



REPORT HAZOP

East Coast Grid Expansion MW880 Milne CS HAZOP Typical for MW880 and MW433 New (Stage 1 and 2) Installations on MOOMBA WILTON PIPELINE

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1. Executive Summary

This report covers the Hazard and Operability (HAZOP) study which was held on 5th and 6th of May for the East Coast Grid Expansion Greenfield MW880 Milne Compressor Station (Typical).

The HAZOP was conducted in accordance with APA Work Instruction WI-R-0002 "HAZOP Study".

The HAZOP study resulted in a total of 153 recommended actions for the scope of work for the upgrade (refer Appendix C).

It is noted that NO previous HAZOP was used in this review.

This HAZOP workshop focused only on the scope of work for this project, the East Coast Grid Expansion Greenfield MW880 Milne Compressor Station (Typical).

This HAZOP has been conducted by difference/exception to the HAZOP completed for SS2 Cromaty CS on SWQP Pipeline. The differences will be clearly identified and analysed as per the HAZOP methodology outlined here.

Major differences between SS2 Cromaty CS and MW880 CS are highlighted below:

Table1 MWW880 CS versus SS2 Cromaty CS Differences

Parameter	SS2	MW880
Class Rating	900#	600#
Main Process Piping Design Pressure	15,320 kPag	7,600 kPag
Pipeline MAOP	14,920 kPag	6,200 kPag (MOP 5,700 kPag)
Main Process Line Pipe Size	450	600
Fuel Gas Offtake Location	Compressor Suction	Compressor Discharge Note during start up there is potential to supply fuel gas as low as 2,300 kPa(g) however this is allowable for the start-up scenario until the discharge system is pressurised
Scrubber Liquids Collection	up to 400L	Up to 200L

Station Isolation	Actuated valves provided on station valve skid	Station isolation to be performed using manual DIB Hot Tap Valves
Station Blowdown	Actuated blowdown valve provided on station valve skid	Manual blowdown valve provided on station discharge
Station Inlet Gas Temp	22 – 32°C	15 – 21°C
Ambient Temp Range	-2.3 – 47.1°C	-8.1 – 46.9°C

2. Introduction

2.1 Project Overview

MWP has been identified as best options for supply of additional gas to both NSW and Victoria to meet demand due to looming shortfall in Bass Strait production.

The capacity expansions will be done in stages as follows:

Table2 Capacity Expansion Stages (TJ/day)

Stage	MWP
Current	446
Stage 1	484
Stage 2	573
Stage 3	686

The following compressor sizes are proposed:

Table 3 Proposed MWP Gas Turbine Models

Site	Size	Stage
MW162	Taurus 70	Stage 3
MW330	Taurus 70	Stage 3
MW433	Mars 100	Stage 1
MW733	Taurus 70	Stage 3
MW880	Mars 100	Stage 2

The following design pressures are assumed for all capacity planning:

Table 4 MWP Design MAOP by Section

Pipe Section	Pressure, kPag
1	5,700
2,3,4	5,200
5,6,7	5,500

Pipe Section	Pressure, kPag
8,9	5,700

The scope of work covers the following:

2.1.1 MWP Scraper Stations

- Install DN600 connection to existing buried headers including installation of tie-in valves and removal of existing lock-o-ring completion plugs with a hot tap machine.
- Clean up and demolish existing dams and associated piping associated with past wet pigging operations.
- Provide control system interconnection from new station controls to existing scraper stations.

2.1.2 MWP Compressors

- Install new greenfield compressor stations at MW162, MW300, MW433, MW733 and MW880
- Install new station vent.
- Site bulk earthworks including build- up to match existing
- Tie-in to existing scraper trap buried completion plugs (stopple machine with buried valves required)
- Supply and install process after-cooler, interconnecting pipework
- Supply and install fuel gas conditioning skid including immersion heater, filter, meter and regulators
- Supply and install interconnecting pipework, valves and station vents.
- Supply and install comms and controls infrastructure
- Supply and install micro-turbines for power generation
- Supply and install compressor air system and dryers
- Supply and install control room, workshop and accommodation modules
- Supply and install water tank
- No allowance to be provided for future second unit with exception of tee on end of pipe header between station isolation and unit isolation valves.

The HAZOP focused on the proposed design, as defined by the P&ID's in Appendix E. Nodes are also delineated on simplified schematics in Appendix D.

2.2 Previous HAZOPs

None reviewed.

3. Abbreviations

Table 5 - Abbreviations

Item	Definition
AS	Australian Standard
HAZOP	Hazard and Operability Study
P&ID	Piping and Instrumentation Diagram
RTU	Remote Terminal Unit
SIF	Safety Instrumented Function

4. HAZOP Objectives and Methodology

4.1 Overview

HAZOP studies are one of the main tools used to consider and apply Process Safety principles and is recognised legally as an established and defined engineering management tool for Hazard Identification and Analysis. HAZOP studies constitute a key element of the projects risk management process and shall conform to the requirements of IEC 61882.

As per HAZOP requirements and to maintain the effectiveness of this HAZOP study, the process employed shall ensure that:

- HAZOP studies are executed effectively to ensure process hazards and operability issues associated with a facility's design are identified;
- All findings are recorded;
- The party responsible for resolution of each recommendation/action are clearly identified; and
- HAZOP recommendations/actions are closed out in a timely fashion to ensure the hazards and operability issues identified have been effectively mitigated when the design is implemented.

4.2 Objectives

The primary objectives of the HAZOP were to:

- Identify hazard and operability problems associated with the following nodes as part of the SoW of the upgrade and as shown in the Node Description Section 4.6 of this document.

- Ensure that the design is safe and operable by assessing whether deviations from the design intent will potentially produce hazardous scenario(s);
- Ensure that the design is robust for all operating and upset scenario(s);
- Identify operability and maintainability issues; and
- Ensure that appropriate actions are identified to address the problems to manage and maintain the facility and environment safely.

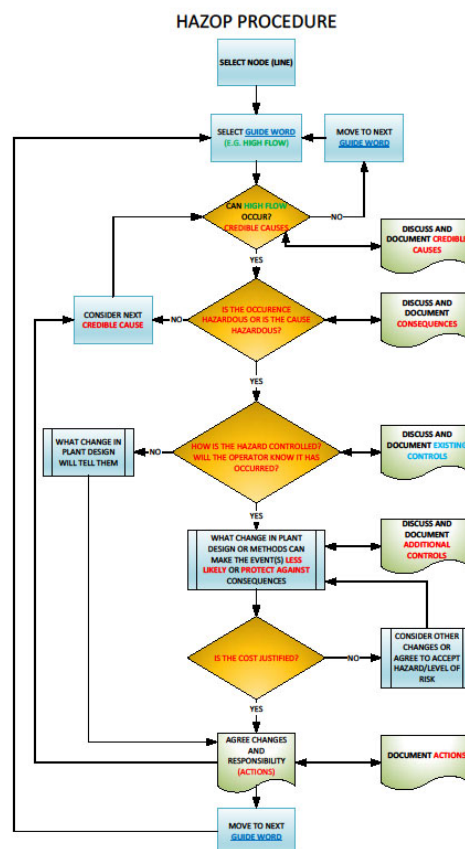
4.3 Methodology

The HAZOP study performed a systematic review of each node as per marked-up P&IDs (see Appendix D), according to APA WI-R-0002.

Prior to this review, an overview of the node was provided by the responsible Process Engineer, and the team discussed the node to fully understand the design intent and operational requirements.

A standard set of guidewords was then applied to each node to identify any potential deviations. If a credible deviation from the design intent was identified, it was examined for possible causes and consequences.

If the consequence indicated a significant potential problem or hazard, the team identified any existing safeguards (i.e. protection, detection and indication). Where required, recommendations were recorded to address the identified deviation. Actionees were assigned to the recommendation identified in the workshop.



4.4 Terms Of reference

Refer to 21100-TOR-R-0004 document for the terms of reference applicable to this HAZOP.

4.5 Guidewords

A summary of the guidewords used for the HAZOP is given below:

1. High Flow/High Level
2. Low Flow/Low Level
3. No Flow/Zero Flow/Empty
4. Reverse Flow
5. High / Low Mixing
6. High Pressure
7. Low Pressure (Including Venting)
8. High Temperature
9. Low Temperature
10. Phase Change
11. Changes in Concentration / Composition
12. Contamination / Impurities/Gaseous
13. Testing Equipment/Product
14. Plant Items Operable/Maintainable
15. Coating degradation-Corrosion
16. Electrical Area Classification/Isolation/Earthing
17. Control and Instrumentation Sufficient for Control/Too Many/Correct Location
18. Maintenance - Testing / Isolation Requirements
19. General

Overview:

1. Isolation
2. Redundancy
3. Security of Supply
4. Safety/LOPA
5. Backup
6. Emergency Response-Planning
7. Emergency Response-Access to Equipment
8. Toxicity
9. Utilities/Services Required Air/N₂/Water/Etc.
10. Materials of Construction Vessels/Pipelines/Piping/Pumps/Others
11. Materials of Construction-Corrosion
12. Initial Start Up/Commissioning
13. Start-Up / Partial Start-up/Maintenance
14. Shutdown/Isolation/Purging
15. Breakdown (Power Failure, Communication System, Air, Steam, Water, Vacuum, Fuel, Vents, Computer, Other);
16. Effluent Gaseous/Liquids/Solids
17. Noise Sources/Issues/Control Measures
18. Fire/Explosion

19. Safety Equipment PPE/Fire Detection/Fire Fighting/Mean of Escape
20. Quality & Consistency (Variation of)
21. Output Reliability/Bottlenecks/Redundancy (Least reliable components, most limiting components)
22. Efficiency Losses (Loss of material, conversions etc.)
23. Simplicity
24. Occupational Health
25. Electrical Safety
26. Packaging
27. Training
28. Safety Management Study
29. Construction HAZID
30. Spare Parts

4.6 Node Description

Table 6 HAZOP NODE DEFINITION (Typical for MW880 AND MW433)

Node #	Node Name	PIDs	Day	Comments	Status
1	Pipeline to Compressor Suction Nozzle	MSE.MILN-DWG-Q-3120 MWP.MILN-DWG-Q-0003 MWP.MILN -DWG-Q-0004 MWP.MILN -DWG-Q-0005 MWP.MILN -DWG-Q-0006 MWP.MILN -DWG-Q-0007	Day1		Completed.
2	Compressor Discharge Including ACHE	SWE.CROM-DWG-Q-0007	Day 1		Completed.
3	ACHE Discharge to Pipeline	MWP.MILN -DWG-Q-0007 MWP.MILN -DWG-Q-0005 MWP.MILN -DWG-Q-0004 MWP.MILN -DWG-Q-0003 MSE.MILN-DWG-Q-3120	Day 1		Completed.
4	Compressor Anti-Surge/Fast Stop Recycle	MWP.MILN -DWG-Q-0007 MWP.MILN -DWG-Q-0005 MWP.MILN -DWG-Q-0006	Day 1		Completed.
5a	Station Vent/Blow Down	MWP.MILN -DWG-Q-0003 MWP.MILN -DWG-Q-0004	Day 1		Completed.
5b	Unit Vent/Blow Down	MWP.MILN -DWG-Q-0005 MWP.MILN -DWG-Q-0004	Day 1		Completed.
5c	LP Fuel Gas Skid Vent/Blow Down	MWP.MILN -DWG-Q-0011 MWP.MILN -DWG-Q-0004	Day 1		Completed.
5e	HP Fuel Gas Skid Vent/Blow Down	MWP.MILN -DWG-Q-0010 MWP.MILN -DWG-Q-0004	Day 1		Completed.
6b	Compressor Liquids Drain - Discussion	MWP.MILN -DWG-Q-0008			

Node #	Node Name	PIDs	Day	Comments	Status
7	HP fuel gas skid including filtration, heating, regulation to GT inlet	MWP.MILN -DWG-Q-0003 MWP.MILN -DWG-Q-0009 MWP.MILN -DWG-Q-0010 MWP.MILN -DWG-Q-0008	Day 1	Preliminary HAZOP. Refer Vendor Packages HAZOP Strategy.	Completed.
8	LP fuel gas skid including regulation, filtration to MT inlet	MWP.MILN -DWG-Q-0010 MWP.MILN -DWG-Q-0011 MWP.MILN -DWG-Q-0012	Day 2	Preliminary HAZOP. Refer Vendor Packages HAZOP Strategy.	Completed.
11	Instrument Air Supply to IA Regulators to IA Manifold and Consumers <ul style="list-style-type: none"> Valve Actuators (Refer Node16) Compressor Air Buffer and Package Air Supply Compressor Unit Self Cleaning Filters Compressor Unit Fire Dampers 	MWP.MILN -DWG-Q-0013 MWP.MILN -DWG-Q-0014 MWP.MILN -DWG-Q-0008	Day 2		Completed.
13	Oily Water to Oily Water Holding Tank <ul style="list-style-type: none"> From IA Package Drain to Local Interceptor 	MWP.MILN -DWG-Q-0013	-	This will not been reviewed as the triple interceptor pit is on hold and there is no other equipment shown.	N/A
14	Turbine/Compressor Lube Oil Cooler	MWP.MILN -DWG-Q-0008	Day 2		Completed.
15	Fire System PID -	MWP.MILN -DWG-Q-0017	-	Package is on hold at this stage and cannot be HAZOP-ed. Refer Vendor Packages HAZOP Strategy.	N/A
16	Safety and Miscellaneous Systems PID- Discussion Only	MWP.MILN -DWG-Q-0018	-	This is not a PID and	N/A

Node #	Node Name	PIDs	Day	Comments	Status
				cannot be HAZOP-ed. Refer Vendor Packages HAZOP Strategy.	
17	Actuated Valve Local Control Panels PID – Discussion Only	MWP.MILN -DWG-Q-0019	-	This Node will not been HAZOP-ed and shall refer to APA Standard configuration. APA design team to provide the applicable standards to the PEM and MTM (Action on Sohail Hameed and John Etubus)	N/A
18	Water System PID	MWP.MILN -DWG-Q-0020	Day 2		Completed.
O1	Overview 1-Compressor Utilities	MWP.MILN -DWG-Q-0008	Day 2		Completed.
O2	Overview 2-All Station	All PID's	Day 2		Completed.

NOTE: Nodes Xa,b,c,d,e can be assessed by exception/difference.

Nodes are delineated on the P&ID's on simplified schematics in Appendix D.

Reference P&ID's

- MWP.MILN -DWG-Q-0003 IFH
- MWP.MILN -DWG-Q-0004 IFH
- MWP.MILN -DWG-Q-0005 IFH
- MWP.MILN -DWG-Q-0006 IFH
- MWP.MILN -DWG-Q-0007 IFH
- MWP.MILN -DWG-Q-0008 IFH
- MWP.MILN -DWG-Q-0009 IFH
- MWP.MILN -DWG-Q-0010 IFH
- MWP.MILN -DWG-Q-0011 IFH
- MWP.MILN -DWG-Q-0012 IFH
- MWP.MILN -DWG-Q-0013 IFH
- MWP.MILN -DWG-Q-0014 IFH
- MWP.MILN -DWG-Q-0016 IFH
- MWP.MILN -DWG-Q-0017 IFH
- MWP.MILN -DWG-Q-0018 IFH
- MWP.MILN -DWG-Q-0019 IFH

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- MWP.MILN -DWG-Q-0020 IFH
- MSE.MILN-DWG-Q-3120 IFH

HAZOP P&ID's are attached in Appendix E.

The following Process Conditions have been used for the assessment:

Table 7 HAZOP NODE PROCESS CONDITIONS (Typical for MW880 and MW443)

Node #	Node Name	Fluid	Flow		Pressure		Temperature		Design Pressure	Design Temperature
			kSm ³ /h		kPag		°C		kPag	°C
1	Pipeline to Compressor Suction Nozzle (incl. Scrubber)	Natural Gas	300	750	2,400	5,024	15	22	7,600	-29 / 65
2	Compressor Discharge	Natural Gas	300	750	4,600	5,700	26	90	7,600	-29 / 160
3	ACHE to Pipeline	Natural Gas	300	750	4,550	5,700	26	45	7,600	-29 / 65
4	FSV	Natural Gas	0	Note 2	2,400	5,700	26	90	7,600	-29 / 160
	ASV								7,600	-29 / 65
5a/b/c/e	Station Vent	Natural Gas	0	30*	0	600*	- 40*	32	1,960	-45 / 65
7	HP Fuel Gas skid to FG Heater	Natural Gas	1.8	3.8	4,600 (Note 3)	5,700	26	45	7,600	-29 / 65
	FG Heater and HP Regulators	Natural Gas	1.8	3.8	4,600	5,700	26	45	7,600	-29 / 65
					3,300	3,400	20	30	4,700	-29 / 65
	LP FG Filter Coalescer to Turbine	Natural Gas	1.8	3.6	535	555	5	30	1,960	-29 / 65
8	LP FG to Micro Turbines	Natural Gas	0	0.2	3,300	3,400	20	30	4,700	-29 / 65
					535	555	5	30	1,960	-29 / 65
11	IA Supply to Regulators	Compressed Air	0	0.1*	550	1,000	Ambient		1,400	-101 / 65
	IA Supply to Consumers	Compressed Air	0	0.1*	550	750	Ambient		1,400	-101 / 65
13	Oily Water Holding Tank	Water (Trace wash down oils)	Wash down water only		Atmospheric		Ambient		Atmospheric	Ambient
14	Compressor Lube Oil Cooler	Lube Oil	up to 897 LPM		000	1,034	50	74	1,034	74
15	Fire System	N/A								
16	Safety and Miscellaneous Systems	N/A								
17	Actuated Valve Panels	IA / IG								

18	Water System	Water								
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Notes:

1. * denote values to be confirmed pending process calculations.
2. ASV and FSV flow requirements to be confirmed pending Solar surge and recycle design.
3. May be as low as 2,400 kPag during start up prior to compression.
4. Nodes Xa,b,c,d,e can be assessed by exception/difference.

4.7 Vendor Packages HAZOP Strategy

Table 8 HAZOP STRATEGY-VENDOR PACKAGES-MW880 MILNE CS

Node #	Node Name	APA PIDs	Vendor PIDs	Comments
	Solar Package	MWP.MILN-DWG-Q-0008	TBC	Standard design statement or proof of HAZOP to be provided by Solar.
7	HP fuel gas skid including filtration, heating, regulation to GT inlet	MWP.MILN-DWG-Q-0003 MWP.MILN-DWG-Q-0009 MWP.MILN-DWG-Q-0010 MWP.MILN-DWG-Q-0008	TBC	Preliminary HAZOP. If there are no significant process design changes, re-HAZOP may not be required.
8	LP fuel gas skid including regulation, filtration to MT inlet	MWP.MILN-DWG-Q-0010 MWP.MILN-DWG-Q-0011 SWE.CROM-DWG-Q-0012	TBC	Preliminary HAZOP. If there are no significant process design changes, re-HAZOP may not be required.
11	Instrument Compressor Package Air	MWP.MILN-DWG-Q-0013	TBC	APA and MTM to try and outsource an existing, already HAZOP-ed design
15	Fire System PID - Discussion Only	MWP.MILN-DWG-Q-0017	TBC	<ol style="list-style-type: none"> 1. For the Solar part of the PID-Q-0017 (WM2510) the project to outsource an existing design for a MARS 100 if possible. Action assigned to Kevin Martin. 2. APA to outsource an existing approved design for package CF-2551 on PID-Q-0017 and provide to

Node #	Node Name	APA PIDs	Vendor PIDs	Comments
				MTM. Action assigned to Sohail Hameed.
16	Safety and Miscellaneous Systems PID-Discussion Only	MWP.MILN-DWG-Q-0018	TBC	<ol style="list-style-type: none"> The information on this PID shall be discussed during the CHAZOP workshop. Action assigned to Peyman Orangi. The project should implement strategy on the approach with vendors for this package. Michael Palmisano.
	Micro Turbines	MWP.MILN-DWG-Q-0012	TBC	Requires HAZOP with vendor or provide proof package HAZOP

NOTE: Vendor Packages HAZOP or Proof of HAZOP is required for Vendor packages.

5. Workshop Attendees

A list of Attendees for HAZOP workshop is provided in Appendix B.

6. Study Findings

6.1 HAZOP Action Summary

A total of 153 actions were generated during the HAZOP workshop (See HAZOP minutes – Appendix A. The term “No change to existing. No further issues” was used for potential deviations where the workshop team agreed that the existing safeguards were adequate and that no further risk reduction measures were required or that NO CHANGE by the project was identified to the existing asset which has been reviewed via previous HAZOP workshops.

The HAZOP actions listed in Appendix C should be read in conjunction with the minutes in Appendix A to provide context and understanding of intended consequence mitigation.

6.2 HAZOP Action Management and Close Out

The actions assigned during the HAZOP workshop shall be tracked, monitored and closed out as part of the FEED or Detail Design (DD) process.

Appendix C identifies which actions will be closed as part of the FEED and/or Detail Design.

Once all actions have been closed out, a HAZOP Closeout Report will be generated to document the actions taken.

HAZOP Report

ECG Expansion MW880 Milne Compressor Station



The FEED HAZOP Close out Report shall clearly identify which actions have been closed off during FEED and which actions will be closed off during detail design.

Individual HAZOP Actions Close out Sheets have been added to this document Appendix F.

7. References

Table 9 Referenced Documents

Document	Document Number
HAZOP Review Minutes	21100-MOM-R-0003
HAZOP Terms of Reference	21100-TOR-R-0004
WI – HAZOP Study	WI-R-0002
AS 2885.1:2018	Pipelines – Gas and Liquid Petroleum – Design and Construction
P&ID's covered in the workshop	Refer above for each individual Node.

Appendix A **HAZOP MINUTES**

Refer to 21100-MOM-R-0003 for full record of the MW880 Milne CS HAZOP Workshop discussions.

Appendix B ATTENDANCE RECORD

Name	Company	Position/Role	Initials	5/05/2021	6/05/2021
Radu Fagarasan	APA	Principal Mechanical Engineer/HAZOP Facilitator	FRF	Y	Y
Harrison Platt	APA	APA-Process Engineer HAZOP Scribe	HP	Y	Y
Peyman Orangi	APA	APA-Team Lead Bid Support	PO	N	N
Sean Armitage	Momentum	Momentum Engineering	SA	N	N
Martin Ulyatt	APA	APA-Principal EIC/FSA Engineer	MU	Y	Y
Mudassar Chughtai	APA	APA-Senior Mechanical Engineer	MC	Y	Y
Adrian Higgs	APA	APA-Senior E&I Engineer	AH	Y	Y
Heng Zhang	APA	APA-I&CS Engineer	HZ	N	N
Alex Kristovskis	APA	APA-Project Manager	AK	N	N
Daniel Baker	APA	APA-Regional Manager Young	DB	N	N
Sohail Hameed	APA	Senior E&IC Engineer	SH	Y	Y
Chris Broad	APA	APA-Team Lead Process and Optimisation	CBr	N	N
Caroline Button	APA	APA-Team Lead Process & Pipeline Engineering	CB	Y	Y
Bart Calvert	APA	APA-Engineering Bid Manager	BC	N	N
Mark Wright	APA	APA-Asset Manager	MW	N	N
Kevin Martin	APA	APA-Senior Rotating Engineer	KM	N	N
Sanjay Chhanabhai	APA	APA-Team Lead E&IC Engineering-East	SC	N	N
Toby Sullivan	APA	APA-Team Lead Mechanical Engineering - East	TS	N	N
Rupert Greenwood	APA	APA-Process Engineer	RG	N	N
IOC Engineering	APA	APA IOC		N	N
Samantha French	APA	APA-Program Administrator	SF	N	N
James Brandt	APA	APA-Asset Management Specialist	JB	N	N
Rod Graham	APA	APA-Senior Technical Officer E&I	RG	Y	N
John Etubus	Momentum	Momentum Engineering Process	JE	Y	Y
Thao Ho	APA	APA-Process Engineer - E&P	VH	N	N
Shaun Quinlan	APA	APA-Technical Officer E&I	SQ	N	N
Michael Palmisano	Momentum	Momentum Engineering E&I	MP	Y	Y
Han Ho	Momentum	Momentum Engineering E&I	HH	N	N
Christopher Daines	Momentum	Momentum Engineering Mechanical	CD	Y	Y
Craig Clarke	APA	APA-Manager Project Dev. & Assurance	CC	N	N

Appendix C HAZOP ACTION SUMMARY

NODE	GUIDE WORD	ITEM	POSSIBLE CAUSES	CONSEQUENCES	EXISTING SAFEGUARDS	ACTION	ACTION	ACTION	FEED/DD	CLOSE OUT COMMENTS	CLOSE OUT DATE	SIGNATURE
							BY	NO.				
Node 1												
1	High Flow/High Level	N1-1-1A	Failure of Compressor control FIC-1201	High gas velocity Equipment damage (Thermowells TW-2200A/B, TW-2203A/B/C, Potential damage to suction cyclone F-210, Temporary strainer SP-03) Potential damage to small branch connections	Use of twisted square thermowells which are less sensitive to vortex induced vibration PDAHH-2202 and PDAHH-2100 across temporary strainer and suction scrubber(PD is proportional to velocity) Small branch connection, thermowells and suction piping velocity limits compliant with APA piping velocity guidelines	Consider to establish High flow alarm on FIT-1201	JE	1	FEED			
1	High Flow/High Level	N1-1-1B	Failure of Compressor control FIC-1201	High gas velocity Equipment damage (Thermowells TW-2200A/B, TW-2203A/B/C, Potential damage to suction cyclone F-210, Temporary strainer SP-03) Potential damage to small branch connections	Use of twisted square thermowells which are less sensitive to vortex induced vibration PDAHH-2202 and PDAHH-2100 across temporary strainer and suction scrubber(PD is proportional to velocity) Small branch connection, thermowells and suction piping velocity limits compliant with APA piping velocity guidelines	Compressor line sizing to consider high flow rates resulting from FIC control failure and start up condition	JE	2	FEED			
1	High Flow/High Level	N1-1-5	Low suction pressure causing high velocity	SAME AS NODE N-1-1-1 but for a short duration	SAME AS NODE N-1-1-1	Clamp on FIC-1201 to limit flow depending on process condition	JE	3	FEED			
1	High Flow/High Level	N1-1-7	Filter drain valve BF-2180 and PL-2182 left open (PID-0006 G8)	NONE	NONE	Provide lockable tags on BF-2180 and PL-2182 RO to be installed in the drain downstream of PL-2182	JE	4	FEED			
1	High Flow/High Level	N1-1-8	Rupture up to the compressor C-220	Potential equipment damage and potential for escalation of the emergency event with gas inventory from the suction pipeline	PALL-2200	Consider additional safeguards e.g.. Closing the unit isolation valve SDV-2000 and / or station isolation valve SDV-1001	JE	5	FEED			
1	Low Flow/Low Level	N1-2-3	Misalignment of valves (valves partially closed)	Restriction of supply to compressor	NONE	Station ready (XA-7083) to include correct alignment of actuated valves	MP	6	FEED/DD			
1	High Pressure	N1-6-1	High pressure due to fire on F-2100	Damage to the vessel and potential vessel rupture	PSV-2100	Project team to consider how AS 1210 section 8 applies to F-2100 and PSV-2100	CB / RF	7	FEED/DD			
1	High Pressure	N1-6-2	High pressure due to fire on F-2100	Damage to the vessel and potential vessel rupture	PSV-2100	A spare PSV to be supplied for quick replacement when PSV-2100 needs to be serviced	SH	8	FEED/DD			
1	High Temperature	N1-8-1	After cooler EA-2401 failure (fans not operating) and high recycle rates into the suction line from the fast stop line	high suction temperatures leading to high thermal stress and potential flange leakage	low select coming from TIC-2003 TAHH-2004 will trip compressor and recycle hot gas from fast stop line mixing with cooler gas from anti surge line	Consider additional methods of protection for suction piping from high temperature coming from the fast stop line e.g. .(the fast stop line downstream of the unit valve skid should be converted to piping spec A15C04 all the way to the compressor suction nozzle)	JE	9	FEED			
1	High Temperature	N1-8-2	Hot fast stop recycle line fail open	AS ABOVE	NONE	Implement compressor unit trip on high suction temperature (e.g. TIT-2200B) set a piping design limit	JE	10	FEED			
1	General	N1-19-1	incorrect symbols on PID regarding solenoid valve or limit switches on actuated valves (solenoids missing or shown in incorrect position)	confusion in operation	NONE	show the correct symbols and functionality for the actuated valves in accordance with APA standard 530-SP-P-0037	JE / MP	11	FEED			
1	General	N1-19-2	incorrect symbols on PID-MW43-0120 regarding the Valve DIB-0001 regarding body bleed	Incorrect depiction of the valve confusion in operation	NONE	show the correct symbols and functionality for DIB-0001	JE	12	FEED			
1	General	N1-19-3	Transitions for underground to aboveground missing on PID-MW43-0120	Incorrect depiction of equipment confusion in operation	NONE	show the correct Transitions for underground to aboveground on PID-MW43-0120	JE / CD / SH	13	FEED			
1	General	N1-19-4	Transitions for underground to aboveground missing on PID-MW43-0120	Incorrect depiction of equipment confusion in operation	NONE	APA to provide correct hot taping details for similar installation to MTM	MC	14	FEED/DD			
1	General	N1-19-5	CP protection and insulation not properly shown on PID-MW43-0120 in regards to all the above ground to below ground transitions	Incorrect depiction of equipment confusion in operation	NONE	Provide appropriate CP protection and insulation on PID-MW43-0120 in regards to all the above ground to below ground transitions (consider the use of FIK instead of MIJs)	MP / JE	15	FEED			
1	General	N1-19-6	incorrect depiction of the manual load bypass (BF-0002 and RO-0002)	Incorrect depiction of equipment confusion in operation	NONE	relocate bypass from pig trap to just around DIB-0001 (local to the DIB)	JE	16	FEED			
1	General	N1-19-7	inability for the operator to read the station pressure	Incorrect operation of the station	NONE	Add pressure indicator downstream of DIB-0001 close to DIB-0001	JE	17	FEED			
1	General	N1-19-8	Added simplicity	potential failure of limit switches	NONE	remove position switches DIB-0001 and provide lockable tabs (valve is locked open)	JE	18	FEED			
Node 2												
2	High Flow/High Level	N2-1-1	Failure of Compressor control FIC-1201	High gas velocity Equipment damage	Use of twisted square thermowells which are less sensitive to vortex induced vibration	After cooler scope of work to address potential vibration issues in the tubing rigidity of the after cooler frame and the air plenum	CD	19	FEED			
2	High Flow/High Level	N2-1-5	Rupture downstream of the compressor C-220	Potential equipment damage and potential for escalation of the emergency event with	NONE	Design team should locate pressure sensing points on the pipeline downstream of the compressor and ensure appropriate action is taken by the IOC (because this is what is assumed	RG	20	FEED/DD			
2	Low Flow/Low Level	N2-2-3	Fast stop valve FSV-2386 fail open	Restriction of supply to consumers		Provide position discrepancy alarm ZS-2386 / FSV-2386	MP	21	FEED/DD			
2	Reverse Flow	N2-4	Check valve CK-2300 inadequate for low flow scenario	Valve chattering	NONE	Valve datasheet to specify minimum flow for operation	CD	22	FEED			
2	High Pressure	N2-6-1	Failure of PIC-2002 (due to the failure of the over speed control)	potential equipment failure, piping and pipeline failure	Pressure trip PAHH-2305, PAHH-2304 and PAHH-2310	set pressure set points, alarms and trips as per 530-GD-Q-0005	JE	23	FEED			
2	High Temperature	N2-8-1	failure of EA-2401 fans	Potential for differential temperature on each cooler bay leading to thermal stresses in the piping	NONE	Pipe stress analysis to consider this failure case as part of the analysis during detailed design	CD	24	DD			
Node 3												
3	High Flow/High Level	N3-1-7	Failure of the FIC-1201	Damage to equipment FE-1201	FAH-1201 Refer Action 1 in NODE 1 (reference high flow alarm).	Consider removing trip FAHH-1201 and consider implementing RO flow meter instead of flow nozzle, if RO is implemented, set tapping point for PIT-1201 on the piping will be required	JE	25	FEED			
3	Low Flow/Low Level	N3-2-4	Anti surge valve ASV-2385 fail open	Restriction of supply to consumers	ZT-2385	Provide position discrepancy alarm ZT-2385 / FC-2385	MP	26	FEED/DD			
3	Reverse Flow	N3-4-1	Check valve CK-2011 inadequate for low flow scenario	Valve chattering	NONE	Valve datasheet to specify minimum flow for operation	CD	27	FEED			
3	High Temperature	N3-8-1	failure of EA-2401 fans	Exceeding of station piping / pipeline design envelope	TIC-2003 and TAH-2004 and TAHH-2004	Consider implementing fan failure indication on SCADA	MP	28	FEED/DD			
3	Low Temperature	N3-9	Cold ambient temperature with low compression head and cooler fans operating continuously leading to gas temperatures below pipeline MDMT	exceeding the pipeline MDMT and potential for brittle failure	NONE	Process to provide calculation with variables in the cause considered to establish a minimum gas temperature for this operational scenario If calculation proves there is a problem, Establish low temperature alarm on either TIT-2003 or TIT-2004 and / or appropriate operator or control system response	JE	29	DD			
3	Plant Items Operable/Maintainable	N3-14	inconsistencies of symbology in PIDs	potential to implement permissive incorrectly	NONE	Rename PDALL-2030 to PDAHH-2030	JE	30	FEED			
3	General	N3-19-1	BF-1100 on PID-Q-0003 on station bypass is shown normally closed	inability to free flow into the pipeline in case the compressor station trips	NONE	Show BF-1100 on PID-Q-0003 normally open	JE	31	FEED			
3	General	N3-19-2	Added simplicity	potential failure of limit switches	NONE	remove position switches DIB-0004 and provide lockable tabs (valve is locked open)	JE	32	FEED			
3	General	N3-19-3	incorrect discharge temperature set points shown on TIT-2004	potential failure of the coating in the pipeline	NONE	show the correct discharge temperature set point for TIT-2004 aligned with a discharge temperature of maximum 45 degC discharge to the pipeline	JE	33	FEED			

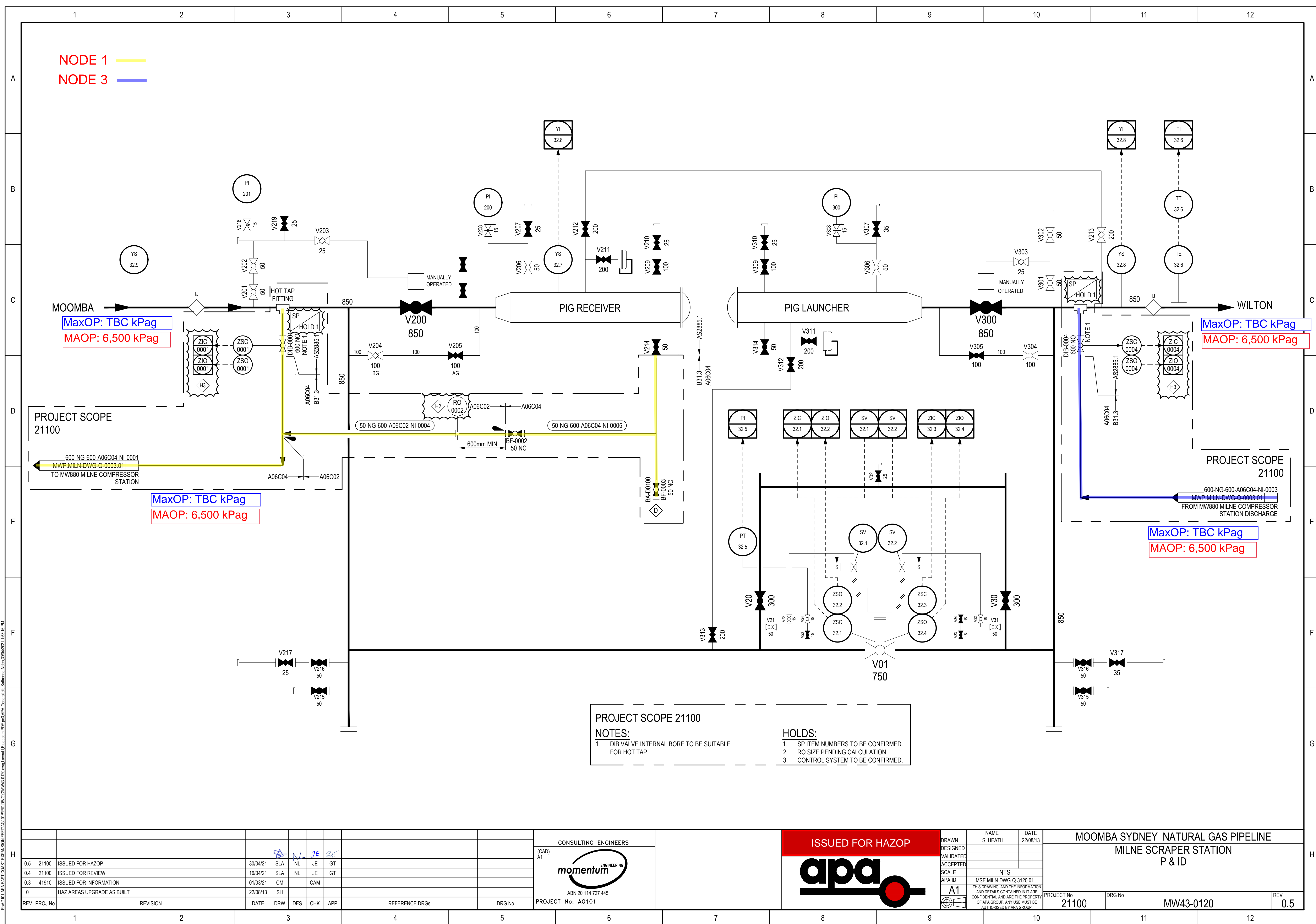
Node	Guide Word	Item	Possible Causes	Consequences	Existing Safeguards	Action	Action	Action	Feed/DD	Close Out Comments	Close Out Date	Signature
							BY	NO.				
3	General	N3-19-4	inability for the operator to read the station pressure	Incorrect operation of the station	NONE	Add pressure indicator upstream of DIB-0004 close to DIB-0004	JE	34	FEED			
3	General	N3-19-5	Note 5 incorrectly attached to BF-1015 position switches	Incorrect depiction of the station equipment	NONE	remove note 5 attached to BF-1015 position switches	JE	35	FEED			
3	General	N3-19-6	BF-1015 showing normally open position	Incorrect depiction of the station equipment	NONE	Show BF-1015 in locked closed position and show LC on the PID and provide locking tabs on the valve	JE	36	FEED			
Node 4												
4	High Flow/High Level	N4-1-1	Anti surge valve ASV-2385 fail open	Restriction of supply to consumers Velocity exceeding design limits	ZT-2385 and refer action 26 Node 3 (ref discrepancy alarm)	During detailed design when Solar information regarding ASV is available check velocity limits / FIT vibration in the piping against APA guidelines	JE	37	DD			
4	High Flow/High Level	N4-1-2	Fast stop valve FSV-2386 fail open	Restriction of supply to consumers Velocity exceeding design limits	ZT-2386 and refer action 26 Node 2 (ref discrepancy alarm)	During detailed design when Solar information regarding FSV is available check velocity limits / FIT vibration in the piping against APA guidelines	JE	38	DD			
4	Low Flow/Low Level	N4-2-1	Anti surge valve ASV-2385 fail to open to the required position by anti surge control system	Potential for compressor surge and mechanical damage	Fast stop valve FSV-2386	Confirm the Solar instrumentation logic trips the compressor C-2200 on surge detection	KM	39	FEED/DD			
4	Testing Equipment/Product	N4-13	Anti surge or Fast stop valves jammed closed	Surge and potential damage to compressor C-2200	Compressor start up and purging sequence checks of the anti surge valve / fast stop valve and permissive to operate (including checking ASV / FSV move off the seat) annual testing / maintenance by APA	Project team to highlight this feature identified as a safeguard in the functional description	KM	40	FEED/DD			
4	Plant Items Operable/Maintainable	N4-14	hot recycle piping temperature exceeding 60degC	personnel injury due to hot recycle piping	NONE	Provide personnel protection insulation on hot recycle fast stop line al the way to the suction line	JE	41	FEED			
4	Coating Degradation/Corrosion	N4-15	inadequate painting spec for the high temperature piping A06C05 (up to the max piping operating temperature)	potential for accelerated corrosion	NONE	Investigate whether APA has existing standard for high temperature piping to maximum operating temperature for the piping consider using system 5 in APA spec 530-SP-M-9602	MC	42	FEED/DD			
4	Control and Instrumentation Sufficient for Control/Too Many/Correct Location	N4-17	The current PIDs do not depict the APA standard for anti surge, fast stop valves and actuators	non compliance to APA current standards	NONE	the anti surge and fast stop design to comply with the following standards bellow or seek deviation: 530-DWG-J-0059 Actuator Panel - Fail Close / Open Piping and Instrumentation Diagram 530-DWG-J-0062 Actuator Panel - Quick Acting/Fast Stop Valve Piping & Instrumentation Diagram 530-DWG-J-0061 Actuator Panel - Anti-Surge Valve Piping and Instrumentation Diagram 530-DWG-J-0063 Actuator Panel - Shutdown & Blowdown Valve Piping and Instrumentation Diagram 530-DWG-J-0060 Actuator Panel - Fail Last (with Storage) Piping and Instrumentation Diagram	SH / JE	43	FEED			
Node 5a (Station Manual Blow Down)												
5a	Low Flow/Low Level	N5a-2-2	BF-1015 leaking and ignition of gas at the vent stack due to lightning strike	ongoing burning of gas and on station blowdown, the gas will ignite	NONE	Investigate appropriate testing procedures in order to test the integrity of the blow down valve BF-1015	CB	44	FEED/DD			
5a	Low Temperature	N5a-9	RO-1021 JT effect	potential for brittle failure of piping and equipment downstream of RO	Piping downstream of the RO is low temperature piping	During Detailed design, pipe stress analysis to check overall stresses in the underground section (fully restrained) is below the allowable stresses in the code (ASME B31.3)	CD	45	DD			
5a	Contamination / Impurities/Liquids	N5a-11	Rain water in the stack	accelerated stack and piping corrosion		Review the PID to show the correct tag number for the vent stack (530-SP-Q-0003, VS - Vent Stack) correct vendor scope of supply and correct location of the drain point	JE	46	FEED			
5a	Plant Items Operable/Maintainable	N5a-14	Compressor able to start without checking the position of BF-1015	Continuous blowdown is possible	NONE	Provide note to show permissive compressor start only when BF-1015 is closed (similar to BDV-2040) Valve BF-1015 to be lockde closed.	JE	47	FEED			
5a	Coating Degradation/Corrosion	N5a-15	cathodic protection system not provided for the underground section of pipe	Corrosion of the underground piping	piping coating compliant to APA underground piping coating standard	Provide cathodic protection (sacrificial anode) for the underground piping section to the standard 530-SP-E-0005	MP	48	FEED/DD			
5a	Electrical Area Classification/Isolation/Earthing	N5a-16	static electricity build up in the blowdown piping	Potential for ignition of gas	NONE	ensure vent stack is equipotentially bonded	MP	49	FEED/DD			
Node 5b/c/e (Actuated Blow Downs)												
5b	Low Flow/Low Level	N5b-2-2	BDV-2040 leaking and ignition due to lightning strike	ongoing burning of gas and on station blowdown, the gas will ignite	NONE	Investigate appropriate testing procedures in order to test the integrity of the blow down valve BDV-2040	CB	50	FEED/DD			
5b	No Flow/Zero Flow/Empty	N5b-3	BDV-2040 not opening on request by the control system	Inability to vent the station	PIT-1201 can be monitored by personnel to observe blow down (manually initiated blow down) (Potentially no monitoring during automatic blow down)	Ensure that ESD1 ESD2 PSD (including blow down) is alarmed to IOC and ensure unsuccessful ESD1 ESD2 PSD (including blow down) is alarmed to IOC in accordance with 530-PHL-Z-0001 and 530-EDP-Q-0025	MP	51	FEED/DD			
5b	Low Temperature	N5b-9	RO-2042 JT effect	potential for brittle failure of piping and equipment downstream of RO	Piping downstream of the RO is low temperature piping	During Detailed design, pipe stress analysis to check overall stresses in the underground section (fully restrained) is below the allowable stresses in the code (ASME B31.3)	CD	52	DD			
5b	Contamination / Impurities/Liquids	N5b-11	Rain water in the stack	accelerated stack and piping corrosion		Review the PID to show the correct tag number for the vent stack (530-SP-Q-0003, VS - Vent Stack) correct vendor scope of supply and correct location of the drain point	JE	53	FEED			
5b	Plant Items Operable/Maintainable	N5b-14	Compressor able to start without checking the position of BDV-2040	Continuous blowdown is possible	NONE	Ensure permissive note on PIDs incorporate purging and pressurisation cycle and align with other APA compressor stations	JE	54	FEED			
5b	General	N5b-19-1	note 2 on PID-Q-0004 is incomplete	Inaccurate representation of plant	NONE	Add "bypass also allows suction side of compressor to blow down on station blow down"	JE	55	FEED			
5b	General	N5b-19-2	check valve CK-1200 has high opening pressure	Inability to completely vent the line during blowdown	NONE	Ensure project selects a check valve type with a very low opening pressure	CD	56	FEED			
Node 7												
7	High Flow/High Level	N7-1-2	Blow down valve BDV-2691 fail open Blow down valve BDV-2327A fail open	AS ABOVE	RO-2692 RO-2525	Implement permissive compressor to start only if BDV-2691 is closed in line with other blow down valves	JE	57	FEED			
7	High Flow/High Level	N7-1-3	Blow down valve BDV-2691 fail open Blow down valve BDV-2327A fail open	AS ABOVE	RO-2692 RO-2525	Provide a discrepancy alarm between SV-2691 and ZAC-2691 (to be retagged to ZIC-2691)	MP / JE	58	FEED			
7	High Flow/High Level	N7-1-4	Manual vents or drains left open	restriction of supply to consumers Gas release and potential ignition	NONE	APA Ops to investigate and provide advise on which vent and drain valves are required to be locked this applies to all vents and drains in the facility show the correct locked position on PIDs	CB / JE	59	FEED			
7	High Level	N7-1-9	High level in E-2640 water tank due to overfill	overflow to ground	filling valve has a floating device to shut down filling Operator controlled procedure	Show the float device on the PID	JE	60	FEED			
7	High Level	N7-1-10	High liquid level in filter coalescer vessel F-2610 / F-2630	potential liquid carryover into HP / LP fuel gas skid	NONE	Fuel gas take off on PID-Q-0003 reference B4 to be taken from the top of the pipe show as a note on the PID	JE	61	FEED			
7	Low Flow/Low Level	N7-2-3	Misalignment of valves	AS ABOVE	Refer to action in NODE N1-2-3	manual valves in the flow path to be provided with lockable tabs	CD	62	FEED			
7	High Pressure	N7-6-1	Failure of the regulators PCV-2660 open	High pressure with potential for LOC and ignition and explosion	HAZOP workshop view is that high flow will always result in high pressure due to limited volumes. SSV-2655 and SSV-2675 PAHH-2690	Consider removing trip SDV_2327B from PAHH-2690 Confirm this is ok by inspection of AS 3814. Implement trip to compressor from PAHH-2690. Update PIDs to reflect this.	SH/ KM / JE	63	FEED			
7	High Pressure	N7-6-2	Failure of the regulators PCV-2660 open	High pressure with potential for LOC and ignition and explosion	HAZOP workshop view is that high flow will always result in high pressure due to limited volumes. SSV-2655 and SSV-2675 PAHH-2690	APA (KM) to advise MTM on the required set point for the HP fuel gas regulators slam shuts, PSV and high pressure PAH / PAHH alarms and trips as well as all the set point, alarms and trips for low pressure MTM to show correct set points on PIDs	KM / JE	64	FEED			

