001	AUXILIARY BOILER NO.1
PCCS-01-TC-PX-2365-00027-001	AUXILIARY BOILER FLASH DRUM
PCCS-02-TC-PX-2365-00108-001	MP STEAM AND CONDENSATE DISTRIBUTION
PCCS-01-TC-PX-2365-00004-001	NEW STEAM TURBINE HP/IP/LP CASING

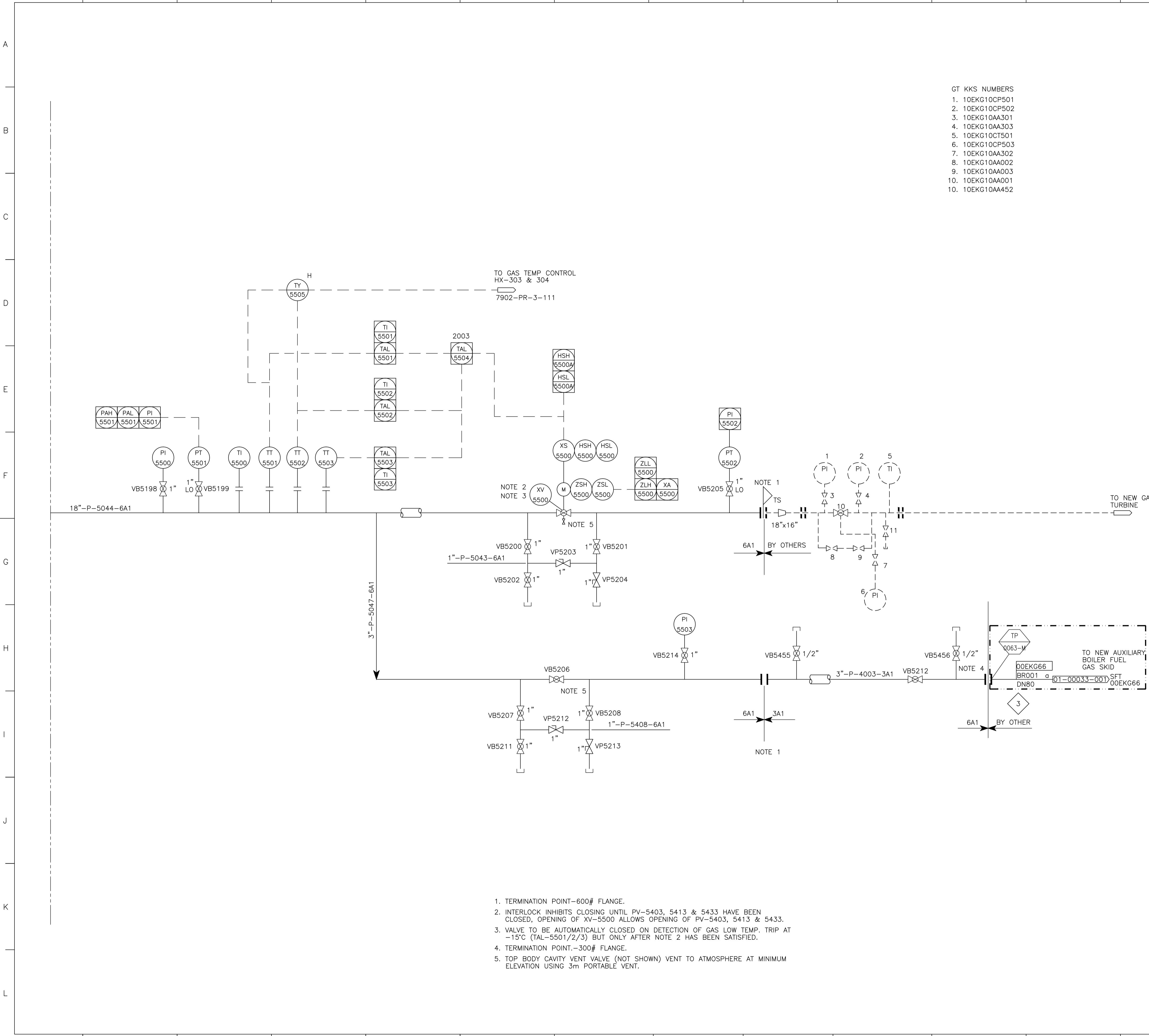
AA1A	150	230	7	d
BA1A	300	310	19	c
BA1A	300	270	27	b
BA1A	300	250	19	a

PIPING MATERIAL	ANSI-CLASS	MAX. ALLOWABLE WORKING TEMPERATURE (°C)	MAX. ALLOWABLE WORKING PRESSURE (barg)	DESIGN SECTION

Rev	Date	Revision Object	Written by	Checked by	Approved by

  
**PETERHEAD CCS (ONSHORE)**  
**PETERHEAD CCS PROJECT**  
**PIPING AND INSTRUMENTATION DIAGRAM**  
**AUXILIARY STEAM SYSTEM**

DOC. CLASS:	SCALE: NTS	SHEET: 1/1
CLIENT Doc. Ref:	PCCS-01-TC-PX-2365-00031-001	REVISION FORMAT
		K01 A1



- GT KKS NUMBERS
- 10EKG10CP501
  - 10EKG10CP502
  - 10EKG10AA301
  - 10EKG10AA303
  - 10EKG10CT501
  - 10EKG10CP503
  - 10EKG10AA302
  - 10EKG10AA002
  - 10EKG10AA003
  - 10EKG10AA001
  - 10EKG10AA452

- GENERAL NOTES:
- FOR STANDARD SYMBOLS AND NOMENCLATURE SEE DRAWINGS PCCS-00-TC-PX-2365-00001-001 TO PCCS-00-TC-PX-2365-00008-001.
  - ALL VENTS AND DRAINS TO BE DN20 UNLESS OTHERWISE INDICATED.
  - FOR INTERLOCKS, REFER TO CAUSE AND EFFECT DIAGRAM; DOCUMENT NUMBER PCCS-01-TC-IN-6604-00001.
  - EPC CONTRACTOR TO RECONFIRM AND FINALISE LINE SIZES DURING DETAILED DESIGN.
  - EPC CONTRACTOR TO RECONFIRM AND FINALISE EQUIPMENT DETAILS/ELEVATIONS DURING DETAILED DESIGN.
  - DETAILS OF OPEN DRAIN (UNDERGROUND SYSTEM) TO BE DEVELOPED DURING EPC PHASE.
  - ALARMS AND ESD SET POINTS TO BE PROVIDED BY EPC CONTRACTOR.

- NOTES:
- DESIGN CONDITIONS AS PER UPSTREAM LINE CONDITIONS.
  - TIE-IN LOCATION/DEMOLITION SCOPE TO BE CONFIRMED BY PIPING AND LAYOUT.
  - NEW LINE RATING AT TIE-IN POINT 300#.

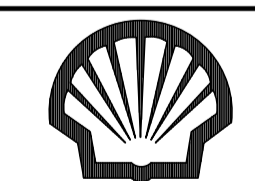
EKG PIPING SYSTEM (SUPPLY OF GASEOUS FUELS)  
SFT HEATING AND FUEL GAS SYSTEM

HOLDS:

REFERENCE DRAWINGS				
DRAWING NUMBER	TITLE			
	CLIENT			
	PCCS-01-TC-PX-2365-00033-001			
	FUEL GAS SKID			

BA1B	300	85	39	a
PIPING MATERIAL	PRESSURE NOMINAL	MAX. ALLOWABLE WORKING TEMPERATURE (°C)	MAX. ALLOWABLE WORKING PRESSURE (barg)	DESIGN SECTION

Rev	Date	Revision Object	Written by	Checked by	Approved by



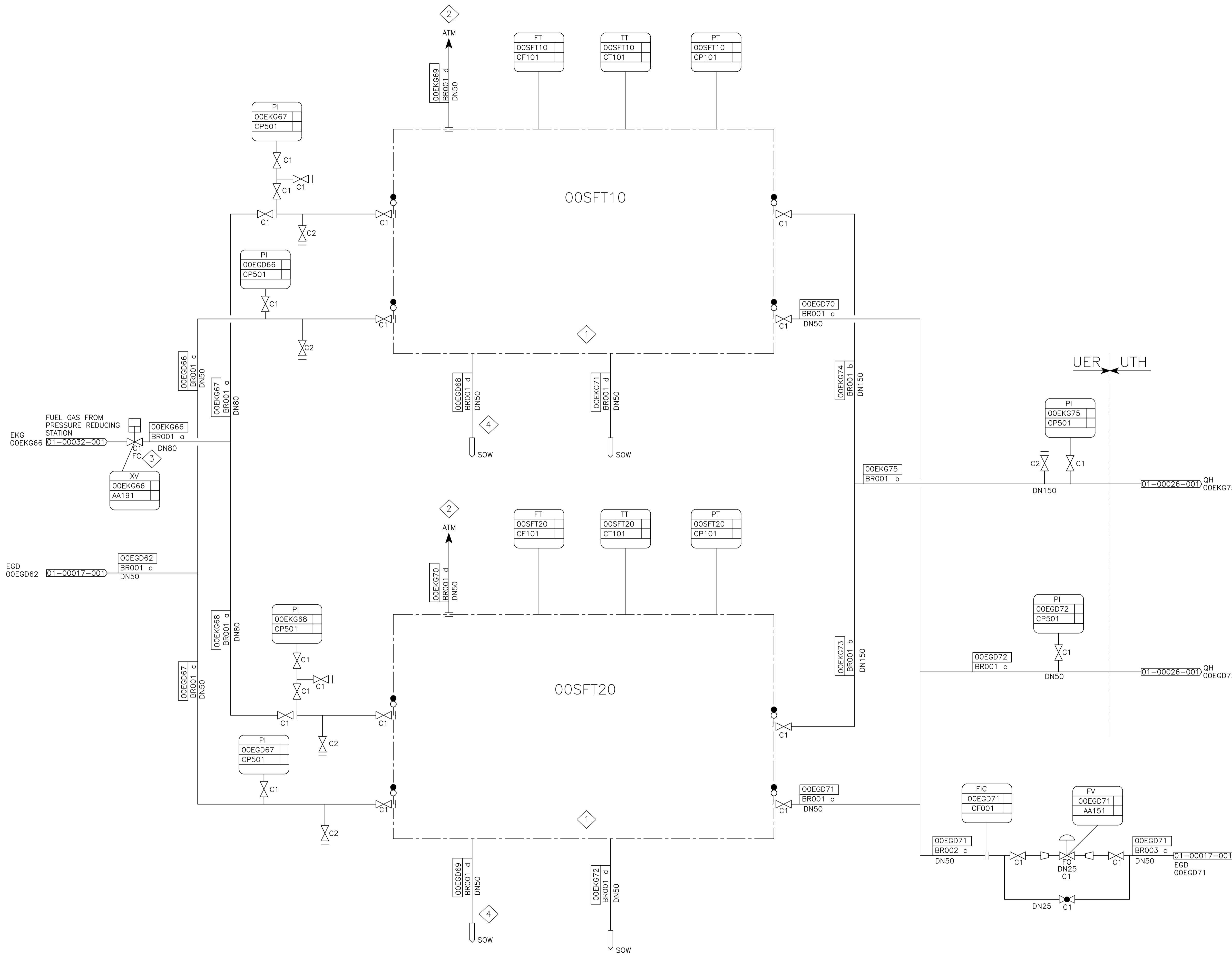
**PETERHEAD CCS (ONSHORE)**  
**PETERHEAD CCS PROJECT**  
**PIPING AND INSTRUMENTATION DIAGRAM**  
**NEW GAS TURBINES GAS FEEDER LINE-PRS**

DOC. CLASS:	SCALE: NTS	SHEET: 1/1
CLIENT Doc. Ref:	PCCS-01-TC-PX-2365-00032-001	REVISION FORMAT
		K01 A1

- TERMINATION POINT-600# FLANGE.
- INTERLOCK INHIBITS CLOSING UNTIL PV-5403, 5413 & 5433 HAVE BEEN CLOSED, OPENING OF XV-5500 ALLOWS OPENING OF PV-5403, 5413 & 5433.
- VALVE TO BE AUTOMATICALLY CLOSED ON DETECTION OF GAS LOW TEMP. TRIP AT -15°C (TAL-5501/2/3) BUT ONLY AFTER NOTE 2 HAS BEEN SATISFIED.
- TERMINATION POINT.-300# FLANGE.
- TOP BODY CAVITY VENT VALVE (NOT SHOWN) VENT TO ATMOSPHERE AT MINIMUM ELEVATION USING 3m PORTABLE VENT.



00SFT10/20  
FUEL GAS/FUEL OIL  
CONDITIONING PACKAGE



- GENERAL NOTES:
- FOR STANDARD SYMBOLS AND NOMENCLATURE SEE DRAWINGS PCCS-00-TC-PX-2365-00001-001 TO PCCS-00-TC-PX-2365-00008-001.
  - ALL VENTS AND DRAINS TO BE DN20 UNLESS OTHERWISE INDICATED.
  - FOR INTERLOCKS, REFER TO CAUSE AND EFFECT DIAGRAM; DOCUMENT NUMBER PCCS-01-TC-IN-6604-00001.
  - EPC CONTRACTOR TO RECONFIRM AND FINALISE LINE SIZES DURING DETAILED DESIGN.
  - EPC CONTRACTOR TO RECONFIRM AND FINALISE EQUIPMENT DETAILS/ELEVATIONS DURING DETAILED DESIGN.
  - DETAILS OF OPEN DRAIN (UNDERGROUND SYSTEM) TO BE DEVELOPED DURING EPC PHASE.
  - ALARMS AND ESD SET POINTS TO BE PROVIDED BY EPC CONTRACTOR.

- NOTES:
- NEW FUEL GAS SKIDS TO REPLACE EXISTING DEMOLISHED SKIDS. TO INCLUDE AND NOT LIMITED TO FILTERS, FLOW MEASUREMENT, ELECTRIC HEATER AND PRESSURE LET DOWN, OVERPRESSURE PROTECTION. TO BE LOCATED NEAR TO NEW AUXILIARY BOILER HOUSE.
  - VENT TO ATMOSPHERE AT SAFE LOCATION.
  - EMERGENCY (ESD) ISOLATION VALVE TO BE AT LEAST 15 METERS FROM
  - ROUTE FUEL OIL DRIPS TO OIL WATER SEPARATOR NEAR NEW AUXILIARY BOILER HOUSE.
  - CONDITIONING PACKAGE TO BE SIZED FOR TWO FUEL OIL PUMPS IN OPERATION.
  - EPC CONTRACTOR TO EVALUATE USING OF AUTOMATIC WATER RELEASE VALVES.

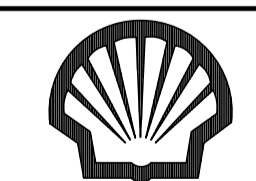
EGD PIPING SYSTEMS (SUPPLY OF LIQUID FUEL)  
EKG PIPING SYSTEMS (SUPPLY OF GASEOUS FUELS)  
EKA RECEIVING EQUIPMENT (SUPPLY OF GASEOUS FUELS)  
QH AUXILIARY STEAM GENERATING SYSTEM  
SFT HEATING AND FUEL GAS SYSTEM  
UTH AUXILIARY STEAM GENERATOR BUILDING  
UER STRUCTURES FOR FORWARDING OF GASEOUS FUELS

HOLDS:

DRAWING NUMBER		TITLE	
CLIENT			
PCCS-01-TC-PX-2365-00032-001		NEW GAS TURBINES GAS FEEDER LINE-PRS	
PCCS-01-TC-PX-2365-00026-001		AUXILIARY PACKAGE BOILER	

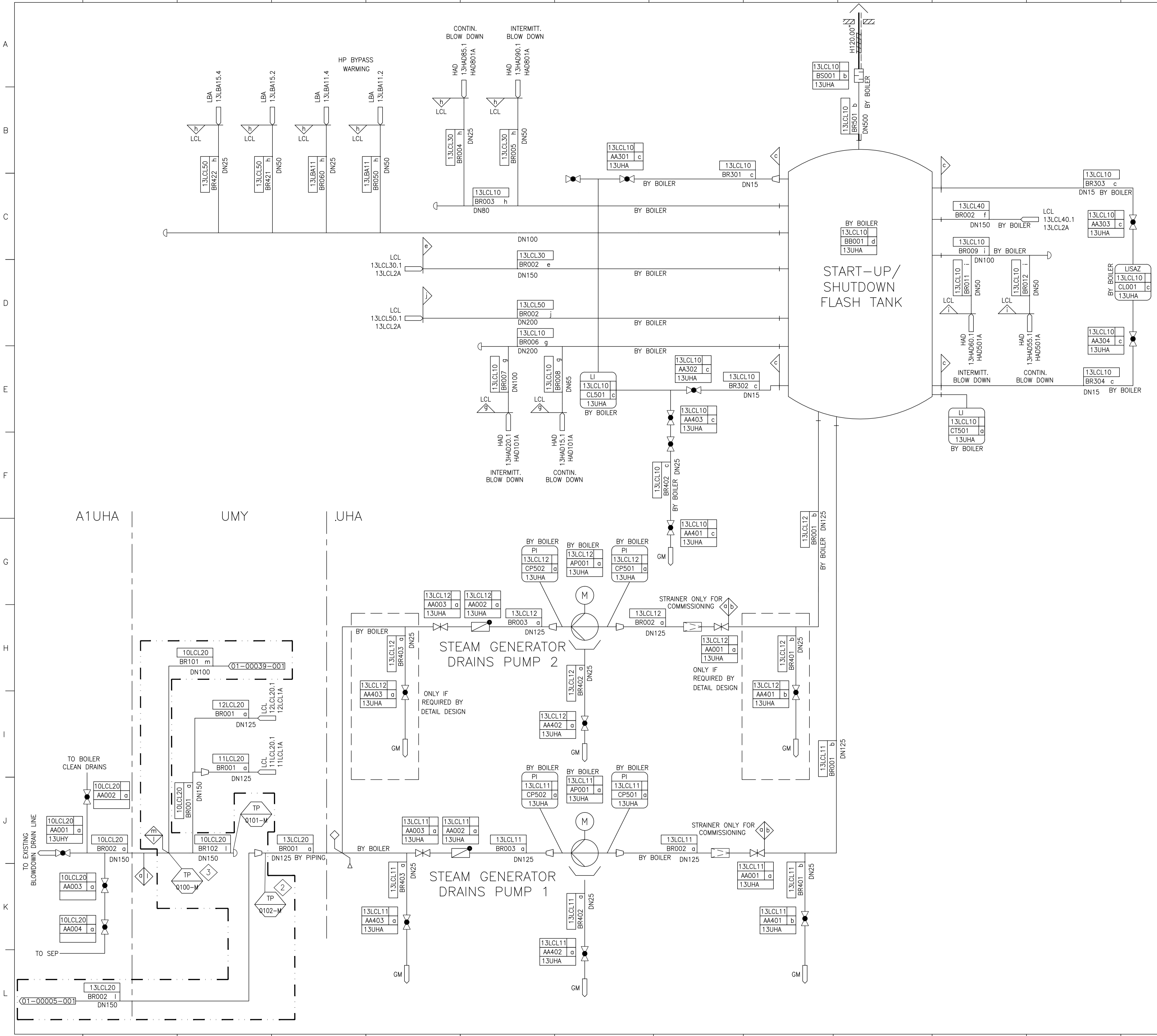
AA1B	150	85	3.5	d
AA1B	150	85	4.5	c
BA1B	300	85	3.5	b
BA1B	300	85	39	a
PIPING MATERIAL	ANSI CLASS	MAX. ALLOWABLE WORKING TEMPERATURE (°C)	MAX. ALLOWABLE WORKING PRESSURE (bar)	DESIGN SECTION

Rev	Date	Revision Object	Written by	Checked by	Approved by

  
**PETERHEAD CCS (ONSHORE)**  
**PETERHEAD CCS PROJECT**  
**PIPING AND INSTRUMENTATION DIAGRAM**  
**AUXILIARY BOILER FUEL GAS SKID**

DOC. CLASS:	SCALE: NTS	SHEET: 1/1
CLIENT Doc. Ref:	PCCS-01-TC-PX-2365-00033-001	REVISION FORMAT K01 A1





**GENERAL NOTES:**  
 1. FOR STANDARD SYMBOLS AND NOMENCLATURE SEE DRAWINGS PCCS-00-TC-PX-2365-00002-001 TO PCCS-00-TC-PX-2365-00008-001.  
 2. ALL VENTS AND DRAINS TO BE DN20 UNLESS OTHERWISE INDICATED.  
 3.

4. FOR INTERLOCKS, REFER TO CAUSE AND EFFECT DIAGRAM; DOCUMENT NUMBER PCCS-01-TC-IN-6604-00001.  
 5. EPC CONTRACTOR TO RECONFIRM AND FINALISE LINE SIZES DURING DETAILED DESIGN.  
 6. EPC CONTRACTOR TO RECONFIRM AND FINALISE EQUIPMENT DETAILS/ELEVATIONS DURING DETAILED DESIGN.  
 7. DETAILS OF OPEN DRAIN (UNDERGROUND SYSTEM) TO BE DEVELOPED DURING EPC PHASE.  
 8. ALARMS AND ESD SET POINTS TO BE PROVIDED BY EPC.

**NOTES:**  
 1. DRAINS CONNECTIONS RECONFIGURED SO THAT ALL CONNECTIONS TO HRSG 11/12 PIPING ARE SEGREGATED FROM HRSG 13 PIPING-EPC CONTRACTOR TO CONFIRM.  
 2. TIE-IN LOCATION TO BE CONFIRMED BY PIPING AND LAYOUT.  
 3. EPC CONTRACTOR TO DETERMINE IF PIPEWORK IS SUITABLE FOR UPSTREAM CONDITIONS.

NOTE: - DRAINS AND VENTS MAY BE CHANGED DUE TO PIPING LAYOUT  
 - DESIGN DATA MARKED WITH \* IS SPECIFIED BY SIEMENS  
 ALL OTHER DATA BY BOILER SUPPLIER

**GM** PLANT DRAINAGE SYSTEM  
**HAD** EVAPORATOR SYSTEM  
**LCL** STEAM GENERATOR DRAINS SYSTEM  
**A1UHA** EXISTING BOILER HOUSE  
**UHA** BOILER HOUSE  
**UHY** PIPE BRIDGE  
**UMY** BRIDGE STRUCTURE

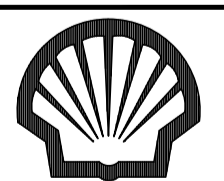
**HOLDS:**

REFERENCE DRAWINGS

DRAWING NUMBER	TITLE

AA1A	150	180	11.5	m
AA1A	150	180	6	l
				k
				j
				i
				h
				g
				f
				e
		465*	6*	d
A312 TP316*		465*	6*	c
A106 GRB*	150*	465*	6*	b
A106 GRB*	150*	100*	6*	a
WERKSTOFF DER ROHRLEITUNG	ANSI-KLASSE	ZUL. BETRIEBS-TEMPERATUR	ZUL. BETRIEBS-UEBERDRUCK	AUSLEGUNGS-ABSCHNITT
PIPING MATERIAL	ANSI-CLASS	MAX. ALLOWABLE WORKING TEMP. t <sub>zul</sub> IN °C	MAX. ALLOWABLE WORKING PRESS. P <sub>e,zul</sub> IN MPa	DESIGN SECTION

Rev	Date	Revision Object	Written by	Checked by	Approved by



**PETERHEAD  
CCS (ONSHORE)**

**PETERHEAD CCS PROJECT**

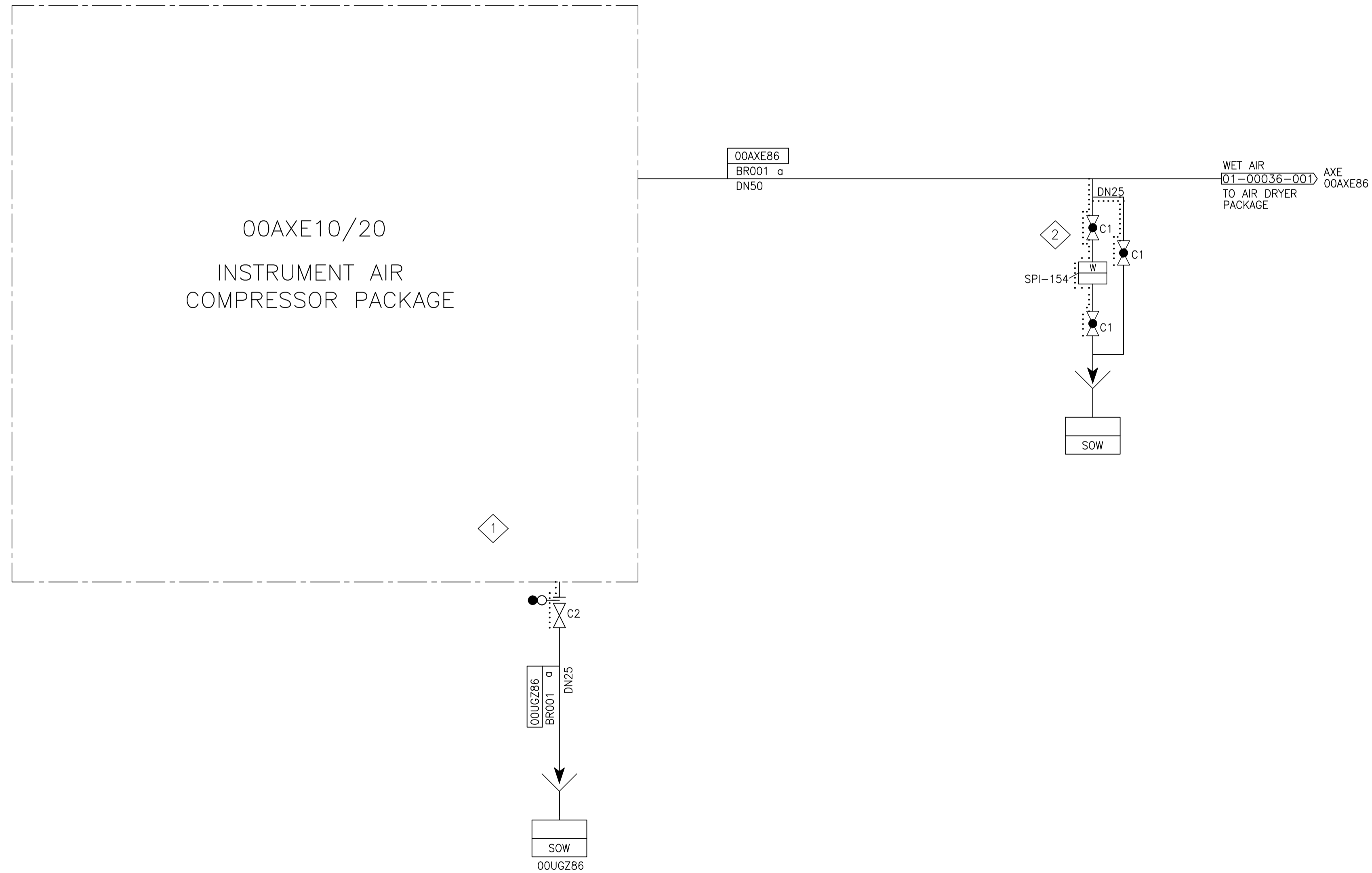
**PIPING AND INSTRUMENTATION DIAGRAM**

**STEAM GENERATOR DRAINS SYSTEM HRSG 13**

DOC. CLASS:	SCALE: NTS	SHEET: 1/1
CLIENT Doc. Ref:	PCCS-01-TC-PX-2365-00034-001	REVISION FORMAT K01 A1
LAST REV DATE:		

00AXE10  
ANO10/020  
INSTRUMENT AIR  
COMPRESSOR PACKAGE

00AXE10/20  
INSTRUMENT AIR  
COMPRESSOR PACKAGE



GENERAL NOTES:

- FOR STANDARD SYMBOLS AND NOMENCLATURE SEE DRAWINGS PCCS-00-TC-PX-2365-00002-001 TO PCCS-00-TC-PX-2365-00008-001.
- ALL VENTS AND DRAINS TO BE DN20 UNLESS OTHERWISE INDICATED.
- 
- FOR INTERLOCKS, REFER TO CAUSE AND EFFECT DIAGRAM; DOCUMENT NUMBER PCCS-01-TC-IN-6004-00001.
- EPC CONTRACTOR TO RECONFIRM AND FINALISE LINE SIZES DURING DETAILED DESIGN.
- EPC CONTRACTOR TO RECONFIRM AND FINALISE EQUIPMENT DETAILS/ELEVATIONS DURING DETAILED DESIGN.
- DETAILS OF OPEN DRAIN (UNDERGROUND SYSTEM) TO BE DEVELOPED DURING EPC PHASE.
- ALARMS AND ESD SET POINTS TO BE PROVIDED BY EPC CONTRACTOR.

NOTES:

- ALL ISOLATION VALVES, BLINDS OF THE PACKAGE ARE IN VENDOR SCOPE.
- NUMBER OF WATER TRAPS AND LOCATIONS SHALL BE FINALISED BY THE EPC CONTRACTOR.
- AN ALARM SHALL INDICATE IN THE CONTROL ROOM THE LOSS OF AIR COMPRESSOR.

