เอกสารแนบ 2-20
ตารางสรุปข้อมูลการระบายก๊าซเรือนกระจก

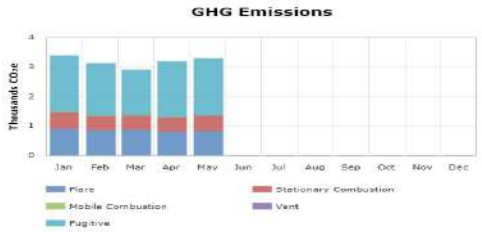
PTTEP

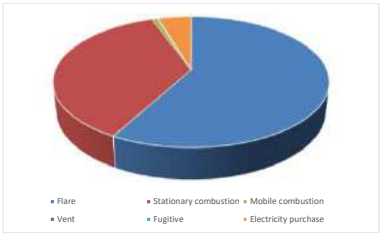
Environmental Performance Report

Project : Sinphuhorm , **Activity** : Production , **Year** : 2023

Export Date : 12 June 2023 16:53:58

Environmental Performance Data	Unit	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	YTD	Q1	Q2	Q3
GHG Emission																	
Scope - 1 Direct GHG Emission	Tonne CO2e	1,478.12	1,350.24	1,372.76	1,311.42	1,358.86	1,314.53	1,340.72	1,332.32	1,353.13	1,306.11	1,379.89	1,443.01	16,341.1	9,380.18609	6,444.11664	
Flare	Tonne CO2e	912.45	836.37	851.86	795.11	816.98	789.60	797.03	790.70	811.17	870.75	819.07	839.33	9,930.4	2,600.68304	1,612.09141	
Stationary combustion	Tonne CO2e	553.47	502.22	506.64	503.95	527.79	512.62	530.77	528.59	528.98	420.62	547.75	590.50	6,253.9	1,562.33463	1,031.73138	
Mobile combustion	Tonne CO2e	10.10	9.56	12.17	10.27	12.00	10.22	10.83	10.94	10.89	12.65	10.98	11.09	131.7	31.82795	22.27467	
Vent	Tonne CO2e	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.0	N/A		
Fugitive	Tonne CO2e	2.09	2.09	2.09	2.09	2.09	2.09	2.09	2.09	2.09	2.09000	2.09	2.09	25.1	5,185.34048	3,778.01918	
Scope - 2 Indirect GHG Emission	Tonne CO2e	60.51	57.44	67.41	69.67	72.60	69.24	70.51	70.57	66.40	60.91	63.82	62.67	327.6	185.36345	142.26806	
Electricity purchase	Tonne CO2e	60.51	57.44	67.41	69.67	72.60	69.24	70.51	70.57	66.40	60.91	63.82	62.67000	791.8	185.36345	142.26806	
Scope - 3 Other indirect GHG Emission	Tonne CO2e																
Public air travel	Tonne CO2e	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A		
Mobile fuel combustion	Tonne CO2e																
Total GHG Emission	Tonne CO2e	1,538.63	1,407.68	1,440.17	1,381.09	1,431.46	1,383.77	1,411.23	1,402.89	1,419.53	1,367.02	1,443.71	1,505.68	17,132.9	9,565.54955	6,586.38469	
	Tonne CO2e / Thousand tonne production	26.40	26.00	30.45	23.89	24.32	24.51	23.87	25.43	24.42	33.28	24.69	24.60	25.72	59.89317	56.45093	
GHG emission intensity	Tonne CO2e /KBOE	6.35	6.30	6.84	6.12	6.14	6.16	6.16						44.1	6.47905	6.12868	
Gross Hydrocarbon Production	Tonne	58,270.30	54,150.37	47,289.53	57,813.05	58,861.46	56,464.29	59,133.60	55,172.70	58,130.62	41,078.68	58,473.00	61,202.58	666,040.2			
	Thousand tonne production	58.27	54.15	47.29	57.81	58.86	56.46	59.13	55.17	58.13	41.08	58.47	61.20	666.0			





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SSHE Management System Manual

PTTEP

PTT Exploration and Production Public Company Limited

SSHE Management System Manual

Document Code: 11003-STD-SSHE-MNL-000-001-R04

November 2016

Approval Register	
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THIS DOCUMENT WILL BE REVIEWED EVERY
REVISED EARLIER

Revision History			
Rev.	Description of Revision	Authorised by	Date
0	New	PEP	Nov 2005
1	This PTTEP SSHE MS replaces the PTTEP SSHE MS – Standard.PSH.009, Rev.0 issued November 2005. Changes to the document include: • CEO accountability towards SSHE MS. • SSHE organisation structure and linkage among SSHE Department, SSHE advisors and operating Assets. • Roles and responsibilities of key positions as well as integration of supplementary part into the main context. • Integration of the supplementary part into the main context.	CEO	Oct 2008
2	This PTTEP SSHE MS Rev.2 replaces Rev.1 October 2008. Changes to the document are detailed below: • Position titles changes that reflect new organisation structure issued on 1 April 2010 • SSHE Vision and Mission and SSHE Policy updates • Integration of OHSAS 18001:2007 into this Management System, especially the aspects of participation and consultation in Element 3 Organisation and Resources. (3.4 – SSHE Communication) • Definitions of the roles and responsibilities of the management representative. • Comprehensive changes made as a result of the SSHE MS internal audit conducted in October 2010. • Customisation of SSHE MS Element 5 and 6. • Exclusion of some of the previously existing content. Only clearly focused and distinctly targeted content was retained.	CEO	Dec 2010

Revision History			
Rev.	**Description of Revision**	**Authorised by**	**Date**
3	This PTTEP SSHE MS Rev.3 replaces Rev. 2 (Dec.2010). Significant changes to this document include: • SSHE Documentation Management Standard document structure aligned with (SSHE-106-STD-330), ARIMS and PEGS documents. • SSHE MS elements have been revised so as to comply with the IOGP Guidelines for the Development and Application of Health, Safety and Environmental Management Systems (IOGP Report No. 6.36/210). Planning part is now highlighted in Element 5 of the SSHE MS. Titles of Element 5 and 6 have also been updated as follows: o Element 5: Implementation and Operational Control to Planning and Operational Control. o Element 6: Monitoring and Measurement to Implementation and Monitoring. • SSHE Culture is now included in Element 1 – Leadership and Commitment to support the Step Change in SSHE initiative, further enabling speedier Company movement towards becoming an LTI-Free Organisation by 2013 and a TRI-Free Organisation by 2015. • Updated SSHE KPI rationale (Leading and Lagging Indicators) is now included in Element 6 - Implementation and Monitoring. List of SSHE Standards and document codes referred to in each SSHE MS element and sub-element have been revised.	CEO	Nov 2011
4	This PTTEP SSHE MS Rev.4 replaces Revision 3. • The style of the manual was changed to explain how SSHE is managed in PTTEP. • The document highlights the available SSHE Standards and their supporting SSHE Procedures and Guidelines.	CEO	Nov 2016

Revision History			
Rev.	**Description of Revision**	**Authorised by**	**Date**
	• Updated Company SSHE Vision, Mission and Policy • Incorporated the new way SSHE is organised within the Company (SSHE Operating Model). • More detail provided in Section 6.4.1 SSHE Risk Assessment. • The Hazard and Effects Management Standard, SSHE-106-STD-410 has been removed as it was a duplicate of SSHE-106-STD-400 Risk Management Standard. • Process Safety Management Standard SSHE-106-STD-440 has replaced the Asset Integrity Management Standard SSHE-106-STD-430. Asset Integrity Management is documented in OEMS documents element 5 Reliability and Asset Integrity. • Added Human Factors Engineering (Standard, SSHE-106-STD-450). • Personal Protective Equipment (PPE) Standard, SSHE-106-STD-580 has been removed and the requirements have been incorporated in SSHE-106-STD-540 Operation Safety Management Standard. • 6.5.7 Management of SSHE Aspects been replaced by Sections for Environment Management, Security Management, Operational Safety Management and Occupational Health Management. • Added 6.5.10 PTTEP Life Saving Program. • References to CMS documents have been updated. • Added for clarity Appendix B Key Accountabilities Function Group and Line Partner SSHE Staff.		

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SSHE VISION, MISSION AND POLICY

PTTEP

VISION AND MISSIONS
Safety, Security, Health and Environment (SSHE)

Vision

PTTEP will be a leading company that strives to achieve Safety, Security, Health and Environment (SSHE) excellence through a compliance culture as our license to operate towards becoming a zero-incident organization.

Missions

- Prevent all incidents through operational and process safety management.
- Constantly manage and improve our well-established SSHE Management System and its readiness to be able to promptly and effectively respond to emergencies, crises, and security-related events.
- Help to deliver energy reliably and securely by using proven and environmentally friendly technology and by operating responsibly to ensure PTTEP's sustainable development.
- Create a SSHE culture grounded in leadership at every level of the organization, from management to contractors, where everybody understands the crucial importance of SSHE risks, and uncompromisingly manages these SSHE risks in their own working environment.
- Achieve top quartile SSHE performance in the exploration and production industry.

[redacted]

Date 15 FEB 2016

PTTEP

Safety, Security, Health and Environment (SSHE) Policy

PTTEP places SSHE as a core value that shall be integrated into our business. We believe that all incidents are preventable, and are fully committed to being a zero incident organisation. PTTEP, therefore, shall adhere to safe operating standards to ensure operational and process safety, the health of everybody involved in our operations and communities in which we operate, environmental protection, and security of our people and assets. This is to prevent personal injuries and major accident events, and to support the key objective of sustainable development.

To meet these commitments, PTTEP has in place a SSHE Management System (SSHE MS) that outlines the main principles and accountabilities to drive for continuous improvement. PTTEP shall:

- Strive to nurture a positive SSHE culture through visible leadership and commitment to SSHE, and involvement of all employees and contractors to implement the SSHE MS. Line Management has a responsibility with clear authorities and accountabilities for SSHE performance.
- Meet or exceed compliance requirements with all applicable SSHE laws, regulations, and international specifications in all our global operations.
- Strive to manage operational and process safety as a fundamental and critical element in our SSHE philosophy and practice. To achieve this SSHE risks shall be identified, eliminated, and minimised to be As Low As Reasonably Practicable (ALARP).
- Continuously reinforce to all employees and contractors the right to exercise their "Stop Work Authority (SWA)" when operations start to deviate from safe operating practices. Everybody is accountable for their own safety and the safety of those around them.
- Promote employee health as part of an effective occupational health management system.
- Ensure all employees and contractors are assessed and maintain the required level of job and SSHE competency.
- Identify and plan for emerging security threats and respond proactively to emergencies and crisis to minimise their impact.
- Strive to achieve and maintain SSHE excellence by setting measurable SSHE objectives, KPIs, and targets, and assessing performance through regular audits and reviews.
- Communicate SSHE issues and performance in an open and transparent manner, and share SSHE best practices internally and externally.

The successful implementation of this policy requires total commitment from PTTEP employees and contractors at all levels.

[redacted]

1. PURPOSE

The PTTEP Safety, Security, Health and Environment Management System (SSHE MS), a reflection of our Corporate Vision and mission, is essential for the effective operation of all SSHE and SSHE-related activities. Properly structured and implemented, this system is the foundation for operational and risk control. Most importantly, the success of the system depends on commitment from PTTEP staff and Contractors at all levels.

This document provides an overview of how PTTEP manages SSHE and highlights the available SSHE Standards, Procedures and Guidelines available to manage SSHE risks.

The PTTEP SSHE MS is aligned with:

- the International Association for Oil and Gas Producers (IOGP) Guidelines of which it is a participating member and
- the latest ISO Standards, 14001 and 18001

(See overview in Appendix A)

The PTTEP SSHE Management System comprises seven key elements. The structure model and brief description of each element are illustrated in Figure 1 and Table 1, respectively.

Figure 1: PTTEP SSHE Management System

Table 1: Key Elements of the PTTEP SSHE Management System

SSHE MS Element	Addressing
1. Leadership and Commitment	Top-down commitment and SSHE culture, essential to the success of the SSHE MS
2. Policy and Strategic Objectives	Corporate intentions, principles of action and aspirations with respect to SSHE
3. Organisation, Resources and Documentation	Organisation of people, resources and documentation for sound SSHE performance
4. Evaluation and Risk Management	Identification and evaluation of SSHE risks, for activities, products and services, and development of risk reduction measures
5. Planning and Operational Control	Planning the conduct of work activities, including planning for changes and emergency response
6. Implementation and Monitoring	Performance and monitoring of activities, and how corrective action is to be taken when necessary
7. Audit and Review	Periodic assessments of SSHE MS performance, effectiveness and fundamental suitability

2. SCOPE

This SSHE Management System applies to all PTTEP premises, operations, activities and all personnel working for or on behalf of PTTEP unless otherwise specified.

Where Contractors are used to perform specific activities, it is the responsibility of the PTTEP Activity Owner to determine through Mode of contract assessment whether the PTTEP SSHE MS will apply to those activities. The same conditions apply to all sub-contracted personnel. In all circumstances, PTTEP will attempt to positively influence SSHE aspects of the work as far as practicable

3. REFERENCES

3.1 PTTEP SSHE CONTROLLING DOCUMENTS

Document Number	Document Title
-	SSHE Vision, Mission and Policy

3.2 OTHER REFERENCE DOCUMENTS

Document Number	Document Title
IOGP Report No. 6.36/210	International Association of Oil and Gas Producers (IOGP), Guidelines for the Development and Application of Health, Safety and Environmental Management Systems
ISO 14001:2004	Environmental Management Systems – Requirements with Guidance for Use
BS OHSAS 18001:2007	Occupational Health and Safety Management Systems – Requirements
-	PTT Group SSHE Management Standards (December 2010)

4. DEFINITIONS

4.1 GENERAL DEFINITIONS

Terminology	Description
As Low As Reasonably Practicable (ALARP)	A term used to define tolerable risk acceptance only where risk reduction is impractical or cost benefit analysis is carried out and a judgment is made that the cost of further risk reduction is grossly disproportionate when compared to the actual risk reduction that would be achieved.
Lost Time Injury (LTI)	A fatality or lost work day case. The number of LTI is the sum of fatalities and lost work day cases.
Major Accident Event (MAE)	An incident that has very severe consequences such as multiple fatalities, or equivalent environmental / facility damage.
SSHE Critical Position	Job Positions involving SSHE Critical Tasks
SSHE Critical Task	SSHE critical task is where substandard performance could lead to missing SSHE preventive barriers and could contribute to a Major Accident Events. (See details in Training and Competency Standard)
SSHE Management System (MS) Manual	A comprehensive guide to the PTTEP SSHE Management System and the associated SSHE Standards, which are issued to address all of its elements, and provide an overview of the approach.

Terminology	Description
SSHE Policy	The highest level document containing a formal statement of principles that identifies PTTEP expectations in managing SSHE.
SSHE Procedure	Procedures that define the steps in identifying SSHE practices within PTTEP. They are specific, action-orientated and describe processes in compliance with SSHE Standards that must be followed.
Supporting Documents	Associated documents supporting the implementation of the SSHE Management System. These documents must be consistent with the SSHE Policy, SSHE Management System Manual, Standards and Procedures.
Total Recordable Injury (TRI)	The number of recordable incidents which are summary of Fatalities + Lost Work Day Cases + Restricted Work Day Cases + Medical Treatment Cases).

4.2 ORGANISATION AND DEPARTMENTS

Terminology	Description
Corporate	Refers to the PTTEP business groups hierarchically above Asset level, and located in the PTTEP headquarters, Bangkok.
Function Group	Refers to a Corporate level business group. These may have associated Divisions, Departments, or operational Assets within their hierarchy.
Division	A business group may have one or more distinct groups within its hierarchy. These are referred to as Divisions.
Asset	Refers to an operating Asset, site, or location within a respective Function Group.
Department	A subgroup within a Function Group, Division or Asset.

4.3 LANGUAGE

May	Indicates a possible course of action
Should	Indicates a preferred course of action
Shall	Indicates a course of action with a mandatory status

4.4 COMMON ACRONYMS

Set out below are common specific terms presented in alphabetical order:

CEO	President & Chief Executive Officer
COO	Chief Operating Officer
CSR	Corporate Social Responsibility
EVP	Executive Vice President
MAE	Major Accident Event
MS	Management System
SSHE	Safety, Security, Health and Environment
SVP	Senior Vice President
TSH	Safety , Security, Health and Environment Division or Senior Vice President, Safety, Security, Health and Environment Division

5. ROLES AND RESPONSIBILITIES

5.1 KEY PERSONNEL ROLES AND RESPONSIBILITIES

- Human Resources and Line Management shall ensure all PTTEP staff and Contractors are made aware of the SSHE Management System.
  - All PTTEP Staff (including services staff) shall attend the SSHE 1 course.
  - All Contractors shall be briefed on the SSHE MS prior to commencing workscope under contract.
- Detailed roles and responsibilities documented in the SSHE Roles and Responsibilities Standard, SSHE-106-STD-100 shall be followed

6. SAFETY, SECURITY, HEALTH, ENVIRONMENT MANAGEMENT

Below an overview of how PTTEP manages SSHE by the 7 Elements of the SSHE MS:

6.1 LEADERSHIP AND COMMITMENT

Top management, including the President and CEO, COO, EVPs and SVPs recognise the need for SSHE risk management and are committed to achieve high SSHE Standards.

They:

- Adopt the PTTEP SSHE Policy and strategic objectives;

- Effectively communicate the PTTEP SSHE Policy to all personnel under their authority, including Contractors, to ensure a safe, secure, healthy workplace and protection of the Environment in any operations that are carried out.
- Lead and motivate all staff and Contractors to adopt high SSHE Standards.
- Provide resources to identify eliminate or reduce and manage SSHE risks in balance with business performance, to effectively achieve PTTEP Corporate objectives.
- Review SSHE performance and set SSHE targets.
- Participate and become involved with employees and Contractors in the creation and sustainability of a "SSHE Culture".

A SSHE culture refers to the way PTTEP personnel think, act, behave and perform their duties. It identifies an attitude that must be shared by all, requiring each person to consistently contribute to create a healthy, environmentally responsible, secure and safe workplace.

Furthermore management at all levels provide and demonstrate SSHE leadership and commitment by:

a) Being visible and leading by example that nothing supersedes safe working practice (Top Management Visits);

b) Defining roles and responsibilities and delegating authorities to facilitate effective SSHE management system;

c) Putting SSHE matters on top of meeting agendas;

d) Ensuring that all operations are performed in compliance with the local legislation and International requirements;

e) Participating in setting and reviewing SSHE objectives and targets;

f) Communicating proactively the importance of SSHE considerations in business decisions to a wide range of audiences including employees and Contractors;

g) Recognising performance and safe behaviours when objectives and targets are achieved;

h) Encouraging two-way communication and listening to employees' concerns as measures to enhance SSHE culture and performance;

i) Ensuring that the lessons learnt from previous incidents are brought to attention and shared among personnel;

j) Being actively involved in SSHE activities and reviews, either in meetings or at operating sites.

Detailed requirements are captured in SSHE Roles and Responsibilities Standard, SSHE-106-STD-100

6.2 POLICY AND STRATEGIC OBJECTIVES

The PTTEP SSHE Policy addresses the Corporate SSHE objectives, aspirations, principles of action and commitments with respect to Safety, Security, Health and Environment with the aim of improved performance.

PTTEP TSH organisation drafts the SSHE Policy and Strategic Objectives and presents this to the SSHE Management committee for review and endorsement.

The SSHE-SD Council will ensure the Policy and Strategic Objectives will serve the Company and that they are aligned with those of the PTT group.

The CEO signs the final version of the companies SSHE Policy and Strategic Objectives after which the TSH Operational Safety staff cascades this to line organisations.

The words of the Corporate SSHE Policy and Strategic Objectives must not be altered, but may be added to by Assets.

As part of the Policy dissemination process the Policy:

- Is available in the local language in all countries where PTTEP operates,
- Is displayed at companies facilities and Contractors offices on site,
- Is contained in every invitation to tender, in all contract requests and is provided to all Company Contractors and
- It is available in the SSHE INTRANET.

To achieve the SSHE Strategic Objectives TSH develops SSHE Plans with KPIs for the organisation.

Additional information of SSHE Plan Management is available in SSHE MS element 5 - Planning and Operational control

6.2.1 Due Diligence / JV Requirements

In today's world legacy issues relating to the SSHE aspects of potential acquisitions are very important and can be costly if not identified early in the process. PTTEP uses the SSHE Due Diligence / JV Requirements Process to investigate a potential business investment prior to signing a contract or making business transactions, e.g. acquisition of Assets as operator, investment as non-operator etc. The relevant areas of concern may include SSHE aspects of facilities design, operation and integrity, and influencing SSHE performance in Joint Ventures.

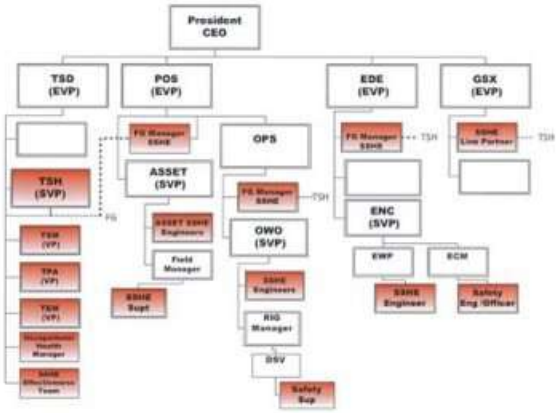
See detailed requirements in SSHE Due Diligence / JV Requirements Standard, SSHE-106-STD-200.

6.3 ORGANISATION, RESOURCES AND DOCUMENTATION

ORGANISATION

The SSHE-SD Council, consisting of the COO, all EVP's and selected SVP's and led by the President and CEO of the Company, set the Companies SSHE Vision, Mission, Policy and goals.

Below is an overview of the organisational principles for SSHE organisation within PTTEP (red boxes)



As can been seen in above organigram SSHE professionals are embedded in those organisations that execute activities, called Functional Groups, namely Production, Drilling and Engineering. Seismic activities (GSX organisation) will get full time support from a Line Partner when the planning for the seismic activities start. SSHE Line Partners will also be allocated to other activities requiring SSHE support for a longer periods of time when required.

The reporting line of Function Group SSHE Manager and SSHE Line Partners follows PTTEP matrix organisation principles. SSHE operating model is identified as Corporate-Governed Function, i.e. a function which FG SSHE manager has solid-line reporting directly to FG and dotted-line reporting to Corporate SSHE Division. This is to ensure full accountability at FG while allowing Corporate SSHE Division to provide guidance relating SSHE Policy and SSHE MS requirements, and ensure SSHE compliance. To support this the Performance Development and Appraisal (PDA) of embedded staff is jointly reviewed (70% by Line and 30% by TSH)

Security, Technical Safety and Health support is provided by the Corporate organisation. The support effort is captured in Service Level Agreements or Requests for Services. Additional Safety support will also be captured in the SLA.

RESOURCES

PTTEP is committed to maintaining an adequate level of resources to effectively implement the SSHE MS.

a) Line Management is accountable for allocating sufficient resources (staff and budget) to support the SSHE management system implementation.

b) The risks inherent in operations, emergency Procedures, shifts, leave and competency levels are all taken into account when determining resourcing levels.

c) The SSHE Department is staffed with professionals specialised in, Safety, Security, Health and Environment disciplines, to advise and support Line Management.

d) Service Level Agreements (SLA) between the SSHE Division and the Assets and Project help determine the level of Corporate support required. The SLA's are updated annually.

Necessary resources allocation, including personnel, budget, time, equipment, etc., are regular reviewed to ensure its continuous effective implementation.

To ensure new ventures also comply with the Corporate SSHE requirements and get the right organisation and SSHE support, Corporate SSHE has developed the Minimum SSHE Requirements for New Venture Guideline SSHE-106-GDL-301.

SSHE ROLES AND RESPONSIBILITIES

The President and CEO, or his delegate, is ultimately accountable for all SSHE matters to achieve success in Company directions and SSHE Policy.

The Function Group organisations are responsible and accountable for SSHE management and the implementation of the SSHE MS with the support of the SSHE professionals embedded in the line organisations. The Function Group SSHE Plans and KPI's are aligned to the Corporate SSHE Plan.