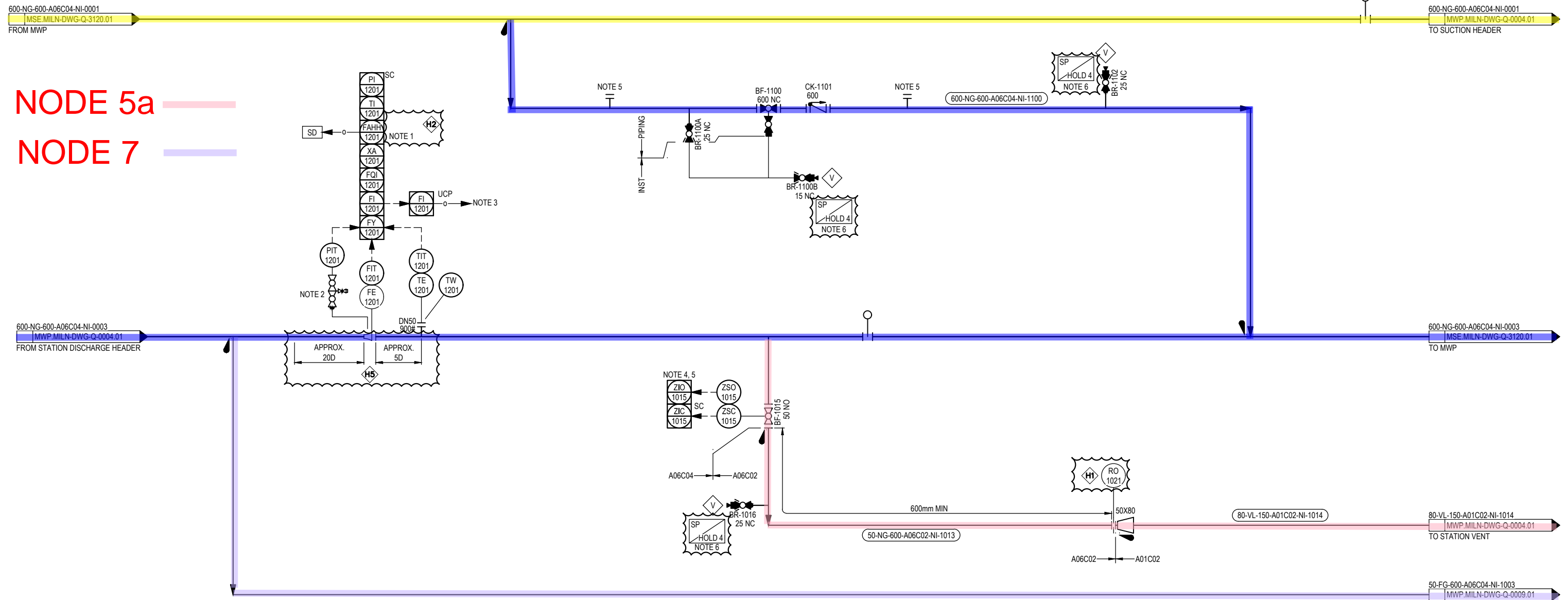
NODE	GUIDE WORD	ITEM	POSSIBLE CAUSES	CONSEQUENCES	EXISTING SAFEGUARDS	ACTION	ACTION	ACTION	FEED/DD	CLOSE OUT COMMENTS	CLOSE OUT DATE	SIGNATURE
							BY	NO.				
7	Low Pressure (Including Venting)	N7-7	Rupture downstream	As per NODE N7-1-1	HAZOP workshop view is that rupture will always result in low pressure due to limited volumes. PALL-2690	Modify Note 6 on PID-Q-0010 to read "PALL-2690 will trip SDV-2600"	JE	65	FEED			
7	High Temperature	N7-8-2	favourable condition leading to high gas temperature	exceeding piping and equipment design temperature envelope with a potential for high thermal stress and LOC	Maximum water temperature is 60 degC Downstream piping design temperature envelope is 60 degC	MTM to confirm the maximum temperature acceptable for the micro turbines. Refer to action 93 NODE 8 (ref. remove TAHH-5064)	MP / JE	66	FEED			
7	Low Temperature	N7-9-1	low gas temperature during black start with fuel gas heater not online	potential for liquids dropping out of the fuel gas	Very small volumes of gas	Procedure to be developed to start up microturbine first to get heater E-2640 online and operational before the main turbine can start when heater achieves set point temperature, then add this to station ready indicator XA-7083	MP	67	FEED/DD			
7	Low Temperature	N7-9-2	heater not performing as designed	Process fuel gas is under temperature	NONE	Provide thermowell downstream of the heater E-2640 in the vicinity of DB-2644 for heater heater performance monitoring Provide twisted square type thermowell the correct size and correct pressure rating connection for thermowell should be provided in the fuel gas line and shown on the PID	JE	68	FEED			
7	Low Temperature	N7-9-4	heating element failure (E-2640)	Turbine operating outside operating limits	TALL-2689	Set TALL-2689 trip at -5 degC with a time delay of 10 min to enable start up Set TAL-2689 alarm at -2 degC wit no time delay	JE	69	FEED			
7	Low Temperature	N7-9-5	heater not performing as designed	Process fuel gas is under temperature	NONE	APA (KM) to check with Solar that any start and running (including black start) at -5 degC is acceptable for operation of the gas turbine	KM	70	FEED/DD			
7	Low Temperature	N7-9-6	heating element failure (E-2640)	Process fuel gas under temperature with potential for brittle failure of downstream piping and equipment	NONE	Consider setting low temperature alarm with the appropriate operator action on the thermowell TW-XTBC refer action 68.	CB / JE	71	FEED			
7	General	N7-19-1	Symbols for F-2610 and F-2630 currently show a flange for the top lid	inaccurate depiction of the top lid	NONE	Ensure QOC is provided on F-2610 and F-2630. Show the correct arrangement on the PID	SQ / JE	72	FEED			
7	General	N7-19-2	Failure position of regulators is not shown on PID	Potential for error in operation	NONE	Show the regulator failure position on the PIDs on loss of motive power (instrument gas) Preference is for the regulators to fails close on loss of motive power	JE / CD	73	FEED			
7	General	N7-19-3	No alarm on the discrepancy between SV-2655 / SV-2675 vs ZS-2655 / ZS-2675 for each slam shut	Potential for error in operation	NONE	Provide alarm on the discrepancy between SV-2655 / SV-2675 vs ZS-2655 / ZS-2675 for each slam shut and show this feature on the PID	JE / MP	74	FEED			
7	General	N7-19-4	Filter vessel F-2685 is not protected by fire pressure relief as required by the pressure vessel code	Code non compliance	NONE	Establish whether F-2685 is a pressure vessel or not and add fire case PSV if it is a pressure vessel	JE	75	FEED			
7	General	N7-19-5	Basket strainer filter in the Solar supply upstream SDV-2327B is not shown on the PID	Incorrect depiction of equipment	NONE	show the basket strainer filter upstream of SDV-2327B on PID-Q-0008 and clearly mark it as part of Solar supply	JE	76	FEED			
7	General	N7-19-6	F-2610 / F-2630 currently shown as dust filters on the PID	Incorrect depiction of equipment	NONE	F-2610 / F-2630 are to be specified and shown as the filter coalescing type filters on the PIDs	JE	77	FEED			
7	General	N7-19-7	Fuel gas PIDs currently depict a specific PCV / slam shut configuration	The final selected elements may not be reflected on the PIDs	NONE	Once the final elements (PCV / SS) is selected by the vendor, depict the correct hook up configuration on the PID (e.g. pilot, sensing lines)	JE	78	DD			
7	General	N7-19-8	thermowell, temperature element, size and rating not shown on the PID on TIT-2689	incorrect depiction of equipment	NONE	show the thermowell, temperature element, size and rating on the PID on TIT-2689 as well as the correct installation detail in 50 NB piping	JE	79	FEED			
7	General	N7-19-9	Slam shut SSV-2655 or SSV-2675 trips leads to call out on site	potentially unnecessary call out	NONE	Consider whether a remote or automatic reset of slam shut by IOC should be implemented	CB	80	FEED/DD			
7	General	N7-19-10	unnecessary functionality by having open and close signals to SSVs	potential unnecessary complexity	NONE	Consider whether a remote open or close operation of slam shut is required by IOC	CB	81	FEED/DD			
7	General	N7-19-11	different configuration of pneumatic lines going to the actuators of SSV-2655 / SSV-2675 is incorrect	incorrect depiction of equipment which is not rated for 4,000 kPa	NONE	Show the correct lines going into the SSV actuators SSV-2655 / SSV-2675 and show the correct equipment and functionality desired for the two slam shut valves	MP / JE	82	FEED			
Node 8												
8	High Flow/High Level	N8-1-1	Failure of the regulators PCV-5020 / PCV-5050open	High velocity gas upstream and downstream with potential equipment failure (Piping, valves, Thermo wells, filters, heater)	PDAH-5060 Thermowells to be twisted square type HAZOP workshop view is that high flow will always result in high pressure due to limited volumes. Refer to high pressure safeguards	Investigate with the filter(F-5060) vendor the clean / dirty / collapse differential pressure and provide an alarm set as close as possible to the dirt DP and a trip as close as possible to the collapse DP (PAH-5060 PAHH-5060)	JE	83	DD			
8	High Flow/High Level	N8-1-2	Blow down valve BDV-5066 fail open	AS ABOVE	RO-5067	Provide a discrepancy alarm between SV-5066 and ZAC-5066 (to be retagged to ZIC-5066)	MP / JE	84	FEED			
8	High Flow/High Level	N8-1-3	Manual vents or drains left open	restriction of supply to consumers Gas release and potential ignition	NONE	APA Ops to investigate and provide advise on which vent and drain valves are required to be locked this applies to all vents and drains in the facility show the correct locked position on PIDs	CB /JE	85	FEED			
8	High Level	N8-1-7	High liquid level in filter coalescer vessel F-5060	potential liquid carryover into LP fuel gas skid	NONE	Consider the fuel gas take off on PID-Q-0010 reference D6 to be taken from downstream of the filter coalescer F-2685 If changed, show on the PID	JE	86	FEED			
8	Low Flow/Low Level	N8-2-3	Misalignment of valves	AS ABOVE	Valve limit switches on actuated valves	manual valves in the flow path to be provided with lockable tabs	CD	87	FEED			
8	High Pressure	N8-6-2	Failure of the regulators PCV-5020 / PCV-5050 open	High pressure with potential for LOC and ignition and explosion	HAZOP workshop view is that high flow will always result in high pressure due to limited volumes. SSV-5015 and SSV-5045 PAHH-5065	the micro turbine vendor to advise MTM on the required rating for the flexible tubing into the micro turbine and set point for the LP fuel gas regulators slam shuts, PSV and high pressure PAH / PAHH alarms and trips as well as all the set point, alarms and trips for low pressure MTM to show correct set points on PIDs	MP / JE	88	FEED			
8	Low Pressure (Including Venting)	N8-7	Rupture downstream	As per NODE N8-1-1	HAZOP workshop view is that rupture will always result in low pressure due to limited volumes. PALL-6065	Modify Note 2 on PID-Q-0011 to read "PALL-5065 will trip upstream SDV-5000" modify Note next to PALL-5065 to read Note 2 instead of Note 1	JE	89	FEED			
8	Low Temperature	N8-9-1	low gas temperature during black start with fuel gas heater not online	potential for liquids dropping out of the fuel gas	Very small volumes of gas vendor confirmed low temperature fuel gas is ok for micro turbine	Check with the micro turbine vendor if -10degC fuel gas is acceptable for micro turbines and for how long	MP	90	FEED/DD			
8	Low Temperature	N8-9-2	low gas temperature during black start with fuel gas heater not online	potential for liquids dropping out of the fuel gas	Very small volumes of gas vendor confirmed low temperature fuel gas is ok for micro turbine	Review the temperature set point of TIT-5064 (high and low) once the vendor data is available	MP / JE	91	DD			
8	Low Temperature	N8-9-3	heating element failure (E-2640)	No significant consequences identified	Piping and equipment is rated to -29DegC				FEED/DD			
8	Low Temperature	N8-9-4	Low ambient temperature concurrent with plant being shut down and low temperature trip TIT-5064 set incorrectly	inability to start up the plant post shut down	NONE	Provide a bypass on the trip (approx. 10 min) for start up or remove TALL-5064	JE	92	FEED			
8	Plant Items Operable/Maintainable	N8-14-1	TAHH-5064 has not been claimed as a safeguard	Spurious trip	NONE	Remove TAH / TAHH-5064, maximum fuel gas design temperature confirmed at TBC by micro turbine vendor check that all the equipment is rated for the water bath high temperature trip	MP / JE	93	FEED			
8	Plant Items Operable/Maintainable	N8-14-2	Incorrect depiction of symbols /signals on PID-Q-0012 control room section	unclear operation of plant	Drawing is on HOLD	1. only depict safety instrument systems (SIS) for those functions declared by APA LOPA 2. Mod BUS link to state "To SCS"	MP / JE	94	FEED			
8	Electrical Area Classification/Isolation/Earthing	N8-16	Insufficient earthing for flexible connections or lack of electrical	potential for ignition	NONE	Confirming if any special earthing requirements around flexible connection next to micro turbine connection	MP	95	FEED/DD			
8	General	N8-19-1	Filter vessel F-5060 is not protected by fire pressure relief as required by the pressure vessel code	Code non compliance	NONE	Establish whether F-2685 is a pressure vessel or not and add fire case PSV if it is a pressure vessel	JE	96	FEED			
8	General	N8-19-2	The filter coalescer F-5060 may not be required	unnecessary equipment	NONE	Investigate with the micro turbine Vendor if filter coalescer F-5060 is required immediately before the micro turbine given there is already one filter coalescer upstream of both pressure cuts (HP /LP)	MP	97	FEED/DD			

NODE	GUIDE WORD	ITEM	POSSIBLE CAUSES	CONSEQUENCES	EXISTING SAFEGUARDS	ACTION	ACTION	ACTION	FEED/DD	CLOSE OUT COMMENTS	CLOSE OUT DATE	SIGNATURE
							BY	NO.				
8	General	N8-19-3	thermowell, temperature element, size and rating not shown on the PID on TIT-5064	incorrect depiction of equipment	NONE	show the thermowell, temperature element, size and rating on the PID on TIT-5064 as well as the correct installation detail in 50 NB piping	JE	98	FEED			
8	General	N8-19-4	Thermowell temperature element can be affected by the RO in flow element FE-5070	potential failure of the thermowell due to high stresses	NONE	Provide minimum 6D separation between FE-5070 and TIT-5064 Add note on the PID	JE	99	FEED			
8	General	N8-19-5	Slam shut SSV-5015 or SSV-5045 trips leads to call out on site	potentially unnecessary call out	NONE	Consider whether a remote or automatic reset of slam shut by IOC should be implemented	CB	100	FEED/DD			
8	General	N8-19-6	unnecessary functionality by having open and close signals to SSVs	potential unnecessary complexity	NONE	Consider whether a remote open or close operation of slam shut is required by IOC	CB	101	FEED/DD			
8	General	N8-19-7	different configuration of pneumatic lines going to the actuators of SSV-5015 / SSV-5045 is incorrect	incorrect depiction of equipment which is not rated for 4,000 kPa	NONE	Show the correct lines going into the SSV actuators SSV-5015 / SSV-5045 and show the correct equipment and functionality desired for the two slam shut valves	MP / JE	102	FEED			
Node 11												
11	Low Flow/Low Level	N11-2-3	Air compressors not running	Restriction of / no supply to consumer	2 x 100% air compressors (duty and stand by) Instrument Air receiver to supply for 20 min	Facility to hold air bottles for start up Add a note on the PID	JE	103	FEED			
11	High Pressure	N11-6	PCV-2710 / PCV-2720 fail open	Potential leak or rupture in the downstream equipment and / or consumers	Self cleaning filters have their own PSV Air to fire damper has its own regulation and PCV Actuated valves local instrument panels have their own PSV PAH-2720 and PAHH-2720 PSV-2701 on V-2701 set at 1400 kPa All instrument air piping is Class 150	Modify note 1 on PID-Q-0014 to explicitly state "gas compressor C-2200" Modify note 2 on PID-Q-0014 to trip the Air compressor only	JE	104	FEED			
11	Low Pressure (Including Venting)	N11-7	Various (e.g., Rupture, blockages and valve misalignment)	Restriction of supply to consumers	PAL-2720 and PALL-2720 PAL-2518 All safety devices are fail safe on loss of instrument air	Confirm with Solar that the enclosure fire dampers are de-energised to close (fail safe)	KM	105	FEED/DD			
11	Plant Items Operable/Maintainable	N11-14	Insufficient data sent to SCADA	Insufficient data to operate package equipment	NONE	Air compressor vendor battery limits to include interface data	MP/SH	106	FEED/DD			
Node 14												
14	High Flow/High Level	N14-1-1	High flow received from the package	Potential Vibration in the piping	Provided in Package	Confirm there is a safeguard for high flow in the package	KM	107	FEED/DD			
14	High Flow/High Level	N14-1-2	High flow received from the package	Potential Vibration in the piping	Provided in Package	APA to confirm the maximum oil flowrate for the oil cooler package Process to verify that the maximum velocity given by the package will not result in vibration in the piping	KM / JE	108	FEED			
14	Low Flow/Low Level	N14-2-3	pinhole leak in piping	LOC and ignition of hot oil mist	no ignition sources present in the area	Consider zoning around piping associated with oil cooler to remove possible sources of ignition	SH	109	FEED/DD			
14	High Pressure	N14-6	High pressure received from the package	Piping and equipment failure	Provided in Package	Confirm there is a safeguard for high pressure in the package	KM	110	FEED/DD			
14	High Temperature	N14-8	No significant concern			Confirm the maximum temperature coming from the package	KM	111	FEED/DD			
14	Contamination / Impurities/Solids	N14-12	Construction debris and weld splatter	potential damage to equipment inside the package (i.e. pump)	NONE	SOW to include cleaning procedure for the oil piping post welding and construction during detailed design	CD	112	DD			
Node 18												
18	High Level	N18-1-4	overflowing of T-1701/02/03	Water carry over to outside of compound	float valves installed on inlet	Install a local level gauge indicator on T-1701/02/03	JE	113	FEED			
18	Low Flow/Low Level	N18-2	Pump can empty the tank completely low level in T-1701/02/03	low water flow or no water available pump cavitation and motor heating	NONE	Install a local level gauge on T-1701/02/03 with a low level switch to interlock pump P-1706	JE	114	FEED			
18	High Pressure	N18-6-1	Dead heading the pump P-1706 by closing valves downstream	Potential for high pressure	Pump is centrifugal therefore is dead headed the downstream piping rate higher than the max discharge pressure Pressure switch on pump P-1706	Confirm the piping specifications downstream of the pump is rated higher than the maximum head the pump is capable of providing	JE	115	DD			
18	Low Pressure (Including Venting)	N18-7	Demand higher than supply	pressure drop in outlet header	High demand will always result in low pressure Refer low pressure safeguards	Discharge pressure measurement required to be shown starting pump P-1706	JE	116	FEED			
18	High Temperature	N18-8	Overheating of pump P-1706 due to lack of fluid	Damage to the pump P-1706	NONE	Consider minimum flow bypass around P-1706	JE / CD	117	DD			
18	Low Temperature	N18-9	Low ambient temperatures leading water freezing - the ambient minimum temperature at Milne identified to reach 8degC	Piping blockage water is not available to some consumers (e.g. safety showers)	Unmanned facility, no night time work is expected no significant consequences identified	Consider providing insulation for critical water systems e.g. safety showers / eye washes to offset the low ambient temperature	JE	118	FEED			
18	Testing Equipment/Product	N18-13-1	insufficient facilities to check water suitability for drinking	Potential for personal poisoning	NONE	If potable water skid is required for this site (refer action 123 ref. solutions to provide drinkable water) include in the vendor SOW a provision for testing and dosing of water quality	CD	119	DD			
18	Testing Equipment/Product	N18-13-2	insufficient facilities to check water quality for spraying equipment, safety showers etc.	Potential for damage to equipment	NONE	Provide a water testing and dosing (or UV light protection) program for the water used in facilities	PO	120	FEED/DD			
18	Plant Items Operable/Maintainable	N18-14	No significant concern			PID symbology to show pressure switch ON/OFF pump control and tank tank level switch interlock as vendor supply local control as opposed to station control system (tank LALL proposed to be sent to station control system and IOC	JE / MP	121	FEED			
18	General	N18-19-1	Water for personal accommodation not shown on PID	no water to the Accommodation	NONE	Show water to Accommodation as a water consumer on the PID	JE	122	FEED			
18	General	N18-19-2	Water in this system is not potable at this time	Poisoning workers	NONE	Project to identify solutions to provide clean drinking water and water use for kitchen and showers based on a water quality report for the water source on site provide by APA	JE / BC	123	FEED/DD			
18	General	N18-19-3	Water in this system is not potable at this time	Poisoning workers	NONE	Project to clearly separate and segregate and tag the potable water outlets / consumers and non-potable water outlets / consumers	JE / BC	124	FEED/DD			
18	General	N18-19-4	Water in this system is not compliant with Solar specification	potential damage to Solar equipment	NONE	Project to confirm water quality requirements from Solar and provide complaint source of water	KM / BC	125	FEED/DD			
18	General	N18-19-5	Safety showers / eye wash stations not shown on this station	inability to shower in case of hazardous liquids spillage	NONE	Project to run risk assessment and identify whether safety showers and eye wash stations are required on this site	PO	126	FEED/DD			
18	General	N18-19-6	Thermal release on safety showers / eye wash stations draining the water out of the station	water not available	NONE	If safety showers / eye wash station are required, design a thermal relief system in such a way that water wastage is not creditable, APA / MTM to provide review of the vendor proposed system	PO	127	FEED/DD			
18	General	N18-19-7	No signal to IOC is show in regards to tank level	Inability to remotely alert IOC operators of the low level in T-1701/02/03	NONE	Review the need for tank level to be sent to IOC by SCADA	PO / SH	128	FEED/DD			
Overview 1 - Compressor Utilities												
O1	Temperature	O1-1	Seal gas supply temperature outsourced from downstream of the after cooler and may result in temperature being too low	Potential for dropping liquids and damage to dry gas seals	NONE	Process to provide calculations of the lowest temperature for the dry gas seals and align with Solar's specification, provide additional heating for liquid removal if any hazard of noncompliance has been identified. Alternative seal gas sources may be considered if required	JE / KM	129	DD			

Node	Guide Word	Item	Possible Causes	Consequences	Existing Safeguards	Action	Action	Action	Feed/DD	Close Out Comments	Close Out Date	Signature
							By	No.				
O1	Flow	O1-6	Un even distribution of the fire water over the fire enclosure	Potential for inadequate compressor suppression	two separate systems are provided, one for each half of the enclosure	Solar to produce hydraulic calculations to show fire water distribution inside the compressor enclosure	KM	130	FEED/DD			
O1	Plant Items Operable/Maintainable	O1-14-1	Nitrogen bottles associated with the fire system are of different size and height	inability to replace bottles	NONE	Provide flexible connections suitably rated for pressure to allow ease of N2 bottle replacement	KM	131	FEED/DD			
O1	Electrical Area Classification/Isolation/Earthing	O1-16	The fire system cabinets supplied by Solar are no hazardous area rated	Potential for gas ignition and explosion	NONE	project to consider design options to address constraints associated with 40degC ambient limitation on fire water cabinet equipment	MP	132	FEED/DD			
Overview 1 - Station Overview												
O2	Backup	O2-5	Micro turbines power generation failure in the common points of failure	power is unavailable for compressor station and facilities such as accommodation block and workshop	UPS for essential systems	calculation to be provided regarding the capacity of the battery back up for 48 hours considering the site access time by operations and remote location consider alternative solutions for the power back up as per the RAM study recommendations (e.g. diesel generator)	MP	133	FEED/DD			
O2	Emergency Response - Planning	O2-6	remote location	inability to respond to emergency	to be reviewed during 3D model review	Provide an area for the safe landing of a helicopter to respond to emergencies	CD	134	FEED			
O2	Initial Start Up/Commissioning	O2-12	unavailability of fuel gas heater on start up	Inability to start up compressor on black start	initial options discussed for black start such as use of instrument air receiver or external compressed air in bottles	Consider alternative options for black start of compressor station (i.e. back-up diesel generator)	MP	135	FEED/DD			
O2	Breakdown Power Failure Communication System Air	O2-15	Micro turbines power generation failure in the common points of failure	power is unavailable for compressor station and facilities such as accommodation block and workshop	UPS for essential systems	Consider back up option in terms of power failure particularly to accommodation and workshop and given the remoteness of the site	PO	136	FEED/DD			
O2	Electrical Safety	O2-25-1	static electricity build up during the drainage of the suction scrubber F-2100	Potential for gas ignition	Earthing procedures	Signage to be provided on the drain line to state that earthing is required during drainage Add a note on the PID	PO / JE	137	NOT BY MTM			
O2	Electrical Safety	O2-25-2	static electricity build up during the drainage of the suction scrubber F-2100	Potential for gas ignition	Earthing procedures	earthing reels to be provided on site for this purpose show this requirement on the earthing drawing	SH	138	FEED/DD			
O2	Safety Management Study	O2-28	station external threats not identified	potential for personnel injury and / or non compliance AS 2885	none	Project to run safety management study workshop as required AS 2885.6	PO	139	FEED/DD			
O2	General	O2-31-1	Information missing at local and remote operators	unable to attend to alarms	NONE	Create a single PID that includes all the agreeable process data that is being parsed from UCP to SCS for display on local SCADA and /or remote SCADA	SH / AH	140	FEED/DD			
O2	General	O2-31-2	PID symbols and valve designators not in accordance with APA standard 530-WI-Q-0001 e.g. inclusion of Valve type on all PIDs can be removed and referred to valve list	non compliance with APA standards, potential for inconsistencies	NONE	Review PIDs in regards to APA WI and provide compliance or seek deviation	JE	141	FEED			
O2	General	O2-31-3	Pressure vessel to piping ANSI class separation not shown on some of the pressure vessels (e.g. fuel gas system)	incorrect depiction of class separation of pressure vessels and piping	NONE	show correct depiction of class separation of pressure vessels and piping	JE	142	FEED			
O2	General	O2-31-4	Misalignment of valves	AS ABOVE	Refer to action in NODE N1-2-3	manual valves should be provided with lockable tabs	CD	143	FEED			
O2	General	O2-31-5	Fire system is on HOLD and may involve multiple vendors	this package cannot be HAZOPed at this stage	NONE	For the Solar part of the PID-Q-0017 (WM2510) the project to outsource an existing design for a MARS 100 if possible	KM	144	FEED/DD			
O2	General	O2-31-6	Fire system is on HOLD and may involve multiple vendors	this package cannot be HAZOPed at this stage	NONE	APA to outsource an existing approved design for package CF-2551 on PID-Q-0017 and provide to MTM	SH	145	FEED/DD			
O2	General	O2-31-7	Safety systems on HOLD and may involve multiple vendors	this package cannot be HAZOPed as it is not process design	NONE	The information on this PID shall be discussed during the CHAZOP workshop	PO	146	FEED/DD			
O2	General	O2-31-8	Safety systems on HOLD and may involve multiple vendors	this package cannot be HAZOPed as it is not process design	NONE	the project should implement strategy on the approach with vendors for this package	MP	147	FEED/DD			
O2	General	O2-31-9	Local Actuator panels PID on HOLD and not HAZOPed		Refer to APA published standards for local actuator control panels	APA design team to provide the applicable standards to the PEM and MTM	SH / JE	148	FEED			
O2	General	O2-31-11	blow down valves BDV-2691 on PID-Q-0010 and BDV-5066 on PID-Q-0011 are shown as NO as a symbol on the PID	Incorrect depiction of plant	NONE	blow down valves BDV-2691 on PID-Q-0010 and BDV-5066 on PID-Q-0011 are to be shown as NC as a symbol on the PID	JE	150	FEED			
O2	General	O2-31-12	Current PID shows valve body vents and seal loading to the system	this is unnecessary for a Class 600 valve	NONE	Consider to remove the loading line and bleed line to the main piping from the body bleed. Maintain body bleed but to atmosphere	JE	151	FEED			
O2	General	O2-31-13	Current location of the spectacle blinds shown for station isolation may not be suitable for construction / hot tapping activities	inability to positively isolate the gas incoming sources	NONE	review the station positive isolation measures currently on the PIDs (e.g. spectacle blinds) to account for positive isolation for construction and hot tapping activities and the ability to flow via the free flow bypass (BF-1100)	CB / MC	152	FEED/DD			
O2	General	O2-31-14	Spectacle blinds are not tagged	inaccurate representation of plant	NONE	Consider tagging the spectacle blinds if they are not standard piping items	JE / CD / MC	153	FEED			

Appendix D **NODE MARKUPS**





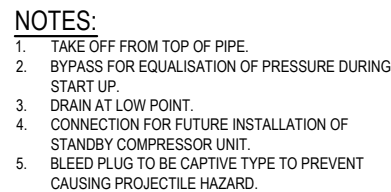
NOTES:

1. FAHH-1201 IS SET AT THE METER DESIGN FLOW (1% ABOVE MAXIMUM STATION DESIGN FLOW) AND WILL ISOLATE THE STATION BY CLOSING THE SDV-1001, SDV-1018 AND WILL STOP THE COMPRESSOR (FSLO).
2. VALVE PROVIDED BY FLOWMETER VENDOR.
3. FLOW INPUT TO UCP FOR COMPRESSOR UNIT SPEED CONTROL.
4. BLOWDOWN VALVE OUT OF POSITION WILL TRIP THE COMPRESSOR UNIT.
5. FUTURE CONNECTIONS FOR TEMPORARY FILTER DURING PIGGING.
6. BLEED PLUG TO BE CAPTIVE TYPE TO PREVENT CAUSING PROJECTILE HAZARD.

HOLDS:

1. RO SIZE PENDING CALCULATION.
2. HIGH FLOW ALARM SET POINT TO BE CONFIRMED.
3. ALL LINE SIZES TO BE CONFIRMED.
4. SP ITEM NUMBERS TO BE CONFIRMED.
5. STRAIGHT LENGTH REQUIREMENTS TO BE CONFIRMED.

[illegible]

[illegible]



600-NG-600-A06C04-NI-2000
D12 MWP.MILN-DWG-Q-0004.01
FROM SUCTION STATION HEADER

NOTES:

1. RO SIZED TO MEET SOLAR SPECIFIED PRESSURISATION/DEPRESSURISATION RATE 2000 kPa/min (MAXIMUM).
2. ENSURE PIPING DESIGN PROVIDES SUFFICIENT SPACE ON THE REMOVABLE SPOOL BETWEEN SHUTDOWN VALVE AND FLANGE.
3. ZSC-2040 (CLOSED) IS PERMISSIVE SIGNAL FOR COMPRESSOR TO START.
4. OPEN PERMISSIVE FOR SDV-2030 DURING START UP.
5. OPEN PERMISSIVE FOR SDV-2000.
6. TANH-2004 WILL TRIP THE COMPRESSOR UNIT (FSLO DEPRESSURISE).
7. CONTROL SET POINT OF PI-2002 IS NOT TO EXCEED SYSTEM MOP OF 5,500kPa.
8. PRESSURE INPUT TO UCP FOR COMPRESSOR UNIT SPEED CONTROL MINIMUM SELECT.
9. TEMPERATURE INPUT TO UCP FOR COMPRESSOR UNIT TEMPERATURE CONTROL.
10. BLOWDOWN VALVE OUT OF POSITION WILL STOP THE COMPRESSOR UNIT (FSLO DEPRESSURISE).
11. BLEED PLUG TO BE CAPTIVE TYPE TO PREVENT CAUSING PROJECTILE HAZARD.
12. REFER TO P&ID MWP.MILN-DWG-Q-0019.01 FOR ACTUATOR DETAILS.

HOLDS:

1. RO SIZE PENDING CALCULATION.
2. ASV AND FSV SIZE TO BE CONFIRMED PENDING SOLAR CALCULATION.
3. LINE SIZES TO BE CONFIRMED PENDING LINE SIZING CALCULATION.
4. SP ITEM NUMBERS TO BE CONFIRMED.

NODE 1
 NODE 3
 NODE 4
 NODE 5b

[illegible]

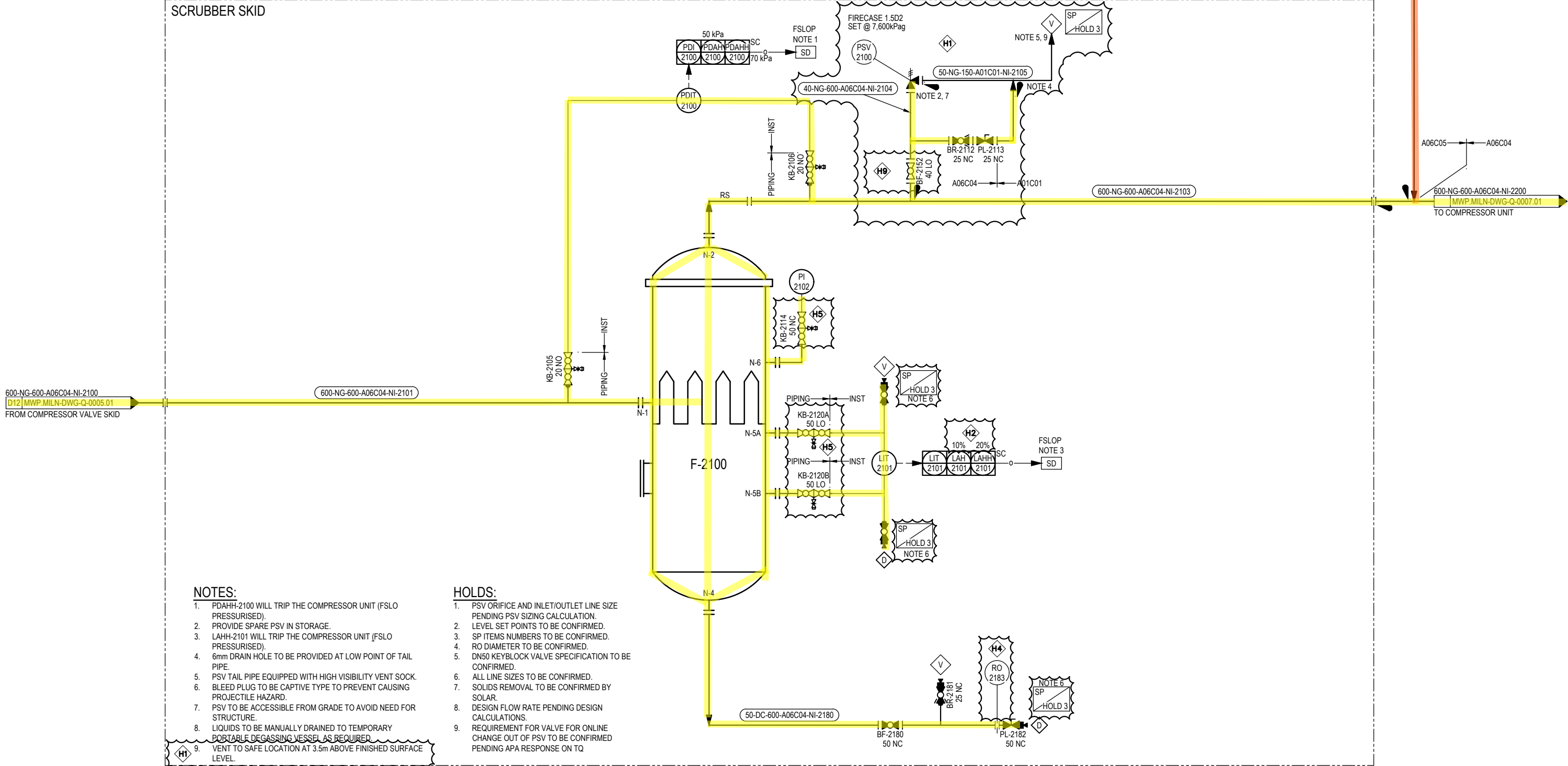
NODE 1
NOD 4

200-NG-600-A06C05-NI-2306
MWP.MILN-DWG-Q-0005.01
FROM FSV-2386 & ASV-2385

F-2100
COMPRESSOR SUCTION SCRUBBER

SOLIDS REMOVAL: 100% REMOVAL OF PARTICLES > 3 MICRONS
DESIGN PRESSURE: FM 7.600 kPag
DESIGN TEMPERATURE: 20/65°C
DESIGN FLOWRATE: HOLD 8
LIQUID HOLDUP VOLUME: MIN 200L

SCRUBBER SKID



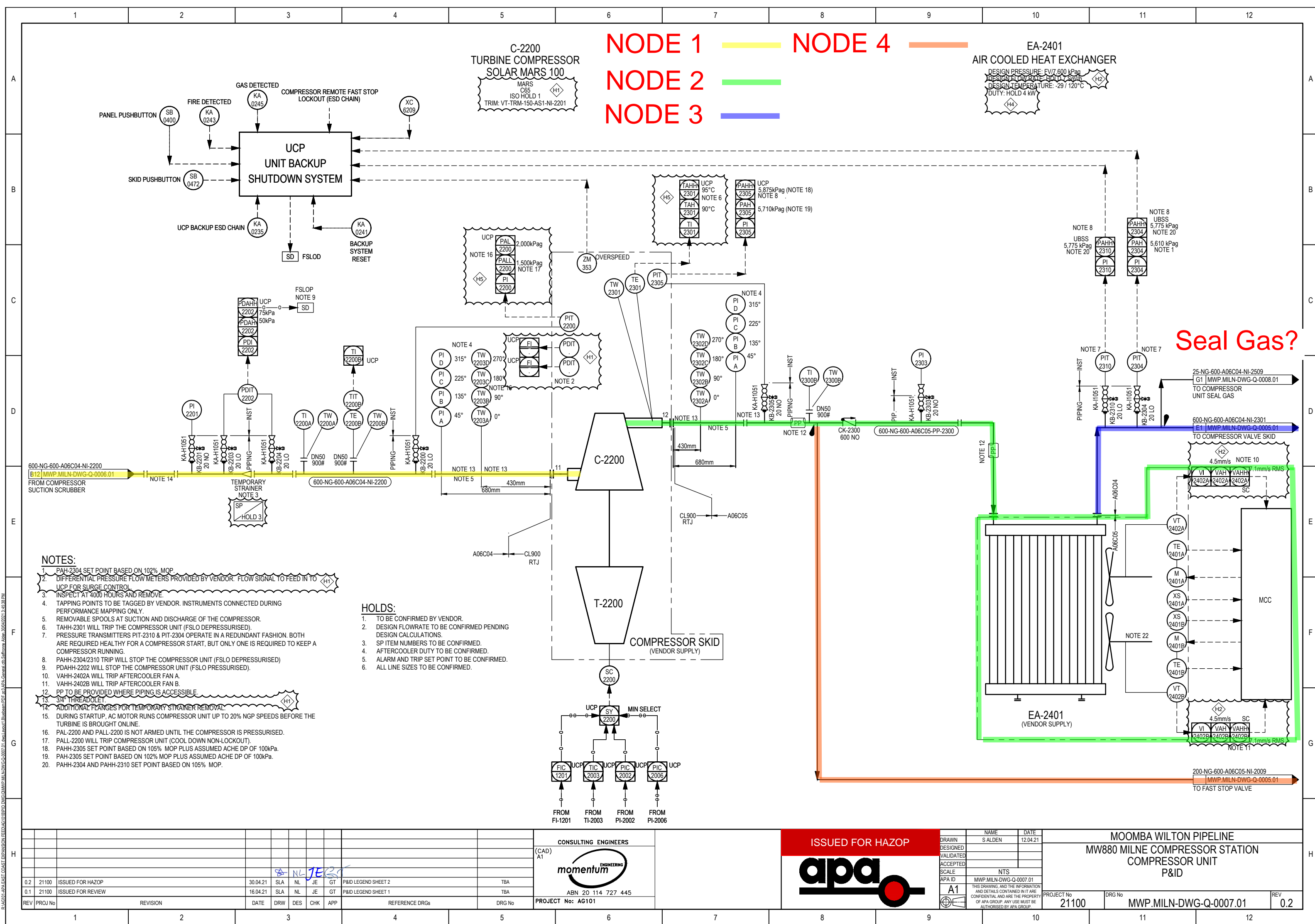
NOTES:

1. PDAH-2100 WILL TRIP THE COMPRESSOR UNIT (FSLO PRESSURISED).
2. PROVIDE SPARE PSV IN STORAGE.
3. LAHH-2101 WILL TRIP THE COMPRESSOR UNIT (FSLO PRESSURISED).
4. 6mm DRAIN HOLE TO BE PROVIDED AT LOW POINT OF TAIL PIPE.
5. PSV TAIL PIPE EQUIPPED WITH HIGH VISIBILITY VENT SOCK.
6. BLEED PLUG TO BE CAPTIVE TYPE TO PREVENT CAUSING PROJECTILE HAZARD.
7. PSV TO BE ACCESSIBLE FROM GRADE TO AVOID NEED FOR STRUCTURE.
8. LIQUIDS TO BE MANUALLY DRAINED TO TEMPORARY PORTABLE DEGASSING VESSEL AS REQUIRED.
9. VENT TO SAFE LOCATION AT 3.5m ABOVE FINISHED SURFACE LEVEL.

HOLDS:

1. PSV ORIFICE AND INLET/OUTLET LINE SIZE PENDING PSV SIZING CALCULATION.
2. LEVEL SET POINTS TO BE CONFIRMED.
3. SP ITEMS NUMBERS TO BE CONFIRMED.
4. RO DIAMETER TO BE CONFIRMED.
5. DN50 KEYBLOCK VALVE SPECIFICATION TO BE CONFIRMED.
6. ALL LINE SIZES TO BE CONFIRMED.
7. SOLIDS REMOVAL TO BE CONFIRMED BY SOLAR.
8. DESIGN FLOW RATE PENDING DESIGN CALCULATIONS.
9. REQUIREMENT FOR VALVE FOR ONLINE CHANGE OUT OF PSV TO BE CONFIRMED PENDING APA RESPONSE ON TQ.

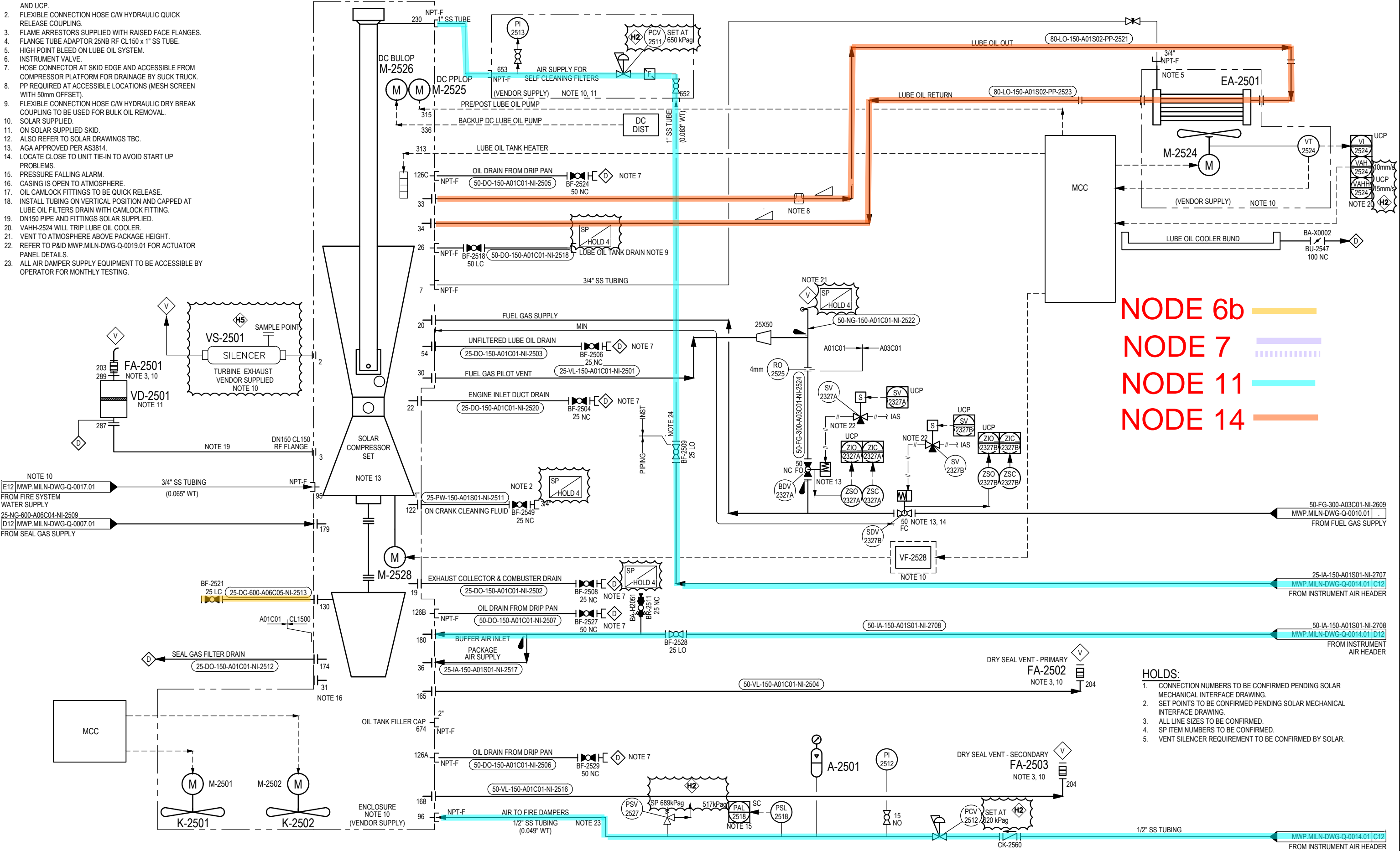
										CONSULTING ENGINEERS		ISSUED FOR HAZOP		DRAWN		NAME		DATE		MOOMBA WILTON PIPELINE			
										(CAD) A1		momentum ENGINEERING		DESIGNED		S ALDEN		12.04.21		MW880 MILNE COMPRESSOR STATION			
														VALIDATED						COMPRESSOR SUCTION SCRUBBER			
														ACCEPTED						P&ID			
														SCALE		NTS							
														APA ID		MWP.MILN-DWG-Q-0006.01							
														THIS DRAWING, AND THE INFORMATION AND DETAILS CONTAINED IN IT ARE CONFIDENTIAL AND ARE THE PROPERTY OF APA GROUP. ANY USE MUST BE AUTHORISED BY APA GROUP.									
										PROJECT No: AG101				PROJECT No		21100		DRG No		MWP.MILN-DWG-Q-0006.01			
																				REV 0.2			



NOTES:

1. ALL SOLAR ALARMS, STATUS INDICATIONS AVAILABLE TO SCADA VIA COMMUNICATIONS LINK BETWEEN STATION RTU AND UCP.
2. FLEXIBLE CONNECTION HOSE C/W HYDRAULIC QUICK RELEASE COUPLING.
3. FLAME ARRESTORS SUPPLIED WITH RAISED FACE FLANGES.
4. FLANGE TUBE ADAPTOR 25NB RF CL150 x 1" SS TUBE.
5. HIGH POINT BLEED ON LUBE OIL SYSTEM.
6. INSTRUMENT VALVE.
7. HOSE CONNECTOR AT SKID EDGE AND ACCESSIBLE FROM COMPRESSOR PLATFORM FOR DRAINAGE BY SUCK TRUCK.
8. PP REQUIRED AT ACCESSIBLE LOCATIONS (MESH SCREEN WITH 50mm OFFSET).
9. FLEXIBLE CONNECTION HOSE C/W HYDRAULIC DRY BREAK COUPLING TO BE USED FOR BULK OIL REMOVAL.
10. SOLAR SUPPLIED.
11. ON SOLAR SUPPLIED SKID.
12. ALSO REFER TO SOLAR DRAWINGS TBC.
13. AGA APPROVED PER AS3814.
14. LOCATE CLOSE TO UNIT TIE-IN TO AVOID START UP PROBLEMS.
15. PRESSURE FALLING ALARM.
16. CASING IS OPEN TO ATMOSPHERE.
17. OIL CAMLOCK FITTINGS TO BE QUICK RELEASE.
18. INSTALL TUBING ON VERTICAL POSITION AND CAPPED AT LUBE OIL FILTERS DRAIN WITH CAMLOCK FITTING.
19. DN150 PIPE AND FITTINGS SOLAR SUPPLIED.
20. VAHH-2524 WILL TRIP LUBE OIL COOLER.
21. VENT TO ATMOSPHERE ABOVE PACKAGE HEIGHT.
22. REFER TO P&ID MWP.MILN-DWG-Q-0019.01 FOR ACTUATOR PANEL DETAILS.
23. ALL AIR DAMPER SUPPLY EQUIPMENT TO BE ACCESSIBLE BY OPERATOR FOR MONTHLY TESTING.