AXE COMPRESSED GENERATION SYSTEM  
UGZ STRUCTURE FOR WATER SUPPLY DISPOSAL  
QFQ GENERAL CONTROL AIR SUPPLY

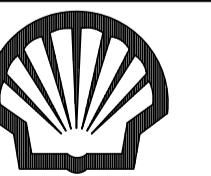
HOLDS:

REFERENCE DRAWINGS

DRAWING NUMBER	TITLE
CLIENT	
PCCS-01-TC-PX-2365-00038-001	INSTRUMENT AIR DRYER PACKAGE
PCCS-01-TC-PX-2365-00037-001	GENERAL COMPRESSED AIR BUFFER VESSEL

AA1B	150	85	10	α
PIPING MATERIAL	ANSI CLASS	MAX. ALLOWABLE WORKING TEMPERATURE (°C)	MAX. ALLOWABLE WORKING PRESSURE ( barg)	DESIGN SECTION

Rev	Date	Revision Object	Written by	Checked by	Approved by



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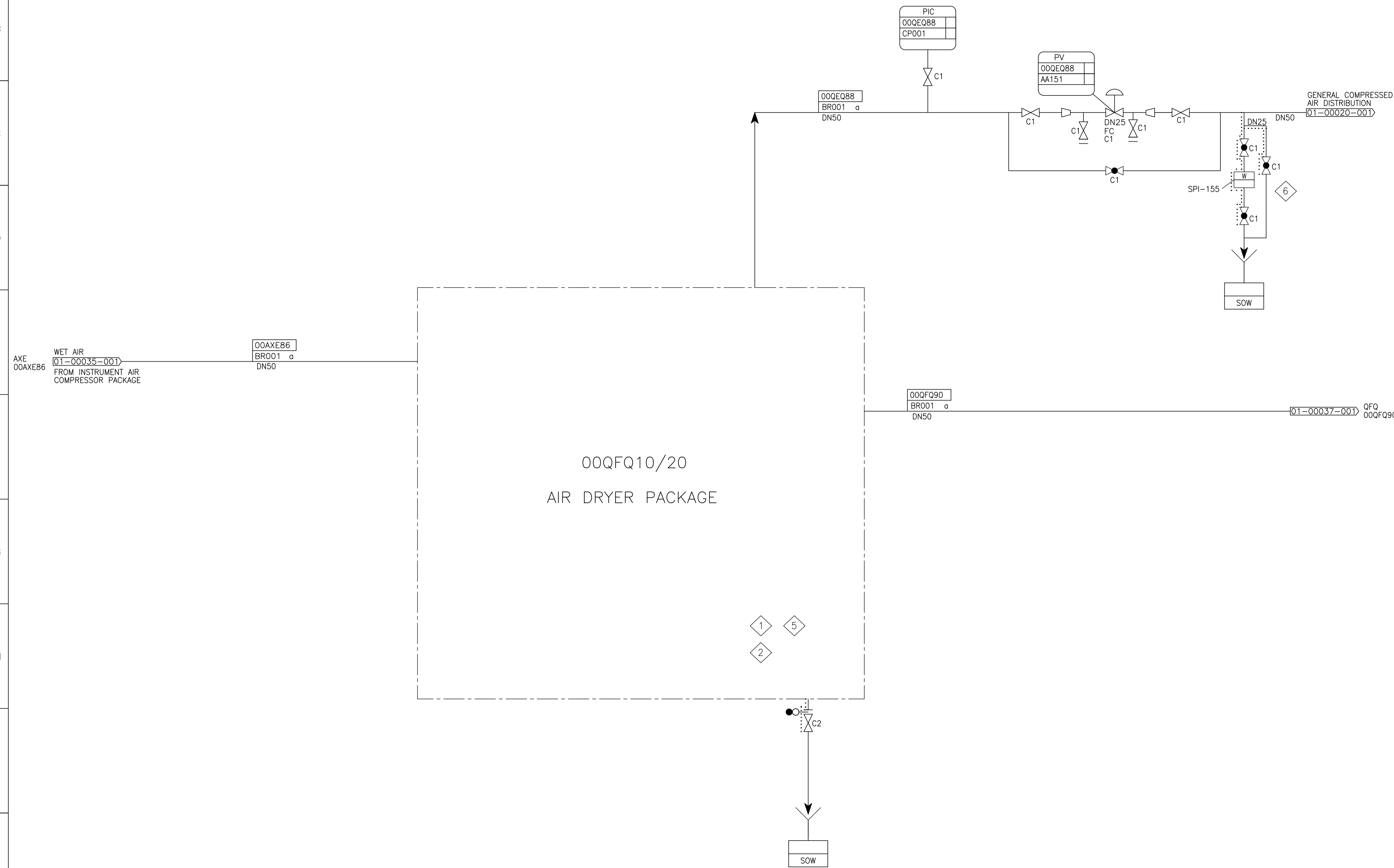
PETERHEAD CCS PROJECT  
PIPING AND INSTRUMENTATION DIAGRAM  
INSTRUMENT AIR COMPRESSOR PACKAGE

DOC. CLASS: SCALE: NTS SHEET: 1/1

CLIENT Doc. Ref.	PCCS-01-TC-PX-2365-00035-001	REVISION	FORMAT
		K01	A1

LAST REV DATE:

00QFQ10  
AT010/020  
AIR DRYER PACKAGE



- GENERAL NOTES:
- FOR STANDARD SYMBOLS AND NOMENCLATURE SEE DRAWINGS PCCS-00-TC-PX-2365-00002-001 TO PCCS-00-TC-PX-2365-00008-001.
  - ALL VENTS AND DRAINS TO BE DN20 UNLESS OTHERWISE INDICATED.
  - 
  - FOR INTERLOCKS, REFER TO CAUSE AND EFFECT DIAGRAM; DOCUMENT NUMBER PCCS-01-TC-IN-6604-00001.
  - EPC CONTRACTOR TO RECONFIRM AND FINALISE LINE SIZES DURING DETAILED DESIGN.
  - EPC CONTRACTOR TO RECONFIRM AND FINALISE EQUIPMENT DETAILS/ELEVATIONS DURING DETAILED DESIGN.
  - DETAILS OF OPEN DRAIN (UNDERGROUND SYSTEM) TO BE DEVELOPED DURING EPC PHASE.
  - ALARMS AND ESD SET POINTS TO BE PROVIDED BY EPC CONTRACTOR.

- NOTES:
- MOISTURE ANALYSER TO BE PART OF DRYER PACKAGE 00QFQ10 AT010/020.
  - ALL ISOLATION VALVES AND BLINDS OF THE PACKAGE ARE IN VENDOR SCOPE.
  - PRESSURE CONTROLLER TO CONSERVE INSTRUMENT AIR WHEN SUPPLY PRESSURE FALLS.
  - AIR DRYER PACKAGE SHALL BE INCLUDED AS PART OF THE INSTRUMENT AIR COMPRESSOR PACKAGE.
  - AIR DRYER PACKAGE SHALL BE SUPPLIED WITH OUTLET DEW POINT ANALYSER.
  - NUMBER OF WATER TRAPS AND LOCATIONS SHALL BE FINALISED BY THE EPC CONTRACTOR.

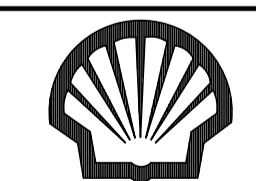
OEQ COMPRESSED AIR AND CARRIER AIR SUPPLY SYSTEM  
QFQ GENERAL CONTROL AIR SUPPLY

HOLDS:

REFERENCE DRAWINGS		
DRAWING NUMBER	TITLE	
	CLIENT	
PCCS-01-TC-PX-2365-00035-001	INSTRUMENT AIR COMPRESSOR PACKAGE	
PCCS-01-TC-PX-2365-00037-001	INSTRUMENT AIR BUFFER VESSEL	

AA1B	150	85	10	α
PIPING MATERIAL	ANSI CLASS	MAX. ALLOWABLE WORKING TEMPERATURE (°C)	MAX. ALLOWABLE WORKING PRESSURE (barg)	DESIGN SECTION

Rev	Date	Revision Object	Written by	Checked by	Approved by



**PETERHEAD  
CCS (ONSHORE)**

**PETERHEAD CCS PROJECT**

**PIPING AND INSTRUMENTATION DIAGRAM**

**AIR DRYER PACKAGE**

DOC. CLASS:	SCALE: NTS	SHEET: 1/1
CLIENT Doc. Ref:	PCCS-01-TC-PX-2365-00036-001	REVISION FORMAT
		K01 A1

00QFQ10  
BB010  
INSTRUMENT AIR BUFFER VESSEL

INSIDE DIAMETER/TAN TO TAN : 2300/7000 (mm/mm)  
DESIGN PRESSURE/TEMPERATURE : 10/85 (Barg/°C)  
INSULATION TYPE :  
TRIM LINE NUMBER :

- GENERAL NOTES:
- FOR STANDARD SYMBOLS AND NOMENCLATURE SEE DRAWINGS PCCS-00-TC-PX-2365-00002-001 TO PCCS-00-TC-PX-2365-00008-001.
  - ALL VENTS AND DRAINS TO BE DN20 UNLESS OTHERWISE INDICATED.
  - 
  - FOR INTERLOCKS, REFER TO CAUSE AND EFFECT DIAGRAM; DOCUMENT NUMBER PCCS-01-TC-IN-6604-00001.
  - EPC CONTRACTOR TO RECONFIRM AND FINALISE LINE SIZES DURING DETAILED DESIGN.
  - EPC CONTRACTOR TO RECONFIRM AND FINALISE EQUIPMENT DETAILS/ELEVATIONS DURING DETAILED DESIGN.
  - DETAILS OF OPEN DRAIN (UNDERGROUND SYSTEM) TO BE DEVELOPED DURING EPC PHASE.
  - ALARMS AND ESD SET POINTS TO BE PROVIDED BY EPC CONTRACTOR.

- NOTES:
- TO BE PROVIDED WITH 6mm HOLE AT ELBOW AND PIPE TO DRAIN AT SAFE LOCATION.
  - TO SAFE LOCATION.
  - TO BE SUPPORTED FOR SONIC FLOW.
  - CONNECTION FOR SAMPLE.
  - CHECK VALVES SHALL BE OF DISSIMILAR TYPE.

QFQ GENERAL CONTROL AIR SUPPLY

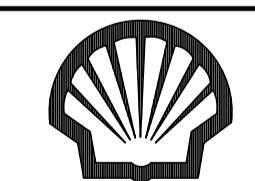
HOLDS:

DRAWING NUMBER		TITLE	
CLIENT			
PCCS-01-TC-PX-2365-00036-001	AIR DRYER PACKAGE		
PCCS-01-TC-PX-2365-00019-001	INSTRUMENT AIR DISTRIBUTION TO NEW PPS FACILITIES		

ADDA	150	85	10	b
AA1B	150	85	10	a

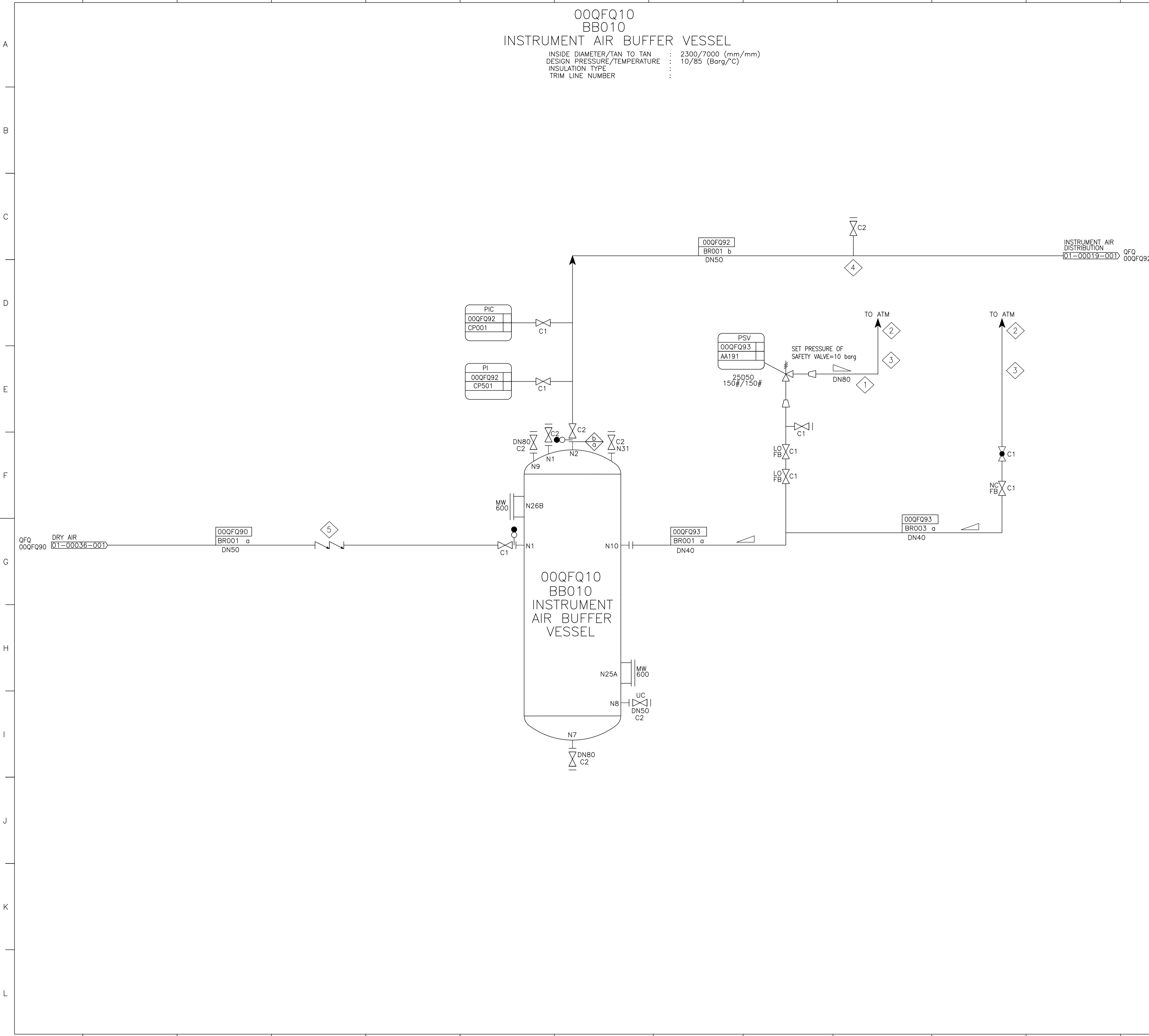
PIPING MATERIAL	ANSI CLASS	MAX. ALLOWABLE WORKING TEMPERATURE (°C)	MAX. ALLOWABLE WORKING PRESSURE (barg)	DESIGN SECTION

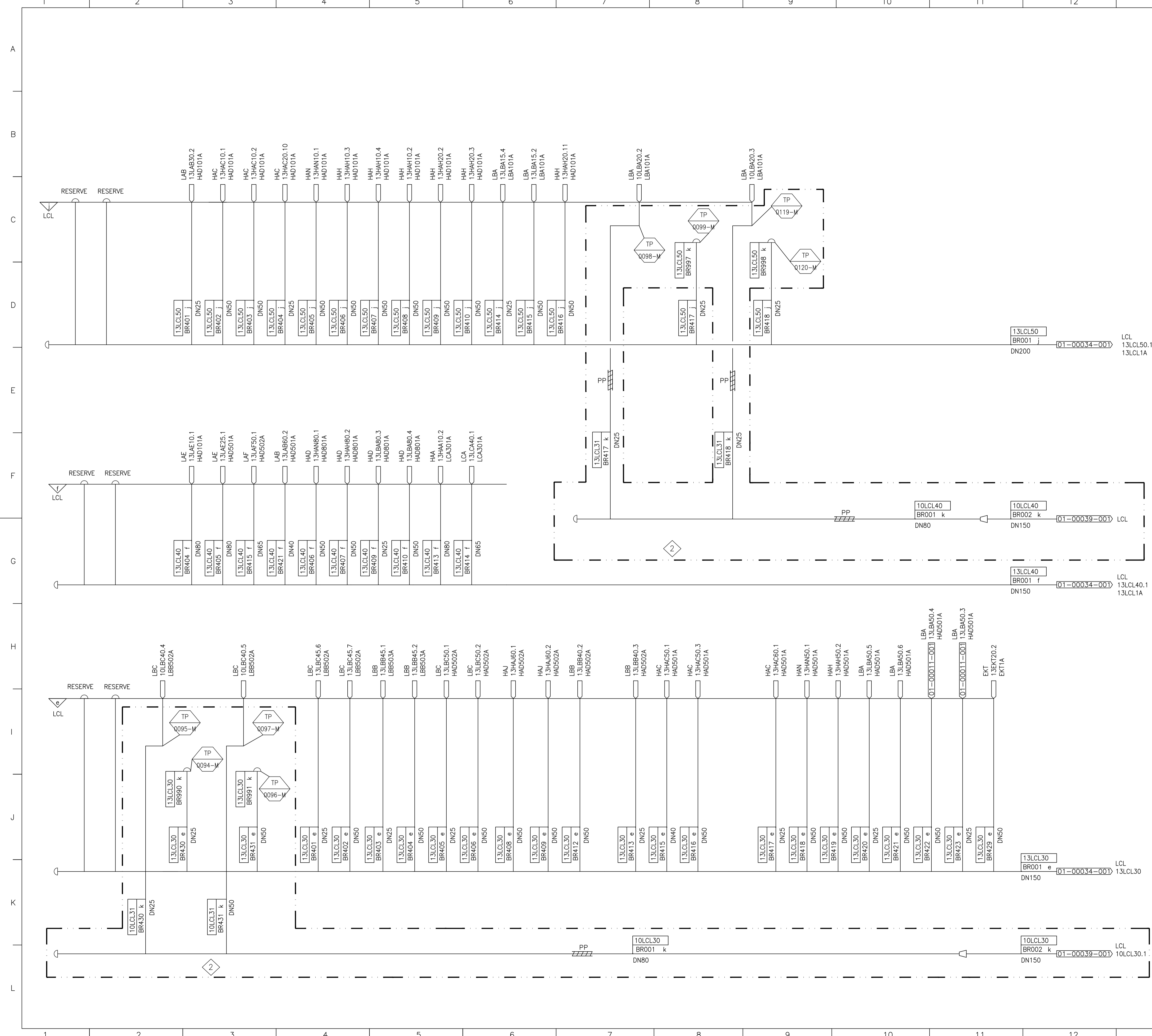
Rev	Date	Revision Object	Written by	Checked by	Approved by



PETERHEAD  
CCS (ONSHORE)  
PETERHEAD CCS PROJECT  
PIPING AND INSTRUMENTATION DIAGRAM  
INSTRUMENT AIR BUFFER VESSEL

DOC. CLASS:	SCALE: NTS	SHEET: 1/1
CLIENT Doc. Ref.	PCCS-01-TC-PX-2365-00037-001	REVISION FORMAT
		K01 A1





- GENERAL NOTES:
1. FOR STANDARD SYMBOLS AND NOMENCLATURE SEE DRAWINGS PCCS-00-TC-PX-2365-00002-001 TO PCCS-00-TC-PX-2365-00008-001.
  2. ALL VENTS AND DRAINS TO BE DN20 UNLESS OTHERWISE INDICATED.
  - 3.
  4. FOR INTERLOCKS, REFER TO CAUSE AND EFFECT DIAGRAM; DOCUMENT NUMBER PCCS-01-TC-IN-6604-00001.
  5. EPC CONTRACTOR TO RECONFIRM AND FINALISE LINE SIZES DURING DETAILED DESIGN.
  6. EPC CONTRACTOR TO RECONFIRM AND FINALISE EQUIPMENT DETAILS/ELEVATIONS DURING DETAILED DESIGN.
  7. DETAILS OF OPEN DRAIN (UNDERGROUND SYSTEM) TO BE DEVELOPED DURING EPC PHASE.
  8. ALARMS AND ESD SET POINTS TO BE PROVIDED BY EPC.
- NOTES:
1. DRAINS CONNECTIONS RECONFIGURED SO THAT ALL CONNECTIONS TO HRSG 11/12 PIPING ARE SEGREGATED FROM HRSG 13 PIPING-EPC CONTRACTOR TO CONFIRM.
  2. CONNECTIONS SHOWN ARE TYPICAL AND PRELIMINARY AND SHALL BE CONFIRMED AND OPTIMISED BY EPC CONTRACTOR.
- GM PLANT DRAINAGE SYSTEM  
 HAC ECONOMIZER SYSTEM  
 HAD EVAPORATOR SYSTEM  
 HAH HP SUPERHEATER SYSTEM  
 HAJ REHEATER SYSTEM  
 LAB FEEDWATER PIPING SYSTEM  
 LAE HP DESUPERHEATING SYSTEM  
 LAF IP DESUPERHEATING SYSTEM  
 LBA MAIN STEAM PIPING SYSTEM  
 LBB HOT REHEAT PIPING SYSTEM  
 LBC COLD REHEAT PIPING SYSTEM  
 LCL STEAM GENERATOR DRAINS SYSTEM  
 LBG AUXILIARY STEAM PIPING SYSTEM  
 UHA BOILER HOUSE

HOLDS:


REFERENCE DRAWINGS	
DRAWING NUMBER	TITLE

NOTE: - DRAINS AND VENTS MAY BE CHANGED DUE TO PIPING LAYOUT

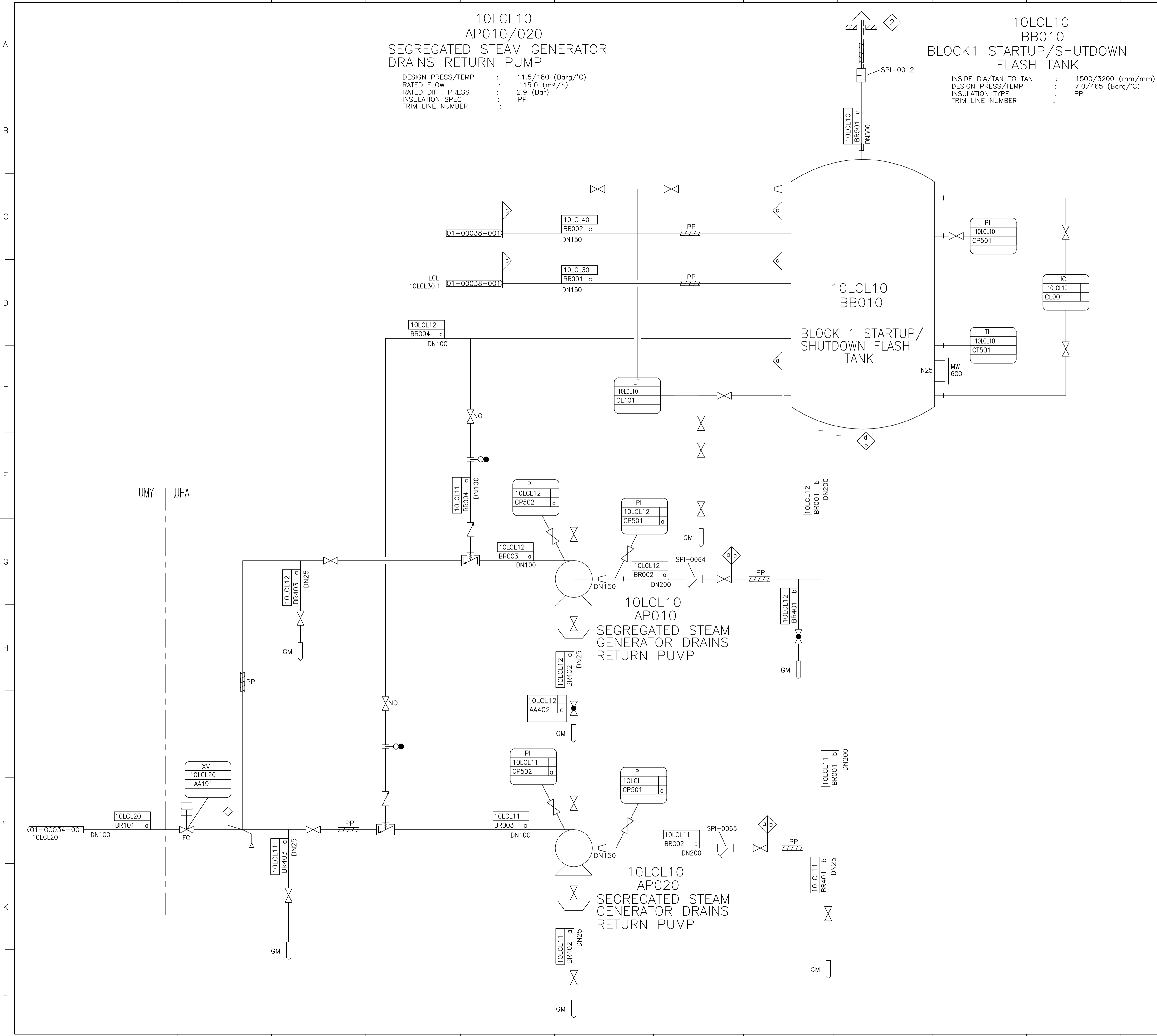
ER1A	900	465	7	k
				j
				i
				h
				g
				f
				e
				d
				c
				b
				a

WERKSTOFF DER ROHRLEITUNG	ANSI-KLASSE	ZUL. BETRIEBS-TEMPERATUR MAX. ALLOWABLE WORKING TEMP. t <sub>zul</sub> IN °C	ZUL. BETRIEBS-UEBERDRUCK MAX. ALLOWABLE WORKING PRESS. P <sub>e,zul</sub> IN barg	AUSLEGESCHNITT ABSCHNITT
PIPING MATERIAL	ANSI-CLASS			DESIGN SECTION

Rev	Date	Revision Object	Written by	Checked by	Approved by

  
**PETERHEAD CCS (ONSHORE)**  
**PETERHEAD CCS PROJECT**  
**PIPING AND INSTRUMENTATION DIAGRAM**  
**STEAM GENERATOR DRAINS SYSTEM HRSG 11,12 & 13**

DOC. CLASS:	SCALE: NTS	SHEET: 1/1
CLIENT Doc. Ref:	PCCS-01-TC-PX-2365-00038-001	REVISION FORMAT
		K01 A1



GENERAL NOTES:

- FOR STANDARD SYMBOLS AND NOMENCLATURE SEE DRAWINGS PCCS-00-TC-PX-2365-00002-001 TO PCCS-00-TC-PX-2365-00008-001.
- ALL VENTS AND DRAINS TO BE DN20 UNLESS OTHERWISE INDICATED.
- 
- FOR INTERLOCKS, REFER TO CAUSE AND EFFECT DIAGRAM; DOCUMENT NUMBER PCCS-01-TC-IN-6604-00001.
- EPC CONTRACTOR TO RECONFIRM AND FINALISE LINE SIZES DURING DETAILED DESIGN.
- EPC CONTRACTOR TO RECONFIRM AND FINALISE EQUIPMENT DETAILS/ELEVATIONS DURING DETAILED DESIGN.
- DETAILS OF OPEN DRAIN (UNDERGROUND SYSTEM) TO BE DEVELOPED DURING EPC PHASE.
- ALARMS AND ESD SET POINTS TO BE PROVIDED BY EPC.

NOTES:

- DRAINS CONNECTIONS RECONFIGURED SO THAT ALL CONNECTIONS TO HRSG 11/12 PIPING ARE SEGREGATED FROM HRSG 13 PIPING-EPC CONTRACTOR TO CONFIRM.
- VENT TO ATMOSPHERE AT SAFE LOCATION.
- CONNECTIONS SHOWN ARE TYPICAL AND PRELIMINARY AND SHALL BE CONFIRMED AND OPTIMISED BY EPC CONTRACTOR.
- ORDER OF DRAINS MAY BE CHANGED DUE TO PIPING LAYOUT.