Corporate SSHE Division (TSH) is responsible for developing the SSHE Vision, Mission, Policy, Targets and Plans for managing SSHE in PTTEP and they develop and maintain the SSHE MS documentation. They provide SSHE management support to Function Group organisations.

Appendix B describes the roles and responsibilities for the Function Group embedded SSHE Staff.

SSHE Roles and Responsibilities are described in SSHE Roles and Responsibilities Standard SSHE-106-STD-100.

DOCUMENTATION

6.3.1 Corporate Oversight of SSHE Management System

To give people an overview of all the requirements from the SSHE MS Standards and what the Corporate Oversight Activities will be, the Corporate Oversight of SSHE Management System Standard was developed. The SSHE MS Manual and the Corporate Oversight of the SSHE MS Standard will provide a good overview of how SSHE is managed within PTTEP and what the SSHE MS requirements are.

Corporate Oversight of the SSHE MS Standard has been written such that Assets and service providers can verify their compliance against the requirements of the SSHE MS Standards

Oversight and interfaces of the SSHE Management System are exercised by the PTTEP SSHE Division with reference to the requirements of the PTTEP Corporate SSHE management system and associated Standards, Procedures and Guidelines.

However, in precedence to the SSHE MS requirements, all PTTEP Subsidiaries shall comply with applicable SSHE legislation.

See detailed requirements in Corporate Oversight of SSHE MS Standard, 11003-STD-SSHE-300-002-R01.

6.3.2 Contractor Management

Approximately 80% of PTTEP annual capital and operations expenditure is spent on contracts for goods and services supply. In view of this PTTEP considers Contractors management to be an SSHE critical issue. Safety, Security, Health and Environment issues are handled proactively in all phases of the contracting process to ensure that Contractors manage SSHE in line with the PTTEP SSHE Policy and strategic objectives.

Contract Holders are responsible for complying with the Supply Chain Management and SSHE Contractor Management requirements.

From a SSHE perspective:

- All potential Contractors must pass the SSHE prequalification assessment to participate in tenders
- Bridging documents describe how SSHE will be managed between Company and Contractor. They are in place before commencement of work scope.
- Contract Holder has a SSHE Monitoring plan in place to monitor Contractor performance as agreed in the bridging document.

PTTEP Policies and Procedures for tendering, awarding and managing contracts are specified in:

- Supply Chain Management Contract Management Guideline G-1013-0000-001.

For managing the SSHE risks in contacting see:

- SSHE Contractor Management Standard SSHE-106-STD-310 which highlights the high level requirements and
- SSHE Contractor Management Procedure SSHE-106-PRD-310 which explains the detailed steps to be taken how to get the SSHE risks addressed in contracts.

6.3.3 Communication

6.3.3.1 Internal Communications

The key objective for internal communication of SSHE issues is to ensure that employees, PTTEP Contractors, partners and other interested parties are aware of:

- The SSHE MS and its requirements
- Their roles and responsibilities in achieving compliance with defined policies, objectives and targets.
- The SSHE hazards / risks (including significant environmental aspects and impacts) associated with jobs and activities, their identification, evaluation, the preventative, control and recovery associated measures.
- The PTTEP and Function Group SSHE performance against targets.
- Lessons learnt from incident investigations, audits and inspections made and the management review process.

Significant effort is put into measuring KPI's and compiling statistics. The SSHE performance statistics can be found on the SSHE INTRANET.

Verbal feedback to staff and Contractors is given at monthly SSHE meetings.

Hierarchy of SSHE Meetings:

- **At Corporate level:** A quarterly SSHE-SD Council Meeting (Highest Level) is chaired by the CEO. Other SSHE-SD Council members are the COO, EVP's and selected SVP's appointed by the CEO.
- **At Asset level**: Asset monthly team meetings are held.
- **Thailand specific**: Assets (Field offices) will have a SSHE committee as per Thai law which meets on a monthly basis.
- **Functional:** All executing activity organisations conduct monthly, 2 weekly of weekly SSHE meetings.
- **Contract Holders**: Conduct SSHE meetings with Contractors on a monthly basis.
- **All employees (Company and Contractors)** are made aware of their SSHE responsibilities during their induction. Records of the SSHE induction process are maintained.
- For meetings with more than 6 people SSHE moments will be shared.

6.3.3.2 EXTERNAL COMMUNICATIONS

PTTEP reports its SSHE performance data to:

- Parent Company PTT.
- At country level to government agencies where PTTEP is the operator.
- In the annual CSR report.
- The International Association of Oil & Gas producers (IOGP) and uses the IOGP feedback from all companies to benchmark itself.

See detailed requirements in SSHE Communication Standard, SSHE-106-STD-320.

6.3.4 Documentation Management

The Corporate SSHE Division is responsible for maintaining an up to date Corporate reference library of all applicable SSHE Standards, Procedures and Guidelines.

The hierarchy of the SSHE documents is in compliance with the PTTEP Document Policy and is illustrated in Figure 1. The documentation hierarchy is categorized based on the level of enforcement, approval authority and the level of detailed content. In case of conflicts between documents from different tiers the higher tier document prevails.

Figure 2: Document Hierarchy

The SSHE MS documentation can be viewed as a series of explanations or statements of how the system (and ISO systems, e.g. 14001) requirements are applied by PTTEP.

The hierarchy and definitions of SSHE documentation:

SSHE Policy	The highest level document containing a formal statement of principles that identifies expectations of PTTEP in managing SSHE.
SSHE MS Manual / Standards	Mandatory requirements to ensure SSHE Policy compliance. Implementation of SSHE MS / Standards is mandatory throughout PTTEP.
Procedures / Specifications	Procedures define steps in identifying SSHE practices within PTTEP. They are specific, actions-orientated and describe processes, in compliance with SSHE Standards. Implementation of Procedure is mandatory. Specifications refer to PTTEP Internal Engineering Standards, which are incorporated into the PTTEP Engineering and General Specification (PEGS) system.

Guidelines	Guidelines outline best practice processes which are strongly recommended. They are written to provide information and advice on particular subjects. Corporate Guidelines are to be used by Assets to make specific Procedures.
Supporting documents	Associated documents supporting the implementation of SSHE MS. These documents shall be consistent with SSHE Policy, Standards and Procedures. Example of Supporting Documents includes: SSHE plans, regulations, International and national technical references, minutes of meetings, SSHE risk assessment and monitoring records, etc.

PTTEP Assets, Departments, Divisions, Functional Groups, and Subsidiaries shall use the Corporate Standards and Procedures, i.e. do not copy and maintain a similar SSHE document hierarchy as Corporate SSHE documents. Asset documents shall demonstrate a line of site to Corporate SSHE documents. Legal requirements in the country where PTTEP operates shall be complied with at all times, i.e. first priority.

Corporate level SSHE documentation is reviewed and updated every 5 years or earlier if there are significant changes which affects activities. When documents have been updated an email will be sent to all in the Company, along with a PowerPoint presentation describing changes.

All controlled SSHE documentation can be found on the SSHE intranet under the SSHE MS .

SSHE related documents in the SSHE Management System include, but are not limited to:

a) Documents initiated by the Corporate SSHE Division e.g. SSHE Policy and Strategic Objectives, Standards, Procedures and Guidelines;

b) Documents initiated by other functions within PTTEP e.g. PTTEP Engineering and General Specifications (PEGS), Corporate Management System;

c) Documents initiated by other functions outside PTTEP e.g. regulations, external reports;

d) Documents, including records, as required by the organisation to ensure the effective planning, operation and control of processes in relation to the management of SSHE risks.

To ensure the consistency in the document contents and approach, PTTEP SSHE document hierarchy and its management and control is defined in SSHE Documentation Management Standard, 11003-STD-SSHE-330-001-R04.

6.3.5 Training and Competence

The Corporate SSHE Division and the line organisations have established minimum SSHE training and competence requirements for all staff and Contractors to ensure all personnel performing tasks that can impact SSHE have appropriate experience, qualifications and training to undertake important risk control measures.

Line Management with support of SSHE Superintendents, SSHE Officers and HR keep records of training and competency requirements of staff and ensure they keep their certification up to date.

The competency of employee and Contractor personnel are regularly assessed in order to outline the necessary training programs for further implementation.

See detailed requirements in SSHE Training and Competence Standard, SSHE-106-STD-340.

6.3.6 REGULATORY COMPLIANCE

PTTEP ensures that they comply with all local legislation and laws of the country they operate in.

Processes are put in place to identify and record all applicable legislation and ensure compliance to those laws and regulation through audits. Where the International regulations are more stringent the Company will comply with these to.

The Legal Division will identify the changes in laws and regulations and will communicate these to the SSHE Division / Department. The respective SSHE Manager will review the new legislation to understand its impact on the Company's activities and communicate these impacts and their advice to the line.

See detailed requirements in SSHE Regulatory Compliance Standard, SSHE-106-STD-350

6.4 EVALUATION AND RISK MANAGEMENT

6.4.1 SSHE Risk Management

PTTEP requires that all activity significant risks are identified, prioritized and managed effectively.

One applies the Hazard and Effects Management Process (HEMP) for this. The purpose for this process is to identify, evaluate and determine effective controls for Safety, Security, Health and Environmental hazards, aspects and effects associated with PTTEP's activities.

- A **hazard** is an intrinsic property of anything with the potential to cause harm. Harm includes ill-health, and injury, damage to property, plant, products or the Environment, production losses, or increased liabilities.
- An environmental **aspect** is defined as any element of an organisations activities, products or services that interacts with the Environment
- An **effect** is usually an adverse impact on people, the Environment, and property or Company reputation. Effect also includes adverse or beneficial impacts to Environment, social or cultural systems, either directly or indirectly.

The process is applicable to all business processes in the lifecycle of an operation from conception to abandonment. The tools and techniques available are applied in a logical and rigorous way, setting acceptance criteria and screening them as the process proceeds.

The arrangements identified as necessary to manage assessed threats and potential consequences and effects are then incorporated in the design phase, for existing operations it is necessary to verify that what is in place is suitable and sufficient. If not, remedial actions are taken and all necessary Procedures are incorporated into the SSHE MS. The principles of **identify**, **assess**, **control** and **recover** are the basis of HEMP, with the individual stages summarised in the following steps:

- **Identify** hazards, aspects and potential effects.
- **Assess** risks.
- Establish risk reduction measures to prevent or **control** incidence and / or mitigate effects, **recovery** preparedness.
- Compare with objectives and performance criteria to demonstrate that risks are reduced to as Low As Reasonably Practicable (ALARP).
- Record Hazards and Effects.

The HEMP process is applied to facility design, construction, modification and abandonment. The principles apply to the assessment of Safety, Security, Health and Environment risks.

To ensure the effective control of risks, risk reduction measures are addressed according to the following hierarchy:

i) Elimination;

ii) Substitution;

iii) Engineering controls;

iv) Procedural controls;

v) Personal protective equipment.

Risk Assessment Screening Criteria

Once hazards, aspects and effects have been identified, they are assessed for their overall risk level. Risk is defined as the product of likelihood and consequence of an event. PTTEP uses a Risk Assessment Matrix for risk assessment.

The matrix can be used for risk assessment of relatively simple activities or where the exposure of the workforce, public, Environment or the Asset is relatively straightforward to assess. Within the matrix, risks are defined as high, medium and low.

See detailed requirements in SSHE Risk Management Standard, SSHE-106-STD-400

Supporting documents

Hazard Identification (HAZID) Study Guideline SSHE-106-GDL-411

Quantitative Risk Assessment (QRA) Guideline SSHE-106-GDL-404

6.4.2 Safety Case

The Safety Case is the means of both ensuring and demonstrating that suitable and sufficient measures are in place to prevent a Major Accident Event (MAE) and to reduce the effects of these events should they occur. A Major Accident Event is classified as those accidents that may cause multiple fatalities or equivalent environmental damage, production loss, plant damage and reputation damage as per consequences rated severity level 5 Major in the PTTEP Risk Assessment Matrix.

The process of developing the Safety Case will improve safe operation by ensuring a systematic review of the Major Accident Events, and the adequacy of the risk control measures that are implemented, both during initial development of the Safety Case, and subsequently in a process of continuous improvement.

The regular reviewing of the barriers put in place and their performance Standards documented in the Safety Case also ensures continuous improvement in Safety performance.

There are 2 types of Safety Cases namely those for Facilities and those for Activities.

Facility Safety cases:

- Concept Selection Report in the select phase of a Project outlines the Formal Safety Assessment process as it relates specifically to a given concept and leads to the development of discipline and system-specific designs by ensuring that reliable and effective Safety and emergency systems are incorporated to provide an overall system which will help to reduce the loss of life, production and capital investment should an accidental event occur.
- Design Safety Case is intended to provide demonstrate that the detailed engineering design has taken account of issues identified at concept selection stage, and has delivered a facility design that reduces risks to As Low As Reasonably Practicable (ALARP). It will demonstrate that the Safety Critical Elements (SCEs) and their Performance Standards (PS) have been identified and are measurable and effective against the identified risks.
- Operations Safety Case through a Statement of Fitness demonstrates how the design, operational, maintenance and inspection (Asset Integrity), incident response and SSHE Management System combine to reduce risks at the facility to ALARP, i.e. all identified MAE barriers are in place and kept healthy. All facilities PTTEP operates have a Safety Case or are in the process of getting a Safety Case.

Activity Safety Cases:

PTTEP requires all activities which have potential risk consequences assessed with a severity major (5), i.e. assessed as a main accident event (MAE), Drilling for example has been assessed to have several potential MAE's.

- **Drilling or well construction activities Safety Case** - Rigs are required to have such a Safety Case based on International Association of Drilling Contractor Guidelines which demonstrate control of high risk activities or MAE's such as well blowout, explosion, fire, loss of integrity, shallow gas, structural failure, dropped objects, vehicle collision, adverse weather, loss of stability etc. The Contractors Safety Case gets added to with a campaign specific risk assessment and mitigation methods.

See detailed requirements in Safety Case Standard, SSHE-106-STD-420.

Supporting documents

Concept Selection Report and Safety Case Guideline SSHE-106-GDL-421

6.4.3 Process Safety Management

Process Safety is concerned with the prevention of Major Accident Events that can occur during the drilling and servicing of wells and production and processing of hydrocarbons. The prevention of Process Safety Events relies on the design and integrity of barriers (Plant, Processes and People). Process Safety Management relies on elements from the following Management Systems in PTTEP:

- SSHE Management System,
- EDE Corporate Management System for Field Development, Engineering, Construction and Maintenance,
- Well Engineering Management System Framework.
- Operating Assets Management Systems

To manage Process Safety PTTEP uses Audits to verify compliance to the above mentioned management systems requirements and it tracks leading indicators. Hierarchy of PS events:

The following Process Safety indicators are tracked and can be found under PTTEP Performance Status on the SSHE INTRANET home page:

- The Major Accident Event Rate (MAER, number/MMhrs)
- Los of Primary Containment Rate (LOPCR, Number/MMhrs. (Production + Drilling))

See detailed requirements in Process Safety Management Standard, SSHE-106-STD-440

Supporting Guidelines

Loss of Primary Containment (LOPC) Reporting and Reduction Guideline SSHE-106-GDL-431

6.4.4 Human Factors Engineering

PTTEP applies Human Factors Engineering (HFE) to the design of systems and workplace:

- To reduce risk to Health, personal and process Safety and the Environment
- To eliminate or reduce the likelihood or mitigate the consequences of human error

- To improve human efficiency and productivity, thereby enhancing operational performance

The structured methodology to do this benefits both staff and business results.

See detailed requirements in Human Factors Engineering Standard, SSHE-106-STD-450.

Supporting documents

HFE Design for Process Safety Critical Tasks PEGS-1015-SAF-020, which explains the HFE techniques

HFE Workplace Design Specification PEGS-1015-SAF-021, where one captures the information from the studies to be implemented in the design.

6.5 PLANNING AND OPERATIONAL CONTROL

6.5.1 Emergency and Crisis Management

Preparedness and planning for an emergency or crisis are an important part of the Company operations in preventing fatalities and injuries, reducing damages to the Environment and property. The ultimate objective of emergency and crisis management is to accelerate the resumption of normal operations.

The Emergency and Crisis Management Standard explains how the Company is organized to deal with emergencies and what is expected from Assets.

TSH organisation manages the Corporate Emergency Control Centre and organizes training for the Corporate emergency response team members.

All Assets and Projects have their Emergency Plans which are aligned with the Corporate Emergency and Crisis Management Plans.

Desktop emergency and crisis drills are performed periodically, including mobilisation of the Emergency Control Centre (ECC), to test readiness and crisis management response.

See detailed requirements in Emergency and Crisis Management Standard, SSHE-106-STD-500.

Supporting documents

Crisis Management Plan, SSHE-PDR-501

Emergency Plan, SSHE-106PDR-502

Corporate Spill Contingency Plan, SSHE-106-PDR-503

TSH Business Continuity Plan, SSHE-106-PDR-504

Medical Emergency Management Guideline, SSHE-106-GDL-501

6.5.2 Permit to Work

One of the main barriers to prevent incidents is the Permit to Work (PTW) system and is therefore a Safety Critical Element and mandatory to have in all PTTEP operations. The Permit to Work system is used to:

- Ensure work activities are coordinated such that conflicting work is controlled,
- Give permission for defined work to be performed on specific equipment or at specified location, by authorised personnel.
- Ensure the person in charge of a unit / plan / installation is aware of work taking place
- Ensure hazards and Safety precautions are identified and implemented before work starts
- Providing a system of continuous control and records showing nature of work / precautions have been checked
- Ensure equipment is in a safe condition to be worked on.
- Providing a formal handover Procedure when work extends beyond a shift and handback when work has been completed.
- Provide a means of safely suspending permits when work cannot continue.

The PTW system is an integral part of a safe system of work including risk assessment, and can be used to properly manage a wide range of activities.

See detailed requirements in Permit to Work Standard, SSHE-106-STD-510.

6.5.3 Environment Management

PTTEP manages the risks to changes in Biodiversity or Ecosystems arising from environmental aspects of Assets and activities in accordance with the requirements set out in the Environmental Management Standard. The Environmental Standard includes minimum environmental requirements for the following aspects: air emission from flaring and venting, industrial and household wastewater and solid waste, noise, energy consumption, biodiversity and other related issues.

The Company requires all operating Assets to have ISO 14001 certification which sets out the criteria for an Environment Management System.

See detailed requirements in Environmental Management Standard, SSHE-106-STD-520

Supporting documents

Environmental Impact Assessment for Exploration and Production Procedure SSHE-106-PDR-401

Environmental Aspect Identification and Evaluation Guideline SSHE-106-GDL-401

Waste Management Guideline, SSHE-106-GDL-521

Biodiversity Management Guideline, SSHE-106-GDL-522

Water Management Guideline, SSHE-106-GDL-523

Energy Efficiency Guideline, SSHE-106-GDL-524

ISO 14001 Implementation and Checklist Guideline, SSHE-106-GDL-525

Net Environmental Benefit Analysis Guideline, SSHE-106-GDL-526

Gas Flaring and Venting Reduction Guideline, SSHE-106-GDL-527

6.5.4 Security Management

PTTEP has a structured approach to managing Security risks by assessing Security threats and providing controls to safeguard people, Assets including information, and reputation. The Corporate Security team provides the support to all Assets.

Security risk management plans are in place for Assets. Security threats are monitored and Security alert levels are reported daily.

See detailed requirements in Security Management Standard, SSHE-106-STD-530.

Supporting documents

Security Risk and Threat analysis and assessment Guideline SSHE-106-GDL-402

New Development Security Planning Requirements Guideline, SSHE-106-GDL-532

Office Security Guideline, SSHE-106-GDL-533

Working with Armed Security Forces Guideline, SSHE-106-GDL-534

Security Awareness Guideline, SSHE-106-GDL-535

Executive Protection Guideline, SSHE-106-GDL-537

6.5.5 Operational Safety Management

The Operational Safety Management Standard provides a framework for managing operational Safety in the activities which are carried out both on and offshore in the Exploration and Production oil and gas industry. It outlines the Safety management requirements to ensure adequate controls and recovery barriers are put in place for all Safety Critical Activities and hazardous activities. It covers topics how to manage SSHE in an operational Environment, e.g. Hazard & Risk assessment, Job Safety Analysis, Permit to Work System, SSHE Contractor Management, Use of Personal Protective Equipment and its Standards, Management of Change, Communication, Monitoring, Audit and Review.

All Hazards and Safety Critical Activities will be covered by Procedures and or Site Safety Instructions. Corporate SSHE will provide Guidelines where necessary which can be used by the Assets to develop Procedures and or site Safety instructions.

See detailed requirements in Operations Safety Management Standard, SSHE-106-STD-540.

Supporting documents

Lifting Operation Procedure, SSHE-106-PDR-541

Marine Operation Safety Guideline, 12007-GDL-SSHE-540_02-001-R1.1

Land Transport Safety Guideline, SSHE-106-GDL-540/04

Drop Objects Prevention Safety Guideline, SSHE-106-GDL-540/06

Simultaneous Operations Guideline, SSHE-106-GDL-540/07

Diving and Underwater Operations Guideline SSHE-106-GDL-540/08

Working at Height Safety Guideline, SSHE-106-GDL-540/09

Pressure Testing Guideline, SSHE-106-GDL-540/10

Job Safety Analysis (JSA) Guideline, SSHE-106-GDL-540/13

6.5.6 Corporate SSHE Plan

The Company SSHE strategic objectives and targets are set in accordance with the Company direction and a comprehensive SSHE Plan is developed to meet them. The Corporate SSHE Plan Standard provides the framework in developing, implementing and managing Corporate and all functional groups SSHE plans that have defined timescales, are resourced and supported with budgets.

Line Management ensure that Asset and Project SSHE plans and improvement programmes are established and aligned with Corporate SSHE plans as well as identified potential risks.

See detailed requirements in Corporate SSHE Plan Standard, 11003-STD-SSHE-550-003-R03.

6.5.7 Occupational Health Management

PTTEP will protect the Health and Safety of everybody who plays part in its operation. Provision of occupational Health services means carrying out activities in the workplace with the specific aim of protecting and promoting workers' Safety, Health and well-being, as well as improving working conditions and the working Environment. For PTTEP, these services are provided by occupational Health professionals as part of special service units of SSHE Division in coordination with the Asset medical personnel and Asset / Project SSHE. The Occupational Health Management System enables the organisation to control its Health risks and to achieve higher Standards of performance by means of continuous improvement.

Key aspect is that PTTEP requires all who play part in its operation to have a fitness to work certificate.

See detailed requirements in Occupational Health Management Standard, SSHE-106-STD-560.

Supporting documents

Health Risk Assessment Guideline SSHE-106-GDL-403

Medical Assessment of Fitness to Work for Domestic Offshore Workers Procedure, SSHE-106-PDR-561

Fitness to Work Guideline, SSHE-106-GDL-561

Work Related Injury Illness Case Management Guideline, SSHE-106-GDL-562

Site Medical and Health Care Services Guideline, SSHE-106-GDL-563

Drugs and Alcohol Guideline, SSHE-106-GDL-564

HIV-AIDS Management Guideline, SSHE-106-GDL-565

Industrial Hygiene Monitoring Guideline, SSHE-106-GDL-566

Health Impact Assessment for Exploration and Production Guideline, SSHE-106-GDL-567

Health Risk Management for International Assignees Guideline, SSHE-106-GDL-568

Medical Surveillance Management Guideline, SSHE-106-GDL-569

6.5.8 Management of Change

The Management of Change Standard specifies minimum requirements for systematically managing permanent and temporary changes to any work process, facility, operations or organisation to ensure that any risk or hazard arising from that change is identified, assessed and controlled and business activities do not get overlooked.

Any Change has the potential to impact a currently stable arrangement. Change is managed such that the new arrangement itself is demonstrated to be stable, as well as being safe and effective, and does not introduce any new risk. Stability is achieved by ensuring that full consideration is given to each and every impact of the Change. Effective MOC process therefore requires multi-disciplinary and multi-functional reviews (e.g. Technical Authority (TA) for Technical Change, and Job Family Master (JFM), HR and Line Management for Administrative Change, etc.), appropriate levels of approval, and a consistent and rigorous Procedure to ensure that changes are effectively managed.

See detailed requirements in Management of Change Standard, SSHE-106-STD-570.