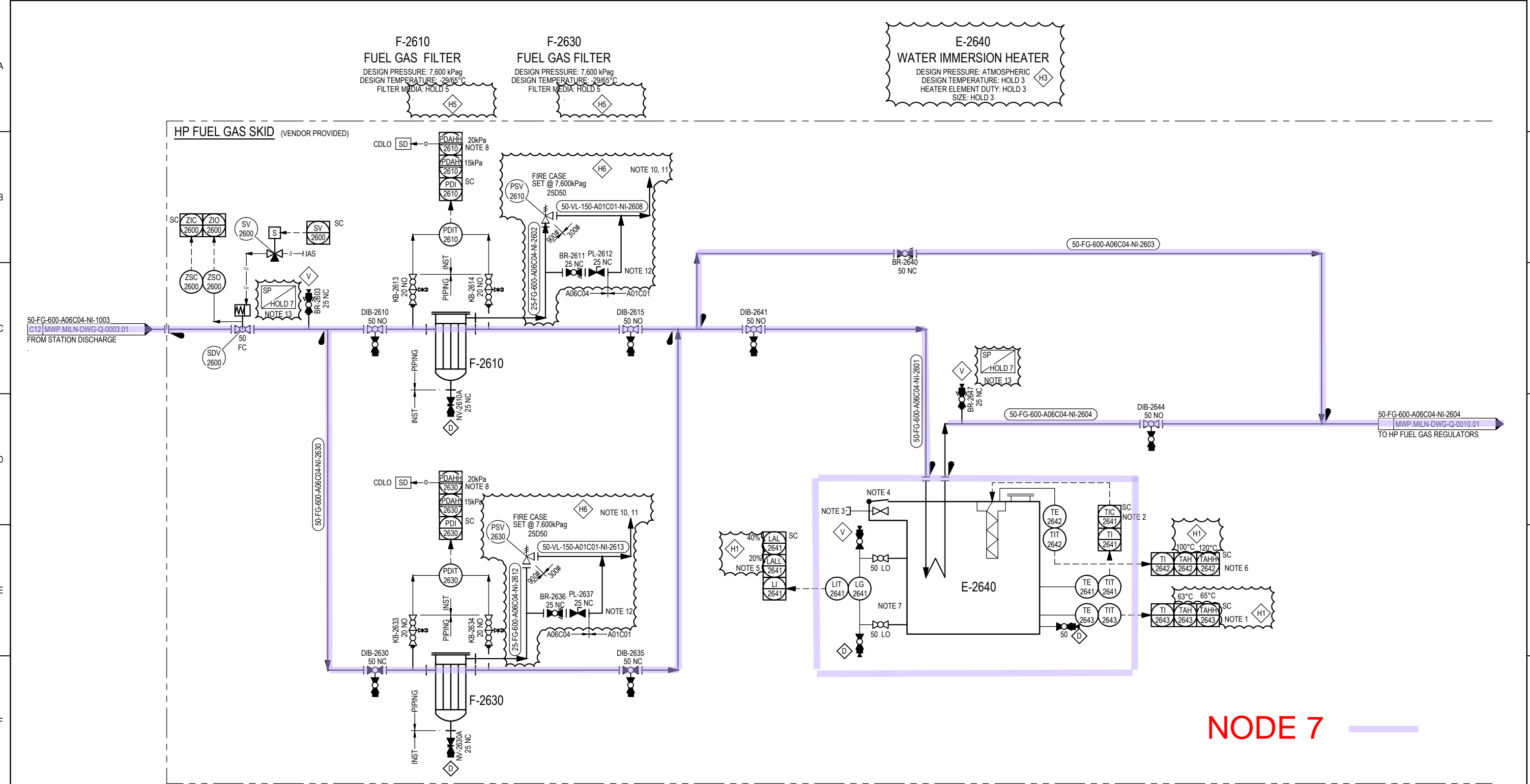
VF-2528 VARIABLE FREQUENCY DRIVE FLAME ARRESTOR FA-2501 L.O. VENT DEMISTER VD-2501 AIR ACCUMULATOR A-2501 ENCLOSURE VENTILATION FAN K-2502 AIR INLET FILTER FAN K-2501 EA-2501 LUBE OIL COOLER FA-2502 FLAME ARRESTOR FA-2503 FLAME ARRESTOR



NODE 6b
NODE 7
NODE 11
NODE 14

- HOLDS:**
1. CONNECTION NUMBERS TO BE CONFIRMED PENDING SOLAR MECHANICAL INTERFACE DRAWING.
 2. SET POINTS TO BE CONFIRMED PENDING SOLAR MECHANICAL INTERFACE DRAWING.
 3. ALL LINE SIZES TO BE CONFIRMED.
 4. SP ITEM NUMBERS TO BE CONFIRMED.
 5. VENT SILENCER REQUIREMENT TO BE CONFIRMED BY SOLAR.

CONSULTING ENGINEERS										ISSUED FOR HAZOP		MOOMBA WILTON PIPELINE			
(CAD) A1										momentum ENGINEERING		MW880 MILNE COMPRESSOR STATION			
PROJECT No: AG101										apa		COMPRESSOR FACILITIES			
ABN 20 114 727 445										NAME S ALDEN		P&ID			
DATE 30.04.21										DATE 12.04.21		PROJECT No 21100			
SLA NL JE GT										SCALE NTS		DRG No			
PAID LEGEND SHEET 2										MWP.MILN-DWG-Q-0008.01		REV 0.2			
PAID LEGEND SHEET 1										THIS DRAWING, AND THE INFORMATION AND DETAILS CONTAINED IN IT ARE CONFIDENTIAL AND ARE THE PROPERTY OF APA GROUP. ANY USE MUST BE AUTHORISED BY APA GROUP.					
REFERENCE DRGs										PROJECT No 21100					
DRG No										MWP.MILN-DWG-Q-0008.01					



NODE 7

- HOLDS:**
- 1. SET POINTS PENDING VENDOR INFORMATION.
 - 2. REQUIREMENT FOR OVERPRESSURE/OVERTEMPERATURE PROTECTION TO BE CONFIRMED PENDING HEATER DESIGN.
 - 3. WATER CONTROL TEMPERATURE FOR REQUIRED HEATER TO BE CONFIRMED PENDING HEATER DESIGN.
 - 4. ALL LINE SIZES TO BE CONFIRMED.
 - 5. FILTER MEDIA REQUIREMENT TO BE CONFIRMED.
 - 6. PSV ORIFICE SIZE, LINE SIZE AND FLANGE RATING TO BE CONFIRMED PENDING CALCULATION.
 - 7. SP ITEMS NUMBERS TO BE CONFIRMED.

- NOTES:**
- 1. TAAH-2643 WILL TRIP THE HEATER ELEMENT IN E-2640.
 - 2. TIC-2641 CONTROLS THE WATER TEMPERATURE IN THE IMMERSION HEATER TO 60°C.
 - 3. MANUAL FILL POINT FOR WATER FILL AS REQUIRED.
 - 4. WATER IMMERSION HEATER IS OPEN TO ATMOSPHERE VIA HINGED FLAP.
 - 5. LALL-2641 WILL TRIP THE HEATER ELEMENT IN E-2640.
 - 6. TAAH-2642 WILL TRIP THE HEATER ELEMENT IN E-2640.
 - 7. E-2640 TO BE PROVIDED WITH HEAT CONSERVATION INSULATION.
 - 8. PDAH-2610/PDAH-2630 WILL TRIP THE COMPRESSOR UNIT CDLO.
 - 9. REFER TO P&ID MWP.MILN-DWG-Q-0019.01 FOR ACTUATOR PANEL DETAILS.
 - 10. PSV TAIL PIPE TO BE EQUIPPED WITH HIGH VISIBILITY VENT SOCK.
 - 11. PSV TAIL PIPE TO ROUTE A MINIMUM OF 3.6M FROM GRADE OR MANNED PLATFORM.
 - 12. PSV TAIL PIPE TO BE EQUIPPED WITH 6MM DRAIN HOLE AT LOW POINT
 - 13. BLEED PLUG TO BE CAPTIVE STYLE TO PREVENT CAUSING PROJECTIVE HAZARD.

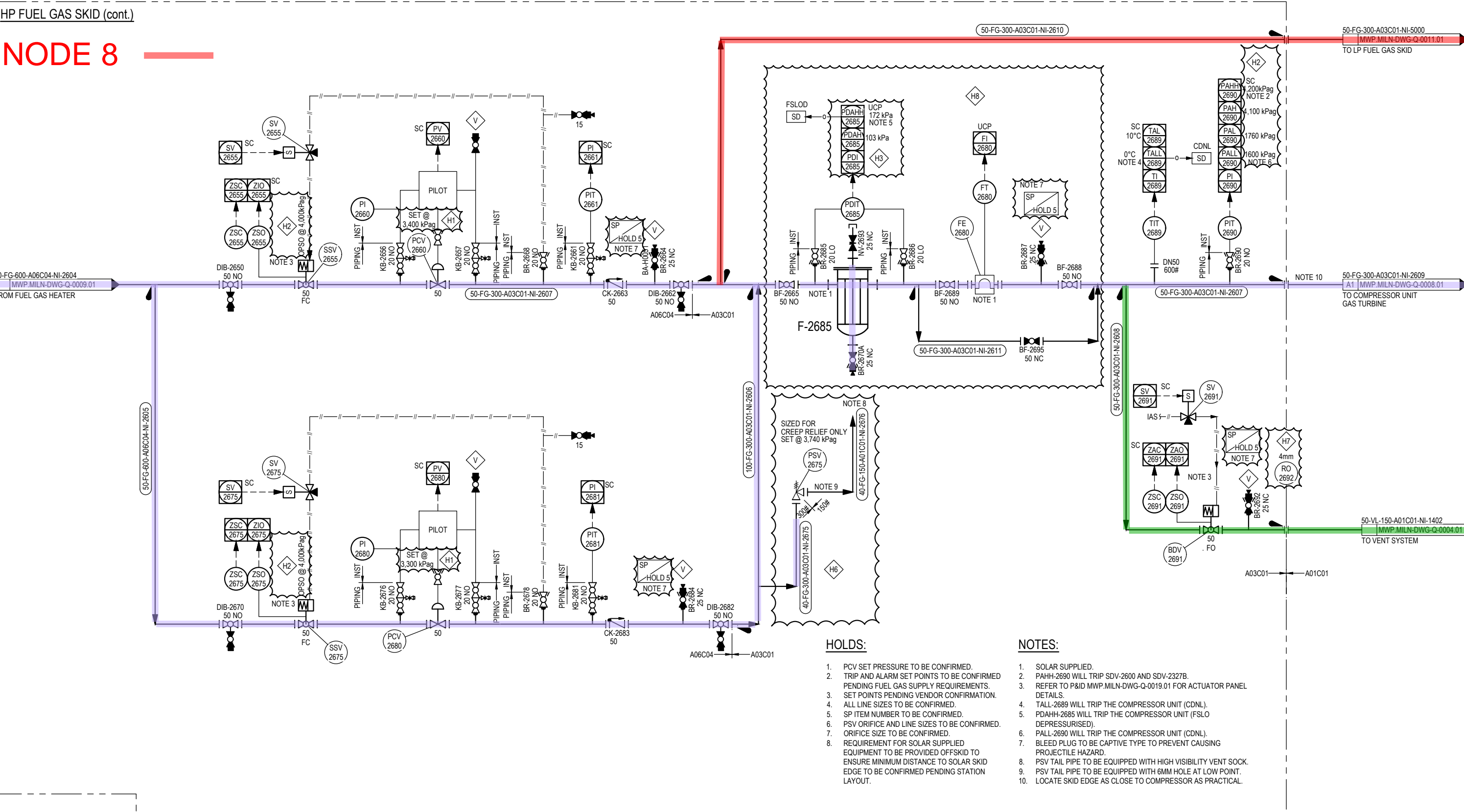
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NODE 5e
NODE 7
NODE 8

HP FUEL GAS SKID (cont.)

NODE 8

F-2685
FUEL GAS COALESCING FILTER
FILTER MEDIA: TBC
DESIGN PRESSURE: FV/4,200 kPag
DESIGN TEMPERATURE: -29/65°C
NOTE 1





HOLDS:

1. PCV SET PRESSURE TO BE CONFIRMED.
2. TRIP AND ALARM SET POINTS TO BE CONFIRMED PENDING FUEL GAS SUPPLY REQUIREMENTS.
3. SET POINTS PENDING VENDOR CONFIRMATION.
4. ALL LINE SIZES TO BE CONFIRMED.
5. SP ITEM NUMBER TO BE CONFIRMED.
6. PSV ORIFICE AND LINE SIZES TO BE CONFIRMED.
7. ORIFICE SIZE TO BE CONFIRMED.
8. REQUIREMENT FOR SOLAR SUPPLIED EQUIPMENT TO BE PROVIDED OFFSKID TO ENSURE MINIMUM DISTANCE TO SOLAR SKID EDGE TO BE CONFIRMED PENDING STATION LAYOUT.

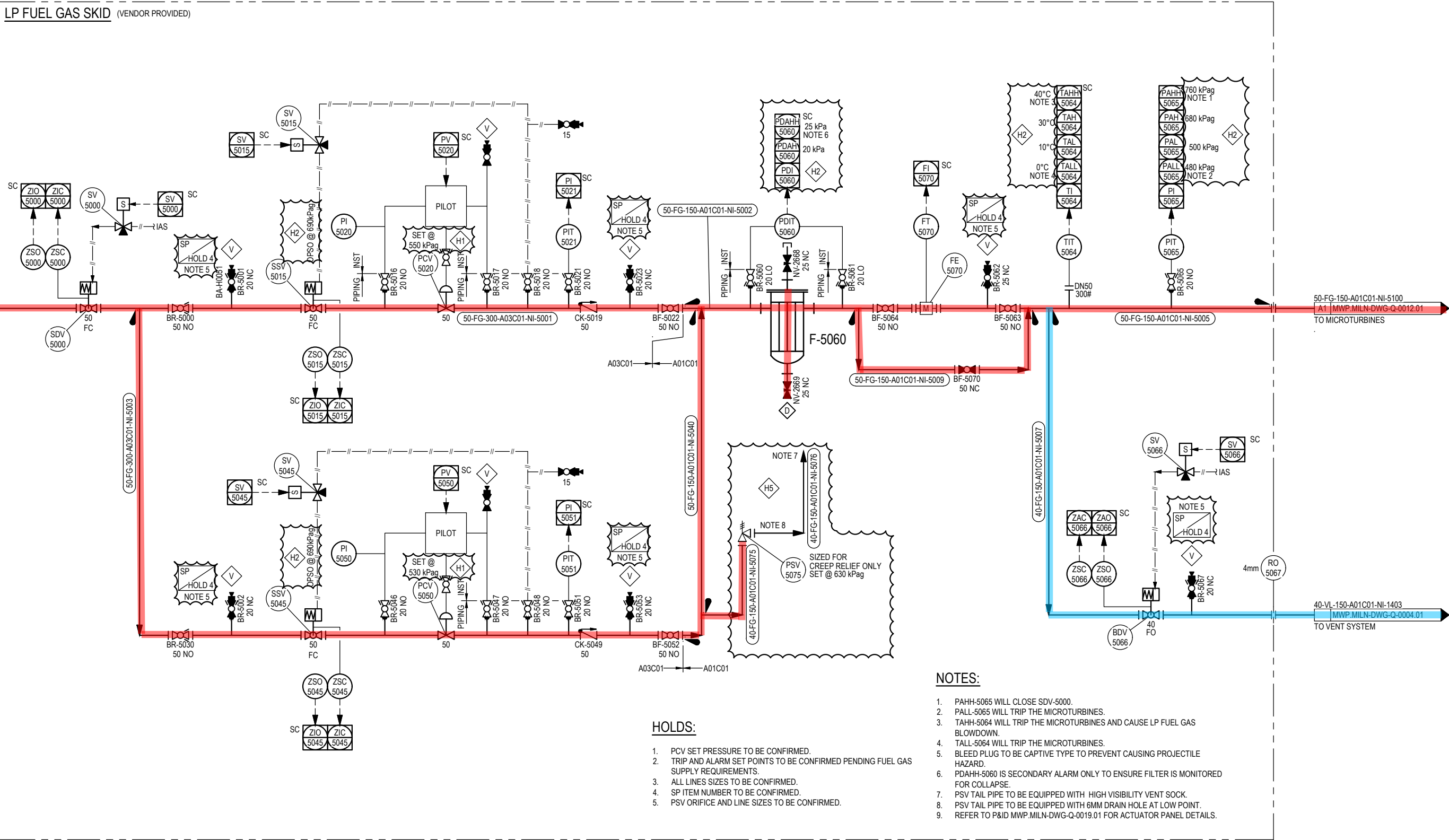
NOTES:

1. SOLAR SUPPLIED.
2. PAHH-2690 WILL TRIP SDV-2600 AND SDV-2327B.
3. REFER TO P&ID MWP.MILN-DWG-Q-0019.01 FOR ACTUATOR PANEL DETAILS.
4. TALL-2689 WILL TRIP THE COMPRESSOR UNIT (CDNL).
5. PDAHH-2685 WILL TRIP THE COMPRESSOR UNIT (FSLO DEPRESSURISED).
6. PALL-2690 WILL TRIP THE COMPRESSOR UNIT (CDNL).
7. BLEED PLUG TO BE CAPTIVE TYPE TO PREVENT CAUSING PROJECTILE HAZARD.
8. PSV TAIL PIPE TO BE EQUIPPED WITH HIGH VISIBILITY VENT SOCK.
9. PSV TAIL PIPE TO BE EQUIPPED WITH 6MM HOLE AT LOW POINT.
10. LOCATE SKID EDGE AS CLOSE TO COMPRESSOR AS PRACTICAL.

										CONSULTING ENGINEERS		ISSUED FOR HAZOP		NAME		DATE		MOOMBA WILTON PIPELINE			
										(CAD) A1				DRAWN		S ALDEN		12.04.21		MW880 MILNE COMPRESSOR STATION	
												ABN 20 114 727 445		DESIGNED						HP FUEL GAS SKID - SHEET 2	
												PROJECT No: AG93		VALIDATED						P&ID	
														ACCEPTED							
														SCALE		NTS					
														APR ID		MWP.MILN-DWG-Q-0010.01					
																THIS DRAWING, AND THE INFORMATION AND DETAILS CONTAINED IN IT ARE CONFIDENTIAL AND ARE THE PROPERTY OF APA GROUP. ANY USE MUST BE AUTHORISED BY APA GROUP.					
																PROJECT No		21100		DRG No	
																				MWP.MILN-DWG-Q-0010.01	
																				REV	
																				0.2	

NODE 5c
NODE 8

F-5060
LP FUEL GAS COALESCING FILTER
FILTER MEDIA: TBC
DESIGN PRESSURE: FV/1,960 kPag
DESIGN TEMPERATURE: -29/65°C



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NODE 8

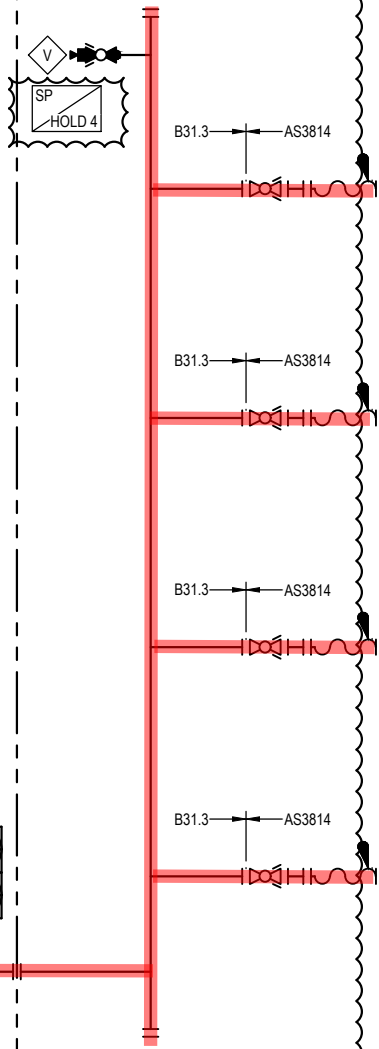
NOTES:

1. REFER TO MWP.MILN-DWG-Q-0019.01 FOR ACTUATOR PANEL DETAILS.

HOLDS:

1. PACKAGE DETAILS TO BE CONFIRMED.
2. ALL LINE SIZES TO BE CONFIRMED.
3. VENDOR DRAWING NUMBERS TO BE CONFIRMED.
4. SP ITEM NUMBERS TO BE CONFIRMED.
5. RO SIZE PENDING CALCULATION.

VENDOR PROVIDED



MT-5100

REFER TO VENDOR DRAWINGS

H3

MT-5101

REFER TO VENDOR DRAWINGS

H3

MT-5102

REFER TO VENDOR DRAWINGS

H3

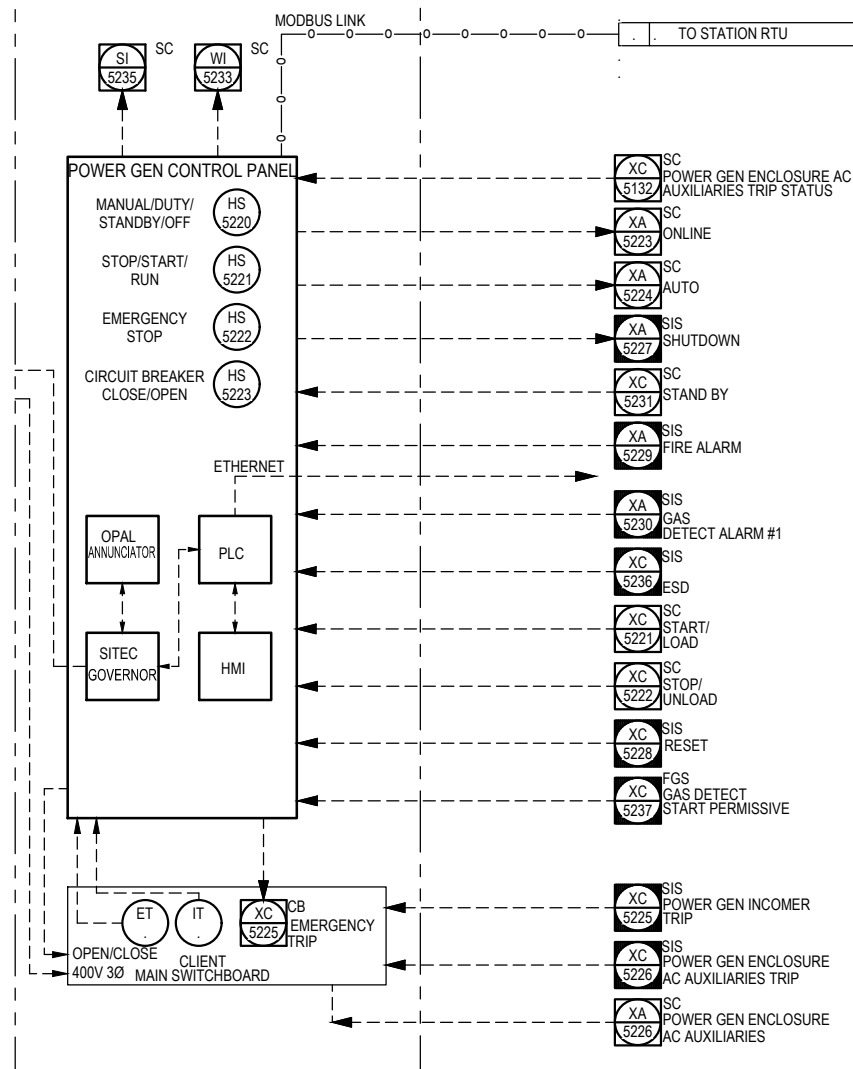
MT-5103

REFER TO VENDOR DRAWINGS

H3

H1

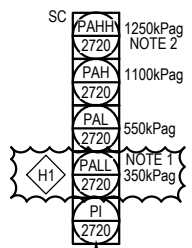
CONTROL ROOM



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MOOMBA WILTON PIPELINE			
MW880 MILNE COMPRESSOR STATION			
INSTRUMENT AIR PACKAGE			
P&ID			
PROJECT No	DRG No		REV
21100	MWP MIL N-DWG-Q-0013.01		02

NODE 11



50-IA-150-A01S01-NI-2703
MWP.MILN-DWG-Q-0013.01
FROM INSTRUMENT AIR PACKAGE

50-IA-150-A01S01-NI-2711

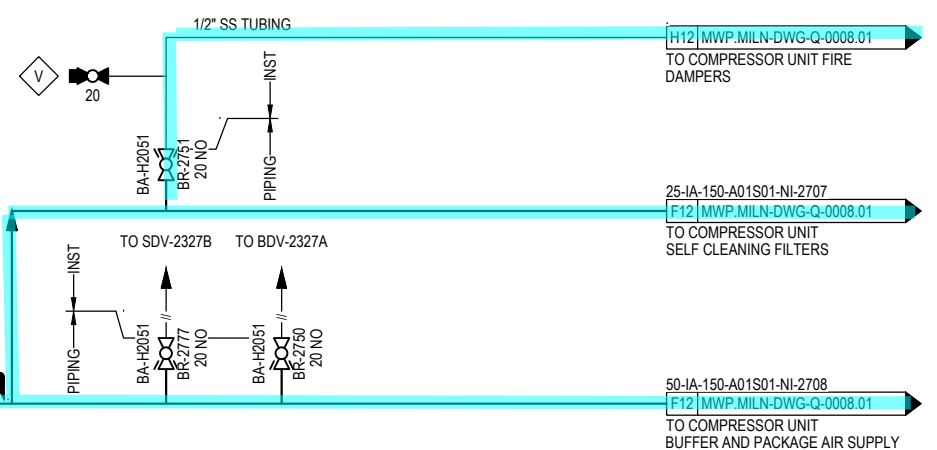
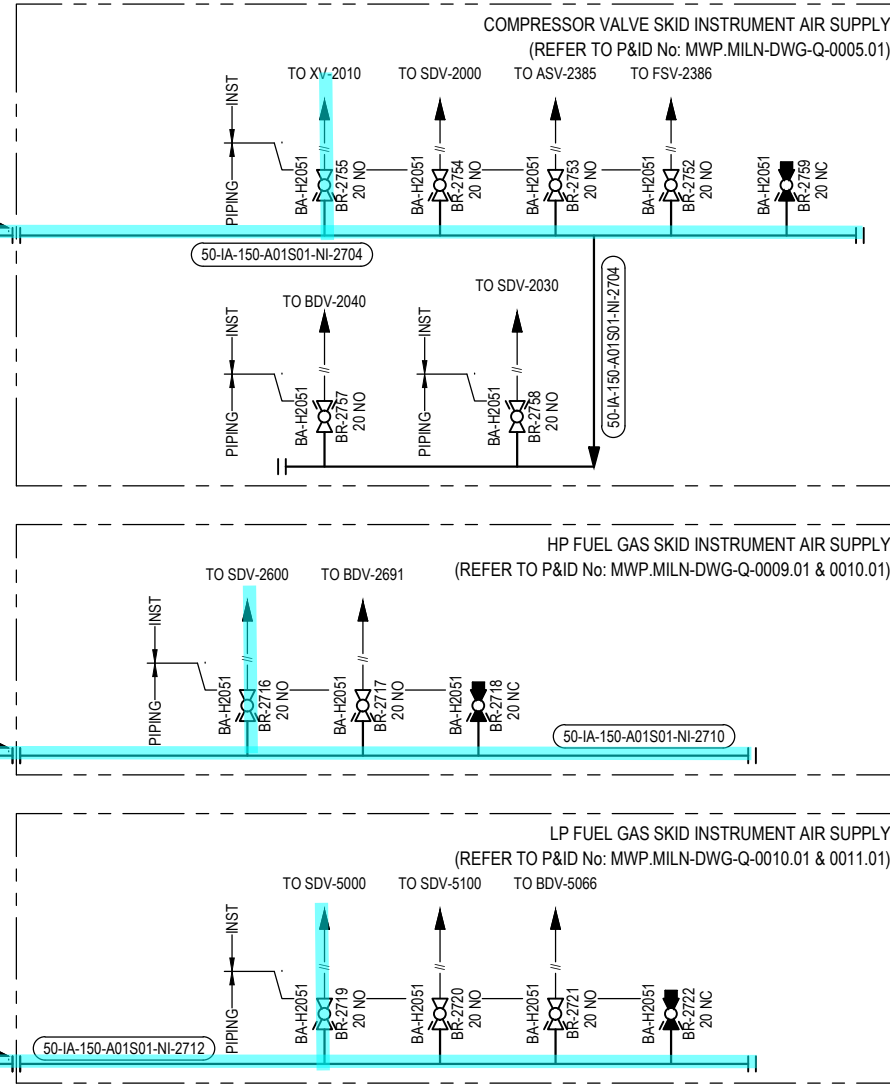
50-IA-150-A01S01-NI-2709

50-IA-150-A01S01-NI-2704

50-IA-150-A01S01-NI-2704

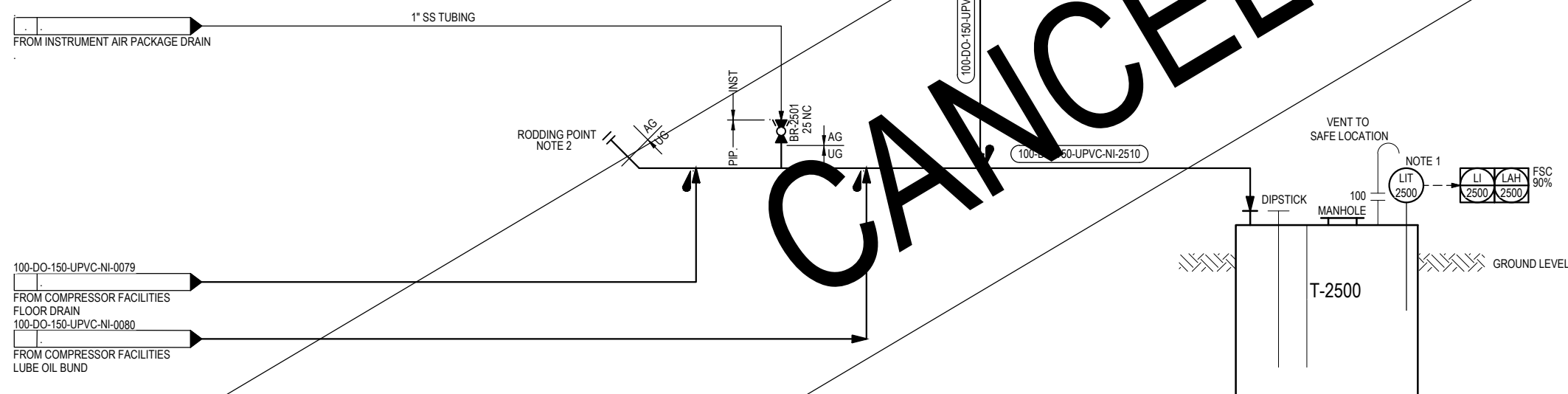
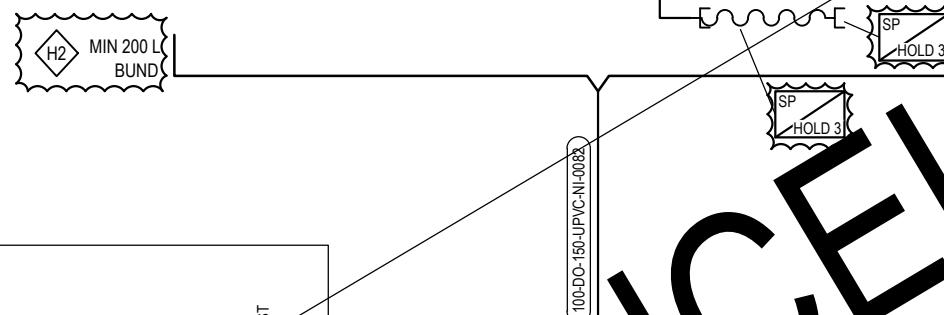
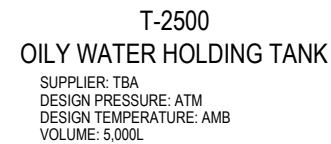
50-IA-150-A01S01-NI-2710

50-IA-150-A01S01-NI-2712



- NOTES:
- PALL-2720 WILL STOP THE GAS COMPRESSOR UNIT C-2200 (CDNL).
 - PAHH-2720 WILL TRIP THE AIR COMPRESSOR PACKAGE.
- HOLDS:
- LOW AIR PRESSURE TRIP SET POINT TO BE CONFIRMED PENDING AIR USER REQUIREMENTS.

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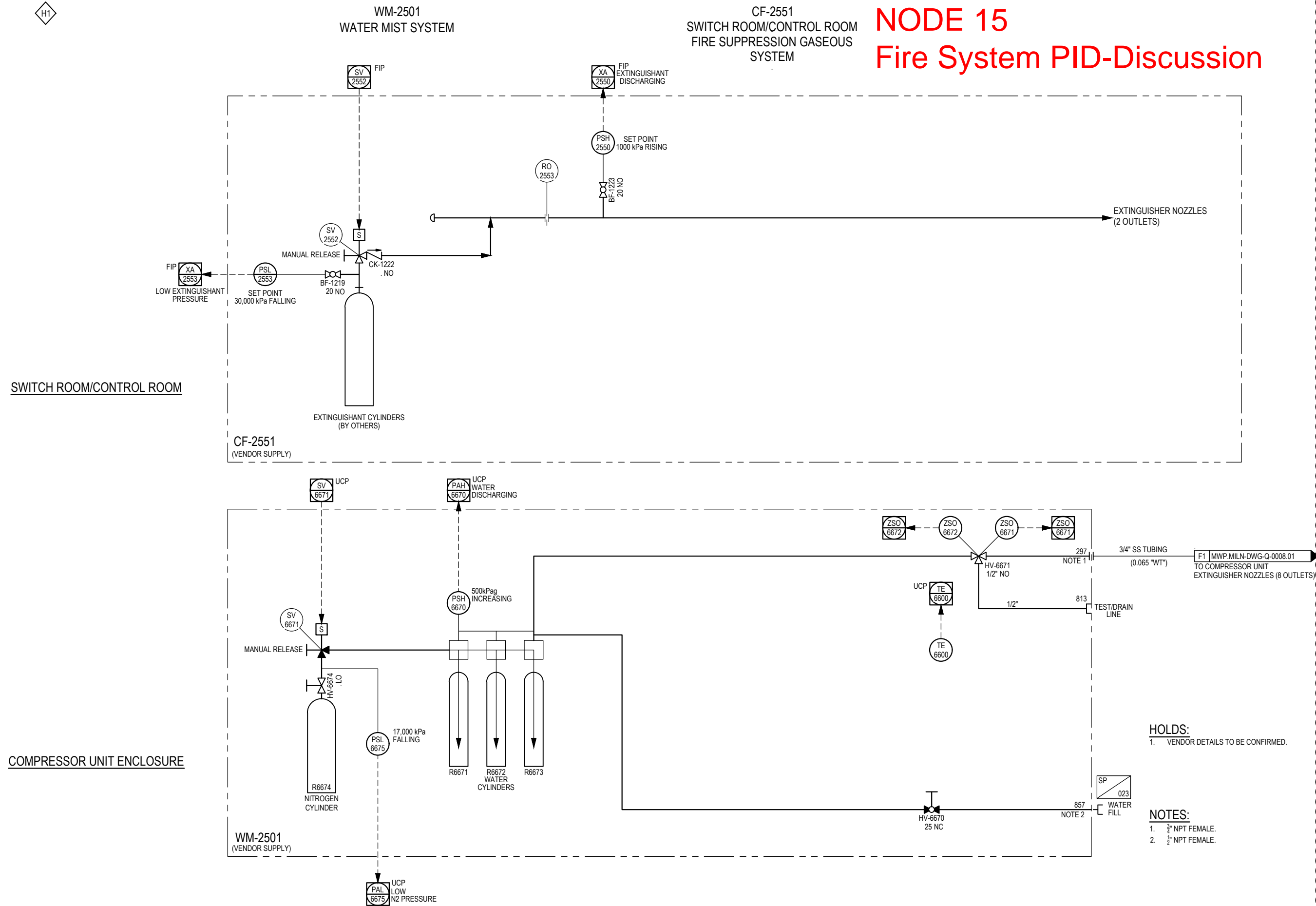
1. ULTRASONIC LEVEL INDICATOR TRANSMITTER.
2. ENSURE SUFFICIENT RODDING POINTS IN PIPING DESIGN.
3. PSV INTEGRAL TO PUMP.
4. OIL STORE SHELTER TO OVERHANG SUMP BOUNDARY TO PREVENT RAIN ACCUMULATION.
5. BUND TO BE SIZED FOR AT LEAST THE CAPACITY OF THE LARGEST OIL VESSEL.

1. TRANSFER PUMP REQUIREMENT TO BE CONFIRMED.
2. REQUIRED QUANTITY OF STORED OIL TO BE CONFIRMED.
3. SP ITEM NUMBER TO BE CONFIRMED.

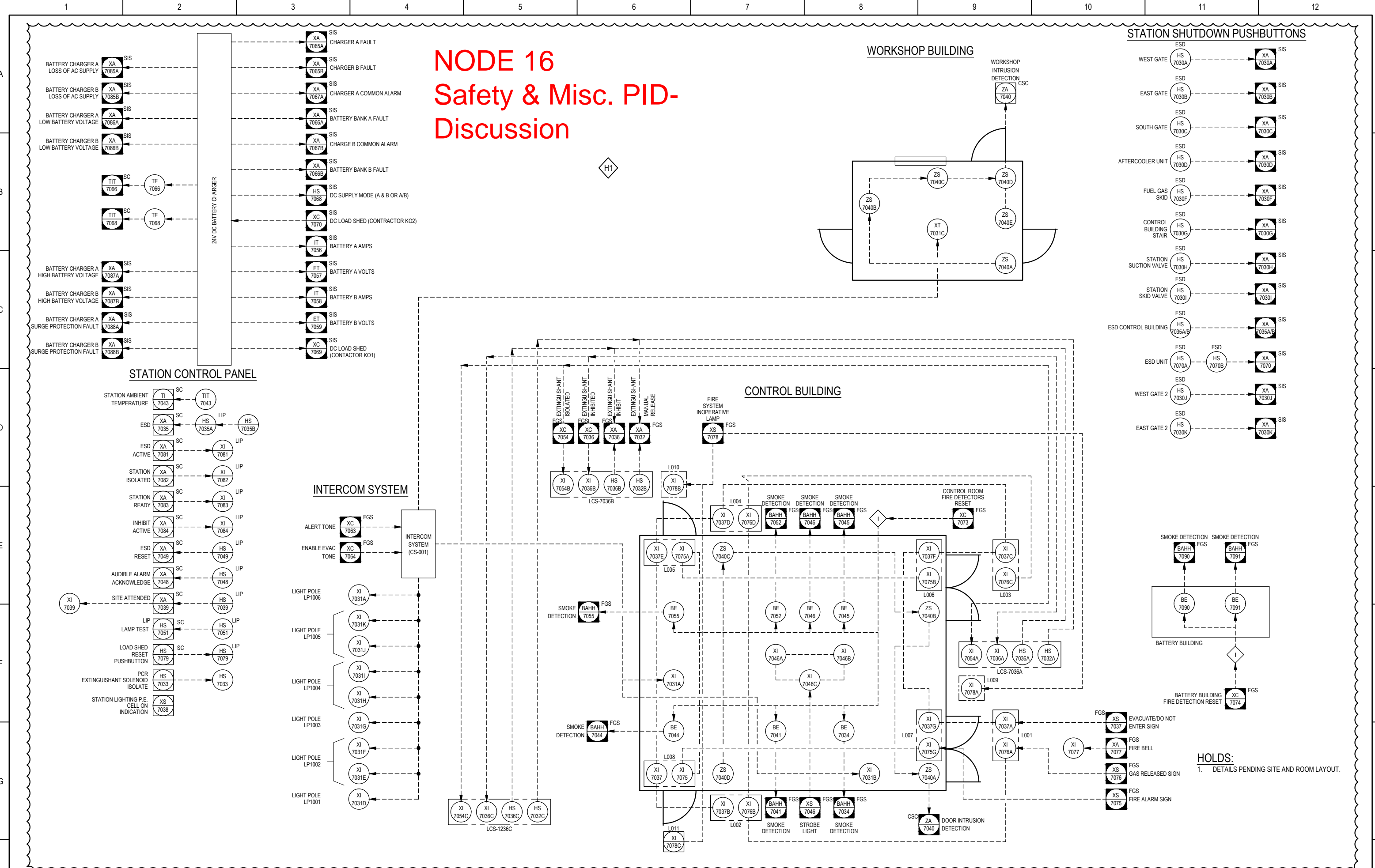
[illegible]

NODE 15

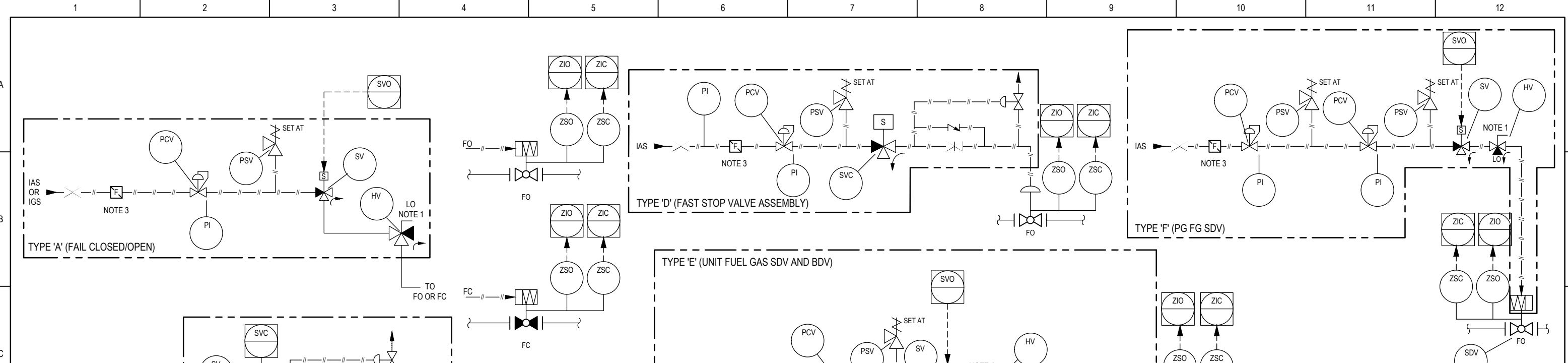
Fire System PID-Discussion

[illegible]

NODE 16
Safety & Misc. PID-
Discussion



<div><div><div>CONSULTING ENGINEERS</div><div>(CAD) A1</div><div><div>momentum</div><div>ENGINEERING</div></div><div>ABN 20 114 727 445</div><div>PROJECT No: AG101</div></div><div><div>ISSUED FOR HAZOP</div><div><div>apa</div><div></div></div></div></div>											
<div><div><div><div>DRAWN</div><div>DESIGNED</div><div>VALIDATED</div><div>ACCEPTED</div><div>SCALE</div><div>APA ID</div><div>A1</div></div><div><div>NAME</div><div>S ALDEN</div><div>DATE</div><div>12.04.21</div><div>NTS</div><div>MWP.MILN-DWG-Q-0018.01</div><div>THIS DRAWING, AND THE INFORMATION AND DETAILS CONTAINED IN IT ARE CONFIDENTIAL AND ARE THE PROPERTY OF APA GROUP. ANY USE MUST BE AUTHORISED BY APA GROUP.</div></div></div><div><div>PROJECT No</div><div>21100</div><div>DRG No</div><div>MWP.MILN-DWG-Q-0018.01</div><div>REV</div><div>0.2</div></div></div> <div><div>MOOMBA WILTON PIPELINE</div><div>MW880 MILNE COMPRESSOR STATION</div><div>SAETY AND MISC SYSTEMS</div><div>P&ID</div></div>											
0.2	21100	ISSUED FOR HAZOP	30.04.21	HL	NL	JE	GT	PAID LEGEND SHEET 2	TBA		
0.1	21100	ISSUED FOR REVIEW	16.04.21	SLA	NL	JE	GT	PAID LEGEND SHEET 1	TBA		
REV	PROJ No	REVISION	DATE	DRW	DES	CHK	APP	REFERENCE DRGs	DRG No		
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3											
4											
5											
6											
7											
8											
9											
10											
11											
12											



NODE 17
Valve Control Local
Panels PID-
Discussion

HOLDS:

1. ACTUATOR MODEL AND CONDITIONS TO BE CONFIRMED.

2. ALL VALVE SIZES TO BE CONFIRMED.
1. 3 WAY VALVE LOCKED IN OPERATE POSITION. PERMIT TO WORK PROCEDURES APPLY WHEN OPERATING VALVE.