GM PLANT DRAINAGE SYSTEM  
 HAD EVAPORATOR SYSTEM  
 LCL STEAM GENERATOR DRAINS SYSTEM

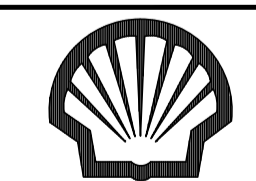
A1UHA EXISTING BOILER HOUSE  
 UHA BOILER HOUSE  
 UHY PIPE BRIDGE  
 UMY BRIDGE STRUCTURE

HOLDS:

ER1A	900	465	7	d
ER1A	900	465	30	c
AA1A	150	180	7	b
AA1A	150	180	11.5	a

WERKSTOFF DER ROHRLEITUNG PIPING MATERIAL	ANSI-KLASSE ANSI-CLASS	ZUL. BETRIEBS-TEMPERATUR MAX. ALLOWABLE WORKING TEMP. t <sub>zul</sub> IN °C	ZUL. BETRIEBS-UEBERDRUCK MAX. ALLOWABLE WORKING PRESS. P <sub>e,zul</sub> IN barg	AUSLEGUNGS-ABSCHNITT DESIGN SECTION
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Rev	Date	Revision Object	Written by	Checked by	Approved by



**PETERHEAD  
CCS (ONSHORE)**

**PETERHEAD CCS PROJECT**

**PIPING AND INSTRUMENTATION DIAGRAM**

**STEAM GENERATOR DRAINS HRSG 11 & 12 FLASH TANK**

DOC. CLASS:	SCALE: NTS	SHEET: 1/1
CLIENT Doc. Ref:	PCCS-01-TC-PX-2365-00039-001	REVISION FORMAT
		K01 A1





13LCM03  
BB010  
BLOCK 2 CLEAN DRAINS VESSEL

INSIDE DIAMETER/TAN TO TAN : 1500/3200 (mm/mm)  
DESIGN PRESS./TEMP : 7.0/530 (Barg/°C)  
INSULATION TYPE : PP  
TRIM LINE NUMBER :

13LCM03  
AP010/020  
SEGREGATED CLEAN DRAINS RETURN PUMP (HRSG 13)

DESIGN PRESS./TEMP : 9.5/180 (Barg/°C)  
RATED FLOW : 126.5 (m³/h)  
RATED DIFF. PRESS : 1.1 (Bar)  
INSULATION SPEC : PP  
TRIM LINE NUMBER :

- GENERAL NOTES:
- FOR STANDARD SYMBOLS AND NOMENCLATURE SEE DRAWINGS PCCS-00-TC-PX-2365-00002-001 TO PCCS-00-TC-PX-2365-00008-001.
  - ALL VENTS AND DRAINS TO BE DN20 UNLESS OTHERWISE INDICATED.
  - 
  - FOR INTERLOCKS, REFER TO CAUSE AND EFFECT DIAGRAM; DOCUMENT NUMBER PCCS-01-TC-IN-6604-00001.
  - EPC CONTRACTOR TO RECONFIRM AND FINALISE LINE SIZES DURING DETAILED DESIGN.
  - EPC CONTRACTOR TO RECONFIRM AND FINALISE EQUIPMENT DETAILS/ELEVATIONS DURING DETAILED DESIGN.
  - DETAILS OF OPEN DRAIN (UNDERGROUND SYSTEM) TO BE DEVELOPED DURING EPC PHASE.
  - ALARMS AND ESD SET POINTS TO BE PROVIDED BY EPC.
  - CONNECTIONS SHOWN ARE TYPICAL AND PRELIMINARY AND SHALL BE CONFIRMED AND OPTIMISED BY EPC CONTRACTOR.

- NOTES:
- DRAINS CONNECTIONS RECONFIGURED SO THAT ALL CONNECTIONS TO HRSG 11/12 PIPING ARE SEGREGATED FROM HRSG 13 PIPING-EPC CONTRACTOR TO CONFIRM.
  - VENT TO ATMOSPHERE AT SAFE LOCATION.
  - ORDER OF DRAINS MAY BE CHANGED DUE TO PIPING LAYOUT.

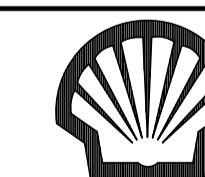
- LBA80 LP MAIN STEAM PIPING SYSTEM  
LBA10 HP MAIN STEAM PIPING SYSTEM  
LBB HOT REHEAT PIPING SYSTEM  
LCM CLEAN DRAINS SYSTEM  
UMA STEAM TURBINE BUILDING

HOLDS:

AA1A	150	180	9.5	e
ER1A	900	545	30	d
DA1A	600	400	7	c
ER1A	900	530	7	b
AA1A	150	180	7	a

WERKSTOFF DER ROHRLEITUNG	ANSI-KLASSE	ZUL. BETRIEBS-TEMPERATUR MAX. ALLOWABLE WORKING TEMP. t <sub>zul</sub> IN °C	ZUL. BETRIEBS-UEBERDRUCK MAX. ALLOWABLE WORKING PRESS. P <sub>e,zul</sub> IN barg	AUSLEGUNGS-ABSCHNITT DESIGN SECTION
PIPING MATERIAL	ANSI-CLASS			

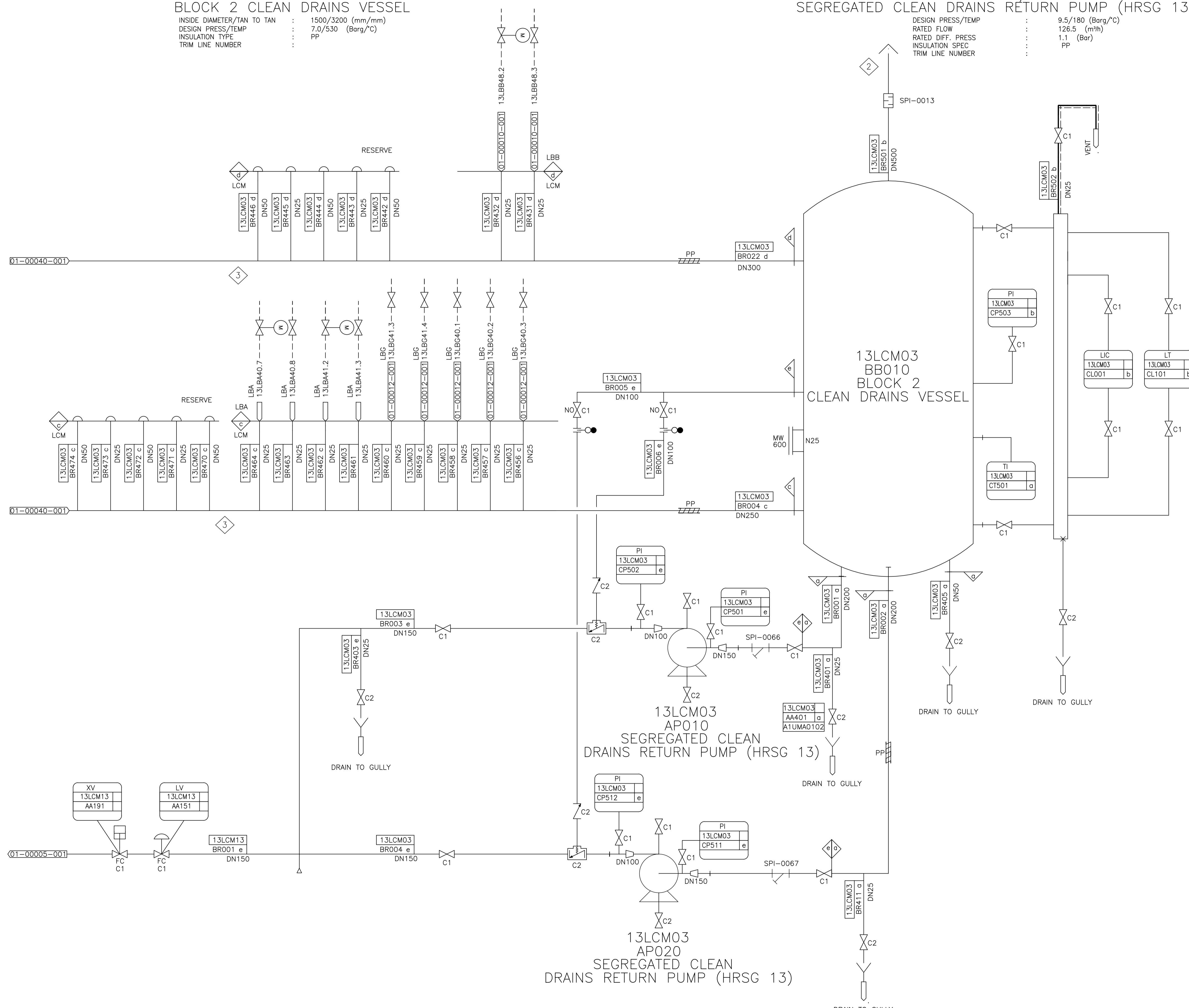
Rev	Date	Revision Object	Written by	Checked by	Approved by

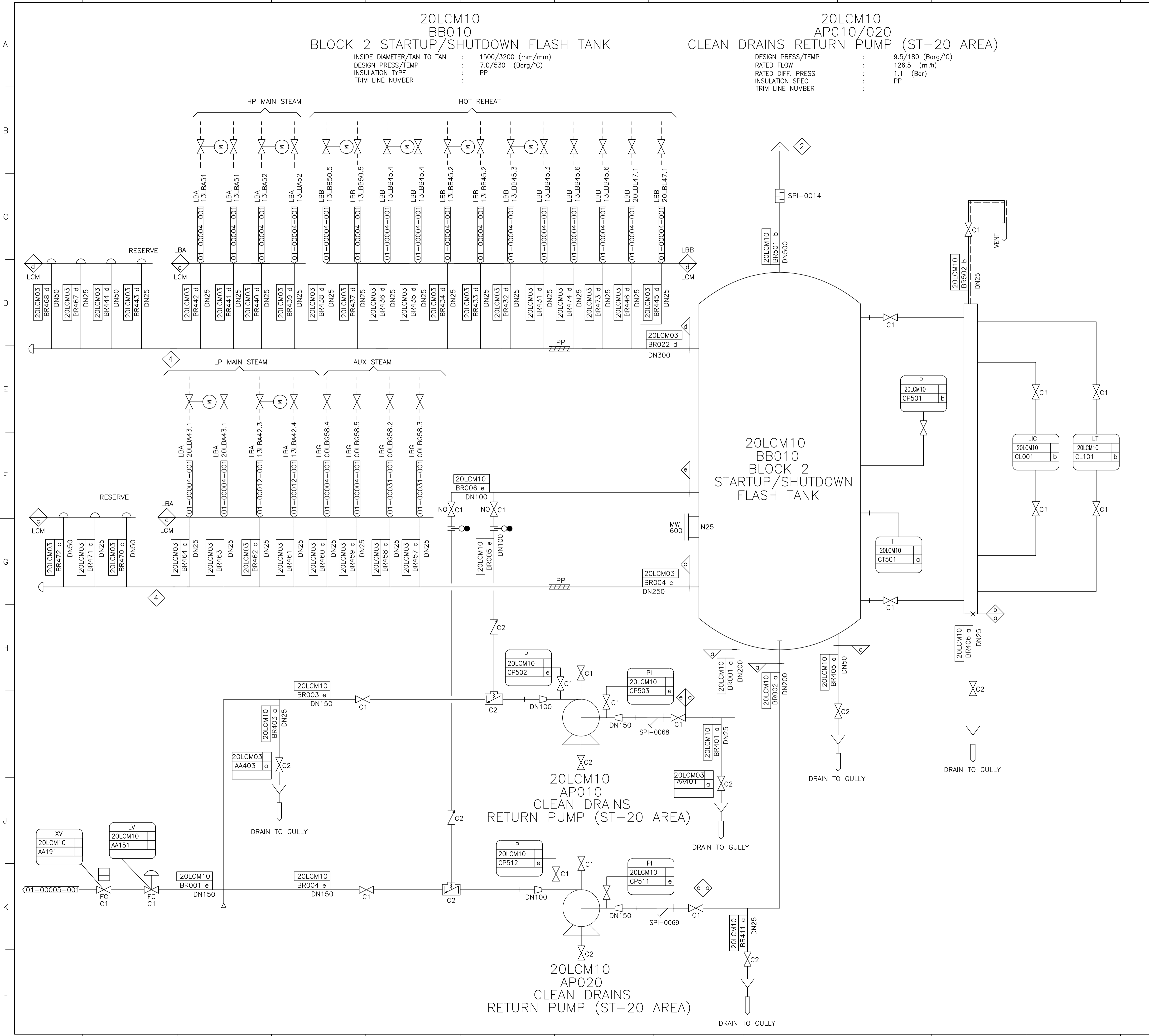


PETERHEAD  
CCS (ONSHORE)  
PETERHEAD CCS PROJECT  
PIPING AND INSTRUMENTATION DIAGRAM  
CLEAN DRAINS SYSTEM BLOCK 2

DOC. CLASS:	SCALE: NTS	SHEET: 1/1
CLIENT Doc. Ref:	PCCS-01-TC-PX-2365-00041-001	REVISION K01 FORMAT A1

LAST REV DATE:





**20LCM10  
BB010  
BLOCK 2 STARTUP/SHUTDOWN FLASH TANK**

INSIDE DIAMETER/TAN TO TAN : 1500/3200 (mm/mm)  
 DESIGN PRESS/TEMP : 7.0/530 (Barg/°C)  
 INSULATION TYPE : PP  
 TRIM LINE NUMBER :

**20LCM10  
AP010/020  
CLEAN DRAINS RETURN PUMP (ST-20 AREA)**

DESIGN PRESS/TEMP : 9.5/180 (Barg/°C)  
 RATED FLOW : 126.5 (m³/h)  
 RATED DIFF. PRESS : 1.1 (Bar)  
 INSULATION SPEC : PP  
 TRIM LINE NUMBER :

- GENERAL NOTES:**
- FOR STANDARD SYMBOLS AND NOMENCLATURE SEE DRAWINGS PCCS-00-TC-PX-2365-00002-001 TO PCCS-00-TC-PX-2365-00008-001.
  - ALL VENTS AND DRAINS TO BE DN20 UNLESS OTHERWISE INDICATED.
  - 
  - FOR INTERLOCKS, REFER TO CAUSE AND EFFECT DIAGRAM; DOCUMENT NUMBER PCCS-01-TC-IN-6604-00001.
  - EPC CONTRACTOR TO RECONFIRM AND FINALISE LINE SIZES DURING DETAILED DESIGN.
  - EPC CONTRACTOR TO RECONFIRM AND FINALISE EQUIPMENT DETAILS/ELEVATIONS DURING DETAILED DESIGN.
  - DETAILS OF OPEN DRAIN (UNDERGROUND SYSTEM) TO BE DEVELOPED DURING EPC PHASE.
  - ALARMS AND ESD SET POINTS TO BE PROVIDED BY EPC.

- NOTES:**
- DRAINS CONNECTIONS RECONFIGURED SO THAT ALL CONNECTIONS TO HRSG 11/12 PIPING ARE SEGREGATED FROM HRSG 13 PIPING-EPC CONTRACTOR TO CONFIRM.
  - VENT TO ATMOSPHERE AT SAFE LOCATION.
  - CONNECTIONS SHOWN ARE TYPICAL AND PRELIMINARY AND SHALL BE CONFIRMED AND OPTIMISED BY EPC CONTRACTOR.
  - ORDER OF DRAINS MAY BE CHANGED DUE TO PIPING LAYOUT.


- LEGEND:**
- LBA80 LP MAIN STEAM PIPING SYSTEM
  - LBA10 HP MAIN STEAM PIPING SYSTEM
  - LBB HOT REHEAT PIPING SYSTEM
  - LCM CLEAN DRAINS SYSTEM
  - UMA STEAM TURBINE BUILDING

**HOLDS:**

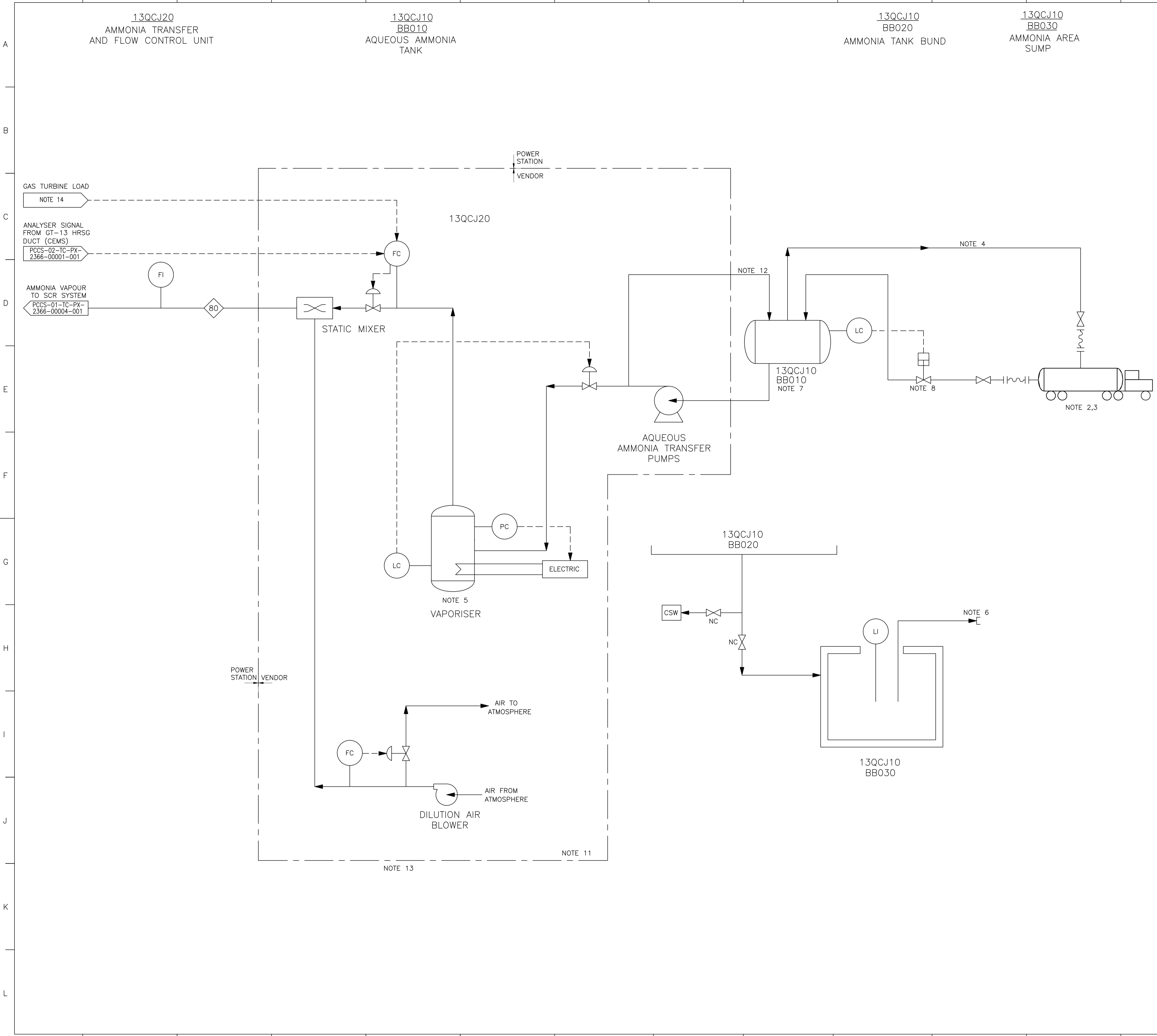
Item	Quantity	Unit	Material	Designation
AA1A	150			e
EA1A	900			d
BA1A	300			c
EA1A	900			b
AA1A	150			a

WERKSTOFF DER ROHRLEITUNG	ANSI-KLASSE	ZUL. BETRIEBS-TEMPERATUR MAX. ALLOWABLE WORKING TEMP. t <sub>zul</sub> IN °C	ZUL. BETRIEBS-UEBERDRUCK MAX. ALLOWABLE WORKING PRESS. P <sub>e,zul</sub> IN bar	AUSLEGUNGS-ABSCHNITT DESIGN SECTION
PIPING MATERIAL	ANSI-CLASS			

Rev	Date	Revision Object	Written by	Checked by	Approved by

  
**PETERHEAD CCS (ONSHORE)**  
**PETERHEAD CCS PROJECT**  
**PIPING AND INSTRUMENTATION DIAGRAM**  
**CLEAN DRAINS SYSTEM STEAM TURBINE 20**

DOC. CLASS:	SCALE: NTS	SHEET: 1/1
CLIENT Doc. Ref.:	PCCS-01-TC-PX-2365-00042-001	REVISION FORMAT
		K01 A1



**GENERAL NOTES**

- FOR STANDARD SYMBOLS REFER TO LEGEND SHEET PCCS-00-TC-PX-2366-00001-001.
- FOR HEAT AND MATERIAL BALANCE REFER TO DOCUMENT NUMBER PCCS-01-TC-PX-8240-00001.

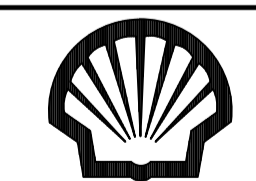
**NOTES**

- DELETED.
- AMMONIA UNLOADING PUMP LOCATED ON ROAD TANKER.
- LOCATE SAFETY SHOWER/EYEWASH UNIT AT TANKER UNLOADING BAY.
- VAPOUR BALANCING CONNECTION DURING TANKER UNLOADING.
- VAPOURIZER TO BE PROVIDED WITH DEMIN WATER UTILITY CONNECTION FOR OFFLINE BLOWDOWN REMOVAL, RESIDUE SENT TO WWTP VIA VACUUM TRUCK OR BULK CONTAINER.
- VACUUM TANKER CONNECTION (ROAD ACCESS REQUIRED).
- DESIGN AQUEOUS AMMONIA TANK 13QCJ10 BB010 FOR VACUUM CONDITION.
- VALVE TO CLOSE ON HIGH LEVEL IN AQUEOUS AMMONIA TANK 13QCJ10BB010.
- AMMONIA GAS DETECTION/MONITORING TO BE PROVIDED.
- DELETED.
- VENDOR TO SPECIFY RECOMMENDED METHOD FOR CONTROL AND VAPORISATION OF INJECTED AMMONIA DURING EPC. OPTIONS FOR VAPORISATION:  
 - ELECTRIC HEATING OF AMMONIA LIQUID/AIR.  
 - HOT FLUE GAS FROM HRSG 13.
- RECIRCULATION CONTROL OF TRANSFER PUMP BY VENDOR.
- PROCESS SCHEME SHOWN HEREIN IS A TYPICAL ARRANGEMENT VENDOR SHALL DEFINE THE MOST SUITABLE OPTION.
- SIGNAL ORIGIN TO BE CONFIRMED BY EPC CONTRACTOR.

HOLDS

THIS IS A NEW PFD. ALL ITEMS SHOWN ARE NEW.

Rev	Date	Revision Object	Written by	Checked by	Approved by



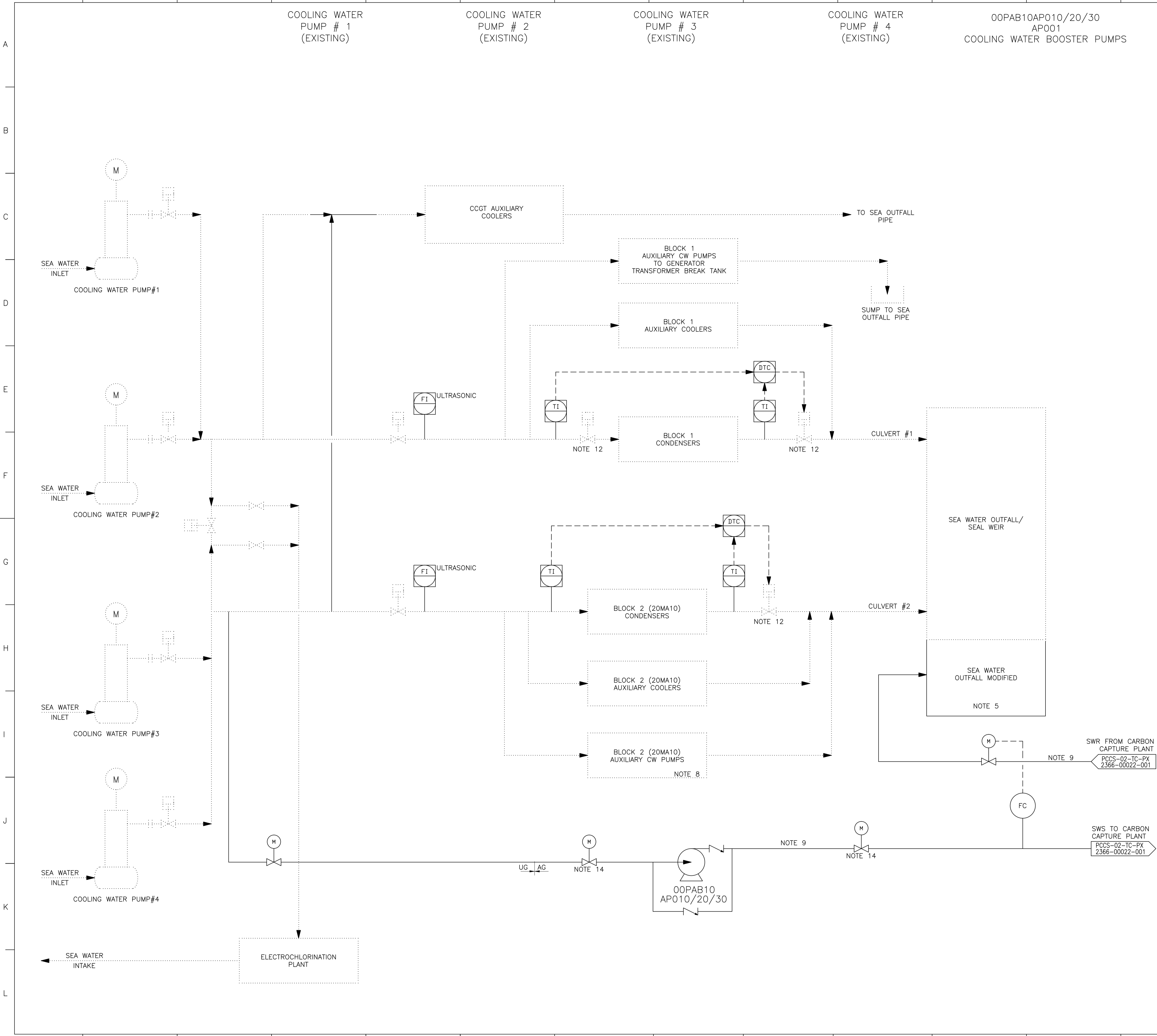
**PETERHEAD  
CCS (ONSHORE)**

**PETERHEAD CCS PROJECT**

**PROCESS FLOW SCHEME**

**AQUEOUS AMMONIA STORAGE AND TRANSFER TO SCR SYSTEM**

DOC. CLASS:	SCALE: NTS	SHEET: 1/1
CLIENT Doc. Ref:	PCCS-01-TC-PX-2366-00001-001	REVISION FORMAT K01 A1
LAST REV DATE:		



**GENERAL NOTES**

- FOR STANDARD SYMBOLS REFER TO LEGEND SHEET PCCS-00-TC-PX-2366-00001-001.
- FOR HEAT AND MATERIAL BALANCE REFER TO DOCUMENT NUMBER PCCS-01-TC-PX-8240-00001.

**NOTES**

- DELETED.
- DELETED.
- DELETED.
- DELETED.
- CULVERT#2 SIDE OF OUTFALL TO BE EXTENDED TO INSTALL NEW CCPCP SEA WATER DISCHARGE PIPING.
- DELETED.
- DELETED.
- AUXILIARY COOLING WATER TO NEW BLOCK 2 GENERATOR TRANSFORMER NOT REQUIRED. EXISTING UNIT 2 BFW PUMP OIL COOLERS OUT OF SERVICE. GENERAL SERVICE WATER COOLER REQUIREMENT TO BE DEFINED DURING FEED PHASE.
- NEW SEA WATER COOLING SUPPLY/RETURN PIPING TO/FROM CCPCP.
- DELETED.
- DELETED.
- 4 THROTTLING VALVES PROVIDED, 1 ON EACH PASS OF EACH CONDENSER.
- DELETED.
- TYPICAL SHUT-OFF VALVE ARRANGEMENT PER BOOSTER PUMP.