Supporting documents

Management of Change Standard, CMS-12060-STD-404

Change Management - Projects (Engineering & Construction) CMS-12060-STD-405

Management of Deviations for Operating Assets CMS-12060-STD-406

Accountability and Ownership for Management of Change (MOC), CMS-12060-STD-407

6.5.9 Chemical Management

To manage chemical hazards, chemicals used by both Company and Contractors for PTTEP activities are properly managed. There are controls for the purchasing, storage, handling, transportation, spill response and disposal of all chemicals used by PTTEP operating sites / Assets.

See detailed requirements in Chemical Management Standard, SSHE-106-STD-590

6.5.10 PTTEP Life Saving Program

The Life Saving Rules were developed by 26 IOGP member companies which cooperatively set up a task force to analyse information and causal factors from 20-years historic data of fatality, serious injury and high potential incidents which occurred in E&P industries from 1991 – 2010 (1,923 Fatalities from 1,484 Incidents and 1,279 High Potential Incidents). The taskforce concluded that most of the fatalities and serious injuries were from 18 high risk activities. Then specific rules were set to each activity / element for responsible personnel to follow and ensure that proper precautions would be applied so that the risks would be managed and controlled.

Each Life Saving Icon consists of a simple icon and descriptive text with a one page additional detailed guidance to explain why the rule is important and what aspects workers and supervisors should focus on. Each Icon is also linked to controls and barriers which if used properly can prevent or avoid fatal incidents.

Those 18 high risk activities were then translated to 18 icons of the Life Saving Program, consisting of 8 core icons and 10 supplemental icons.

8 Core Elements

	Obtain authorisation before entering a confined space		**Verify isolation before work begins and use the specified life protecting equipment**
	Protect yourself against a fall when working at height		**Wear your seat belt**
	Work with a valid work permit when required		**While driving, do not use your phone and do not exceed speed limits**
	Do not walk under a suspended load		**Follow prescribed Journey Management Plan**

10 Supplemental Elements

	Prevent dropped objects		**Wear a personal flotation device when required**
	Position yourself in a safe zone in relation to moving and energised equipment		**No alcohol or drugs while working or driving**
	Obtain authorisation before starting excavation activities		**Do not smoke outside designated smoking areas**
	Conduct gas tests when required		**Obtain authorisation before overriding or disabling Safety critical equipment**
	Do not work under or near overhead electric power lines		**Follow prescribed lift plan**

See detailed requirements in PTTEP Life Saving Standard, SSHE-106-STD-595

6.6 IMPLEMENTATION AND MONITORING

6.6.1 Incident Management

The Company is of the opinion that all incidents are preventable and if an incident occurs effort must be undertaken to prevent recurrence. The Incident Management Standard sets the minimum requirements for PTTEP Operating companies for reporting, classifying, investigating and following-up all incidents. All incidents are reported through PTTEP web-based Incident Management System (IMS). The reported data is analysed and summarised.

SSHE staff will also report incidents to the local regulators in a timely as required by law.

All incidents require a timely appropriate investigation, with accountability assigned, in order to identify the root causes of the incident and identify preventative and corrective actions to prevent recurrence. The progress of implementing remedial actions is monitored till close-out using the IMS.

SSHE Alerts / Lessons Learnt from incidents are disseminate to all Assets for their self-learning and discussion in meetings in order to ensure continuous improvement of the SSHE Management System and its performance.

See detailed requirements in Incident Management Standard, SSHE-106-STD-600.

Supporting documents

Occupational Illness Case Identification Guideline, SSHE-106-GDL-601

Incident Investigation Guideline, SSHE-106-GDL-602

SSHE Incident Reporting Perimeter Guideline, SSHE-106-GDL-603

6.6.2 SSHE Key Performance Indicator and Performance Management

The successful implementation of SSHE MS requires embedding SSHE into every Function Group annual Key Performance Indicators (KPIs). These indicators are linked to SSHE Policy targets and SSHE MS requirements. Effective SSHE KPIs require both leading and lagging indicators. Leading indicators are forward looking and predictive, aimed at raising the awareness of the possibility of incidents that might happen while lagging indicators provide information on incidents that have occurred and provides insights into means of preventing similar incidents in the future.

SSHE performance management provides a means to check and illustrate how SSHE Risk Management is achieved and how far the SSHE MS implementation is from the desired level. It also helps to identify priority areas for attention and the corrective actions that are needed. The SSHE performance is reviewed and evaluated regularly to measure the Line Management commitment to SSHE. The results of SSHE performance reviews and evaluations are fed back to Line Management and are used to actively correct deficiencies and to set new goals and priorities. In short, SSHE performance measurement forms the basis of continual improvement.

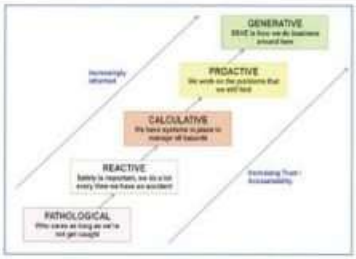
SSHE performance statistic and reports can be found on the SSHE INTRANET Home page

The use of benchmarking for analysis and comparison against other organisations is also important for performance management system that it reveals what needs to be improved as well as the processes, methodologies, approaches and practices. PTTEP benchmarks itself through the International Association of Oil and Gas Producers (IOGP) and has set the goal to be in the top quartile SSHE management performers. Formal management reviews evaluate SSHE MS performance and help management in deciding whether the current measures are sufficient or excessive and are driving the organisation to the right result.

See detailed requirements in SSHE KPI and Performance Management Standard, SSHE-106-STD-610

6.6.3 Behavioural Based Safety (BBS)

In order to achieve the companies SSHE objectives the Safety culture needs strengthening. To do this the Behaviour Based Safety process (BBS) has been adopted. BBS focuses on what people do, analyses why they do it and then applies research supported intervention technique to improve the behavioural processes.



Reference for IOGP 388: Human factors- A means of Improving HSE Performance

A SSHE Culture maturity model is used to measure the improvements found through the culture surveys.

The aim is to become Generative:

- Striving for Continuous improvement.
- SSHE seen as a profit centre.
- New ideas are welcome.

All Line Management ensure that the results from the BBS process are communicated, reviewed and analysed to determine the site exposure and indicators for improvement.

See detailed requirements in Behaviour Based Safety Standard, SSHE-106-STD-620

6.7 AUDIT AND REVIEW

AUDIT (Compliance)

Audits form part of the Company's assurance process. The Audit Standard sets out to have a uniform way of managing SSHE compliance auditing in PTTEP to determine:

1. Whether or not SSHE Management System elements and activities conform to planned arrangements, and are implemented effectively.
2. The effective functioning of the SSHE MS in fulfilling the Company's SSHE Policy, objectives and performance criteria.
3. Compliance with relevant legislative requirements.
4. Identification of areas for improvement, leading to progressively better SSHE management.

An annual audit plan is in place with a 5 year look ahead.

The audit plan covers the following audit Types:

1. SSHE MS Audits.
2. SSHE specific Audits, e.g. Safety, Security, Health and Environmental Audits.
3. Technical Safety Reviews, e.g. Project Technical Reviews, Operational Technical Reviews, etc.
4. Specialist Audits, e.g. Drilling Audits, ISO audits, Contractor Audits.

5. OE Management System Audit.
6. DMF Audits (Thai Regulator).
7. Others.

The Standard list the frequencies of all types of audits.

The Audit findings and recommendations are uploaded into the Corporate action tracking tool to monitor close out.

REVIEW (Suitable and Effective)

The SSHE MS and its performance is reviewed every 5 years to ensure its continuing suitability and effectiveness. Reviews are used to reinforce continuous efforts to improve SSHE performance.

See detailed requirements in Audit and Review Standard, SSHE-106-STD-700.

Supporting Documents:

Security Review and Audit Guideline, SSHE-106-GDL-701

Operations Readiness Review Guideline, SSHE-106-GDL-702

Project Technical Review Guideline, SSHE-106-GDL-703

Pre Start Up Audit Guideline, SSHE-106-GDL-704

Operational Technical Review Guideline, SSHE-106-GDL-705

In today's world legacy issues relating to the SSHE aspects of potential acquisitions are very important and can be costly if not identified early in the process. PTTEP uses the SSHE Due Diligence / JV Requirements Process to investigate a potential business investment prior to signing a contract or making business

APPENDIX A: CORRESPONDENCE BETWEEN OHSAS 18001:2007, ISO 14001:2004, IOGP 210, PTT GROUP SSHE MS AND PTTEP SSHE MS

OHSAS 18001:2007		ISO 14001:2004		IOGP 210		PTT Group SSHE MS		PTTEP SSHE MS	
1	Scope	1	Scope		Purpose and scope			2.0	Scope
2	Normative Reference	2	Normative Reference						
3	Terms and definitions	3	Terms and definitions	Annex	Definitions	IV	Definitions	4.0	Definitions
4	OH&S management system elements (title only)	4	Environmental management system requirements (title only)	-	-	-	-	-	-
4.1	General requirements	4.1	General requirements		Purpose and scope	I(2)	Purpose and overview of SSHE management Standards	1.0	Purpose
4.2	OH&S Policy	4.2	Environmental Policy	1 & S1 2 & S2	Leadership and commitment Policy and strategic objectives	II III(1)(a) III(2)(c)	GSHE Policy Policy New Assets / Projects	5.2.1	Policy
4.3	Planning (title only)	4.3	Planning (title only)	3 & S3 5.1 & S5.1	Planning (title only) General	-	-	-	-
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4.3.3	Objectives and programme(s)	4.3.3	Objectives, targets and programme(s)	4.4 & S4.4	Objectives and performance criteria	III(4)(d)	Objectives, targets and business planning	5.2.2	Strategic objectives
4.4	Implementation and operation (title only)	4.4	Implementation and operation (title only)	-	-	-	-	-	-
4.4.1	Resources, roles, responsibility, accountability and authority	4.4.1	Resources, roles, responsibility and authority	3.1 & S3.1 3.2 & S3.2 3.3 & S3.3	Organisational structure and responsibilities Management representative(s) Resources	III(1)(a) III(1)(b)	Resources Structure, roles and accountability	6.3.1 6.3.2 6.3.3	Organisation and resource Management representative Corporate oversight of SSHE MS

APPENDIX B: KEY ACCOUNTABILITIES FUNCTION GROUP AND LINE PARTNER SSHE STAFF

	FG SSHE Manager (POS, OPS), Senior Engineer (EDE)	SSHE Engineers / Line Partners (PTF, PTN, Inter Assets)	Site Safety Superintendent / Safety Officer
Purpose	Provides expertise in the development of SSHE programs for the Production Asset and Operations support group to achieve its SSHE Objectives. This includes, implementation of the SSHE MS requirements, evaluating SSHE statistics, plan, implement, monitor and review protective and preventative Safety measures.	Helps promotes a positive SSHE Culture and is responsible for ensuring the Asset operations comply with the Safety regulation and the SSHE Policy, Standards and Procedures. Compiles all SSHE data and issues these to Corporate SSHE. Reviews Assets SSHE performance and proposes improvement campaigns.	Provides Safety expertise to minimize operational losses, occupational Health problems, accidents and injuries through implementation of SSHE MS requirements and the use BBS tools. Gathers and reports all SSHE
Leadership	Advises FG's EVP on SSHE Culture and SSHE performance improvements Give consultancy and contributs in career development, POA and KPIs of SSHE personnel under FG.	Advise Asset SVP, VP on SSHE Culture and SSHE performance improvements. Gather SOC information and analyze data for trends. Propose SSHE improvements	Review Safety observation Cards and promote improvements
Policy	Implements the SSHE Policy and verifies Compliance Arranges distribution of applicable Thai laws to be adhered too and provides guidance to the applicability of laws against POS activities	Implements the SSHE Policy in Asset and verifies compliance Provides clear overview of SSHE laws applicable to the Assets activities and verifies compliance to SSHE Laws	Verifies compliance to SSHE Policy Explains SSHE Law requirements to Site Operations and ensures compliance.

OHSAS 18001:2007		ISO 14001:2004		IOGP 210		PTT Group SSHE MS		PTTEP SSHE MS	
4.4.2	Competence, training and awareness	4.4.2	Competence, training and awareness	5.4 & S5.4	Competence	III(1)(c)	Competency and training	6.3.7	Training and competency
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4.4.5	Control of documents	4.4.5	Control of documents	3.7 & S3.7	Documentation and its control	III(3)(d)	Documentation and recordkeeping	6.3.6	Documentation management
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4.5.3	Incident investigation, nonconformity, corrective action and preventative action (title only)	-	-	-	-	III(4)(a)	Incident management	6.6.1	Incident management
4.5.3.1	Incident investigation	-	-	6.5 & S6.5 6.6 & S6.6	Incident reporting Incident follow-up	III(4)(a)	Incident management	6.6.1	Incident management
4.5.3.2	Nonconformity, corrective action and preventive action	4.5.3	Nonconformity, corrective action & preventive action	5.4 & S5.4	Non-compliance and corrective action	III(4)(a) III(4)(c)	Incident management Inspection and audits	6.6.1	Incident management
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4.6	Management Review	4.6	Management Review	7.2 & S7.2	Reviewing	III(1)(c)	Management review	6.7.2	Review

	FG SSHE Manager (POS, OPS), Senior Engineer (EDE)	SSHE Engineer / SSHE Officer (PTF, PTN, Inter Assets)	Site Safety Superintendent / Safety Officer
Organisation, Resources and Documentation	With TSH and TSM reviews Support resource requirements and develops Service Level Agreements and develops and agrees with POS the SSHE budget Implements SSHE MS Standards, Procedures and Guidelines. Optimizes the number of applicable Site SSHE Procedures / Safe Working instruction to prevent unnecessary duplication between Assets. Arranges FG's SSHE meeting Manages compliance to Thailand SSHE committee requirements Arranges SSHE training support requirements with Corporate SSHE.	Advises FG's SSHE of Service Level Agreement requirements and budgetary requirements for all Asset SSHE activities Responsible for the role out of new Corporate SSHE documents in the Assets. Manages SSHE Documentation in Asset and ensures Alignment with Corporate SSHE documents Arranges Assets SSHE Meetings Arranges SSHE training of Asset staff with TSM and maintains training records. Ensures SSHE onboarding training is provided to all new staff. Assist with SSHE Contractor Management requirements as per SSHE Contractor Management Procedure Member of a SSHE Committee	Ensures understanding of Corporate SSHE Standards, Procedures and Guidelines and POS SSHE documents Ensures all Site SSHE documents are up to date Provides SSHE training on site for both staff and Contractors. Arranges Site SSHE Meetings. (Operations and SSHE Committee Meetings) Reports SSHE issues to the local labor Department. Ensures staff SSHE competency is up to date. Communicate SSHE issues and promote SSHE campaigns within Asset / site.

	FG SSHE Manager (POS, OPS), Senior Engineer (EDE)	SSHE Engineer / SSHE Officer (PTF, PTN, Inter Assets)	Site Safety Superintendent / Safety Officer
Implementation and Monitoring	Analysis SSHE performance and proposes improvement plans for the FG Reviews all incident reports and ensures compliance to Incident management Standard, quality of investigations and recommendations. Participate / facilitate in medium and high rated incidents	Analysis SSHE performance and proposes improvement plans for Asset Participates in incident investigations. Reviews incident investigations to verify that the incident has been investigated properly and that the correct remedial action recommendations have been given. Monitors the follow up. Based on incident reviews propose and help develop remedial Safety campaigns.	Analysis SSHE performance and proposes improvement plans for Site. Facilitates onsite initial incident investigations and monitors follow up of recommendations.
Audit and Review	With Corporate agree the Audit Plan and ensure budgetary support. Lead internal SSHE compliance Audits For FG's leadership visits provide Terms of Reference.	Assist with the planning of audits and reviews within the Asset. Be Asset focal point for external Audits Develop and execute Asset internal SSHE compliance Audits Do MOC compliance audits. Review quality of MAE prevention tool Review quality and applicability of SSHE documentation	Develop internal SSHE audit plan. Lead compliance audits to Procedures Conduct routine SSHE inspections.

	FG SSHE Manager (POS, OPS), Senior Engineer (EDE)	SSHE Engineer / SSHE Officer (PTF, PTN, Inter Assets)	Site Safety Superintendent / Safety Officer
Evaluation and Risk Assessment	Provides SSHE Risk Assessment support to all FG's Operations. Maintains SSHE Risk Register. Ensures compliance to Safety Case Requirements Tracks Process Safety performance Takes a proactive approach to the use of the MAE tool	Participates / Leads HEMP studies when required (HAZID, Bow tie, JHA) Assists with the development and update of Safety Cases and ensures they are in compliance with the Safety Case Standard. Responsible for the Safety Section of Safety cases. All remedial actions are followed up. Provides LOPC calculations for Process Safety KPI's Ensures Process Safety data for KPI's are reported and KPI's tracked Ensures MAE tool is up to date and used by Asset and verify quality of input data. Ensures Security and Health Risk assessments are done. Coordinates EIA follow up requirements	Applies HEMP to manage daily activities (HAZID, Bow tie, JSA) Advocates the use of the Safety Case MOPO and Bow-ties for management of daily activities. Supplies data for Process Safety KPI's and MAE Prevention Tool

	FG SSHE Manager (POS, OPS), Senior Engineer (EDE)	SSHE Engineer / SSHE Officer (PTF, PTN, Inter Assets)	Site Safety Superintendent / Safety Officer
Planning and Operational Control	Assists TSM with the Corporate Emergency plans. Manages FG's Duty Roster Ensures Safety Critical Activities have been identified Assists with the Development of FG's SSHE Plan in Alignment with the Corporate SSHE Plan and monitors implementation of the plan.	Ensures Asset Emergency / Crisis Management plans are up to date and exercised. Manages the Assets Duty rooster. Maintains a listing of all SSHE critical activities and their SSHE management requirements Reports Assets SSHE data to Corporate SSHE Assists with the development of the Assets SSHE Plan and ensures alignment with FG's SSHE plan Reviews risk assessment for MOCs	With OIM develops Emergency exercise training plan for the year. Retrains staff based on lessons learnt from Emergency exercises. Provides Operational Safety Support on site. (PPE, Fire, fighting, chemical management, waste management, use of Site SSHE Procedures etc.) Compile SSHE performance and statistics (including occupational Health, environmental and process Safety). Assists with the development of the Site SSHE plan and ensures alignment with the Assets SSHE plan. Facilitates SSHE risk assessments for the MOC process

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Process System Operation Manual

PTTEP

SINPHUHORM ASSET

PSH/F

Process System Operation Manual

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		Signature	Date
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	(Field Manager, PSH		

PREFACE

Scope/Purpose

This Operations Procedure Manual (OPM) provides system information for each system of the Sinphuhorm Wellpad and Gas Processing Plant (GPP) facilities.

All Operating personnel should be familiar with the content of the relevant OPM section prior to commencing operation of the System.

This OPM does not supersede, nor does it relieve responsibility for compliance with any other documentation that may be relevant. It should be used in conjunction with the latest P&IDs, which are referenced as appropriate.

Operations Manuals and Procedures

This OPM consists of individual sections which address the operation of each System in the Sinphuhorm Gas Plant. Each system is covered in its own section which details the system description, equipment description, instrumentation and control, EHS requirements and reference information.

Each system also has a detailed System Operations Procedure (SOP) (Doc Nos: PH-10-OP-SOP-00001 to 00013).

For details of the Overall Startup of the Sinphuhorm Gas Plant refer to Process and Utility Systems Overview (Doc No: PH-10-OP-MAN-00004), Addendum 1 Flowchart for the Overall Startup of the Sinphuhorm Gas Plant.

Document Control/Revision

This OPM is a controlled document.

It shall be subjected to periodic review and update to ensure the continued accuracy of the document in line with the ongoing operation of the facilities. In addition, changes to the document may also be identified as part of the management of change process, as appropriate.

Furthermore, anyone referencing this document is encouraged to propose corrections, changes or amendments to the content.

Any proposed changes/amendments must be submitted to the nominated Issue Authority identified on the front of this document for approval prior to incorporation into the manual.

Once amendments are developed, approved and issued for this manual, they will be copied to all nominated holders of the manual, accompanied by an amendment instruction sheet.

Nominated holders of this document are responsible for ensuring that the amendment is properly incorporated and the issue/amendment record page is updated accordingly.

ABBREVIATIONS

ACB	Air Circuit Breakers
AEP	Authorised Electrical Person
AFFF	Aqueous Fire Fighting Foam
APFR	Automatic Power Factor Regulator
BMS	Burner Management System
BOL	Bill of Lading
BPD	Barrels Per Day
BTU	British Thermal Units
CLMS	Condensate Loading and Metering System
CPI	Corrugated Plate Interceptor
DCS	Distributed Control System
EHS	Environmental, Health and Safety
ESD	Emergency Shutdown
GPP	Gas Processing Plant
GRP	Glass Reinforced Plastic
HIPPS	High Integrity Pressure Protection System
HL	High Level
HP	High Pressure
HPU	Hydraulic Power Unit
LA	Level Alarm
LAH	Level Alarm High
LAHH	Level Alarm High High
LAL	Level Alarm Low
LALL	Level Alarm Low Low
JT	Joules Thomson
KO	Knockout
LC	Level Control
LP	Low Pressure
LED	Light Emitting Diode
LPG	Liquefied Petroleum Gas
LTS	Low Temperature Separator
LV	Level Valve
MAWP	Maximum Allowable Working Pressure
MCB	Miniature Circuit Breakers
MCC	Motor Control Centre
MCCB	Moulded Case Circuit Breakers
MMSCF	Million Standard Cubic Feet
MP	Medium Pressure
MPCB	Motor Protection Circuit Breakers
MSDS	Material Safety Data Sheet
NACE	National Association of Corrosion Engineers
NL	Normal Level

OD	Outside Diameter
OPM	Operations Procedure Manual
P&ID	Piping and Instrument Diagram
PCSS	Process Control and Safety System
PEA	Provincial Electricity Authority
PFD	Process Flow Diagram
PMG	Permanent Magnet Generator
PPE	Personal Protective Equipment
PSD	Process Shutdown
PSS	Process Safety System
PTFE	Polytetrafluoroethylene
RTU	Radio Transmission Unit
RS-PCSS	Remote Sensing-Process Control and Safety System
SCSSV	Surface Controlled Subsurface Safety Valve
SCU	Starter Control Unit
SDS	Shutdown System
SOP	System Operations Procedure
SSV	Surface Safety Valve
TAS	Terminal Automation System
TEG	Tri-ethylene Glycol
UFD	Utility Flow Diagram
UPS	Uninterruptible Power Supply
VSD	Variable Speed Drive
WHCP	Wellhead Control Panel
WV	Wing Valve

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SECTION 12.0 FIRE AND SERVICE WATER SYSTEM

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1.0 INTRODUCTION

1.1 System Purpose/Function

The processing facilities on Wellpad A are designed to produce gas from five wellheads and export the fluids to the Gas Processing Plant (GPP) via the main pipeline. The wellpad provides manifold facilities to import fluids from Wellpads B/C and export these to the GPP. The wellpad also provides pigging facilities Wellpads B/C and to the GPP.

1.2 Primary Components

Wellpad A is located south end of the field and is comprised of the following Primary Components:

Tag No	Equipment Title/Description
113-00-Z-001	PH5 Wellhead
113-00-Z-002	Future Wellhead
113-00-Z-003	Future Wellhead
113-00-Z-004	Future Wellhead
113-00-Z-005	Future Wellhead
113-30-S-001	Wellhead Control Panel (WHCP)
113-00-S-007	Portable Test Separator
113-62-V-001	Pig Launcher
115-62-V-001	Pig Receiver – Located at Gas Processing Plant (GPP)
113-62-V-004	Pig Receiver – For Wellpads B
113-62-V-005	Pig Receiver – For Wellpads C

1.3 Primary Interfaces

Input Interfaces:

- Wellpad B (refer to Section 1.0B of this manual)
- Wellpad C (refer to Section 1.0C of this manual)
- PCSS System (refer to SOP Volume 14 Process Control and Safety System)
- Power Generation System (refer to SOP Volume 1A-3 (Doc No: PH-10-OP-SOP-00001A-03))
- Chemical Injection (refer to SOP Volume 1A-2 (Doc No: PH-10-OP-SOP-00001A-02))

Output Interfaces:

- Gas Processing, Metering and Export System (refer to Section 2.0 of this manual)
- Flare System (refer to SOP Volume 1A-2 (Doc No: PH-10-OP-SOP-00001A-02))

2.0 SYSTEM DESCRIPTION

2.1 System Overview

Refer to Figure 1A-1.1 – Wellhead and Production Manifolds Simplified Overview Schematic.