2. FAIL CLOSED/OPEN VALVES SHOWN IN OPERATING CONDITION (SOLENOID ENERGISED).

3. INTEGRATED FILTER AND PRESSURE REGULATOR WITH PRESSURE GAUGES.

4. REFER TO P&IDS IN TABLE BELOW FOR CONTROL SYSTEM INTERFACES.

ITEM	P&ID	SYSTEM	ACTUATOR PANEL TYPE	ACTUATION SCHEMATIC/PANEL DWG	TAG	STATUS	NB SIZE (mm)	SUPPLY PRESS. (kPag) MIN/MAX	PCV SETPOINT (kPag)	PRV SETPOINT (kPag)	DESIGN PRESSURE (kPag)	ACTUATOR MODEL	FUNCTION
1	MWP.MILN-DWG-Q-0005.01	UNIT	A	TBA	SDV-2000	FC	450	700/750	TBA	TBA	TBA	TBA	COMPRESSOR SUCTION VALVE, SOLENOID AUTO RESET
2	MWP.MILN-DWG-Q-0005.01	UNIT	A	TBA	XV-2010	FC	50	700/750	TBA	TBA	TBA	TBA	COMPRESSOR PRESSURISATION VALVE, SOLENOID AUTO RESET
3	MWP.MILN-DWG-Q-0005.01	UNIT	A	TBA	SDV-2030	FC	450	700/750	TBA	TBA	TBA	TBA	COMPRESSOR DISCHARGE VALVE, SOLENOID AUTO RESET
4	MWP.MILN-DWG-Q-0005.01	UNIT	A	TBA	BDV-2040	FO	50	700/750	TBA	TBA	TBA	TBA	COMPRESSOR BLOWDOWN VALVE, SOLENOID AUTO RESET
6	MWP.MILN-DWG-Q-0005.01	UNIT	D	TBA	FSV-2386	FO	100	700/750	TBA	TBA	TBA	TBA	COMPRESSOR FAST STOP VALVE, SOLENOID AUTO RESET
7	MWP.MILN-DWG-Q-0005.01	UNIT	C	TBA	ASV-2385	FO	100	700/750	TBA	TBA	TBA	TBA	COMPRESSOR ANTI-SURGE VALVE, SOLENOID AUTO RESET
8	MWP.MILN-DWG-Q-0008.01	UNIT	TYPE "E" (PART)	TBA	SDV-2327B	FC	50	700/750	TBA	TBA	TBA	TBA	COMPRESSOR UTILITIES FUEL GAS INLET VALVE, SOLENOID AUTO RESET
9	MWP.MILN-DWG-Q-0008.01	UNIT	TYPE "E" (PART)	TBA	BDV-2327A	FO	50	700/750	TBA	TBA	TBA	TBA	COMPRESSOR UTILITIES FUEL GAS BLOWDOWN VALVE, SOLENOID AUTO RESET
10	MWP.MILN-DWG-Q-0010.01	UNIT FG	A	TBA	BDV-2691	FO	80	700/750	TBA	TBA	TBA	TBA	FUEL GAS BLOWDOWN VALVE, SOLENOID AUTO RESET
11	MWP.MILN-DWG-Q-0009.01	UNIT FG	A	TBA	SDV-2600	FC	50	700/750	TBA	TBA	TBA	TBA	HP FUEL GAS SKID INLET ISOLATION VALVE SOLENOID AUTO RESET
12	MWP.MILN-DWG-Q-0011.01	POWER GEN FG	A	TBA	BDV-5066	FO	40	700/750	TBA	TBA	TBA	TBA	LP FUEL GAS SKID BLOWDOWN VALVE SOLENOID AUTO RESET
13	MWP.MILN-DWG-Q-0011.01	POWER GEN FG	A	TBA	SDV-5000	FC	50	700/750	TBA	TBA	TBA	TBA	LP FUEL GAS SKID INLET ISOLATION VALVE SOLENOID AUTO RESET
14	MWP.MILN-DWG-Q-0012.01	MICROTURBINES	A	TBA	SDV-5100	FC	50	700/750	TBA	TBA	TBA	TBA	MICROTURBINE FUEL GAS ISOLATION VALVE SOLENOID AUTO RESET

0.221100ISSUED FOR HAZOP30.04.21SLANLJEGT

0.121100ISSUED FOR REVIEW16.04.21SLANLJEGT

REVPROJNo

REVISION

DATE

DRW

DES

CHK

APP

REFERENCE DRGs

DRG No

CONSULTING ENGINEERS

(CAD) A1

ABN 20 114 727 445

PROJECT No: AG101

ISSUED FOR HAZOP

DRAWNDESIGNEDVALIDATEDACCEPTEDSCALE

A1

NAME
S ALDEN

DATE
12.04.21

NTS

MWP.MILN-DWG-Q-0019.01

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MOOMBA WILTON PIPELINE

MW880 MILNE COMPRESSOR STATION

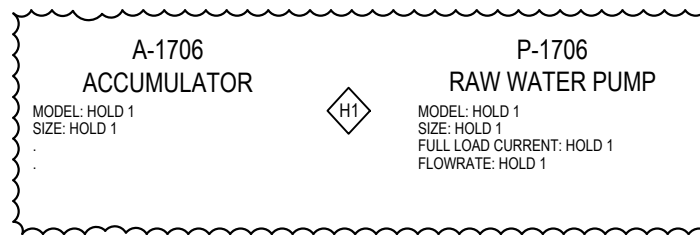
ACTUATOR PANELS

P&ID

PROJECT No
21100

DRG No
MWP.MILN-DWG-Q-0019.01

REV
0.2

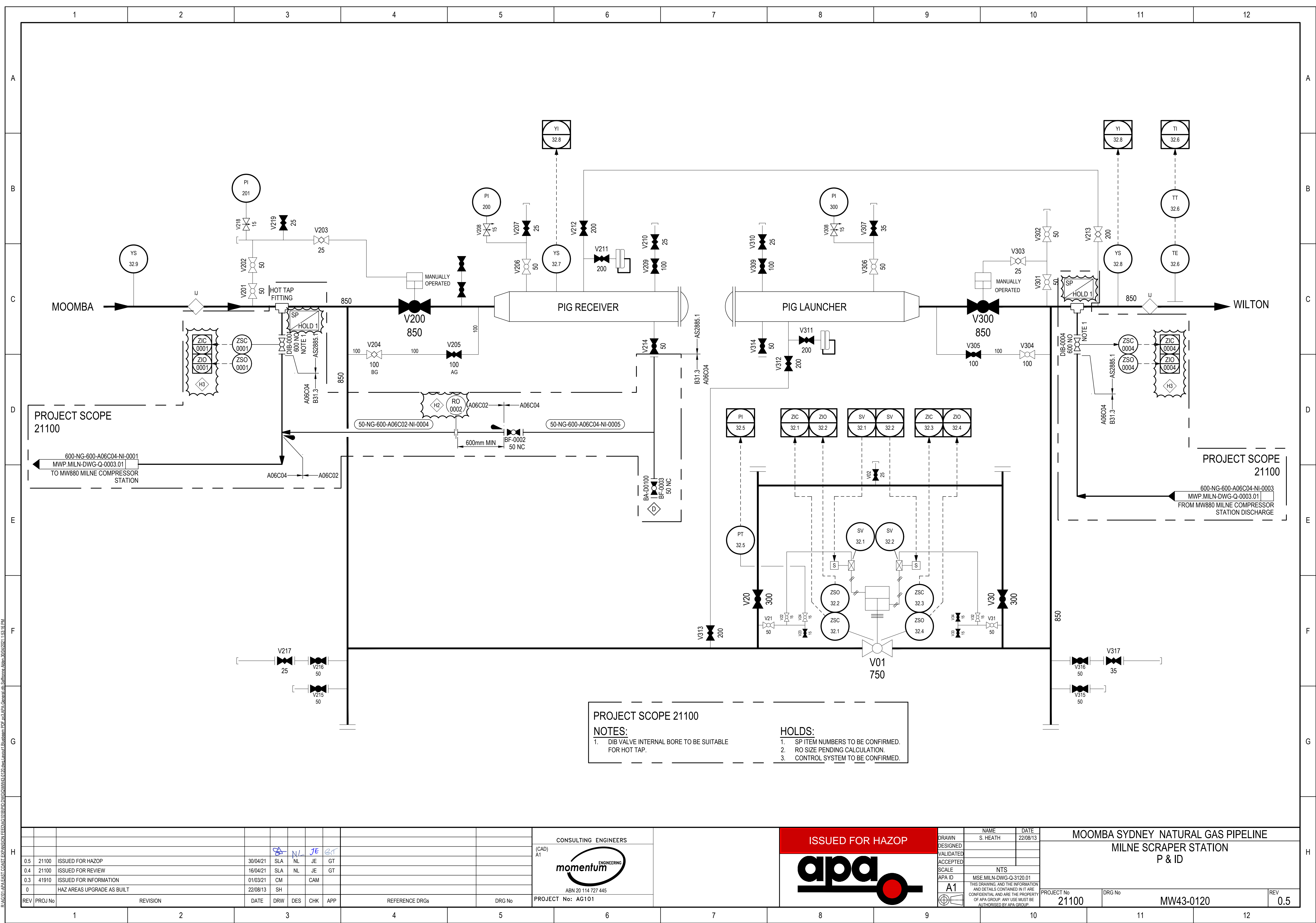


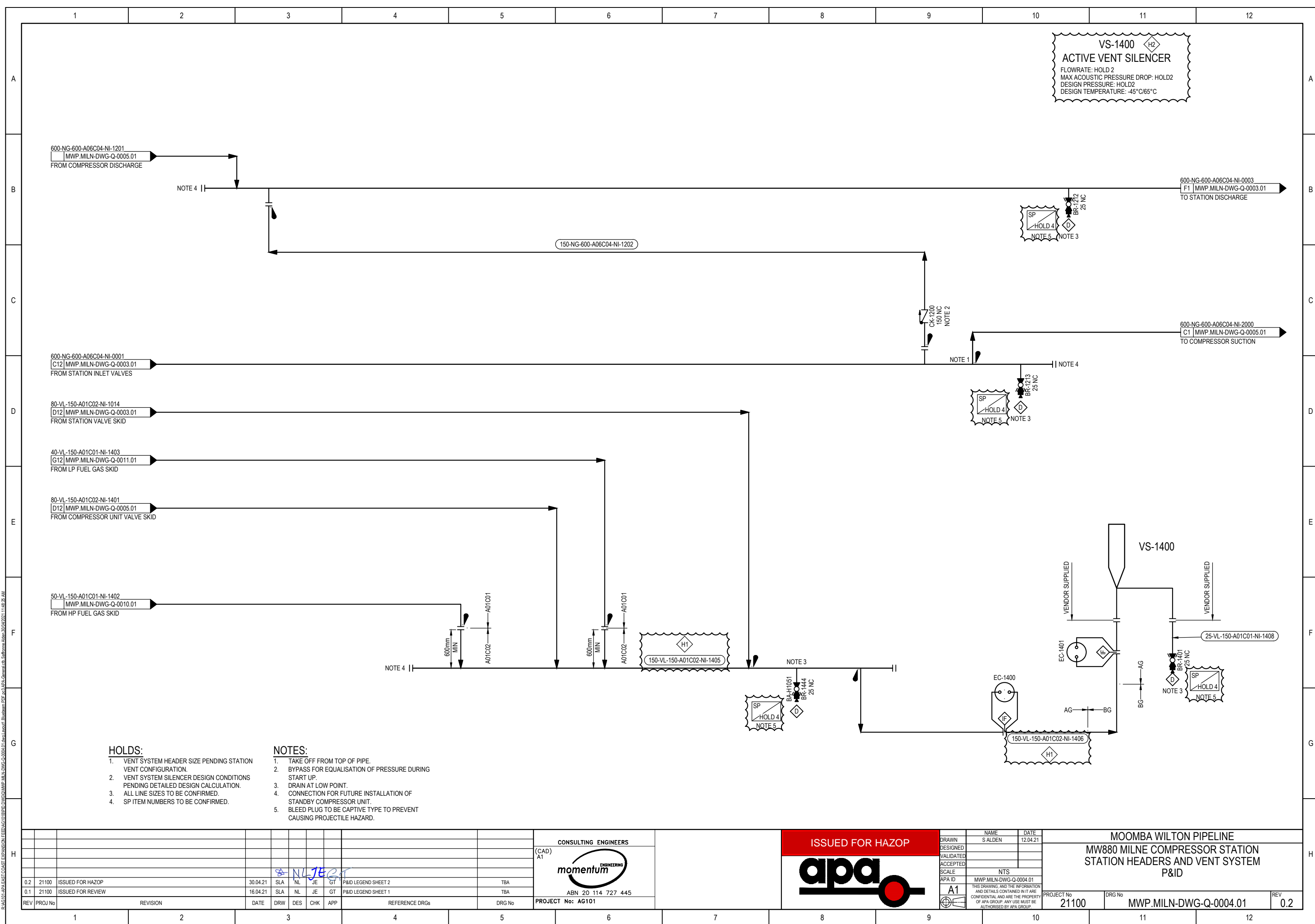
NOTES:
1. FLOAT VALVES INSTALLED UNDER THE ACCESS MANWAY FOR EASE OF INSTALLATION.

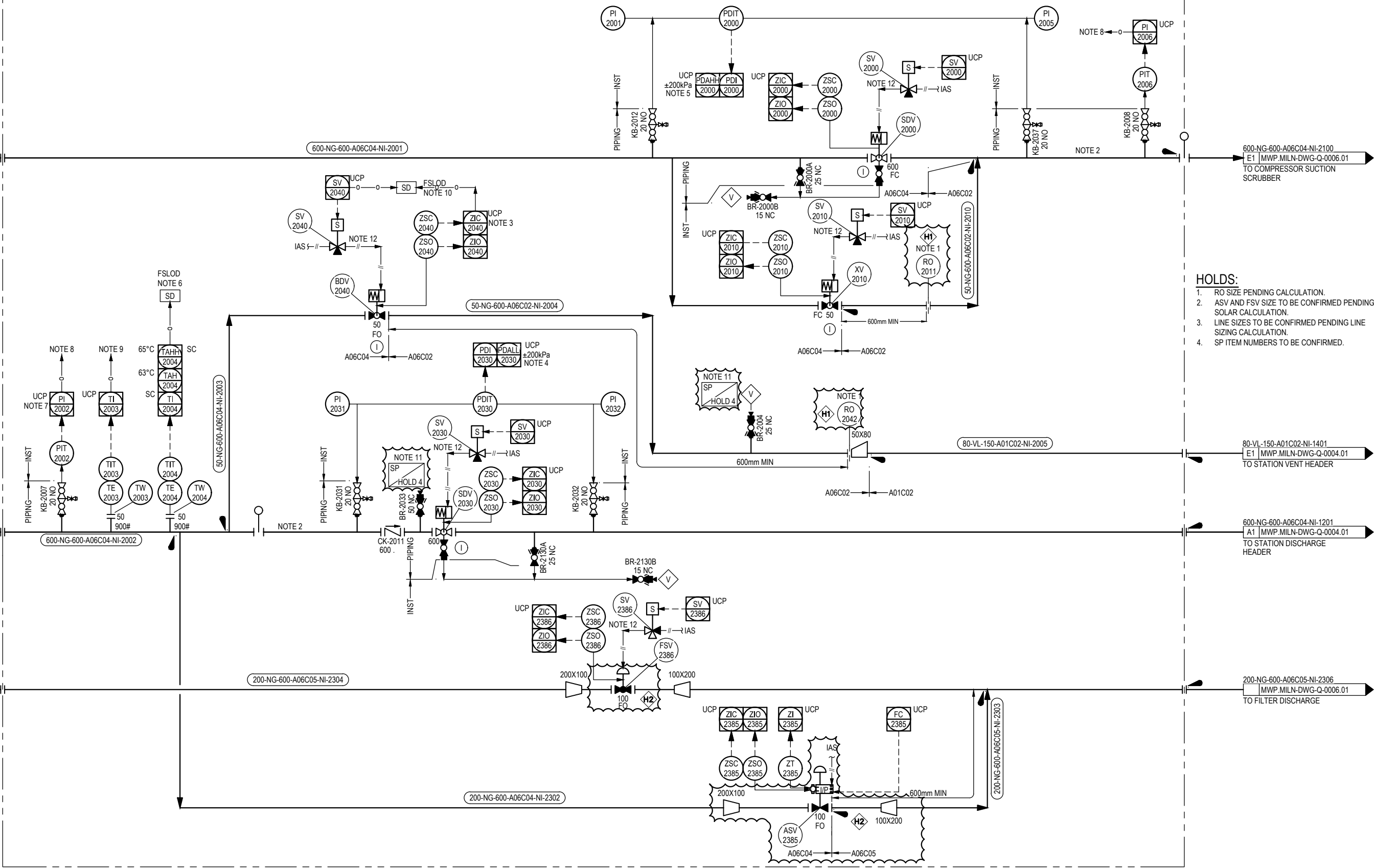
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Appendix E HAZOP-P&IDS

R:\GIS\APA EAST COAST EXPANSION\FEED\PD DWG\600\MW43-0120\Ana Layout\Bulldozer PDF\63\APA Central\ch\Stiffness Area\30/04/2021 1:53:15 PM



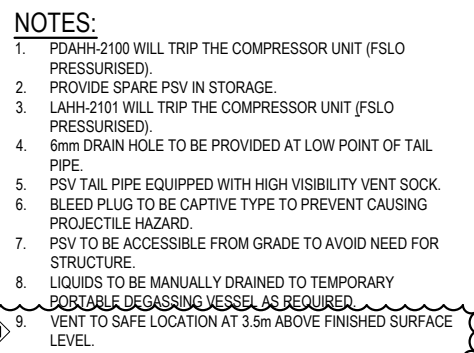




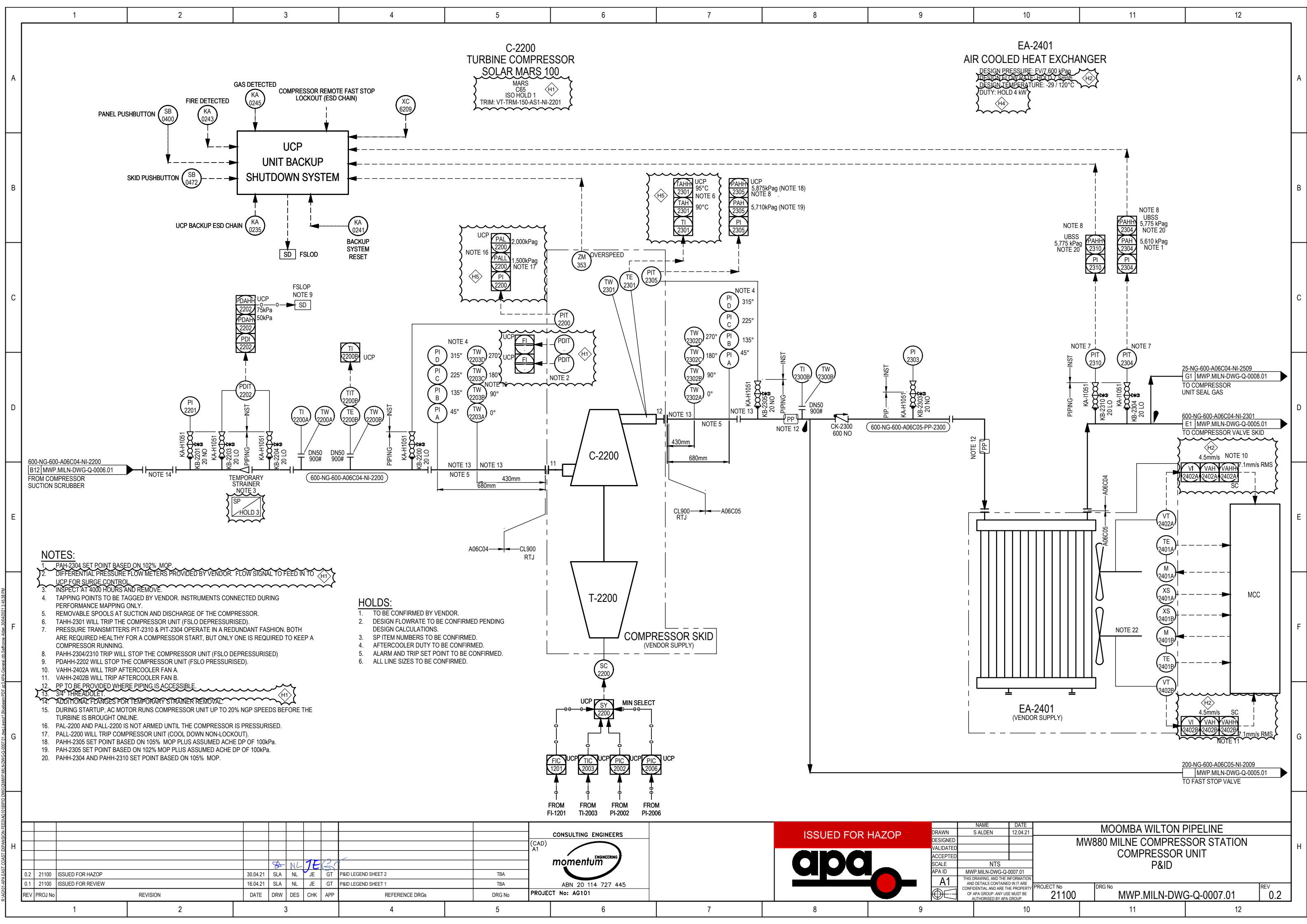
1. RO SIZED TO MEET SOLAR SPECIFIED PRESSURISATION/DEPRESSURISATION RATE 2000 kPa/min (MAXIMUM).
2. ENSURE PIPING DESIGN PROVIDES SUFFICIENT SPACE ON THE REMOVABLE SPOOL BETWEEN SHUTDOWN VALVE AND FLANGE.
3. ZSC-2040 (CLOSED) IS PERMISSIVE SIGNAL FOR COMPRESSOR TO START.
4. OPEN PERMISSIVE FOR SDV-2030 DURING START UP.
5. OPEN PERMISSIVE FOR SDV-2000.
6. TANH-2004 WILL TRIP THE COMPRESSOR UNIT (FSLO DEPRESSURISE).
7. CONTROL SET POINT OF PI-2002 IS NOT TO EXCEED SYSTEM MOP OF 5,500kPag.
8. PRESSURE INPUT TO UCP FOR COMPRESSOR UNIT SPEED CONTROL MINIMUM SELECT.
9. TEMPERATURE INPUT TO UCP FOR COMPRESSOR UNIT TEMPERATURE CONTROL.
10. BLOWDOWN VALVE OUT OF POSITION WILL STOP THE COMPRESSOR UNIT (FSLO DEPRESSURISE).
11. BLEED PLUG TO BE CAPTIVE TYPE TO PREVENT CAUSING PROJECTILE HAZARD.
12. REFER TO P&ID MWP.MILN-DWG-Q-0019.01 FOR ACTUATOR DETAILS.

1. RO SIZE PENDING CALCULATION.
2. ASV AND FSV SIZE TO BE CONFIRMED PENDING SOLAR CALCULATION.
3. LINE SIZES TO BE CONFIRMED PENDING LINE SIZING CALCULATION.
4. SP ITEM NUMBERS TO BE CONFIRMED.

[illegible]

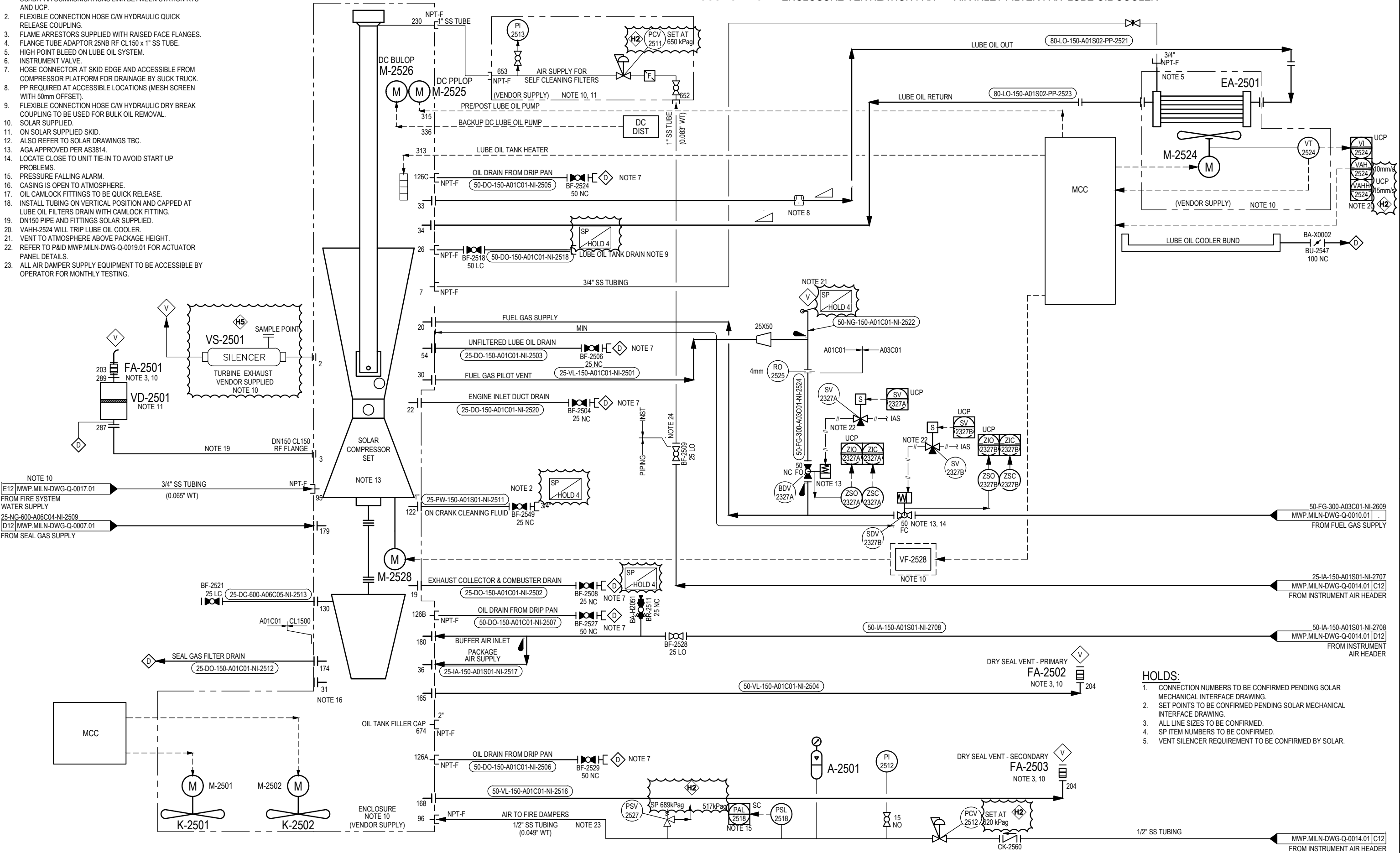


R:\AG101-APA EAST COAST EXPANSION FEED\AG101BIPID DWG\Q1MWP_MILN-DWG-Q-0006.01.dwg, Layout1, Bluebeam PDF, Bluebeam PDF, pc3.APA-General.cfb, Saffronne Alden, 30/04/2021 2:30:02 PM



NOTES:

1. ALL SOLAR ALARMS, STATUS INDICATIONS AVAILABLE TO SCADA VIA COMMUNICATIONS LINK BETWEEN STATION RTU AND UCP.
2. FLEXIBLE CONNECTION HOSE C/W HYDRAULIC QUICK RELEASE COUPLING.
3. FLAME ARRESTORS SUPPLIED WITH RAISED FACE FLANGES.
4. FLANGE TUBE ADAPTOR 25NB RF CL150 x 1" SS TUBE.
5. HIGH POINT BLEED ON LUBE OIL SYSTEM.
6. INSTRUMENT VALVE.
7. HOSE CONNECTOR AT SKID EDGE AND ACCESSIBLE FROM COMPRESSOR PLATFORM FOR DRAINAGE BY SUCK TRUCK.
8. PP REQUIRED AT ACCESSIBLE LOCATIONS (MESH SCREEN WITH 50mm OFFSET).
9. FLEXIBLE CONNECTION HOSE C/W HYDRAULIC DRY BREAK COUPLING TO BE USED FOR BULK OIL REMOVAL.
10. SOLAR SUPPLIED.
11. ON SOLAR SUPPLIED SKID.
12. ALSO REFER TO SOLAR DRAWINGS TBC.
13. AGA APPROVED PER AS3814.
14. LOCATE CLOSE TO UNIT TIE-IN TO AVOID START UP PROBLEMS.
15. PRESSURE FALLING ALARM.
16. CASING IS OPEN TO ATMOSPHERE.
17. OIL CAMLOCK FITTINGS TO BE QUICK RELEASE.
18. INSTALL TUBING ON VERTICAL POSITION AND CAPPED AT LUBE OIL FILTERS DRAIN WITH CAMLOCK FITTING.
19. DN150 PIPE AND FITTINGS SOLAR SUPPLIED.
20. VAHH-2524 WILL TRIP LUBE OIL COOLER.
21. VENT TO ATMOSPHERE ABOVE PACKAGE HEIGHT.
22. REFER TO P&ID MWP.MILN-DWG-Q-0019.01 FOR ACTUATOR PANEL DETAILS.
23. ALL AIR DAMPER SUPPLY EQUIPMENT TO BE ACCESSIBLE BY OPERATOR FOR MONTHLY TESTING.

VF-2528
VARIABLE FREQUENCY DRIVEFA-2501
FLAME ARRESTORVD-2501
L.O. VENT DEMISTERA-2501
AIR ACCUMULATORK-2502
ENCLOSURE VENTILATION FANK-2501
AIR INLET FILTER FANEA-2501
LUBE OIL COOLERFA-2502
FLAME ARRESTORFA-2503
FLAME ARRESTOR

HOLDS:

1. CONNECTION NUMBERS TO BE CONFIRMED PENDING SOLAR MECHANICAL INTERFACE DRAWING.
2. SET POINTS TO BE CONFIRMED PENDING SOLAR MECHANICAL INTERFACE DRAWING.
3. ALL LINE SIZES TO BE CONFIRMED.
4. SP ITEM NUMBERS TO BE CONFIRMED.
5. VENT SILENCER REQUIREMENT TO BE CONFIRMED BY SOLAR.

CONSULTING ENGINEERS

(CAD)
A1momentum
ENGINEERING

ABN 20 114 727 445

PROJECT No: AG101

ISSUED FOR HAZOP



NAME	DATE
S ALDEN	12.04.21
DESIGNED	
VALIDATED	
ACCEPTED	
SCALE	NTS
APA ID	MWP.MILN-DWG-Q-0008.01
A1	

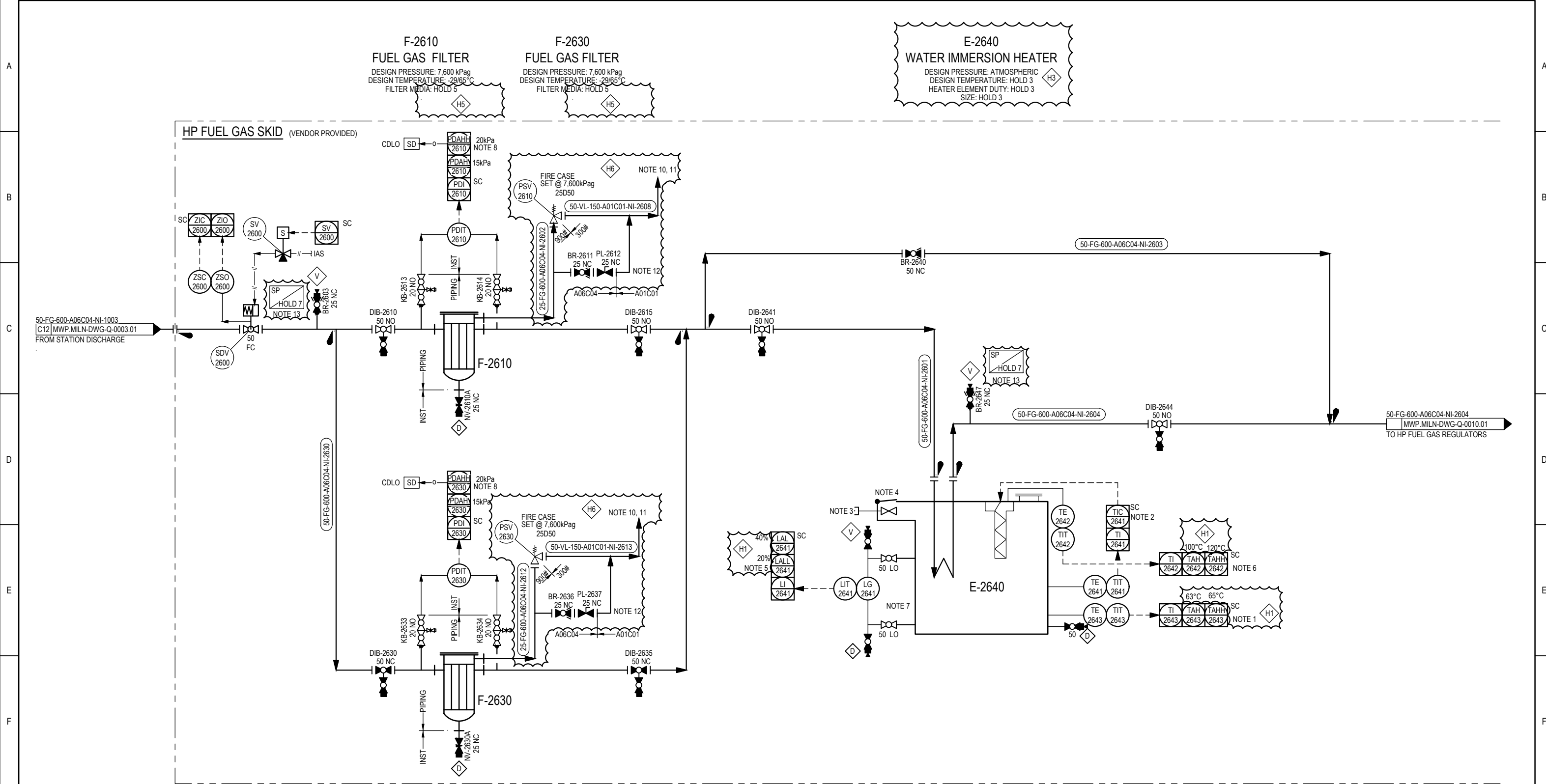
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MOOMBA WILTON PIPELINE

MW880 MILNE COMPRESSOR STATION
COMPRESSOR FACILITIES
P&ID

PROJECT No	DRG No	REV
21100	MWP.MILN-DWG-Q-0008.01	0.2

REV	PROJ No	REVISION	DATE	DRW	DES	CHK	APP	REFERENCE DRGs	DRG No
0.2	21100	ISSUED FOR HAZOP	30.04.21	SLA	NL	JE	GT	P&ID LEGEND SHEET 2	TBA
0.1	21100	ISSUED FOR REVIEW	16.04.21	SLA	NL	JE	GT	P&ID LEGEND SHEET 1	TBA

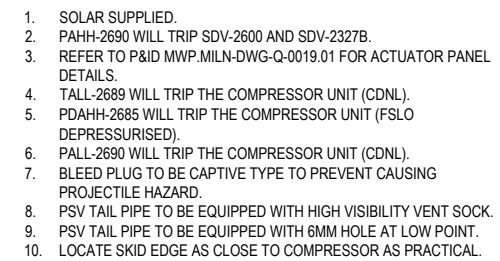


- HOLDS:**
- SET POINTS PENDING VENDOR INFORMATION.
 - REQUIREMENT FOR OVERPRESSURE/OVERTEMPERATURE PROTECTION TO BE CONFIRMED PENDING HEATER DESIGN.
 - WATER CONTROL TEMPERATURE FOR REQUIRED HEATER TO BE CONFIRMED PENDING HEATER DESIGN.
 - ALL LINE SIZES TO BE CONFIRMED.
 - FILTER MEDIA REQUIREMENT TO BE CONFIRMED.
 - PSV ORIFICE SIZE, LINE SIZE AND FLANGE RATING TO BE CONFIRMED PENDING CALCULATION.
 - SP ITEMS NUMBERS TO BE CONFIRMED.

- NOTES:**
- TAHH-2643 WILL TRIP THE HEATER ELEMENT IN E-2640.
 - TIC-2641 CONTROLS THE WATER TEMPERATURE IN THE IMMERSION HEATER TO 60°C.
 - MANUAL FILL POINT FOR WATER FILL AS REQUIRED.
 - WATER IMMERSION HEATER IS OPEN TO ATMOSPHERE VIA HINGED FLAP.
 - LALL-2641 WILL TRIP THE HEATER ELEMENT IN E-2640.
 - TAHH-2642 WILL TRIP THE HEATER ELEMENT IN E-2640.
 - E-2640 TO BE PROVIDED WITH HEAT CONSERVATION INSULATION.
 - PDAH-2610/PDAH-2630 WILL TRIP THE COMPRESSOR UNIT CDLO.
 - REFER TO P&ID MWP.MILN-DWG-Q-0019.01 FOR ACTUATOR PANEL DETAILS.
 - PSV TAIL PIPE TO BE EQUIPPED WITH HIGH VISIBILITY VENT SOCK.
 - PSV TAIL PIPE TO ROUTE A MINIMUM OF 3.6M FROM GRADE OR MANNED PLATFORM.
 - PSV TAIL PIPE TO BE EQUIPPED WITH 6MM DRAIN HOLE AT LOW POINT
 - BLEED PLUG TO BE CAPTIVE STYLE TO PREVENT CAUSING PROJECTIVE HAZARD.

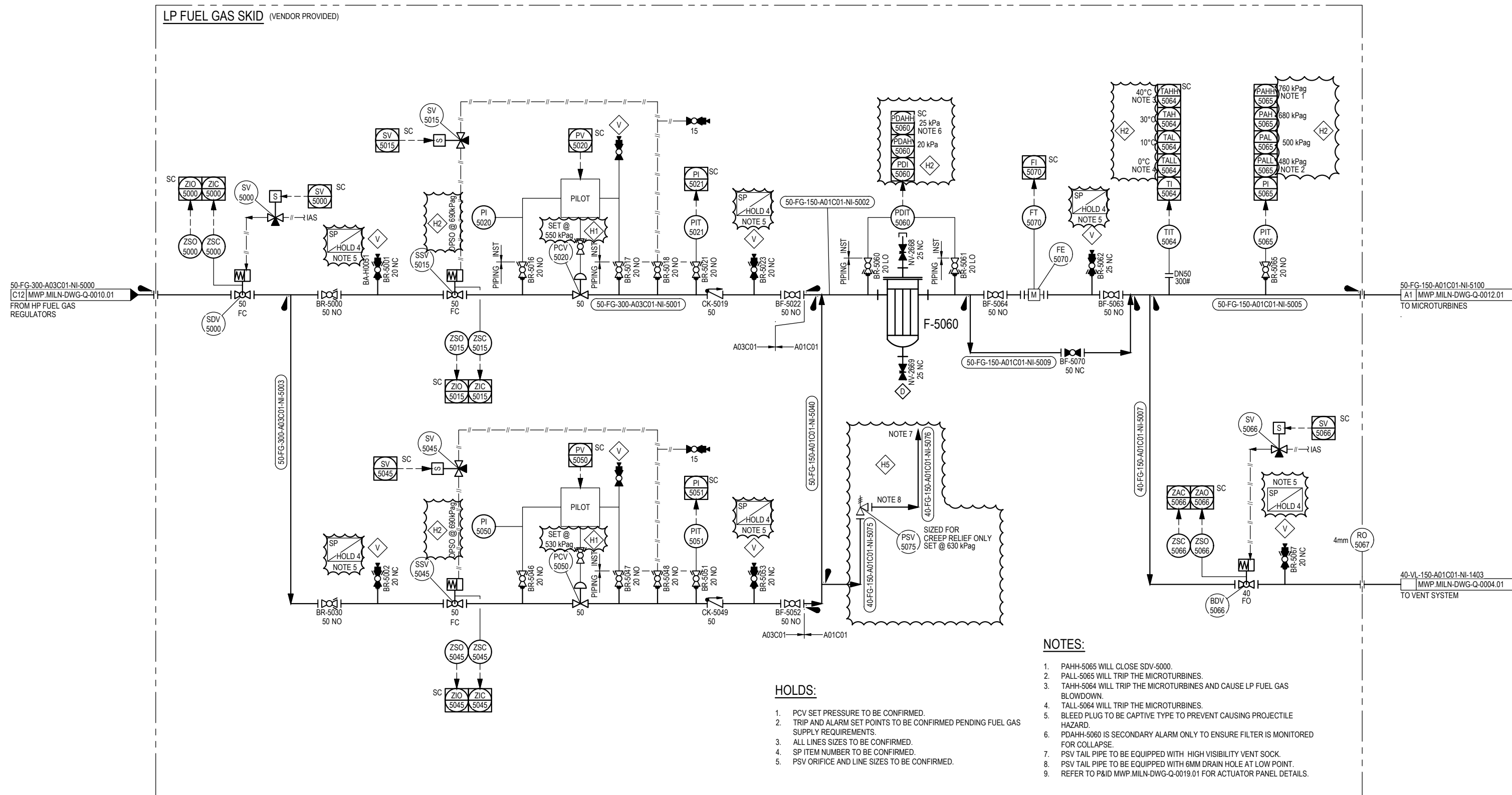
								CONSULTING ENGINEERS				ISSUED FOR HAZOP				MOOMBA WILTON PIPELINE			
								(CAD) A1				DRAWN S ALDEN				DATE 12.04.21			
								momentum ENGINEERING				DESIGNED							
								ABN 20 114 727 445				VALIDATED							
								PROJECT No: AG101				ACCEPTED							
												SCALE NTS							
												APA ID MWP.MILN-DWG-Q-0009.01							
												THIS DRAWING, AND THE INFORMATION AND DETAILS CONTAINED IN IT ARE CONFIDENTIAL AND ARE THE PROPERTY OF APA GROUP. ANY USE MUST BE AUTHORISED BY APA GROUP.							
												PROJECT No 21100				DRG No			
																MWP.MILN-DWG-Q-0009.01			
																REV 0.2			

50-FG-600-A06C04-NI-2604
MWP.MILN-DWG-Q-0009.01
FROM FUEL GAS HEATER

[illegible]

F-5060
LP FUEL GAS COALESCING FILTER

FILTER MEDIA: TBC
DESIGN PRESSURE: FV/1,960 kPag
DESIGN TEMPERATURE: -29/65°C



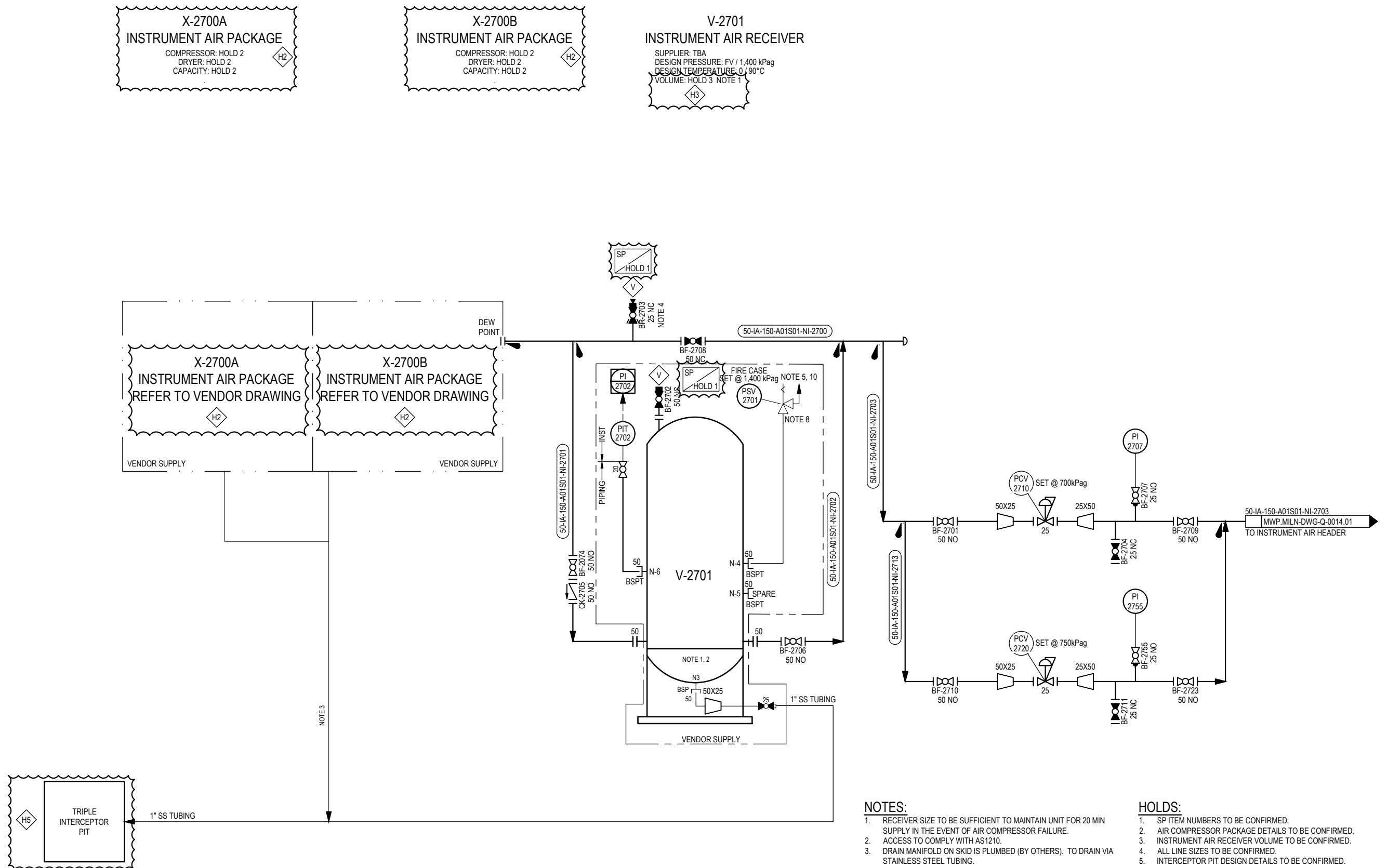
NOTES:

1. PAHH-5065 WILL CLOSE SDV-5000.
2. PALL-5065 WILL TRIP THE MICROTURBINES.
3. TAAH-5064 WILL TRIP THE MICROTURBINES AND CAUSE LP FUEL GAS BLOWDOWN.
4. TALL-5064 WILL TRIP THE MICROTURBINES.
5. BLEED PLUG TO BE CAPTIVE TYPE TO PREVENT CAUSING PROJECTILE HAZARD.
6. PDAHH-5060 IS SECONDARY ALARM ONLY TO ENSURE FILTER IS MONITORED FOR COLLAPSE.
7. PSV TAIL PIPE TO BE EQUIPPED WITH HIGH VISIBILITY VENT SOCK.
8. PSV TAIL PIPE TO BE EQUIPPED WITH 6MM DRAIN HOLE AT LOW POINT.
9. REFER TO P&ID MWP.MILN-DWG-G-0019.01 FOR ACTUATOR PANEL DETAILS.

HOLDS:

1. PCV SET PRESSURE TO BE CONFIRMED.
2. TRIP AND ALARM SET POINTS TO BE CONFIRMED PENDING FUEL GAS SUPPLY REQUIREMENTS.
3. ALL LINES SIZES TO BE CONFIRMED.
4. SP ITEM NUMBER TO BE CONFIRMED.
5. PSV ORIFICE AND LINE SIZES TO BE CONFIRMED.