**HOLDS:**

..... EXISTING  
 ——— NEW

SWR FROM CARBON CAPTURE PLANT  
 PCCS-02-TC-PX-2366-00022-001

SWS TO CARBON CAPTURE PLANT  
 PCCS-02-TC-PX-2366-00022-001

Rev	Date	Revision Object	Written by	Checked by	Approved by



**PETERHEAD CCS (ONSHORE)**

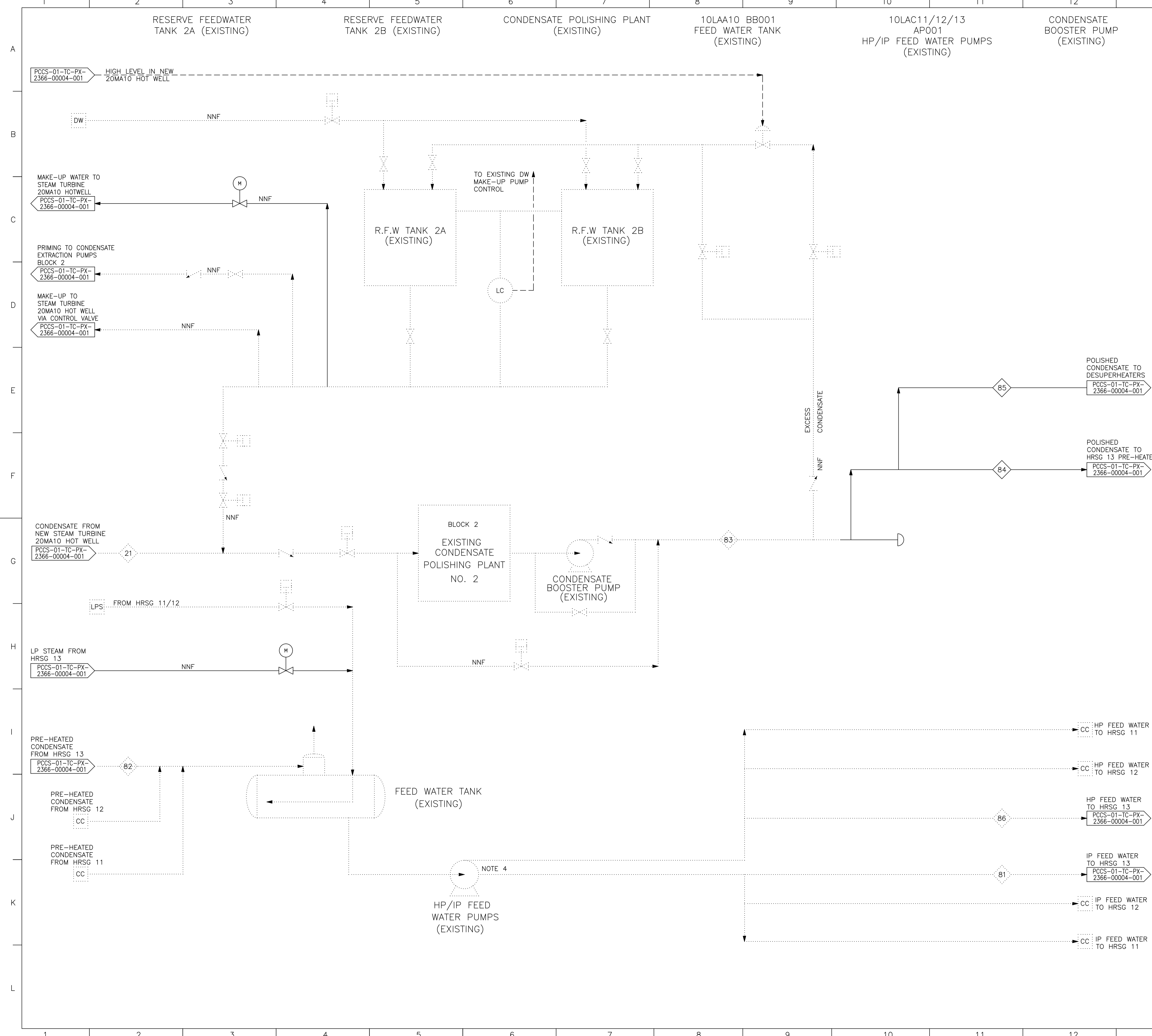
**PETERHEAD CCS PROJECT**

**UTILITY FLOW SCHEME**

**SEA WATER DISTRIBUTION SUPPLY AND RETURN**

DOC. CLASS:	SCALE: NTS	SHEET: 1/1
CLIENT Doc. Ref:	PCCS-01-TC-PX-2366-00002-001	REVISION FORMAT
		K01 A1
LAST REV DATE:		





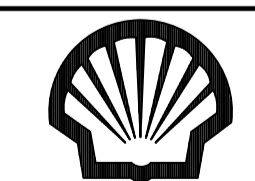
GENERAL NOTES  
 1. FOR STANDARD SYMBOLS REFER TO LEGEND SHEET PCCS-00-TC-PX-2366-00001-001.  
 2. FOR HEAT AND MATERIAL BALANCE REFER TO DOCUMENT NUMBER PCCS-01-TC-PX-8240-00001.

NOTES  
 1. DELETED.  
 2. DELETED.  
 3. EXISTING CONDENSATE LINE TO BLOCK 1 TURBINE IP BYPASS (HRSG 13) TO BE DISCONNECTED AND ISOLATED. NEW CONDENSATE LINE FOR 20MA10 BYPASSES AND DESUPERHEATER IN LP STEAM SUPPLY TO CCP WITHIN 20MA10 SCOPE OF SUPPLY.  
 4. EXISTING MULTI-STAGE FEED WATER PUMPS CONTROL PHILOSOPHY AND HYDRAULIC CIRCUIT TO BE REVIEWED DURING FEED PHASE.

HOLDS

..... EXISTING  
 \_\_\_\_\_ NEW

Rev	Date	Revision Object	Written by	Checked by	Approved by



**PETERHEAD  
 CCS (ONSHORE)**

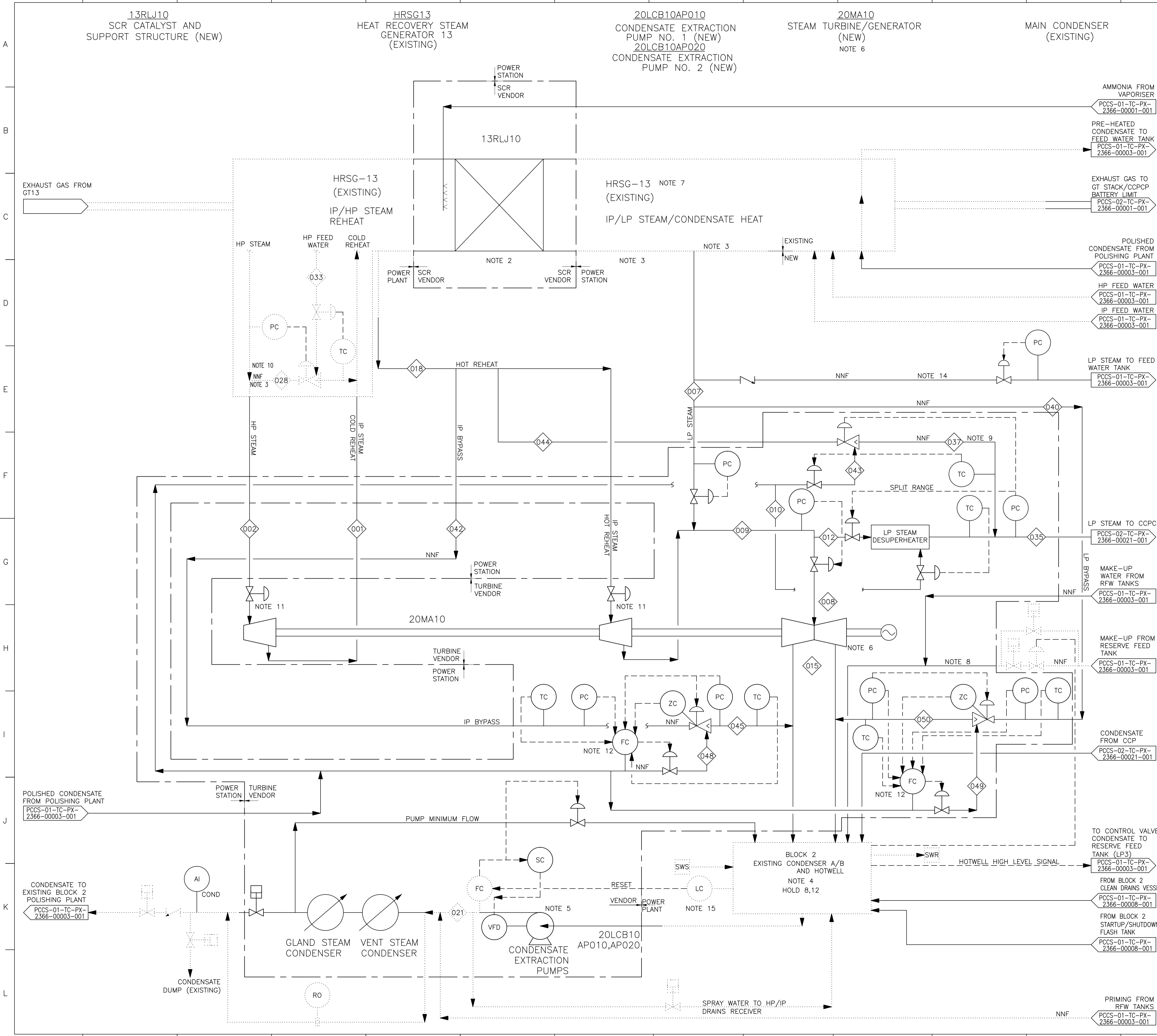
**PETERHEAD CCS PROJECT**

**PROCESS FLOW SCHEME**

**CONDENSATE POLISHING AND FEED WATER TANK**

DOC. CLASS:	SCALE: NTS	SHEET: 1/1
CLIENT Doc. Ref:	PCCS-01-TC-PX-2366-00003-001	REVISION FORMAT
		K01 A1
		LAST REV DATE:






- GENERAL NOTES
- FOR STANDARD SYMBOLS REFER TO LEGEND SHEET PCCS-00-TC-PX-2366-00001-001.
  - FOR HEAT AND MATERIAL BALANCE REFER TO DOCUMENT NUMBER PCCS-01-TC-PX-8240-00001.
- NOTES
- DELETED.
  - NEW SCR UNIT TO BE POSITIONED IN HRSG SPACE ALLOCATED FOR FUTURE NOX REMOVAL CATALYST.
  - PFD SHOWS NEW PIPING CONNECTIONS FROM EXISTING HRSG-13 TO NEW STEAM TURBINE 20MA10. UNIT 1 EXISTING STEAM TURBINE CONNECTIONS TO HRSG-13 VIA COMMON MANIFOLD TO BE ISOLATED.
  - EXISTING BLOCK 2 MAIN CONDENSER MODIFIED FOR NEW CAPACITY AND CARBON CAPTURE PLANT TIE-IN.
  - NEW VARIABLE SPEED DRIVEN PUMPS TO REPLACE EXISTING PUMPS.
  - NEW STEAM TURBINE 20MA10 AND NEW AIR-COOLED GENERATOR TO REPLACE EXISTING UNIT 2 STEAM TURBINE/GENERATOR.
  - EXISTING HRSG13 AND ASSOCIATED LOCAL PIPING, STEAM DRUMS AND CONTROL VALVES CONTAINED WITHIN THIS BOX.
  - ON LOW LEVEL IN HOTWELL, MAKE-UP WATER FROM RESERVE FEEDWATER TANK VIA EXISTING CONTROL VALVE.
  - LP STEAM TO CCPCP DURING 20MA10 START-UP OR TRIP.
  - EXISTING HP STEAM BYPASS LOCATED AT HRSG-13, TO BE RE-USED.
  - STOP/GOVERNOR VALVE.
  - ALGORITHMIC TEMPERATURE CONTROL.
  - REMOVAL/RE-USE OF EXISTING UNIT 2 STEAM TURBINE AUXILIARY SYSTEMS TO BE CONSIDERED DURING FEED PHASE.
  - LP STEAM TO FEEDWATER TANK DURING BLOCK 1 SHUTDOWN.
  - EPC CONTRACTOR SHALL ASSESS IF THE EXISTING LEVEL CONTROLLER IS SUITABLE FOR THE NEW SERVICE.

HOLDS:

..... EXISTING  
 \_\_\_\_\_ NEW

Rev	Date	Revision Object	Written by	Checked by	Approved by



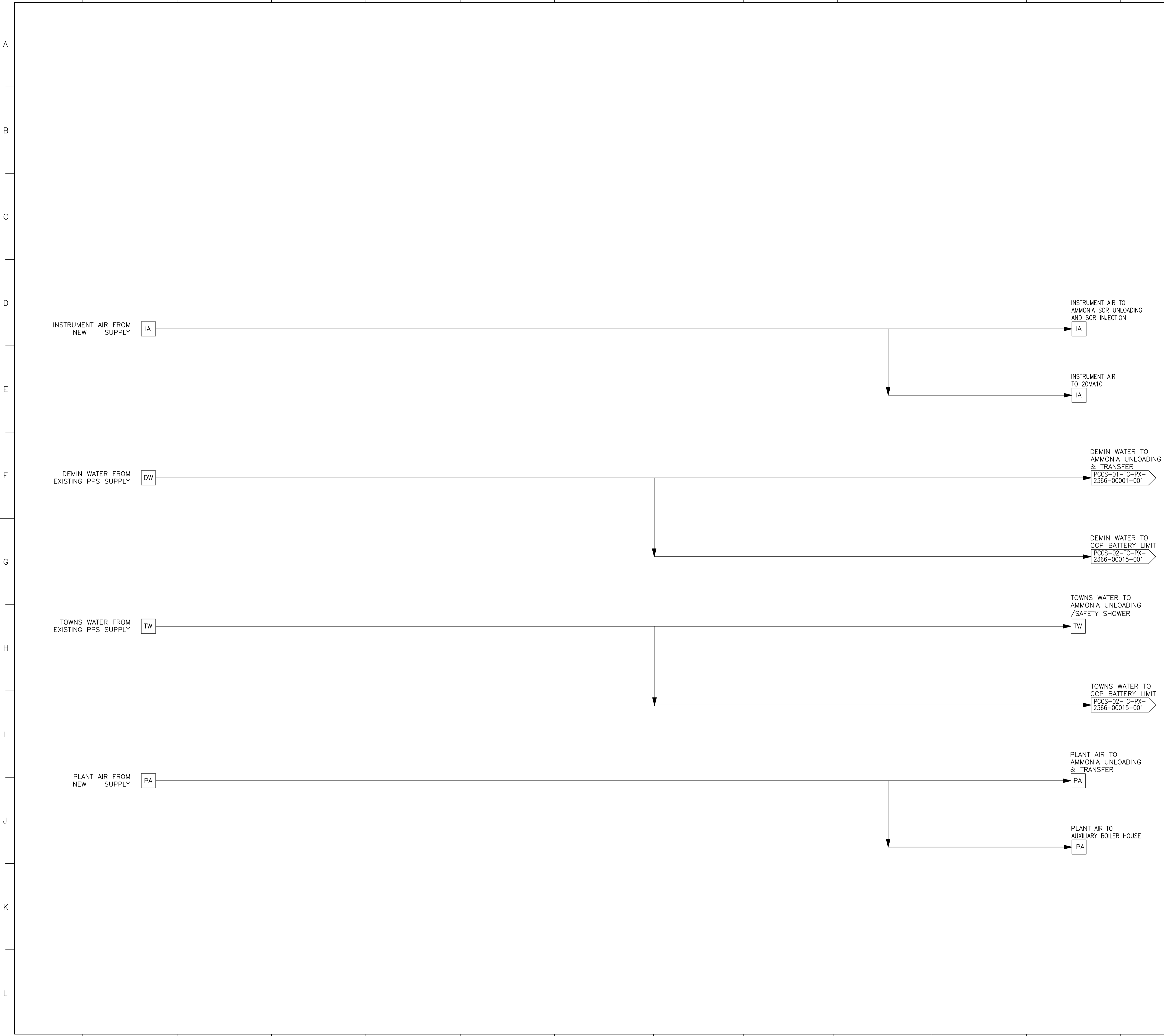
**PETERHEAD CCS (ONSHORE)**

**PETERHEAD CCS PROJECT**

**PROCESS FLOW SCHEME**

**GENERATION FACILITIES HRSG13 & ST20**

DOC. CLASS:	SCALE: NTS	SHEET:
CLIENT Doc. Ref:	PCCS-01-TC-PX-2366-00004-001	REVISION FORMAT
	K01	A1
LAST REV DATE:		



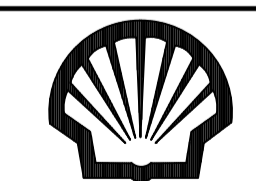
GENERAL NOTES  
 1. FOR STANDARD SYMBOLS REFER TO LEGEND SHEET PCCS-00-TC-PX-2366-00001-001.  
 2. FOR HEAT AND MATERIAL BALANCE REFER TO DOCUMENT NUMBER PCCS-01-TC-PX-8240-00001.

NOTES  
 1. DELETED.  
 2. EXISTING TOWNS WATER, DEMINERALISED WATER SYSTEMS TO BE EXTENDED TO INCLUDE GENERATION FACILITIES AND CARBON CAPTURE AND COMPRESSION PLANT SCOPE OF WORK.

HOLDS

THIS IS A NEW PFD. ALL ITEMS SHOWN ARE NEW.

Rev	Date	Revision Object	Written by	Checked by	Approved by



**PETERHEAD  
CCS (ONSHORE)**

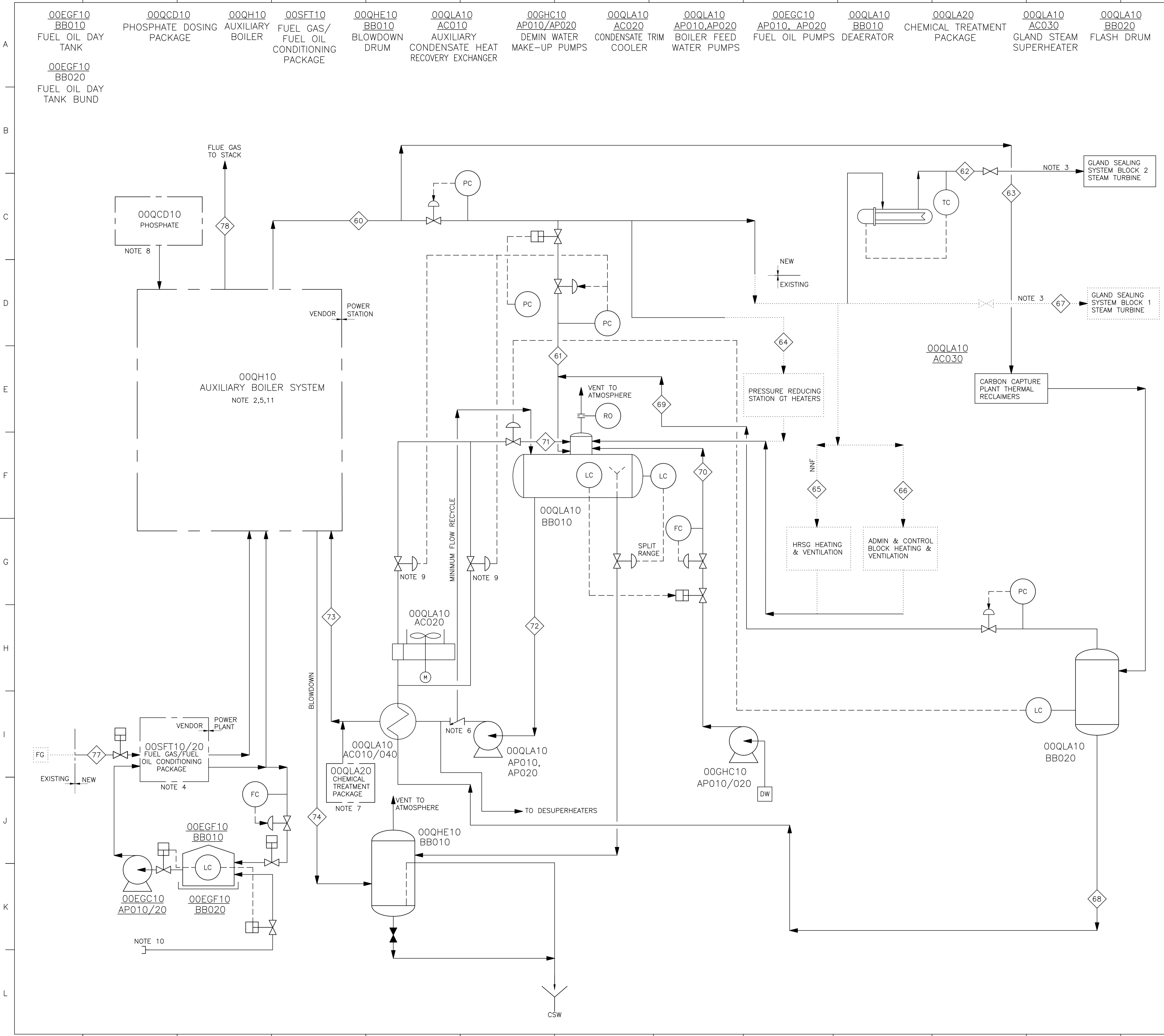
**PETERHEAD CCS PROJECT**

**UTILITY FLOW SCHEME**

**ADDITIONAL GENERATION FACILITIES AND CCPCP UTILITY DISTRIBUTION**

DOC. CLASS:	SCALE: NTS	SHEET: 1/1
CLIENT Doc. Ref:	PCCS-01-TC-PX-2366-00005-001	REVISION FORMAT
		K01 A1
		LAST REV DATE:

FILESPEC:



**GENERAL NOTES**

- FOR STANDARD SYMBOLS REFER TO LEGEND SHEET PCCS-00-TC-PX-2366-00001-001.
- FOR HEAT AND MATERIAL BALANCE REFER TO DOCUMENT NUMBER PCCS-01-TC-PX-8240-00001.

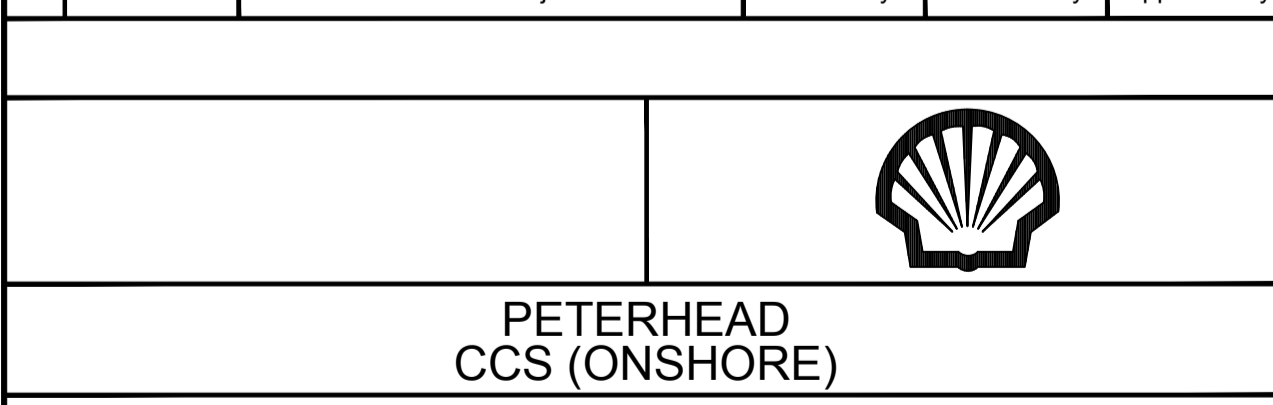
**NOTES**

- DELETED.
- EXISTING AUXILIARY BOILER HOUSE AND ASSOCIATED EQUIPMENT, PIPING AND INSTRUMENTATION TO BE DEMOLISHED. NEW AUXILIARY BOILERS TO BE INSTALLED IN NEW LOCATION.
- STEAM TURBINE START-UP DEMAND ONLY, LINE NORMALLY KEPT WARM BY PURGING STEAM VIA RESTRICTION ORIFICE LOCATED IN DRAIN LINE UPSTREAM OF ACTIVATED VALVE AT TURBINE.
- FUEL GAS SKID TO INCLUDE GAS FILTER, FLOW METER, PRESSURE LETDOWN AND GAS CONDITIONING SYSTEM.
- BOILER PACKAGE TO INCLUDE SUPERHEATER, BURNERS, FLUE GAS DUCTING TO ATMOSPHERE VIA NEW STACK AND STEAM FLOW METER MONITORING SYSTEM SHOULD BE PROVIDED TO ANALYSE NO<sub>x</sub> CONTENT TO FLUE GAS TO ENSURE LEGAL EMISSION LEVELS ARE MET.
- AUTO RECIRCULATION VALVE.
- AMINE INJECTION FOR pH CONTROL VENDOR TO ADVISE.
- PHOSPHATE DOSING.
- REVERSE ACTING VALVES.
- FOR FILLING FUEL OIL DAY TANK FROM ROAD TANKER.
- NUMBER OF AUXILIARY BOILER UNITS BY VENDOR.

HOLDS

..... EXISTING  
 ——— NEW

Rev	Date	Revision Object	Written by	Checked by	Approved by



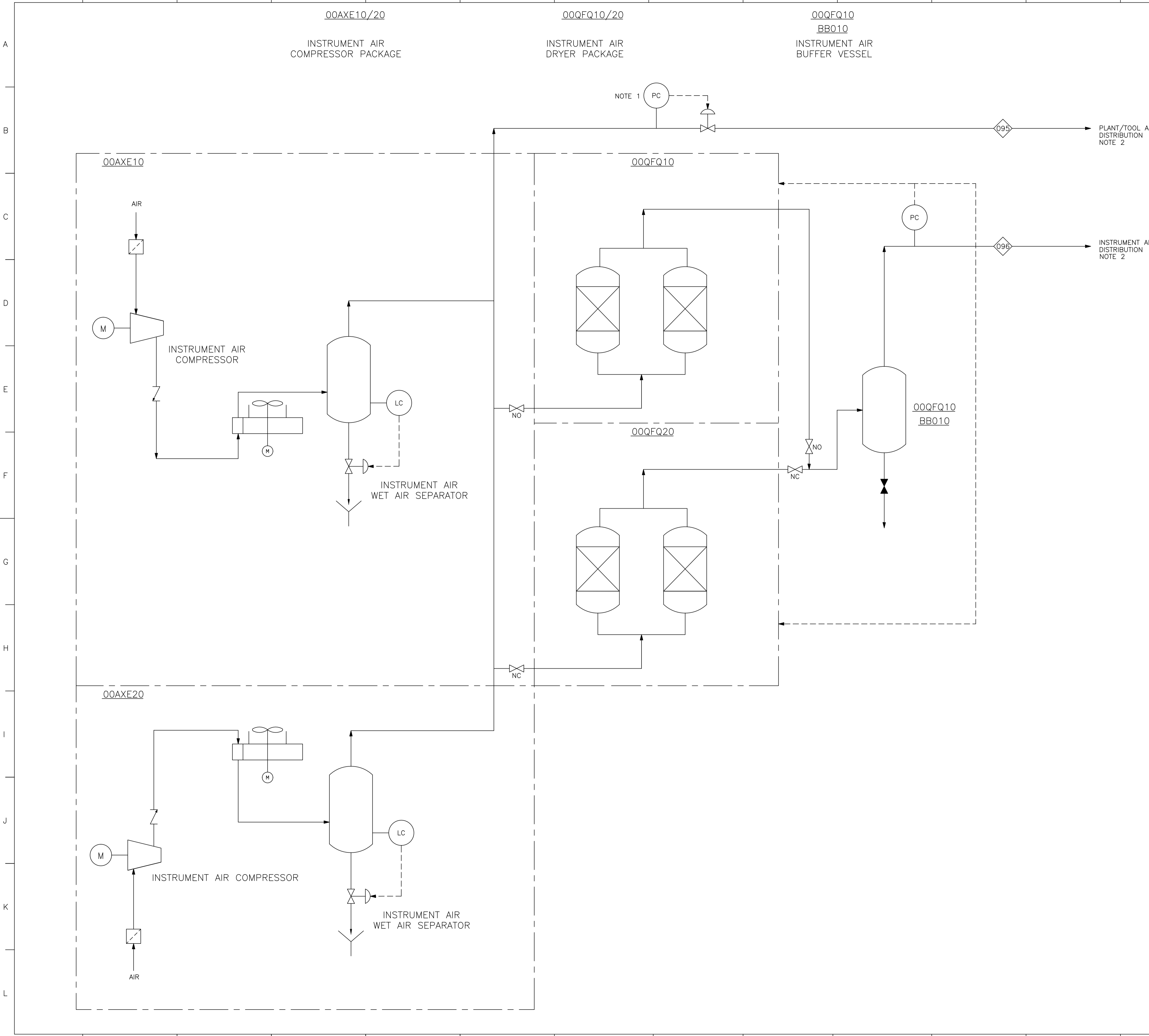
**PETERHEAD CCS (ONSHORE)**

**PETERHEAD CCS PROJECT**

**PROCESS FLOW SCHEME**

**NEW AUXILIARY BOILERS AND STEAM DISTRIBUTION**

DOC. CLASS:	SCALE: NTS	SHEET: 1/1
CLIENT Doc. Ref:	PCCS-01-TC-PX-2366-00006-001	REVISION FORMAT
		K01 A1




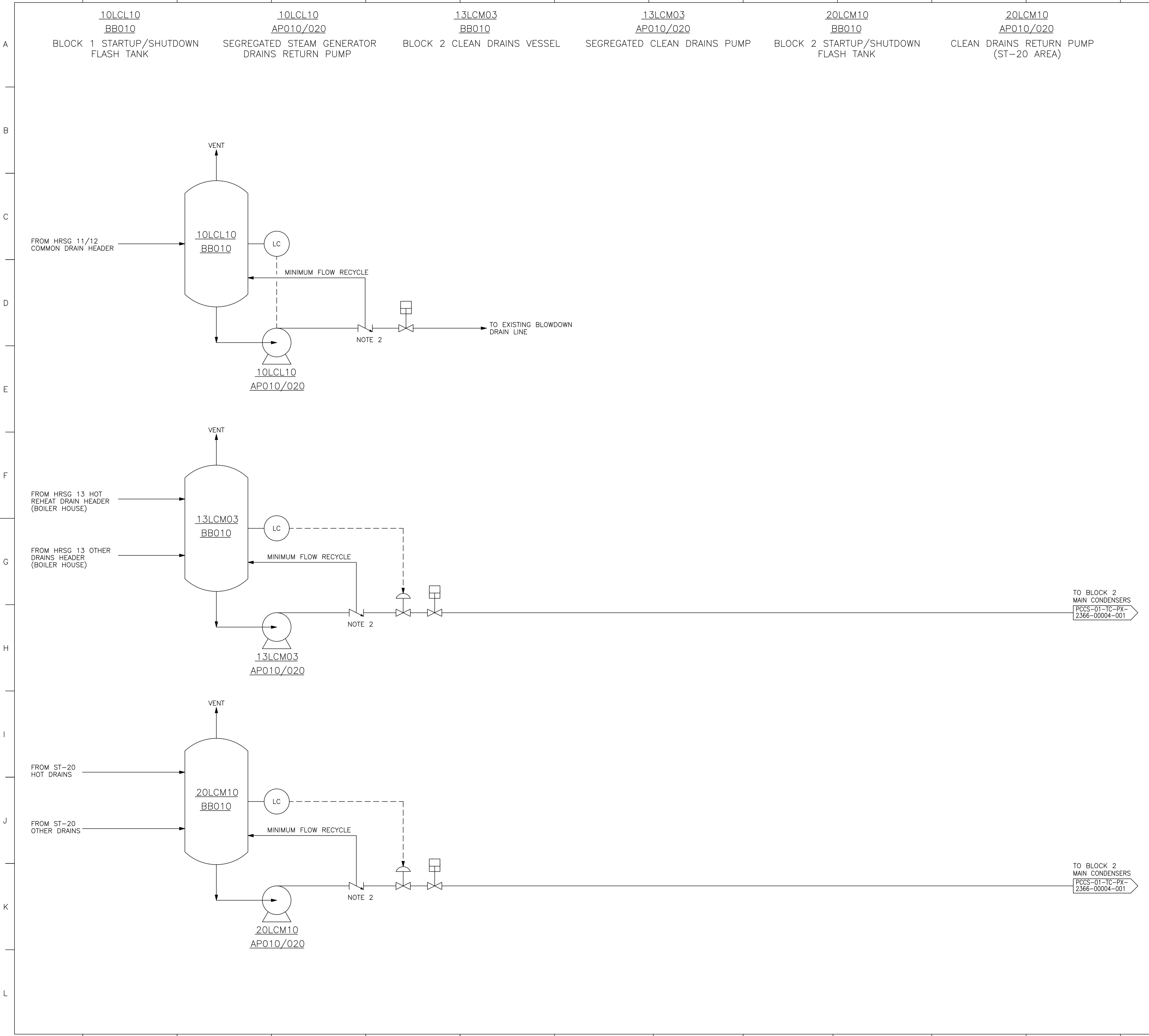
GENERAL NOTES:  
 1. FOR STANDARD SYMBOLS REFER TO LEGEND SHEET PCCS-00-TC-PX-2366-00001-001.  
 2. FOR HEAT AND MATERIAL BALANCE REFER TO DOCUMENT NUMBER PCCS-01-TC-PX-8240-00001.