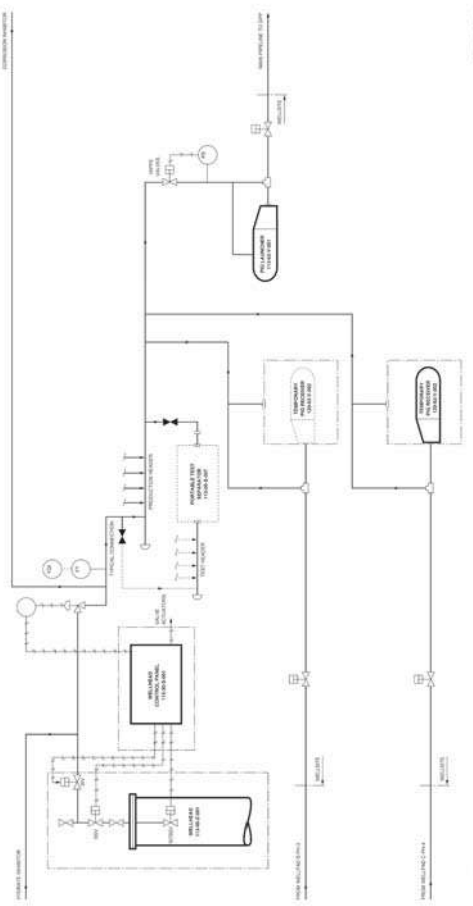
Wellpad A is equipped with one production wellhead and four wellheads in the future, each with corrosion inhibitor/ hydrate inhibitor injection facilities and a wellhead control panel for control and shutdown requirements. There is also provision for a portable test separator.

In addition to the fluids produced at Wellpad A, the facility receives production fluids from Wellpad B and Wellpad C for transfer to the GPP.

A permanent pig launcher is installed for pigging of the main pipeline to the GPP where the pig receiver is installed. A pig receiver is provided for pigging of the gathering pipelines from Wellpad B and Wellpad C.

PH-10-OP-MAN-00002

Figure 1A-1.1 – Wellhead and Production Manifolds Simplified Overview Schematic



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2.2 Primary Flow Description

Refer to the following P&IDs:

- PHM-113-FE-002 Wellhead Details
- PHM-113-FE-001 Wellhead Control Panel
- PHM-113-FE-004 Production Header
- PHM-113-FE-005 Pig Launcher
- PHM-113-FE-006 Pig Receivers
- PHM-115-FE-001 GPP Pig Receiver

2.2.1 Systems

For the purposes of this document, Wellpad A is separated into several sections as follows:

- Production
- Gathering Pipelines
- Main Pipeline to GPP

2.2.2 Production

Production Wellheads

The Wellpad has one production wellhead and four wellheads in the future (113-00-Z-001-113-00-Z-005). For the purpose of clear description tag numbers associated with wellhead 113-00-Z-001 only are used in this document.

At each well, the reservoir fluids are produced to surface through 4 ½" diameter productions tubing to the associated production wellhead, 113-00-Z-001 to 113-00-Z-005.

Each of the production wellheads is equipped with the following:

- Hydraulically operated Surface Controlled Subsurface Safety Valve (SCSSV)
- Manually operated master valve
- Hydraulically operated Surface Safety Valve (SSV)
- Hydraulically operated Wing Valve (WV)
- Hydraulically operated wellhead choke
- Chemical injection lines for injection of hydrate inhibitor and Corrosion inhibitor

The first isolation valve in each production string is the SCSSV, which is located in the production tubing string at approximately 53-56mRT distance below the surface.

The valve is operated hydraulically from the WHCP from a high-pressure hydraulic supply and fails closed on loss of hydraulic pressure.

The wellhead houses a manual block valve and then the SSV, which is the second hydraulically controlled valve. The SSV valve is operated hydraulically from the WHCP from a medium pressure supply and fails closed on loss of hydraulic pressure. The final valve on the tree is the hydraulically controlled Wing Valve (WV) which is also controlled hydraulically from the WHCP.

The produced fluids flow through a then the hydraulically adjustable choke valve, which is used to maintain back pressure on the well and set the flow from the well.

The choke valve is also used to bring a well into production in a controlled manner to avoid damage to the well and upset of downstream equipment.

The produced fluids flow from the wellheads via the well flow lines to the production manifold. Each of the well flow lines is of 150 mm diameter.

Alternatively, if well testing is to be performed, each flow line has a facility to divert flow to a 6" diameter test manifold, which connects to a portable test separator on site. Following well testing, the fluids from the test separator are routed to the production manifold to rejoin the fluids from the other wells. The operator can manually align valves to direct the output of any single well to the test header.

Production Manifold

The purpose of the production manifold is to collect produced fluids from the wells and route them via the 10" diameter production header to the main pipeline for processing at the Gas Processing Plant (GPP).

Chemical Injection

There is the facility to inject hydrate inhibitor of the choke valve. There is also a corrosion inhibitor injection point downstream of the choke.

Wellhead Control

Wellhead Control Panel 113-30-S-001 houses the wellhead controls for each well. The wellhead control panel is provided with hydraulic reservoirs, pumps, filters, piping, instruments, control logic and controls to provide high, medium and low pressure hydraulic fluid to operate surface safety valves, subsurface safety valves, wing valves and choke valves.

Control of the wellhead valves can be carried out locally at the WHCP or remotely via the Remote Sensing- Process Control and Safety System (RS-PCSS). The WHCP control panel logic sends and receives signals to/from the GPP Process Control and Safety System (PCSS).

2.2.3 Gathering Pipelines

There are two 10" diameter gathering pipelines importing production fluids from Wellpad B and Wellpad C. Each of the gathering pipelines has a hydraulically operated inlet shutdown valve operated via the WHCP and has the provision to use a pig receiver for inspection, maintenance and cleaning operations.

2.2.4 Main Pipeline to GPP

The main multiphase export pipeline to the Gas Processing Plant is 400 mm diameter and is 64 km long. The main pipeline is provided with a hydraulically operated, export shutdown valve operated via the WHCP and a pig launcher to enable cleaning and inspection operations to be performed.

In addition to the export shutdown valve, a High Integrity Pressure Protection System (HIPPS) is provided for pipeline protection. The HIPPS operates two further shutdown valves utilising a voting system with three independent pressure transmitters and a logic solver. The HIPPS is provided with its own Hydraulic Power Unit (HPU) for the control of the HIPPS shutdown valves.

At the GPP, the main pipeline is provided with an import shutdown valve and a pig receiver.

3.0 EQUIPMENT DESCRIPTION

3.1 Wellheads 113-00-Z-001/5

Refer to P&ID: PHM-113-FE-002 Wellhead Details.

Note: There is provision made for 5 Wellheads, only one typical Wellhead 113-00-Z-001 is described below.

3.1.1 Function

Wellhead 113-00-Z-001 allows for isolation of production well and the flow control of the produced fluids from the well.

3.1.2 Technical Data

For details of the design and operating parameters, refer to Table 1A-1.1 – Design and Operating Parameters Wellhead 113-00-Z-001.

Table 1A-1.1 – Design and Operating Parameters Wellhead 113-00-Z-001

Parameter	Design	Operating
Pressure	85-227.5 barg	40 to 227.5barg
Temperature (Max/Min)	-	34°C to 66°C
Capacity	-	
Size	7" to 13 3/8" CSG, 4 ½" Tbg	

3.1.3 Technical Description

The wellhead supports the casing strings and production tubing and provides the mounting for the Xmas tree.

The Wellhead Control Panel (WHCP) 113-30-S-001 Surface Controlled Subsurface Safety Valve 00-SCSSV-101, Surface Safety Valve 00-SSV-102, Wing Valve 00-WV-103 and Choke Valve 00-CV-104. The WHCP is described in Paragraph 3.2 Wellhead Control Panel 113-30-S-001.

The SCSSV is a hydraulically operated shutdown valve located in the production string and is a self equalising, full bore valve designed to avoid any restriction to flow. The valve is opened and held in the open position by hydraulic pressure supplied by the WHCP.

If hydraulic pressure is lost or the operator initiates closure of the SCSSV, the spring in the actuator forces the valve to the closed position.

The hydraulic control line to the SCSSV enters the casing through the wellhead and is attached to the exterior of the production tubing. Closure of the SCSSV isolates the well from the surface facilities.

The next valve in the flow path is the master valve, which is the lower valve in the Xmas tree. This valve is a full bore manual block valve located directly below the surface safety valve (SSV).

The SSV is a hydraulically operated shutdown valve located above the manual master valve in the Xmas tree. The SSV is a full bore valve, which is opened and held in the open position by hydraulic pressure supplied by the WHCP. On loss of hydraulic pressure the valve is moved to the closed position by a spring in the actuator.

At the top of the tree there is a swab valve which is full bore manual isolation valve which has a threaded section and a screw cap on the flange above the valve. This valve is only used when access is required to the well bore to perform wire line or other invasive operations.

The well fluids leave the tree through the wing valve which is mounted on the side of the tree above the SSV. The wing valve is a hydraulically operated gate valve controlled by hydraulic pressure supplied by the WHCP and is used to isolate the X-mas tree from the production facilities.

Control of the well pressure and flow to the production manifold is through the hydraulically operated choke valve which is located down stream of the wing valve. The choke valve position is set by a hydraulic stepping type actuator which can drive the valve in small increments in

either direction. Hydraulic pressure for the actuator is supplied by the WHCP and direction of travel is controlled by a four way solenoid valve.

3.2 Wellhead Control Panel 113-30-S-001

Refer to P&ID: PHM-113-FE-001 Wellhead Control Panel and SA/06/WHCP-B101C/4-1 Vendor WHCP Schematic Diagram.

3.2.1 Function

The Wellhead Control Panel 113-30-S-001 houses the control logic for operation of the Surface Safety Valves (SSVs), Surface Controlled Subsurface Safety Valves (SCSSVs), Wing Valves, Choke Valves and Pipeline Shutdown Valves. The skid contains the hydraulic reservoir, accumulators, pumps, filters, piping, instruments and provides the high, medium and low-pressure hydraulic supplies to operate the actuators on the valves.

The panel also supplies the nitrogen for the zone 1 and 2 Fusible Plug Loops for fire protection of the wellpad.

3.2.2 Technical Data

For details of the design and operating parameters, refer to Table 1A-1.2 – Design and Operating Parameters Wellhead Control Panel 113-30-S-001.

Table 1A-1.2 – Design and Operating Parameters Wellhead Control Panel 113-30-S-001

Parameter	Design	Operating
Reservoir Capacity	100 Liters	
Accumulator Capacity	38l each	
Accumulator Pressure	413barg each	
MAWP High	413barg	
MAWP Medium	413barg	
MAWP Low	200barg	
Size	3.25m x 1.2m x 2.10m	

3.2.3 Technical Description

The WHCP contains the electronic control equipment, hydraulics and nitrogen supply for protection, operation and control of the production wells. Each well has its own well control panel slot.

The well control panel performs the following functions:

Provides a HP 350 barg hydraulic supply for operation of the SCSSVs which can be opened and closed individually from the WHCP

Provides an MP 300 barg hydraulic supply for operation of the SSVs and WVs. Which can be opened and closed individually from the WHCP

Performs the logic governing the sequence of operation of the SCSSV, SSV and WV

Provide 150 barg hydraulic pressure for operation of the choke valves. Individual well choke valves can be stepped open and closed individually from the WHCP or remotely from the DCS

Provide 150 barg hydraulic pressure for operation of the gathering pipeline shutdown valves and main pipeline shutdown valves

Provide 6.0 barg low pressure hydraulic control supply for the pilots which switch the supply to the SCSSVs, SSVs and WVs

Provide nitrogen at a pressure of 8.0 barg for operation of the zone 1 and 2 fusible plug loops

Provide for selection and control of the HP and MP hydraulic pumps

The electronic controls are linked to the Distributed Control System (DCS) and the Process Safety System (PSS). DCS and PSS inputs and outputs are transmitted to and from the WHCP.

The high pressure and medium pressure hydraulic pumps are housed in the WHCP together with associated filters and safety relief valves. These provide hydraulic pressure for the high, medium and low hydraulic systems. The hydraulic fluid reservoir is equipped with an atmospheric vent.

Hydraulic oil for the WHCP is held in a reservoir. The reservoir is partitioned to segregate the returns from the SDVs, SSVs and WVs from the returns from the SCSSV which may be contaminated with reservoir fluids.

The two high pressure 100% electric motor driven hydraulic pumps, operating in a duty/standby configuration take suction from the bottom of the fluid supply reservoir and raises the pressure of the hydraulic fluid. Each pump discharge is protected by a pressure safety valve set at a pressure to 420barg releasing excess pressure to the hydraulic return header.

The two medium pressure 100% electric motor driven hydraulic pumps, operating in a duty / standby configuration take suction from the bottom of the fluid supply reservoir and delivers raises the pressure of the hydraulic fluid. Each pump discharge is protected by a pressure safety valve set at a pressure to 415barg releasing excess pressure to the hydraulic return header.

Both the HP and MP hydraulic supply pumps are backed up by a manual hydraulic pump, which can be lined up to either the HP or MP system.

A pre-charged accumulator is provided on each of the HP and MP hydraulic supply headers to provide capacity and prevent constant stopping and starting of the pumps. The accumulators are pre-charged with nitrogen to 240 barg. for HP, 210 barg. for MP.

On the MP supply line downstream of the MP accumulator there are two tie ins. The first is routed via a self regulating pressure control valve set at 150 barg which is the supply for the gathering and main pipeline shutdown valves. The second tie in is routed via a pair of self-regulating pressure control valves set at 6.0barg and goes to supply the low pressure control supply for operation of the SCSSVs, SSVs and WVs.

Nitrogen bottles in the WHCP supply the Zone 1 and 2 fusible plug loops via a self-regulating pressure control valve set at 6.0 barg.

3.3 Portable Test Separator 113-00-S-007

Refer to P&ID: PHM-113-FE-004 Production Header.

3.3.1 Function

Portable Test Separator 113-00-S-007 is a three-phase separator which separates the oil, produced water and gas in the well stream, in a similar manner to the production separator. The flow in each phase is measured during well testing to enable the performance of the well to be monitored.

3.3.2 Technical Data

For details of the design and operating parameters, refer to Table 1A-1.3 – Design and Operating Parameters Portable Test Separator 113-00-S-007.

Table 1A-1.3 – Design and Operating Parameters Portable Test Separator 113-00-S-007

Parameter	Design	Operating
Pressure	227.5 barg	40 to 95 barg
Temperature (Max/Min)	-29/85°C	17 to 66°C
Capacity	50mmscfd	

3.3.3 Technical Description

The test separator will be provided by the vendor that is contracted to do well testing. Reference should be made to the relevant vendor documentation for details of the test separator.

3.4 High Integrity Pressure Protection System HPU

Refer to P&ID: PH-113-FE-005 Pig Launcher.

3.4.1 Function

Shutdown Valves 00-SDV-106 and 00-SDV-107 are equipped with a High Integrity Pressure Protection System HPU that provides hydraulic supply for their operation when required by the HIPPS.

3.4.2 Technical Data

For details of the design and operating parameters, refer to Table 1A-1.4 – Design and Operating Parameters High Integrity Pressure Protection System HPU.

Table 1A-1.4 – Design and Operating Parameters High Integrity Pressure Protection System HPU

Parameter	Design	Operating
Pressure	228barg	35-85barg
Temperature (Max/Min)	–29 to 85°C	17-50 °C

3.4.3 Technical Description

The High Integrity Pressure Protection System HPU consists of a hydraulic pump unit to open the valve. Hydraulic pressure to open the valve is hand pumped until the valve is fully opened. The pressure is locked in place and then released as required by solenoids actuated by the HIPPS Logic Solver the valve closing by actuator spring.

For details of the instrumentation for monitoring, control and shutdown of the HIPPS refer to Paragraph 4.0.

3.5 Pig Launcher 113-62-V-001

Refer to P&ID: PHM-113-FE-005 Pig Launcher.

3.5.1 Function

Pig Launcher 113-62-V-001 is provided to launch pigs, including intelligent pigs, for inspection, maintenance and cleaning of the main pipeline from the wellpad A to the gas processing plant.

The pig launcher is normally isolated from the export line, depressurised and drained. When in service the operating pressure is dependent upon pipeline pressure.

3.5.2 Technical Data

For details of the design and operating parameters, refer to Table 1A-1.5 – Design and Operating Parameters Pig Launcher 113-62-V-001.

Table 1A-1.5 – Design and Operating Parameters Pig Launcher 113-62-V-001

Parameter	Design	Operating
Pressure	94.4barg	35 to 85barg
Temperature (Max/Min)	-29/85°C	17 to 50°C
Capacity	50mmscfd	

3.5.3 Technical Description

The launcher is comprised of a horizontal, carbon steel, cylindrical barrel fitted with an end closure, which is interlocked to prevent opening prior to complete depressurisation and draining of the launcher. The major barrel has an external diameter of 500 mm and length of 5.2 m. The minor barrel has an external diameter of 400 mm and length of 1.5 m. The minor barrel has an internal diameter to match the inside diameter of the main pipeline. Connection between the two barrel sections is by an eccentric reducer such that the bottom of the launcher is a straight line.

To ensure safe operation of the vents, drain and line valves when performing pig loading and launching operations, the sequence of operation of the following valves and door release are controlled by a key interlock system on the following items:

- SP-002 – End closure
- 62-BV-501 – Pig launcher outlet valve
- 62-BV-502 – Pig launcher outlet valve
- 00-BV-532 – Pig launcher bypass valve
- V1 (PG388)– Kicker line first valve isolation
- V2 (PG389) – Kicker line bypass first valve isolation
- V3 (PG390) - Kicker line bypass second valve isolation
- V4 (PG530) – Kicker line second valve isolation
- V5 (PG531) - Pig launcher eaualizing valve
- V6 (PG536)– Rear drain valve first isolation
- V7 (PG538)– Rear drain valve second isolation
- V8 (PG539)– Forward drain valve first isolation
- V9 (PG541)– Forward drain valve second isolation
- V10(VH059)– Vent to flare first isolation
- V11-(VH057)- Vent to flare second isolation
- V12(PG532)– Atmospheric vent second isolation
- V13(PG533) – Atmospheric vent first isolation
- V14(PG535) – Purging point second valve isolation
- V15(PG534)- Purging point first valve isolation

Local Instrumentation

Local Pressure Indicators 62-PG-101 and 62-PG-102 are provided on the launcher barrel equalisation line to indicate the pressure in the launcher. Pressure Indicator 62-PG-101 is a low range gauge with overpressure protection provided to indicate pressure when the launcher has been depressurised prior to opening.

Local Intrusive Pig Signaller 62-ZI-102 is provided to indicate passage of the pig through the minor barrel of the launcher.

For details of the instrumentation for monitoring, control and shutdown of the launcher refer to Paragraph 4.0.

3.6 Pig Receiver 115-62-V-001

Refer to P&ID: PHM-115-FE-001 GPP Pig Receiver.

3.6.1 Function

Pig Receiver 115-62-V-001 is provided to receive pigs, including intelligent pigs, for inspection, maintenance and cleaning of the main pipeline from the wellpad to the gas processing plant. The pig receiver is normally isolated from the export line, depressurised and drained. When in service the operating pressure is dependent upon pipeline pressure.

3.6.2 Technical Data

For details of the design and operating parameters, refer to Table 1A-1.6 – Design and Operating Parameters Pig Receiver 115-62-V-001.

Table 1A-1.6 – Design and Operating Parameters Pig Receiver 115-62-V-001

Parameter	Design	Operating
Pressure	94.4barg	35 to 85barg
Temperature (Max/Min)	-29 to 85°C	15 to 45°C
Capacity	50mmscfd	

3.6.3 Technical Description

The receiver is comprised of a horizontal, carbon steel, cylindrical barrel fitted with an end closure, which is interlocked to prevent opening prior to complete depressurisation of the receiver. The major barrel has an external diameter of 500 mm and length of 5.4 m. The minor barrel has an external diameter of 400 mm and length of 5.2 m. Connection between the two barrel sections is by an eccentric reducer such that the bottom of the launcher is a straight line. The minor barrel has an internal diameter to match the inside diameter of the main pipeline.

To ensure safe operation of the vents, drain and line valves when performing pig retrieval and receiving operations, the sequence of operation of the following valves and door release are controlled by a key interlock system on the following items:

- SP-001 – End closure
- PG-105 – Pig receiver inlet valve first isolation
- PG-107 – Pig receiver inlet valve second isolation
- PG-104 – Pig receiver bypass valve isolation
- PG-115 – Kicker line valve first isolation
- PG-113 – Kicker line valve second isolation
- PG-117 – Kicker line bypass valve first isolation
- PG-116 – Kicker line bypass valve second isolation

- PG/DC-004 – Rear drain valve first isolation
- PG/DC-005- Rear dain valve second isolation
- PG/DC-001 –Forward drain valve first isolation
- PG/DC-002- Forward drain valve second isolation
- PG/RFV-004 – Vent to flare valve first isolation
- PG/RFV-005 – Vent to flare valve second isolation
- PG-125 – Atmospheric vent
- PG-124 – Atmospheric vent
- PG-108 – Purging point valve second isolation
- PG-109 –Purging point valve first isolation

Local Instrumentation

Local Pressure Indicators 62-PG-101 and 62-PG-102 are provided on the receiver barrel equalisation line to indicate the pressure in the receiver. Pressure Indicator 62-PG-101 is a low range gauge with overpressure protection provided to indicate pressure when the receiver has been depressurised prior to opening.

Local Intrusive Pig Signaller 62-ZI-102 is provided to indicate passage of the pig through the minor barrel of the launcher.

For details of the instrumentation for monitoring, control and shutdown of the launcher refer to Paragraph 4.0.

3.7 Pig Receiver 113-62-V-004 (From wellpad C)

Refer to P&ID: PHM-113-FE-006 SPH3 and SPH4 Receiver

3.7.1 Function

A Pig Receiver 113-62-V-004, which can be connected to the Wellpad C gathering pipeline to receive pigs passing through the pipelines, is provided at Wellpad A.

The pig receiver can receive pigs, for intelligent pigs for cleaning and inspection, of the gathering pipelines from Wellpads C. The pig receiver is normally isolated from the export line, depressurised and drained. When in service the operating pressure is dependent upon pipeline pressure.

3.7.2 Technical Data

For details of the design and operating parameters, refer to Table 1A-1.7 – Design and Operating Parameters Pig Receiver 113-62-V-004.

Table 1A-1.7 – Design and Operating Parameters Pig Receiver 113-62-V-004

Parameter	Design	Operating
Pressure	227.5barg	35 to 85barg
Temperature (Max/Min)	-29/85°C	17 to 50°C
Capacity	50mmscfd	

3.7.3 Technical Description

The receiver is comprised of a horizontal, carbon steel, cylindrical barrel fitted with an end closure, which is interlocked to prevent opening prior to complete depressurisation of the receiver. The major barrel has an external diameter of 300mm and length of 4.5m.

The minor barrel has an external diameter of 250mm and length of 4.3m. The minor barrel has an internal diameter to match the inside diameter of the gathering pipeline.

To ensure safe operation of the vents, drain and line valves when performing pig retrieval and receiving operations, the sequence of operation of the following valves and door release are controlled by a key interlock system on the following items:

- SP-007 – End closure
- PG-403 – Pig receiver inlet valve first isolation
- PG-405 – Pig receiver inlet valve second isolation
- PG-406 – Pig receiver bypass valve isolation
- PG-411 – Kicker line valve first isolation
- PG-413 – Kicker line valve second isolation
- PG-521- Kicker line valve third isolation
- PG-407 – Kicker line bypass valve first isolation
- PG-409 – Kicker line bypass valve second isolation
- PG-410 – Kicker line bypass valve third isolation
- PG-527 – Rear drain valve first isolation
- PG-529 - Rear dain valve second isolation
- PG-524 - Forward drain valve first isolation
- PG-526 - Forward drain valve second isolation
- PG-518 – Vent to flare valve first isolation
- PG-516 – Vent to flare valve second isolation
- VH-061 - Vent to flare valve third isolation
- PG-523 – Atmospheric vent valve first isolation
- PG-522 – Atmospheric vent valve second isolation
- PG-519 – Purging point valve first isolation
- PG-520 – Purging point valve second isolation

Local Instrumentation

Local Pressure Indicators 62-PG-103 and 62-PG-105 are provided on the launcher barrel equalisation line to indicate the pressure in the launcher. Pressure Indicator 62-PG-103 is a low range gauge with overpressure protection provided to indicate pressure when the launcher has been depressurised prior to opening.