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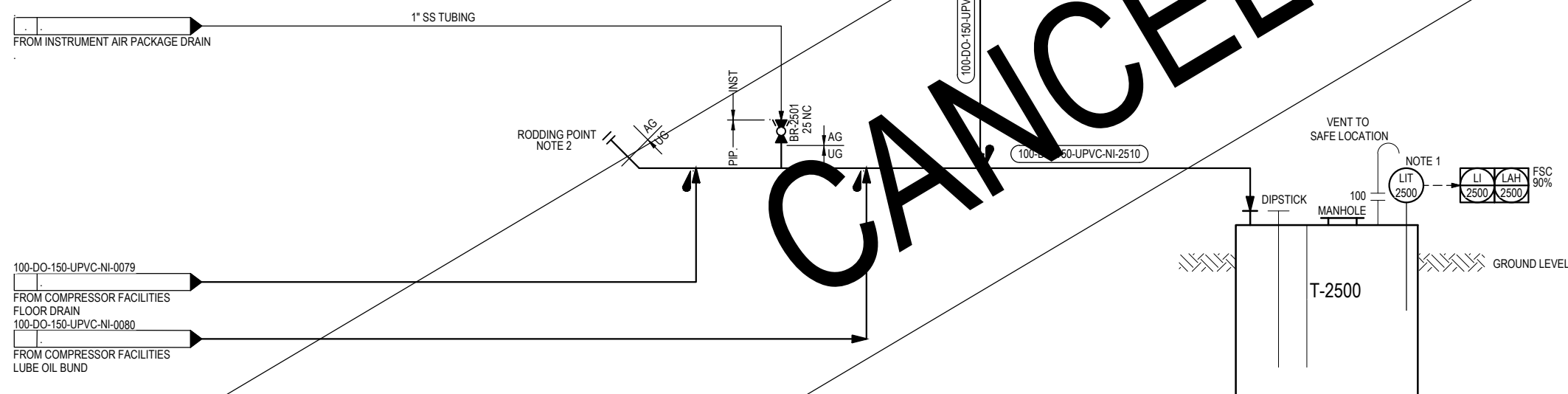
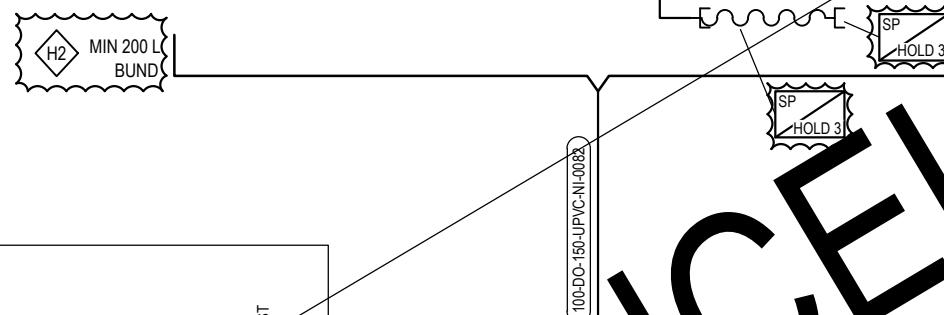
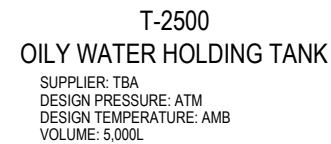
- NOTES:

1. RECEIVER SIZE TO BE SUFFICIENT TO MAINTAIN UNIT FOR 20 MIN SUPPLY IN THE EVENT OF AIR COMPRESSOR FAILURE.
2. ACCESS TO COMPLY WITH AS1210.
3. DRAIN MANIFOLD ON SKID IS PLUMBED (BY OTHERS). TO DRAIN VIA STAINLESS STEEL TUBING.
4. PROVISION FOR BACK UP AIR SUPPLY.
5. VENT TO SAFE LOCATION.
6. PSV TAIL PIPE EQUIPPED WITH HIGH VISIBILITY VENT SOCK.
7. HIGH WATER DEWPOINT ALARM AT -20°C TO ALERT OPERATOR IF AIR IS FAILING TO MEET SOLAR REQUIREMENT OF MORE THAN 10°C BELOW THE MINIMUM AMBIENT TEMPERATURE.
8. PSV TAIL PIPE TO BE EQUIPPED WITH 6MM DRAIN HOLE AT LOW POINT.
9. PSV TO BE ACCESSIBLE FROM GRADE.

HOLDS:

1. SP ITEM NUMBERS TO BE CONFIRMED.
2. AIR COMPRESSOR PACKAGE DETAILS TO BE CONFIRMED.
3. INSTRUMENT AIR RECEIVER VOLUME TO BE CONFIRMED.
4. ALL LINE SIZES TO BE CONFIRMED.
5. INTERCEPTOR PIT DESIGN DETAILS TO BE CONFIRMED.

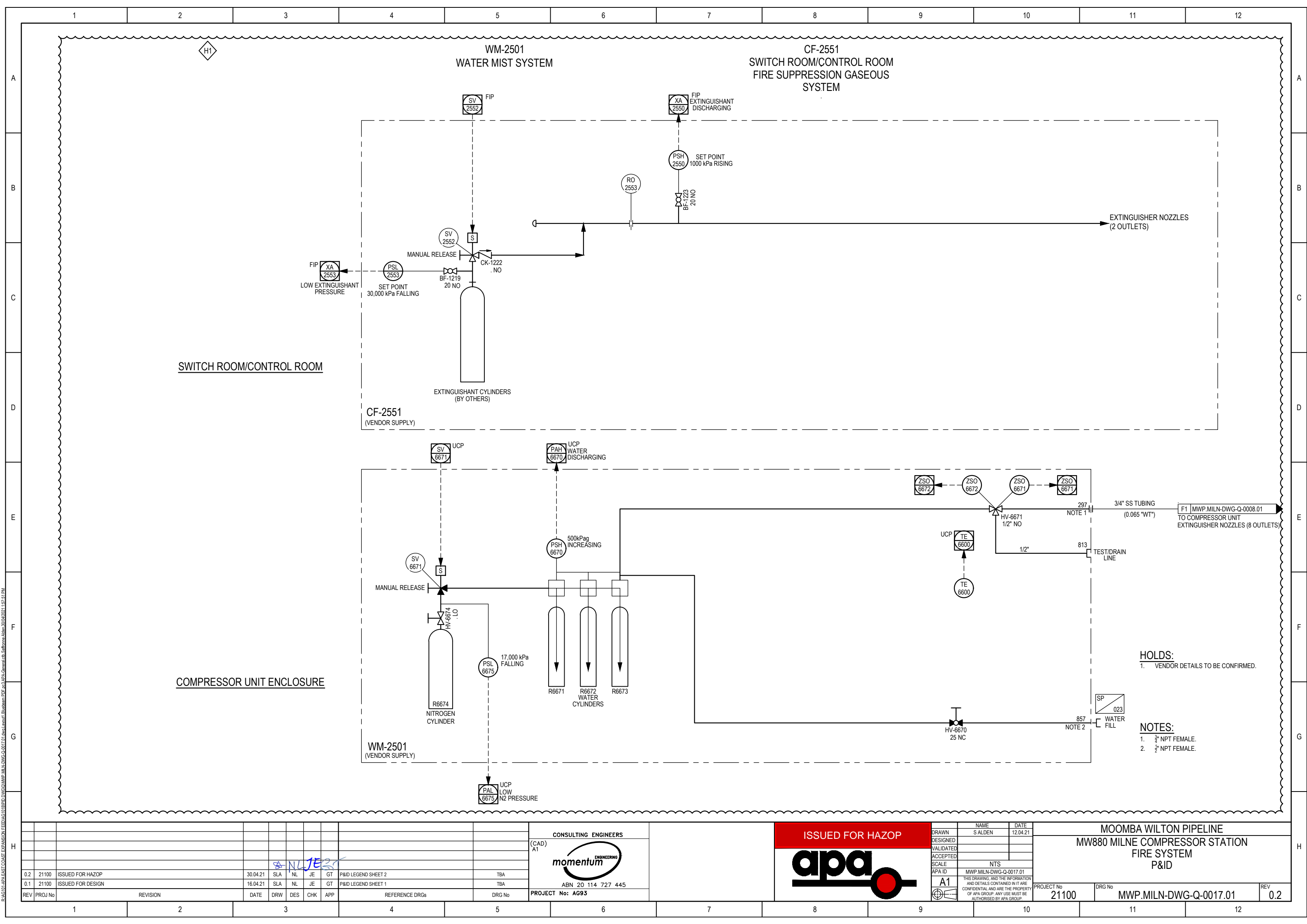
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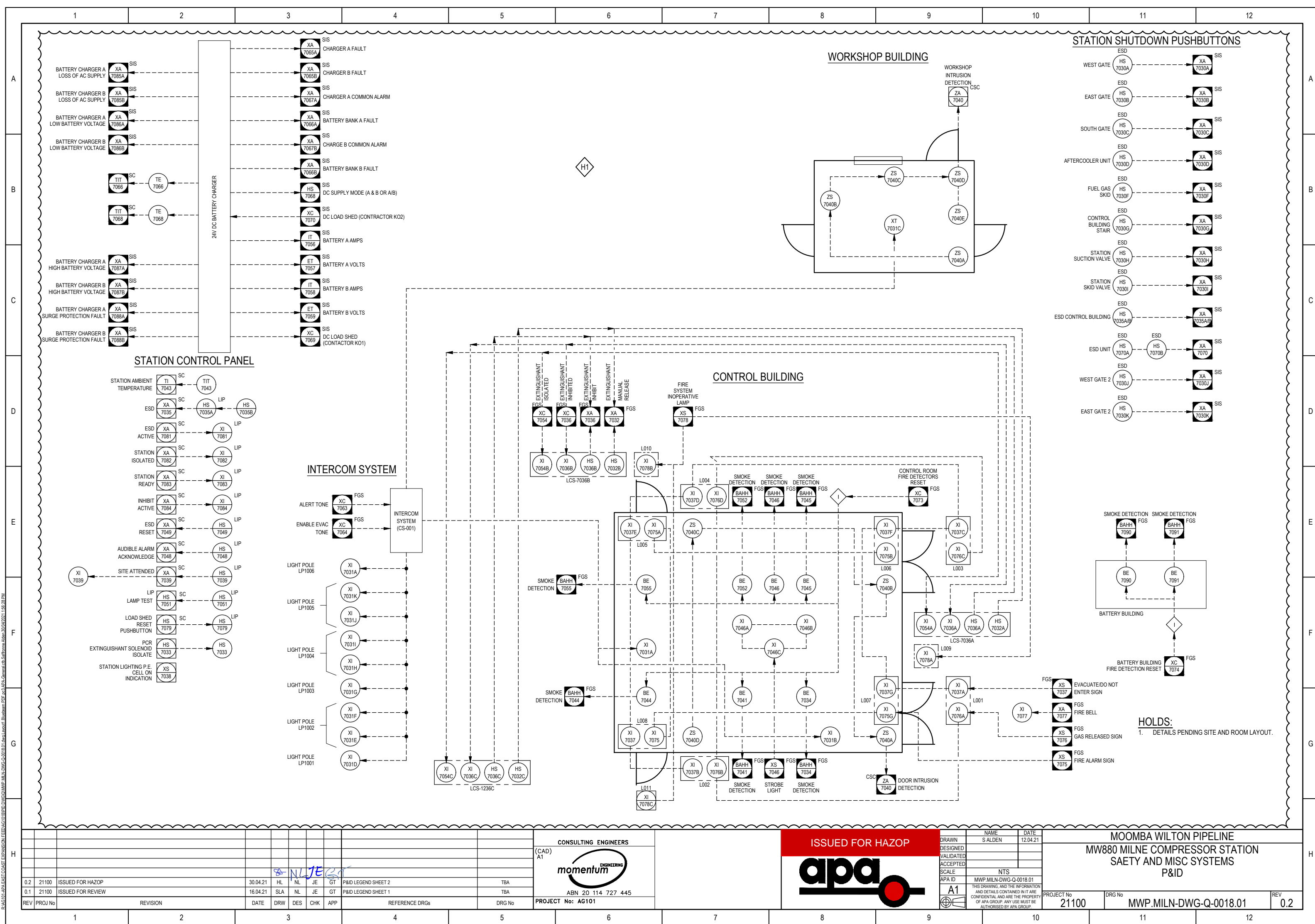


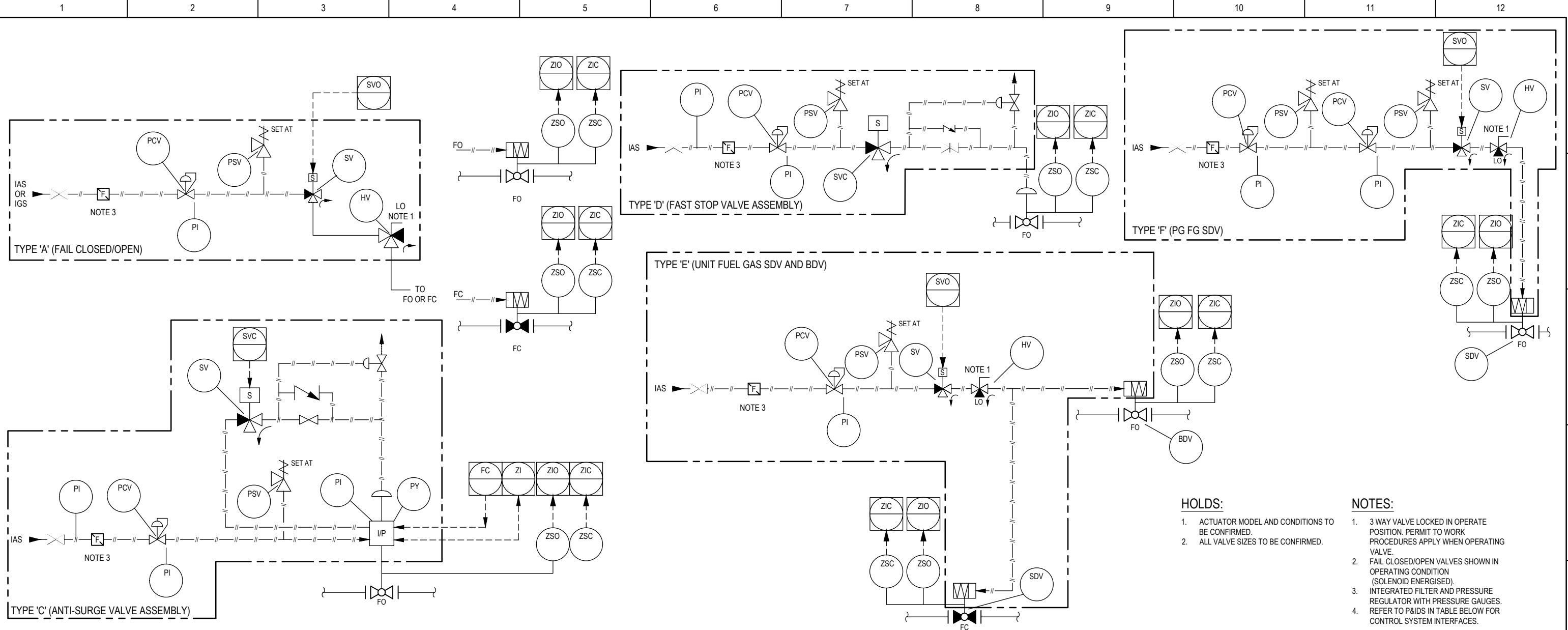
1. ULTRASONIC LEVEL INDICATOR TRANSMITTER.
2. ENSURE SUFFICIENT RODDING POINTS IN PIPING DESIGN.
3. PSV INTEGRAL TO PUMP.
4. OIL STORE SHELTER TO OVERHANG SUMP BOUNDARY TO PREVENT RAIN ACCUMULATION.
5. BUND TO BE SIZED FOR AT LEAST THE CAPACITY OF THE LARGEST OIL VESSEL.

1. TRANSFER PUMP REQUIREMENT TO BE CONFIRMED.
2. REQUIRED QUANTITY OF STORED OIL TO BE CONFIRMED.
3. SP ITEM NUMBER TO BE CONFIRMED.

[illegible]







ITEM	P&ID	SYSTEM	ACTUATOR PANEL TYPE	ACTUATION SCHEMATIC/PANEL DWG	TAG	STATUS	NB SIZE (mm)	SUPPLY PRESS. (kPag) MIN/MAX	PCV SETPOINT (kPag)	PRV SETPOINT (kPag)	DESIGN PRESSURE (kPag)	ACTUATOR MODEL	FUNCTION
1	MWP.MILN-DWG-Q-0005.01	UNIT	A	TBA	SDV-2000	FC	450	700/750	TBA	TBA	TBA	TBA	COMPRESSOR SUCTION VALVE, SOLENOID AUTO RESET
2	MWP.MILN-DWG-Q-0005.01	UNIT	A	TBA	XV-2010	FC	50	700/750	TBA	TBA	TBA	TBA	COMPRESSOR PRESSURISATION VALVE, SOLENOID AUTO RESET
3	MWP.MILN-DWG-Q-0005.01	UNIT	A	TBA	SDV-2030	FC	450	700/750	TBA	TBA	TBA	TBA	COMPRESSOR DISCHARGE VALVE, SOLENOID AUTO RESET
4	MWP.MILN-DWG-Q-0005.01	UNIT	A	TBA	BDV-2040	FO	50	700/750	TBA	TBA	TBA	TBA	COMPRESSOR BLOWDOWN VALVE, SOLENOID AUTO RESET
6	MWP.MILN-DWG-Q-0005.01	UNIT	D	TBA	FSV-2386	FO	100	700/750	TBA	TBA	TBA	TBA	COMPRESSOR FAST STOP VALVE, SOLENOID AUTO RESET
7	MWP.MILN-DWG-Q-0005.01	UNIT	C	TBA	ASV-2385	FO	100	700/750	TBA	TBA	TBA	TBA	COMPRESSOR ANTI-SURGE VALVE, SOLENOID AUTO RESET
8	MWP.MILN-DWG-Q-0008.01	UNIT	TYPE "E" (PART)	TBA	SDV-2327B	FC	50	700/750	TBA	TBA	TBA	TBA	COMPRESSOR UTILITIES FUEL GAS INLET VALVE, SOLENOID AUTO RESET
9	MWP.MILN-DWG-Q-0008.01	UNIT	TYPE "E" (PART)	TBA	BDV-2327A	FO	50	700/750	TBA	TBA	TBA	TBA	COMPRESSOR UTILITIES FUEL GAS BLOWDOWN VALVE, SOLENOID AUTO RESET
10	MWP.MILN-DWG-Q-0010.01	UNIT FG	A	TBA	BDV-2691	FO	80	700/750	TBA	TBA	TBA	TBA	FUEL GAS BLOWDOWN VALVE, SOLENOID AUTO RESET
11	MWP.MILN-DWG-Q-0009.01	UNIT FG	A	TBA	SDV-2600	FC	50	700/750	TBA	TBA	TBA	TBA	HP FUEL GAS SKID INLET ISOLATION VALVE SOLENOID AUTO RESET
12	MWP.MILN-DWG-Q-0011.01	POWER GEN FG	A	TBA	BDV-5066	FO	40	700/750	TBA	TBA	TBA	TBA	LP FUEL GAS SKID BLOWDOWN VALVE SOLENOID AUTO RESET
13	MWP.MILN-DWG-Q-0011.01	POWER GEN FG	A	TBA	SDV-5000	FC	50	700/750	TBA	TBA	TBA	TBA	LP FUEL GAS SKID INLET ISOLATION VALVE SOLENOID AUTO RESET
14	MWP.MILN-DWG-Q-0012.01	MICROTURBINES	A	TBA	SDV-5100	FC	50	700/750	TBA	TBA	TBA	TBA	MICROTURBINE FUEL GAS ISOLATION VALVE SOLENOID AUTO RESET

[illegible]

R:\AS101\APA-EAST COAST EXPANSION FEED AS101E\PD DWG\MWP.MILN-DWG-Q-0020.01.dwg User: J. Bullock Date: 30/04/2021 12:19:01 PM

T-1701
WATER STORAGE TANK
SIZE: HOLD 2
CAPACITY: 10,000L

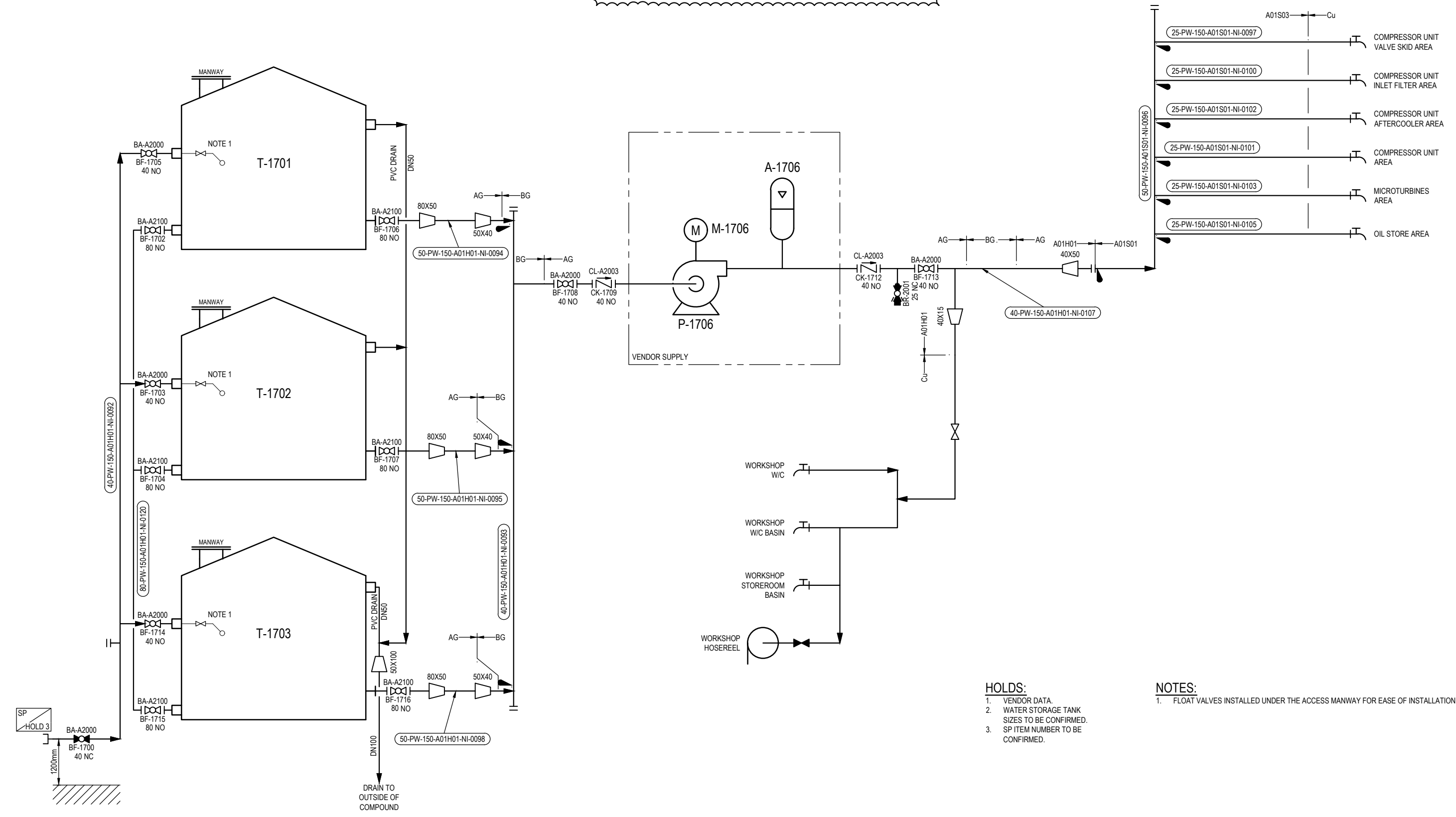
T-1702
WATER STORAGE TANK
SIZE: HOLD 2
CAPACITY: 10,000L
H2

T-1703
WATER STORAGE TANK
SIZE: HOLD 2
CAPACITY: 10,000L

A-1706
ACCUMULATOR
MODEL: HOLD 1
SIZE: HOLD 1

H1

P-1706
RAW WATER PUMP
MODEL: HOLD 1
SIZE: HOLD 1
FULL LOAD CURRENT: HOLD 1
FLOWRATE: HOLD 1



- HOLDS:**
- 1. VENDOR DATA.
 - 2. WATER STORAGE TANK SIZES TO BE CONFIRMED.
 - 3. SP ITEM NUMBER TO BE CONFIRMED.

- NOTES:**
- 1. FLOAT VALVES INSTALLED UNDER THE ACCESS MANWAY FOR EASE OF INSTALLATION.

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Appendix F **INDIVIDUAL ACTION SHEETS**

ACTION CLOSEOUT SHEET



Client: APA
Project Number: 21100
Project Name: East Coast Grid Expansion - MW880 Milne CS HAZOP

Action No.

Node: 1
Drawings: MSE.MILN-DWG-Q-3120; MWP.MILN-DWG-Q-0003; MWP.MILN-DWG-Q-0004; MWP.MILN-DWG-Q-0005; MWP.MILN-DWG-Q-0006; MWP.MILN-DWG-Q-0007.
Guideword: High Flow/High Level

Cause/Issue:
Failure of Compressor control FIC-1201.

Consequence:
High gas velocity.
Equipment damage.
(Thermowells TW-2200A/B, TW-2203A/B/C, Potential damage to suction cyclone F-210, Temporary strainer SP-03).
Potential damage to small branch connections.

Safeguard:
Use of twisted square thermowells which are less sensitive to vortex induced vibration.
PDAHH-2202 and PDAHH-2100 across temporary strainer and suction scrubber (PD is proportional to velocity).
Small branch connection, thermowells and suction piping velocity limits compliant with APA piping velocity guidelines.

Action:
Consider to establish High flow alarm on FIT-1201.

Responsibility
John Etubus

Closeout Response (Attach all relevant supporting documentation.)

Signoff

	Actionee	Discipline Approval	Project Approval
Signature:	<hr/>	<hr/>	<hr/>
Name:	John Etubus	<hr/>	<hr/>
Title	Momentum Engineering - Process	<hr/>	<hr/>
Date:	<hr/>	<hr/>	<hr/>

ACTION CLOSEOUT SHEET



Client: APA
Project Number: 21100
Project Name: East Coast Grid Expansion - MW880 Milne CS HAZOP

Action No.

Node: 1
Drawings: MSE.MILN-DWG-Q-3120; MWP.MILN-DWG-Q-0003; MWP.MILN-DWG-Q-0004; MWP.MILN-DWG-Q-0005; MWP.MILN-DWG-Q-0006; MWP.MILN-DWG-Q-0007.
Guideword: High Flow/High Level

Cause/Issue:
Failure of Compressor control FIC-1201.

Consequence:
High gas velocity.
Equipment damage.
(Thermowells TW-2200A/B, TW-2203A/B/C, Potential damage to suction cyclone F-210, Temporary strainer SP-03).
Potential damage to small branch connections.

Safeguard:
Use of twisted square thermowells which are less sensitive to vortex induced vibration.
PDAHH-2202 and PDAHH-2100 across temporary strainer and suction scrubber (PD is proportional to velocity).
Small branch connection, thermowells and suction piping velocity limits compliant with APA piping velocity guidelines.

Action:
Compressor line sizing to consider high flow rates resulting from FIC control failure and start up condition.

Responsibility
John Etubus

Closeout Response (Attach all relevant supporting documentation.)

Signoff

	Actionee	Discipline Approval	Project Approval
Signature:	<hr/>	<hr/>	<hr/>
Name:	John Etubus	<hr/>	<hr/>
Title	Momentum Engineering - Process	<hr/>	<hr/>
Date:	<hr/>	<hr/>	<hr/>

ACTION CLOSEOUT SHEET



Client: APA
Project Number: 21100
Project Name: East Coast Grid Expansion - MW880 Milne CS HAZOP

Action No.

Node: 1
Drawings: MSE.MILN-DWG-Q-3120; MWP.MILN-DWG-Q-0003; MWP.MILN-DWG-Q-0004; MWP.MILN;-DWG-Q-0005; MWP.MILN-DWG-Q-0006; MWP.MILN-DWG-Q-0007.
Guideword: High Flow/High Level

Cause/Issue:
Low suction pressure causing high velocity.

Consequence:
SAME AS NODE N-1-1-1 but for a short duration.

Safeguard:
SAME AS NODE N-1-1-1

Action:
Clamp on FIC-1201 to limit flow depending on process condition.

Responsibility
John Etubus

Closeout Response (Attach all relevant supporting documentation.)

Signoff

	Actionee	Discipline Approval	Project Approval
Signature:	<hr/>	<hr/>	<hr/>
Name:	John Etubus	<hr/>	<hr/>
Title	Momentum Engineering - Process	<hr/>	<hr/>
Date:	<hr/>	<hr/>	<hr/>

ACTION CLOSEOUT SHEET



Client: APA
Project Number: 21100
Project Name: East Coast Grid Expansion - MW880 Milne CS HAZOP

Action No.

Node: 1
Drawings: MSE.MILN-DWG-Q-3120; MWP.MILN-DWG-Q-0003; MWP.MILN-DWG-Q-0004; MWP.MILN; -DWG-Q-0005; MWP.MILN-DWG-Q-0006; MWP.MILN-DWG-Q-0007.
Guideword: High Flow/High Level

Cause/Issue:
Filter drain valve BF-2180 and PL-2182 left open (PID-0006 G8).

Consequence:
NONE

Safeguard:
NONE

Action:
Provide lockable tags on BF-2180 and PL-2182.
RO to be installed in the drain downstream of PL-2182.

Responsibility
John Etubus

Closeout Response (Attach all relevant supporting documentation.)

Signoff

	Actionee	Discipline Approval	Project Approval
Signature:	<hr/>	<hr/>	<hr/>
Name:	John Etubus	<hr/>	<hr/>
Title	Momentum Engineering - Process	<hr/>	<hr/>
Date:	<hr/>	<hr/>	<hr/>

ACTION CLOSEOUT SHEET



Client: APA
Project Number: 21100
Project Name: East Coast Grid Expansion - MW880 Milne CS HAZOP

Action No.

Node: 1
Drawings: MSE.MILN-DWG-Q-3120; MWP.MILN-DWG-Q-0003; MWP.MILN-DWG-Q-0004; MWP.MILN; -DWG-Q-0005; MWP.MILN-DWG-Q-0006; MWP.MILN-DWG-Q-0007.
Guideword: High Flow/High Level

Cause/Issue:
Rupture up to the compressor C-220.

Consequence:
Potential equipment damage and potential for escalation of the emergency event with gas inventory from the suction pipeline.

Safeguard:
PALL-2200

Action:
Consider additional safeguards e.g. Closing the unit isolation valve SDV-2000 and / or station isolation valve SDV-1001.

Responsibility
John Etubus

Closeout Response (Attach all relevant supporting documentation.)

Signoff

	Actionee	Discipline Approval	Project Approval
Signature:	<hr/>	<hr/>	<hr/>
Name:	John Etubus	<hr/>	<hr/>
Title	Momentum Engineering - Process	<hr/>	<hr/>
Date:	<hr/>	<hr/>	<hr/>

ACTION CLOSEOUT SHEET



Client: APA
Project Number: 21100
Project Name: East Coast Grid Expansion - MW880 Milne CS HAZOP

Action No.

Node: 1
Drawings: MSE.MILN-DWG-Q-3120; MWP.MILN-DWG-Q-0003; MWP.MILN-DWG-Q-0004; MWP.MILN; -DWG-Q-0005; MWP.MILN-DWG-Q-0006; MWP.MILN-DWG-Q-0007.
Guideword: Low Flow/Low Level

Cause/Issue:
Misalignment of valves (valves partially closed).

Consequence:
Restriction of supply to compressor.

Safeguard:
NONE

Action:
Station ready (XA-7083) to include correct alignment of actuated valves.

Responsibility
Micheal Palmisano

Closeout Response (Attach all relevant supporting documentation.)

Signoff

	Actionee	Discipline Approval	Project Approval
Signature:	<hr/>	<hr/>	<hr/>
Name:	Micheal Palmisano	<hr/>	<hr/>
Title	Momentum Engineering E&I	<hr/>	<hr/>
Date:	<hr/>	<hr/>	<hr/>

ACTION CLOSEOUT SHEET



Client: APA
Project Number: 21100
Project Name: East Coast Grid Expansion - MW880 Milne CS HAZOP

Action No.

Node: 1
Drawings: MSE.MILN-DWG-Q-3120; MWP.MILN-DWG-Q-0003; MWP.MILN-DWG-Q-0004; MWP.MILN;-DWG-Q-0005; MWP.MILN-DWG-Q-0006; MWP.MILN-DWG-Q-0007.
Guideword: High Pressure

Cause/Issue:
High pressure due to fire on F-2100.

Consequence:
Damage to the vessel and potential vessel rupture.

Safeguard:
PSV-2100

Action:
Project team to consider how AS 1210 section 8 applies to F-2100 and PSV-2100.

Responsibility
Caroline Button / Radu Fagarasan

Closeout Response (Attach all relevant supporting documentation.)

Signoff

	Actionee	Discipline Approval	Project Approval
Signature:	<hr/>	<hr/>	<hr/>
Name:	Caroline Button / Radu Fagarasan <hr/>	<hr/>	<hr/>
Title	APA -Team Lead Process & Pipeline Engineering / APA - Principal Mechanical Engineer <hr/>	<hr/>	<hr/>
Date:	<hr/>	<hr/>	<hr/>

ACTION CLOSEOUT SHEET



Client: APA
Project Number: 21100
Project Name: East Coast Grid Expansion - MW880 Milne CS HAZOP

Action No.

Node: 1
Drawings: MSE.MILN-DWG-Q-3120; MWP.MILN-DWG-Q-0003; MWP.MILN-DWG-Q-0004; MWP.MILN; -DWG-Q-0005; MWP.MILN-DWG-Q-0006; MWP.MILN-DWG-Q-0007.
Guideword: High Pressure

Cause/Issue:
High pressure due to fire on F-2100.

Consequence:
Damage to the vessel and potential vessel rupture.

Safeguard:
PSV-2100

Action:
A spare PSV to be supplied for quick replacement when PSV-2100 needs to be serviced.

Responsibility
Sohail Hameed

Closeout Response (Attach all relevant supporting documentation.)

Signoff

	Actionee	Discipline Approval	Project Approval
Signature:	<hr/>	<hr/>	<hr/>
Name:	Sohail Hameed	<hr/>	<hr/>
Title	Senior E&IC Engineer	<hr/>	<hr/>
Date:	<hr/>	<hr/>	<hr/>

ACTION CLOSEOUT SHEET



Client: APA
Project Number: 21100
Project Name: East Coast Grid Expansion - MW880 Milne CS HAZOP

Action No.

Node: 1
Drawings: MSE.MILN-DWG-Q-3120; MWP.MILN-DWG-Q-0003; MWP.MILN-DWG-Q-0004; MWP.MILN-DWG-Q-0005; MWP.MILN-DWG-Q-0006; MWP.MILN-DWG-Q-0007.
Guideword: High Temperature

Cause/Issue:
After cooler EA-2401 failure (fans not operating) and high recycle rates into the suction line from the fast stop line.

Consequence:
High suction temperatures leading to high thermal stress and potential flange leakage.

Safeguard:
Low select coming from TIC-2003.
TAHH-2004 will trip compressor and recycle.
Hot gas from fast stop line mixing with cooler gas from anti surge line.

Action:
Consider additional methods of protection for suction piping from high temperature coming from the fast stop line (e.g. the fast stop line downstream of the unit valve skid should be converted to piping spec A15C04 all the way to the compressor suction nozzle).

Responsibility

Closeout Response (Attach all relevant supporting documentation.)

Signoff

	Actionee	Discipline Approval	Project Approval
Signature:	<input type="text"/>	<input type="text"/>	<input type="text"/>
Name:	John Etubus	<input type="text"/>	<input type="text"/>
Title	Momentum Engineering - Process	<input type="text"/>	<input type="text"/>
Date:	<input type="text"/>	<input type="text"/>	<input type="text"/>

ACTION CLOSEOUT SHEET



Client: APA
Project Number: 21100
Project Name: East Coast Grid Expansion - MW880 Milne CS HAZOP

Action No.

Node: 1
Drawings: MSE.MILN-DWG-Q-3120; MWP.MILN-DWG-Q-0003; MWP.MILN-DWG-Q-0004; MWP.MILN;-DWG-Q-0005; MWP.MILN-DWG-Q-0006; MWP.MILN-DWG-Q-0007.
Guideword: High Temperature

Cause/Issue:
Hot fast stop recycle line fail open.

Consequence:
AS ABOVE

Safeguard:
NONE

Action:
Implement compressor unit trip on high suction temperature (e.g. TIT-2200B) set a piping design limit.

Responsibility
John Etubus

Closeout Response (Attach all relevant supporting documentation.)

Signoff

	Actionee	Discipline Approval	Project Approval
Signature:	<hr/>	<hr/>	<hr/>
Name:	John Etubus	<hr/>	<hr/>
Title	Momentum Engineering - Process	<hr/>	<hr/>
Date:	<hr/>	<hr/>	<hr/>

ACTION CLOSEOUT SHEET



Client: APA
Project Number: 21100
Project Name: East Coast Grid Expansion - MW880 Milne CS HAZOP

Action No.

Node: 1
Drawings: MSE.MILN-DWG-Q-3120; MWP.MILN-DWG-Q-0003; MWP.MILN-DWG-Q-0004; MWP.MILN;-DWG-Q-0005; MWP.MILN-DWG-Q-0006; MWP.MILN-DWG-Q-0007.
Guideword: General

Cause/Issue:

incorrect symbols on PID regarding solenoid valve or limit switches on actuated valves (solenoids missing or shown in incorrect position).

Consequence:

Confusion in operation.

Safeguard:

NONE

Action:

Show the correct symbols and functionality for the actuated valves in accordance with APA standard 530-SP-P-0037.

Responsibility

John Etubus / Michael Palmisano

Closeout Response (Attach all relevant supporting documentation.)

Signoff

	Actionee	Discipline Approval	Project Approval
Signature:	<hr/>	<hr/>	<hr/>
Name:	John Etubus / Michael Palmisano <hr/>	<hr/>	<hr/>
Title	Momentum Engineering - Process / Momentum Engineering E&I <hr/>	<hr/>	<hr/>
Date:	<hr/>	<hr/>	<hr/>

ACTION CLOSEOUT SHEET



Client: APA
Project Number: 21100
Project Name: East Coast Grid Expansion - MW880 Milne CS HAZOP

Action No.

Node: 1
Drawings: MSE.MILN-DWG-Q-3120; MWP.MILN-DWG-Q-0003; MWP.MILN-DWG-Q-0004; MWP.MILN;-DWG-Q-0005; MWP.MILN-DWG-Q-0006; MWP.MILN-DWG-Q-0007.
Guideword: General

Cause/Issue:
Incorrect symbols on PID-MW43-0120 regarding the Valve DIB-0001 regarding body bleed.

Consequence:
Incorrect depiction of the valve.
Confusion in operation.

Safeguard:
NONE

Action:
Show the correct symbols and functionality for DIB-0001.

Responsibility
John Etubus

Closeout Response (Attach all relevant supporting documentation.)

Signoff

	Actionee	Discipline Approval	Project Approval
Signature:	<hr/>	<hr/>	<hr/>
Name:	John Etubus	<hr/>	<hr/>
Title	Momentum Engineering - Process	<hr/>	<hr/>
Date:	<hr/>	<hr/>	<hr/>

ACTION CLOSEOUT SHEET



Client: APA
Project Number: 21100
Project Name: East Coast Grid Expansion - MW880 Milne CS HAZOP

Action No.

Node: 1
Drawings: MSE.MILN-DWG-Q-3120; MWP.MILN-DWG-Q-0003; MWP.MILN-DWG-Q-0004; MWP.MILN;-DWG-Q-0005; MWP.MILN-DWG-Q-0006; MWP.MILN-DWG-Q-0007.
Guideword: General

Cause/Issue:
Transitions for underground to aboveground missing on PID-MW43-0120.

Consequence:
Incorrect depiction of equipment.
Confusion in operation.

Safeguard:
NONE

Action:
Show the correct Transitions for underground to aboveground on PID-MW43-0120.

Responsibility
John Etubus / Christopher Daines / Sohail Hameed

Closeout Response (Attach all relevant supporting documentation.)

Signoff

	Actionee	Discipline Approval	Project Approval
Signature:	<hr/>	<hr/>	<hr/>
Name:	John Etubus / Christopher Daines / Sohail Hameed	<hr/>	<hr/>
Title	Momentum Engineering - Process / Momentum Engineering Mechanical / APA - Senior E&IC Engineer	<hr/>	<hr/>
Date:	<hr/>	<hr/>	<hr/>

ACTION CLOSEOUT SHEET



Client: APA
Project Number: 21100
Project Name: East Coast Grid Expansion - MW880 Milne CS HAZOP

Action No.

Node: 1
Drawings: MSE.MILN-DWG-Q-3120; MWP.MILN-DWG-Q-0003; MWP.MILN-DWG-Q-0004; MWP.MILN;-DWG-Q-0005; MWP.MILN-DWG-Q-0006; MWP.MILN-DWG-Q-0007.
Guideword: General

Cause/Issue:
Transitions for underground to aboveground missing on PID-MW43-0120.

Consequence:
Incorrect depiction of equipment.
Confusion in operation.

Safeguard:
NONE

Action:
APA to provide correct hot taping details for similar installation to MTM.

Responsibility
Mudassar Chughtai

Closeout Response (Attach all relevant supporting documentation.)

Signoff

	Actionee	Discipline Approval	Project Approval
Signature:	<hr/>	<hr/>	<hr/>
Name:	Mudassar Chughtai	<hr/>	<hr/>
Title	APA-Senior Mechanical Engineer	<hr/>	<hr/>
Date:	<hr/>	<hr/>	<hr/>

ACTION CLOSEOUT SHEET



Client: APA
Project Number: 21100
Project Name: East Coast Grid Expansion - MW880 Milne CS HAZOP

Action No.

Node: 1
Drawings: MSE.MILN-DWG-Q-3120; MWP.MILN-DWG-Q-0003; MWP.MILN-DWG-Q-0004; MWP.MILN;-DWG-Q-0005; MWP.MILN-DWG-Q-0006; MWP.MILN-DWG-Q-0007.
Guideword: General

Cause/Issue:
CP protection and insulation not properly shown on PID-MW43-0120 in regards to all the above ground to below ground transitions.

Consequence:
Incorrect depiction of equipment.
Confusion in operation.

Safeguard:
NONE

Action:
Provide appropriate CP protection and insulation on PID-MW43-0120 in regards to all the above ground to below ground transitions (consider the use of FIK instead of MIJs).

Responsibility
Michael Palmisano / John Etubus

Closeout Response (Attach all relevant supporting documentation.)

Signoff

	Actionee	Discipline Approval	Project Approval
Signature:	<hr/>	<hr/>	<hr/>
Name:	Michael Palmisano / John Etubus	<hr/>	<hr/>
Title	Momentum Engineering - E&I / Momentum Engineering - Process	<hr/>	<hr/>
Date:	<hr/>	<hr/>	<hr/>

ACTION CLOSEOUT SHEET



Client: APA
Project Number: 21100
Project Name: East Coast Grid Expansion - MW880 Milne CS HAZOP

Action No.

Node: 1
Drawings: MSE.MILN-DWG-Q-3120; MWP.MILN-DWG-Q-0003; MWP.MILN-DWG-Q-0004; MWP.MILN;-DWG-Q-0005; MWP.MILN-DWG-Q-0006; MWP.MILN-DWG-Q-0007.
Guideword: General

Cause/Issue:
Incorrect depiction of the manual load bypass (BF-0002 and RO-0002).

Consequence:
Incorrect depiction of equipment.
Confusion in operation.

Safeguard:
NONE

Action:
Relocate bypass from pig trap to just around DIB-0001 (local to the DIB).

Responsibility
John Etubus

Closeout Response (Attach all relevant supporting documentation.)

Signoff

	Actionee	Discipline Approval	Project Approval
Signature:	<hr/>	<hr/>	<hr/>
Name:	John Etubus	<hr/>	<hr/>
Title	Momentum Engineering - Process	<hr/>	<hr/>
Date:	<hr/>	<hr/>	<hr/>

ACTION CLOSEOUT SHEET



Client: APA
Project Number: 21100
Project Name: East Coast Grid Expansion - MW880 Milne CS HAZOP

Action No.

Node: 1
Drawings: MSE.MILN-DWG-Q-3120; MWP.MILN-DWG-Q-0003; MWP.MILN-DWG-Q-0004; MWP.MILN; -DWG-Q-0005; MWP.MILN-DWG-Q-0006; MWP.MILN-DWG-Q-0007.
Guideword: General

Cause/Issue:
Inability for the operator to read the station pressure.

Consequence:
Incorrect operation of the station.

Safeguard:
NONE

Action:
Add pressure indicator downstream of DIB-0001 close to DIB-0001.

Responsibility
John Etubus

Closeout Response (Attach all relevant supporting documentation.)

Signoff

	Actionee	Discipline Approval	Project Approval
Signature:	<hr/>	<hr/>	<hr/>
Name:	John Etubus	<hr/>	<hr/>
Title	Momentum Engineering - Process	<hr/>	<hr/>
Date:	<hr/>	<hr/>	<hr/>

ACTION CLOSEOUT SHEET



Client: APA
Project Number: 21100
Project Name: East Coast Grid Expansion - MW880 Milne CS HAZOP

Action No.

Node: 1
Drawings: MSE.MILN-DWG-Q-3120; MWP.MILN-DWG-Q-0003; MWP.MILN-DWG-Q-0004; MWP.MILN;-DWG-Q-0005; MWP.MILN-DWG-Q-0006; MWP.MILN-DWG-Q-0007.
Guideword: General

Cause/Issue:
Added simplicity.

Consequence:
Potential failure of limit switches.

Safeguard:
NONE

Action:
Remove position switches DIB-0001 and provide lockable tabs (valve is locked open).

Responsibility
John Etubus

Closeout Response (Attach all relevant supporting documentation.)

Signoff

	Actionee	Discipline Approval	Project Approval
Signature:	<hr/>	<hr/>	<hr/>
Name:	John Etubus	<hr/>	<hr/>
Title	Momentum Engineering - Process	<hr/>	<hr/>
Date:	<hr/>	<hr/>	<hr/>

ACTION CLOSEOUT SHEET



Client: APA
Project Number: 21100
Project Name: East Coast Grid Expansion - MW880 Milne CS HAZOP

Action No.

Node: 2
Drawings: MWP.MILN-DWG-Q-0007.
Guideword: High Flow/High Level

Cause/Issue:
Failure of Compressor control FIC-1201.

Consequence:
High gas velocity.
Equipment damage.
(Thermowells TW-2302A/B/C/D, TW-2300B, TW-2301).
Potential damage to small branch connections.

Safeguard:
Use of twisted square thermowells which are less sensitive to vortex induced vibration.
PDAHH-2202 and PDAHH-2100 across temporary strainer and suction scrubber (PD is proportional to velocity).
Small branch connection, thermowells and suction piping velocity limits compliant with APA piping velocity guidelines.

Action:
After cooler scope of work to address potential vibration issues in the tubing rigidity of the after cooler frame and the air plenum.

Responsibility

Closeout Response (Attach all relevant supporting documentation.)

Signoff

	Actionee	Discipline Approval	Project Approval
Signature:	<hr/>	<hr/>	<hr/>
Name:	Christopher Daines <hr/>	<hr/>	<hr/>
Title	Momentum Engineering Mechanical <hr/>	<hr/>	<hr/>
Date:	<hr/>	<hr/>	<hr/>

ACTION CLOSEOUT SHEET



Client: APA
Project Number: 21100
Project Name: East Coast Grid Expansion - MW880 Milne CS HAZOP

Action No.

Node: 2
Drawings: MWP.MILN-DWG-Q-0007.
Guideword: High Flow/High Level

Cause/Issue:
Rupture downstream of the compressor C-220.

Consequence:
Potential equipment damage and potential for escalation of the emergency event with gas inventory from the suction pipeline.

Safeguard:
NONE

Action:
Design team should locate pressure sensing points on the pipeline downstream of the compressor and ensure appropriate action is taken by the IOC (because this is what is assumed is done at other stations).

Responsibility
Rupert Greenwood

Closeout Response (Attach all relevant supporting documentation.)