NOTES:  
 1. MINIMUM PRESSURE CONTROLLER.  
 2. SUPPLY TO AUXILIARY BOILER HOUSE BLOCK 2 (HRSG13 & GT13) SCR & AMMONIA SYSTEM

HOLDS

Rev	Date	Revision Object	Written by	Checked by	Approved by

 <b>PETERHEAD CCS (ONSHORE)</b>	
<b>PETERHEAD CCS PROJECT</b> <b>UTILITY FLOW SCHEME</b> <b>NEW POWER PLANT INSTRUMENT AIR SYSTEM</b>	
DOC. CLASS:	SCALE: NTS
CLIENT Doc. Ref:	SHEET: 1/1
PCCS-01-TC-PX-2366-00007-001	REVISION FORMAT
	K01 A1
LAST REV DATE:	

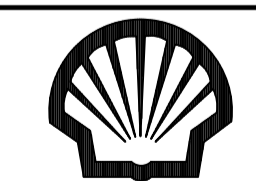


GENERAL NOTES:  
 1. FOR STANDARD SYMBOLS REFER TO LEGEND SHEET PCCS-00-TC-PX-2366-00001-001.  
 2. FOR HEAT AND MATERIAL BALANCE REFER TO DOCUMENT NUMBER PCCS-01-TC-PX-8240-00001.

NOTES:  
 1. ARRANGEMENT OF DRAINS SYSTEM TO BE REVIEWED AND OPTIMISED BY EPC CONTRACTOR.  
 2. AUTO RECIRCULATION VALVE.

HOLDS

Rev	Date	Revision Object	Written by	Checked by	Approved by

 <b>PETERHEAD CCS (ONSHORE)</b>	
<b>PETERHEAD CCS PROJECT</b> <b>UTILITY FLOW SCHEME</b> <b>STEAM DRAINS COLLECTION SYSTEM</b>	
DOC. CLASS:	SCALE: NTS
CLIENT Doc. Ref:	SHEET: 1/1
PCCS-01-TC-PX-2366-00008-001	REVISION FORMAT
K01	A1
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## Peterhead CCS Project

**Doc Title: Process Description (CCS Project ‘Generation Facilities’)**

Doc No. **PCCS-01-TC-PX-5527-00001**

Revision: **K01**

### **KEYWORDS**

Goldeneye, CO<sub>2</sub>, Carbon Capture and Storage, Process Description.





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## 1. Introduction

This document presents the Process Description of Generation Facilities which forms part of the Peterhead CCS Project.

The existing power generation facilities at the Peterhead Power Station are to be modified in order to provide a flue gas feedstock to the new Carbon Capture Plant. The existing combined cycle power station has three gas turbines (GT-11/12/13) which generate electricity. Exhaust gas is used by associated steam generators (HRSG-11/12/13) in order to drive the Block 1 steam turbine which generates additional electricity.

Flue gas to the Carbon Capture Plant will be fed from GT-13 via HRSG-13. The steam generated from HRSG-13 will be used to drive a new steam turbine which will replace the existing redundant Unit 2 steam turbine. The other two gas turbines (GT-11/12) and steam generators (HRSG-11/12) will continue to raise steam to drive the Block 1 steam turbine.

## 2. Process Description

A brief process description for the generation facilities new and modified equipment is given herein. Please refer to process flow schemes (PFSs) which are referenced at the beginning of each section and summarised below.

**Table 2-1: Process flow schemes**

PFS Number	PFS title
PCCS-01-TC-PX-2366-00001	Aqueous Ammonia Storage And Transfer To SCR System
PCCS-01-TC-PX-2366-00002	Sea Water Distribution Supply And Return
PCCS-01-TC-PX-2366-00003	Condensate Polishing And Feed Water Tank
PCCS-01-TC-PX-2366-00004	Generation Facilities HRSG 13 & ST20
PCCS-01-TC-PX-2366-00005	Additional Generation Facilities And CCPCP Utility Distribution
PCCS-01-TC-PX-2366-00006	New Auxiliary Boilers And Steam Distribution
PCCS-01-TC-PX-2366-00007	New Power Plant Instrument Air System
PCCS-01-TC-PX-2366-00008	Steam Drains Collection System
PCCS-02-TC-PX-2366-00001	(CCCP) Pre-treatment: Booster Fan

### 2.1. Selective Catalytic Reduction Unit

The purpose of the SCR Unit is to reduce NO<sub>x</sub> concentration in the flue gas from HRSG-13 by injecting ammonia in the gas stream upstream of a catalyst bed before it passes to the capture plant. Nitrogen Oxides (primarily NO and NO<sub>2</sub>) form during the combustion of natural gas. The reduction of NO<sub>x</sub> in the exhaust gas is critical for the CCP system. The presence of NO<sub>2</sub> in the flue gas results in amine solvent degradation, increased amine waste generation in the reclaimer unit and formation of harmful nitrosamines.



The SCR section is designed to ensure NO<sub>x</sub> concentration in flue gas entering CCP is less than or equal to 1 ppm<sub>v</sub> on a dry basis. This is based on normal case GT 100% flow conditions of 12.8% O<sub>2</sub> and 7.7% H<sub>2</sub>O. For clarity, this equates to 2.76ppmv (dry) at 3% O<sub>2</sub> or 0.909 ppmv (dry) at 15% O<sub>2</sub>.

The SCR System comprises the following components:

- Aqueous Ammonia Unloading
- Aqueous Ammonia Storage and Transfer Equipment
- Ammonia Flow Control Unit
- Ammonia Injection Manifold and Ammonia Injection Grid
- SCR Catalyst on Catalyst Support Structure
- Continuous Emission Monitoring System

### ***2.1.1. Ammonia Storage and Transfer***

This description should be read in conjunction with the Process Flow Scheme Dwg No. PCCS-01-TC-PX-2366-00001.

Aqueous ammonia solution will be unloaded to the Aqueous Ammonia Tank (13QCJ10BB010) from a road tanker equipped with a pump via a coupling connection. An aqueous solution (approximately 25%w) is the preferred form as the pure anhydrous form is a hazardous and also highly volatile chemical.

In the event that a high level is reached in the tank, then the valve in the unloading line will automatically close. During the unloading operation vapour, displaced from the tank will return to the tanker vapour coupling connection via a vapour balancing line.

During the unloading operation, spills will be contained within a kerbed area, draining to the ammonia area sump. The tank will be equipped with an emergency breakaway coupling to protect against loss of ammonia during a drive-away incident during filling. Appropriate administrative protocols should be implemented to ensure that only 25%w ammonia is used to fill the tank.

From the storage tank ammonia is transferred to the Ammonia Flow Control Unit. Vaporisation of the ammonia and gaseous dilution will be achieved by the vendor chosen technology. The ammonia vapour flow to the SCR unit injection manifold upstream of the catalyst bed is controlled by the measurement of NO<sub>x</sub> and ammonia in the flue gas at the outlet of the HRSG-13.

A safety shower and eyewash will be provided at the unloading station in the event of operator exposure to aqueous ammonia.

### ***2.1.2. Ammonia Injection and Catalyst Bed***

This description should be read in conjunction with the PFS Dwg Nos. PCCS-01-TC-PX-2366-00001, PCCS-01-TC-PX-2366-00004 and PCCS-02-TC-PX-2366-00001.

The mixture of ammonia vapour and gaseous diluent (per implemented vendor technology) will be injected into the flue gas flowing through HRSG-13 upstream of the SCR Catalyst Bed (13RLJ10). The bed is located in the available space between the High Pressure (HP) Evaporator and HP Economiser sections within HRSG-13. The mixed ammonia vapour and flue gas flow through SCR Catalyst section which is a Vanadium Pentoxide-based Catalyst contained on a support structure.

The catalyst supports the chemical reaction between nitrogen oxides and ammonia, converting the reactants to nitrogen and water vapour. After the catalyst bed the flue gas is further cooled in HRSG-13 before entering the duct upstream of the existing GT Stack.

A Continuous Emission Monitoring System (CEMS) is installed in the duct: This analyses the flue gas for NH<sub>3</sub>, total NO<sub>x</sub>, O<sub>2</sub> and moisture and is used to control the rate of ammonia injection into the



SCR catalyst. The flow of flue gas fed the Carbon Capture Plant is controlled to ensure that only a small slip stream flows to atmosphere via the existing GT Stack.

## 2.2. Cooling Water (Sea Water) Distribution

This description should be read in conjunction with the PFS Dwg No. PCCS-01-TC-PX-2366-00002.

Cooling water is delivered to the existing SSE Generation Facilities on a once through basis by pumping sea water from an intake via a pumping station which consists of four Cooling Water Pumps. Sea water enters the pump suction under gravity through a tunnel via a forebay and drum screens. The four discharge lines connect into common discharge main from which Culverts No.1 and No.2 are taken. Pumps 1 and 2 are connected to Culvert No.1 and pumps 3 and 4 are connected to Culvert No.2. By opening an isolation valve between the two halves of the common discharge main, the discharge from all pumps can supply both Culvert No. 1 and Culvert No.2.

Modifications to the cooling water system will be made in order to supply sea water cooling to the carbon capture plant whilst ensuring cooling water supply to the existing power plant and modified steam turbine, ST-20, is met. Three different options are currently being investigated in order to come to the most suitable arrangement.

The modifications to the cooling water system involve adding 3 x 50% booster pumps to supply a closed loop cooling system within the CCP from existing pump discharge via a new supply pipe. Sea water is returned to the existing sea weir at the outfall via a new discharge pipe. The existing cooling water pumps remain unchanged.

A differential temperature control loop will allow throttling of the main condensers to cope with different operating scenarios.

## 2.3. Block-2 Power Generation and Steam Condensate System

The steam generated in HRSG-13 using the GT-13 flue gas heat is then fed to the new steam turbine, 20MA10, in order to generate electricity (using Generator 20MKA) which is sent to the grid. This new turbine and generator replace the existing Unit 2 turbine and generator. It has a combined HP / IP casing and two double flow LP casings.

Steam to the carbon capture plant is extracted from the IP/LP crossover line, the remaining low pressure steam passes through the LP casing. A control valve limits the pressure of steam supplied to the carbon capture plant from the crossover line. Combined with pressure control on the LP turbine inlet, this ensures that the required delivery pressure to the carbon capture plant is achieved at all times.

The LP casing exhaust is condensed under vacuum using sea water from culvert No.2 as the cooling medium. The condensate from ST20 (using new condensate extraction pumps) together with condensate returned from the CCP is pumped back to HRSG-13 via existing treatment facilities including the existing Unit 2 polishing plant.

### 2.3.1. STEAM Condensate System

This description should be read in conjunction with the PFS Dwg Nos. PCCS-01-TC-PX-2366-00003 and PCCS-01-TC-PX-2366-00004.

The exhaust steam/condensate from the LP cylinders of the steam turbine is condensed under vacuum using the main condensers located underneath. Each condenser consists of four water-boxes, two inlets and two outlets, and uses sea water cooling, which is supplied with a temperature from 5 to 15°C and returned with a maximum normal operating temperature of 27.5°C. The maximum permitted discharge temperature for sea water from the site is 32°C. Condensate at a temperature just



below saturation then enters the hot well section along with recovered steam condensate returned from the CCP with a temperature of 40°C.

The condensate level in the hot well is controlled. On low level demineralised water is supplied as make-up from the two existing Reserve Feed Water Tanks (2A and 2B). These are made up, on demand, from the Water Treatment Plant. On high level in the hot well, condensate can be returned to the RFW tanks. On high high level condensate can be discharged via a dump valve located in the Condensate Extraction Pump discharge.

Condensate from the hot well section will be pumped using new variable speed driven Condensate Extraction Pumps (20LCB35AP010/AP020) via the Steam Turbine Vent Steam Condenser and the Gland Steam Condenser to the existing Unit 2 Condensate Polishing Plant, where trace dissolved minerals and suspended matter are removed. From the polishing plant, condensate flows to the HRSG-13 Condensate Preheater. Polished condensate is used to desuperheat LP Steam supplied as extract steam to the CCPCP, as well as desuperheating the IP and LP bypass streams in the event of the steam turbine tripping or being out of service and at start-up/ shut-down. Most of the preheated condensate flows to the Feed Water Tank after mixing with pre-heated condensate from HRSG 11 and 12. The rest of the preheated condensate is fed to the LP Steam Drum on demand.

The common Feed Water Tank has a deaerator and is supplied with the polished condensate from HRSG 11, 12 and 13. LP Steam from HRSG-11 and 12 or from HRSG-13, in case of Block 1 shutdown, can be used to strip the oxygen and other dissolved gases from the condensate (however continuous deaeration is not commonly in use). The resultant feed water is pumped to the HRSG units by the HP/IP Feed Water Pumps.

### ***2.3.2. NEW Steam Turbine and HRSG-13***

This description should be read in conjunction with the PFS Dwg No. PCCS-01-TC-PX-2366-00004. Preheated condensate feeds the LP Steam drum which is part of HRSG-13. In the LP evaporator section the LP-drum condensate is converted to LP steam, which is then directed to the HRSG-13 LP-Superheater section to raise the temperature above the saturation point. LP steam leaves HRSG-13 and flows to the new Steam Turbine 20MA10. This generated LP Steam is combined with the exhaust steam from the IP-turbine in the IP/LP crossover piping. Extract LP Steam is sent to the CCPCP through a pressure letdown valve and the LP Steam Desuperheater which uses polished condensate as the desuperheating fluid, the steam to the CCPCP crosses a battery limit where reverse flow protection is implemented. The remaining steam flows to the LP turbine via a pressure control valve. This control valve is set to ensure that there is sufficient pressure at the IP exhaust to supply LP Steam to the CCP. The exhaust from the LP turbines is condensed under vacuum in the main condenser.

IP Feed Water entering HRSG-13 first flows to the IP-economiser section before it enters the IP-Drum and Evaporation section of HRSG-13. After the evaporator (i.e. from the IP drum), the IP steam enters the IP superheater. Then it mixes with the CRH and together the streams enter the reheater for further superheating, emanating as the HRH stream for admission to the IP turbine. The combined flow is then sent to the IP-turbine for electrical power generation. The exhaust steam from the IP-turbine is fed to the LP-turbine, following the extraction of LP Steam supplied to the CCP.

HP Feed Water flows to the HRSG-13 HP-economiser section. It is directed to the HP-Drum and HP-Evaporation section of HRSG-13. Generated vapour then flows to HP-Superheater. Superheated HP Steam is fed to the HP-turbine for electric power generation. The exhaust steam from the HP-turbine is Cold Reheat steam, as mentioned above.

In the event that the steam turbine trips or is out of service, whilst the GT and HRSG are in operation, bypass valves operate to divert the various levels of generated steam around the new steam turbine. HP Steam is letdown into the Cold Reheat line after desuperheating with HP Boiler Feed



Water from the Feed Water Tank. The IP and LP turbine bypasses will letdown into the main condenser after desuperheating with polished condensate. In order to ensure the supply of LP Steam to the CCP, a bypass valve is provided to letdown IP steam into the CCP LP Steam supply line after desuperheating with polished condensate.

## 2.4. Instrument Air System

This description should be read in conjunction with the Process Flow Diagram Dwg No. PCCS-01-TC-PX-2366-00007-001.

Plant and Instrument Air required for the Block 2 generation facilities is supplied by the new Instrument Air Compressor Package 00AXE10 AN010 and dried by the Air Dryer Package 00QFQ10 AT010/AT020.

Atmospheric air taken from a non-hazardous area is filtered before being compressed by the Instrument Air Compressor to about 7 barg. Wet compressed air is cooled against air condensed water is removed in the Wet Air Separator (inside the Instrument Air Compressor Package). Plant/tool air is taken directly from the Wet Air Separator for use in the Block 2 Power Generation facilities.

Instrument air is dried in Instrument Air Dryer Package to achieve a water dew point of  $-40^{\circ}\text{C}$  (at atmospheric Pressure); or at operating pressure, from a maximum oversaturation of 5%, dew point should be at least  $10^{\circ}\text{C}$  below the lowest ambient air temperature, whichever is lower at the drier outlet.

Dry instrument air is taken for use in the Block 2 Power Generation facilities through the Instrument Air Buffer Vessel 00QFQ10 BB010 where hold-up time is provided. A minimum pressure controller is provided on the plant air header to stop supply to plant air users if pressure falls below a minimum value.

## 2.5. Utility Distribution

This description should be read in conjunction with the PFS Dwg No. PCCS-01-TC-PX-2366-00005.

Instrument and Plant Air is required for ammonia unloading, transferring and injection facilities, the new Auxiliary Boiler House, HRSG-13, GT-13 and new steam turbine operation. The demand will be covered by the new Instrument and Plant Air generation facilities dedicated to the Power Generation facilities.

Supply of Demineralised Water and Towns Water to the ammonia unloading and transfer facilities as well as the CCP will be supplied from the existing PPS facilities. These services will tie in to the existing Power Station system.

## 2.6. Auxiliary Boilers

This description should be read in conjunction with the PFS Dwg No. PCCS-01-TC-PX-2366-00006.

The existing auxiliary boilers will be demolished to create plot space for the construction of the new CCP. New auxiliary boilers will be constructed on a new plot space.

A new Auxiliary Boiler system will be installed to principally provide start-up MP Steam for the Block 1 and Block 2 steam turbine gland seal system, and a continuous supply of steam to the fuel gas heaters (before pressure letdown) when GT's and Auxiliary Boiler users are operating. The CCP have identified heaters which require MP Steam and will be supplied from the Auxiliary Boilers. These are the Thermal Reclaimer Reboilers E-2203, E-2205 and E-2207.

Small continuous users are the existing Administration and Control Block as well as the HRSG Heating and Ventilation Units. Additionally there is the requirement to keep the turbine start-up





steam supply line warm. Part of the steam will be sent to Deaerator 00QLA10 BB101 under pressure control.

The boilers will be principally fired with fuel gas with back-up fuel oil for partial load. The fuel gas is supplied via a fuel gas skid which includes gas filters, flow meters, pressure letdown and gas conditioning systems. The fuel oil is also supplied by a skid containing coalescing filters. In addition a feed pump will supply fuel oil from a feed tank and provide the motive pressure for the filters. The boiler system will be supplied with a Phosphate Dosing unit, 00QCD10. A pressure controller on the MP Steam supply header will regulate the boiler firing rate in order to control the rate of steam production.

Condensate from the MP Steam users will be returned to a Flash Drum 00QLA10 BB020 running at 15 barg, or direct to a lower pressure deaerator 00QLA10 BB010 running at 5 barg, depending on the condensate return pressure. Flash vapour is returned to the deaerator under pressure control to help deaerate make-up DM water. Condensate return, regulated by level control, enters the Deaerator. The level in the deaerator will be maintained by the addition of demineralised water from the Water Treatment Plant via booster pumps 00GHA10 AP010/020. On high level, excess water will be discharged to the drain system via the overflow pipe and control valve.

The elevated operating pressure of the flash drum means that useful heat can be recovered via Auxiliary Condensate Heat Recovery Exchanger 00QLA10 AC010, to heat the boiler feed water. To reduce venting of water from the deaerator, air cooled Condensate Trim Cooler 00QLA10 AC020 passes the condensate to the deaerator.

Recovered steam condensate and make up DM water is contacted with the steam to strip off the dissolved gases in the deaerator section and vent them to atmosphere. Boiler Feed Water is discharged from the Deaerator to the Boilers on flow control via the Boiler Feed Water Pumps AP010, AP020.

The oxygen removal process within the deaerator is enhanced by adding oxygen scavenger if required through the Chemical Treatment Package 10QLA20. A Chemical dosing package for pH control is also provided.

To prevent the buildup of suspended solids and dissolved chemicals, a blowdown stream will be introduced from the boiler and routed to the Blowdown Drum 00QHE10 BB010. The drum will vent to the atmosphere and condensate will be released to Clean Storm Water system via an overflow.

### 3. Condensate Drains

This description should be read in conjunction with the PFS Dwg No. PCCS-01-TC-PX-2366-00008. Modifications will be made to clean drains and steam generator drains systems in order to provide segregation between Block 1 and Block 2. Drains connections associated with Block 1 that currently drain to vessel 13LCL10 BB010 (currently pumping via pumps 13LCL11 AP001 and 13LCL12 AP001 to the Boiler Clean Drains Vessel) are taken to a segregated new vessel 10LCL10 BB010. This new vessel returns condensate to the Boiler Clean Drains Vessel, whereas 13LCM10 BB010 will be pumped directly to the Block 2 ST condenser on level control.

In a similar way, a new vessel 13LCM03 BB010 and associated pumps will collect condensate drains from HRSG 13 on the north side of the pipe bridge (inside the turbine hall), also being pumped to the Block 2 condenser. A third vessel, 20LCM10 will collect drains local to new turbine ST20.



## 4. Glossary of Terms

<b>Term</b>	<b>Definition</b>
CCP	Carbon Capture Plant
CCPCP	Carbon Capture Plant and Compression Plant
CCS	Carbon Capture and Storage
CEMS	Continuous Emission and Monitoring System
DM	Demineralised
GT	Gas Turbine
HP	High Pressure
HRSG	Heat Recovery Steam Generator
IP	Intermediate Pressure
LP	Low Pressure
MP	Medium Pressure
NH <sub>3</sub>	Ammonia
NO	Nitric oxide
NO <sub>2</sub>	Nitrogen Dioxide
NO <sub>x</sub>	Oxides of Nitrogen
O <sub>2</sub>	Oxygen
PFS	Process Flow Scheme
PPS	Peterhead Power Station
RFW	Reserve Feed Water
SCR	Selective Catalytic Reduction
ST	Steam Turbine



# Peterhead CCS Project

**Doc Title: Utilities Requirement Report (Generation Facilities)**

Doc No.: **PCCS-01-TC-PX-7180-00005**

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## **KEYWORDS**

Goldeneye, CO<sub>2</sub>, Carbon Capture and Storage, Utilities.



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## 1. Introduction

The Peterhead Carbon Capture and Storage (CCS) Project would be the world's first commercial scale demonstration of CO<sub>2</sub> capture, transport and offshore geological storage from a (post combustion) gas-fired power station. Carbon Capture technology will be fitted to an existing gas-fired power station at Peterhead in North East Scotland, UK, at a site with sufficient space for the construction of the post combustion CO<sub>2</sub> capture plant and the compression and conditioning plant. Approximately one million tonnes of CO<sub>2</sub> will be captured from the flue gas produced by the Peterhead Power Station and stored each year in a depleted Goldeneye reservoir currently operated by Shell. After capture, the CO<sub>2</sub> will be routed to compression, also located at the Peterhead Power Station site, where it will be compressed, cooled and conditioned for water and oxygen removal to meet a suitable transportation and storage specification. Following post-compression cooling the resulting dense phase CO<sub>2</sub> stream will be transported direct offshore via a new offshore pipeline which will tie-in subsea to the existing Goldeneye pipeline. The CO<sub>2</sub> will be permanently stored in an area centered on the depleted Goldeneye gas field.

## 2. Scope of document

This document covers the requirements of the those sections of the existing power plant that are being modified by the Peterhead CCS project (Block 2). The requirements of the remainder of the existing power plant (Block 1) are included within this report for Demineralised water, Towns water and Sea Water systems where they share a combined system with Block 2. The utilities included are:

- Demineralised Water
- Towns Water
- Sea Water
- Instrument Air (Block 2)
- Service Air (except Turbine Hall)
- Fuel Oil (for the Auxiliary Boiler)
- Fuel Gas (for the Auxiliary Boiler)

The utilities not included in this report are:

- Fire Water [1]
- Waste Water Treatment
- Service Air (Turbine Hall) - where no changes are planned to the service air network
- Nitrogen - which is supplied by bottles and only required for start-up and maintenance



### 3. Assessment of Utility Requirements

#### 3.1. Demineralised Water

The major users of demineralised water are make-up to the Auxiliary Boiler and the HRSGs in Block 1 & 2.

In their response to CCS-095-TQ, SSE have stated that the current operating load of the power plant is 33 m<sup>3</sup>/h; 2/3 of this has been assumed to be required to supply Block 1 in the future.

The New Auxiliary Boiler and Block 2 HRSG are assumed to have a continuous blowdown of 1% of the total steam production in the relevant circuit and an intermittent blowdown of 5% additionally some steam is lost from the Auxiliary boiler system and this is included in the usage numbers below. This will be confirmed by the Auxiliary Boiler Vendor's requirements.

A further 1 m<sup>3</sup>/h has been allowed for other small users.

**Table 3-1: Demineralised Water**

Item	Normal Operation (m <sup>3</sup> /h)	Peak Requirement (m <sup>3</sup> /h)	Notes
Auxiliary Boiler	0.5	12.0	Required blowdown rate to be confirmed by Auxiliary Boiler Vendor
Block 2 HRSG	3.9	19.6	
Block 1	22.0	22.0	
Auxiliary Boiler Blowdown Quench	0	11.9	
Other	1.0	1.0	
<b>TOTAL</b>	<b>27.4</b>	<b>66.5</b>	

Note that this does not include Demineralised water used by the CCP which is given in [2].

#### 3.2. Towns Water

The main users of Towns water are the demineralised water plant and Gland Seals for the existing and new Sea Water Pumps.

As demineralised water usage is not expected to increase above the current normal production, that rate (162 m<sup>3</sup>/h demineralised water requiring 200 m<sup>3</sup>/h of towns water) has been assumed for this report.

Water for purging the gland seals of the existing sea water pumps has been estimated at 3 m<sup>3</sup>/h per pump and for new pumps the conservative position of 3 Booster Pumps each requiring 6 m<sup>3</sup>/h has been assumed.

A further 10 m<sup>3</sup>/h has been included for general use.



**Table 3-2: Towns Water**

Item	Normal Operation (m <sup>3</sup> /h)	Peak Requirement (m <sup>3</sup> /h)	Notes
Demineralised Water Production	43.2	200	Peak Requirement reflects operation at current rates
Potable Water (due to Power Plant personnel)	0.45	3.5	Calculated based on 100 L/d/person
Potable Water (due to CCP personnel) *	0.1	0.5	Calculated based on 100 L/d/person
Fire Water Make-Up	0.1 (Nominal)		
General Use	4	10	
Sea Water Pumps	9	9	
Sea Water Booster Pumps	18	18	Dependent on pump selection & vendor information
Auxiliary Boiler Blowdown Quench	0.85	0.93	
<b>TOTAL</b>	<b>75.7</b>	<b>242</b>	

Note that this does not include Towns water used within the CCP which is given in [2].