Local Intrusive Pig Signaller 62-ZI-103 is provided to indicate passage of the pig through the minor barrel of the receiver.

For details of the instrumentation for monitoring, control and shutdown of the launcher refer to Paragraph 4.0.

Pig Receiver 113-62-V-005 (From wellpad B)

Refer to P&ID: PHM-113-FE-006 (SPH3 and SPH4 Receiver.)

3.7.1.1 Function

A Pig Receiver 113-62-V-005, which can be connected to the Wellpad B gathering pipeline to receive pigs passing through the pipelines, is provided at Wellpad A.

The pig receiver can receive pigs, for intelligent pigs for cleaning and inspection, of the gathering pipelines from Wellpads B. The pig receiver is normally isolated from the export line, depressurised and drained. When in service the operating pressure is dependent upon pipeline pressure.

3.7.2.1 Technical Data

For details of the design and operating parameters, refer to Table 1A-1.7.1 – Design and Operating Parameters Pig Receiver 113-62-V-005

Table 1A-1.7.1 – Design and Operating Parameters Pig Receiver 113-62-V-005

Parameter	Design	Operating
Pressure	227.5barg	35 to 85barg
Temperature (Max/Min)	-29/85°C	17 to 50°C
Capacity	50mmscfd	

3.7.4 Technical Description

The receiver is comprised of a horizontal, carbon steel, cylindrical barrel fitted with an end closure, which is interlocked to prevent opening prior to complete depressurisation of the receiver. The major barrel has an external diameter of 300mm and length of 4.5m.

The minor barrel has an external diameter of 250mm and length of 4.3m. The minor barrel has an internal diameter to match the inside diameter of the gathering pipeline.

To ensure safe operation of the vents, drain and line valves when performing pig retrieval and receiving operations, the sequence of operation of the following valves and door release are controlled by a key interlock system on the following items:

- SP-008 – End closure
- PG-421 – Pig receiver inlet valve first isolation
- PG-423 – Pig receiver inlet valve second isolation
- PG-424 – Pig receiver bypass valve isolation
- PG-534 – Kicker line valve first isolation
- PG-536 – Kicker line valve second isolation
- PG-542 – Kicker line valve third isolation
- PG-530 – Kicker line bypass valve first isolation
- PG-532 – Kicker line bypass valve second isolation
- PG-533 – Kicker line bypass valve third isolation
- PG-548 – Rear drain valve first isolation
- PG-550 – Rear dain valve second isolation
- PG-545 – Forward drain valve first isolation
- PG-547 - Forward drain valve second isolation
- PG-539 – Vent to flare valve first isolation
- PG-537 – Vent to flare valve second isolation
- VH-063 - Vent to flare valve third isolation

- PG-544 – Atmospheric vent valve first isolation
- PG-543 – Atmospheric vent valve second isolation
- PG-540 – Purging point valve first isolation
- PG-541– Purging point valve second isolation

Local Instrumentation

Local Pressure Indicators 62-PG-104 and 62-PG-104 108 are provided on the receiver barrel equalisation line to indicate the pressure in the launcher. Pressure Indicator 62-PG-104 is a low range gauge with overpressure protection provided to indicate pressure when the receiver has been depressurised prior to opening.

Local Intrusive Pig Signaller 62-ZI-104 is provided to indicate passage of the pig through the minor barrel of the receiver.

For details of the instrumentation for monitoring, control and shutdown of the launcher refer to Paragraph 4.0.

4.0 INSTRUMENTATION AND CONTROL

4.1 Wellheads 113-00-Z-001/5

Refer to P&ID: PHM-113-FE-002 Wellhead Details.

Note: There is provision made for one well for production and four wells in the future at Wellpad A. A typical Wellhead 113-00-Z-001 is described below.

4.1.1 Pressure

The well flow line is provided with a Pressure Transmitter 00-PT-111 upstream of the choke valve, which provides indication on the DCS via Pressure Indicator 00-PI-111.

The well flow line is provided with a Pressure Transmitter 00-PT-112 downstream of the choke valve, which provides indication and high and low pressure alarms on the DCS via Pressure Indicator 00-PIA-112.

Pressure Transmitter 00-PT-120 downstream of the choke valve, provides a high pressure trip to the PSD via Pressure Indicator 00-PIA-120.

Pressure Transmitter 00-PT-121 downstream of the choke valve, provides a low pressure trip to the PSD via Pressure Indicator 00-PIA-121.

4.1.2 Flow

Fluid flow through the well flow line is monitored by Flow Transmitter 00-FT-102 downstream of the choke valve, which provides totalised flow indication on the DCS via Flow Totaliser 00-FQI-102.

Corrosion inhibitor flow to the well flow line is monitored by Flow Transmitter 00-FT-101, which is displayed on the DCS via Flow Indicator 00-FIA-101.

4.1.3 Temperature

Temperature Transmitter 00-TT-101 upstream of the choke valve provides temperature indication through 00-TI-101 on the DCS.

The well flow line is provided with a Temperature Transmitter 00-TT-102 downstream of the choke valve, which provides temperature indication and a low temperature alarm on the DCS via Temperature Indicator 00-TIA-102.

4.1.4 Choke Valve

The choke valve position is indicated on the wellhead control panel by Position Indicator 00-ZI-104B. The choke position is repeated on the DCS through Position Indicator 00-ZI-104A.

For choke valve control refer to Paragraph 4.2 Wellhead Control Panel.

4.2 Wellhead Control Panel 113-30-S-001

Refer to P&ID: PHM-113-FE-001 Wellhead Control Panel and SA/06/WHCP-B101C/4-1 Vendor WHCP Schematic Diagram.

4.2.1 Pressure

The HP hydraulic SCSSV supply pressure is monitored by Pressure Transmitter PTH-3, which provides indication on the PSS via Pressure Indicator Alarm 30-PIA-101. Pressure Indicator Alarm 30-PIA-101 generates a low-pressure alarm and a low-pressure trip signal for the ESD System.

The MP hydraulic SSV supply pressure is monitored by Pressure Transmitter PTH-2, which provides indication on the PSS via Pressure Indicator Alarm 30-PIA-102. Pressure Indicator Alarm 30-PIA-102 generates a low-pressure alarm and a low-pressure trip signal for the ESD System.

The MP hydraulic SDV and choke valve supply pressure is monitored by Pressure Transmitter PTH-1, which provides indication on the PSS via Pressure Indicator Alarm 30-PIA-103. Pressure Indicator Alarm 30-PIA-103 generates a low-pressure alarm and a low-pressure trip signal for the ESD System.

The LP hydraulic control supply pressure is monitored by Pressure Transmitter PTL-1, which provides indication on the PSS via Pressure Indicator Alarm 30-PIA-104. Pressure Indicator Alarm 30-PIA-104 generates a low-pressure alarm and a low-pressure trip signal for the ESD System.

The fusible plug loop pressures for zone 1 and zone 2 are monitored by Pressure Switches PS-2 and PS-3 respectively, which provide indication on the PSS via Pressure Indicator Alarm 80-PIA-101. Pressure Indicator Alarm 80-PIA-101 generates a low-pressure trip signal for the ESD System.

The following local pressure indicators are provided on the front panel of the WHCP:

- PF-5 – HP Hydraulic Header Pressure
- PF-4 – MP Hydraulic Header Pressure
- PF-3 – Choke Valve/SDV MP Hydraulic Header Pressure
- PE-1 – LP Hydraulic Header Pressure
- PE-2 – Fusible Plug Loop Zone 1 Pressure
- PE-3 – Fusible Plug Loop Zone 2 Pressure

4.2.2 Differential Pressure

The hydraulic reservoir suction strainer differential pressure is measured by Pressure Differential Transmitter PAD-1 and indicated on the DCS by Pressure Differential Indicator 30-PDIA-101, which provides a high differential pressure alarm.

The HP pump discharge filter differential pressure is measured by Pressure Differential Transmitter PAD-3 and indicated on the DCS by Pressure Differential Indicator 30-PDIA-102, which provides a high differential pressure alarm.

The MP pump discharge filter differential pressure is measured by Pressure Differential Transmitter PAD-2 and indicated on the DCS by Pressure Differential Indicator 30-PDIA-103, which provides a high differential pressure alarm.

4.2.3 Level

The level in the hydraulic oil reservoir is monitored by Level Transmitter PAE-1 and indicated on the PSS via Level Indicator Alarm 30-LIA-101. Level Indicator Alarm 30-LIA-101 provides a low-level trip signal for the ESD System.

Local level indication at the hydraulic oil reservoir is provided by Level Gauges PV-1 and PV-2.

4.2.4 Motor Control

The Motor Controls are located left of centre in the front of the WHCP in two groups one for the HP system and one for the MP system. The groups include the following indicators, pushbuttons and selector switches:

Indicators			
XA-PD-1	HP Duty Pump Remote	XA-PD-2	HP Duty Pump Local
XA-PD-3	HP Pump Fault	XA-PD-4	HP Pump Running
XA-PD-5	HP Standby Pump Remote	XA-PD-6	HP Standby Pump Local
XA-PD-7	HP Standby Pump Fault	XA-PD-8	HP Standby Pump Running
XA-PD-9	MP Duty Pump Remote	XA-PD-10	MP Duty Pump Local
XA-PD-11	MP Pump Fault	XA-PD-12	MP Pump Running
XA-PD-13	MP Standby Pump Remote	XA-PD-14	MP Standby Pump Local
XA-PD-15	MP Standby Pump Fault	XA-PD-16	MP Standby Pump Running
Push Buttons			
PB-PC-1	HP Duty Pump Start	PB-PC-2	HP Duty Pump Stop
PB-PC-3	HP Standby Pump Start	PB-PC-3	HP Standby Pump Stop
PB-PC-4	MP Duty Pump Start	PB-PC-5	MP Duty Pump Stop
PB-PC-6	MP Standby Pump Start	PB-PC-7	
Selector Switches			
SEL-PAF-1	HP Pump Duty/Standby	SEL-PAF-2	HP Pump Local/Remote
SEL-PAF-3	MP Pump Duty/Standby	SEL-PAF-4	MP Pump Local/Remote

4.2.5 Master Section

The Master section of the WHCP is located above the pump section and includes the following indicators and pushbuttons:

Indicators			
XA-PD-15	Prod Manifold Pres. Lo-Lo	XA-PD-16	Common Start-up Bypass Ind
XA-PD-17	ESD Activated	XA-PD-18	PSD Activated

Indicators			
XA-PD-19	USD Activated	XA-PD-20	Fusible Plug Loop Zone 1
XA-PD-21	Fusible Plug Loop Zone 2	XA-PD-22	C/V Hyd Pressure Lo-Lo
XA-PD-23	LP Hdr Pressure Lo-Lo	XA-PD-24	MP Hdr Pressure Lo-Lo
XA-PD-25	HP Hdr Pressure Lo-Lo		
Push Buttons			
PB-PC-9	Total Surface SD	PB-PC-10	Total Sub-Surface SD
PB-PC-11	Lamp Test		
00-HS2-125	ESD Pushbutton (WHCP)	00-HS1-125	ESD Pushbutton (GPP)
00-HS2-124	PSD Pushbutton (WHCP)	00-HS1-124	PSD Pushbutton (GPP)
00-HS2-123	USD Pushbutton (WHCP)	00-HS1-123	USD Pushbutton (GPP)
PB-PC-14	USD Pushbutton/Reset	PB-PC-15	Prod Manifold Start-up Bypass

4.2.6 Well Control Modules

Each well slot has a module in the WHCP which has two parts, the upper part being a gauge panel and the lower part housing the controls and indicators for the tree valves and choke controls The well module are located on the left side of the WHCP front panel. The following indicators, pushbuttons and selector switches are provided on each of the well control modules:

Pressure Indicators			
ME-4	SCSSV Hydraulic Pressure		
ME-3	SSV Hydraulic Pressure		
ME-2	Wing Valve Hydraulic Pressure		
ME-1	Choke Valve Hydraulic Pressure		
Indicator Lamps			
XA-MD-1	Flowline Pressure Hi-Hi	XA-MD-2	Flowline Pressure Lo-Lo
XA-MD-3	WSD Status	MM-1	Choke Valve Position Indicator
Push Buttons			
PB-MB-1	SCSSV Open	PB-MB-2	SCSSV Close
PB-MB-3	SSV Open	PB-MB-4	SSV Close
PB-MB-5	Wing Valve Open	PB-MB-6	Wing Valve Close
00-HS-126	Well Shutdown	PB-MB-8	Well Shutdown Reset
PB-MB-9	Choke Valve Step Open	PB-MB-10	Choke Valve Step Close
PB-MB-11	Flowline Start-up Bypass		

Selector Switch			
SEL-MC-1	Local/Remote Choke Valve Step Control, this selector switch is lockable in the Local position		

The following status indications are repeated on the DCS:

- 30-XI-101 SCSSV Status (DCS)
- 30-XI-102 SSV Status (DCS)
- 30-XI-103 Wing Valve Status (DCS)

Well Control

The 6 barg control oil supply is made available for operation of the tree valves when the ESD button PP1 has been reset and the fusible plug loop has been pressurised to reset the pilot valve PU2. Loss of pressure in the control loop results in closure of all tree valves and SCSSVs. This action opens pilot valves PU4 and PU5 on the control supply to the SSV and SCSSV in preparation for opening.

The hydraulic supply to the SCSSV is switched by Solenoid Valve MF-3, which supplies control oil to the Pilot Valve MG-3 which supplies HP oil to the actuator. The Solenoid Valve MF-3 can be operated remotely or from the pushbutton on the associated well control module.

When the SCSSV is open sensed by Pressure Switch MM3, the SSV can be opened. The hydraulic supply to the SSV is switched by Solenoid Valve MF-2, which supplies control oil to the Pilot Valve MG-2 which supplies MP oil to the actuator. The Solenoid Valve MF-2 can be operated remotely or from the pushbutton on the associated well control module.

When the SSV is open sensed by Pressure Switch MM2, the WV can be opened. The hydraulic supply to the WV is switched by Solenoid Valve MF-1, which supplies control oil to the Pilot Valve MG-1 which supplies MP oil to the actuator. The Solenoid Valve MF-1 can be operated remotely or from the pushbutton on the associated well control module.

To control the closing sequence for the production well on an ESD or fusible loop failure the control oil line to the pilot valves is depressurised.

The Pilot Valve MG1 for the wing valve closes immediately and vents the WV actuator to close the valve.

The Pilot Valve MG2 for the SSV closes following closure of Pilot Valve PU4 after a 10-20 seconds time delay set by PD1 and vents the SSV actuator to close the valve.

The Pilot Valve MG3 for the SCSSV closes following closure of Pilot Valve PU5 after a 21-30 seconds time delay set by PD2 and vents the SSV actuator to close the valve.

4.2.7 Choke Control

The choke valve is set by a hydraulic motor which drives the choke in either the open or closed direction. The direction of travel is selected through Solenoid Valves 00XV104A
or B which direct the hydraulic supply to the selected side of the actuator. Control of the choke can be selected to be from the well module or remotely from the DCS through a switch on the well module. Indication of valve position is provided on the well module and on the DCS.

4.2.8 Fusible Plug Loops

The fusible plug loops provide fire detection for the Wellpad A. Following activation the loop must be repaired and it is quickly pressurised by pressing and holding of the Three-way Valve PR-1 until the required pressure is achieved in the loop indicated by the associated pressure gauge

and pressure status indicator. The pressure regulator PU-1 provides pressure make up through a restriction orifice.

If the loop is damaged, nitrogen is lost from the loop and if the loss rate is greater than the make up rate pressure in the loop will fall and a shutdown of the wells is initiated through PU2 Fusible loop pressure is monitored by Pressure Transmitter (80PIA101) PTL-2 which provides a signal to the shutdown system.

4.3 Portable Test Separator 113-00-S-007

Refer to P&ID: PHM-113-FE-004 Production Header.

The test separator will be provided by the vendor that is contracted to do well testing. Reference should be made to the relevant vendor documentation for details of the test separator.

4.4 High Integrity Pressure Protection System HPU

Refer to P&ID: PHM-113-FE-005 Pig Launcher

4.4.1 Pressure

Pressure Transmitters 00-PT-122A/B/C provides an input signal to the HIPPS Logic Solver that in turn compares the signals from the transmitters. Should 2 out of 3 transmitters indicate a pipeline pressure above the trip setting, the Logic Solver which de-energise the hydraulic solenoids at shut down valves 00-SDV-106 and 00-SDV-107 HPUs to close in and protect the pipeline.

4.5 Wellpad A Export Flow Line and Pig Launcher 113-62-V-001

Refer to P&ID: PHM-113-FE-005 Pig Launcher.

4.5.1 Pressure

The pressure in the export flow line upstream of 00-SDV-106 is monitored by Pressure Transmitter 00-PT-115 which provides indication on the DCS through 00-PI-115.

The pressure in the export flow line upstream of 62-SDV-101 is monitored by Pressure Transmitters 00-PT-122A/B/C which provides signals to the HIPPS logic solver. If the pressure measured by any two of the transmitters exceeds 94.4barg, the HIPPS logic solver will close 00-SDV-106 and 00-SDV-107 by tripping the hydraulic supply to the valve actuator.

The pressure in the export flow line upstream of 62-SDV-101 is also monitored by Pressure Transmitter 00-PT-116 which provides a low pressure trip signal to the SDS which initiates executive actions as described in the cause and effect charts.

4.5.2 Temperature

The Temperature in the export flow line upstream of 00-SDV-106 is monitored by Temperature Transmitter 00-TT-103 which provides indication on the DCS through 00-TI-103.

4.5.3 Pig Launcher Valve Sequencing

To ensure safe operation of the pig launcher a key interlock system is provided to control the sequence of operation of the process isolation, drain and vent valves and opening of the pig launcher closure. Operation of the interlock system is described in the operating procedures.

4.6 GPP Import Flow Line and Pig Receiver 115-62-V-001

Refer to P&ID: PHM-115-FE-001 GPP Pig Receiver.

4.6.1 Pressure

The pressure in the flow line to the slug catcher upstream of 00-SDV-101 is monitored by Pressure Transmitter 00-PT-101 which provides indication through 00-PI-101 and high and low pressure alarms on the DCS.

The pressure in the export flow line to the slug catcher is also monitored by Pressure Transmitter 00-PT-103 which provides a low pressure trip signal to the SDS which initiates executive actions as described in the cause and effect charts.

4.6.2 Temperature

The Temperature in the flow line to the slug catcher is also monitored by Temperature Transmitter 00-TT-101 which provides indication on the DCS through 00-TI-101.

4.6.3 Pig Receiver Valve Sequencing

To ensure safe operation of the pig receiver a key interlock system is provided to control the sequence of operation of the process isolation, drain and vent valves and opening of the pig receiver closure. Operation of the interlock system is described in the operating procedures.

4.7 Wellpad A Import Flow Lines and Pig Receiver 113-62-V-004 (From wellpad C) Pig Receiver 113-62-V-005 (From wellpad B)

Refer to P&ID: PHM-113-FE-006 SPH3 and SPH4 Pig Receiver

4.7.1 Pressure

The pressure in the import flow line from Wellpad B downstream of 62-SDV-102 is monitored by Pressure Transmitter 00-PT-117 which provides indication through 00-PI-117 on the DCS.

The pressure in the import flow line from Wellpad C downstream of 62-SDV-103 is monitored by Pressure Transmitter 00-PT-119 which provides indication through 00-PI-119 on the DCS.

4.7.2 Temperature

The Temperature in the flow line from Wellpad B downstream of 62-SDV-102 is monitored by Temperature Transmitter 00-TT-104 which provides indication on the DCS through 00-TI-104.

The Temperature in the flow line from Wellpad C downstream of 62-SDV-103 is monitored by Temperature Transmitter 00-TT-105 which provides indication on the DCS through 00-TI-105.

4.7.3 Pig Receiver Valve Sequencing

To ensure safe operation of the pig receiver a key interlock system is provided to control the sequence of operation of the process isolation, drain and vent valves and opening of the pig receiver closure. Operation of the interlock system is described in the operating procedures.

5.0 ENVIRONMENTAL, health and safety REQUIREMENTS

5.1 General EHS Requirements

5.1.1 Chemicals

The following chemical is used in this system, or may be present under upset conditions:

- Corrosion inhibitor
- Methanol
- Hydraulic oil

Personnel should ensure that they are fully familiar with the Material Safety Data Sheet (MSDS) for each chemical, which details precautions and the protective apparel and equipment necessary when handling the chemicals. The precautions detailed must be adhered to at all times.

5.1.2 Hazardous Sources

Table 1A-1.8 – Hazardous Sources lists potential hazardous sources that may be present under upset conditions affecting the Process Facilities.

Table 1A-1.8 – Hazardous Sources

Hazard	Source	Hazardous Event	Effect	Control
Liquid hydrocarbons under pressure	Wellheads, production flowlines and manifolds	Potential for injury due to contact with hazardous liquids	Potential for personnel injury	Inspection and maintenance routines
		Loss of containment and release of flammable liquids	Unignited liquid release and potential for gas release and fire/explosion	Fire and gas detection
Methanol and corrosion inhibitor under pressure	Wellheads	Potential for injury due to contact with hazardous liquids	Potential for personnel injury	Inspection and maintenance routines
		Loss of containment and release of flammable liquids	Unignited liquid release and potential for fire/explosion	Fire detection
Hydrocarbon gas under pressure	Wellheads, production flowlines and manifolds	Potential for injury due to contact with hazardous liquids	Potential for personnel injury	Inspection and maintenance routines
		Loss of containment and release of flammable gas	Unignited gas release and potential for fire/explosion	Fire and gas detection
Hydraulic oil under pressure	SCSSVs, SSVs Wing Valves, Choke Valves, Shutdown Valves, WHCP, HIPPS Valves and HPU	Potential for injury due to contact with liquids under pressure	Potential for personnel injury	Inspection and maintenance routines

5.2 Specific Health and Safety Requirements

The correct use of Personal Protective Equipment (PPE) is fundamental in securing a safe and healthy place of work for all personnel. PPE shall be used in conjunction with appropriate health, environment and safety procedures that are designed to minimise the potential risk of harm or injury to personnel, while also promoting safe working practices.

5.3 Specific Environmental Requirements

To prepare the production facilities for the introduction of hydrocarbon gas, it is necessary to remove all air from the system. Nitrogen may be utilized for this purpose. Similarly, when preparing equipment for maintenance, nitrogen may be used to purge hydrocarbons from the system before breaking containment and introducing air.

When purging the system of air prior to introduction of hydrocarbons, the atmoPig in the system should be tested with an oxygen content analyzer to determine the level of oxygen remaining in the purged system.

When purging is being performed to remove hydrocarbons, a suitable test instrument, which uses thermal conductivity or infra-red absorption, capable of detecting hydrocarbons in nitrogen must be used. Pelister type instruments cannot be used, as they require at least 13% oxygen to operate.

WARNING: NITROGEN IS AN ASPHYXIANT, AND IS COLOURLESS AND ODOURLESS: RAPID AND UNRECOGNISED LOSS OF CONSCIOUSNESS CAN OCCUR IN PERSONS EXPOSED TO A NITROGEN-ENRICHED ATMOPIG. WHEN USING NITROGEN, CARE SHOULD BE TAKEN TO ENSURE THAT NITROGEN ESCAPES ARE DISPERSED AND NOT ALLOWED TO COLLECT IN ENCLOSED AREAS.