Signoff

	Actionee	Discipline Approval	Project Approval
Signature:	<hr/>	<hr/>	<hr/>
Name:	Rupert Greenwood <hr/>	<hr/>	<hr/>
Title	APA-Process Engineer <hr/>	<hr/>	<hr/>
Date:	<hr/>	<hr/>	<hr/>

ACTION CLOSEOUT SHEET



Client: APA
Project Number: 21100
Project Name: East Coast Grid Expansion - MW880 Milne CS HAZOP

Action No.

Node: 2
Drawings: MWP.MILN-DWG-Q-0007.
Guideword: Low Flow/Low Level

Cause/Issue:
Fast stop valve FSV-2386 fail open.

Consequence:
Restriction of supply to consumers.

Safeguard:

Action:
Provide position discrepancy alarm ZS-2386 / FSV-2386.

Responsibility

Closeout Response (Attach all relevant supporting documentation.)

Signoff

	Actionee	Discipline Approval	Project Approval
Signature:	<input type="text"/>	<input type="text"/>	<input type="text"/>
Name:	Micheal Palmisano	<input type="text"/>	<input type="text"/>
Title	Momentum Engineering E&I	<input type="text"/>	<input type="text"/>
Date:	<input type="text"/>	<input type="text"/>	<input type="text"/>

ACTION CLOSEOUT SHEET



Client: APA
Project Number: 21100
Project Name: East Coast Grid Expansion - MW880 Milne CS HAZOP

Action No.

Node: 2
Drawings: MWP.MILN-DWG-Q-0007.
Guideword: Reverse Flow

Cause/Issue:
Check valve CK-2300 inadequate for low flow scenario.

Consequence:
Valve chattering.

Safeguard:
NONE

Action:
Valve datasheet to specify minimum flow for operation.

Responsibility
Christopher Daines

Closeout Response (Attach all relevant supporting documentation.)

Signoff

	Actionee	Discipline Approval	Project Approval
Signature:	<hr/>	<hr/>	<hr/>
Name:	Christopher Daines <hr/>	<hr/>	<hr/>
Title	Momentum Engineering Mechanical <hr/>	<hr/>	<hr/>
Date:	<hr/>	<hr/>	<hr/>

ACTION CLOSEOUT SHEET



Client: APA
Project Number: 21100
Project Name: East Coast Grid Expansion - MW880 Milne CS HAZOP

Action No.

Node: 2
Drawings: MWP.MILN-DWG-Q-0007.
Guideword: High Pressure

Cause/Issue:
Failure of PIC-2002 (due to the failure of the over speed control).

Consequence:
Potential equipment failure, piping and pipeline failure.

Safeguard:
Pressure trip PAHH-2305, PAHH-2304 and PAHH-2310.

Action:
Set pressure set points, alarms and trips as per 530-GD-Q-0005.

Responsibility

Closeout Response (Attach all relevant supporting documentation.)

Signoff

	Actionee	Discipline Approval	Project Approval
Signature:	<input type="text"/>	<input type="text"/>	<input type="text"/>
Name:	<input type="text" value="John Etubus"/>	<input type="text"/>	<input type="text"/>
Title	<input type="text" value="Momentum Engineering - Process"/>	<input type="text"/>	<input type="text"/>
Date:	<input type="text"/>	<input type="text"/>	<input type="text"/>

ACTION CLOSEOUT SHEET



Client: APA
Project Number: 21100
Project Name: East Coast Grid Expansion - MW880 Milne CS HAZOP

Action No.

Node: 2
Drawings: MWP.MILN-DWG-Q-0007.
Guideword: High Temperature

Cause/Issue:
Failure of EA-2401 fans.

Consequence:
Potential for differential temperature on each cooler bay leading to thermal stresses in the piping.

Safeguard:
NONE

Action:
Pipe stress analysis to consider this failure case as part of the analysis during detailed design.

Responsibility
Christopher Daines

Closeout Response (Attach all relevant supporting documentation.)

Signoff

	Actionee	Discipline Approval	Project Approval
Signature:	<hr/>	<hr/>	<hr/>
Name:	Christopher Daines <hr/>	<hr/>	<hr/>
Title	Momentum Engineering Mechanical <hr/>	<hr/>	<hr/>
Date:	<hr/>	<hr/>	<hr/>

ACTION CLOSEOUT SHEET



Client: APA
Project Number: 21100
Project Name: East Coast Grid Expansion - MW880 Milne CS HAZOP

Action No.

Node: 3
Drawings: MWP.MILN-DWG-Q-0007; MWP.MILN-DWG-Q-0005; MWP.MILN-DWG-Q-0004; MWP.MILN-DWG-Q-0003; MSE.MILN-DWG-Q-3120.
Guideword: High Flow/High Level

Cause/Issue:

Failure of the FIC-1201.

Consequence:

Damage to equipment FE-1201.

Safeguard:

FAH-1201.
Refer Action 1 in NODE 1 (reference high flow alarm).

Action:

Consider removing trip FAHH-1201 and consider implementing RO flow meter instead of flow nozzle, if RO is implemented, set tapping point for PIT-1201 on the piping will be required.

Responsibility

John Etubus

Closeout Response (Attach all relevant supporting documentation.)

Signoff

	Actionee	Discipline Approval	Project Approval
Signature:	<hr/>	<hr/>	<hr/>
Name:	John Etubus	<hr/>	<hr/>
Title	Momentum Engineering - Process	<hr/>	<hr/>
Date:	<hr/>	<hr/>	<hr/>

ACTION CLOSEOUT SHEET



Client: APA
Project Number: 21100
Project Name: East Coast Grid Expansion - MW880 Milne CS HAZOP

Action No.

Node: 3
Drawings: MWP.MILN-DWG-Q-0007; MWP.MILN-DWG-Q-0005; MWP.MILN-DWG-Q-0004; MWP.MILN-DWG-Q-0003; MSE.MILN-DWG-Q-3120.
Guideword: Low Flow/Low Level

Cause/Issue:
Anti surge valve ASV-2385 fail open.

Consequence:
Restriction of supply to consumers.

Safeguard:
ZT-2385

Action:
Provide position discrepancy alarm ZT-2385/FC-2385.

Responsibility
Micheal Palmisano

Closeout Response (Attach all relevant supporting documentation.)

Signoff

	Actionee	Discipline Approval	Project Approval
Signature:	<hr/>	<hr/>	<hr/>
Name:	Micheal Palmisano	<hr/>	<hr/>
Title	Momentum Engineering E&I	<hr/>	<hr/>
Date:	<hr/>	<hr/>	<hr/>

ACTION CLOSEOUT SHEET



Client: APA
Project Number: 21100
Project Name: East Coast Grid Expansion - MW880 Milne CS HAZOP

Action No.

Node: 3
Drawings: MWP.MILN-DWG-Q-0007; MWP.MILN-DWG-Q-0005; MWP.MILN-DWG-Q-0004; MWP.MILN-DWG-Q-0003; MSE.MILN-DWG-Q-3120.
Guideword: Reverse Flow

Cause/Issue:
Check valve CK-2011 inadequate for low flow scenario.

Consequence:
Valve chattering.

Safeguard:
NONE

Action:
Valve datasheet to specify minimum flow for operation.

Responsibility
Christopher Daines

Closeout Response (Attach all relevant supporting documentation.)

Signoff

	Actionee	Discipline Approval	Project Approval
Signature:	<hr/>	<hr/>	<hr/>
Name:	Christopher Daines <hr/>	<hr/>	<hr/>
Title	Momentum Engineering Mechanical <hr/>	<hr/>	<hr/>
Date:	<hr/>	<hr/>	<hr/>

ACTION CLOSEOUT SHEET



Client: APA
Project Number: 21100
Project Name: East Coast Grid Expansion - MW880 Milne CS HAZOP

Action No.

Node: 3
Drawings: MWP.MILN-DWG-Q-0007; MWP.MILN-DWG-Q-0005; MWP.MILN-DWG-Q-0004; MWP.MILN-DWG-Q-0003; MSE.MILN-DWG-Q-3120.
Guideword: High Temperature

Cause/Issue:
Failure of EA-2401 fans.

Consequence:
Exceeding of station piping / pipeline design envelope.

Safeguard:
TIC-2003 and TAH-2004 and TAHH-2004.

Action:
Consider implementing fan failure indication on SCADA.

Responsibility
Micheal Palmisano

Closeout Response (Attach all relevant supporting documentation.)

Signoff

	Actionee	Discipline Approval	Project Approval
Signature:	<hr/>	<hr/>	<hr/>
Name:	Micheal Palmisano	<hr/>	<hr/>
Title	Momentum Engineering E&I	<hr/>	<hr/>
Date:	<hr/>	<hr/>	<hr/>

ACTION CLOSEOUT SHEET



Client: APA
Project Number: 21100
Project Name: East Coast Grid Expansion - MW880 Milne CS HAZOP

Action No.

Node: 3
Drawings: MWP.MILN-DWG-Q-0007; MWP.MILN-DWG-Q-0005; MWP.MILN-DWG-Q-0004; MWP.MILN-DWG-Q-0003; MSE.MILN-DWG-Q-3120.
Guideword: Low Temperature

Cause/Issue:

Cold ambient temperature with low compression head and cooler fans operating continuously leading to gas temperatures below pipeline MDMT.

Consequence:

Exceeding the pipeline MDMT and potential for brittle failure.

Safeguard:

NONE

Action:

Process to provide calculation with variables in the cause considered to establish a minimum gas temperature for this operational scenario.
If calculation proves there is a problem, Establish low temperature alarm on either TIT-2003 or TIT-2004 and / or appropriate operator or control system response.

Responsibility

John Etubus

Closeout Response (Attach all relevant supporting documentation.)

Signoff

	Actionee	Discipline Approval	Project Approval
Signature:	<hr/>	<hr/>	<hr/>
Name:	John Etubus	<hr/>	<hr/>
Title	Momentum Engineering - Process	<hr/>	<hr/>
Date:	<hr/>	<hr/>	<hr/>

ACTION CLOSEOUT SHEET



Client: APA
Project Number: 21100
Project Name: East Coast Grid Expansion - MW880 Milne CS HAZOP

Action No.

Node: 3
Drawings: MWP.MILN-DWG-Q-0007; MWP.MILN-DWG-Q-0005; MWP.MILN-DWG-Q-0004; MWP.MILN-DWG-Q-0003; MSE.MILN-DWG-Q-3120.
Guideword: Plant Items Operable/Maintainable

Cause/Issue:
Inconsistencies of symbology in PIDs.

Consequence:
Potential to implement permissive incorrectly.

Safeguard:
NONE

Action:
Rename PDALL-2030 to PDAH-2030.

Responsibility
John Etubus

Closeout Response (Attach all relevant supporting documentation.)

Signoff

	Actionee	Discipline Approval	Project Approval
Signature:	<hr/>	<hr/>	<hr/>
Name:	John Etubus	<hr/>	<hr/>
Title	Momentum Engineering - Process	<hr/>	<hr/>
Date:	<hr/>	<hr/>	<hr/>

ACTION CLOSEOUT SHEET



Client: APA
Project Number: 21100
Project Name: East Coast Grid Expansion - MW880 Milne CS HAZOP

Action No.

Node: 3
Drawings: MWP.MILN-DWG-Q-0007; MWP.MILN-DWG-Q-0005; MWP.MILN-DWG-Q-0004; MWP.MILN-DWG-Q-0003; MSE.MILN-DWG-Q-3120.
Guideword: General

Cause/Issue:
BF-1100 on PID-Q-0003 on station bypass is shown normally closed.

Consequence:
Inability to free flow into the pipeline in case the compressor station trips.

Safeguard:
NONE

Action:
Show BF-1100 on PID-Q-0003 normally open.

Responsibility
John Etubus

Closeout Response (Attach all relevant supporting documentation.)

Signoff

	Actionee	Discipline Approval	Project Approval
Signature:	<hr/>	<hr/>	<hr/>
Name:	John Etubus	<hr/>	<hr/>
Title	Momentum Engineering - Process	<hr/>	<hr/>
Date:	<hr/>	<hr/>	<hr/>

ACTION CLOSEOUT SHEET



Client: APA
Project Number: 21100
Project Name: East Coast Grid Expansion - MW880 Milne CS HAZOP

Action No.

Node: 3
Drawings: MWP.MILN-DWG-Q-0007; MWP.MILN-DWG-Q-0005; MWP.MILN-DWG-Q-0004; MWP.MILN-DWG-Q-0003; MSE.MILN-DWG-Q-3120.
Guideword: General

Cause/Issue:

Added simplicity.

Consequence:

Potential failure of limit switches.

Safeguard:

NONE

Action:

Remove position switches DIB-0004 and provide lockable tabs (valve is locked open).

Responsibility

John Etubus

Closeout Response (Attach all relevant supporting documentation.)

Signoff

	Actionee	Discipline Approval	Project Approval
Signature:	<hr/>	<hr/>	<hr/>
Name:	John Etubus	<hr/>	<hr/>
Title	Momentum Engineering - Process	<hr/>	<hr/>
Date:	<hr/>	<hr/>	<hr/>

ACTION CLOSEOUT SHEET



Client: APA
Project Number: 21100
Project Name: East Coast Grid Expansion - MW880 Milne CS HAZOP

Action No.

Node: 3
Drawings: MWP.MILN-DWG-Q-0007; MWP.MILN-DWG-Q-0005; MWP.MILN-DWG-Q-0004; MWP.MILN-DWG-Q-0003; MSE.MILN-DWG-Q-3120.
Guideword: General

Cause/Issue:
Incorrect discharge temperature set points shown on TIT-2004.

Consequence:
Potential failure of the coating in the pipeline.

Safeguard:
NONE

Action:
Show the correct discharge temperature set point for TIT-2004 aligned with a discharge temperature of maximum 45 degC discharge to the pipeline.

Responsibility
John Etubus

Closeout Response (Attach all relevant supporting documentation.)

Signoff

	Actionee	Discipline Approval	Project Approval
Signature:	<hr/>	<hr/>	<hr/>
Name:	John Etubus	<hr/>	<hr/>
Title	Momentum Engineering - Process	<hr/>	<hr/>
Date:	<hr/>	<hr/>	<hr/>

ACTION CLOSEOUT SHEET



Client: APA
Project Number: 21100
Project Name: East Coast Grid Expansion - MW880 Milne CS HAZOP

Action No.

Node: 3
Drawings: MWP.MILN-DWG-Q-0007; MWP.MILN-DWG-Q-0005; MWP.MILN-DWG-Q-0004; MWP.MILN-DWG-Q-0003; MSE.MILN-DWG-Q-3120.
Guideword: General

Cause/Issue:
Inability for the operator to read the station pressure.

Consequence:
Incorrect operation of the station.

Safeguard:
NONE

Action:
Add pressure indicator upstream of DIB-0004 close to DIB-0004.

Responsibility
John Etubus

Closeout Response (Attach all relevant supporting documentation.)

Signoff

	Actionee	Discipline Approval	Project Approval
Signature:	<hr/>	<hr/>	<hr/>
Name:	John Etubus	<hr/>	<hr/>
Title	Momentum Engineering - Process	<hr/>	<hr/>
Date:	<hr/>	<hr/>	<hr/>

ACTION CLOSEOUT SHEET



Client: APA
Project Number: 21100
Project Name: East Coast Grid Expansion - MW880 Milne CS HAZOP

Action No.

Node: 3
Drawings: MWP.MILN-DWG-Q-0007; MWP.MILN-DWG-Q-0005; MWP.MILN-DWG-Q-0004; MWP.MILN-DWG-Q-0003; MSE.MILN-DWG-Q-3120.
Guideword: General

Cause/Issue:
Note 5 incorrectly attached to BF-1015 position switches.

Consequence:
Incorrect depiction of the station equipment.

Safeguard:
NONE

Action:
Remove note 5 attached to BF-1015 position switches.

Responsibility
John Etubus

Closeout Response (Attach all relevant supporting documentation.)

Signoff

	Actionee	Discipline Approval	Project Approval
Signature:	<hr/>	<hr/>	<hr/>
Name:	John Etubus	<hr/>	<hr/>
Title	Momentum Engineering - Process	<hr/>	<hr/>
Date:	<hr/>	<hr/>	<hr/>

ACTION CLOSEOUT SHEET



Client: APA
Project Number: 21100
Project Name: East Coast Grid Expansion - MW880 Milne CS HAZOP

Action No.

Node: 3
Drawings: MWP.MILN-DWG-Q-0007; MWP.MILN-DWG-Q-0005; MWP.MILN-DWG-Q-0004; MWP.MILN-DWG-Q-0003; MSE.MILN-DWG-Q-3120.
Guideword: General

Cause/Issue:
BF-1015 showing normally open position.

Consequence:
Incorrect depiction of the station equipment.

Safeguard:
NONE

Action:
Show BF-1015 in locked closed position and show LC on the PID and provide locking tabs on the valve.

Responsibility
John Etubus

Closeout Response (Attach all relevant supporting documentation.)

Signoff

	Actionee	Discipline Approval	Project Approval
Signature:	<hr/>	<hr/>	<hr/>
Name:	John Etubus	<hr/>	<hr/>
Title	Momentum Engineering - Process	<hr/>	<hr/>
Date:	<hr/>	<hr/>	<hr/>

ACTION CLOSEOUT SHEET



Client: APA
Project Number: 21100
Project Name: East Coast Grid Expansion - MW880 Milne CS HAZOP

Action No.

Node: 4
Drawings: MWP.MILN-DWG-Q-0007; MWP.MILN-DWG-Q-0005; MWP.MILN-DWG-Q-0006.
Guideword: High Flow/High Level

Cause/Issue:
Anti surge valve ASV-2385 fail open.

Consequence:
Restriction of supply to consumers.
Velocity exceeding design limits.

Safeguard:
ZT-2385 and refer action 26 Node 3 (ref discrepancy alarm).

Action:
During detailed design when Solar information regarding ASV is available check velocity limits / FIT vibration in the piping against APA guidelines.

Responsibility

Closeout Response (Attach all relevant supporting documentation.)

Signoff

	Actionee	Discipline Approval	Project Approval
Signature:	<input type="text"/>	<input type="text"/>	<input type="text"/>
Name:	<input type="text" value="John Etubus"/>	<input type="text"/>	<input type="text"/>
Title	<input type="text" value="Momentum Engineering - Process"/>	<input type="text"/>	<input type="text"/>
Date:	<input type="text"/>	<input type="text"/>	<input type="text"/>

ACTION CLOSEOUT SHEET



Client: APA
Project Number: 21100
Project Name: East Coast Grid Expansion - MW880 Milne CS HAZOP

Action No.

Node: 4
Drawings: MWP.MILN-DWG-Q-0007; MWP.MILN-DWG-Q-0005; MWP.MILN-DWG-Q-0006.
Guideword: High Flow/High Level

Cause/Issue:
Fast stop valve FSV-2386 fail open.

Consequence:
Restriction of supply to consumers.
Velocity exceeding design limits.

Safeguard:
ZT-2386 and refer action 26 Node 2 (ref discrepancy alarm).

Action:
During detailed design when Solar information regarding FSV is available check velocity limits / FIT vibration in the piping against APA guidelines.

Responsibility

Closeout Response (Attach all relevant supporting documentation.)

Signoff

	Actionee	Discipline Approval	Project Approval
Signature:	<input type="text"/>	<input type="text"/>	<input type="text"/>
Name:	<input type="text" value="John Etubus"/>	<input type="text"/>	<input type="text"/>
Title	<input type="text" value="Momentum Engineering - Process"/>	<input type="text"/>	<input type="text"/>
Date:	<input type="text"/>	<input type="text"/>	<input type="text"/>

ACTION CLOSEOUT SHEET



Client: APA
Project Number: 21100
Project Name: East Coast Grid Expansion - MW880 Milne CS HAZOP

Action No.

Node: 4
Drawings: MWP.MILN-DWG-Q-0007; MWP.MILN-DWG-Q-0005; MWP.MILN-DWG-Q-0006.
Guideword: Low Flow/Low Level

Cause/Issue:
Anti surge valve ASV-2385 fail to open to the required position by anti surge control system.

Consequence:
Potential for compressor surge and mechanical damage.

Safeguard:
Fast stop valve FSV-2386.

Action:
Confirm the Solar instrumentation logic trips the compressor C-2200 on surge detection.

Responsibility
Kevin Martin

Closeout Response (Attach all relevant supporting documentation.)

Signoff

	Actionee	Discipline Approval	Project Approval
Signature:	<hr/>	<hr/>	<hr/>
Name:	Kevin Martin	<hr/>	<hr/>
Title	APA-Senior Rotating Engineer	<hr/>	<hr/>
Date:	<hr/>	<hr/>	<hr/>

ACTION CLOSEOUT SHEET



Client: APA
Project Number: 21100
Project Name: East Coast Grid Expansion - MW880 Milne CS HAZOP

Action No.

Node: 4
Drawings: MWP.MILN-DWG-Q-0007; MWP.MILN-DWG-Q-0005; MWP.MILN-DWG-Q-0006.
Guideword: Testing Equipment/Product

Cause/Issue:
Anti surge or Fast stop valves jammed closed.

Consequence:
Surge and potential damage to compressor C-2200.

Safeguard:
Compressor start up and purging sequence checks of the anti surge valve / fast stop valve and permissive to operate (including checking ASV / FSV move off the seat).
Annual testing / maintenance by APA.

Action:
Project team to highlight this feature identified as a safeguard in the functional description.

Responsibility

Closeout Response (Attach all relevant supporting documentation.)

Signoff

	Actionee	Discipline Approval	Project Approval
Signature:	<input type="text"/>	<input type="text"/>	<input type="text"/>
Name:	Kevin Martin	<input type="text"/>	<input type="text"/>
Title	APA-Senior Rotating Engineer	<input type="text"/>	<input type="text"/>
Date:	<input type="text"/>	<input type="text"/>	<input type="text"/>

ACTION CLOSEOUT SHEET



Client: APA
Project Number: 21100
Project Name: East Coast Grid Expansion - MW880 Milne CS HAZOP

Action No.

Node: 4
Drawings: MWP.MILN-DWG-Q-0007; MWP.MILN-DWG-Q-0005; MWP.MILN-DWG-Q-0006.
Guideword: Plant Items Operable/Maintainable

Cause/Issue:
Hot recycle piping temperature exceeding 60degC.

Consequence:
Personnel injury due to hot recycle piping.

Safeguard:
NONE

Action:
Provide personnel protection insulation on hot recycle fast stop line al the way to the suction line.

Responsibility
John Etubus

Closeout Response (Attach all relevant supporting documentation.)

Signoff

	Actionee	Discipline Approval	Project Approval
Signature:	<hr/>	<hr/>	<hr/>
Name:	John Etubus	<hr/>	<hr/>
Title	Momentum Engineering - Process	<hr/>	<hr/>
Date:	<hr/>	<hr/>	<hr/>

ACTION CLOSEOUT SHEET



Client: APA
Project Number: 21100
Project Name: East Coast Grid Expansion - MW880 Milne CS HAZOP

Action No.

Node: 4
Drawings: MWP.MILN-DWG-Q-0007; MWP.MILN-DWG-Q-0005; MWP.MILN-DWG-Q-0006.
Guideword: Coating Degradation/Corrosion

Cause/Issue:
Inadequate painting spec for the high temperature piping A06C05 (up to the max piping operating temperature).

Consequence:
Potential for accelerated corrosion.

Safeguard:
NONE

Action:
Investigate whether APA has existing standard for high temperature piping to maximum operating temperature for the piping. Consider using system 5 in APA spec 530-SP-M-9602.

Responsibility
Mudassar Chughtai

Closeout Response (Attach all relevant supporting documentation.)

Signoff

	Actionee	Discipline Approval	Project Approval
Signature:	<hr/>	<hr/>	<hr/>
Name:	Mudassar Chughtai	<hr/>	<hr/>
Title	APA-Senior Mechanical Engineer	<hr/>	<hr/>
Date:	<hr/>	<hr/>	<hr/>

ACTION CLOSEOUT SHEET



Client: APA
Project Number: 21100
Project Name: East Coast Grid Expansion - MW880 Milne CS HAZOP

Action No.

Node: 4
Drawings: MWP.MILN-DWG-Q-0007; MWP.MILN-DWG-Q-0005; MWP.MILN-DWG-Q-0006.
Guideword: Control and Instrumentation Sufficient for Control/Too Many/Correct Location

Cause/Issue:
The current PIDs do not depict the APA standard for anti surge, fast stop valves and actuators.

Consequence:
Non-compliance to APA current standards.

Safeguard:
NONE

Action:
The anti surge and fast stop design to comply with the following standards bellow or seek deviation:
530-DWG-J-0059 Actuator Panel - Fail Close / Open Piping and Instrumentation Diagram;
530-DWG-J-0062 Actuator Panel - Quick Acting/Fast Stop Valve Piping & Instrumentation Diagram;
530-DWG-J-0061 Actuator Panel - Anti-Surge Valve Piping and Instrumentation Diagram;
530-DWG-J-0063 Actuator Panel - Shutdown & Blowdown Valve Piping and Instrumentation Diagram;
530-DWG-J-0060 Actuator Panel - Fail Last (with Storage) Piping and Instrumentation Diagram.

Responsibility
Sohail Hameed / John Etubus

Closeout Response (Attach all relevant supporting documentation.)

Signoff

	Actionee	Discipline Approval	Project Approval
Signature:	<hr/>	<hr/>	<hr/>
Name:	Sohail Hameed / John Etubus	<hr/>	<hr/>
Title	APA - Senior E&IC Engineer / Momentum Engineering - Process	<hr/>	<hr/>
Date:	<hr/>	<hr/>	<hr/>

ACTION CLOSEOUT SHEET



Client: APA
Project Number: 21100
Project Name: East Coast Grid Expansion - MW880 Milne CS HAZOP

Action No.

Node: 5a
Drawings: MWP.MILN -DWG-Q-0003 MWP.MILN -DWG-Q-0004
Guideword: Low Flow/Low Level

Cause/Issue:
BF-1015 leaking and ignition of gas at the vent stack due to lightning strike.

Consequence:
Ongoing burning of gas and on station blowdown, the gas will ignite.

Safeguard:
NONE

Action:
Investigate appropriate testing procedures in order to test the integrity of the blow down valve BF-1015.

Responsibility
Caroline Button

Closeout Response (Attach all relevant supporting documentation.)

Signoff

	Actionee	Discipline Approval	Project Approval
Signature:	<hr/>	<hr/>	<hr/>
Name:	Caroline Button <hr/>	<hr/>	<hr/>
Title	APA-Team Lead Process&Pipeline Engineering <hr/>	<hr/>	<hr/>
Date:	<hr/>	<hr/>	<hr/>

ACTION CLOSEOUT SHEET



Client: APA
Project Number: 21100
Project Name: East Coast Grid Expansion - MW880 Milne CS HAZOP

Action No.

Node: 5a
Drawings: MWP.MILN -DWG-Q-0003 MWP.MILN -DWG-Q-0004
Guideword: Low Temperature

Cause/Issue:
RO-1021 JT effect.

Consequence:
Potential for brittle failure of piping and equipment downstream of RO.

Safeguard:
Piping downstream of the RO is low temperature piping.

Action:
During Detailed design, pipe stress analysis to check overall stresses in the underground section (fully restrained) is below the allowable stresses in the code (ASME B31.3).

Responsibility
Christopher Daines

Closeout Response (Attach all relevant supporting documentation.)

Signoff

	Actionee	Discipline Approval	Project Approval
Signature:	<hr/>	<hr/>	<hr/>
Name:	Christopher Daines <hr/>	<hr/>	<hr/>
Title	Momentum Engineering Mechanical <hr/>	<hr/>	<hr/>
Date:	<hr/>	<hr/>	<hr/>

ACTION CLOSEOUT SHEET



Client: APA
Project Number: 21100
Project Name: East Coast Grid Expansion - MW880 Milne CS HAZOP

Action No.

Node: 5a
Drawings: MWP.MILN -DWG-Q-0003 MWP.MILN -DWG-Q-0004
Guideword: Contamination / Impurities/Liquids

Cause/Issue:
Rain water in the stack.

Consequence:
Accelerated stack and piping corrosion.

Safeguard:

Action:
Review the PID to show the correct tag number for the vent stack (530-SP-Q-0003, VS - Vent Stack) correct vendor scope of supply and correct location of the drain point.

Responsibility

Closeout Response (Attach all relevant supporting documentation.)

Signoff

	Actionee	Discipline Approval	Project Approval
Signature:	<input type="text"/>	<input type="text"/>	<input type="text"/>
Name:	John Etubus	<input type="text"/>	<input type="text"/>
Title	Momentum Engineering - Process	<input type="text"/>	<input type="text"/>
Date:	<input type="text"/>	<input type="text"/>	<input type="text"/>

ACTION CLOSEOUT SHEET



Client: APA
Project Number: 21100
Project Name: East Coast Grid Expansion - MW880 Milne CS HAZOP

Action No.

Node: 5a
Drawings: MWP.MILN -DWG-Q-0003 MWP.MILN -DWG-Q-0004
Guideword: Plant Items Operable/Maintainable

Cause/Issue:
Compressor able to start without checking the position of BF-1015.

Consequence:
Continuous blowdown is possible.

Safeguard:
NONE

Action:
Provide note to show permissive compressor start only when BF-1015 is closed (similar to BDV-2040).
Valve BF-1015 to be lockde closed.

Responsibility
John Etubus

Closeout Response (Attach all relevant supporting documentation.)

Signoff

	Actionee	Discipline Approval	Project Approval
Signature:	<hr/>	<hr/>	<hr/>
Name:	John Etubus	<hr/>	<hr/>
Title	Momentum Engineering - Process	<hr/>	<hr/>
Date:	<hr/>	<hr/>	<hr/>

ACTION CLOSEOUT SHEET



Client: APA
Project Number: 21100
Project Name: East Coast Grid Expansion - MW880 Milne CS HAZOP

Action No.

Node: 5a
Drawings: MWP.MILN -DWG-Q-0003 MWP.MILN -DWG-Q-0004
Guideword: Coating Degradation/Corrosion

Cause/Issue:
Cathodic protection system not provided for the underground section of pipe.

Consequence:
Corrosion of the underground piping.

Safeguard:
Piping coating compliant to APA underground piping coating standard.

Action:
Provide cathodic protection (sacrificial anode) for the underground piping section to the standard 530-SP-E-0005.

Responsibility
Micheal Palmisano

Closeout Response (Attach all relevant supporting documentation.)

Signoff

	Actionee	Discipline Approval	Project Approval
Signature:	<hr/>	<hr/>	<hr/>
Name:	Micheal Palmisano	<hr/>	<hr/>
Title	Momentum Engineering E&I	<hr/>	<hr/>
Date:	<hr/>	<hr/>	<hr/>

ACTION CLOSEOUT SHEET



Client: APA
Project Number: 21100
Project Name: East Coast Grid Expansion - MW880 Milne CS HAZOP

Action No.

Node: 5a
Drawings: MWP.MILN -DWG-Q-0003 MWP.MILN -DWG-Q-0004
Guideword: Electrical Area Classification/Isolation/Earthing

Cause/Issue:
Static electricity build up in the blowdown piping.

Consequence:
Potential for ignition of gas.

Safeguard:
NONE

Action:
Ensure vent stack is equipotentially bonded.

Responsibility
Micheal Palmisano

Closeout Response (Attach all relevant supporting documentation.)

Signoff

	Actionee	Discipline Approval	Project Approval
Signature:	<hr/>	<hr/>	<hr/>
Name:	Micheal Palmisano	<hr/>	<hr/>
Title	Momentum Engineering E&I	<hr/>	<hr/>
Date:	<hr/>	<hr/>	<hr/>

ACTION CLOSEOUT SHEET



Client: APA
Project Number: 21100
Project Name: East Coast Grid Expansion - MW880 Milne CS HAZOP

Action No.

Node: 5b
Drawings: MWP.MILN -DWG-Q-0005 MWP.MILN -DWG-Q-0004
Guideword: Low Flow/Low Level

Cause/Issue:
BDV-2040 leaking and ignition due to lightning strike

Consequence:
Ongoing burning of gas and on station blowdown, the gas will ignite.

Safeguard:
NONE

Action:
Investigate appropriate testing procedures in order to test the integrity of the blow down valve BDV-2040.

Responsibility
Caroline Button

Closeout Response (Attach all relevant supporting documentation.)

Signoff

	Actionee	Discipline Approval	Project Approval
Signature:	<hr/>	<hr/>	<hr/>
Name:	Caroline Button <hr/>	<hr/>	<hr/>
Title	APA-Team Lead Process&Pipeline Engineering <hr/>	<hr/>	<hr/>
Date:	<hr/>	<hr/>	<hr/>

ACTION CLOSEOUT SHEET



Client: APA
Project Number: 21100
Project Name: East Coast Grid Expansion - MW880 Milne CS HAZOP

Action No.

Node: 5b
Drawings: MWP.MILN -DWG-Q-0005 MWP.MILN -DWG-Q-0004
Guideword: No Flow/Zero Flow/Empty

Cause/Issue:
BDV-2040 not opening on request by the control system

Consequence:
Inability to vent the station.

Safeguard:
PIT-1201 can be monitored by personnel to observe blow down (manually initiated blow down).
(Potentially no monitoring during automatic blow down).

Action:
Ensure that ESD1 ESD2 PSD (including blow down) is alarmed to IOC and ensure unsuccessful ESD1 ESD2 PSD (including blow down) is alarmed to IOC in accordance with 530-PHL-Z-0001 and 530-EDP-Q-0025.

Responsibility

Closeout Response (Attach all relevant supporting documentation.)

Signoff

	Actionee	Discipline Approval	Project Approval
Signature:	<input type="text"/>	<input type="text"/>	<input type="text"/>
Name:	Micheal Palmisano	<input type="text"/>	<input type="text"/>
Title	Momentum Engineering E&I	<input type="text"/>	<input type="text"/>
Date:	<input type="text"/>	<input type="text"/>	<input type="text"/>

ACTION CLOSEOUT SHEET



Client: APA
Project Number: 21100
Project Name: East Coast Grid Expansion - MW880 Milne CS HAZOP

Action No.

Node: 5b
Drawings: MWP.MILN -DWG-Q-0005 MWP.MILN -DWG-Q-0004
Guideword: Low Temperature

Cause/Issue:
RO-2042 JT effect

Consequence:
Potential for brittle failure of piping and equipment downstream of RO.

Safeguard:
Piping downstream of the RO is low temperature piping.

Action:
During Detailed design, pipe stress analysis to check overall stresses in the underground section (fully restrained) is below the allowable stresses in the code (ASME B31.3).

Responsibility
Christopher Daines

Closeout Response (Attach all relevant supporting documentation.)

Signoff

	Actionee	Discipline Approval	Project Approval
Signature:	<hr/>	<hr/>	<hr/>
Name:	Christopher Daines <hr/>	<hr/>	<hr/>
Title	Momentum Engineering Mechanical <hr/>	<hr/>	<hr/>
Date:	<hr/>	<hr/>	<hr/>

ACTION CLOSEOUT SHEET



Client: APA
Project Number: 21100
Project Name: East Coast Grid Expansion - MW880 Milne CS HAZOP

Action No.

Node: 5b
Drawings: MWP.MILN -DWG-Q-0005 MWP.MILN -DWG-Q-0004
Guideword: Contamination / Impurities/Liquids

Cause/Issue:
Rain water in the stack

Consequence:
Accelerated stack and piping corrosion.

Safeguard:

Action:
Review the PID to show the correct tag number for the vent stack (530-SP-Q-0003, VS - Vent Stack) correct vendor scope of supply and correct location of the drain point.

Responsibility

Closeout Response (Attach all relevant supporting documentation.)

Signoff

	Actionee	Discipline Approval	Project Approval
Signature:	<input type="text"/>	<input type="text"/>	<input type="text"/>
Name:	John Etubus	<input type="text"/>	<input type="text"/>
Title	Momentum Engineering - Process	<input type="text"/>	<input type="text"/>
Date:	<input type="text"/>	<input type="text"/>	<input type="text"/>

ACTION CLOSEOUT SHEET



Client: APA
Project Number: 21100
Project Name: East Coast Grid Expansion - MW880 Milne CS HAZOP

Action No.

Node: 5b
Drawings: MWP.MILN -DWG-Q-0005 MWP.MILN -DWG-Q-0004
Guideword: Plant Items Operable/Maintainable

Cause/Issue:
Compressor able to start without checking the position of BDV-2040

Consequence:
Continuous blowdown is possible.

Safeguard:
NONE

Action:
Ensure permissive note on PIDs incorporate purging and pressurisation cycle and align with other APA compressor stations.

Responsibility
John Etubus

Closeout Response (Attach all relevant supporting documentation.)

Signoff

	Actionee	Discipline Approval	Project Approval
Signature:	<hr/>	<hr/>	<hr/>
Name:	John Etubus	<hr/>	<hr/>
Title	Momentum Engineering - Process	<hr/>	<hr/>
Date:	<hr/>	<hr/>	<hr/>

ACTION CLOSEOUT SHEET



Client: APA
Project Number: 21100
Project Name: East Coast Grid Expansion - MW880 Milne CS HAZOP

Action No.

Node: 5b
Drawings: MWP.MILN -DWG-Q-0005 MWP.MILN -DWG-Q-0004
Guideword: General

Cause/Issue:
Note 2 on PID-Q-0004 is incomplete.

Consequence:
Inaccurate representation of plant.

Safeguard:
NONE

Action:
Add "bypass also allows suction side of compressor to blow down on station blow down".

Responsibility
John Etubus

Closeout Response (Attach all relevant supporting documentation.)

Signoff

	Actionee	Discipline Approval	Project Approval
Signature:	<hr/>	<hr/>	<hr/>
Name:	John Etubus	<hr/>	<hr/>
Title	Momentum Engineering - Process	<hr/>	<hr/>
Date:	<hr/>	<hr/>	<hr/>

ACTION CLOSEOUT SHEET



Client: APA
Project Number: 21100
Project Name: East Coast Grid Expansion - MW880 Milne CS HAZOP

Action No.

Node: 5b
Drawings: MWP.MILN -DWG-Q-0005 MWP.MILN -DWG-Q-0004
Guideword: General

Cause/Issue:
Check valve CK-1200 has high opening pressure.

Consequence:
Inability to completely vent the line during blowdown.

Safeguard:
NONE

Action:
Ensure project selects a check valve type with a very low opening pressure.

Responsibility
Christopher Daines

Closeout Response (Attach all relevant supporting documentation.)

Signoff

	Actionee	Discipline Approval	Project Approval
Signature:	<hr/>	<hr/>	<hr/>
Name:	Christopher Daines <hr/>	<hr/>	<hr/>
Title	Momentum Engineering Mechanical <hr/>	<hr/>	<hr/>
Date:	<hr/>	<hr/>	<hr/>

ACTION CLOSEOUT SHEET



Client: APA
Project Number: 21100
Project Name: East Coast Grid Expansion - MW880 Milne CS HAZOP

Action No.

Node: 7
Drawings: MWP.MILN-DWG-Q-0003; MWP.MILN-DWG-Q-0009; MWP.MILN-DWG-Q-0010; MWP.MILN-DWG-Q-0008.
Preliminary HAZOP. Refer Vendor Packages HAZOP Strategy.
Guideword: High Flow/High Level

Cause/Issue:
Blow down valve BDV-2691 fail open.
Blow down valve BDV-2327A fail open.

Consequence:
AS ABOVE

Safeguard:
RO-2692
RO-2525

Action:
Implement permissive compressor to start only if BDV-2691 is closed in line with other blow down valves.

Responsibility

Closeout Response (Attach all relevant supporting documentation.)

Signoff

	Actionee	Discipline Approval	Project Approval
Signature:	<input type="text"/>	<input type="text"/>	<input type="text"/>
Name:	<input type="text" value="John Etubus"/>	<input type="text"/>	<input type="text"/>
Title	<input type="text" value="Momentum Engineering - Process"/>	<input type="text"/>	<input type="text"/>
Date:	<input type="text"/>	<input type="text"/>	<input type="text"/>

ACTION CLOSEOUT SHEET



Client: APA
Project Number: 21100
Project Name: East Coast Grid Expansion - MW880 Milne CS HAZOP

Action No.

Node: 7
Drawings: MWP.MILN-DWG-Q-0003; MWP.MILN-DWG-Q-0009; MWP.MILN-DWG-Q-0010; MWP.MILN-DWG-Q-0008.
Preliminary HAZOP. Refer Vendor Packages HAZOP Strategy.
Guideword: High Flow/High Level

Cause/Issue:
Blow down valve BDV-2691 fail open.
Blow down valve BDV-2327A fail open.

Consequence:
AS ABOVE

Safeguard:
RO-2692
RO-2525

Action:
Provide a discrepancy alarm between SV-2691 and ZAC-2691 (to be retagged to ZIC-2691).

Responsibility
Michael Palmisano / John Etubus

Closeout Response (Attach all relevant supporting documentation.)

Signoff

	Actionee	Discipline Approval	Project Approval
Signature:	<hr/>	<hr/>	<hr/>
Name:	Michael Palmisano / John Etubus	<hr/>	<hr/>
Title	Momentum Engineering - E&I / Momentum Engineering - Process	<hr/>	<hr/>
Date:	<hr/>	<hr/>	<hr/>

ACTION CLOSEOUT SHEET



Client: APA
Project Number: 21100
Project Name: East Coast Grid Expansion - MW880 Milne CS HAZOP

Action No.

Node: 7
Drawings: MWP.MILN-DWG-Q-0003; MWP.MILN-DWG-Q-0009; MWP.MILN-DWG-Q-0010; MWP.MILN-DWG-Q-0008.
Preliminary HAZOP. Refer Vendor Packages HAZOP Strategy.
Guideword: High Flow/High Level

Cause/Issue:
Manual vents or drains left open.

Consequence:
Restriction of supply to consumers.
Gas release and potential ignition.

Safeguard:
NONE

Action:
APA Ops to investigate and provide advise on which vent and drain valves are required to be locked.
This applies to all vents and drains in the facility.
show the correct locked position on PIDs

Responsibility
Caroline Button / John Etubus

Closeout Response (Attach all relevant supporting documentation.)

Signoff

	Actionee	Discipline Approval	Project Approval
Signature:	<hr/>	<hr/>	<hr/>
Name:	Caroline Button / John Etubus	<hr/>	<hr/>
Title	APA -Team Lead Process & Pipeline Engineering / Momentum Engineering - Process	<hr/>	<hr/>
Date:	<hr/>	<hr/>	<hr/>

ACTION CLOSEOUT SHEET



Client: APA
Project Number: 21100
Project Name: East Coast Grid Expansion - MW880 Milne CS HAZOP

Action No.

Node: 7
Drawings: MWP.MILN-DWG-Q-0003; MWP.MILN-DWG-Q-0009; MWP.MILN-DWG-Q-0010; MWP.MILN-DWG-Q-0008.
Preliminary HAZOP. Refer Vendor Packages HAZOP Strategy.
Guideword: High Level

Cause/Issue:
High level in E-2640 water tank due to overfill.

Consequence:
Overflow to ground.

Safeguard:
Filling valve has a floating device to shut down filling.
Operator controlled procedure.

Action:
Show the float device on the PID.

Responsibility
John Etubus

Closeout Response (Attach all relevant supporting documentation.)

Signoff

	Actionee	Discipline Approval	Project Approval
Signature:	<hr/>	<hr/>	<hr/>
Name:	John Etubus	<hr/>	<hr/>
Title	Momentum Engineering - Process	<hr/>	<hr/>
Date:	<hr/>	<hr/>	<hr/>

ACTION CLOSEOUT SHEET



Client: APA
Project Number: 21100
Project Name: East Coast Grid Expansion - MW880 Milne CS HAZOP

Action No.

Node: 7
Drawings: MWP.MILN-DWG-Q-0003; MWP.MILN-DWG-Q-0009; MWP.MILN-DWG-Q-0010; MWP.MILN-DWG-Q-0008.
Preliminary HAZOP. Refer Vendor Packages HAZOP Strategy.
Guideword: High Level

Cause/Issue:
High liquid level in filter coalescer vessel F-2610/F-2630.

Consequence:
Potential liquid carryover into HP/LP fuel gas skid.

Safeguard:
NONE

Action:
Fuel gas take off on PID-Q-0003 reference B4 to be taken from the top of the pipe.
Show as a note on the PID.

Responsibility
John Etubus

Closeout Response (Attach all relevant supporting documentation.)

Signoff

	Actionee	Discipline Approval	Project Approval
Signature:	<hr/>	<hr/>	<hr/>
Name:	John Etubus	<hr/>	<hr/>
Title	Momentum Engineering - Process	<hr/>	<hr/>
Date:	<hr/>	<hr/>	<hr/>

ACTION CLOSEOUT SHEET



Client: APA
Project Number: 21100
Project Name: East Coast Grid Expansion - MW880 Milne CS HAZOP

Action No.

Node: 7
Drawings: MWP.MILN-DWG-Q-0003; MWP.MILN-DWG-Q-0009; MWP.MILN-DWG-Q-0010; MWP.MILN-DWG-Q-0008.
Preliminary HAZOP. Refer Vendor Packages HAZOP Strategy.
Guideword: Low Flow/Low Level

Cause/Issue:
Misalignment of valves.

Consequence:
AS ABOVE

Safeguard:
Refer to action in NODE N1-2-3.

Action:
Manual valves in the flow path to be provided with lockable tabs.

Responsibility
Christopher Daines

Closeout Response (Attach all relevant supporting documentation.)

Signoff

	Actionee	Discipline Approval	Project Approval
Signature:	<hr/>	<hr/>	<hr/>
Name:	Christopher Daines <hr/>	<hr/>	<hr/>
Title	Momentum Engineering Mechanical <hr/>	<hr/>	<hr/>
Date:	<hr/>	<hr/>	<hr/>

ACTION CLOSEOUT SHEET



Client: APA
Project Number: 21100
Project Name: East Coast Grid Expansion - MW880 Milne CS HAZOP

Action No.

Node: 7
Drawings: MWP.MILN-DWG-Q-0003; MWP.MILN-DWG-Q-0009; MWP.MILN-DWG-Q-0010; MWP.MILN-DWG-Q-0008.
Preliminary HAZOP. Refer Vendor Packages HAZOP Strategy.
Guideword: High Pressure

Cause/Issue:
Failure of the regulators PCV-2660 open.

Consequence:
High pressure with potential for LOC and ignition and explosion.

Safeguard:
HAZOP workshop view is that high flow will always result in high pressure due to limited volumes.
SSV-2655 and SSV-2675.
PAHH-2690

Action:
Consider removing trip SDV_2327B from PAHH-2690.
Confirm this is ok by inspection of AS 3814.
Implement trip to compressor from PAHH-2690.
Update PIDs to reflect this.

Responsibility
Sohail Hameed / Kevin Martin / John Etubus

Closeout Response (Attach all relevant supporting documentation.)

Signoff

	Actionee	Discipline Approval	Project Approval
Signature:	<hr/>	<hr/>	<hr/>
Name:	Sohail Hameed / Kevin Martin / John Etubus <hr/>	<hr/>	<hr/>
Title	APA - Senior E&IC Engineer / APA - Senior Rotating Engineer / Momentum Engineering - Process <hr/>	<hr/>	<hr/>
Date:	<hr/>	<hr/>	<hr/>

ACTION CLOSEOUT SHEET



Client: APA
Project Number: 21100
Project Name: East Coast Grid Expansion - MW880 Milne CS HAZOP

Action No. 64

Node: 7
Drawings: MWP.MILN-DWG-Q-0003; MWP.MILN-DWG-Q-0009; MWP.MILN-DWG-Q-0010; MWP.MILN-DWG-Q-0008.
Preliminary HAZOP. Refer Vendor Packages HAZOP Strategy.
Guideword: High Pressure

Cause/Issue:
Failure of the regulators PCV-2660 open.