\* But consumed in PowerStation facilities.

### 3.3. Sea Water

The flow rates in the table below are based upon a summer sea water supply temperature of 15°C with a maximum return temperature to the outfall of 27.5°C.

Numbers in this section are taken from the Cooling Water Optimisation Process Study Report and require confirmation with vendors during EPC.

**Table 3-3: Sea Water**

Item	Normal Operation (t/h)	Peak Requirement (t/h)	Notes
GT/HRSG System	1850		
Block 1 Condenser (Two GTs)	35000		
Block 1 Auxiliary CW	1000		



Item	Normal Operation (t/h)	Peak Requirement (t/h)	Notes
Block 2 Condenser (GT13 Base Load)	16500		Value required to achieve minimum flow through condenser, based on half the condenser tubes being in operation.
Block 2 Auxiliary CW	500		330 t/h due to Steam Turbine auxiliaries
<b>TOTAL</b>	<b>54850</b>		

Note that this does not include sea water used within the CCP which is given in [2].

### 3.4. Instrument Air

Instrument Air for Block 2 has been initially estimated at 100 Nm<sup>3</sup>/h for each major item or package (to be confirmed by vendors) and a further 45 m<sup>3</sup>/h for control valves and other instrumentation.

**Table 3-4: Instrument Air**

Item	Normal Operation (Nm <sup>3</sup> /h)	Peak Requirement (Nm <sup>3</sup> /h)	Notes
Gas Turbine	100	100	Best Estimate to be confirmed by GT Vendor
HRSG	100	100	Best Estimate to be confirmed by HRSG Vendor
Steam Turbine	5	10	Provisional number from Steam Turbine vendor, to be confirmed on final vendor selection
Ammonia Transfer & Flow Control unit and SCR	25	25	Best Estimate to be confirmed by unit & Catalyst Vendors
Auxiliary Boiler	100	100	Best Estimate to be confirmed by Auxiliary Boiler package Vendor
Valves and Instruments (external to packages)	50	50	
<b>TOTAL</b>	<b>380</b>	<b>385</b>	

Note that this does not include Instrument Air used within the CCP which is given in [2].



### 3.5. Service Air

Service Air requirements are estimated to be 85 Nm<sup>3</sup>/h/hose station and up to 3 hose stations are assumed to be running at any time.

Table 3-5: Service Air

Item	Normal Operation (Nm <sup>3</sup> /h)	Peak Requirement (Nm <sup>3</sup> /h)	Notes
Hose Stations	0	255	

Note that this does not include Service Air used within the CCP which is given in [2].

### 3.6. Total Air

It is currently assumed that both the new Instrument Air and new Service Air requirements will be met from a single set of air compressors with the Service Air taken from upstream of the plant air dryers. The Service Air header will have shut down valves near the take-off point that will isolate the service air header from the compressors and the Instrument Air header; these valves will be activated on low pressure in the Plant Air header.

Table 3-6: Total Air

Item	Normal Operation (Nm <sup>3</sup> /h)	Peak Requirement (Nm <sup>3</sup> /h)	Notes
Total Air Requirement	380	640	



### 3.7. Fuel Oil

The duty required of the new Auxiliary Boilers when fired on Fuel Oil is approximately 3.65 MW, corresponding to running the Pressure Reduction Station heaters, the Admin building heating etc. and keep warm steam to the Gland Seals. Using an assumed minimum efficiency for the Auxiliary Boilers of 86% and a LHV for the Fuel Oil of 43.0 MJ/kg a peak fuel gas requirement of 360 kg/h has been calculated. As Fuel Oil is expected to only be a backup fuel supply no normal usage is anticipated.

**Table 3-7: Fuel Oil**

Item	Normal Operation (kg/h)	Peak Requirement (kg/h)	Notes
Auxiliary Boiler Fuel Oil Requirement	0	360	

### 3.8. Fuel Gas

The Maximum duty required of the new Auxiliary Boilers is approximately 13.6 MW, corresponding to the steam requirement at start-up of the power plant. Using an assumed minimum efficiency for the Auxiliary Boilers of 86% and a LHV for the Fuel Gas of 46.3 MJ/kg (the annual average for the gas supplied currently to the site) a peak fuel gas requirement of 1800 Nm<sup>3</sup>/h has been calculated. Similarly a required flow for normal operation of approximately 950 Nm<sup>3</sup>/h has been calculated.

**Table 3-8: Fuel Gas**

Item	Normal Operation (Nm <sup>3</sup> /h)	Peak Requirement (Nm <sup>3</sup> /h)	Notes
Auxiliary Boiler Fuel Gas Requirement	950	1800	



## 4. Conclusions

The required utility flows for the Power Station after CCP modifications are:

Table 4-1: Required utility flows for the Power Station

Item	Normal Requirement	Peak Requirement
Demineralised Water *	27.4 m <sup>3</sup> /h	66.5 m <sup>3</sup> /h
Towns Water *	57.7 m <sup>3</sup> /h	242 m <sup>3</sup> /h
Sea Water *	54860 t/h	54860 t/h
Total Air *	380 Nm <sup>3</sup> /h	640 Nm <sup>3</sup> /h
Fuel Oil	0 kg/h	360 kg/h
Fuel Gas (Auxiliary Boiler)	950 Nm <sup>3</sup> /h	1800 Nm <sup>3</sup> /h

\* The requirements for CCP as stated in [2] should be added to these values to obtain the overall site consumption.



## 5. References - Bibliography

1. PCCS-00-TC-HX-0505-00011, Firewater Demand Report
2. PCCS-02-TC-PX-7180-00005, Utilities Summary (CCP)





## 6. Glossary of Terms

<b>Term</b>	<b>Definition</b>
CCP	Carbon Capture Plant
CCS	Carbon Capture and Storage
CW	Cooling Water
EPC	Engineering, procurement and construction
GT	Gas Turbine
HRSG	Heat Recovery Steam Generator
KKS	Key Knowledge Services
LHV	Lower Heating Value
PCB	Service Cooling Water System (KKS Nomenclature)
SCR	Selective Catalytic Reduction



# Peterhead CCS Project

**Doc Title: Heat & Material Balance (Generation Facilities)**

Doc No. **PCCS-01-TC-PX-8240-00001**

Revision: **K01**

## **KEYWORDS**

Goldeneye, CO<sub>2</sub>, Carbon Capture and Storage. Heat & Material Balance.



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## 1. Introduction

The Peterhead Carbon Capture and Storage (CCS) Project would be the world’s first commercial scale demonstration of post combustion CO<sub>2</sub> capture, transport and offshore geological storage from a gas-fired power station. Carbon Capture technology will be fitted to an existing gas-fired power station at Peterhead in North East Scotland, UK, at a site with sufficient space for the construction of the post combustion CO<sub>2</sub> capture plant and the compression and conditioning plant. Approximately one million tonnes / year of CO<sub>2</sub> will be captured from the flue gas produced by the Peterhead Power Station and stored each year in the depleted Goldeneye reservoir currently operated by Shell. After capture, the CO<sub>2</sub> will be routed to compression, also located at the Peterhead Power Station site, where it will be compressed, cooled and conditioned for water and oxygen removal to meet a suitable transportation and storage specification. Following post-compression cooling the resulting dense phase CO<sub>2</sub> stream will be transported direct offshore via a new offshore pipeline which will tie-in subsea to the existing Goldeneye pipeline. The CO<sub>2</sub> will be permanently stored in an area centred on the depleted Goldeneye gas field.

## 2. Scope of Document

The scope of this document is to present the Heat & Material Balances (H&MB) for the Steam Unit (sections 3-11 of this document) and the Auxiliary Boiler and Steam Distribution (sections 12 & 13 of this document). The streams presented are those shown on the PFDs.

Case A presented for the Auxiliary Boiler corresponds to a worst case requirement for Steam Unit cases 6 - 9. Case B for the Auxiliary Boiler is directly applicable to Cases 1-3 of the Steam Unit and corresponds to a worst case requirement for Steam Unit cases 4 & 5.

The design basis of the Auxiliary Boiler assumes that Start-up levels of steam flow to the Gland Seals are not required at the same time as steam to the Thermal Reclaimers.

**Table 2-1: Table of Holds**

Reference	Page No	Description
1	General	Steam turbine efficiencies will need to be confirmed during EPC when machine selection is made.
2		Deleted
3		Deleted
4	8 - 40	Ammonia Vapour rate and properties are dependent on SCR requirements and will need to be provided by the SCR vendor and Ammonia Package vendor.

### General Notes

Refer to PFS: PCCS-01-TC-PX-2366-00004-001 (Attachment A) for associated stream numbers for the Steam Unit balances presented in Sections 3 - 11.

Refer to PFS: PCCS-01-TC-PX-2366-00006-001 (Attachment B) for associated stream numbers for the Auxiliary Boiler balances presented in Sections 12 & 13.



### **3. Steam Unit: Case 1 - Design Load Max 1040 mbar (with Extraction to CCP)**

Client: Shell U.K. LTD

Basis: Case 1 - Design with Extraction to CCP

### Steam System Heat Material Balance

PCCS-01-TC-PX-8240-00001

Stream		001	002	003	007	008	009	010
		IP steam from turbine	HP steam from HRSG	Cold Reheat Return to HRSG	LP steam from HRSG	Inlet to LP Turbine	Combined LP steam	desuperheating water for CCS extraction
Description								
Temperature	°C	361.0	525.0	360.5	236.7	220.4	220.6	24.3
Pressure	bara	33.35	107.00	32.82	5.10	3.12	3.22	25.22
Total Molar Flowrate	kgmol/hr	15,705	16,138	15,705	1,818	9,348	20,797	730
Total Mass Flowrate	kg/hr	282,996	290,808	282,996	32,760	168,444	374,760	13,158
Total Molecular Weight		18	18	18	18	18	18	18
Vapor Molar Flowrate	kgmol/hr	15,705	16,138	15,705	1,818	9,348	20,797	-
Vapor Mass Flowrate	kg/hr	282,996	290,808	282,996	32,760	168,444	374,760	-
Vapor Act Vol Flow	m³/hr	23,394	9,242	23,775	14,814	121,244	261,366	-
Vapor Molecular Weight		18	18	18	18	18	18	-
Vapor Density, Act	kg/m³	12.097	31.466	11.903	2.211	1.389	1.434	-
Vapor Z		0.94	0.92	0.94	0.98	0.99	0.99	-
Vapor Viscosity	Cp	0.0227	0.0300	0.0227	0.0176	0.0170	0.0170	-
Vapor Enthalpy	kJ/kg	3136.2	3429.7	3136.2	2932.6	2906.8	2906.8	-
Liquid Molar Flowrate	kgmol/hr	-	-	-	-	-	-	730
Liquid Mass Flowrate	kg/hr	-	-	-	-	-	-	13,158
Liquid Act Vol Flow	m³/hr	-	-	-	-	-	-	13.18
Liquid Molecular Weight		-	-	-	-	-	-	18.02
Liquid Density, Act	kg/m³	-	-	-	-	-	-	998.4
Liquid Viscosity	Cp	-	-	-	-	-	-	0.906
Liquid Surf Tension	dyne/cm	-	-	-	-	-	-	72.1
Liquid Enthalpy	kJ/kg	-	-	-	-	-	-	104.0
Composition, mol %	Comp. MW							
CO2	44.01							
N2	28.01							
O2	32.00							
H2O	18.02	100.00	100.00	100.00	100.00	100.00	100.00	100.00
H2	2.02							
ARGON	39.95							
NITRDIOX	46.01							
CO	28.01							
HYCHLORD	36.46							
SO2	64.06							
NH3	17.03							
HF	20.01							



Client: Shell U.K. LTD

Basis: Case 1 - Design with Extraction to CCP

### Steam System Heat Material Balance

PCCS-01-TC-PX-8240-00001

Stream		012	015	018	021	028	033	035
		LP steam to desuperheater	Outlet from LP Turbine	Hot reheat from HRSG	Total LP Condensate	HP steam letdown (NNF)	HP-IP letdown desuperheating water (NNF)	LP steam to CCS
Description								
Temperature	°C	220.6	23.8	518.2	24.3	-	-	141.0
Pressure	bara	3.22	0.0294	32.05	25.22	-	-	3.22
Total Molar Flowrate	kgmol/hr	11,449	9,497	18,721	21,676	-	-	12,178
Total Mass Flowrate	kg/hr	206,316	171,144	337,356	390,600	-	-	219,456
Total Molecular Weight		18	18	18	18	-	-	18
Vapor Molar Flowrate	kgmol/hr	11,449	9,497	18,721				12,178
Vapor Mass Flowrate	kg/hr	206,316	171,144	337,356	-			219,456
Vapor Act Vol Flow	m³/hr	143,889	172	37,541	-			126,098
Vapor Molecular Weight		18	18	18	-			18
Vapor Density, Act	kg/m³	1.434	997.431	8.986	-			1.740
Vapor Z		0.99	0.00	0.98	-			0.97
Vapor Viscosity	Cp	0.0170	0.9168	0.0294	-			0.0137
Vapor Enthalpy	kJ/kg	2906.8	2332.5	3494.5	-	-	-	2738.7
Liquid Molar Flowrate	kgmol/hr	-	-	-	21,676			-
Liquid Mass Flowrate	kg/hr	-	-	-	390,600			-
Liquid Act Vol Flow	m³/hr	-	-	-	391.21			-
Liquid Molecular Weight		-	-	-	18.02			-
Liquid Density, Act	kg/m³	-	-	-	998.4			-
Liquid Viscosity	Cp	-	-	-	0.906			-
Liquid Surf Tension	dyne/cm	-	-	-	72.1			-
Liquid Enthalpy	kJ/kg	-	-	-	104.0			-
Composition, mol %	Comp. MW							
CO2	44.01							
N2	28.01							
O2	32.00							
H2O	18.02	100.00	100.00	100.00	100.00			100.00
H2	2.02							
ARGON	39.95							
NITRDIOS	46.01							
CO	28.01							
HYCHLORD	36.46							
SO2	64.06							
NH3	17.03							
HF	20.01							

Client: Shell U.K. LTD

Basis: Case 1 - Design with Extraction to CCP

## Steam System Heat Material Balance

PCCS-01-TC-PX-8240-00001

Stream		037	040	042	043	044	045	048
Description		steam from IP letdown to CCS (NNF)	LP bypass steam to desuperheater (NNF)	IP bypass to letdown (NNF)	desuperheating water for IP letdown to CCS (NNF)	IP steam for letdown to CCS (NNF)	Steam from IP bypass letdown to condenser (NNF)	desuperheating water to IP letdown desuperheater (NNF)
Temperature	°C	-	-	-	-	-	-	-
Pressure	bara	-	-	-	-	-	-	-
Total Molar Flowrate	kgmol/hr	-	-	-	-	-	-	-
Total Mass Flowrate	kg/hr	-	-	-	-	-	-	-
Total Molecular Weight		-	-	-	-	-	-	-
Vapor Molar Flowrate	kgmol/hr							
Vapor Mass Flowrate	kg/hr							
Vapor Act Vol Flow	m³/hr							
Vapor Molecular Weight								
Vapor Density, Act	kg/m³							
Vapor Z								
Vapor Viscosity	Cp							
Vapor Enthalpy	kJ/kg							
Liquid Molar Flowrate	kgmol/hr							
Liquid Mass Flowrate	kg/hr							
Liquid Act Vol Flow	m³/hr							
Liquid Molecular Weight								
Liquid Density, Act	kg/m³							
Liquid Viscosity	Cp							
Liquid Surf Tension	dyne/cm							
Liquid Enthalpy	kJ/kg							
Composition, mol %	Comp. MW							
CO2	44.01							
N2	28.01							
O2	32.00							
H2O	18.02							
H2	2.02							
ARGON	39.95							
NITRDIOX	46.01							
CO	28.01							
HYCHLORD	36.46							
SO2	64.06							
NH3	17.03							
HF	20.01							

Client: Shell U.K. LTD

Basis: Case 1 - Design with Extraction to CCP

## Steam System Heat Material Balance

PCCS-01-TC-PX-8240-00001

Stream		049	050	080
		desuperheating water to LP letdown desuperheater (NNF)	Steam from LP bypass letdown to condenser (NNF)	Ammonia Vapour to SCR System
<b>Description</b>				
Temperature	°C	-	-	HOLD 4
Pressure	bara	-	-	HOLD 4
Total Molar Flowrate	kgmol/hr	-	-	HOLD 4
Total Mass Flowrate	kg/hr	-	-	HOLD 4
Total Molecular Weight		-	-	HOLD 4
Vapor Molar Flowrate	kgmol/hr			HOLD 4
Vapor Mass Flowrate	kg/hr			HOLD 4
Vapor Act Vol Flow	m³/hr			HOLD 4
Vapor Molecular Weight				HOLD 4
Vapor Density, Act	kg/m³			HOLD 4
Vapor Z				HOLD 4
Vapor Viscosity	Cp			HOLD 4
Vapor Enthalpy	kJ/kg			HOLD 4
Liquid Molar Flowrate	kgmol/hr			HOLD 4
Liquid Mass Flowrate	kg/hr			HOLD 4
Liquid Act Vol Flow	m³/hr			HOLD 4
Liquid Molecular Weight				HOLD 4
Liquid Density, Act	kg/m³			HOLD 4
Liquid Viscosity	Cp			HOLD 4
Liquid Surf Tension	dyne/cm			HOLD 4
Liquid Enthalpy	kJ/kg			HOLD 4
Composition, mol %	Comp. MW			HOLD 4
CO2	44.01			HOLD 4
N2	28.01			HOLD 4
O2	32.00			HOLD 4
H2O	18.02			HOLD 4
H2	2.02			HOLD 4
ARGON	39.95			HOLD 4
NITRDIOX	46.01			HOLD 4
CO	28.01			HOLD 4
HYCHLORD	36.46			HOLD 4
SO2	64.06			HOLD 4
NH3	17.03			HOLD 4
HF	20.01			HOLD 4



#### **4. Steam Unit: Case 2 - Design Load Max 1040 mbar (with No Extraction to CCP)**

Client: Shell U.K. LTD

Basis: Case 2 - Design with no Extraction to CCP

### Steam System Heat Material Balance

PCCS-01-TC-PX-8240-00001

Stream		001	002	003	007	008	009	010
Description		IP steam from turbine	HP steam from HRSG	Cold Reheat Return to HRSG	LP steam from HRSG	Inlet to LP Turbine	Combined LP steam	desuperheating water for CCS extraction
Temperature	°C	361.9	524.6	361.4	238.3	288.5	288.6	34.7
Pressure	bara	33.77	107.20	33.24	6.50	6.24	6.34	25.59
Total Molar Flowrate	kgmol/hr	15,741	16,150	15,741	1,818	20,837	20,837	-
Total Mass Flowrate	kg/hr	283,644	291,024	283,644	32,760	375,480	375,480	-
Total Molecular Weight		18	18	18	18	18	18	18
Vapor Molar Flowrate	kgmol/hr	15,741	16,150	15,741	1,818	20,837	20,837	-
Vapor Mass Flowrate	kg/hr	283,644	291,024	283,644	32,760	375,480	375,480	-
Vapor Act Vol Flow	m³/hr	23,177	9,224	23,549	11,596	153,519	151,092	-
Vapor Molecular Weight		18	18	18	18	18	18	-
Vapor Density, Act	kg/m³	12.238	31.552	12.045	2.825	2.446	2.485	-
Vapor Z		0.94	0.92	0.94	0.98	0.98	0.98	-
Vapor Viscosity	Cp	0.0227	0.0300	0.0227	0.0176	0.0198	0.0198	-
Vapor Enthalpy	kJ/kg	3137.4	3428.4	3137.4	2930.6	3037.5	3037.5	-
Liquid Molar Flowrate	kgmol/hr	-	-	-	-	-	-	-
Liquid Mass Flowrate	kg/hr	-	-	-	-	-	-	-
Liquid Act Vol Flow	m³/hr	-	-	-	-	-	-	0.00
Liquid Molecular Weight		-	-	-	-	-	-	18.02
Liquid Density, Act	kg/m³	-	-	-	-	-	-	995.3
Liquid Viscosity	Cp	-	-	-	-	-	-	0.724
Liquid Surf Tension	dyne/cm	-	-	-	-	-	-	70.5
Liquid Enthalpy	kJ/kg	-	-	-	-	-	-	147.5
Composition, mol %	Comp. MW							
CO2	44.01							
N2	28.01							
O2	32.00							
H2O	18.02	100.00	100.00	100.00	100.00	100.00	100.00	100.00
H2	2.02							
ARGON	39.95							
NITRDIQX	46.01							
CO	28.01							
HYCHLORD	36.46							
SO2	64.06							
NH3	17.03							
HF	20.01							

Client: Shell U.K. LTD

Basis: Case 2 - Design with no Extraction to CCP

### Steam System Heat Material Balance

PCCS-01-TC-PX-8240-00001

Stream		012	015	018	021	028	033	035
		LP steam to desuperheater	Outlet from LP Turbine	Hot reheat from HRSG	Total LP Condensate	HP steam letdown (NNF)	HP-IP letdown desuperheating water (NNF)	LP steam to CCS
Description								
Temperature	°C	288.6	34.3	518.2	34.7	-	-	166.0
Pressure	bara	6.34	0.0542	32.48	25.59	-	-	6.34
Total Molar Flowrate	kgmol/hr	-	20,977	18,777	20,977	-	-	-
Total Mass Flowrate	kg/hr	-	378,000	338,364	378,000	-	-	-
Total Molecular Weight		18	18	18	18	-	-	18
Vapor Molar Flowrate	kgmol/hr	-	20,977	18,777				-
Vapor Mass Flowrate	kg/hr	-	378,000	338,364	-			-
Vapor Act Vol Flow	m³/hr	-	380	37,143	-			-
Vapor Molecular Weight		18	18	18	-			18
Vapor Density, Act	kg/m³	2.485	994.312	9.110	-			3.289
Vapor Z		0.98	0.00	0.98	-			0.95
Vapor Viscosity	Cp	0.0198	0.7293	0.0294	-			0.0146
Vapor Enthalpy	kJ/kg	3037.5	2376.5	3494.0	-	-	-	2769.6
Liquid Molar Flowrate	kgmol/hr	-	-	-	20,977			-
Liquid Mass Flowrate	kg/hr	-	-	-	378,000			-
Liquid Act Vol Flow	m³/hr	-	-	-	379.78			-
Liquid Molecular Weight		-	-	-	18.02			-
Liquid Density, Act	kg/m³	-	-	-	995.3			-
Liquid Viscosity	Cp	-	-	-	0.724			-
Liquid Surf Tension	dyne/cm	-	-	-	70.5			-
Liquid Enthalpy	kJ/kg	-	-	-	147.5			-
Composition, mol %	Comp. MW							
CO2	44.01							
N2	28.01							
O2	32.00							
H2O	18.02	100.00	100.00	100.00	100.00			100.00
H2	2.02							
ARGON	39.95							
NITRDIIX	46.01							
CO	28.01							
HYCHLORD	36.46							
SO2	64.06							
NH3	17.03							
HF	20.01							



Client: Shell U.K. LTD

Basis: Case 2 - Design with no Extraction to CCP

### Steam System Heat Material Balance

PCCS-01-TC-PX-8240-00001

Stream		037	040	042	043	044	045	048
Description		steam from IP letdown to CCS (NNF)	LP bypass steam to desuperheater (NNF)	IP bypass to letdown (NNF)	desuperheating water for IP letdown to CCS (NNF)	IP steam for letdown to CCS (NNF)	Steam from IP bypass letdown to condenser (NNF)	desuperheating water to IP letdown desuperheater (NNF)
Temperature	°C	-	-	-	-	-	-	-
Pressure	bara	-	-	-	-	-	-	-
Total Molar Flowrate	kgmol/hr	-	-	-	-	-	-	-
Total Mass Flowrate	kg/hr	-	-	-	-	-	-	-
Total Molecular Weight		-	-	-	-	-	-	-
Vapor Molar Flowrate	kgmol/hr							
Vapor Mass Flowrate	kg/hr							
Vapor Act Vol Flow	m³/hr							
Vapor Molecular Weight								
Vapor Density, Act	kg/m³							
Vapor Z								
Vapor Viscosity	Cp							
Vapor Enthalpy	kJ/kg							
Liquid Molar Flowrate	kgmol/hr							
Liquid Mass Flowrate	kg/hr							
Liquid Act Vol Flow	m³/hr							
Liquid Molecular Weight								
Liquid Density, Act	kg/m³							
Liquid Viscosity	Cp							
Liquid Surf Tension	dyne/cm							
Liquid Enthalpy	kJ/kg							
Composition, mol %	Comp. MW							
CO2	44.01							
N2	28.01							
O2	32.00							
H2O	18.02							
H2	2.02							
ARGON	39.95							
NITRDIOX	46.01							
CO	28.01							
HYCHLORD	36.46							
SO2	64.06							
NH3	17.03							
HF	20.01							

Client: Shell U.K. LTD

Basis: Case 2 - Design with no Extraction to CCP

## Steam System Heat Material Balance

PCCS-01-TC-PX-8240-00001

Stream		049	050	080
<b>Description</b>		<b>desuperheating water to LP letdown desuperheater (NNF)</b>	<b>Steam from LP bypass letdown to condenser (NNF)</b>	<b>Ammonia Vapour to SCR System</b>
Temperature	°C	-	-	HOLD 4
Pressure	bara	-	-	HOLD 4
Total Molar Flowrate	kgmol/hr	-	-	HOLD 4
Total Mass Flowrate	kg/hr	-	-	HOLD 4
Total Molecular Weight		-	-	HOLD 4
Vapor Molar Flowrate	kgmol/hr			HOLD 4
Vapor Mass Flowrate	kg/hr			HOLD 4
Vapor Act Vol Flow	m³/hr			HOLD 4
Vapor Molecular Weight				HOLD 4
Vapor Density, Act	kg/m³			HOLD 4
Vapor Z				HOLD 4
Vapor Viscosity	Cp			HOLD 4
Vapor Enthalpy	kJ/kg			HOLD 4
Liquid Molar Flowrate	kgmol/hr			HOLD 4
Liquid Mass Flowrate	kg/hr			HOLD 4
Liquid Act Vol Flow	m³/hr			HOLD 4
Liquid Molecular Weight				HOLD 4
Liquid Density, Act	kg/m³			HOLD 4
Liquid Viscosity	Cp			HOLD 4
Liquid Surf Tension	dyne/cm			HOLD 4
Liquid Enthalpy	kJ/kg			HOLD 4
Composition, mol %	Comp. MW			HOLD 4
CO2	44.01			HOLD 4
N2	28.01			HOLD 4
O2	32.00			HOLD 4
H2O	18.02			HOLD 4
H2	2.02			HOLD 4
ARGON	39.95			HOLD 4
NITRDIQX	46.01			HOLD 4
CO	28.01			HOLD 4
HYCHLORD	36.46			HOLD 4
SO2	64.06			HOLD 4
NH3	17.03			HOLD 4
HF	20.01			HOLD 4



## **5. Steam Unit: Case 3 – Normal Case (100% GT Load)**

Client: Shell U.K. LTD

Basis: Case 3 - Normal Case with Extraction to CCP

### Steam System Heat Material Balance

PCCS-01-TC-PX-8240-00001

Stream		001	002	003	007	008	009	010
Description		IP steam from turbine	HP steam from HRSG	Cold Reheat Return to HRSG	LP steam from HRSG	Inlet to LP Turbine	Combined LP steam	desuperheating water for CCS extraction
Temperature	°C	362.0	526.5	361.5	235.5	244.7	245.0	21.0
Pressure	bara	32.10	103.50	31.58	4.18	3.72	3.92	25.25
Total Molar Flowrate	kgmol/hr	15,167	15,583	15,167	1,598	10,908	19,806	716
Total Mass Flowrate	kg/hr	273,312	280,800	273,312	28,800	196,560	356,904	12,910
Total Molecular Weight		18	18	18	18	18	18	18
Vapor Molar Flowrate	kgmol/hr	15,167	15,583	15,167	1,598	10,908	19,806	-
Vapor Mass Flowrate	kg/hr	273,312	280,800	273,312	28,800	196,560	356,904	-
Vapor Act Vol Flow	m³/hr	23,575	9,275	23,966	15,906	124,545	214,596	-
Vapor Molecular Weight		18	18	18	18	18	18	-
Vapor Density, Act	kg/m³	11.593	30.275	11.404	1.811	1.578	1.663	-
Vapor Z		0.94	0.93	0.95	0.98	0.99	0.99	-
Vapor Viscosity	Cp	0.0227	0.0300	0.0227	0.0176	0.0180	0.0180	-
Vapor Enthalpy	kJ/kg	3141.0	3437.4	3141.0	2933.7	2954.4	2954.4	-
Liquid Molar Flowrate	kgmol/hr	-	-	-	-	-	-	716
Liquid Mass Flowrate	kg/hr	-	-	-	-	-	-	12,910
Liquid Act Vol Flow	m³/hr	-	-	-	-	-	-	12.92
Liquid Molecular Weight		-	-	-	-	-	-	18.02
Liquid Density, Act	kg/m³	-	-	-	-	-	-	999.2
Liquid Viscosity	Cp	-	-	-	-	-	-	0.979
Liquid Surf Tension	dyne/cm	-	-	-	-	-	-	72.6
Liquid Enthalpy	kJ/kg	-	-	-	-	-	-	90.2
Composition, mol %	Comp. MW							
CO2	44.01							
N2	28.01							
O2	32.00							
H2O	18.02	100.00	100.00	100.00	100.00	100.00	100.00	100.00
H2	2.02							
ARGON	39.95							
NITRDIOX	46.01							
CO	28.01							
HYCHLORD	36.46							
SO2	64.06							
NH3	17.03							
HF	20.01							