6.0 REFERENCE INFORMATION

6.1 Company Documentation

Document Number	Document Title
PH-10-OP-00001A	System Operations Procedure Well Pad A
PH-10-OP-SOP-00001A-01	Standard Operating Procedure Well Pad A Process Facilities
-	-
-	-
-	-

6.2 Vendor Documentation

Document Number	Document Title
SA/06/WHCP-B101C/4-1	WHCP Schematic Diagram
SA/06/WHCP-C101C/5-1	WHCP General Arrangement (2 Sheets)
SA/06/WHCP-C102C/6-1	WHCP General Arrangement (2 Sheets)
SA/06/WHCP-C103C/4-1	WHCP Module Details

6.3 Engineering Drawings (PFDs, UFDs and P&IDs)

Drawing Number	Drawing Title
PHM-113-FP-001	Sinphuhorm Wellpad A PFD – Wells and Production Header
PHM-113-FP-002	Sinphuhorm Wellpad A – Export Manifold
PHM-113-FE-001	Sinphuhorm Wellpad A P&ID – Wellhead Control Panel
PHM-113-FE-002	Sinphuhorm Wellpad A P&ID – Wellhead Details
PHM-113-FE-004	Sinphuhorm Wellpad A P&ID – Production Header
PHM-113-FE-005	Sinphuhorm Wellpad A P&ID – Pig Launcher
PHM-113-FE-006	Sinphuhorm Wellpad A P&ID – SPH3 and SPH4 Pig Receivers
PHM-115-FE-001	Sinphuhorm GPP P&ID – GPP Pig Receiver

SECTION 1.0 A-2
WELLPAD A PROCESS UTILITIES

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FIGURE

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1.0 INTRODUCTION

1.1 System Purpose/Function

The Processing Utilities on Wellpad A are provided to support production from the production wells on the site and include chemical injection and flaring of any excess gas.

1.2 Primary Components

Wellpad A is comprised of the following Primary Components:

Tag No	Equipment Title/Description
113-64-T-001	Corrosion Inhibitor Tank
113-64-T-002	Hydrate Inhibitor Tank
113-64-PM-001	Corrosion Inhibitor Injection Pump
113-64-PM-010	Hydrate Inhibitor Injection Pump
113-16-Z-001	HP Flare Stack
113-16-S-008	Auto Ignition Panel
113-16-V-005	HP Flare Drum
113-16-Z-002	HP Flare Tip

1.3 Primary Interfaces

Input Interfaces:

- PCSS System (refer to SOP Volume 14 Process Control and Safety System)
- Power Generation System (refer to Section 3.0 of this manual)
- Wellpad A – Process (refer to Section 1.0A of this manual)

Output Interfaces:

- Wellpad A – Process (refer to Section 1.0A of this manual)

2.0 SYSTEM DESCRIPTION

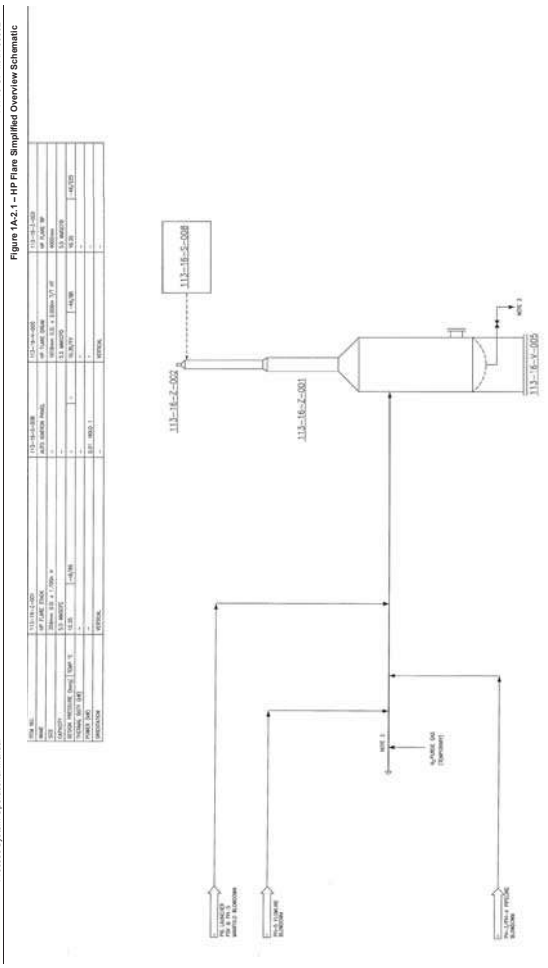
2.1 System Overview

Refer to Figure 1A-2.1 – Process Utilities Simplified Overview Schematic.

Wellpad A is equipped with corrosion inhibitor injection facilities to control corrosion in the flow lines and hydrate inhibitor injection facilities to prevent hydrate formation as the fluids flow through the choke.

Wellpad A is also equipped with a HP flare facility for disposal of gas by burning when operating the pig launchers and receivers or when a pipeline is being blown down.

Figure 1A-2.1 – HP Flare Simplified Overview Schematic



2.2 Primary Flow Description

Refer to the following P&IDs: PHM-113-FE-007 Chemical Injection and PHM-113-FE-008 HP Flare system.

2.2.1 Systems

For the purposes of this document, Wellpad A process utilities are separated into sections as follows:

- Chemical injection
- HP Flare System

2.2.2 Chemical Injection

Corrosion Inhibitor

The corrosion inhibitor is stored in the corrosion Inhibitor Tank 113-64-T-001 which holds 1m^3 of chemical sufficient to treat 14 days of production. The tank is filled from chemical drums through a corrosion filling line on top of the tank.

Chemical flows from a nozzle in the base of the tank to the suction of the injection pump through a suction strainer.

The chemical is pumped to the injection point on the well flowline downstream of the choke valve, by a dedicated electric motor driven Metering Pump 113-64-PM-001 at a rate of up to 2l/hr. The injection rate is set by manual adjustment of the pump stroke.

A calibration pot is provided on the pump suction to enable the injection rate to be checked for accuracy. A pulsation damper is installed on the pump discharge to reduce surges at the injection point.

To prevent the back flow of reservoir fluids to the chemical injection facility two non return valves are installed close to the injection point. To avoid problems due to common mode failure the non return valves are of different manufacture.

Hydrate Inhibitor

The hydrate inhibitor is stored in the hydrate Inhibitor Tank 113-64-T-0024 which holds 0.52m^3 of chemical sufficient to start one production well. The tank is filled from chemical drums through a corrosion filling line on top of the tank.

Chemical flows from a nozzle in the base of the tank to the suction of the injection pump through a suction strainer.

The chemical is pumped to the injection point on the well flowline upstream of the choke valve, by a dedicated electric motor driven Metering Pump 113-64-PM-010 at a rate of up to 10l/hr. The injection rate is set by manual adjustment of the pump stroke. A calibration pot is provided on the pump suction to enable the injection rate to be checked for accuracy. A pulsation damper is installed on the pump discharge to reduce surges at the injection point.

An interlock is provided with the choke valve in the controls for the pump to prevent operation when the choke is closed.

2.2.3 HP Flare System

Gas vented from the pig launchers and receivers or during blowdown of the pipelines flows into the 150mm flare header and on to the HP Flare Drum 113-16-V-005.

In the flare drum liquid is separated from the gas and collects in the bottom of the vessel and the gas flows to the flare tip for disposal. The collected liquids are manually drained to a drained pit and transferred to a road tanker, which transports the liquids to a disposal point.

As there is normally no flow to the HP flare there is a requirement for a continuous purge at the flare tip. When the flare is required, the header and flare stack is purged with nitrogen before hydrocarbon gas is routed to the flare. When the flare header has been purged, LPG is supplied to the pilot burner at the flare tip and the pilot is lit by a high energy spark.

On completion of flaring, the flame is extinguished, the flare drum is drained, the flare header, flare drum and flare stack are inerted using nitrogen and the pilot is extinguished.

3.0 EQUIPMENT DESCRIPTION

3.1 Corrosion Inhibitor Tank 113-64-T-001

Refer to P&ID: PHM-113-FE-007 Chemical Injection.

3.1.1 Function

Corrosion Inhibitor Tank 113-64-T-001 is provided to store sufficient chemical for 14 days of operation at the well site. A tank will be provided for each well as the wells are installed.

3.1.2 Technical Data

For details of the design and operating parameters, refer to Table 1A-2.1 – Design and Operating Parameters Corrosion Inhibitor Tank 113-64-T-001.

Table 1A-2.1 – Design and Operating Parameters Corrosion Inhibitor Tank 113-64-T-001

Parameter	Design	Operating
Pressure	Liquid Full	ATM
Temperature	65°C	Ambient
Capacity	1m^3	

3.1.3 Technical Description

The Corrosion Inhibitor Tank 113-64-T-001 is a rectangular stainless steel tank 1.0m wide, 1.3m long, 1.0m high located on a support frame just above ground level. The tank is located in a drip tray along with the pump.

The tank is provided with an inspection hatch (hand hole), connection for filling and a vent with flame arrestor all located on top of the tank.

Indication of the level in the tank is provided by a local Level Gauge 64-LG-101.

3.2 Corrosion Inhibitor Injection Pump 113-64-PM-001

Refer to P&ID: PHM-113-FE-007 Chemical Injection.

3.2.1 Function

Corrosion Inhibitor Injection Pump 113-64-PM-001 delivers chemical to the production flowline downstream of the choke. A pump will be provided for each well as the wells are installed.

3.2.2 Technical Data

For details of the design and operating parameters, refer to Table 1A-2.2 – Design and Operating Parameters Corrosion Inhibitor Injection Pump 1135-64-PM-001.

Table 1A-2.2 – Design and Operating Parameters Corrosion Inhibitor Injection Pump 113-64-PM-001

Parameter	Design	Operating
Pressure	105barg	50 to 92barg
Temperature	65°C	Ambient
Capacity	0 to 2l/h	
Stroke rate	80 strokes per minute	
Power	0.37kW	

3.2.3 Technical Description

Corrosion Inhibitor Injection Pump 113-64-PM-001 is a LEWA Type LDB1, positive displacement, variable stroke diaphragm pump capable of delivering an accurately metered quantity of chemical to the injection point. Adjustment to discharge flow is made through a calibrated hand wheel on the pump.

The pump is fitted with a suction strainer, a calibration gauge and a discharge pulsation damper. The wetted parts of the pump are manufactured from stainless steel and the diaphragm is of PTFE.

The pump is driven through gearing by an electric motor which is operated through controls positioned at the pump.

Discharge pressure is indicated locally on local Pressure Gauge 64-PG-101.For details of the injection pump control and protection; refer to Paragraph 4.0 Instrumentation and Control.

3.3 Hydrate Inhibitor Tank 113-64-T-002

Refer to P&ID: PHM-113-FE-007 Chemical Injections.

3.3.1 Function

Hydrate Inhibitor Tank 113-64-T-002 is provided to store sufficient chemical for start up of a single well at the well site. A tank will be provided for each well as the wells are installed.

3.3.2 Technical Data

For details of the design and operating parameters, refer to Table 1A-2.3 – Design and Operating Parameters Hydrate Inhibitor Tank 113-64-T-002.

Table 1A-2.3 – Design and Operating Parameters Hydrate Inhibitor Tank 113-64-T-002

Parameter	Design	Operating
Pressure	Liquid Full	ATM
Temperature	65°C	Ambient
Capacity	0.52m^3	

3.3.3 Technical Description

The Hydrate Inhibitor Tank 113-64-T-002 is a rectangular stainless steel tank 1.0m wide, 0.7m long, 1.0m high located on a support frame just above ground level. The tank is located in a drip tray along with the pump.

The tank is provided with an inspection hatch (hand hole), connection for filling and a vent with flame arrestor, all located on top of the tank.

Indication of the level in the tank is provided by a local Level Gauge 64-LG-102.

3.4 Hydrate Inhibitor Injection Pump 113-64-PM-010

Refer to P&ID: PHM-113-FE-007 Chemical Injection.

3.4.1 Function

Hydrate Inhibitor Injection Pump 113-64-PM-010 delivers methanol to the production flowline upstream of the choke during start-up or the well. A pump will be provided for each well as the wells are installed.

3.4.2 Technical Data

For details of the design and operating parameters, refer to Table 1A-2.4 – Design and Operating Parameters Hydrate Inhibitor Injection Pump 113-64-PM-010.

Table 1A-2.4 – Design and Operating Parameters Hydrate Inhibitor Injection Pump 113-64-PM-010

Parameter	Design	Operating
Pressure	227.5barg	100 to 200barg
Temperature	65°C	Ambient
Capacity	0 to 10l/h	
Stroke rate	112 strokes per minute	
Power	0.75kW	

3.4.3 Technical Description

The Hydrate Inhibitor Injection Pump 113-64-PM-010 is a LEWA Type LDC1, positive displacement, variable stroke diaphragm pump capable of delivering an accurately metered quantity of chemical to the injection point. Adjustment to discharge flow is made through a calibrated hand wheel on the pump.

The pump is fitted with a suction strainer, a calibration gauge and a discharge pulsation damper. The wetted parts of the pump are manufactured from stainless steel and the diaphragm is of PTFE.

The pump is driven through gearing by an electric motor, which is operated through controls positioned at the pump.

Discharge pressure is indicated locally on local Pressure Gauge 64-PG-102.

For details of the injection pump control and protection, refer to Paragraph 4.0 Instrumentation and Control.

3.5 HP Flare Drum 113-16-V-005 and Flare

Refer to P&ID: PHM-113-FE-008 HP Flare System.

3.5.1 Function

The HP flare drum receives the fluids from the flare header. The gas vapours are routed to the HP flare stack, and the collected liquids are manually drained to a sump for disposal.

3.5.2 Technical Data

For details of the design and operating parameters, refer to Table 1A-2.5 – Design and Operating Parameters HP Flare Drum 113-16-V-005.

Table 1A-2.5 – Design and Operating Parameters HP Flare Drum 113-16-V-005

Parameter	Design	Operating
Pressure	10.35barg/Full Vacuum	0-0.5barg
Temperature (Max/Min)	-46°C to 85°C	0 to ambient
Gas Flow Capacity	5.5MMscfd	Up to 5.5MMscfd

3.5.3 Technical Description

HP flare drum is a vertical vessel with a diameter of 1.018m and has a height of 2.0m, tan to tan. The flare stack with the flare tip is mounted on top of the flare drum, positioning the flare tip 40m above the ground. The top of the vessel has a 0.8m high truncated cone to reduce the flow path from the vessel diameter down to the diameter of the flare stack.

Fluids, primarily gas, from the HP flare collection header enter the vessel through a 200mm inlet nozzle on the side of the vessel.

The gas leaves the vessel through a 355.6mm outlet nozzle located on the top of the vessel and flows directly into the flare stack. The stack directs the gas through a vertical 150mm line to the flare tip where the gas is burnt at a ZEECO MJ6 flare tip.

The liquids leave the vessel under manual control through a 50mm outlet nozzle located on the bottom of the vessel and flow to a drain sump.

A 50mm purge point is provided on the dead end of the flare header which has fittings and isolation valve for connection to a temporary nitrogen supply. The flare header slopes towards the flare drum to ensure pockets of liquid do not collect anywhere in the collection system.

A 600mm manway on the side of the vessel provides access to the internals for inspection and maintenance.

Level Gauge 16-LG-101 provides local indication of the liquid level.

For details of the HP Flare drum control and protection, refer to Paragraph 4.0 Instrumentation and Control.

The flare tip has a two pilot burner which are supplied through a 25mm line with LPG from a bottle bank. The fuel gas supply pressure for the burner is regulated by a Pressure Regulator PCV-01.

The pilots are ignited by high energy spark plugs supplied with power from a transformer in the local auto ignition panel at the base of the flare.

4.0 INSTRUMENTATION AND CONTROL

4.1 Corrosion Inhibitor Tank 113-64-T-001

Refer to P&ID: PHM-113-FE-007 Chemical Injection.

4.1.1 Level Monitoring and Protection

Level Switch 64-LS-102 on the corrosion inhibitor tank provides a low level trip to the SDS to stop the pump.

4.2 Corrosion Inhibitor Injection Pump 113-64-PM-001

Refer to P&ID: PHM-113-FE-007 Chemical Injection.

4.2.1 Pump Controls

The Corrosion Inhibitor Injection Pump is operated manually using the stop/start pushbuttons at the pump. Low level in the tank will trip the pump at the MCC.

4.2.2 Pressure Protection

The discharge side of the pump is protected against overpressure due to blocked outlet by a single Relief Valve 64-PSV-101 which is set to relieve back to the tank at 105barg.

4.3 Hydrate Inhibitor Tank 113-64-T-002

Refer to P&ID: PHM-113-FE-007 Chemical Injections.

4.3.1 Level Monitoring and Protection

Level Switch 64-LS-104 on the hydrate inhibitor tank provides a low level trip to the SDS to stop the pump.

4.4 Hydrate Inhibitor Injection Pump 113-64-PM-010

Refer to P&ID: PHM-113-FE-007 Chemical Injections.

4.4.1 Pump Controls

The hydrate inhibitor injection pump is operated manually using the stop/start pushbuttons at the pump. Low level in the tank will trip the pump at the MCC.

An interlock with the choke closed position transmitter prevents the pump from being started until the choke valve is cracked open.

4.4.2 Pressure Protection

The discharge side of the pump is protected against overpressure due to blocked outlet by a single Relief Valve 64-PSV-102 which is set to relieve back to the tank at 227.5barg.

4.5 HP Flare Drum 113-16-V-005 and Flare

Refer to P&ID: PHM-113-FE-008 HP Flare System.

4.5.1 Level Monitoring and Protection

Level Transmitter 16-LT-101 on the HP flare drum provides indication of level on the display in the Wellpad A control room.

Level Switch 16-LS-102 on the HP flare drum provides a high level alarm which is audible and visible at the well site.

4.5.2 Auto Ignition Panel 113-16-S-008

Refer to P&ID: PHM-113-FE-008 HP Flare System.

The auto ignition panel monitors the flame at the pilot burners and provides the controls to relight the burners should they become extinguished.

The following controls are provided on the control panel:

- Control Panel On/Off Switch
- Power On Lamp (white)
- Pilot 1 Low Temp (red)
- Pilot 2 Low Temp (red)

- Auto/Off/Manual Selector Switch for Pilot 1
- Auto/Off/Manual Selector Switch for Pilot 2

Each pilot burner is provided with two Thermocouples 16-TE-101A/B and 16-TE-102A/B to monitor the temperature at the burner to identify if the pilot is burning. Only one thermocouple is in use the second is a spare. The thermocouples provide input to low Temperature Switches 16-TSL-101 and 16-TSL-102, which provide the input to the control panel. Flame failure is repeated through a common alarm on the DCS.

The signal illuminates the red warning lamp for the burner and if Auto is selected on the Auto/Off/Manual Selector Switch for the pilot the signal will initiate ignition of the pilot for a set duration.

The operator can light a pilot burner manually by holding the Auto/Off/Manual Selector Switch in the manual position until the burner is lit. When the switch is released it returns to the Off position.

Power for the ignition spark plugs is provided from a high energy source in the control panel.

5.0 ENVIRONMENTAL, HEALTH AND SAFETY REQUIREMENTS

5.1 General EHS Requirements

5.1.1 Chemicals

The following chemical is used in this system, or may be present under upset conditions:

- Corrosion inhibitor
- Methanol

Personnel should ensure that they are fully familiar with the Material Safety Data Sheet (MSDS) for each chemical, which details precautions and the protective apparel and equipment necessary when handling the chemicals. The precautions detailed must be adhered to at all times.

5.1.2 Hazardous Sources

Table 1A-2.6 – Hazardous Sources lists potential hazardous sources that may be present under upset conditions affecting the Process Utilities System.

Table 1A-2.6 – Hazardous Sources

Hazard	Source	Hazardous Event	Effect	Control
Methanol and corrosion inhibitor under pressure	Chemical Injection pumps	Potential for injury due to contact with hazardous liquids Loss of containment and release of flammable liquids	Potential for personnel injury Flammable liquid release and potential for fire/explosion	Inspection and maintenance routines
Hydrocarbon gas	Flare system	Loss of containment and release of flammable gas	Flammable gas release potential for fire/explosion	Inspection and maintenance routines

Hazard	Source	Hazardous Event	Effect	Control
		HP Flare extinguished		Pilot burner monitoring
Explosive mixture in the flare system	Vented gas	Flash back in the flare system Explosion in the flare system	Potential for personnel injury potential for fire/explosion	Purge flare system completely before venting gas into the flare
High Voltage electricity	Flare ignition system	Damage to insulation	Potential for personnel injury and electric shock	Inspection and maintenance routines

5.2 Specific Health and Safety Requirements

The correct use of Personal Protective Equipment (PPE) is fundamental in securing a safe and healthy place of work for all personnel. PPE shall be used in conjunction with appropriate health, environment and safety procedures that are designed to minimise the potential risk of harm or injury to personnel, while also promoting safe working practices.

5.3 Specific Environmental Requirements

To prepare the flare system for the introduction of hydrocarbon gas, it is necessary to remove all air from the system. Nitrogen is utilized for this purpose. Similarly, when preparing equipment for maintenance, nitrogen may be used to purge hydrocarbons from the system before breaking containment and introducing air.

When purging the system of air prior to introduction of hydrocarbons, the atmoPig in the system should be tested with an oxygen content analyzer to determine the level of oxygen remaining in the purged system.

When purging is being performed to remove hydrocarbons, a suitable test instrument, which uses thermal conductivity or infra-red absorption, capable of detecting hydrocarbons in nitrogen must be used. Pelister type instruments cannot be used, as they require at least 13% oxygen to operate.

WARNING: NITROGEN IS AN ASPHYXIANT, AND IS COLOURLESS AND ODOURLESS: RAPID AND UNRECOGNISED LOSS OF CONSCIOUSNESS CAN OCCUR IN PERSONS EXPOSED TO A NITROGEN-ENRICHED ATMOPIG. WHEN USING NITROGEN, CARE SHOULD BE TAKEN TO ENSURE THAT NITROGEN ESCAPES ARE DISPERSED AND NOT ALLOWED TO COLLECT IN ENCLOSED AREAS.

CASE OF BREAKING OF CONTAINMENT, MERCURY DRAGGER TUBE SHOULD BE USED TO VERIFY TRACE OF MERCURY. IF THE TRACE IS ABOVE 0.05MG/M3, PROTECTION MUST BE WORN. REFER TO PH-10-HS-SWP-00029; SAFE WORK PRACTICES FOR MERCURY CONTAMINATED MATERIAL.

6.0 REFERENCE INFORMATION

6.1 Hess Corporation Company Documentation

Document Number	Document Title
PH-10-OP-SOP-00001A	System Operations Procedure Well Pad A
PH-10-OP-SOP-00001A-02	Standard Operating Procedure of the Well Pad A process Utilities
-	-
-	-
-	-

6.2 Vendor Documentation

Document Number	Document Title
SC-567	Self Supported Flare Stack Assembly
LA05-2620-DS-204-04	Pump Data Sheets
LA05-2620-DS-204-03	Pump Data Sheets
LA05-2620-DS-202-01	Tank Data Sheets
LA05-2620-DS-202-02	Tank Data Sheets
–	Auto Ignition Panel Data Sheet

6.3 Engineering Drawings (PFDs, UFDs and P&IDs)

Document Number	Document Title
PHM-113-FP-010	Sinphuhorm Wellpad A PFD – Chemical injection System
PHM-113-FP-011	Sinphuhorm Wellpad A PFD – HP Flare System
PHM-113-FE-007	Sinphuhorm Wellpad A P&ID – Chemical Injection
PHM-113-FE-008	Sinphuhorm Wellpad A P&ID – HP Flare System

SECTION 1.0 A-3
WELLPAD A UTILITIES

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1.0 INTRODUCTION

1.1 System Purpose/Function

The Utilities on Wellpad A are provided to provide power, process control, and limited life support on the site.

1.2 Primary Components

Wellpad A utilities are comprised of the following Primary Components:

Tag No	Equipment Title/Description
113-ET-51-3101	22kV to 400V, 160 kVA Transformer
113-ES-51-3101	400 Volt Motor Control Centre
113-EG-52-3101	109kW, 400V, 3 phase Emergency Diesel Generator
113-ER-52-3301	10kVA, 230V, 1 phase UPS
113-17-T-001	Service Water Tank

1.3 Primary Interfaces

Input Interfaces:

- PCSS System (refer to SOP Volume 14 Process Control and Safety System)

Output Interfaces:

- Wellpad A – Process (refer to Section 1.0A of this manual)

2.0 SYSTEM DESCRIPTION

2.1 System Overview

Refer to Figure 1A-3.1 – Wellpad A Electrical Schematic.