Consequence:
High pressure with potential for LOC and ignition and explosion.

Safeguard:
HAZOP workshop view is that high flow will always result in high pressure due to limited volumes.
SSV-2655 and SSV-2675.
PAHH-2690

Action:
APA (KM) to advise MTM on the required set point for the HP fuel gas regulators slam shuts, PSV and high pressure PAH / PAHH alarms and trips as well as all the set point, alarms and trips for low pressure.
MTM to show correct set points on PIDs.

Responsibility
Kevin Martin / John Etubus

Closeout Response (Attach all relevant supporting documentation.)

Signoff

	Actionee	Discipline Approval	Project Approval
Signature:	<hr/>	<hr/>	<hr/>
Name:	Kevin Martin / John Etubus <hr/>	<hr/>	<hr/>
Title	APA - Senior Rotating Engineer / Momentum Engineering - Process <hr/>	<hr/>	<hr/>
Date:	<hr/>	<hr/>	<hr/>

ACTION CLOSEOUT SHEET



Client: APA
Project Number: 21100
Project Name: East Coast Grid Expansion - MW880 Milne CS HAZOP

Action No.

Node: 7
Drawings: MWP.MILN-DWG-Q-0003; MWP.MILN-DWG-Q-0009; MWP.MILN-DWG-Q-0010; MWP.MILN-DWG-Q-0008.
Preliminary HAZOP. Refer Vendor Packages HAZOP Strategy.
Guideword: Low Pressure (Including Venting)

Cause/Issue:
Rupture downstream.

Consequence:
As per NODE N7-1-1.

Safeguard:
HAZOP workshop view is that rupture will always result in low pressure due to limited volumes.
PALL-2690.

Action:
Modify Note 6 on PID-Q-0010 to read "PALL-2690 will trip SDV-2600".

Responsibility
John Etubus

Closeout Response (Attach all relevant supporting documentation.)

Signoff

	Actionee	Discipline Approval	Project Approval
Signature:	<hr/>	<hr/>	<hr/>
Name:	John Etubus	<hr/>	<hr/>
Title	Momentum Engineering - Process	<hr/>	<hr/>
Date:	<hr/>	<hr/>	<hr/>

ACTION CLOSEOUT SHEET



Client: APA
Project Number: 21100
Project Name: East Coast Grid Expansion - MW880 Milne CS HAZOP

Action No.

Node: 7
Drawings: MWP.MILN-DWG-Q-0003; MWP.MILN-DWG-Q-0009; MWP.MILN-DWG-Q-0010; MWP.MILN-DWG-Q-0008.
Preliminary HAZOP. Refer Vendor Packages HAZOP Strategy.
Guideword: High Temperature

Cause/Issue:
Favourable condition leading to high gas temperature.

Consequence:
Exceeding piping and equipment design temperature envelope with a potential for high thermal stress and LOC.

Safeguard:
Maximum water temperature is 60 degC.
Downstream piping design temperature envelope is 60 degC.

Action:
MTM to confirm the maximum temperature acceptable for the micro turbines. Refer to action 93 NODE 8 (ref. remove TAHH-5064).

Responsibility
Michael Palmisano / John Etubus

Closeout Response (Attach all relevant supporting documentation.)

Signoff

	Actionee	Discipline Approval	Project Approval
Signature:	<hr/>	<hr/>	<hr/>
Name:	Michael Palmisano / John Etubus	<hr/>	<hr/>
Title	Momentum Engineering - E&I / Momentum Engineering - Process	<hr/>	<hr/>
Date:	<hr/>	<hr/>	<hr/>

ACTION CLOSEOUT SHEET



Client: APA
Project Number: 21100
Project Name: East Coast Grid Expansion - MW880 Milne CS HAZOP

Action No.

Node: 7
Drawings: MWP.MILN-DWG-Q-0003; MWP.MILN-DWG-Q-0009; MWP.MILN-DWG-Q-0010; MWP.MILN-DWG-Q-0008.
Preliminary HAZOP. Refer Vendor Packages HAZOP Strategy.
Guideword: Low Temperature

Cause/Issue:
Low gas temperature during black start with fuel gas heater not online.

Consequence:
Potential for liquids dropping out of the fuel gas.

Safeguard:
Very small volumes of gas.

Action:
Procedure to be developed to start up microturbine first to get heater E-2640 online and operational before the main turbine can start.
When heater achieves set point temperature, then add this to station ready indicator XA-7083.

Responsibility

Closeout Response (Attach all relevant supporting documentation.)

Signoff

	Actionee	Discipline Approval	Project Approval
Signature:	<input type="text"/>	<input type="text"/>	<input type="text"/>
Name:	Micheal Palmisano	<input type="text"/>	<input type="text"/>
Title	Momentum Engineering E&I	<input type="text"/>	<input type="text"/>
Date:	<input type="text"/>	<input type="text"/>	<input type="text"/>

ACTION CLOSEOUT SHEET



Client: APA
Project Number: 21100
Project Name: East Coast Grid Expansion - MW880 Milne CS HAZOP

Action No.

Node: 7
Drawings: MWP.MILN-DWG-Q-0003; MWP.MILN-DWG-Q-0009; MWP.MILN-DWG-Q-0010; MWP.MILN-DWG-Q-0008.
Preliminary HAZOP. Refer Vendor Packages HAZOP Strategy.
Guideword: Low Temperature

Cause/Issue:
Heater not performing as designed.

Consequence:
Process fuel gas is under temperature.

Safeguard:
NONE

Action:
Provide thermowell downstream of the heater E-2640 in the vicinity of DB-2644 for heater heater performance monitoring
Provide twisted square type thermowell.
the correct size and correct pressure rating connection for thermowell should be provided in the fuel gas line and shown on the PID

Responsibility
John Etubus

Closeout Response (Attach all relevant supporting documentation.)

Signoff

	Actionee	Discipline Approval	Project Approval
Signature:	<hr/>	<hr/>	<hr/>
Name:	John Etubus	<hr/>	<hr/>
Title	Momentum Engineering - Process	<hr/>	<hr/>
Date:	<hr/>	<hr/>	<hr/>

ACTION CLOSEOUT SHEET



Client: APA
Project Number: 21100
Project Name: East Coast Grid Expansion - MW880 Milne CS HAZOP

Action No.

Node: 7
Drawings: MWP.MILN-DWG-Q-0003; MWP.MILN-DWG-Q-0009; MWP.MILN-DWG-Q-0010; MWP.MILN-DWG-Q-0008.
Preliminary HAZOP. Refer Vendor Packages HAZOP Strategy.
Guideword: Low Temperature

Cause/Issue:
Heating element failure (E-2640).

Consequence:
Turbine operating outside operating limits.

Safeguard:
TALL-2689

Action:
Set TALL-2689 trip at -5 degC with a time delay of 10 min to enable start up.
Set TAL-2689 alarm at -2 degC wit no time delay.

Responsibility
John Etubus

Closeout Response (Attach all relevant supporting documentation.)

Signoff

	Actionee	Discipline Approval	Project Approval
Signature:	<hr/>	<hr/>	<hr/>
Name:	John Etubus	<hr/>	<hr/>
Title	Momentum Engineering - Process	<hr/>	<hr/>
Date:	<hr/>	<hr/>	<hr/>

ACTION CLOSEOUT SHEET



Client: APA
Project Number: 21100
Project Name: East Coast Grid Expansion - MW880 Milne CS HAZOP

Action No.

Node: 7
Drawings: MWP.MILN-DWG-Q-0003; MWP.MILN-DWG-Q-0009; MWP.MILN-DWG-Q-0010; MWP.MILN-DWG-Q-0008.
Preliminary HAZOP. Refer Vendor Packages HAZOP Strategy.
Guideword: Low Temperature

Cause/Issue:
Heater not performing as designed.

Consequence:
Process fuel gas is under temperature.

Safeguard:
NONE

Action:
APA (KM) to check with Solar that any start and running (including black start) at -5 degC is acceptable for operation of the gas turbine.

Responsibility
Kevin Martin

Closeout Response (Attach all relevant supporting documentation.)

Signoff

	Actionee	Discipline Approval	Project Approval
Signature:	<hr/>	<hr/>	<hr/>
Name:	Kevin Martin	<hr/>	<hr/>
Title	APA-Senior Rotating Engineer	<hr/>	<hr/>
Date:	<hr/>	<hr/>	<hr/>

ACTION CLOSEOUT SHEET



Client: APA
Project Number: 21100
Project Name: East Coast Grid Expansion - MW880 Milne CS HAZOP

Action No.

Node: 7
Drawings: MWP.MILN-DWG-Q-0003; MWP.MILN-DWG-Q-0009; MWP.MILN-DWG-Q-0010; MWP.MILN-DWG-Q-0008.
Preliminary HAZOP. Refer Vendor Packages HAZOP Strategy.
Guideword: Low Temperature

Cause/Issue:
Heating element failure (E-2640).

Consequence:
Process fuel gas under temperature with potential for brittle failure of downstream piping and equipment.

Safeguard:
NONE

Action:
Consider setting low temperature alarm with the appropriate operator action on the thermowell TW-XXTBC.
Refer action 68.

Responsibility
Caroline Button / John Etubus

Closeout Response (Attach all relevant supporting documentation.)

Signoff

	Actionee	Discipline Approval	Project Approval
Signature:	<hr/>	<hr/>	<hr/>
Name:	Caroline Button / John Etubus	<hr/>	<hr/>
Title	APA -Team Lead Process & Pipeline Engineering / Momentum Engineering - Process	<hr/>	<hr/>
Date:	<hr/>	<hr/>	<hr/>

ACTION CLOSEOUT SHEET



Client: APA
Project Number: 21100
Project Name: East Coast Grid Expansion - MW880 Milne CS HAZOP

Action No.

Node: 7
Drawings: MWP.MILN-DWG-Q-0003; MWP.MILN-DWG-Q-0009; MWP.MILN-DWG-Q-0010; MWP.MILN-DWG-Q-0008.
Preliminary HAZOP. Refer Vendor Packages HAZOP Strategy.
Guideword: General

Cause/Issue:
Symbols for F-2610 and F-2630 currently show a flange for the top lid.

Consequence:
Inaccurate depiction of the top lid.

Safeguard:
NONE

Action:
Ensure QOC is provided on F-2610 and F-2630. Show the correct arrangement on the PID.

Responsibility
Shaun Quinlan / John Etubus

Closeout Response (Attach all relevant supporting documentation.)

Signoff

	Actionee	Discipline Approval	Project Approval
Signature:	<hr/>	<hr/>	<hr/>
Name:	Shaun Quinlan / John Etubus <hr/>	<hr/>	<hr/>
Title	APA Technical Officer - E&I / Momentum Engineering - Process <hr/>	<hr/>	<hr/>
Date:	<hr/>	<hr/>	<hr/>

ACTION CLOSEOUT SHEET



Client: APA
Project Number: 21100
Project Name: East Coast Grid Expansion - MW880 Milne CS HAZOP

Action No.

Node: 7
Drawings: MWP.MILN-DWG-Q-0003; MWP.MILN-DWG-Q-0009; MWP.MILN-DWG-Q-0010; MWP.MILN-DWG-Q-0008.
Preliminary HAZOP. Refer Vendor Packages HAZOP Strategy.
Guideword: General

Cause/Issue:
Failure position of regulators is not shown on PID.

Consequence:
Potential for error in operation.

Safeguard:
NONE

Action:
Show the regulator failure position on the PIDs on loss of motive power (instrument gas).
Preference is for the regulators to fail close on loss of motive power.

Responsibility
John Etubus / Christopher Daines

Closeout Response (Attach all relevant supporting documentation.)

Signoff

	Actionee	Discipline Approval	Project Approval
Signature:	<hr/>	<hr/>	<hr/>
Name:	John Etubus / Christopher Daines <hr/>	<hr/>	<hr/>
Title	Momentum Engineering - Process / Momentum Engineering Mechanical <hr/>	<hr/>	<hr/>
Date:	<hr/>	<hr/>	<hr/>

ACTION CLOSEOUT SHEET



Client: APA
Project Number: 21100
Project Name: East Coast Grid Expansion - MW880 Milne CS HAZOP

Action No.

Node: 7
Drawings: MWP.MILN-DWG-Q-0003; MWP.MILN-DWG-Q-0009; MWP.MILN-DWG-Q-0010; MWP.MILN-DWG-Q-0008.
Preliminary HAZOP. Refer Vendor Packages HAZOP Strategy.
Guideword: General

Cause/Issue:
No alarm on the discrepancy between SV-2655/SV-2675 vs ZS-2655/ZS-2675 for each slam shut.

Consequence:
Potential for error in operation.

Safeguard:
NONE

Action:
Provide alarm on the discrepancy between SV-2655 / SV-2675 vs ZS-2655 / ZS-2675 for each slam shut and show this feature on the PID.

Responsibility
John Etubus / Michael Palmisano

Closeout Response (Attach all relevant supporting documentation.)

Signoff

	Actionee	Discipline Approval	Project Approval
Signature:	<hr/>	<hr/>	<hr/>
Name:	John Etubus / Michael Palmisano	<hr/>	<hr/>
Title	Momentum Engineering - Process / Momentum Engineering E&I	<hr/>	<hr/>
Date:	<hr/>	<hr/>	<hr/>

ACTION CLOSEOUT SHEET



Client: APA
Project Number: 21100
Project Name: East Coast Grid Expansion - MW880 Milne CS HAZOP

Action No.

Node: 7
Drawings: MWP.MILN-DWG-Q-0003; MWP.MILN-DWG-Q-0009; MWP.MILN-DWG-Q-0010; MWP.MILN-DWG-Q-0008.
Preliminary HAZOP. Refer Vendor Packages HAZOP Strategy.
Guideword: General

Cause/Issue:
Filter vessel F-2685 is not protected by fire pressure relief as required by the pressure vessel code.

Consequence:
Code non-compliance.

Safeguard:
NONE

Action:
Establish whether F-2685 is a pressure vessel or not and add fire case PSV if it is a pressure vessel.

Responsibility
John Etubus

Closeout Response (Attach all relevant supporting documentation.)

Signoff

	Actionee	Discipline Approval	Project Approval
Signature:	<hr/>	<hr/>	<hr/>
Name:	John Etubus	<hr/>	<hr/>
Title	Momentum Engineering - Process	<hr/>	<hr/>
Date:	<hr/>	<hr/>	<hr/>

ACTION CLOSEOUT SHEET



Client: APA
Project Number: 21100
Project Name: East Coast Grid Expansion - MW880 Milne CS HAZOP

Action No.

Node: 7
Drawings: MWP.MILN-DWG-Q-0003; MWP.MILN-DWG-Q-0009; MWP.MILN-DWG-Q-0010; MWP.MILN-DWG-Q-0008.
Preliminary HAZOP. Refer Vendor Packages HAZOP Strategy.
Guideword: General

Cause/Issue:
Basket strainer filter in the Solar supply upstream SDV-2327B is not shown on the PID.

Consequence:
Incorrect depiction of equipment.

Safeguard:
NONE

Action:
Show the basket strainer filter upstream of SDV-2327B on PID-Q-0008 and clearly mark it as part of Solar supply.

Responsibility
John Etubus

Closeout Response (Attach all relevant supporting documentation.)

Signoff

	Actionee	Discipline Approval	Project Approval
Signature:	<hr/>	<hr/>	<hr/>
Name:	John Etubus	<hr/>	<hr/>
Title	Momentum Engineering - Process	<hr/>	<hr/>
Date:	<hr/>	<hr/>	<hr/>

ACTION CLOSEOUT SHEET



Client: APA
Project Number: 21100
Project Name: East Coast Grid Expansion - MW880 Milne CS HAZOP

Action No. 77

Node: 7
Drawings: MWP.MILN-DWG-Q-0003; MWP.MILN-DWG-Q-0009; MWP.MILN-DWG-Q-0010; MWP.MILN-DWG-Q-0008.
Preliminary HAZOP. Refer Vendor Packages HAZOP Strategy.
Guideword: General

Cause/Issue:
F-2610/F-2630 currently shown as dust filters on the PID.

Consequence:
Incorrect depiction of equipment.

Safeguard:
NONE

Action:
F-2610/F-2630 are to be specified and shown as the filter coalescing type filters on the PIDs.

Responsibility
John Etubus

Closeout Response (Attach all relevant supporting documentation.)

Signoff

	Actionee	Discipline Approval	Project Approval
Signature:	<hr/>	<hr/>	<hr/>
Name:	John Etubus	<hr/>	<hr/>
Title	Momentum Engineering - Process	<hr/>	<hr/>
Date:	<hr/>	<hr/>	<hr/>

ACTION CLOSEOUT SHEET



Client: APA
Project Number: 21100
Project Name: East Coast Grid Expansion - MW880 Milne CS HAZOP

Action No.

Node: 7
Drawings: MWP.MILN-DWG-Q-0003; MWP.MILN-DWG-Q-0009; MWP.MILN-DWG-Q-0010; MWP.MILN-DWG-Q-0008.
Preliminary HAZOP. Refer Vendor Packages HAZOP Strategy.
Guideword: General

Cause/Issue:
Fuel gas PIDs currently depict a specific PCV / slam shut configuration.

Consequence:
The final selected elements may not be reflected on the PIDs.

Safeguard:
NONE

Action:
Once the final elements (PCV / SS) is selected by the vendor, depict the correct hook up configuration on the PID (e.g. pilot, sensing lines).

Responsibility
John Etubus

Closeout Response (Attach all relevant supporting documentation.)

Signoff

	Actionee	Discipline Approval	Project Approval
Signature:	<hr/>	<hr/>	<hr/>
Name:	John Etubus	<hr/>	<hr/>
Title	Momentum Engineering - Process	<hr/>	<hr/>
Date:	<hr/>	<hr/>	<hr/>

ACTION CLOSEOUT SHEET



Client: APA
Project Number: 21100
Project Name: East Coast Grid Expansion - MW880 Milne CS HAZOP

Action No.

Node: 7
Drawings: MWP.MILN-DWG-Q-0003; MWP.MILN-DWG-Q-0009; MWP.MILN-DWG-Q-0010; MWP.MILN-DWG-Q-0008.
Preliminary HAZOP. Refer Vendor Packages HAZOP Strategy.
Guideword: General

Cause/Issue:
Thermowell, temperature element, size and rating not shown on the PID on TIT-2689.

Consequence:
Incorrect depiction of equipment.

Safeguard:
NONE

Action:
Show the thermowell, temperature element, size and rating on the PID on TIT-2689 as well as the correct installation detail in 50 NB piping.

Responsibility

Closeout Response (Attach all relevant supporting documentation.)

Signoff

	Actionee	Discipline Approval	Project Approval
Signature:	<input type="text"/>	<input type="text"/>	<input type="text"/>
Name:	John Etubus	<input type="text"/>	<input type="text"/>
Title	Momentum Engineering - Process	<input type="text"/>	<input type="text"/>
Date:	<input type="text"/>	<input type="text"/>	<input type="text"/>

ACTION CLOSEOUT SHEET



Client: APA
Project Number: 21100
Project Name: East Coast Grid Expansion - MW880 Milne CS HAZOP

Action No.

Node: 7
Drawings: MWP.MILN-DWG-Q-0003; MWP.MILN-DWG-Q-0009; MWP.MILN-DWG-Q-0010; MWP.MILN-DWG-Q-0008.
Preliminary HAZOP. Refer Vendor Packages HAZOP Strategy.
Guideword: General

Cause/Issue:
Slam shut SSV-2655 or SSV-2675 trips leads to call out on site.

Consequence:
Potentially unnecessary call out.

Safeguard:
NONE

Action:
Consider whether a remote or automatic reset of slam shut by IOC should be implemented.

Responsibility
Caroline Button

Closeout Response (Attach all relevant supporting documentation.)

Signoff

	Actionee	Discipline Approval	Project Approval
Signature:	<hr/>	<hr/>	<hr/>
Name:	Caroline Button	<hr/>	<hr/>
Title	APA-Team Lead Process&Pipeline Engineering	<hr/>	<hr/>
Date:	<hr/>	<hr/>	<hr/>

ACTION CLOSEOUT SHEET



Client: APA
Project Number: 21100
Project Name: East Coast Grid Expansion - MW880 Milne CS HAZOP

Action No.

Node: 7
Drawings: MWP.MILN-DWG-Q-0003; MWP.MILN-DWG-Q-0009; MWP.MILN-DWG-Q-0010; MWP.MILN-DWG-Q-0008.
Preliminary HAZOP. Refer Vendor Packages HAZOP Strategy.
Guideword: General

Cause/Issue:
Unnecessary functionality by having open and close signals to SSVs.

Consequence:
Potential unnecessary complexity.

Safeguard:
NONE

Action:
Consider whether a remote open or close operation of slam shut is required by IOC.

Responsibility
Caroline Button

Closeout Response (Attach all relevant supporting documentation.)

Signoff

	Actionee	Discipline Approval	Project Approval
Signature:	<hr/>	<hr/>	<hr/>
Name:	Caroline Button	<hr/>	<hr/>
Title	APA-Team Lead Process&Pipeline Engineering	<hr/>	<hr/>
Date:	<hr/>	<hr/>	<hr/>

ACTION CLOSEOUT SHEET



Client: APA
Project Number: 21100
Project Name: East Coast Grid Expansion - MW880 Milne CS HAZOP

Action No.

Node: 7
Drawings: MWP.MILN-DWG-Q-0003; MWP.MILN-DWG-Q-0009; MWP.MILN-DWG-Q-0010; MWP.MILN-DWG-Q-0008.
Preliminary HAZOP. Refer Vendor Packages HAZOP Strategy.
Guideword: General

Cause/Issue:
Different configuration of pneumatic lines going to the actuators of SSV-2655/SSV-2675 is incorrect.

Consequence:
Incorrect depiction of equipment which is not rated for 4,000 kPa.

Safeguard:
NONE

Action:
Show the correct lines going into the SSV actuators SSV-2655 / SSV-2675 and show the correct equipment and functionality desired for the two slam shut valves.

Responsibility
Michael Palmisano / John Etubus

Closeout Response (Attach all relevant supporting documentation.)

Signoff

	Actionee	Discipline Approval	Project Approval
Signature:	<hr/>	<hr/>	<hr/>
Name:	Michael Palmisano / John Etubus <hr/>	<hr/>	<hr/>
Title	Momentum Engineering - E&I / Momentum Engineering - Process <hr/>	<hr/>	<hr/>
Date:	<hr/>	<hr/>	<hr/>

ACTION CLOSEOUT SHEET



Client: APA
Project Number: 21100
Project Name: East Coast Grid Expansion - MW880 Milne CS HAZOP

Action No.

Node: 8
Drawings: MWP.MILN-DWG-Q-0010; MWP.MILN-DWG-Q-0011; MWP.MILN-DWG-Q-0012.
Preliminary HAZOP. Refer Vendor Packages HAZOP Strategy.
Guideword: High Flow/High Level

Cause/Issue:
Failure of the regulators PCV-5020/PCV-5050 open.

Consequence:
High velocity gas upstream and downstream with potential equipment failure (Piping, valves, Thermo wells, filters, heater).

Safeguard:
PDAH-5060.
Thermowells to be twisted square type.
HAZOP workshop view is that high flow will always result in high pressure due to limited volumes.
Refer to high pressure safeguards.

Action:
Investigate with the filter(F-5060) vendor the clean / dirty / collapse differential pressure and provide an alarm set as close as possible to the dirt DP and a trip as close as possible to the collapse DP (PAH-5060 PAHH-5060).

Responsibility

Closeout Response (Attach all relevant supporting documentation.)

Signoff

	Actionee	Discipline Approval	Project Approval
Signature:	<input type="text"/>	<input type="text"/>	<input type="text"/>
Name:	<input type="text" value="John Etubus"/>	<input type="text"/>	<input type="text"/>
Title	<input type="text" value="Momentum Engineering - Process"/>	<input type="text"/>	<input type="text"/>
Date:	<input type="text"/>	<input type="text"/>	<input type="text"/>

ACTION CLOSEOUT SHEET



Client: APA
Project Number: 21100
Project Name: East Coast Grid Expansion - MW880 Milne CS HAZOP

Action No.

Node: 8
Drawings: MWP.MILN-DWG-Q-0010; MWP.MILN-DWG-Q-0011; MWP.MILN-DWG-Q-0012.
Preliminary HAZOP. Refer Vendor Packages HAZOP Strategy.
Guideword: High Flow/High Level

Cause/Issue:
Blow down valve BDV-5066 fail open.

Consequence:
AS ABOVE

Safeguard:
RO-5067

Action:
Provide a discrepancy alarm between SV-5066 and ZAC-5066 (to be retagged to ZIC-5066).

Responsibility
Michael Palmisano / John Etubus

Closeout Response (Attach all relevant supporting documentation.)

Signoff

	Actionee	Discipline Approval	Project Approval
Signature:	<hr/>	<hr/>	<hr/>
Name:	Michael Palmisano / John Etubus	<hr/>	<hr/>
Title	Momentum Engineering - E&I / Momentum Engineering - Process	<hr/>	<hr/>
Date:	<hr/>	<hr/>	<hr/>

ACTION CLOSEOUT SHEET



Client: APA
Project Number: 21100
Project Name: East Coast Grid Expansion - MW880 Milne CS HAZOP

Action No.

Node: 8
Drawings: MWP.MILN-DWG-Q-0010; MWP.MILN-DWG-Q-0011; MWP.MILN-DWG-Q-0012.
Preliminary HAZOP. Refer Vendor Packages HAZOP Strategy.
Guideword: High Flow/High Level

Cause/Issue:
Manual vents or drains left open.

Consequence:
Restriction of supply to consumers.
Gas release and potential ignition.

Safeguard:
NONE

Action:
APA Ops to investigate and provide advise on which vent and drain valves are required to be locked.
This applies to all vents and drains in the facility.
show the correct locked position on PIDs

Responsibility
Caroline Button / John Etubus

Closeout Response (Attach all relevant supporting documentation.)

Signoff

	Actionee	Discipline Approval	Project Approval
Signature:	<hr/>	<hr/>	<hr/>
Name:	Caroline Button / John Etubus	<hr/>	<hr/>
Title	APA -Team Lead Process & Pipeline Engineering / Momentum Engineering - Process	<hr/>	<hr/>
Date:	<hr/>	<hr/>	<hr/>

ACTION CLOSEOUT SHEET



Client: APA
Project Number: 21100
Project Name: East Coast Grid Expansion - MW880 Milne CS HAZOP

Action No.

Node: 8
Drawings: MWP.MILN-DWG-Q-0010; MWP.MILN-DWG-Q-0011; MWP.MILN-DWG-Q-0012.
Preliminary HAZOP. Refer Vendor Packages HAZOP Strategy.
Guideword: High Level

Cause/Issue:
High liquid level in filter coalescer vessel F-5060.

Consequence:
Potential liquid carryover into LP fuel gas skid.

Safeguard:
NONE

Action:
Consider the fuel gas take off on PID-Q-0010 reference D6 to be taken from downstream of the filter coalescer F-2685.
If changed, show on the PID.

Responsibility

Closeout Response (Attach all relevant supporting documentation.)

Signoff

	Actionee	Discipline Approval	Project Approval
Signature:	<input type="text"/>	<input type="text"/>	<input type="text"/>
Name:	John Etubus	<input type="text"/>	<input type="text"/>
Title	Momentum Engineering - Process	<input type="text"/>	<input type="text"/>
Date:	<input type="text"/>	<input type="text"/>	<input type="text"/>

ACTION CLOSEOUT SHEET



Client: APA
Project Number: 21100
Project Name: East Coast Grid Expansion - MW880 Milne CS HAZOP

Action No.

Node: 8
Drawings: MWP.MILN-DWG-Q-0010; MWP.MILN-DWG-Q-0011; MWP.MILN-DWG-Q-0012.
Preliminary HAZOP. Refer Vendor Packages HAZOP Strategy.
Guideword: Low Flow/Low Level

Cause/Issue:
Misalignment of valves.

Consequence:
AS ABOVE

Safeguard:
Valve limit switches on actuated valves.

Action:
Manual valves in the flow path to be provided with lockable tabs.

Responsibility
Christopher Daines

Closeout Response (Attach all relevant supporting documentation.)

Signoff

	Actionee	Discipline Approval	Project Approval
Signature:	<hr/>	<hr/>	<hr/>
Name:	Christopher Daines <hr/>	<hr/>	<hr/>
Title	Momentum Engineering Mechanical <hr/>	<hr/>	<hr/>
Date:	<hr/>	<hr/>	<hr/>

ACTION CLOSEOUT SHEET



Client: APA
Project Number: 21100
Project Name: East Coast Grid Expansion - MW880 Milne CS HAZOP

Action No. 88

Node: 8
Drawings: MWP.MILN-DWG-Q-0010; MWP.MILN-DWG-Q-0011; MWP.MILN-DWG-Q-0012.
Preliminary HAZOP. Refer Vendor Packages HAZOP Strategy.
Guideword: High Pressure

Cause/Issue:
Failure of the regulators PCV-5020 / PCV-5050 open.

Consequence:
High pressure with potential for LOC and ignition and explosion.

Safeguard:
HAZOP workshop view is that high flow will always result in high pressure due to limited volumes.
SSV-5015 and SSV-5045.
PAHH-5065.

Action:
The micro turbine vendor to advise MTM on the required rating for the flexible tubing into the micro turbine and set point for the LP fuel gas regulators slam shuts, PSV and high pressure PAH / PAHH alarms and trips as well as all the set point, alarms and trips for low pressure.
MTM to show correct set points on PIDs.

Responsibility
Michael Palmisano / John Etubus

Closeout Response (Attach all relevant supporting documentation.)

Signoff

	Actionee	Discipline Approval	Project Approval
Signature:	<hr/>	<hr/>	<hr/>
Name:	Michael Palmisano / John Etubus	<hr/>	<hr/>
Title	Momentum Engineering - E&I / Momentum Engineering - Process	<hr/>	<hr/>
Date:	<hr/>	<hr/>	<hr/>

ACTION CLOSEOUT SHEET



Client: APA
Project Number: 21100
Project Name: East Coast Grid Expansion - MW880 Milne CS HAZOP

Action No.

Node: 8
Drawings: MWP.MILN-DWG-Q-0010; MWP.MILN-DWG-Q-0011; MWP.MILN-DWG-Q-0012.
Preliminary HAZOP. Refer Vendor Packages HAZOP Strategy.
Guideword: Low Pressure (Including Venting)

Cause/Issue:
Rupture downstream.

Consequence:
As per NODE N8-1-1

Safeguard:
HAZOP workshop view is that rupture will always result in low pressure due to limited volumes.
PALL-6065.

Action:
Modify Note 2 on PID-Q-0011 to read "PALL-5065 will trip upstream SDV-5000".
Modify Note next to PALL-5065 to read Note 2 instead of Note 1.

Responsibility
John Etubus

Closeout Response (Attach all relevant supporting documentation.)

Signoff

	Actionee	Discipline Approval	Project Approval
Signature:	<hr/>	<hr/>	<hr/>
Name:	John Etubus	<hr/>	<hr/>
Title	Momentum Engineering - Process	<hr/>	<hr/>
Date:	<hr/>	<hr/>	<hr/>

ACTION CLOSEOUT SHEET



Client: APA
Project Number: 21100
Project Name: East Coast Grid Expansion - MW880 Milne CS HAZOP

Action No.

Node: 8
Drawings: MWP.MILN-DWG-Q-0010; MWP.MILN-DWG-Q-0011; MWP.MILN-DWG-Q-0012.
Preliminary HAZOP. Refer Vendor Packages HAZOP Strategy.
Guideword: Low Temperature

Cause/Issue:
Low gas temperature during black start with fuel gas heater not online.

Consequence:
Potential for liquids dropping out of the fuel gas.

Safeguard:
Very small volumes of gas.
Vendor confirmed low temperature fuel gas is ok for micro turbine.

Action:
Check with the micro turbine vendor if -10degC fuel gas is acceptable for micro turbines and for how long.

Responsibility

Closeout Response (Attach all relevant supporting documentation.)

Signoff

	Actionee	Discipline Approval	Project Approval
Signature:	<hr/>	<hr/>	<hr/>
Name:	Micheal Palmisano <hr/>	<hr/>	<hr/>
Title	Momentum Engineering E&I <hr/>	<hr/>	<hr/>
Date:	<hr/>	<hr/>	<hr/>

ACTION CLOSEOUT SHEET



Client: APA
Project Number: 21100
Project Name: East Coast Grid Expansion - MW880 Milne CS HAZOP

Action No.

Node: 8
Drawings: MWP.MILN-DWG-Q-0010; MWP.MILN-DWG-Q-0011; MWP.MILN-DWG-Q-0012.
Preliminary HAZOP. Refer Vendor Packages HAZOP Strategy.
Guideword: Low Temperature

Cause/Issue:
Low gas temperature during black start with fuel gas heater not online.

Consequence:
Potential for liquids dropping out of the fuel gas.

Safeguard:
Very small volumes of gas.
Vendor confirmed low temperature fuel gas is ok for micro turbine.

Action:
Review the temperature set point of TIT-5064 (high and low) once the vendor data is available.

Responsibility
Michael Palmisano / John Etubus

Closeout Response (Attach all relevant supporting documentation.)

Signoff

	Actionee	Discipline Approval	Project Approval
Signature:	<hr/>	<hr/>	<hr/>
Name:	Michael Palmisano / John Etubus	<hr/>	<hr/>
Title	Momentum Engineering - E&I / Momentum Engineering - Process	<hr/>	<hr/>
Date:	<hr/>	<hr/>	<hr/>

ACTION CLOSEOUT SHEET



Client: APA
Project Number: 21100
Project Name: East Coast Grid Expansion - MW880 Milne CS HAZOP

Action No.

Node: 8
Drawings: MWP.MILN-DWG-Q-0010; MWP.MILN-DWG-Q-0011; MWP.MILN-DWG-Q-0012.
Preliminary HAZOP. Refer Vendor Packages HAZOP Strategy.
Guideword: Low Temperature

Cause/Issue:
Low ambient temperature concurrent with plant being shut down and low temperature trip TIT-5064 set incorrectly.

Consequence:
Inability to start up the plant post shut down.

Safeguard:
NONE

Action:
Provide a bypass on the trip (approx. 10 min) for start up or remove TALL-5064.

Responsibility
John Etubus

Closeout Response (Attach all relevant supporting documentation.)

Signoff

	Actionee	Discipline Approval	Project Approval
Signature:	<hr/>	<hr/>	<hr/>
Name:	John Etubus	<hr/>	<hr/>
Title	Momentum Engineering - Process	<hr/>	<hr/>
Date:	<hr/>	<hr/>	<hr/>

ACTION CLOSEOUT SHEET



Client: APA
Project Number: 21100
Project Name: East Coast Grid Expansion - MW880 Milne CS HAZOP

Action No.

Node: 8
Drawings: MWP.MILN-DWG-Q-0010; MWP.MILN-DWG-Q-0011; MWP.MILN-DWG-Q-0012.
Preliminary HAZOP. Refer Vendor Packages HAZOP Strategy.
Guideword: Plant Items Operable/Maintainable

Cause/Issue:
TAHH-5064 has not been claimed as a safeguard.

Consequence:
Spurious trip.

Safeguard:
NONE

Action:
Remove TAH / TAHH-5064, maximum fuel gas design temperature confirmed at TBC by micro turbine vendor.
Check that all the equipment is rated for the water bath high temperature trip.

Responsibility
Michael Palmisano / John Etubus

Closeout Response (Attach all relevant supporting documentation.)

Signoff

	Actionee	Discipline Approval	Project Approval
Signature:	<hr/>	<hr/>	<hr/>
Name:	Michael Palmisano / John Etubus	<hr/>	<hr/>
Title	Momentum Engineering - E&I / Momentum Engineering - Process	<hr/>	<hr/>
Date:	<hr/>	<hr/>	<hr/>

ACTION CLOSEOUT SHEET



Client: APA
Project Number: 21100
Project Name: East Coast Grid Expansion - MW880 Milne CS HAZOP

Action No. 94

Node: 8
Drawings: MWP.MILN-DWG-Q-0010; MWP.MILN-DWG-Q-0011; MWP.MILN-DWG-Q-0012.
Preliminary HAZOP. Refer Vendor Packages HAZOP Strategy.
Guideword: Plant Items Operable/Maintainable

Cause/Issue:
Incorrect depiction of symbols /signals on PID-Q-0012 control room section.

Consequence:
Unclear operation of plant.

Safeguard:
Drawing is on HOLD.

Action:
1. Only depict safety instrument systems (SIS) for those functions declared by APA LOPA.
2. Mod BUS link to state "To SCS".

Responsibility
Michael Palmisano / John Etubus

Closeout Response (Attach all relevant supporting documentation.)

Signoff

	Actionee	Discipline Approval	Project Approval
Signature:	_____	_____	_____
Name:	Michael Palmisano / John Etubus	_____	_____
Title	Momentum Engineering - E&I / Momentum Engineering - Process	_____	_____
Date:	_____	_____	_____

ACTION CLOSEOUT SHEET



Client: APA
Project Number: 21100
Project Name: East Coast Grid Expansion - MW880 Milne CS HAZOP

Action No.

Node: 8
Drawings: MWP.MILN-DWG-Q-0010; MWP.MILN-DWG-Q-0011; MWP.MILN-DWG-Q-0012.
Preliminary HAZOP. Refer Vendor Packages HAZOP Strategy.
Guideword: Electrical Area Classification/Isolation/Earthing

Cause/Issue:
Insufficient earthing for flexible connections or lack of electrical continuity.

Consequence:
Potential for ignition.

Safeguard:
NONE

Action:
Confirming if any special earthing requirements around flexible connection next to micro turbine connection.

Responsibility
Micheal Palmisano

Closeout Response (Attach all relevant supporting documentation.)

Signoff

	Actionee	Discipline Approval	Project Approval
Signature:	<hr/>	<hr/>	<hr/>
Name:	Micheal Palmisano	<hr/>	<hr/>
Title	Momentum Engineering E&I	<hr/>	<hr/>
Date:	<hr/>	<hr/>	<hr/>

ACTION CLOSEOUT SHEET



Client: APA
Project Number: 21100
Project Name: East Coast Grid Expansion - MW880 Milne CS HAZOP

Action No.

Node: 8
Drawings: MWP.MILN-DWG-Q-0010; MWP.MILN-DWG-Q-0011; MWP.MILN-DWG-Q-0012.
Preliminary HAZOP. Refer Vendor Packages HAZOP Strategy.
Guideword: General

Cause/Issue:
Filter vessel F-5060 is not protected by fire pressure relief as required by the pressure vessel code.

Consequence:
Code non-compliance.

Safeguard:
NONE

Action:
Establish whether F-2685 is a pressure vessel or not and add fire case PSV if it is a pressure vessel.

Responsibility
John Etubus

Closeout Response (Attach all relevant supporting documentation.)

Signoff

	Actionee	Discipline Approval	Project Approval
Signature:	<hr/>	<hr/>	<hr/>
Name:	John Etubus	<hr/>	<hr/>
Title	Momentum Engineering - Process	<hr/>	<hr/>
Date:	<hr/>	<hr/>	<hr/>

ACTION CLOSEOUT SHEET



Client: APA
Project Number: 21100
Project Name: East Coast Grid Expansion - MW880 Milne CS HAZOP

Action No.

Node: 8
Drawings: MWP.MILN-DWG-Q-0010; MWP.MILN-DWG-Q-0011; MWP.MILN-DWG-Q-0012.
Preliminary HAZOP. Refer Vendor Packages HAZOP Strategy.
Guideword: General

Cause/Issue:
The filter coalescer F-5060 may not be required.

Consequence:
Unnecessary equipment.

Safeguard:
NONE

Action:
Investigate with the micro turbine Vendor if filter coalescer F-5060 is required immediately before the micro turbine given there is already one filter coalescer upstream of both pressure cuts (HP /LP).

Responsibility
Micheal Palmisano

Closeout Response (Attach all relevant supporting documentation.)

Signoff

	Actionee	Discipline Approval	Project Approval
Signature:	<hr/>	<hr/>	<hr/>
Name:	Micheal Palmisano	<hr/>	<hr/>
Title	Momentum Engineering E&I	<hr/>	<hr/>
Date:	<hr/>	<hr/>	<hr/>

ACTION CLOSEOUT SHEET



Client: APA
Project Number: 21100
Project Name: East Coast Grid Expansion - MW880 Milne CS HAZOP

Action No.

Node: 8
Drawings: MWP.MILN-DWG-Q-0010; MWP.MILN-DWG-Q-0011; MWP.MILN-DWG-Q-0012.
Preliminary HAZOP. Refer Vendor Packages HAZOP Strategy.
Guideword: General

Cause/Issue:
Thermowell, temperature element, size and rating not shown on the PID on TIT-5064.

Consequence:
Incorrect depiction of equipment.

Safeguard:
NONE

Action:
Show the thermowell, temperature element, size and rating on the PID on TIT-5064 as well as the correct installation detail in 50 NB piping.

Responsibility

Closeout Response (Attach all relevant supporting documentation.)

Signoff

	Actionee	Discipline Approval	Project Approval
Signature:	<input type="text"/>	<input type="text"/>	<input type="text"/>
Name:	John Etubus	<input type="text"/>	<input type="text"/>
Title	Momentum Engineering - Process	<input type="text"/>	<input type="text"/>
Date:	<input type="text"/>	<input type="text"/>	<input type="text"/>

ACTION CLOSEOUT SHEET



Client: APA
Project Number: 21100
Project Name: East Coast Grid Expansion - MW880 Milne CS HAZOP

Action No.

Node: 8
Drawings: MWP.MILN-DWG-Q-0010; MWP.MILN-DWG-Q-0011; MWP.MILN-DWG-Q-0012.
Preliminary HAZOP. Refer Vendor Packages HAZOP Strategy.
Guideword: General

Cause/Issue:
Thermowell temperature element can be affected by the RO in flow element FE-5070.

Consequence:
Potential failure of the thermowell due to high stresses.

Safeguard:
NONE

Action:
Provide minimum 6D separation between FE-5070 and TIT-5064.
Add note on the PID.

Responsibility
John Etubus

Closeout Response (Attach all relevant supporting documentation.)

Signoff

	Actionee	Discipline Approval	Project Approval
Signature:	<hr/>	<hr/>	<hr/>
Name:	John Etubus	<hr/>	<hr/>
Title	Momentum Engineering - Process	<hr/>	<hr/>
Date:	<hr/>	<hr/>	<hr/>

ACTION CLOSEOUT SHEET



Client: APA
Project Number: 21100
Project Name: East Coast Grid Expansion - MW880 Milne CS HAZOP

Action No.

Node: 8
Drawings: MWP.MILN-DWG-Q-0010; MWP.MILN-DWG-Q-0011; MWP.MILN-DWG-Q-0012.
Preliminary HAZOP. Refer Vendor Packages HAZOP Strategy.
Guideword: General

Cause/Issue:
Slam shut SSV-5015 or SSV-5045 trips leads to call out on site.

Consequence:
Potentially unnecessary call out.

Safeguard:
NONE

Action:
Consider whether a remote or automatic reset of slam shut by IOC should be implemented.

Responsibility
Caroline Button

Closeout Response (Attach all relevant supporting documentation.)

Signoff

	Actionee	Discipline Approval	Project Approval
Signature:	<hr/>	<hr/>	<hr/>
Name:	Caroline Button	<hr/>	<hr/>
Title	APA-Team Lead Process&Pipeline Engineering	<hr/>	<hr/>
Date:	<hr/>	<hr/>	<hr/>

ACTION CLOSEOUT SHEET



Client: APA
Project Number: 21100
Project Name: East Coast Grid Expansion - MW880 Milne CS HAZOP

Action No.

Node: 8
Drawings: MWP.MILN-DWG-Q-0010; MWP.MILN-DWG-Q-0011; MWP.MILN-DWG-Q-0012.
Preliminary HAZOP. Refer Vendor Packages HAZOP Strategy.
Guideword: General

Cause/Issue:
Unnecessary functionality by having open and close signals to SSVs.

Consequence:
Potential unnecessary complexity.

Safeguard:
NONE

Action:
Consider whether a remote open or close operation of slam shut is required by IOC.

Responsibility

Closeout Response (Attach all relevant supporting documentation.)

Signoff

	Actionee	Discipline Approval	Project Approval
Signature:	<input type="text"/>	<input type="text"/>	<input type="text"/>
Name:	<input type="text" value="Caroline Button"/>	<input type="text"/>	<input type="text"/>
Title	<input type="text" value="APA-Team Lead
Process&Pipeline
Engineering"/>	<input type="text"/>	<input type="text"/>
Date:	<input type="text"/>	<input type="text"/>	<input type="text"/>

ACTION CLOSEOUT SHEET



Client: APA
Project Number: 21100
Project Name: East Coast Grid Expansion - MW880 Milne CS HAZOP

Action No.

Node: 8
Drawings: MWP.MILN-DWG-Q-0010; MWP.MILN-DWG-Q-0011; MWP.MILN-DWG-Q-0012.
Preliminary HAZOP. Refer Vendor Packages HAZOP Strategy.
Guideword: General

Cause/Issue:
Different configuration of pneumatic lines going to the actuators of SSV-5015 / SSV-5045 is incorrect.

Consequence:
Incorrect depiction of equipment which is not rated for 4,000 kPa.

Safeguard:
NONE

Action:
Show the correct lines going into the SSV actuators SSV-5015 / SSV-5045 and show the correct equipment and functionality desired for the two slam shut valves.

Responsibility
Michael Palmisano / John Etubus

Closeout Response (Attach all relevant supporting documentation.)

Signoff

	Actionee	Discipline Approval	Project Approval
Signature:	<hr/>	<hr/>	<hr/>
Name:	Michael Palmisano / John Etubus	<hr/>	<hr/>
Title	Momentum Engineering - E&I / Momentum Engineering - Process	<hr/>	<hr/>
Date:	<hr/>	<hr/>	<hr/>

ACTION CLOSEOUT SHEET



Client: APA
Project Number: 21100
Project Name: East Coast Grid Expansion - MW880 Milne CS HAZOP

Action No.

Node: 11
Drawings: MWP.MILN-DWG-Q-0013; MWP.MILN-DWG-Q-0014; MWP.MILN-DWG-Q-0008.
Guideword: Low Flow/Low Level

Cause/Issue:
Air compressors not running.

Consequence:
Restriction of / no supply to consumer.

Safeguard:
2 x 100% air compressors (duty and stand by).
Instrument Air receiver to supply for 20 min.

Action:
Facility to hold air bottles for start up.
Add a note on the PID.

Responsibility

Closeout Response (Attach all relevant supporting documentation.)

Signoff

	Actionee	Discipline Approval	Project Approval
Signature:	<input type="text"/>	<input type="text"/>	<input type="text"/>
Name:	<input type="text" value="John Etubus"/>	<input type="text"/>	<input type="text"/>
Title	<input type="text" value="Momentum Engineering - Process"/>	<input type="text"/>	<input type="text"/>
Date:	<input type="text"/>	<input type="text"/>	<input type="text"/>

ACTION CLOSEOUT SHEET



Client: APA
Project Number: 21100
Project Name: East Coast Grid Expansion - MW880 Milne CS HAZOP

Action No.

Node: 11
Drawings: MWP.MILN-DWG-Q-0013; MWP.MILN-DWG-Q-0014; MWP.MILN-DWG-Q-0008.
Guideword: High Pressure

Cause/Issue:
PCV-2710 / PCV-2720 fail open.

Consequence:
Potential leak or rupture in the downstream equipment and / or consumers.