Client: Shell U.K. LTD

Basis: Case 3 - Normal Case with Extraction to CCP

### Steam System Heat Material Balance

PCCS-01-TC-PX-8240-00001

Stream		012	015	018	021	028	033	035
		LP steam to desuperheater	Outlet from LP Turbine	Hot reheat from HRSG	Total LP Condensate	HP steam letdown (NNF)	HP-IP letdown desuperheating water (NNF)	LP steam to CCS
Description								
Temperature	°C	244.1	20.6	520.0	21.0	-	-	142.7
Pressure	bara	3.38	0.0242	30.83	25.25	-	-	3.38
Total Molar Flowrate	kgmol/hr	8,898	11,052	17,964	20,667	-	-	9,615
Total Mass Flowrate	kg/hr	160,344	199,152	323,712	372,420	-	-	173,268
Total Molecular Weight		18	18	18	18	-	-	18
Vapor Molar Flowrate	kgmol/hr	8,898	11,052	17,964				9,615
Vapor Mass Flowrate	kg/hr	160,344	199,152	323,712	-			173,268
Vapor Act Vol Flow	m³/hr	111,856	11,138,380	37,576	-			95,154
Vapor Molecular Weight		18	18	18	-			18
Vapor Density, Act	kg/m³	1.433	0.018	8.615	-			1.821
Vapor Z		0.99	1.00	0.98	-			0.97
Vapor Viscosity	Cp	0.0179	0.0097	0.0295	-			0.0138
Vapor Enthalpy	kJ/kg	2954.4	2335.8	3499.8	-	-	-	2741.0
Liquid Molar Flowrate	kgmol/hr	-	-	-	20,667			-
Liquid Mass Flowrate	kg/hr	-	-	-	372,420			-
Liquid Act Vol Flow	m³/hr	-	-	-	372.71			-
Liquid Molecular Weight		-	-	-	18.02			-
Liquid Density, Act	kg/m³	-	-	-	999.2			-
Liquid Viscosity	Cp	-	-	-	0.979			-
Liquid Surf Tension	dyne/cm	-	-	-	72.6			-
Liquid Enthalpy	kJ/kg	-	-	-	90.2			-
Composition, mol %	Comp. MW							
CO2	44.01							
N2	28.01							
O2	32.00							
H2O	18.02	100.00	100.00	100.00	100.00			100.00
H2	2.02							
ARGON	39.95							
NITRDIQX	46.01							
CO	28.01							
HYCHLORD	36.46							
SO2	64.06							
NH3	17.03							
HF	20.01							

Client: Shell U.K. LTD

Basis: Case 3 - Normal Case with Extraction to CCP

### Steam System Heat Material Balance

PCCS-01-TC-PX-8240-00001

Stream		037	040	042	043	044	045	048
Description		steam from IP letdown to CCS (NNF)	LP bypass steam to desuperheater (NNF)	IP bypass to letdown (NNF)	desuperheating water for IP letdown to CCS (NNF)	IP steam for letdown to CCS (NNF)	Steam from IP bypass letdown to condenser (NNF)	desuperheating water to IP letdown desuperheater (NNF)
Temperature	°C	-	-	-	-	-	-	-
Pressure	bara	-	-	-	-	-	-	-
Total Molar Flowrate	kgmol/hr	-	-	-	-	-	-	-
Total Mass Flowrate	kg/hr	-	-	-	-	-	-	-
Total Molecular Weight		-	-	-	-	-	-	-
Vapor Molar Flowrate	kgmol/hr							
Vapor Mass Flowrate	kg/hr							
Vapor Act Vol Flow	m³/hr							
Vapor Molecular Weight								
Vapor Density, Act	kg/m³							
Vapor Z								
Vapor Viscosity	Cp							
Vapor Enthalpy	kJ/kg							
Liquid Molar Flowrate	kgmol/hr							
Liquid Mass Flowrate	kg/hr							
Liquid Act Vol Flow	m³/hr							
Liquid Molecular Weight								
Liquid Density, Act	kg/m³							
Liquid Viscosity	Cp							
Liquid Surf Tension	dyne/cm							
Liquid Enthalpy	kJ/kg							
Composition, mol %	Comp. MW							
CO2	44.01							
N2	28.01							
O2	32.00							
H2O	18.02							
H2	2.02							
ARGON	39.95							
NITRDIOX	46.01							
CO	28.01							
HYCHLORD	36.46							
SO2	64.06							
NH3	17.03							
HF	20.01							

Client: Shell U.K. LTD

Basis: Case 3 - Normal Case with Extraction to CCP

## Steam System Heat Material Balance

PCCS-01-TC-PX-8240-00001

Stream		049	050	080
<b>Description</b>		<b>desuperheating water to LP letdown desuperheater (NNF)</b>	<b>Steam from LP bypass letdown to condenser (NNF)</b>	<b>Ammonia Vapour to SCR System</b>
Temperature	°C	-	-	HOLD 4
Pressure	bara	-	-	HOLD 4
Total Molar Flowrate	kgmol/hr	-	-	HOLD 4
Total Mass Flowrate	kg/hr	-	-	HOLD 4
Total Molecular Weight		-	-	HOLD 4
Vapor Molar Flowrate	kgmol/hr			HOLD 4
Vapor Mass Flowrate	kg/hr			HOLD 4
Vapor Act Vol Flow	m³/hr			HOLD 4
Vapor Molecular Weight				HOLD 4
Vapor Density, Act	kg/m³			HOLD 4
Vapor Z				HOLD 4
Vapor Viscosity	Cp			HOLD 4
Vapor Enthalpy	kJ/kg			HOLD 4
Liquid Molar Flowrate	kgmol/hr			HOLD 4
Liquid Mass Flowrate	kg/hr			HOLD 4
Liquid Act Vol Flow	m³/hr			HOLD 4
Liquid Molecular Weight				HOLD 4
Liquid Density, Act	kg/m³			HOLD 4
Liquid Viscosity	Cp			HOLD 4
Liquid Surf Tension	dyne/cm			HOLD 4
Liquid Enthalpy	kJ/kg			HOLD 4
Composition, mol %	Comp. MW			HOLD 4
CO2	44.01			HOLD 4
N2	28.01			HOLD 4
O2	32.00			HOLD 4
H2O	18.02			HOLD 4
H2	2.02			HOLD 4
ARGON	39.95			HOLD 4
NITRDIQX	46.01			HOLD 4
CO	28.01			HOLD 4
HYCHLORD	36.46			HOLD 4
SO2	64.06			HOLD 4
NH3	17.03			HOLD 4
HF	20.01			HOLD 4





## **6. Steam Unit: Case 4 – Turndown Case (65% Load) with CCP Operating**

Client: Shell U.K. LTD

Basis: Case 4 - 65% GT load with Extraction to CCP

### Steam System Heat Material Balance

PCCS-01-TC-PX-8240-00001

Stream		001	002	003	007	008	009	010
Description		IP steam from turbine	HP steam from HRSG	Cold Reheat Return to HRSG	LP steam from HRSG	Inlet to LP Turbine	Combined LP steam	desuperheating water for CCS extraction
Temperature	°C	366.0	529.1	365.6	222.2	252.5	252.6	23.8
Pressure	bara	24.02	77.98	23.62	4.73	2.99	3.09	25.21
Total Molar Flowrate	kgmol/hr	11,301	11,627	11,301	1,111	8,690	14,592	529
Total Mass Flowrate	kg/hr	203,652	209,520	203,652	20,016	156,600	262,944	9,526
Total Molecular Weight		18	18	18	18	18	18	18
Vapor Molar Flowrate	kgmol/hr	11,301	11,627	11,301	1,111	8,690	14,592	-
Vapor Mass Flowrate	kg/hr	203,652	209,520	203,652	20,016	156,600	262,944	-
Vapor Act Vol Flow	m³/hr	24,011	9,407	24,420	9,473	125,761	204,323	-
Vapor Molecular Weight		18	18	18	18	18	18	-
Vapor Density, Act	kg/m³	8.482	22.273	8.340	2.113	1.245	1.287	-
Vapor Z		0.96	0.95	0.96	0.98	0.99	0.99	-
Vapor Viscosity	Cp	0.0229	0.0300	0.0229	0.0170	0.0183	0.0183	-
Vapor Enthalpy	kJ/kg	3166.2	3471.3	3166.2	2903.6	2972.8	2972.8	-
Liquid Molar Flowrate	kgmol/hr	-	-	-	-	-	-	529
Liquid Mass Flowrate	kg/hr	-	-	-	-	-	-	9,526
Liquid Act Vol Flow	m³/hr	-	-	-	-	-	-	9.54
Liquid Molecular Weight		-	-	-	-	-	-	18.02
Liquid Density, Act	kg/m³	-	-	-	-	-	-	998.5
Liquid Viscosity	Cp	-	-	-	-	-	-	0.915
Liquid Surf Tension	dyne/cm	-	-	-	-	-	-	72.2
Liquid Enthalpy	kJ/kg	-	-	-	-	-	-	102.1
Composition, mol %	Comp. MW							
CO2	44.01							
N2	28.01							
O2	32.00							
H2O	18.02	100.00	100.00	100.00	100.00	100.00	100.00	100.00
H2	2.02							
ARGON	39.95							
NITRDIOX	46.01							
CO	28.01							
HYCHLORD	36.46							
SO2	64.06							
NH3	17.03							
HF	20.01							

Client: Shell U.K. LTD

Basis: Case 4 - 65% GT load with Extraction to CCP

### Steam System Heat Material Balance

PCCS-01-TC-PX-8240-00001

Stream		012	015	018	021	028	033	035
		LP steam to desuperheater	Outlet from LP Turbine	Hot reheat from HRSG	Total LP Condensate	HP steam letdown (NNF)	HP-IP letdown desuperheating water (NNF)	LP steam to CCS
Description								
Temperature	°C	252.6	23.3	523.2	23.8	-	-	139.6
Pressure	bara	3.09	0.0285	23.04	25.21	-	-	3.09
Total Molar Flowrate	kgmol/hr	5,901	8,806	13,299	15,237	-	-	6,431
Total Mass Flowrate	kg/hr	106,344	158,688	239,652	274,572	-	-	115,884
Total Molecular Weight		18	18	18	18	-	-	18
Vapor Molar Flowrate	kgmol/hr	5,901	8,806	13,299				6,431
Vapor Mass Flowrate	kg/hr	106,344	158,688	239,652	-			115,884
Vapor Act Vol Flow	m³/hr	82,636	7,606,840	37,600	-			69,229
Vapor Molecular Weight		18	18	18	-			18
Vapor Density, Act	kg/m³	1.287	0.021	6.374	-			1.674
Vapor Z		0.99	1.00	0.98	-			0.97
Vapor Viscosity	Cp	0.0183	0.0098	0.0296	-			0.0137
Vapor Enthalpy	kJ/kg	2972.8	2369.6	3515.0	-	-	-	0.0
Liquid Molar Flowrate	kgmol/hr	-	-	-	15,237			-
Liquid Mass Flowrate	kg/hr	-	-	-	274,572			-
Liquid Act Vol Flow	m³/hr	-	-	-	274.97			-
Liquid Molecular Weight		-	-	-	18.02			-
Liquid Density, Act	kg/m³	-	-	-	998.5			-
Liquid Viscosity	Cp	-	-	-	0.915			-
Liquid Surf Tension	dyne/cm	-	-	-	72.2			-
Liquid Enthalpy	kJ/kg	-	-	-	102.1			-
Composition, mol %	Comp. MW							
CO2	44.01							
N2	28.01							
O2	32.00							
H2O	18.02	100.00	100.00	100.00	100.00			100.00
H2	2.02							
ARGON	39.95							
NITRDIQX	46.01							
CO	28.01							
HYCHLORD	36.46							
SO2	64.06							
NH3	17.03							
HF	20.01							

Client: Shell U.K. LTD

Basis: Case 4 - 65% GT load with Extraction to CCP

### Steam System Heat Material Balance

PCCS-01-TC-PX-8240-00001

Stream		037	040	042	043	044	045	048
Description		steam from IP letdown to CCS (NNF)	LP bypass steam to desuperheater (NNF)	IP bypass to letdown (NNF)	desuperheating water for IP letdown to CCS (NNF)	IP steam for letdown to CCS (NNF)	Steam from IP bypass letdown to condenser (NNF)	desuperheating water to IP letdown desuperheater (NNF)
Temperature	°C	-	-	-	-	-	-	-
Pressure	bara	-	-	-	-	-	-	-
Total Molar Flowrate	kgmol/hr	-	-	-	-	-	-	-
Total Mass Flowrate	kg/hr	-	-	-	-	-	-	-
Total Molecular Weight		-	-	-	-	-	-	-
Vapor Molar Flowrate	kgmol/hr							
Vapor Mass Flowrate	kg/hr							
Vapor Act Vol Flow	m³/hr							
Vapor Molecular Weight								
Vapor Density, Act	kg/m³							
Vapor Z								
Vapor Viscosity	Cp							
Vapor Enthalpy	kJ/kg	-	-	-	-	-	-	-
Liquid Molar Flowrate	kgmol/hr							
Liquid Mass Flowrate	kg/hr							
Liquid Act Vol Flow	m³/hr							
Liquid Molecular Weight								
Liquid Density, Act	kg/m³							
Liquid Viscosity	Cp							
Liquid Surf Tension	dyne/cm							
Liquid Enthalpy	kJ/kg							
Composition, mol %	Comp. MW							
CO2	44.01							
N2	28.01							
O2	32.00							
H2O	18.02							
H2	2.02							
ARGON	39.95							
NITRDIOX	46.01							
CO	28.01							
HYCHLORD	36.46							
SO2	64.06							
NH3	17.03							
HF	20.01							

Client: Shell U.K. LTD

Basis: Case 4 - 65% GT load with Extraction to CCP

## Steam System Heat Material Balance

PCCS-01-TC-PX-8240-00001

Stream		049	050	080
<b>Description</b>		<b>desuperheating water to LP letdown desuperheater (NNF)</b>	<b>Steam from LP bypass letdown to condenser (NNF)</b>	<b>Ammonia Vapour to SCR System</b>
Temperature	°C	-	-	HOLD 4
Pressure	bara	-	-	HOLD 4
Total Molar Flowrate	kgmol/hr	-	-	HOLD 4
Total Mass Flowrate	kg/hr	-	-	HOLD 4
Total Molecular Weight		-	-	HOLD 4
Vapor Molar Flowrate	kgmol/hr			HOLD 4
Vapor Mass Flowrate	kg/hr			HOLD 4
Vapor Act Vol Flow	m³/hr			HOLD 4
Vapor Molecular Weight				HOLD 4
Vapor Density, Act	kg/m³			HOLD 4
Vapor Z				HOLD 4
Vapor Viscosity	Cp			HOLD 4
Vapor Enthalpy	kJ/kg	-	-	HOLD 4
Liquid Molar Flowrate	kgmol/hr			HOLD 4
Liquid Mass Flowrate	kg/hr			HOLD 4
Liquid Act Vol Flow	m³/hr			HOLD 4
Liquid Molecular Weight				HOLD 4
Liquid Density, Act	kg/m³			HOLD 4
Liquid Viscosity	Cp			HOLD 4
Liquid Surf Tension	dyne/cm			HOLD 4
Liquid Enthalpy	kJ/kg			HOLD 4
Composition, mol %	Comp. MW			HOLD 4
CO2	44.01			HOLD 4
N2	28.01			HOLD 4
O2	32.00			HOLD 4
H2O	18.02			HOLD 4
H2	2.02			HOLD 4
ARGON	39.95			HOLD 4
NITRDIQX	46.01			HOLD 4
CO	28.01			HOLD 4
HYCHLORD	36.46			HOLD 4
SO2	64.06			HOLD 4
NH3	17.03			HOLD 4
HF	20.01			HOLD 4



## **7. Steam Unit: Case 5 - Turndown Case (60% Load) with No Extraction to CCP**

Client: Shell U.K. LTD

Basis: Case 5 - 60%GT Load Design with Extraction to CCP

### Steam System Heat Material Balance

PCCS-01-TC-PX-8240-00001

Stream		001	002	003	007	008	009	010
Description		IP steam from turbine	HP steam from HRSG	Cold Reheat Return to HRSG	LP steam from HRSG	Inlet to LP Turbine	Combined LP steam	desuperheating water for CCS extraction
Temperature	°C	366.3	529.5	366.0	221.0	298.3	298.4	28.8
Pressure	bara	23.47	76.22	23.07	4.73	4.55	4.65	25.35
Total Molar Flowrate	kgmol/hr	11,044	11,355	11,044	1,119	14,266	14,266	-
Total Mass Flowrate	kg/hr	199,008	204,624	199,008	20,160	257,076	257,076	-
Total Molecular Weight		18	18	18	18	18	18	18
Vapor Molar Flowrate	kgmol/hr	11,044	11,355	11,044	1,119	14,266	14,266	-
Vapor Mass Flowrate	kg/hr	199,008	204,624	199,008	20,160	257,076	257,076	-
Vapor Act Vol Flow	m³/hr	24,052	9,417	24,472	9,515	147,507	144,326	-
Vapor Molecular Weight		18	18	18	18	18	18	-
Vapor Density, Act	kg/m³	8.274	21.728	8.132	2.119	1.743	1.781	-
Vapor Z		0.96	0.95	0.96	0.98	0.99	0.99	-
Vapor Viscosity	Cp	0.0230	0.0300	0.0229	0.0169	0.0202	0.0202	-
Vapor Enthalpy	kJ/kg	3168.0	3474.2	3168.0	2901.0	3062.2	3062.2	-
Liquid Molar Flowrate	kgmol/hr	-	-	-	-	-	-	-
Liquid Mass Flowrate	kg/hr	-	-	-	-	-	-	-
Liquid Act Vol Flow	m³/hr	-	-	-	-	-	-	0.00
Liquid Molecular Weight		-	-	-	-	-	-	18.02
Liquid Density, Act	kg/m³	-	-	-	-	-	-	997.2
Liquid Viscosity	Cp	-	-	-	-	-	-	0.818
Liquid Surf Tension	dyne/cm	-	-	-	-	-	-	71.4
Liquid Enthalpy	kJ/kg	-	-	-	-	-	-	123.0
Composition, mol %	Comp. MW							
CO2	44.01							
N2	28.01							
O2	32.00							
H2O	18.02	100.00	100.00	100.00	100.00	100.00	100.00	100.00
H2	2.02							
ARGON	39.95							
NITRDIQX	46.01							
CO	28.01							
HYCHLORD	36.46							
SO2	64.06							
NH3	17.03							
HF	20.01							



Client: Shell U.K. LTD

Basis: Case 5 - 60%GT Load Design with Extraction to CCP

### Steam System Heat Material Balance

PCCS-01-TC-PX-8240-00001

Stream		012	015	018	021	028	033	035
		LP steam to desuperheater	Outlet from LP Turbine	Hot reheat from HRSG	Total LP Condensate	HP steam letdown (NNF)	HP-IP letdown desuperheating water (NNF)	LP steam to CCS
Description								
Temperature	°C	298.4	28.5	523.9	28.8	-	-	154.1
Pressure	bara	4.65	0.0389	22.51	25.35	-	-	4.65
Total Molar Flowrate	kgmol/hr	-	14,374	12,978	14,374	-	-	-
Total Mass Flowrate	kg/hr	-	259,020	233,856	259,020	-	-	-
Total Molecular Weight		18	18	18	18	-	-	18
Vapor Molar Flowrate	kgmol/hr	-	14,374	12,978				-
Vapor Mass Flowrate	kg/hr	-	259,020	233,856	-			-
Vapor Act Vol Flow	m³/hr	-	9,255,190	37,604	-			-
Vapor Molecular Weight		18	18	18	-			18
Vapor Density, Act	kg/m³	1.781	0.028	6.219	-			2.455
Vapor Z		0.99	1.00	0.98	-			0.96
Vapor Viscosity	Cp	0.0202	0.0100	0.0296	-			0.0142
Vapor Enthalpy	kJ/kg	3062.2	2393.9	3517.1	-	-	-	2755.6
Liquid Molar Flowrate	kgmol/hr	-	-	-	14,374			-
Liquid Mass Flowrate	kg/hr	-	-	-	259,020			-
Liquid Act Vol Flow	m³/hr	-	-	-	259.75			-
Liquid Molecular Weight		-	-	-	18.02			-
Liquid Density, Act	kg/m³	-	-	-	997.2			-
Liquid Viscosity	Cp	-	-	-	0.818			-
Liquid Surf Tension	dyne/cm	-	-	-	71.4			-
Liquid Enthalpy	kJ/kg	-	-	-	123.0			-
Composition, mol %	Comp. MW							
CO2	44.01							
N2	28.01							
O2	32.00							
H2O	18.02	100.00	100.00	100.00	100.00			100.00
H2	2.02							
ARGON	39.95							
NITRDIQX	46.01							
CO	28.01							
HYCHLORD	36.46							
SO2	64.06							
NH3	17.03							
HF	20.01							

Client: Shell U.K. LTD

Basis: Case 5 - 60%GT Load Design with Extraction to CCP

### Steam System Heat Material Balance

PCCS-01-TC-PX-8240-00001

Stream		037	040	042	043	044	045	048
Description		steam from IP letdown to CCS (NNF)	LP bypass steam to desuperheater (NNF)	IP bypass to letdown (NNF)	desuperheating water for IP letdown to CCS (NNF)	IP steam for letdown to CCS (NNF)	Steam from IP bypass letdown to condenser (NNF)	desuperheating water to IP letdown desuperheater (NNF)
Temperature	°C	-	-	-	-	-	-	-
Pressure	bara	-	-	-	-	-	-	-
Total Molar Flowrate	kgmol/hr	-	-	-	-	-	-	-
Total Mass Flowrate	kg/hr	-	-	-	-	-	-	-
Total Molecular Weight		-	-	-	-	-	-	-
Vapor Molar Flowrate	kgmol/hr							
Vapor Mass Flowrate	kg/hr							
Vapor Act Vol Flow	m³/hr							
Vapor Molecular Weight								
Vapor Density, Act	kg/m³							
Vapor Z								
Vapor Viscosity	Cp							
Vapor Enthalpy	kJ/kg	-	-	-	-	-	-	-
Liquid Molar Flowrate	kgmol/hr							
Liquid Mass Flowrate	kg/hr							
Liquid Act Vol Flow	m³/hr							
Liquid Molecular Weight								
Liquid Density, Act	kg/m³							
Liquid Viscosity	Cp							
Liquid Surf Tension	dyne/cm							
Liquid Enthalpy	kJ/kg							
Composition, mol %	Comp. MW							
CO2	44.01							
N2	28.01							
O2	32.00							
H2O	18.02							
H2	2.02							
ARGON	39.95							
NITRDIOX	46.01							
CO	28.01							
HYCHLORD	36.46							
SO2	64.06							
NH3	17.03							
HF	20.01							

Client: Shell U.K. LTD

Basis: Case 5 - 60%GT Load Design with Extraction to CCP

## Steam System Heat Material Balance

PCCS-01-TC-PX-8240-00001

Stream		049	050	080
<b>Description</b>		<b>desuperheating water to LP letdown desuperheater (NNF)</b>	<b>Steam from LP bypass letdown to condenser (NNF)</b>	<b>Ammonia Vapour to SCR System</b>
Temperature	°C	-	-	HOLD 4
Pressure	bara	-	-	HOLD 4
Total Molar Flowrate	kgmol/hr	-	-	HOLD 4
Total Mass Flowrate	kg/hr	-	-	HOLD 4
Total Molecular Weight		-	-	HOLD 4
Vapor Molar Flowrate	kgmol/hr			HOLD 4
Vapor Mass Flowrate	kg/hr			HOLD 4
Vapor Act Vol Flow	m³/hr			HOLD 4
Vapor Molecular Weight				HOLD 4
Vapor Density, Act	kg/m³			HOLD 4
Vapor Z				HOLD 4
Vapor Viscosity	Cp			HOLD 4
Vapor Enthalpy	kJ/kg	-	-	HOLD 4
Liquid Molar Flowrate	kgmol/hr			HOLD 4
Liquid Mass Flowrate	kg/hr			HOLD 4
Liquid Act Vol Flow	m³/hr			HOLD 4
Liquid Molecular Weight				HOLD 4
Liquid Density, Act	kg/m³			HOLD 4
Liquid Viscosity	Cp			HOLD 4
Liquid Surf Tension	dyne/cm			HOLD 4
Liquid Enthalpy	kJ/kg			HOLD 4
Composition, mol %	Comp. MW			HOLD 4
CO2	44.01			HOLD 4
N2	28.01			HOLD 4
O2	32.00			HOLD 4
H2O	18.02			HOLD 4
H2	2.02			HOLD 4
ARGON	39.95			HOLD 4
NITRDIQX	46.01			HOLD 4
CO	28.01			HOLD 4
HYCHLORD	36.46			HOLD 4
SO2	64.06			HOLD 4
NH3	17.03			HOLD 4
HF	20.01			HOLD 4



## **8. Steam Unit: Case 6 - Steam Turbine Trip @ Design Load with CCP Operating**





Client: Shell U.K. LTD

Basis: Case 6 - ST Trip @ design flow with CCP operating

### Steam System Heat Material Balance

PCCS-01-TC-PX-8240-00001

Stream		045	048	049	050	080
Description		Steam from IP bypass letdown to condenser (NNF)	desuperheating water to IP letdown desuperheater (NNF)	desuperheating water to LP letdown desuperheater (NNF)	Steam from LP bypass letdown to condenser (NNF)	Ammonia Vapour to SCR System
Temperature	°C	48.1	33.5	33.5	38.1	HOLD 4
Pressure	bara	0.1	35.0	35.0	0.1	HOLD 4
Total Molar Flowrate	kgmol/hr	15,635	4,173	284	2,202	HOLD 4
Total Mass Flowrate	kg/hr	281,736	75,204	5,123	39,672	HOLD 4
Total Molecular Weight		18	18	18	18	HOLD 4
Vapor Molar Flowrate	kgmol/hr					HOLD 4
Vapor Mass Flowrate	kg/hr	281,736	-	-	39,672	HOLD 4
Vapor Act Vol Flow	m³/hr	8,273,907	-	-	1,128,480	HOLD 4
Vapor Molecular Weight		18	-	-	18	HOLD 4
Vapor Density, Act	kg/m³	0.034	-	-	0.035	HOLD 4
Vapor Z		1.00	-	-	1.00	HOLD 4
Vapor Viscosity	Cp	0.0106	-	-	0.0103	HOLD 4
Vapor Enthalpy	kJ/kg	2589.9	-	-	2571.1	HOLD 4
Liquid Molar Flowrate	kgmol/hr	-	4,173	284	-	HOLD 4
Liquid Mass Flowrate	kg/hr	-	75,204	5,123	-	HOLD 4
Liquid Act Vol Flow	m³/hr	-	75.50	5.14	-	HOLD 4
Liquid Molecular Weight		-	18.02	18.02	-	HOLD 4
Liquid Density, Act	kg/m³	-	996.1	996.1	-	HOLD 4
Liquid Viscosity	Cp	-	0.741	0.741	-	HOLD 4
Liquid Surf Tension	dyne/cm	-	70.6	70.6	-	HOLD 4
Liquid Enthalpy	kJ/kg	-	70.4	70.4	-	HOLD 4
Composition, mol %	Comp. MW					HOLD 4
CO2	44.01					HOLD 4
N2	28.01					HOLD 4
O2	32.00					HOLD 4
H2O	18.02	100.00	100.00	100.00	100.00	HOLD 4
H2	2.02					HOLD 4
ARGON	39.95					HOLD 4
NITRDIOX	46.01					HOLD 4
CO	28.01					HOLD 4
HYCHLORD	36.46					HOLD 4
SO2	64.06					HOLD 4
NH3	17.03					HOLD 4
HF	20.01					HOLD 4