Electric power is supplied to Sinphuhorm Wellpad A by overhead provincial power grid cable supplying 22kVolts 3 phase at a frequency of 50Hz.

The incoming electrical power from the overhead lines is passed through a 160kVA transformer to step the voltage down from 22kVolts to 400 volts.

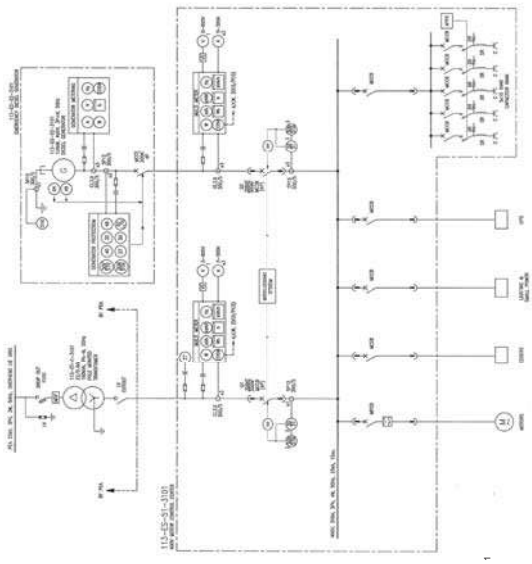
The emergency generation facilities are provided to ensure the continued operation of emergency systems in the event of loss of the main electrical power supply. The generator is connected to the same bus as the main imported power. An interlock is provided on the generator breaker and the transformer incomer breaker to ensure both breakers are not closed at one time.

A UPS system is provided to maintain power to the automation and safety systems during transient power outages for a period of two hours.

The control facilities for Wellpad A are an extension of the system located in the Gas Processing Plant.

The service water system provides water for the toilets and wash basins in the control building.

Figure 1A-3.1 – Wellpad A Electrical Schematic



2.2 Primary Flow Description

2.2.1 Systems

For the purposes of this document, Wellpad A utilities are separated into sections as follows:

- Power generation and Distribution
- Control Facilities
- Service water

2.2.2 Power Generation and Distribution Facilities

Refer to PHM-113-ED-010 – Wellsite PH5 Overall Single Line Diagram.

In normal operation electricity is supplied via overhead power cables to the Wellpad A by the Provincial Electricity Authority (PEA) in Thailand from the grid. PEA supplies the electrical power at 22kV, 3 phase, and 50Hz. On entering the wellpad area the electricity is fed through a drop out fuse and metering facility, and connects to the step down Transformer 113-ET-51-3101, which reduces the voltage from 22kV to 400V. The overhead lines are provided with a lightening arrestor to protect the supply to the gas plant. The above equipment is provided by PEA.

From the transformer the power at 400V is fed to the 400V Motor Control Centre 113-ES-51-3101 which has a single bus.

In the event of a power failure on the Provincial Electricity Authority grid system or power import facility an Emergency Diesel Generator 113-EG-52-3101 has been installed.
The generator is rated at 109kW, 400V, 3 phases with a neutral and 50Hz. The generator is a self contained unit which includes a diesel day tank that can hold sufficient diesel for eight hours running on full load.

On loss of power to the 400V MCC, the emergency generator is started automatically and the generator breaker is closed. The associated interlock opens the incomer breaker on the imported supply as the emergency generator breaker closes to isolate the bus from the normal supply.

Where an interruption to supply is not acceptable for systems such as safety and control systems the system is supplied from a battery backed UPS.

2.2.3 Control Facilities

The control facilities for Wellpad A are housed in the MCC/Technical Room located in a building on the West side of the site. The building also includes the battery room, emergency generator room and the wellhead control panel room along with HVAC system toilet and shower.

The facilities at the Wellpad are monitored and controlled through a Remote Site PCSS which connects to the PCSS at the gas processing plant located approximately 64km from the site. Communication for the control system is via a data link between the GPP and the wellpad.

Signals to and from equipment on site are connected to the PCSS at the Marshalling Cabinet 113-EK-75-0100. A system cable connects the marshalling cabinet to the PCSS System Cabinet 113-EC-75-0100 which holds the control cards and communications facilities for the PCSS. The PCSS system is provided with power from the 230V AC UPS.

Status information from the MCC and HIPPS is communicated through a serial link to the System Cabinet for display on site and at the GPP.

Control signals are provided to the MCC and the WHCP from the Marshalling Cabinet through hard wired connections. The signals to initiate USD, PSD and ESD at the WHCP are included in these signals.

A separate cabinet 113-EC-51s provided for the HIPPS system. As for the control facilities HIPPS status signals are provided to the PCSS system cabinet and other connections are hard wired to the field devices.

2.2.4 Service Water

Service water for use on the site is stored in an elevated Service Water Tank 113-17-T-001. From the tank water is routed to the toilet, washbasins and shower.

When required, the tank is filled from a tanker through a filling connection line at main gate area to the water tank.

3.0 EQUIPMENT DESCRIPTION

3.1 Transformer

Refer to PHM-113-ED-010 Wellsite PH5 overall Single Line Drawing.

3.1.1 Function

The function of the transformer is to transform the voltage supplied to Wellpad A from 22kV to 400V.

3.1.2 Technical Data

For details of the design and operating parameters, refer to Table 1A-3.1 – Design and Operating Parameters Transformer 113-ET-51-3101.

Table 1A-3.1 – Design and Operating Parameters Transformer 113-ET-51-3101

Parameter	Design	Operating
Power	160kVA	Up to 160kVA
Incoming Voltage	22kV	22kV
Outgoing Voltage	400V	400V

3.1.3 Technical Description

The transformer is a, three phase 'Delta' connected primary and 'Y' connected secondary dry type transformer is rated at 160kVA which is pole mounted at the site boundary.

To enable the incoming circuit to be isolated there is an HV Disconnecting Chamber fitted with an air insulated fuse load break disconnecting switch, provided on the primary side of the transformer.

An externally operated tap changer for off circuit operation is provided on the primary windings of the transformer, all tappings are rated for full power. The tap changer allows a ±5% change of transformer output voltage in 2.5% steps.

3.2 400V Motor Control Centre 113-ES-51-3101

Refer to PHM-113-ED-010 Wellsite PH5 overall Single Line Drawing.

3.2.1 Function

The 400V Motor Control Centre receives the 400V, 3 Phase supply from the import transformer and distributes the power to the various feeders, motor control circuits, lighting and small power distribution.

3.2.2 Technical Data

For details of the operating parameters, refer to Table 1A-3.2 – Design and Operating Parameters 400V MCC.113-ES-51-3101.

Table 1A-3.2 – Design and Operating Parameters 400V MCC 113-ES-51-3101

Parameter	Design	Operating
Voltage	1000V	400V
Current	300A	–
Short Circuit Current	25kA for 1 second	–
Control Supply	110V DC and 230V AC	–

3.2.3 Technical Description

The 400V Motor Control Centre 113-ES-51-3101 is a steel cabinet sectionalised into separate compartments which house the breakers, switches and protection devices required to control distribution of power. The MCC is located in the MCC/Technical Room.

Three pole Air Circuit Breakers (ACBs) are used to switch the incoming supplies from the step down transformer and the emergency generator.

The ACBs are withdrawable and provided with safety interlocks so that it is not possible to withdraw or insert when the switching device is closed. Each ACB is provided with a lock off facility to padlock the breaker in the off or isolate position.

The two incomer breakers are provided with metering panels in addition to protection devices.

An electrical interlock is fitted to control operation of the transformer incomer and emergency generator breaker.

An 110V DC supply is provided throughout the switchboard for operation of the following:

- Breaker Tripping and Closing
- Protection and Control circuits
- Breaker Spring Charging

In addition there is a 230V AC single phase supply bus for the space heaters and control devices.

Moulded Case Circuit Breakers (MCCBs) and Motor Protection Circuit Breakers (MPCBs) are providing to switch power to the various loads on the MCC section of the panel.

In general the three poles, fuse-free, MCCBs are provided to switch power to the small power distribution boards and control panels. An MCCB of rating below 400A for a feeder is equipped with thermal and magnetic trip units. If the MCCB is rated above 400 V it is equipped with an adjustable electronic solid-state trip device with monitoring, ammeter readout, complete test facilities and protective features.

The MPCBs are used for motor feeders and include an adjustable magnetic trip unit for short circuit protection. The Motor Starters cater for 'Direct-on-Line' with full voltage start or 'Soft Start' which provides a reduced voltage for motor start. Provisions are also made for Star-delta switching and variable speed drives (VSD).

In order to attempt to maintain the power factor within the range of 1 to 0.8 when the emergency generator is in use, an Automatic Power Factor Regulator (APFR) is installed connected to Single Bus Bar. The APFR switches five banks of capacitors to increase the power factor as the load becomes inductive. A coil is included in the connection to each capacitor bank to reduce the current surge as the bank is switched in and out of service.

3.3 Emergency Generator 113-EG-52-3101

3.3.1 Function

Refer to: PHM-113-ED-010 Wellpad PH5 overall Single Line Drawing and P&ID PHM-113-FE-010.

In the case of a power failure on the imported electricity supply an emergency generator 113-EG-52-3101 starts automatically to supply power to the MCC.

This emergency generator is rated at 109KW, 400V, 3 Phase and neutral at 50Hz. when the emergency generator is used to energise the MCC power from the import transformer must be disconnected.

3.3.2 Technical Data

For details of the design and operating parameters, refer to Table 1A-3.3 – Design and Operating Parameters Emergency Generator 113-EG-52-3101.

Table 1A-3.3 – Design and Operating Parameters Emergency Generator 113-EG-52-3101

Parameter	Design	Operating
Engine Output	106kW (142bhp)	–
Fuel Consumption	26l/hr	–
Fuel Tank Capacity	340 litre	–
Speed	1500rpm	–
Voltage Output	400V, 3 Phase 50Hz	–
Power Output	109kW	–

3.3.3 Technical Description

The diesel engine driver is manufactured by Cummins and is a Model 6BTA5.9-G2 unit, which is a four stroke engine with six cylinders in line. The engine is aspirated by an exhaust driven turbochargers provided with water cooled after coolers. A rig-saver device is provided on the air intake to shut off the combustion air supply to the engine on engine over speed.

Fuel for the engine is stored in a 340 litre fuel tank in the base of the generator package. The injector pumps are controlled electrically from the governor and supplied with fuel by a low pressure fuel pump. The fuel is filtered and passed through a water separator before flowing to the suction of the pump. Excess fuel from returned through a back pressure valve to the day tank.

This engine is water cooled, and has an engine driven air blast cooler to cool the circulating coolant. The coolant is circulated by an engine driven pump.

The engine has wet sump lubrication with an engine driven pump provided to feed lube oil under pressure to the bearings.

A battery powered electric start motor starts the diesel engine. The Valve Regulated Lead Acid batteries in the battery pack are charged by a battery charger powered from the emergency switchboard or alternatively from a small alternator mounted on the engine. The batteries provide sufficient capacity to perform six consecutive 15 second cranking cycles with a 15 second rest between each crank.

The engine drives a Stamford UCi274G alternator, which is directly coupled to the engine. The alternator is a synchronous AC generator with rotary brush less excitation system and Permanent

Magnet Generator (PMG) pilot exciter. The alternator generates three phase power at 400V, and with a frequency of 50Hz. Cooling is provided by forcing air through the alternator using a fan mounted on the rotor.

The voltage output from the alternator is controlled by a MX321 Automatic Voltage Regulator which controls the current in the rotating field coils on the rotor. The alternator is rated for an output of 10 kVA with a power factor of 0.8.

3.4 UPS 113-ER-52-3301-A/B

3.4.1 Function

Refer to PHM-113-ED-010 Wellpad PH5 overall Single Line Drawing.

The UPS is a battery backed power source which provides power to critical systems in the plant which can not tolerate a break in supply. When main and emergency power is lost, the batteries continue to provide power to the inverters in the UPS, maintaining the AC supply without interruption.

3.4.2 Technical Data

For details of the design and operating parameters, refer to Table 1A-3.4 – Design and Operating UPS 113-ER-52-3301-A/B.

Table 1A-3.4 – Design and Operating Parameters UPS 113-ER-52-3301-A/B

Parameter	Design	Operating
Supply Voltage	400V AC, 3 phase, 50Hz	–
Output Voltage	230V AC, 1 phase, 50Hz	–
Operating Time on Battery	2 hours	–
Inverter Rated Output	10kVA (each)	–
Bypass Rated Output	10kVA	–
Fault Tolerance	50kA rms for 1 sec	–
Frequency Tolerance	+0.1%	–
Voltage Tolerance	±1%	–
Battery Volts	220V	–
Battery Capacity	2V 200 Ah/10h @ 20°C	–

3.4.3 Technical Description

The AC UPS system is provided by Gutor Electronics and has a 230V AC Single phase output. The UPS is located in the MCC/technical Room and is comprised of two 100% UPS systems and a single 100% bypass transformer. The output from the UPS is fed to the 230V AC UPS distribution board 113-EB-52-35301 which supplies power to the various users.

Each UPS unit consists of:

- Rectifier/Charger
- Inverter
- 100% Battery Bank
- The bypass facility consist of:
- Bypass Transformer
- Static Bypass Switch
- Manual Bypass Switch

In each UPS the Rectifier/Charger receives three phase power from the Emergency Bus Bar B at 400Volts AC which is rectified to produce a 225V DC which is to provide DC power for the inverter and to charge the associated 220V battery Pack.

The inverter converts the 220V DC to a 230V AC single phase 50Hz supply and has a rated output of 40kVA.

If the main input to the rectifier/charger fails the battery continues to supply the 220V DC power to the inverter to maintain the 230V AC output for at least 2 hours without interruption. When main power is restored the DC power to the inverter is again supplied from the rectifier/charger and at the same time the batteries are recharged.

The bypass transformer also receives three phase power from the Bus Bar at 400Volts AC and produces a 230V AC single phase 50Hz output rated at 10kVA.

The two inverters are continuously synchronised with the bypass transformer, sensing being through the static switch. If there is a fault affecting the two 100% inverters, the supply is automatically switched to the bypass transformer by the static switch within a quarter cycles. The static switch is a high speed solid state switch which can transfer the load between inverters and bypass transformer without noticeable effect on the supply.

The static switch also monitors inverter performance and for alarm conditions and will perform a transfer to protect the UPS from damage caused by a current fault or a short circuit.

The two 100% battery packs are located in a battery room on the end of the substation are sized for HOLD Ah and comprised of valve regulated lead acid batteries. Each battery pack can be isolated from the associated rectifier/charger and inverter by a MCCB fitted with a shunt trip to allow remote tripping of the batteries.

The manual by pass switch allows the two inverters and static switch to be totally isolated from the bypass transformer for maintenance purposes.

The AC distribution board is consists fully insulated bus bars with miniature circuit breakers (MCB) and moulded case circuit breaker (MCCB) feeders. On the distribution board the main circuit breaker has over current and earth fault monitoring with auxiliary contacts to indicate operation of the device. These contacts are wired to the UPS display diagnostic system.

3.5 Service Water Tank 113-17-T-001

3.5.1 Function

Refer to P&D: PHM-113-FE-010 Wellpad A Service Water and Power Generation.

The service water tank is provided to hold water on the site for washing and sanitary purposes.

3.5.2 Technical Data

For details of the design and operating parameters, refer to Table 1A-3.5 – Design and Operating Parameters for Service Water Tank 113-17-T-001.

Table 1A-3.5 – Design and Operating Parameters Service Water Tank 113-17-T-001

Parameter	Design	Operating
Capacity	2.0m^3	–
Elevation Above Ground	2.5m	–
Dimensions L/W/H	1.5m/1.5m/1.5m	–

3.5.3 Technical Description

The service water tank is a steel tank lined with bitumen 1.5m wide/1.5m deep and 1.5m high supported on a concrete structure which raises the base of the tank to 2.5m above the ground.

The tank is filled from a tanker through a fill nozzle fitted with a non return valve and hose connection.

Water leaves the vessel through a 50mm line fitted with an isolation valve.

An overflow line with a 300mm water seal is provided from the side of the tank.

Level in the tank is indicated locally on a Level Gauge 17-LG-101 on the side of the tank.

4.0 INSTRUMENTATION AND CONTROL

4.1 400V MCC 113-ES-51-3101

Refer to PHM-113-ED-010 Wellsite PH5 overall Single Line Drawing.

4.1.1 Power Metering and Protection

The incomer breaker and the emergency generator breaker each have a metering panel which displays the following:

- Power (kW)
- Resistive Power (kVA)
- Reactive Power (kVAR)
- Power Factor (Cos Φ)
- Frequency (Hz)
- Current (per phase) (A)
- Voltage (per phase through a selector switch)
- Watt hours (Wh)
- Hours (h)
- Reactive kVA hours (kVArh)
- The current readings of power, voltage and amperes are repeated in the control room on the DCS.

Overcurrent and earth fault detection devices are provided on the bus side of each incomer breaker to trip the associated breaker if a fault is detected.

An interlock is provided on the incomer breakers from the transformer and emergency generator which allows only one of the breakers to be closed at any time.

4.1.2 Motor Control

Each motor supply cubicle is provided with a Starter Control Unit (SCU) which is energised from the 110V DC supply and communicates with other SCUs and the DCS through a Modbus RTU. The SCU controls the start of the motor through a starter which can be either a Direct on Line starter or provide a soft start through an Auto transformer. The starter is also connected to the On/Off/Auto switch located by the motor in the field.

4.2 Emergency Diesel Generator

Refer to PHM-113-ED-010 Wellpad PH5 overall Single Line Drawing.

4.2.1 Emergency Generator Control Panel

The emergency generator is controlled from a control cabinet located in the substation.

Mounted in the front of the control cabinet is the Power Command Controller PCC2100 which is a microprocessor-based generator set monitoring, metering, and control system. The controller provides an operator interface to the generator set, voltage regulation, governing, and protective functions. Control power for the controller is derived from the UPS.

The operator panel includes a series of LEDs to allow the operator to view the general status of the generator set. The functions displayed include:

Green LEDs to indicate:

- Generator set running operating at rated voltage and frequency
- Remote start signal received
- Red LEDs to indicate:
- Not-in-Auto mode (flashing)
- Common shutdown
- Low Oil Pressure Shutdown
- Overspeed Shutdown

Amber LEDs to indicate:

- Common warning
- Low Oil Pressure Warning
- High Engine Temperature Warning
- Fail To Start

The following Switches are provided on the controller:

Off/Manual/Auto Mode Control Switch – When the switch is selected to Manual or off, the 'Not in Auto' lamp on the panel flashes. If Auto mode is selected, the generator set can be started automatically when power is lost on the normal bus bar.

Manual Run/Stop Control Switch – When the mode control switch is in the Manual position and the Manual Run /Stop switch is pressed, the Generator set will start, immediately. If the generator set is running in the Manual mode, pressing the Run/Stop switch will cause the generator set to shut down after a cool down at idle period.

Panel Lamp/Lamp Test Control Switch – Depressing the panel lamp switch will cause the panel illumination to operate for approximately 10 minutes. Pressing and holding the switch will sequentially illuminate all LEDs on the panel to confirm proper operation of these components.

Emergency Stop Button – Pressing the emergency stop button causes the generator set to shut down immediately. The generator set is prevented from running or cranking with the switch pressed in.

The control panel is equipped with an AC metering panel composed of a series of LEDs configured in bar graphs for each function. The LEDs are colour coded, with green indicating normal range values, amber for warning levels, and red for shutdown conditions. Scales for each function are in % of nominal rated values.

The nine bar-graphs provide the following displays from left to right:

- Simultaneous Current in each phase (3 bars)
- Power (1 bar)

- Power Factor (1 bar)
- Frequency (1 bar)
- Simultaneous Voltage on each phase (3 bars)

The control panel is also provided with an alphanumeric display capable of displaying two lines of data with approximately 20 characters per line. The display is accompanied by a set of six membrane switches, three each side of the display, that are used by the operator to navigate through control menus, and to make control adjustments. All adjustments to volts, frequencies etc are made via the display panel.

All data on the display can be viewed by scrolling through screens with the navigation keys. The display shows all active fault conditions, active and inactive, with the latest displayed first.

The display panel has a screen-saver timer that turns off the display after 30 minutes of inactivity. Touching any key will turn the screen back on.

4.2.2 Engine Control

Remote Start Mode – On loss of power at the switchboard the controller automatically starts the generator set immediately and accelerates the unit to rated speed and voltage by careful control of the engine fuel system and alternator excitation system.

Data Logging – The controller maintains a record of manual control operations, warning and shutdown conditions, and other events. The control also stores critical engine and alternator data before and after a fault occurs, for use in evaluating the root causes for the fault condition.

Cycle Cranking – The controller limits the number of start attempts to be made, the duration of each crank and the duration of the rest period between cranks. The number of start attempts and durations are configurable.

Time Delay Stop (Cool-down) – Configurable for time delay of 0 to 10 minutes prior to ramp to idle or shut down after signal to stop in normal operation modes.

Engine Governing

The integrated digital governor drives the engine fuel control valve. The following features are available in the governing system:

Isochronous Governing – Controls engine speed within plus or minus 0.25% for any steady state load from no load to full load. Frequency drift will not exceed plus or minus 0.5% for a 60°F (33°C) change in ambient temperature over an 8 hour period

Temperature Dynamics – Modifies the engine fuel system (governing) control parameters as a function of engine temperature. Allows engine to be more responsive when warm, and more stable when operating at lower temperature levels

Smart Idle Mode – Engine governing can be regulated at an idle speed for a programmed period on automatic stop of the engine or in manual mode. In an automatic mode, the control will bypass the idle period if the engine at a low load level for sufficient duration for cool-down. During idle mode engine protective functions are adjusted for the lower engine speed, and alternator function and protections are disabled. Idle speed can be initiated by the operator when the generator set is running in the manual mode

4.2.3 Alternator Control

The controller includes an integrated 3-phase line-to-neutral sensing voltage regulation system which performs the following functions:

Digital Output Voltage Regulation – Regulates output voltage to within 0.5% for any loads between no load and full load. On engine starting, or sudden load application, voltage is controlled to a maximum of 5% overshoot over nominal level

Fault Current Regulation – Regulates the output current on any phase to a maximum of 3 times rated current under fault conditions for both single phase and three phase faults. The regulation system will drive a permanent magnet generator (PMG) to provide 3 times rated current on all phases for motor starting and short circuit coordination purposes

4.3 UPS 113-ER-52-3301A/B

Refer to PHM-113-ED-010 Wellpad PH5 overall Single Line Drawing.

4.3.1 UPS Control Panel

The controls for the UPS are located in a panel located in the front door of the UPS cabinet. The panel is divided into four sections.

The top left section is the system panel, which shows the current operation status of the major components of the system on a schematic of the system.

The top centre section is the Operations section which includes buttons for turning the system on and off and a lamp test button for checking if all LED indications function properly.

The top right section is the display unit which consist of a LC display, an alarm LED, an acoustic alarm and a key-pad. With this the operator can set following operational parameters, obtain a list of measurement data, and get access to the event and alarm log.

The lower section of the panel is the alarm indication panel the respective LED lights up, when an alarm has occurred. The following alarm LEDs are included:

- Rectifier Mains Failure
- Rectifier Failure
- DC Out of Tolerance
- Battery Operation
- Battery discharged
- Battery disconnected
- Inverter Fault
- Overload Inverter/Bypass
- Inverter Fuse Blown
- Asynchronous
- Bypass Mains Fault
- Manual Bypass ON
- Over-temperature
- Fan Failure
- EA inhibited
- EN inhibited
- Power Supply Fault

5.0 ENVIRONMENTAL, HEALTH AND SAFETY REQUIREMENTS

5.1 General EHS Requirements

5.1.1 Electrical Safety

Only qualified and authorised personnel can work on or near exposed energised parts of electrical equipment that operate at voltages of more than 50V AC and/or 110V DC.
The personnel must be trained for the task to be performed.