Safeguard:
Self cleaning filters have their own PSV.
Air to fire damper has its own regulation and PCV.
Actuated valves local instrument panels have their own PSV.
PAH-2720 and PAHH-2720.
PSV-2701 on V-2701 set at 1400 kPa.
All instrument air piping is Class 150.

Action:
Modify note 1 on PID-Q-0014 to explicitly state "gas compressor C-2200".
Modify note 2 on PID-Q-0014 to trip the Air compressor only.

Responsibility

Closeout Response (Attach all relevant supporting documentation.)

Signoff

	Actionee	Discipline Approval	Project Approval
Signature:	<input type="text"/>	<input type="text"/>	<input type="text"/>
Name:	<input type="text" value="John Etubus"/>	<input type="text"/>	<input type="text"/>
Title	<input type="text" value="Momentum Engineering - Process"/>	<input type="text"/>	<input type="text"/>
Date:	<input type="text"/>	<input type="text"/>	<input type="text"/>

ACTION CLOSEOUT SHEET



Client: APA
Project Number: 21100
Project Name: East Coast Grid Expansion - MW880 Milne CS HAZOP

Action No.

Node: 11
Drawings: MWP.MILN-DWG-Q-0013; MWP.MILN-DWG-Q-0014; MWP.MILN-DWG-Q-0008.
Guideword: Low Pressure (Including Venting)

Cause/Issue:
Various (e.g. Rupture, blockages and valve misalignment).

Consequence:
Restriction of supply to consumers.

Safeguard:
PAL-2720 and PALL-2720.
PAL-2518.
All safety devices are fail safe on loss of instrument air.

Action:
Confirm with Solar that the enclosure fire dampers are de-energised to close (fail safe).

Responsibility

Closeout Response (Attach all relevant supporting documentation.)

Signoff

	Actionee	Discipline Approval	Project Approval
Signature:	<input type="text"/>	<input type="text"/>	<input type="text"/>
Name:	<input type="text" value="Kevin Martin"/>	<input type="text"/>	<input type="text"/>
Title	<input type="text" value="APA-Senior Rotating Engineer"/>	<input type="text"/>	<input type="text"/>
Date:	<input type="text"/>	<input type="text"/>	<input type="text"/>

ACTION CLOSEOUT SHEET



Client: APA
Project Number: 21100
Project Name: East Coast Grid Expansion - MW880 Milne CS HAZOP

Action No.

Node: 11
Drawings: MWP.MILN-DWG-Q-0013; MWP.MILN-DWG-Q-0014; MWP.MILN-DWG-Q-0008.
Guideword: Plant Items Operable/Maintainable

Cause/Issue:
Insufficient data sent to SCADA.

Consequence:
Insufficient data to operate package equipment.

Safeguard:
NONE

Action:
Air compressor vendor battery limits to include interface data.

Responsibility
Michael Palmisano / Sohail Hameed

Closeout Response (Attach all relevant supporting documentation.)

Signoff

	Actionee	Discipline Approval	Project Approval
Signature:	<hr/>	<hr/>	<hr/>
Name:	Michael Palmisano / Sohail Hameed <hr/>	<hr/>	<hr/>
Title	Momentum Engineering - E&I / APA - Senior E&IC Engineer <hr/>	<hr/>	<hr/>
Date:	<hr/>	<hr/>	<hr/>

ACTION CLOSEOUT SHEET



Client: APA
Project Number: 21100
Project Name: East Coast Grid Expansion - MW880 Milne CS HAZOP

Action No.

Node: 14
Drawings: MWP.MILN-DWG-Q-0008.
Guideword: High Flow/High Level

Cause/Issue:
High flow received from the package.

Consequence:
Potential Vibration in the piping.

Safeguard:
Provided in Package.

Action:
Confirm there is a safeguard for high flow in the package.

Responsibility
Kevin Martin

Closeout Response (Attach all relevant supporting documentation.)

Signoff

	Actionee	Discipline Approval	Project Approval
Signature:	<hr/>	<hr/>	<hr/>
Name:	Kevin Martin	<hr/>	<hr/>
Title	APA-Senior Rotating Engineer	<hr/>	<hr/>
Date:	<hr/>	<hr/>	<hr/>

ACTION CLOSEOUT SHEET



Client: APA
Project Number: 21100
Project Name: East Coast Grid Expansion - MW880 Milne CS HAZOP

Action No.

Node: 14
Drawings: MWP.MILN-DWG-Q-0008.
Guideword: High Flow/High Level

Cause/Issue:
High flow received from the package.

Consequence:
Potential Vibration in the piping.

Safeguard:
Provided in Package.

Action:
APA to confirm the maximum oil flowrate for the oil cooler package.
Process to verify that the maximum velocity given by the package will not result in vibration in the piping.

Responsibility
Kevin Martin / John Etubus

Closeout Response (Attach all relevant supporting documentation.)

Signoff

	Actionee	Discipline Approval	Project Approval
Signature:	<hr/>	<hr/>	<hr/>
Name:	Kevin Martin / John Etubus <hr/>	<hr/>	<hr/>
Title	APA - Senior Rotating Engineer / Momentum Engineering - Process <hr/>	<hr/>	<hr/>
Date:	<hr/>	<hr/>	<hr/>

ACTION CLOSEOUT SHEET



Client: APA
Project Number: 21100
Project Name: East Coast Grid Expansion - MW880 Milne CS HAZOP

Action No.

Node: 14
Drawings: MWP.MILN-DWG-Q-0008.
Guideword: Low Flow/Low Level

Cause/Issue:
Pinhole leak in piping.

Consequence:
LOC and ignition of hot oil mist.

Safeguard:
No ignition sources present in the area.

Action:
Consider zoning around piping associated with oil cooler to remove possible sources of ignition.

Responsibility

Closeout Response (Attach all relevant supporting documentation.)

Signoff

	Actionee	Discipline Approval	Project Approval
Signature:	<hr/>	<hr/>	<hr/>
Name:	Sohail Hameed <hr/>	<hr/>	<hr/>
Title	Senior E&IC Engineer <hr/>	<hr/>	<hr/>
Date:	<hr/>	<hr/>	<hr/>

ACTION CLOSEOUT SHEET



Client: APA
Project Number: 21100
Project Name: East Coast Grid Expansion - MW880 Milne CS HAZOP

Action No.

Node: 14
Drawings: MWP.MILN-DWG-Q-0008.
Guideword: High Pressure

Cause/Issue:
High pressure received from the package.

Consequence:
Piping and equipment failure.

Safeguard:
Provided in Package.

Action:
Confirm there is a safeguard for high pressure in the package.

Responsibility

Closeout Response (Attach all relevant supporting documentation.)

Signoff

	Actionee	Discipline Approval	Project Approval
Signature:	<input type="text"/>	<input type="text"/>	<input type="text"/>
Name:	<input type="text" value="Kevin Martin"/>	<input type="text"/>	<input type="text"/>
Title	<input type="text" value="APA-Senior Rotating Engineer"/>	<input type="text"/>	<input type="text"/>
Date:	<input type="text"/>	<input type="text"/>	<input type="text"/>

ACTION CLOSEOUT SHEET



Client: APA
Project Number: 21100
Project Name: East Coast Grid Expansion - MW880 Milne CS HAZOP

Action No.

Node: 14
Drawings: MWP.MILN-DWG-Q-0008.
Guideword: High Temperature

Cause/Issue:
No significant concern.

Consequence:

Safeguard:

Action:
Confirm the maximum temperature coming from the package.

Responsibility

Closeout Response (Attach all relevant supporting documentation.)

Signoff

	Actionee	Discipline Approval	Project Approval
Signature:	<input type="text"/>	<input type="text"/>	<input type="text"/>
Name:	Kevin Martin	<input type="text"/>	<input type="text"/>
Title	APA-Senior Rotating Engineer	<input type="text"/>	<input type="text"/>
Date:	<input type="text"/>	<input type="text"/>	<input type="text"/>

ACTION CLOSEOUT SHEET



Client: APA
Project Number: 21100
Project Name: East Coast Grid Expansion - MW880 Milne CS HAZOP

Action No.

Node: 14
Drawings: MWP.MILN-DWG-Q-0008.
Guideword: Contamination / Impurities/Solids

Cause/Issue:
Construction debris and weld splatter.

Consequence:
potential damage to equipment inside the package (i.e. pump)

Safeguard:
NONE

Action:
SOW to include cleaning procedure for the oil piping post welding and construction during detailed design.

Responsibility
Christopher Daines

Closeout Response (Attach all relevant supporting documentation.)

Signoff

	Actionee	Discipline Approval	Project Approval
Signature:	<hr/>	<hr/>	<hr/>
Name:	Christopher Daines <hr/>	<hr/>	<hr/>
Title	Momentum Engineering Mechanical <hr/>	<hr/>	<hr/>
Date:	<hr/>	<hr/>	<hr/>

ACTION CLOSEOUT SHEET



Client: APA
Project Number: 21100
Project Name: East Coast Grid Expansion - MW880 Milne CS HAZOP

Action No.

Node: 18
Drawings: MWP.MILN-DWG-Q-0020
Guideword: High Level

Cause/Issue:
Overfilling of T-1701/02/03.

Consequence:
Water carry over to outside of compound.

Safeguard:
Float valves installed on inlet.

Action:
Install a local level gauge indicator on T-1701/02/03.

Responsibility
John Etubus

Closeout Response (Attach all relevant supporting documentation.)

Signoff

	Actionee	Discipline Approval	Project Approval
Signature:	<hr/>	<hr/>	<hr/>
Name:	John Etubus	<hr/>	<hr/>
Title	Momentum Engineering - Process	<hr/>	<hr/>
Date:	<hr/>	<hr/>	<hr/>

ACTION CLOSEOUT SHEET



Client: APA
Project Number: 21100
Project Name: East Coast Grid Expansion - MW880 Milne CS HAZOP

Action No.

Node: 18
Drawings: MWP.MILN-DWG-Q-0020
Guideword: Low Flow/Low Level

Cause/Issue:
Pump can empty the tank completely.
Low level in T-1701/02/03.

Consequence:
Low water flow or no water available.
Pump cavitation and motor heating.

Safeguard:
NONE

Action:
Install a local level gauge on T-1701/02/03 with a low level switch to interlock pump P-1706.

Responsibility

Closeout Response (Attach all relevant supporting documentation.)

Signoff

	Actionee	Discipline Approval	Project Approval
Signature:	<input type="text"/>	<input type="text"/>	<input type="text"/>
Name:	<input type="text" value="John Etubus"/>	<input type="text"/>	<input type="text"/>
Title	<input type="text" value="Momentum Engineering - Process"/>	<input type="text"/>	<input type="text"/>
Date:	<input type="text"/>	<input type="text"/>	<input type="text"/>

ACTION CLOSEOUT SHEET



Client: APA
Project Number: 21100
Project Name: East Coast Grid Expansion - MW880 Milne CS HAZOP

Action No.

Node: 18
Drawings: MWP.MILN-DWG-Q-0020
Guideword: High Pressure

Cause/Issue:
Dead heading the pump P-1706 by closing valves downstream.

Consequence:
Potential for high pressure.

Safeguard:
Pump is centrifugal therefore is dead headed.
The downstream piping rate higher than the max discharge pressure.
Pressure switch on pump P-1706

Action:
Confirm the piping specifications downstream of the pump is rated higher than the maximum head the pump is capable of providing.

Responsibility

Closeout Response (Attach all relevant supporting documentation.)

Signoff

	Actionee	Discipline Approval	Project Approval
Signature:	<input type="text"/>	<input type="text"/>	<input type="text"/>
Name:	John Etubus	<input type="text"/>	<input type="text"/>
Title	Momentum Engineering - Process	<input type="text"/>	<input type="text"/>
Date:	<input type="text"/>	<input type="text"/>	<input type="text"/>

ACTION CLOSEOUT SHEET



Client: APA
Project Number: 21100
Project Name: East Coast Grid Expansion - MW880 Milne CS HAZOP

Action No.

Node: 18
Drawings: MWP.MILN-DWG-Q-0020
Guideword: Low Pressure (Including Venting)

Cause/Issue:
Demand higher than supply.

Consequence:
Pressure drop in outlet header.

Safeguard:
High demand will always result in low pressure.
Refer low pressure safeguards.

Action:
Discharge pressure measurement required to be shown starting pump P-1706.

Responsibility

Closeout Response (Attach all relevant supporting documentation.)

Signoff

	Actionee	Discipline Approval	Project Approval
Signature:	<input type="text"/>	<input type="text"/>	<input type="text"/>
Name:	<input type="text" value="John Etubus"/>	<input type="text"/>	<input type="text"/>
Title	<input type="text" value="Momentum Engineering - Process"/>	<input type="text"/>	<input type="text"/>
Date:	<input type="text"/>	<input type="text"/>	<input type="text"/>

ACTION CLOSEOUT SHEET



Client: APA
Project Number: 21100
Project Name: East Coast Grid Expansion - MW880 Milne CS HAZOP

Action No.

Node: 18
Drawings: MWP.MILN-DWG-Q-0020
Guideword: High Temperature

Cause/Issue:
Overheating of pump P-1706 due to lack of fluid.

Consequence:
Damage to the pump P-1706.

Safeguard:
NONE

Action:
Consider minimum flow bypass around P-1706.

Responsibility
John Etubus / Christopher Daines

Closeout Response (Attach all relevant supporting documentation.)

Signoff

	Actionee	Discipline Approval	Project Approval
Signature:	<hr/>	<hr/>	<hr/>
Name:	John Etubus / Christopher Daines <hr/>	<hr/>	<hr/>
Title	Momentum Engineering - Process / Momentum Engineering Mechanical <hr/>	<hr/>	<hr/>
Date:	<hr/>	<hr/>	<hr/>

ACTION CLOSEOUT SHEET



Client: APA
Project Number: 21100
Project Name: East Coast Grid Expansion - MW880 Milne CS HAZOP

Action No.

Node: 18
Drawings: MWP.MILN-DWG-Q-0020
Guideword: Low Temperature

Cause/Issue:
Low ambient temperatures leading water freezing - the ambient minimum temperature at Milne identified to reach -8degC.

Consequence:
Piping blockage.
Water is not available to some consumers (e.g. safety showers).

Safeguard:
Unmanned facility, no night time work is expected.
No significant consequences identified.

Action:
Consider providing insulation for critical water systems e.g. safety showers / eye washes to offset the low ambient temperature.

Responsibility

Closeout Response (Attach all relevant supporting documentation.)

Signoff

	Actionee	Discipline Approval	Project Approval
Signature:	<hr/>	<hr/>	<hr/>
Name:	John Etubus		
Title	Momentum Engineering - Process		
Date:	<hr/>	<hr/>	<hr/>

ACTION CLOSEOUT SHEET



Client: APA
Project Number: 21100
Project Name: East Coast Grid Expansion - MW880 Milne CS HAZOP

Action No.

Node: 18
Drawings: MWP.MILN-DWG-Q-0020
Guideword: Testing Equipment/Product

Cause/Issue:
Insufficient facilities to check water suitability for drinking.

Consequence:
Potential for personal poisoning.

Safeguard:
NONE

Action:
If potable water skid is required for this site (refer action 123 ref. solutions to provide drinkable water) include in the vendor SOW a provision for testing and dosing of water quality.

Responsibility

Closeout Response (Attach all relevant supporting documentation.)

Signoff

	Actionee	Discipline Approval	Project Approval
Signature:	<input type="text"/>	<input type="text"/>	<input type="text"/>
Name:	<input type="text" value="Christopher Daines"/>	<input type="text"/>	<input type="text"/>
Title	<input type="text" value="Momentum Engineering
Mechanical"/>	<input type="text"/>	<input type="text"/>
Date:	<input type="text"/>	<input type="text"/>	<input type="text"/>

ACTION CLOSEOUT SHEET



Client: APA
Project Number: 21100
Project Name: East Coast Grid Expansion - MW880 Milne CS HAZOP

Action No.

Node: 18
Drawings: MWP.MILN-DWG-Q-0020
Guideword: Testing Equipment/Product

Cause/Issue:
Insufficient facilities to check water quality for spraying equipment, safety showers, etc.

Consequence:
Potential for damage to equipment.

Safeguard:
NONE

Action:
Provide a water testing and dosing (or UV light protection) program for the water used in facilities.

Responsibility
Peyman Orangi

Closeout Response (Attach all relevant supporting documentation.)

Signoff

	Actionee	Discipline Approval	Project Approval
Signature:	<hr/>	<hr/>	<hr/>
Name:	Peyman Orangi <hr/>	<hr/>	<hr/>
Title	APA-Team Lead Bid Support <hr/>	<hr/>	<hr/>
Date:	<hr/>	<hr/>	<hr/>

ACTION CLOSEOUT SHEET



Client: APA
Project Number: 21100
Project Name: East Coast Grid Expansion - MW880 Milne CS HAZOP

Action No.

Node: 18
Drawings: MWP.MILN-DWG-Q-0020
Guideword: Plant Items Operable/Maintainable

Cause/Issue:
No significant concern.

Consequence:

Safeguard:

Action:
PID symbology to show pressure switch ON/OFF pump control and tank tank level switch interlock as vendor supply local control as opposed to station control system (tank LALL proposed to be sent to station control system and IOC).

Responsibility

Closeout Response (Attach all relevant supporting documentation.)

Signoff

	Actionee	Discipline Approval	Project Approval
Signature:	<input type="text"/>	<input type="text"/>	<input type="text"/>
Name:	John Etubus / Michael Palmisano	<input type="text"/>	<input type="text"/>
Title	Momentum Engineering - Process / Momentum Engineering E&I	<input type="text"/>	<input type="text"/>
Date:	<input type="text"/>	<input type="text"/>	<input type="text"/>

ACTION CLOSEOUT SHEET



Client: APA
Project Number: 21100
Project Name: East Coast Grid Expansion - MW880 Milne CS HAZOP

Action No.

Node: 18
Drawings: MWP.MILN-DWG-Q-0020
Guideword: General

Cause/Issue:
Water for personal accommodation not shown on PID.

Consequence:
No water to the accommodation.

Safeguard:
NONE

Action:
Show water to Accommodation as a water consumer on the PID.

Responsibility
John Etubus

Closeout Response (Attach all relevant supporting documentation.)

Signoff

	Actionee	Discipline Approval	Project Approval
Signature:	<hr/>	<hr/>	<hr/>
Name:	John Etubus	<hr/>	<hr/>
Title	Momentum Engineering - Process	<hr/>	<hr/>
Date:	<hr/>	<hr/>	<hr/>

ACTION CLOSEOUT SHEET



Client: APA
Project Number: 21100
Project Name: East Coast Grid Expansion - MW880 Milne CS HAZOP

Action No.

Node: 18
Drawings: MWP.MILN-DWG-Q-0020
Guideword: General

Cause/Issue:
Water in this system is not potable at this time.

Consequence:
Poisoning workers.

Safeguard:
NONE

Action:
Project to identify solutions to provide clean drinking water and water use for kitchen and showers based on a water quality report for the water source on site provide by APA.

Responsibility
John Etubus / Bart Calvert

Closeout Response (Attach all relevant supporting documentation.)

Signoff

	Actionee	Discipline Approval	Project Approval
Signature:	<hr/>	<hr/>	<hr/>
Name:	John Etubus / Bart Calvert	<hr/>	<hr/>
Title	Momentum Engineering - Process / APA - Engineering Bid Manager	<hr/>	<hr/>
Date:	<hr/>	<hr/>	<hr/>

ACTION CLOSEOUT SHEET



Client: APA
Project Number: 21100
Project Name: East Coast Grid Expansion - MW880 Milne CS HAZOP

Action No.

Node: 18
Drawings: MWP.MILN-DWG-Q-0020
Guideword: General

Cause/Issue:
Water in this system is not potable at this time.

Consequence:
Poisoning workers.

Safeguard:
NONE

Action:
Project to clearly separate and segregate and tag the potable water outlets / consumers and non-potable water outlets / consumers.

Responsibility
John Etubus / Bart Calvert

Closeout Response (Attach all relevant supporting documentation.)

Signoff

	Actionee	Discipline Approval	Project Approval
Signature:	<hr/>	<hr/>	<hr/>
Name:	John Etubus / Bart Calvert	<hr/>	<hr/>
Title	Momentum Engineering - Process / APA - Engineering Bid Manager	<hr/>	<hr/>
Date:	<hr/>	<hr/>	<hr/>

ACTION CLOSEOUT SHEET



Client: APA
Project Number: 21100
Project Name: East Coast Grid Expansion - MW880 Milne CS HAZOP

Action No.

Node: 18
Drawings: MWP.MILN-DWG-Q-0020
Guideword: General

Cause/Issue:
Water in this system is not compliant with Solar specification.

Consequence:
Potential damage to Solar equipment.

Safeguard:
NONE

Action:
Project to confirm water quality requirements from Solar and provide complaint source of water.

Responsibility
Kevin Martin / Bart Calvert

Closeout Response (Attach all relevant supporting documentation.)

Signoff

	Actionee	Discipline Approval	Project Approval
Signature:	<hr/>	<hr/>	<hr/>
Name:	Kevin Martin / Bart Calvert	<hr/>	<hr/>
Title	APA - Senior Rotating Engineer / APA - Engineering Bid Manager	<hr/>	<hr/>
Date:	<hr/>	<hr/>	<hr/>

ACTION CLOSEOUT SHEET



Client: APA
Project Number: 21100
Project Name: East Coast Grid Expansion - MW880 Milne CS HAZOP

Action No.

Node: 18
Drawings: MWP.MILN-DWG-Q-0020
Guideword: General

Cause/Issue:
Safety showers/eye wash stations not shown on this station.

Consequence:
Inability to shower in case of hazardous liquids spillage.

Safeguard:
NONE

Action:
Project to run risk assessment and identify whether safety showers and eye wash stations are required on this site.

Responsibility
Peyman Orangi

Closeout Response (Attach all relevant supporting documentation.)

Signoff

	Actionee	Discipline Approval	Project Approval
Signature:	<hr/>	<hr/>	<hr/>
Name:	Peyman Orangi <hr/>	<hr/>	<hr/>
Title	APA-Team Lead Bid Support <hr/>	<hr/>	<hr/>
Date:	<hr/>	<hr/>	<hr/>

ACTION CLOSEOUT SHEET



Client: APA
Project Number: 21100
Project Name: East Coast Grid Expansion - MW880 Milne CS HAZOP

Action No.

Node: 18
Drawings: MWP.MILN-DWG-Q-0020
Guideword: General

Cause/Issue:
Thermal release on safety showers/eye wash stations draining the water out of the station.

Consequence:
Water not available.

Safeguard:
NONE

Action:
If safety showers / eye wash station are required, design a thermal relief system in such a way that water wastage is not creditable, APA / MTM to provide review of the vendor proposed system.

Responsibility
Peyman Orangi

Closeout Response (Attach all relevant supporting documentation.)

Signoff

	Actionee	Discipline Approval	Project Approval
Signature:	<hr/>	<hr/>	<hr/>
Name:	Peyman Orangi <hr/>	<hr/>	<hr/>
Title	APA-Team Lead Bid Support <hr/>	<hr/>	<hr/>
Date:	<hr/>	<hr/>	<hr/>

ACTION CLOSEOUT SHEET



Client: APA
Project Number: 21100
Project Name: East Coast Grid Expansion - MW880 Milne CS HAZOP

Action No.

Node: 18
Drawings: MWP.MILN-DWG-Q-0020
Guideword: General

Cause/Issue:
No signal to IOC is show in regards to tank level.

Consequence:
Inability to remotely alert IOC operators of the low level in T-1701 /02/03.

Safeguard:
NONE

Action:
Review the need for tank level to be sent to IOC by SCADA.

Responsibility
Peyman Orangi / Sohail Hameed

Closeout Response (Attach all relevant supporting documentation.)

Signoff

	Actionee	Discipline Approval	Project Approval
Signature:	<hr/>	<hr/>	<hr/>
Name:	Peyman Orangi / Sohail Hameed <hr/>	<hr/>	<hr/>
Title	APA -Team Lead Bid Support / APA - Senior E&IC Engineer <hr/>	<hr/>	<hr/>
Date:	<hr/>	<hr/>	<hr/>

ACTION CLOSEOUT SHEET



Client: APA
Project Number: 21100
Project Name: East Coast Grid Expansion - MW880 Milne CS HAZOP

Action No.

Node: O1
Drawings: MWP.MILN-DWG-Q-0008
Guideword: Temperature

Cause/Issue:
Seal gas supply temperature outsourced from downstream of the after cooler and may result in temperature being too low.

Consequence:
Potential for dropping liquids and damage to dry gas seals.

Safeguard:
NONE

Action:
Process to provide calculations of the lowest temperature for the dry gas seals and align with Solar's specification, provide additional heating for liquid removal if any hazard of noncompliance has been identified. Alternative seal gas sources may be considered if required.

Responsibility
John Etubus / Kevin Martin

Closeout Response (Attach all relevant supporting documentation.)

Signoff

	Actionee	Discipline Approval	Project Approval
Signature:	<hr/>	<hr/>	<hr/>
Name:	John Etubus / Kevin Martin	<hr/>	<hr/>
Title	Momentum Engineering - Process / APA - Senior Rotating Engineer	<hr/>	<hr/>
Date:	<hr/>	<hr/>	<hr/>

ACTION CLOSEOUT SHEET



Client: APA
Project Number: 21100
Project Name: East Coast Grid Expansion - MW880 Milne CS HAZOP

Action No.

Node: O1
Drawings: MWP.MILN-DWG-Q-0008
Guideword: Flow

Cause/Issue:
Un-even distribution of the fire water over the fire enclosure.

Consequence:
Potential for inadequate compressor suppression.

Safeguard:
Two separate systems are provided, one for each half of the enclosure.

Action:
Solar to produce hydraulic calculations to show fire water distribution inside the compressor enclosure.

Responsibility

Closeout Response (Attach all relevant supporting documentation.)

Signoff

	Actionee	Discipline Approval	Project Approval
Signature:	<input type="text"/>	<input type="text"/>	<input type="text"/>
Name:	<input type="text" value="Kevin Martin"/>	<input type="text"/>	<input type="text"/>
Title	<input type="text" value="APA-Senior Rotating Engineer"/>	<input type="text"/>	<input type="text"/>
Date:	<input type="text"/>	<input type="text"/>	<input type="text"/>

ACTION CLOSEOUT SHEET



Client: APA
Project Number: 21100
Project Name: East Coast Grid Expansion - MW880 Milne CS HAZOP

Action No.

Node: O1
Drawings: MWP.MILN-DWG-Q-0008
Guideword: Plant Items Operable/Maintainable

Cause/Issue:
Nitrogen bottles associated with the fire system are of different size and height.

Consequence:
Inability to replace bottles.

Safeguard:
NONE

Action:
Provide flexible connections suitably rated for pressure to allow ease of N2 bottle replacement.

Responsibility
Kevin Martin

Closeout Response (Attach all relevant supporting documentation.)

Signoff

	Actionee	Discipline Approval	Project Approval
Signature:	<hr/>	<hr/>	<hr/>
Name:	Kevin Martin	<hr/>	<hr/>
Title	APA-Senior Rotating Engineer	<hr/>	<hr/>
Date:	<hr/>	<hr/>	<hr/>

ACTION CLOSEOUT SHEET



Client: APA
Project Number: 21100
Project Name: East Coast Grid Expansion - MW880 Milne CS HAZOP

Action No.

Node: O1
Drawings: MWP.MILN-DWG-Q-0008
Guideword: Electrical Area Classification/Isolation/Earthing

Cause/Issue:
The fire system cabinets supplied by Solar are no hazardous area rated.

Consequence:
Potential for gas ignition and explosion.

Safeguard:
NONE

Action:
project to consider design options to address constraints associated with 40degC ambient limitation on fire water cabinet equipment.

Responsibility
Micheal Palmisano

Closeout Response (Attach all relevant supporting documentation.)

Signoff

	Actionee	Discipline Approval	Project Approval
Signature:	<hr/>	<hr/>	<hr/>
Name:	Micheal Palmisano	<hr/>	<hr/>
Title	Momentum Engineering E&I	<hr/>	<hr/>
Date:	<hr/>	<hr/>	<hr/>

ACTION CLOSEOUT SHEET



Client: APA
Project Number: 21100
Project Name: East Coast Grid Expansion - MW880 Milne CS HAZOP

Action No.

Node: O2
Drawings: All P&IDs
Guideword: Backup

Cause/Issue:
Micro turbines power generation failure in the common points of failure.

Consequence:
Power is unavailable for compressor station and facilities such as accommodation block and workshop.

Safeguard:
UPS for essential systems.

Action:
Calculation to be provided regarding the capacity of the battery back up for 48 hours considering the site access time by operations and remote location.
consider alternative solutions for the power back up as per the RAM study recommendations (e.g. diesel generator).

Responsibility
Micheal Palmisano

Closeout Response (Attach all relevant supporting documentation.)

Signoff

	Actionee	Discipline Approval	Project Approval
Signature:	<hr/>	<hr/>	<hr/>
Name:	Micheal Palmisano	<hr/>	<hr/>
Title	Momentum Engineering E&I	<hr/>	<hr/>
Date:	<hr/>	<hr/>	<hr/>

ACTION CLOSEOUT SHEET



Client: APA
Project Number: 21100
Project Name: East Coast Grid Expansion - MW880 Milne CS HAZOP

Action No.

Node: O2
Drawings: All P&IDs
Guideword: Emergency Response - Planning

Cause/Issue:
Remote location.

Consequence:
Inability to respond to emergency.

Safeguard:
To be reviewed during 3D model review.

Action:
Provide an area for the safe landing of a helicopter to respond to emergencies.

Responsibility

Closeout Response (Attach all relevant supporting documentation.)

Signoff

	Actionee	Discipline Approval	Project Approval
Signature:	<input type="text"/>	<input type="text"/>	<input type="text"/>
Name:	<input type="text" value="Christopher Daines"/>	<input type="text"/>	<input type="text"/>
Title	<input type="text" value="Momentum Engineering
Mechanical"/>	<input type="text"/>	<input type="text"/>
Date:	<input type="text"/>	<input type="text"/>	<input type="text"/>

ACTION CLOSEOUT SHEET



Client: APA
Project Number: 21100
Project Name: East Coast Grid Expansion - MW880 Milne CS HAZOP

Action No.

Node: O2
Drawings: All P&IDs
Guideword: Initial Start Up/Commissioning

Cause/Issue:
Unavailability of fuel gas heater on start up.

Consequence:
Inability to start up compressor on black start.

Safeguard:
Initial options discussed for black start such as use of instrument air receiver or external compressed air in bottles.

Action:
Consider alternative options for black start of compressor station (i.e. back-up diesel generator).

Responsibility
Micheal Palmisano

Closeout Response (Attach all relevant supporting documentation.)

Signoff

	Actionee	Discipline Approval	Project Approval
Signature:	<hr/>	<hr/>	<hr/>
Name:	Micheal Palmisano <hr/>	<hr/>	<hr/>
Title	Momentum Engineering E&I <hr/>	<hr/>	<hr/>
Date:	<hr/>	<hr/>	<hr/>

ACTION CLOSEOUT SHEET



Client: APA
Project Number: 21100
Project Name: East Coast Grid Expansion - MW880 Milne CS HAZOP

Action No.

Node: O2
Drawings: All P&IDs
Guideword: Breakdown: Power Failure; Communication System; Air; Steam; Water; Vacuum; Fuel; Vents; Computer; and Other.

Cause/Issue:
Micro turbines power generation failure in the common points of failure.

Consequence:
Power is unavailable for compressor station and facilities such as accommodation block and workshop.

Safeguard:
UPS for essential systems.

Action:
Consider back up option in terms of power failure particularly to accommodation and workshop and given the remoteness of the site.

Responsibility
Peyman Orangi

Closeout Response (Attach all relevant supporting documentation.)

Signoff

	Actionee	Discipline Approval	Project Approval
Signature:	<hr/>	<hr/>	<hr/>
Name:	Peyman Orangi		
	<hr/>	<hr/>	<hr/>
Title	APA-Team Lead Bid Support		
	<hr/>	<hr/>	<hr/>
Date:	<hr/>	<hr/>	<hr/>

ACTION CLOSEOUT SHEET



Client: APA
Project Number: 21100
Project Name: East Coast Grid Expansion - MW880 Milne CS HAZOP

Action No.

Node: O2
Drawings: All P&IDs
Guideword: Electrical Safety

Cause/Issue:
Static electricity build up during the drainage of the suction scrubber F-2100.

Consequence:
Potential for gas ignition.

Safeguard:
Earthing procedures.

Action:
Signage to be provided on the drain line to state that earthing is required during drainage.
Add a note on the PID.

Responsibility
Peyman Orangi / John Etubus

Closeout Response (Attach all relevant supporting documentation.)

Signoff

	Actionee	Discipline Approval	Project Approval
Signature:	<hr/>	<hr/>	<hr/>
Name:	Peyman Orangi / John Etubus	<hr/>	<hr/>
Title	APA -Team Lead Bid Support / Momentum Engineering - Process	<hr/>	<hr/>
Date:	<hr/>	<hr/>	<hr/>

ACTION CLOSEOUT SHEET



Client: APA
Project Number: 21100
Project Name: East Coast Grid Expansion - MW880 Milne CS HAZOP

Action No.

Node: O2
Drawings: All P&IDs
Guideword: Electrical Safety

Cause/Issue:
Static electricity build up during the drainage of the suction scrubber F-2100.

Consequence:
Potential for gas ignition.

Safeguard:
Earthing procedures.

Action:
Earthing reels to be provided on site for this purpose.
Show this requirement on the earthing drawing.

Responsibility

Closeout Response (Attach all relevant supporting documentation.)

Signoff

	Actionee	Discipline Approval	Project Approval
Signature:	<input type="text"/>	<input type="text"/>	<input type="text"/>
Name:	<input type="text" value="Sohail Hameed"/>	<input type="text"/>	<input type="text"/>
Title	<input type="text" value="Senior E&IC Engineer"/>	<input type="text"/>	<input type="text"/>
Date:	<input type="text"/>	<input type="text"/>	<input type="text"/>

ACTION CLOSEOUT SHEET



Client: APA
Project Number: 21100
Project Name: East Coast Grid Expansion - MW880 Milne CS HAZOP

Action No.

Node: O2
Drawings: All P&IDs
Guideword: Safety Management Study

Cause/Issue:
Station external threats not identified.

Consequence:
Potential for personnel injury and / or non compliance AS 2885.

Safeguard:
NONE

Action:
Project to run safety management study workshop as required AS 2885.6.

Responsibility
Peyman Orangi

Closeout Response (Attach all relevant supporting documentation.)

Signoff

	Actionee	Discipline Approval	Project Approval
Signature:	<hr/>	<hr/>	<hr/>
Name:	Peyman Orangi	<hr/>	<hr/>
Title	APA-Team Lead Bid Support	<hr/>	<hr/>
Date:	<hr/>	<hr/>	<hr/>

ACTION CLOSEOUT SHEET



Client: APA
Project Number: 21100
Project Name: East Coast Grid Expansion - MW880 Milne CS HAZOP

Action No.

Node: O2
Drawings: All P&IDs
Guideword: General

Cause/Issue:
Information missing at local and remote operators.

Consequence:
Unable to attend to alarms.

Safeguard:
NONE

Action:
Create a single PID that includes all the agreeable process data that is being parsed from UCP to SCS for display on local SCADA and /or remote SCADA.

Responsibility
Sohail Hameed / Adrian Higgs

Closeout Response (Attach all relevant supporting documentation.)

Signoff

	Actionee	Discipline Approval	Project Approval
Signature:	<hr/>	<hr/>	<hr/>
Name:	Sohail Hameed / Adrian Higgs <hr/>	<hr/>	<hr/>
Title	APA - Senior E&IC Engineer / APA - Senior E&I Engineer <hr/>	<hr/>	<hr/>
Date:	<hr/>	<hr/>	<hr/>

ACTION CLOSEOUT SHEET



Client: APA
Project Number: 21100
Project Name: East Coast Grid Expansion - MW880 Milne CS HAZOP

Action No.

Node: O2
Drawings: All P&IDs
Guideword: General

Cause/Issue:

PID symbols and valve designators not in accordance with APA standard 530-WI-Q-0001.
e.g. inclusion of Valve type on all PIDs can be removed and referred to valve list.

Consequence:

Non-compliance with APA standards, potential for inconsistencies.

Safeguard:

NONE

Action:

Review PIDs in regards to APA WI and provide compliance or seek deviation.

Responsibility

John Etubus

Closeout Response (Attach all relevant supporting documentation.)

Signoff

	Actionee	Discipline Approval	Project Approval
Signature:	<hr/>	<hr/>	<hr/>
Name:	John Etubus	<hr/>	<hr/>
Title	Momentum Engineering - Process	<hr/>	<hr/>
Date:	<hr/>	<hr/>	<hr/>

ACTION CLOSEOUT SHEET



Client: APA
Project Number: 21100
Project Name: East Coast Grid Expansion - MW880 Milne CS HAZOP

Action No.

Node: O2
Drawings: All P&IDs
Guideword: General

Cause/Issue:
Pressure vessel to piping ANSI class separation not shown on some of the pressure vessels (e.g. fuel gas system).

Consequence:
Incorrect depiction of class separation of pressure vessels and piping.

Safeguard:
NONE

Action:
Show correct depiction of class separation of pressure vessels and piping.

Responsibility
John Etubus

Closeout Response (Attach all relevant supporting documentation.)

Signoff

	Actionee	Discipline Approval	Project Approval
Signature:	<hr/>	<hr/>	<hr/>
Name:	John Etubus	<hr/>	<hr/>
Title	Momentum Engineering - Process	<hr/>	<hr/>
Date:	<hr/>	<hr/>	<hr/>

ACTION CLOSEOUT SHEET



Client: APA
Project Number: 21100
Project Name: East Coast Grid Expansion - MW880 Milne CS HAZOP

Action No.

Node: O2
Drawings: All P&IDs
Guideword: General

Cause/Issue:
Misalignment of valves.

Consequence:
AS ABOVE

Safeguard:
Refer to action in NODE N1-2-3.

Action:
Manual valves should be provided with lockable tabs.

Responsibility
Christopher Daines

Closeout Response (Attach all relevant supporting documentation.)

Signoff

	Actionee	Discipline Approval	Project Approval
Signature:	<hr/>	<hr/>	<hr/>
Name:	Christopher Daines <hr/>	<hr/>	<hr/>
Title	Momentum Engineering Mechanical <hr/>	<hr/>	<hr/>
Date:	<hr/>	<hr/>	<hr/>

ACTION CLOSEOUT SHEET



Client: APA
Project Number: 21100
Project Name: East Coast Grid Expansion - MW880 Milne CS HAZOP

Action No.

Node: O2
Drawings: All P&IDs
Guideword: General

Cause/Issue:
Fire system is on HOLD and may involve multiple vendors.

Consequence:
This package cannot be HAZOPed at this stage.

Safeguard:
NONE

Action:
For the Solar part of the PID-Q-0017 (WM2510) the project to outsource an existing design for a MARS 100 if possible.

Responsibility
Kevin Martin

Closeout Response (Attach all relevant supporting documentation.)

Signoff

	Actionee	Discipline Approval	Project Approval
Signature:	<hr/>	<hr/>	<hr/>
Name:	Kevin Martin	<hr/>	<hr/>
Title	APA-Senior Rotating Engineer	<hr/>	<hr/>
Date:	<hr/>	<hr/>	<hr/>

ACTION CLOSEOUT SHEET



Client: APA
Project Number: 21100
Project Name: East Coast Grid Expansion - MW880 Milne CS HAZOP

Action No.

Node: O2
Drawings: All P&IDs
Guideword: General

Cause/Issue:
Fire system is on HOLD and may involve multiple vendors.

Consequence:
This package cannot be HAZOPed at this stage.

Safeguard:
NONE

Action:
APA to outsource an existing approved design for package CF-2551 on PID-Q-0017 and provide to MTM.

Responsibility
Sohail Hameed

Closeout Response (Attach all relevant supporting documentation.)

Signoff

	Actionee	Discipline Approval	Project Approval
Signature:	<hr/>	<hr/>	<hr/>
Name:	Sohail Hameed	<hr/>	<hr/>
Title	Senior E&IC Engineer	<hr/>	<hr/>
Date:	<hr/>	<hr/>	<hr/>

ACTION CLOSEOUT SHEET



Client: APA
Project Number: 21100
Project Name: East Coast Grid Expansion - MW880 Milne CS HAZOP

Action No.

Node: O2
Drawings: All P&IDs
Guideword: General

Cause/Issue:
Safety systems on HOLD and may involve multiple vendors.

Consequence:
This package cannot be HAZOPed at this stage.

Safeguard:
NONE

Action:
The information on this PID shall be discussed during the CHAZOP workshop.

Responsibility
Peyman Orangi

Closeout Response (Attach all relevant supporting documentation.)

Signoff

	Actionee	Discipline Approval	Project Approval
Signature:	<hr/>	<hr/>	<hr/>
Name:	Peyman Orangi	<hr/>	<hr/>
Title	APA-Team Lead Bid Support	<hr/>	<hr/>
Date:	<hr/>	<hr/>	<hr/>

ACTION CLOSEOUT SHEET



Client: APA
Project Number: 21100
Project Name: East Coast Grid Expansion - MW880 Milne CS HAZOP

Action No.

Node: O2
Drawings: All P&IDs
Guideword: General

Cause/Issue:
Safety systems on HOLD and may involve multiple vendors.

Consequence:
This package cannot be HAZOPed at this stage.

Safeguard:
NONE

Action:
The project should implement strategy on the approach with vendors for this package.

Responsibility
Micheal Palmisano

Closeout Response (Attach all relevant supporting documentation.)

Signoff

	Actionee	Discipline Approval	Project Approval
Signature:	<hr/>	<hr/>	<hr/>
Name:	Micheal Palmisano <hr/>	<hr/>	<hr/>
Title	Momentum Engineering E&I <hr/>	<hr/>	<hr/>
Date:	<hr/>	<hr/>	<hr/>

ACTION CLOSEOUT SHEET



Client: APA
Project Number: 21100
Project Name: East Coast Grid Expansion - MW880 Milne CS HAZOP

Action No.

Node: O2
Drawings: All P&IDs
Guideword: General

Cause/Issue:
Local Actuator panels PID on HOLD and not HAZOPed.

Consequence:

Safeguard:
Refer to APA published standards for local actuator control panels.

Action:
APA design team to provide the applicable standards to the PEM and MTM.

Responsibility

Closeout Response (Attach all relevant supporting documentation.)

Signoff

	Actionee	Discipline Approval	Project Approval
Signature:	<input type="text"/>	<input type="text"/>	<input type="text"/>
Name:	Sohail Hameed / John Etubus	<input type="text"/>	<input type="text"/>
Title	APA - Senior E&IC Engineer / Momentum Engineering - Process	<input type="text"/>	<input type="text"/>
Date:	<input type="text"/>	<input type="text"/>	<input type="text"/>

ACTION CLOSEOUT SHEET



Client: APA
Project Number: 21100
Project Name: East Coast Grid Expansion - MW880 Milne CS HAZOP

Action No.

Node: O2
Drawings: All P&IDs
Guideword: General

Cause/Issue:
Solar Package HAZOP has not been provided to APA.

Consequence:
Items of plant not HAZOPed and not following applicable legislation.

Safeguard:
NONE

Action:
Solar to provide standard design statement or proof of HAZOP for the Solar package.

Responsibility
Kevin Martin

Closeout Response (Attach all relevant supporting documentation.)

Signoff

	Actionee	Discipline Approval	Project Approval
Signature:	<hr/>	<hr/>	<hr/>
Name:	Kevin Martin	<hr/>	<hr/>
Title	APA-Senior Rotating Engineer	<hr/>	<hr/>
Date:	<hr/>	<hr/>	<hr/>

ACTION CLOSEOUT SHEET



Client: APA
Project Number: 21100
Project Name: East Coast Grid Expansion - MW880 Milne CS HAZOP

Action No.

Node: O2
Drawings: All P&IDs
Guideword: General

Cause/Issue:
Blow down valves BDV-2691 on PID-Q-0010 and BDV-5066 on PID-Q-0011 are shown as NO as a symbol on the PID.

Consequence:
Incorrect depiction of plant.

Safeguard:
NONE

Action:
Blow down valves BDV-2691 on PID-Q-0010 and BDV-5066 on PID-Q-0011 are to be shown as NC as a symbol on the PID.

Responsibility
John Etubus

Closeout Response (Attach all relevant supporting documentation.)

Signoff

	Actionee	Discipline Approval	Project Approval
Signature:	<hr/>	<hr/>	<hr/>
Name:	John Etubus	<hr/>	<hr/>
Title	Momentum Engineering - Process	<hr/>	<hr/>
Date:	<hr/>	<hr/>	<hr/>

ACTION CLOSEOUT SHEET



Client: APA
Project Number: 21100
Project Name: East Coast Grid Expansion - MW880 Milne CS HAZOP

Action No.

Node: O2
Drawings: All P&IDs
Guideword: General

Cause/Issue:
Current PID shows valve body vents and seal loading to the system.

Consequence:
This is unnecessary for a Class 600 valve.

Safeguard:
NONE

Action:
Consider to remove the loading line and bleed line to the main piping from the body bleed. Maintain body bleed but to atmosphere.

Responsibility
John Etubus

Closeout Response (Attach all relevant supporting documentation.)

Signoff

	Actionee	Discipline Approval	Project Approval
Signature:	<hr/>	<hr/>	<hr/>
Name:	John Etubus	<hr/>	<hr/>
Title	Momentum Engineering - Process	<hr/>	<hr/>
Date:	<hr/>	<hr/>	<hr/>

ACTION CLOSEOUT SHEET



Client: APA
Project Number: 21100
Project Name: East Coast Grid Expansion - MW880 Milne CS HAZOP

Action No.

Node: O2
Drawings: All P&IDs
Guideword: General

Cause/Issue:
Current location of the spectacle blinds shown for station isolation may not be suitable for construction / hot tapping activities.

Consequence:
Inability to positively isolate the gas incoming sources.

Safeguard:
NONE

Action:
Review the station positive isolation measures currently on the PIDs (e.g. spectacle blinds) to account for positive isolation for construction and hot tapping activities and the ability to flow via the free flow bypass (BF-1100).

Responsibility
Caroline Button / Mudassar Chugtai

Closeout Response (Attach all relevant supporting documentation.)

Signoff

	Actionee	Discipline Approval	Project Approval
Signature:	<hr/>	<hr/>	<hr/>
Name:	Caroline Button / Mudassar Chugtai	<hr/>	<hr/>
Title	APA -Team Lead Process & Pipeline Engineering / APA - Senior Mechanical Engineer	<hr/>	<hr/>
Date:	<hr/>	<hr/>	<hr/>

ACTION CLOSEOUT SHEET



Client: APA
Project Number: 21100
Project Name: East Coast Grid Expansion - MW880 Milne CS HAZOP

Action No.

Node: O2
Drawings: All P&IDs
Guideword: General

Cause/Issue:
Spectacle blinds are not tagged.

Consequence:
Inaccurate representation of plant.

Safeguard:
NONE

Action:
Consider tagging the spectacle blinds if they are not standard piping items.

Responsibility
John Etubus / Christopher Daines / Mudassar Chughtai

Closeout Response (Attach all relevant supporting documentation.)

Signoff

	Actionee	Discipline Approval	Project Approval
Signature:	_____	_____	_____
Name:	John Etubus / Christopher Daines / Mudassar Chughtai	_____	_____
Title	Momentum Engineering - Process / Momentum Engineering Mechanical / APA - Senior Mechanical Engineer	_____	_____
Date:	_____	_____	_____