## **9. Steam Unit: Case 7 - Steam Turbine Trip @ Design Load with CCP Not Operating**





Client: Shell U.K. LTD

Basis: Case 7 - ST Trip @ design flow with No CCP

### Steam System Heat Material Balance

PCCS-01-TC-PX-8240-00001

Stream		045	048	049	050	080
Description		Steam from IP bypass letdown to condenser (NNF)	desuperheating water to IP letdown desuperheater (NNF)	desuperheating water to LP letdown desuperheater (NNF)	Steam from LP bypass letdown to condenser (NNF)	Ammonia Vapour to SCR System
Temperature	°C	50.4	45.8	45.8	50.4	HOLD 4
Pressure	bara	0.1	25.7	25.7	0.1	HOLD 4
Total Molar Flowrate	kgmol/hr	28,708	7,761	270	2,188	HOLD 4
Total Mass Flowrate	kg/hr	517,320	139,860	4,860	39,420	HOLD 4
Total Molecular Weight		18	18	18	18	HOLD 4
Vapor Molar Flowrate	kgmol/hr					HOLD 4
Vapor Mass Flowrate	kg/hr	517,320	-	-	39,420	HOLD 4
Vapor Act Vol Flow	m³/hr	7,875,790	-	-	600,138	HOLD 4
Vapor Molecular Weight		18	-	-	18	HOLD 4
Vapor Density, Act	kg/m³	0.066	-	-	0.066	HOLD 4
Vapor Z		1.00	-	-	1.00	HOLD 4
Vapor Viscosity	Cp	0.0106	-	-	0.0106	HOLD 4
Vapor Enthalpy	kJ/kg	2593.3	-	-	2593.3	HOLD 4
Liquid Molar Flowrate	kgmol/hr	-	7,761	270	-	HOLD 4
Liquid Mass Flowrate	kg/hr	-	139,860	4,860	-	HOLD 4
Liquid Act Vol Flow	m³/hr	-	141.13	4.90	-	HOLD 4
Liquid Molecular Weight		-	18.02	18.02	-	HOLD 4
Liquid Density, Act	kg/m³	-	991.0	991.0	-	HOLD 4
Liquid Viscosity	Cp	-	0.589	0.589	-	HOLD 4
Liquid Surf Tension	dyne/cm	-	68.7	68.7	-	HOLD 4
Liquid Enthalpy	kJ/kg	-	71.9	71.9	-	HOLD 4
Composition, mol %	Comp. MW					HOLD 4
CO2	44.01					HOLD 4
N2	28.01					HOLD 4
O2	32.00					HOLD 4
H2O	18.02	100.00	100.00	100.00	100.00	HOLD 4
H2	2.02					HOLD 4
ARGON	39.95					HOLD 4
NITRDIOX	46.01					HOLD 4
CO	28.01					HOLD 4
HYCHLORD	36.46					HOLD 4
SO2	64.06					HOLD 4
NH3	17.03					HOLD 4
HF	20.01					HOLD 4



## **10. Steam Unit: Case 8 – Steam Turbine Trip @ 65% Load with CCP Operating**





Client: Shell U.K. LTD

Basis: Case 8 - ST Trip @ 65% GT flow with CCP operating

### Steam System Heat Material Balance

PCCS-01-TC-PX-8240-00001

Stream		045	048	049	050	080
Description		Steam from IP bypass letdown to condenser (NNF)	desuperheating water to IP letdown desuperheater (NNF)	desuperheating water to LP letdown desuperheater (NNF)	Steam from LP bypass letdown to condenser (NNF)	Ammonia Vapour to SCR System
Temperature	°C	40.0	30.6	30.6	35.2	HOLD 4
Pressure	bara	0.0	25.2	25.2	0.0	HOLD 4
Total Molar Flowrate	kgmol/hr	13,287	3,620	226	1,754	HOLD 4
Total Mass Flowrate	kg/hr	239,436	65,232	4,072	31,612	HOLD 4
Total Molecular Weight		18	18	18	18	HOLD 4
Vapor Molar Flowrate	kgmol/hr					HOLD 4
Vapor Mass Flowrate	kg/hr	239,436	-	-	31,612	HOLD 4
Vapor Act Vol Flow	m³/hr	8,054,176	-	-	1,047,006	HOLD 4
Vapor Molecular Weight		18	-	-	18	HOLD 4
Vapor Density, Act	kg/m³	0.030	-	-	0.030	HOLD 4
Vapor Z		1.00	-	-	1.00	HOLD 4
Vapor Viscosity	Cp	0.0103	-	-	0.0102	HOLD 4
Vapor Enthalpy	kJ/kg	2574.9	-	-	2566.0	HOLD 4
Liquid Molar Flowrate	kgmol/hr	-	3,620	226	-	HOLD 4
Liquid Mass Flowrate	kg/hr	-	65,232	4,072	-	HOLD 4
Liquid Act Vol Flow	m³/hr	-	65.45	4.09	-	HOLD 4
Liquid Molecular Weight		-	18.02	18.02	-	HOLD 4
Liquid Density, Act	kg/m³	-	996.6	996.6	-	HOLD 4
Liquid Viscosity	Cp	-	0.787	0.787	-	HOLD 4
Liquid Surf Tension	dyne/cm	-	71.1	71.1	-	HOLD 4
Liquid Enthalpy	kJ/kg	-	71.9	71.9	-	HOLD 4
Composition, mol %	Comp. MW					HOLD 4
CO2	44.01					HOLD 4
N2	28.01					HOLD 4
O2	32.00					HOLD 4
H2O	18.02	100.00	100.00	100.00	100.00	HOLD 4
H2	2.02					HOLD 4
ARGON	39.95					HOLD 4
NITRDIOX	46.01					HOLD 4
CO	28.01					HOLD 4
HYCHLORD	36.46					HOLD 4
SO2	64.06					HOLD 4
NH3	17.03					HOLD 4
HF	20.01					HOLD 4





## **11. Steam Unit: Case 9 – Steam Turbine Trip @ 60% Load with CCP Not Operating**





Client: Shell U.K. LTD

Basis: Case 9 - ST Trip @ 60% GT Load with no CCP

## Steam System Heat Material Balance

PCCS-01-TC-PX-8240-00001

Stream		045	048	049	050	080
Description		Steam from IP bypass letdown to condenser (NNF)	desuperheating water to IP letdown desuperheater (NNF)	desuperheating water to LP letdown desuperheater (NNF)	Steam from LP bypass letdown to condenser (NNF)	Ammonia Vapour to SCR System
Temperature	°C	41.4	36.8	36.8	41.4	HOLD 4
Pressure	bara	0.1	25.4	25.4	0.1	HOLD 4
Total Molar Flowrate	kgmol/hr	19,680	5,396	224	1,783	HOLD 4
Total Mass Flowrate	kg/hr	354,636	97,236	4,043	32,123	HOLD 4
Total Molecular Weight		18	18	18	18	HOLD 4
Vapor Molar Flowrate	kgmol/hr					HOLD 4
Vapor Mass Flowrate	kg/hr	354,636	-	-	32,123	HOLD 4
Vapor Act Vol Flow	m³/hr	8,437,136	-	-	764,233	HOLD 4
Vapor Molecular Weight		18	-	-	18	HOLD 4
Vapor Density, Act	kg/m³	0.042	-	-	0.042	HOLD 4
Vapor Z		1.00	-	-	1.00	HOLD 4
Vapor Viscosity	Cp	0.0104	-	-	0.0104	HOLD 4
Vapor Enthalpy	kJ/kg	2577.2	-	-	2577.2	HOLD 4
Liquid Molar Flowrate	kgmol/hr	-	5,396	224	-	HOLD 4
Liquid Mass Flowrate	kg/hr	-	97,236	4,043	-	HOLD 4
Liquid Act Vol Flow	m³/hr	-	97.77	4.06	-	HOLD 4
Liquid Molecular Weight		-	18.02	18.02	-	HOLD 4
Liquid Density, Act	kg/m³	-	994.6	994.6	-	HOLD 4
Liquid Viscosity	Cp	-	0.695	0.695	-	HOLD 4
Liquid Surf Tension	dyne/cm	-	70.1	70.1	-	HOLD 4
Liquid Enthalpy	kJ/kg	-	71.9	71.9	-	HOLD 4
Composition, mol %	Comp. MW					HOLD 4
CO2	44.01					HOLD 4
N2	28.01					HOLD 4
O2	32.00					HOLD 4
H2O	18.02	100.00	100.00	100.00	100.00	HOLD 4
H2	2.02					HOLD 4
ARGON	39.95					HOLD 4
NITRDIOX	46.01					HOLD 4
CO	28.01					HOLD 4
HYCHLORD	36.46					HOLD 4
SO2	64.06					HOLD 4
NH3	17.03					HOLD 4
HF	20.01					HOLD 4



## 12. Auxiliary Boiler: Case A – Start-Up



**Auxiliary Boiler  
 Heat & Material Balance**

Stream		70	71	72	73	74	77	78
Description		Demin Water to Deaerator	Cooled Condensate to Deaerator	Deaerated Water	Boiler Feed Water	Auxiliary Boiler Blowdown	Fuel Gas To Auxiliary Boiler	Auxiliary Boiler Flue Gas
Temperature	°C	15.0	158.9	158.9	158.9	100.0	5.0	BY VENDOR
Pressure	bara	7.01	6.0	6.0	24.2	1.01	31.01	BY VENDOR
Total Molar Flowrate	kgmol/hr	689.4	0.0	1,257.0	1,256.3	12.4	BY VENDOR	BY VENDOR
Total Mass Flowrate	kg/hr	12,419	0.0	22644.7	22632.7	224	BY VENDOR	BY VENDOR
Total Molecular Weight		18.02	18.02	18.02	18.02	18.02	18.11	BY VENDOR
Vapor Molar Flowrate	kgmol/hr	-	-	-	-	2.9	BY VENDOR	BY VENDOR
Vapor Mass Flowrate	kg/hr	-	-	-	-	53	BY VENDOR	BY VENDOR
Vapor Act Vol Flow	m³/hr	-	-	-	-	89	BY VENDOR	BY VENDOR
Vapor Molecular Weight		-	-	-	-	18.02	18.11	BY VENDOR
Vapor Density, Act	kg/m³	-	-	-	-	0.60	26.50	BY VENDOR
Vapor Z		-	-	-	-	0.9844	0.9165	BY VENDOR
Vapor Viscosity	Cp	-	-	-	-	0.0123	0.0104	BY VENDOR
Vapor Enthalpy	kJ/kg	-	-	-	-	2,676.0	192.5	BY VENDOR
Liquid Molar Flowrate	kgmol/hr	689	0	1,257	1,256	9.5	-	BY VENDOR
Liquid Mass Flowrate	kg/hr	12,419	0	22,645	22,633	171	-	BY VENDOR
Liquid Act Vol Flow	m³/hr	12.43	0.00	24.93	24.92	0.18	-	BY VENDOR
Liquid Molecular Weight		18.02	18.02	18.02	18.02	18.02	-	BY VENDOR
Liquid Density, Act	kg/m³	999.2	908.3	908.3	908.3	958.1	-	BY VENDOR
Liquid Viscosity	Cp	1.1390	0.0143	0.1708	0.1712	0.2822	-	BY VENDOR
Liquid Surf Tension	dyne/cm	73.49	46.83	46.83	46.83	58.92	-	BY VENDOR
Liquid Enthalpy	kJ/kg	63.61	2,755.55	2,755.55	671.94	419.07	-	BY VENDOR
Composition, mol %	Comp. MW							BY VENDOR
CO2	44.01						2.129	BY VENDOR
N2	28.01						0.896	BY VENDOR
O2	32.00						0.003	BY VENDOR
H2O	18.02	100.000	100.000	100.000	100.000	100.000		BY VENDOR
H2	2.00						0.002	BY VENDOR
ARGON	39.95							BY VENDOR
NITRDIQX	46.01							BY VENDOR
CO	28.01							BY VENDOR
HYCHLORD	36.46							BY VENDOR
SO2	64.07							BY VENDOR
NH3	17.03							BY VENDOR
HF	20.01							BY VENDOR
METHANE	16.04						89.771	BY VENDOR
ETHANE	30.07						5.281	BY VENDOR
PROPANE	44.10						1.461	BY VENDOR
N-BUTANE	58.12						0.225	BY VENDOR
I-BUTANE	58.12						0.137	BY VENDOR
N-PENTANE	72.15						0.035	BY VENDOR
I-PENTANE	72.15						0.036	BY VENDOR
HEXANE	86.18						0.013	BY VENDOR
HEPTANE	100.21						0.003	BY VENDOR
OCTANE	114.23						0.001	BY VENDOR
HELIUM	4.00						0.007	BY VENDOR



### **13. Auxiliary Boiler: Case B – Normal Operation (All GTs and CCP Operating)**



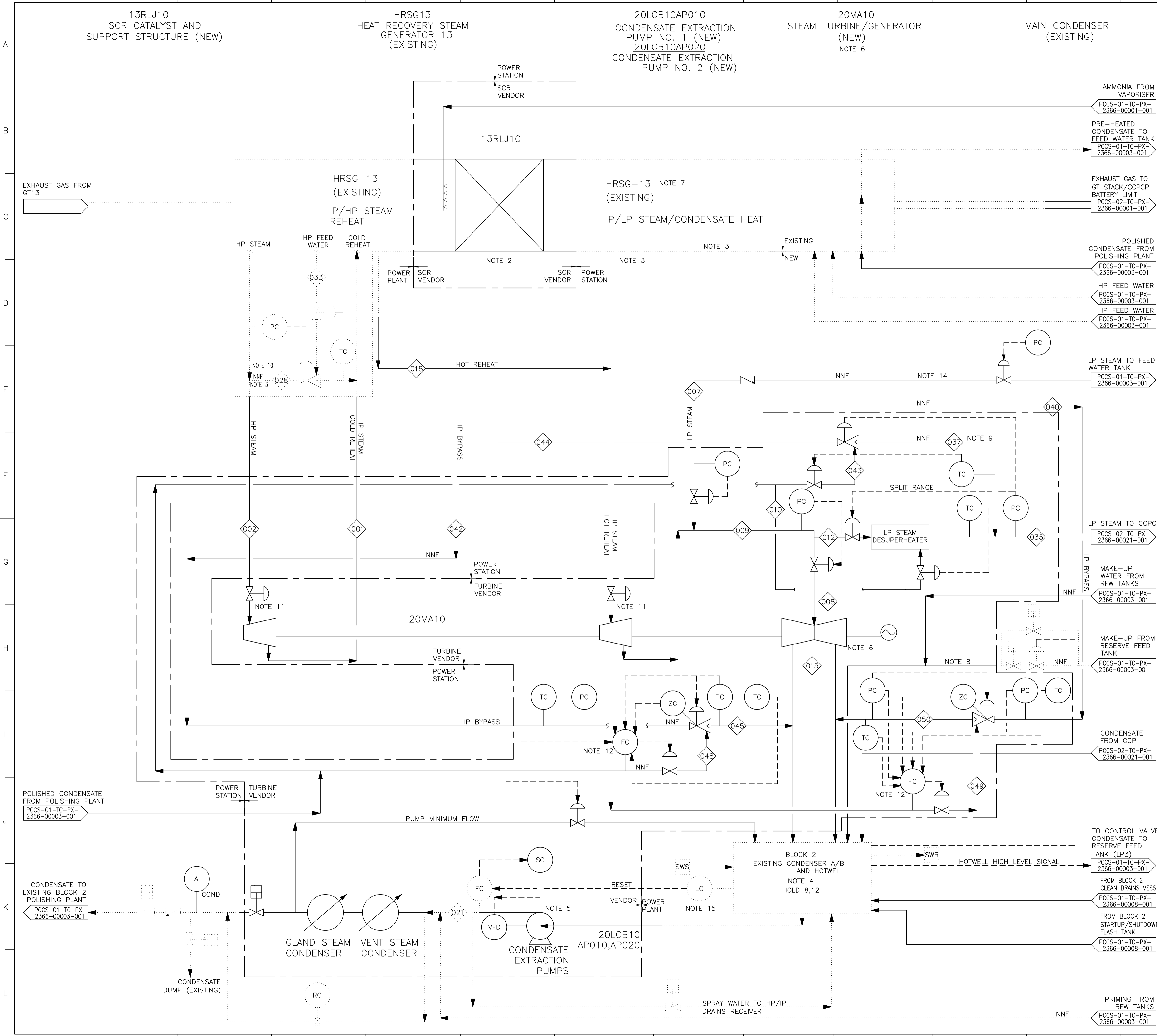


**Auxiliary Boiler  
 Heat & Material Balance**

Stream		70	71	72	73	74	77	78
Description		Demin Water to Deaerator	Cooled Condensate to Deaerator	Deaerated Water	Boiler Feed Water	Auxiliary Boiler Blowdown	Fuel Gas To Auxiliary Boiler	Auxiliary Boiler Flue Gas
Temperature	°C	15.0	151.0	158.9	177.0	100.0	5.0	BY VENDOR
Pressure	bara	7.01	6.0	6.0	24.2	1.01	31.01	BY VENDOR
Total Molar Flowrate	kgmol/hr	28.7	382.3	695.2	686.8	6.8	BY VENDOR	BY VENDOR
Total Mass Flowrate	kg/hr	516	6887.6	12524.4	12373.4	123	BY VENDOR	BY VENDOR
Total Molecular Weight		18.02	18.02	18.02	18.02	18.02	18.11	BY VENDOR
Vapor Molar Flowrate	kgmol/hr	-	-	-	-	1.6	BY VENDOR	BY VENDOR
Vapor Mass Flowrate	kg/hr	-	-	-	-	29	BY VENDOR	BY VENDOR
Vapor Act Vol Flow	m³/hr	-	-	-	-	48	BY VENDOR	BY VENDOR
Vapor Molecular Weight		-	-	-	-	18.02	18.11	BY VENDOR
Vapor Density, Act	kg/m³	-	-	-	-	0.60	26.50	BY VENDOR
Vapor Z		-	-	-	-	0.9844	0.9165	BY VENDOR
Vapor Viscosity	Cp	-	-	-	-	0.0123	0.0104	BY VENDOR
Vapor Enthalpy	kJ/kg	-	-	-	-	2,676.0	192.5	BY VENDOR
Liquid Molar Flowrate	kgmol/hr	29	382	695	687	5.2	-	BY VENDOR
Liquid Mass Flowrate	kg/hr	516	6,888	12,524	12,373	94	-	BY VENDOR
Liquid Act Vol Flow	m³/hr	0.52	7.52	13.79	13.90	0.10	-	BY VENDOR
Liquid Molecular Weight		18.02	18.02	18.02	18.02	18.02	-	BY VENDOR
Liquid Density, Act	kg/m³	999.2	915.8	908.3	890.1	958.1	-	BY VENDOR
Liquid Viscosity	Cp	1.1390	0.1806	0.1708	0.1525	0.2822	-	BY VENDOR
Liquid Surf Tension	dyne/cm	73.49	48.53	46.83	42.87	58.92	-	BY VENDOR
Liquid Enthalpy	kJ/kg	63.61	636.62	2,755.55	750.50	419.07	-	BY VENDOR
Composition, mol %	Comp. MW							BY VENDOR
CO2	44.01						2.129	BY VENDOR
N2	28.01						0.896	BY VENDOR
O2	32.00						0.003	BY VENDOR
H2O	18.02	100.000	100.000	100.000	100.000	100.000		BY VENDOR
H2	2.00						0.002	BY VENDOR
ARGON	39.95							BY VENDOR
NITRDIQX	46.01							BY VENDOR
CO	28.01							BY VENDOR
HYCHLORD	36.46							BY VENDOR
SO2	64.07							BY VENDOR
NH3	17.03							BY VENDOR
HF	20.01							BY VENDOR
METHANE	16.04						89.771	BY VENDOR
ETHANE	30.07						5.281	BY VENDOR
PROPANE	44.10						1.461	BY VENDOR
N-BUTANE	58.12						0.225	BY VENDOR
I-BUTANE	58.12						0.137	BY VENDOR
N-PENTANE	72.15						0.035	BY VENDOR
I-PENTANE	72.15						0.036	BY VENDOR
HEXANE	86.18						0.013	BY VENDOR
HEPTANE	100.21						0.003	BY VENDOR
OCTANE	114.23						0.001	BY VENDOR
HELIUM	4.00						0.007	BY VENDOR



## **ATTACHMENT A – Steam Unit Process Flow Scheme**



GENERAL NOTES

- FOR STANDARD SYMBOLS REFER TO LEGEND SHEET PCCS-00-TC-PX-2366-00001-001.
- FOR HEAT AND MATERIAL BALANCE REFER TO DOCUMENT NUMBER PCCS-01-TC-PX-8240-00001.


NOTES

- DELETED.
- NEW SCR UNIT TO BE POSITIONED IN HRSG SPACE ALLOCATED FOR FUTURE NOX REMOVAL CATALYST.
- PFD SHOWS NEW PIPING CONNECTIONS FROM EXISTING HRSG-13 TO NEW STEAM TURBINE 20MA10. UNIT 1 EXISTING STEAM TURBINE CONNECTIONS TO HRSG-13 VIA COMMON MANIFOLD TO BE ISOLATED.
- EXISTING BLOCK 2 MAIN CONDENSER MODIFIED FOR NEW CAPACITY AND CARBON CAPTURE PLANT TIE-IN.
- NEW VARIABLE SPEED DRIVEN PUMPS TO REPLACE EXISTING PUMPS.
- NEW STEAM TURBINE 20MA10 AND NEW AIR-COOLED GENERATOR TO REPLACE EXISTING UNIT 2 STEAM TURBINE/GENERATOR.
- EXISTING HRSG13 AND ASSOCIATED LOCAL PIPING, STEAM DRUMS AND CONTROL VALVES CONTAINED WITHIN THIS BOX.
- ON LOW LEVEL IN HOTWELL, MAKE-UP WATER FROM RESERVE FEEDWATER TANK VIA EXISTING CONTROL VALVE.
- LP STEAM TO CCPCP DURING 20MA10 START-UP OR TRIP.
- EXISTING HP STEAM BYPASS LOCATED AT HRSG-13, TO BE RE-USED.
- STOP/GOVERNER VALVE.
- ALGORITHMIC TEMPERATURE CONTROL.
- REMOVAL/RE-USE OF EXISTING UNIT 2 STEAM TURBINE AUXILIARY SYSTEMS TO BE CONSIDERED DURING FEED PHASE.
- LP STEAM TO FEEDWATER TANK DURING BLOCK 1 SHUTDOWN.
- EPC CONTRACTOR SHALL ASSESS IF THE EXISTING LEVEL CONTROLLER IS SUITABLE FOR THE NEW SERVICE.

HOLDS:

..... EXISTING  
 \_\_\_\_\_ NEW

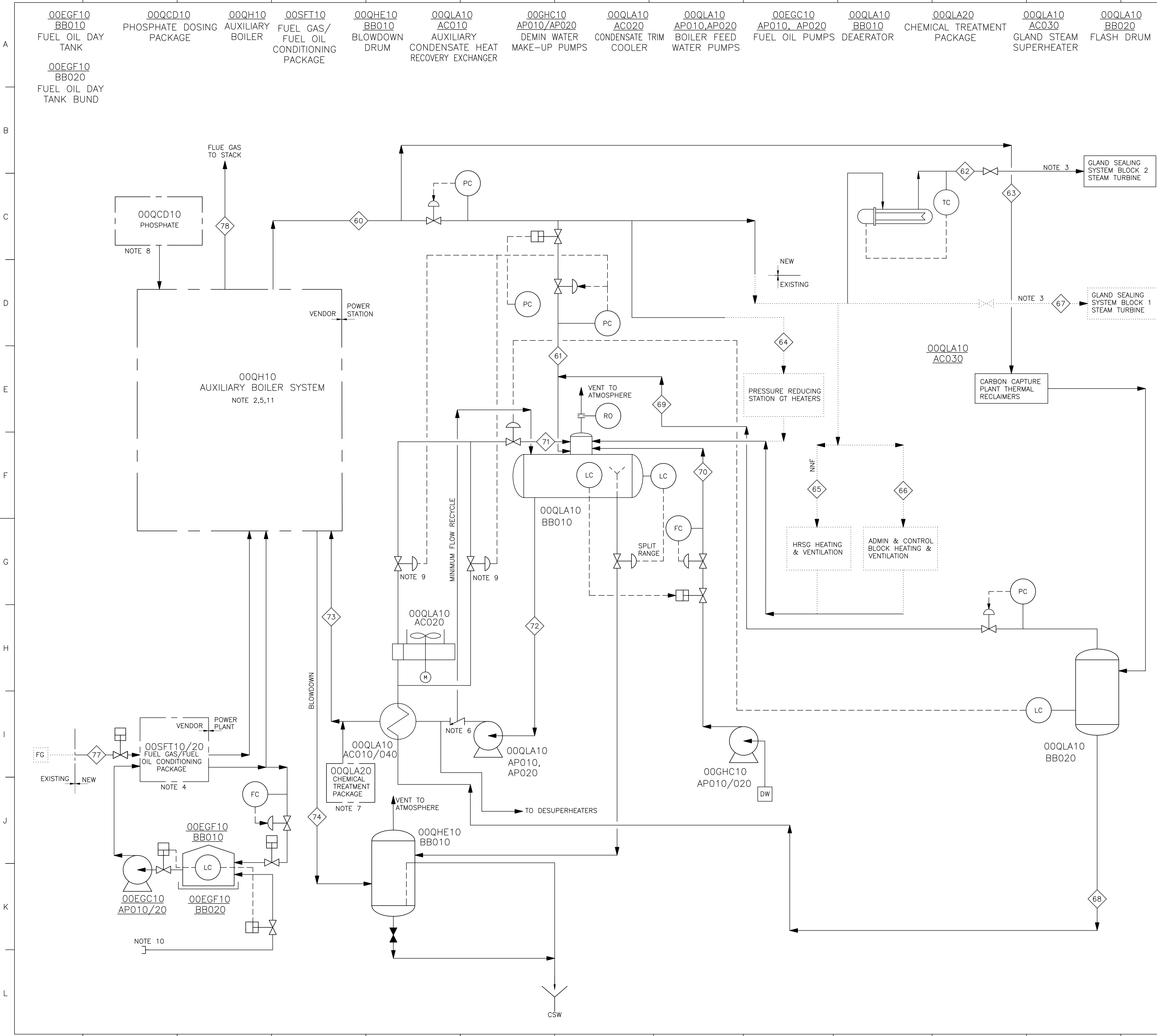
Rev	Date	Revision Object	Written by	Checked by	Approved by

  
**PETERHEAD CCS (ONSHORE)**  
**PETERHEAD CCS PROJECT**  
**PROCESS FLOW SCHEME**  
**GENERATION FACILITIES HRSG13 & ST20**

DOC. CLASS:	SCALE: NTS	SHEET:
CLIENT Doc. Ref:	PCCS-01-TC-PX-2366-00004-001	REVISION FORMAT
		K01 A1



## **ATTACHMENT B – Auxiliary Boiler Process Flow Scheme**

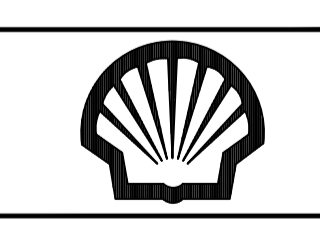


- GENERAL NOTES**
- FOR STANDARD SYMBOLS REFER TO LEGEND SHEET PCCS-00-TC-PX-2366-00001-001.
  - FOR HEAT AND MATERIAL BALANCE REFER TO DOCUMENT NUMBER PCCS-01-TC-PX-8240-00001.
- NOTES**
- DELETED.
  - EXISTING AUXILIARY BOILER HOUSE AND ASSOCIATED EQUIPMENT, PIPING AND INSTRUMENTATION TO BE DEMOLISHED. NEW AUXILIARY BOILERS TO BE INSTALLED IN NEW LOCATION
  - STEAM TURBINE START-UP DEMAND ONLY, LINE NORMALLY KEPT WARM BY PURGING STEAM VIA RESTRICTION ORIFICE LOCATED IN DRAIN LINE UPSTREAM OF ACTIVATED VALVE AT TURBINE.
  - FUEL GAS SKID TO INCLUDE GAS FILTER, FLOW METER, PRESSURE LETDOWN AND GAS CONDITIONING SYSTEM.
  - BOILER PACKAGE TO INCLUDE SUPERHEATER, BURNERS, FLUE GAS DUCTING TO ATMOSPHERE VIA NEW STACK AND STEAM FLOW METER MONITORING SYSTEM SHOULD BE PROVIDED TO ANALYSE NO<sub>x</sub> CONTENT TO FLUE GAS TO ENSURE LEGAL EMISSION LEVELS ARE MET.
  - AUTO RECIRCULATION VALVE.
  - AMINE INJECTION FOR pH CONTROL VENDOR TO ADVISE.
  - PHOSPHATE DOSING.
  - REVERSE ACTING VALVES.
  - FOR FILLING FUEL OIL DAY TANK FROM ROAD TANKER.
  - NUMBER OF AUXILIARY BOILER UNITS BY VENDOR.

HOLDS

..... EXISTING  
 ——— NEW

Rev	Date	Revision Object	Written by	Checked by	Approved by



**PETERHEAD  
CCS (ONSHORE)**

**PETERHEAD CCS PROJECT**

**PROCESS FLOW SCHEME**

**NEW AUXILIARY BOILERS AND STEAM DISTRIBUTION**

DOC. CLASS:	SCALE: NTS	SHEET: 1/1
CLIENT Doc. Ref:	PCCS-01-TC-PX-2366-00006-001	REVISION FORMAT
		K01 A1
		LAST REV DATE:



## 14. Glossary of Terms

<b>Term</b>	<b>Definition</b>
CCS	Carbon Capture and Storage
CO <sub>2</sub>	Carbon Dioxide
GT	Gas Turbine
H&MB	Heat & Material Balance
PFD	Process Flow Diagram
PFS	Process Flow Scheme