Personnel working on or near to electrical equipment shall adhere to the following:

Only qualified and authorised personnel must perform isolation/de-isolation of electrical equipment

Adhere to the Electrical Safety Rules and Procedures

Have knowledge of the construction and operation of specific electrical equipment and the hazards involved

Proper use and maintenance of test instruments and knowledge of their rating limits

Appropriate alerting techniques, such as signs, tags, and barricades for warning and protecting other personnel from electrical hazards.

All incidents or accidents of an electrical nature shall be reported to the supervisor of the work who shall ensure that it is investigated and reported.

All potentially dangerous situations or conditions involving electricity, and all cases of electrical equipment suspected of being in an unsafe condition, must be reported immediately to the Supervisor for investigation.

In all cases, any electrical equipment that gives rise to a dangerous or potentially dangerous situation shall be removed from service, isolated, and tagged 'Do Not Use'.

The equipment shall remain out of service until it has been investigated and deemed safe by an Authorised Electrical Person.

5.1.2 Chemicals

Personnel should ensure that they are fully familiar with the Material Safety Data Sheet (MSDS) for each chemical, which details precautions and the protective apparel and equipment necessary when handling the chemicals.

The precautions detailed must be adhered to at all times.

5.1.3 Hazardous Sources

This section of the procedure identifies the potentially hazardous sources associated with the Power Generation and Distribution System and describes the adverse effects that may result from exposure to them.

The hazardous sources, which may be present under upset conditions, are detailed in Table 1A-3.6 – Hazardous Sources.

5.1.4 Hazardous Sources

Table 1A-3.6 – Hazardous Sources lists potential hazardous sources that may be present under upset conditions affecting the Utilities System.

Table 1A-3.6 – Hazardous Sources

Hazard	Source	Hazardous Event	Effect	Control
High and Low voltage electricity (50V to 22kV)	Switchboards, transformers, UPS and generator	Incorrect operation of equipment	Electric shock Equipment damage	Restricted access (operation of electrical equipment by AEPs)
Static electricity	UPS	Failure to ensure that equipment is fully discharged prior to maintenance	Electric shock Equipment damage	Restricted access (operation of electrical equipment by AEPs)
Diesel oil	Storage tank and diesel lines	Loss of containment Oil mist	Slip hazard, potential for personnel injury Equipment damage	Routine inspections Preventive maintenance
Equipment with moving/ rotating parts	Diesel engine driven generator	Loss of control Missing guards	Potential for personnel injury	Routine inspections Preventative maintenance
Hot engine exhausts	Diesel engine driven generator	Contact with hot surfaces	Potential for serious burns	Insulation policy Use of personal protective equipment

5.2 Specific Health and Safety Requirements

The correct use of Personal Protective Equipment (PPE) is fundamental in securing a safe and healthy place of work for all personnel. PPE shall be used in conjunction with appropriate health, environment and safety procedures that are designed to minimise the potential risk of harm or injury to personnel, while also promoting safe working practices.

5.3 Specific Environmental Requirements

There are no specific environmental requirements for the Power Generation and distribution Systems.

6.0 REFERENCE INFORMATION

6.1 Company Documentation

Document Number	Document Title
2002-DS-1671-01	AC UPS Data Sheet
2002-SP-1671-01	Specification for AC UPS
2002-SP-1697-01	Specification for Diesel Engine Generator
2002-SP-1654-01	Specification for 400V MCC
PH-10-OP-SOP-00001A	System Operations Procedure Well Pad A
PH-10-OP-SOP-00001A-03	Standard Operating Procedure Operation of Well Pad A Utilities

6.2 Vendor Documentation

Document Number	Document Title
–	Descriptive Information for Cummins Generator and Controls

6.3 Engineering Drawings (PFDs, UFDs and P&IDs)

Drawing Number	Drawing Title
PHM-113-ED-010	Overall 400V MCC 113-ES-51-3101 SLD
PHM-113-ED-020 Sht 1 to 3	400V MCC 113-ES-51-3101 SLD
PHM-113-FE-010	P&ID Service Water and Power Generation

SECTION 1.0 B-1
WELLPAD B PROCESS FACILITIES and main pipeline

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1.0 INTRODUCTION

1.1 System Purpose/Function

The Processing facilities on Wellpad B are designed to produce gas from one wellhead and export the fluids to the Gas Processing Plant (GPP) via the manifold facilities at Wellpad A.

1.2 Primary Components

Wellpad B is located in the centre of the field and is comprised of the following Primary Components:

Tag No	Equipment Title/Description
111-00-Z-001	PH-3 Wellhead
111-30-S-001	Wellhead Control Panel (WHCP)
111-00-S-007	Portable Test Separator
111-62-V-003	Pig Launcher – Located at Wellpad B
113-62-V-005	Pig Receiver from Wellpad B – Located at Wellpad A
–	Gathering Pipeline to Wellpad A

1.3 Primary Interfaces

Input interfaces:

- PCSS System (refer to SOP Volume 14 Process Control and Safety System)
- Power Generation System (refer to SOP Volume 1B-3 (Doc No: PH-10-OP-SOP-00001B-03))
- Chemical Injection (refer to SOP Volume 1B-2 (Doc No: PH-10-OP-SOP-00001B-02))

Output interfaces:

- Wellpad A (PH5) (refer to Section 1.0A of this manual)
- Vent System (refer to SOP Volume 1B-2 (Doc No: PH-10-OP-SOP-00001B-02))

2.0 SYSTEM DESCRIPTION

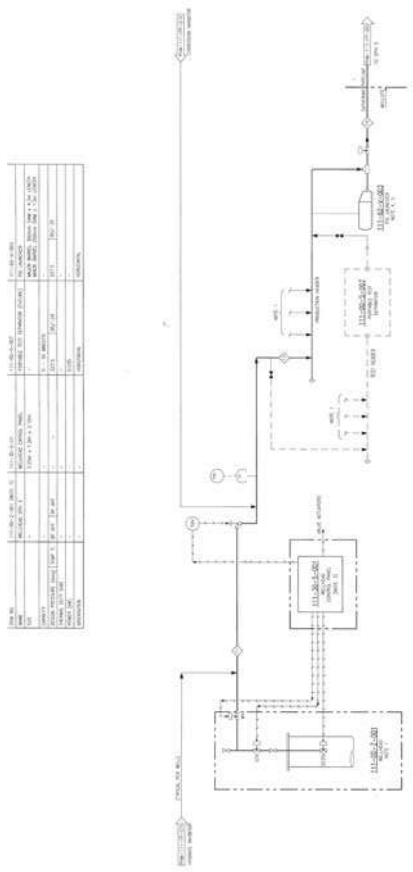
2.1 System Overview

Refer to Figure 1B-1.1 – Wellhead and Production Manifolds Simplified Overview Schematic.

Wellpad B is equipped with one production wellhead with corrosion inhibitor/hydrate inhibitor injection facilities and a wellhead control panel for control and shutdown requirements. Provision has been made for three future wells. There is also provision for a portable test separator.

A pig launcher is provided for pigging of the gathering pipeline from Wellpad B to Wellpad A where a pig receiver is located.

Figure 1B-1.1 – Wellhead and Production Manifolds Simplified Overview Schematic



2.2 Primary Flow Description

Refer of the following P&IDs:

- PHM-111-FE-001 Wellhead Control Panel
- PHM-111-FE-002 Wellhead Details
- PHM-111-FE-004 Production Header
- PHM-111-FE-005 Pig Launcher
- PHM-113-FE-006 Pig Receiver from Wellpad B – Located at Wellpad A

2.2.1 Production

Production Wellhead

The Wellpad has one (1) Production Wellhead 111-00-Z-001 with provision for a total of four (4) wellheads.

The production tubing raises the reservoir fluids to the Production Wellhead located at the surface.

At the well, the reservoir fluids are produced to surface through 4 ½" diameter productions tubing to the Production Wellhead 111-00-Z-001.

The production wellhead is equipped with the following:

- Hydraulically operated Surface Controlled Subsurface Safety Valve (SCSSV)
- Manually operated master valve
- Hydraulically operated Surface Safety Valve (SSV)
- Hydraulically operated Wing Valve (WV)
- Hydraulically operated wellhead choke valve
- Chemical injection lines for injection of hydrate inhibitor and Corrosion inhibitor

The first isolation valve in each production string is the SCSSV, which is located in the production tubing string at approximately 53-56mRT distance below the surface.

The valve is operated hydraulically from the WHCP from a high-pressure hydraulic supply and fails closed on loss of hydraulic pressure.

The wellhead houses a manual block valve and then the SSV, which is the second hydraulically controlled valve. The SSV valve is operated hydraulically from the WHCP from a medium pressure supply and fails closed on loss of hydraulic pressure. The final valve on the tree is the hydraulically controlled Wing Valve (WV), which is also controlled hydraulically from the WHCP a medium pressure supply and fails closed on loss of hydraulic pressure.

The produced fluids flow through a then the hydraulically adjustable choke valve, which is used to maintain back pressure on the well and set the flow from the well.

The choke valve is also used to bring a well into production in a controlled manner to avoid damage to the well and upset of downstream equipment.

The produced fluids flow from the wellhead via a 6" diameter well flow line to the production manifold.

Alternatively, if well testing is to be performed, the flow line has a facility to divert flow to a 150mm diameter test manifold, which connects to a portable test separator on site. Following well testing, the fluids from the test separator are routed back to the production manifold. The operator can manually align valves to direct the output of the well to the test header.

Production Manifold

The purpose of the production manifold is to collect produced fluids from the wells and route them via 8" diameter production header to the Gathering Pipeline to Wellpad A.

The production manifold at Wellpad A routes the fluids to the main pipeline for processing at the Gas Processing Plant (GPP).

Chemical Injection

There is the facility to inject hydrate inhibitor of the choke valve. There is also a corrosion inhibitor injection point downstream of the choke.

Wellhead Control

Wellhead Control Panel 111-30-S-001 houses the wellhead controls for the well. The wellhead control panel is provided with hydraulic reservoirs, pumps, filters, piping, instruments, control logic and controls to provide high, medium and low pressure hydraulic fluid to operate surface safety valve, subsurface safety valve, wing valve, choke valve and shutdown valve.

Control of the wellhead valves can be carried out locally at the WHCP or remotely via the remote Sensing-Process Control and Safety System (RS-PCSS). The WHCP control panel logic sends and receives signals to/from the GPP Process Control and Safety System.

2.2.2 Gathering Pipeline to Wellpad A

The 250mm diameter 4.4km long gathering pipeline exports production fluids from Wellpad B. The gathering pipeline has a hydraulically operated outlet shutdown valve operated via the WHCP and has the provision to use a pig launcher for inspection, maintenance and cleaning operations.

At Wellpad A, the gathering pipeline has a hydraulically operated inlet shutdown valve operated via the WHCP and has the provision to use a pig receiver.

3.0 EQUIPMENT DESCRIPTION

3.1 Wellhead 111-00-Z-001

Refer to P&ID: PHM-111-FE-002 Wellhead Details.

3.1.1 Function

Wellhead 111-00-Z-001 allows for isolation of production well and the flow control of the produced fluids from the well.

3.1.2 Technical Data

For details of the design and operating parameters, refer to Table 1B-1.1 – Design and Operating Parameters Wellhead 111-00-Z-001.

Table 1B-1.1 – Design and Operating Parameters Wellhead 111-00-Z-001

Parameter	Design	Operating
Pressure	85-227.5 barg	40 to 227.5barg
Temperature (Max/Min)	-	34°C to 66°C
Capacity	-	–
Size	7" -13 3/8" CSG	–

3.1.3 Technical Description

The wellhead supports the casing strings and production tubing and provides the mounting for the Xmas tree.

The Wellhead Control Panel (WHCP) 111-30-S-001 controls Surface Controlled Subsurface Safety Valve 00-SCSSV-101, Surface Safety Valve 00-SSV-102, Wing Valve 00-WV-103 and Choke Valve 00-CV-104. The WHCP is described in Paragraph 3.2 Wellhead Control Panel 113-30-S-001.

The SCSSV is a hydraulically operated shutdown valve located in the production string and is a self equalising, full bore valve designed to avoid any restriction to flow. The valve is opened and held in the open position by hydraulic pressure supplied by the WHCP.

If hydraulic pressure is lost or the operator initiates closure of the SCSSV, the spring in the actuator forces the valve to the closed position.

The hydraulic control line to the SCSSV enters the casing through the wellhead and is attached to the exterior of the production tubing. Closure of the SCSSV isolates the well from the surface facilities.

The next valve in the flow path is the master valve, which is the lower valve in the Xmas tree. This valve is a full bore manual block valve located directly below the Surface Safety Valve (SSV).

The SSV is a hydraulically operated shutdown valve located above the master valve in the xmas tree. The SSV is a full bore valve, which is opened and held in the open position by hydraulic pressure supplied by the WHCP. On loss of hydraulic pressure the valve is moved to the closed position by a spring in the actuator.

At the top of the tree there is a swab valve which is full bore manual isolation valve which has a threaded section and a screw cap on the flange above the valve. This valve is only used when access is required to the well bore to perform wire line or other invasive operations.

The well fluids leave the tree through the wing valve, which is mounted on the side of the tree above the SSV. The wing valve is a hydraulically operated gate valve controlled by hydraulic pressure supplied by the WHCP and is used to isolate the X-mas tree from the production facilities.

Control of the well pressure and flow to the production manifold is through the hydraulically operated choke valve, which is located down stream of the wing valve. The choke valve position is set by a hydraulic stepping type actuator, which can drive the valve in small increments in either direction. Hydraulic pressure for the actuator is supplied by the WHCP and direction of travel is controlled by a four way solenoid valve.

3.2 Wellhead Control Panel 111-30-S-001

Refer to P&ID: PHM-111-FE-001 Wellhead Control Panel and SA/06/WHCP-B101C/4-1 Vendor WHCP Schematic Diagram.

3.2.1 Function

The Wellhead Control Panel 111-30-S-001 houses the control logic for operation of the Surface Safety Valves (SSVs), Surface Controlled Subsurface Safety Valves (SCSSVs), Wing Valves, Choke Valves and Pipeline Shutdown Valves. The skid contains the hydraulic reservoir, accumulators, pumps, filters, piping, instruments and provides the high, medium and low-pressure hydraulic supplies to operate the actuators on the valves.

The panel also supplies the nitrogen for the zone 1 and 2 Fusible Plug Loops for fire protection of the wellpad.

3.2.2 Technical Data

For details of the design and operating parameters, refer to Table 1B-1.2 – Design and Operating Parameters Wellhead Control Panel 111-30-S-001.

Table 1B-1.2 – Design and Operating Parameters Wellhead Control Panel 111-30-S-001

Parameter	Design	Operating
Reservoir Capacity	100 Lter or 0.1 m^3	
Accumulator Capacity	38l each	
Accumulator Pressure	413barg each	
MAWP High	413barg	
MAWP Medium	413barg	
MAWP Low	200barg	
Size	3.25m x 1.2m x 2.10M	

3.2.3 Technical Description

The WHCP contains the electronic control equipment, hydraulics and nitrogen supply for protection, operation and control of the production wells. Each well has its own well control panel slot.

The well control panel performs the following functions:

- Provides a HP 350barg hydraulic supply for operation of the SCSSVs which can be opened and closed individually from the WHCP
- Provides an MP 300barg hydraulic supply for operation of the SSVs and WVs. Which can be opened and closed individually from the WHCP
- Performs the logic governing the sequence of operation of the SCSSV, SSV and WV
- Provide 190barg hydraulic pressure for operation of the choke valves. Individual well choke valves can be stepped open and closed individually from the WHCP or remotely from the DCS
- Provide 190barg hydraulic pressure for operation of the gathering pipeline shutdown valves.
- Provide 6.0barg low pressure hydraulic control supply for the pilots which switch the supply to the SCSSVs, SSVs and WVs
- Provide nitrogen at a pressure of 8barg for operation of the zone 1 and 2 fusible plug loops
- Provide for selection and control of the HP and MP hydraulic pumps

The electronic controls are linked to the Distributed Control System (DCS) and the Process Safety System (PSS) the Remote Sensing-Process Control and Safety System(RS-PCSS). DCS and (RS-PCSS) inputs and outputs are transmitted to and from the WHCP.

The high pressure and medium pressure hydraulic pumps are housed in the WHCP together with associated filters and safety relief valves. These provide hydraulic pressure for the high, medium and low hydraulic systems. The hydraulic fluid reservoir is equipped with an atmospheric vent.

Hydraulic oil for the WHCP is held in a reservoir. The reservoir is partitioned to segregate the returns from the SDVs, SSVs and WVs from the returns from the SCSSV which may be contaminated with reservoir fluids.

The two high pressure 100% electric motor driven hydraulic pumps, operating in a duty/standby configuration take suction from the bottom of the fluid supply reservoir and raises the pressure of the hydraulic fluid. Each pump discharge is protected by a pressure safety valve set at a pressure to 420barg releasing excess pressure to the hydraulic return header.

The two medium pressure 100% electric motor driven hydraulic pumps, operating in a duty/standby configuration take suction from the bottom of the fluid supply reservoir and delivers raises the pressure of the hydraulic fluid. Each pump discharge is protected by a pressure safety valve set at a pressure to 415barg releasing excess pressure to the hydraulic return header.

Both the HP and MP hydraulic supply pumps are backed up by a manual hydraulic pump, which can be lined up to either the HP or MP system.

A pre-charged accumulator is provided on each of the HP and MP hydraulic supply headers to provide capacity and prevent constant stopping and starting of the pumps. The accumulators are pre-charged with nitrogen to 240 barg. for HP, 210 barg. for MP.

On the MP supply line downstream of the MP accumulator there are two tie ins. The first is routed via a self regulating pressure control valve set at 150barg which is the supply for the gathering pipeline shutdown valve. The second tie in is routed via a pair of self regulating pressure control valves set at 6.0barg and goes to supply the low pressure control supply for operation of the SCSSVs, SSVs and WVs.

Nitrogen bottles in the WHCP supply the Zone 1 and 2 fusible plug loops via a self regulating pressure control valve set at 6.0barg.

3.3 Portable Test Separator 111-00-S-007

Refer to P&ID: PHM-111-FE-004 Production Header.

3.3.1 Function

Portable Test Separator 111-00-S-007 is a three-phase separator which separates the oil, produced water and gas in the well stream, in a similar manner to the production separator. The flow in each phase is measured during well testing to enable the performance of the well to be monitored.

3.3.2 Technical Data

For details of the design and operating parameters, refer to Table 1B-1.3 – Design and Operating Parameters Portable Test Separator 111-00-S-007.

Table 1B-1.3 – Design and Operating Parameters Portable Test Separator 111-00-S-007

Parameter	Design	Operating
Pressure	227.5barg	40 to 95barg
Temperature (Max/Min)	-29/85°C	17 to 66°C
Capacity	50mmscfd	

3.3.3 Technical Description

The test separator will be provided by the vendor that is contracted to do well testing. Reference should be made to the relevant vendor documentation for details of the test separator.

3.4 Pig Launcher 120-62-V-001

Refer to P&ID: PHM-111-FE-005 Pig Launcher.

3.4.1 Function

Pig Launcher 111-62-V-003 is provided to launch pigs, including intelligent pigs, for inspection, maintenance and cleaning of the gathering pipeline from Wellpad B to Wellpad A. The pig launcher is normally isolated from the export line, depressurised and drained. When in service the operating pressure is dependent upon pipeline pressure.

3.4.2 Technical Data

For details of the design and operating parameters, refer to Table 1B-1.4 – Design and Operating Parameters Pig Launcher 111-62-V-003.

Table 1B-1.4 – Design and Operating Parameters Pig Launcher 120-62-V-001

Parameter	Design	Operating
Pressure	227.5barg	35 to 85barg
Temperature (Max/Min)	-29/85°C	17 to 50°C
Capacity	50mmscfd	

3.4.3 Technical Description

The launcher is comprised of a horizontal, carbon steel, cylindrical barrel fitted with an end closure, which is interlocked to prevent opening prior to complete depressurisation and draining of the launcher. The major barrel has an external diameter of 300mm and length of 4.5m. The minor barrel has an external diameter of 250mm and length of 4.3m. The minor barrel has an internal diameter to match the inside diameter of the gathering pipeline.

To ensure safe operation of the vents, drain and line valves when performing pig loading and launching operations, the sequence of operation of the following valves and door release are controlled by a key interlock system on the following items:

- SP-003 – End closure
- 62-BV-005 – Pig launcher outlet valve
- 62-BV-006 – Pig launcher outlet valve
- 00-BV-009 – Pig launcher bypass valve
- V1(PG-294) – Kicker line
- V2(PG-297)– Kicker line bypass valve
- V4(PG-501) – Kicker line
- V6(PG-510)– Rear drain valve
- V8(PG-513) – Forward drain valve
- V10(PG-502) – Vent to vent header
- V12(PG-506) – Atmospheric vent
- V13(PG-505) – Atmospheric vent
- V14(PG-508) – Purge point

Local Instrumentation

Local Pressure Indicators 62-PG-101 and 62-PG-102 are provided on the launcher barrel equalisation line to indicate the pressure in the launcher. Pressure Indicator 62-PG-101 is a low range gauge with overpressure protection provided to indicate pressure when the launcher has been depressurised prior to opening.

Local Intrusive Pig Signaller 62-ZI-101 is provided to indicate passage of the pig through the minor barrel of the launcher.

3.5 Pig Receiver from Wellpad B – Located at Wellpad A 113-62-V-005

Refer to P&ID: PHM-113-FE-006 Pig Receivers from Wellpad B- Located at Wellpad A.

3.5.1 Function

A pig receiver 113-62-V-005, which can be connected from the Wellpad B gathering pipeline to receive pigs passing through the pipelines, is provided at Wellpad A.

The pig receiver can receive pigs, for intelligent pigs for cleaning and inspection, of the gathering pipelines from Wellpads B. The pig receiver is normally isolated from the export line, depressurised and drained. When in service the operating pressure is dependent upon pipeline pressure.

3.5.2 Technical Data

For details of the design and operating parameters, refer to Table 1B-1.5 – Design and Operating Parameters Pig Receiver 120-62-V-002.

Table 1B-1.5 – Design and Operating Parameters Pig Receiver 113-62-V-005 from Wellpad B – Located at Wellpad A

Parameter	Design	Operating
Pressure	227.5barg	35 to 85barg
Temperature (Max/Min)	-29/85°C	17 to 50°C
Capacity	50mmscfd	

3.5.3 Technical Description

The receiver is comprised of a horizontal, carbon steel, cylindrical barrel fitted with an end closure, which is interlocked to prevent opening prior to complete depressurisation of the receiver. The major barrel has an external diameter of 300mm and length of 4.5m. The minor barrel has an external diameter of 250mm and length of 4.3m. The minor barrel has an internal diameter to match the inside diameter of the gathering pipeline.

To ensure safe operation of the vents, drain and line valves when performing pig retrieval and receiving operations, the sequence of operation of the following valves and door release are controlled by a key interlock system on the following items:

Pig Receiver 113-62-V-005 from Wellpad B receiving position

- SP-008 – End closure
- 62-BV-003 – Pig receiver inlet valve
- 62-BV-004 – Pig receiver inlet valve
- 00-BV-010 – Pig receiver bypass valve
- V1(PG-534) – Kicker line
- V2(PG-407) – Kicker line bypass valve

- V4(PG-542) – Kicker line
- V6(PG-548) – Rear drain valve
- V8(PG-545) – Forward drain valve
- V10(PG-539) – Vent to flare
- V12(PG-543) – Atmospheric vent
- V13(PG-544) – Atmospheric vent
- V149(PG-541) – Purge point

Local Instrumentation

Local Pressure Indicators 62-PG-107 and 62-PG-108 are provided on the receiver barrel equalisation line to indicate the pressure in the receiver. Pressure Indicator 62-PG-108 is a low range gauge with overpressure protection provided to indicate pressure when the receiver has been depressurised prior to opening.

Local Intrusive Pig Signaller 62-ZI-104 is provided to indicate passage of the pig through the minor barrel of the receiver.

4.0 INSTRUMENTATION AND CONTROL

4.1 Wellhead 111-00-Z-001

Refer to P&ID: PHM-111-FE-002 Wellhead Details.

Note: There is provision made for four Wells at Wellpad B. A typical Wellhead 111-00-Z-001 is described below.

4.1.1 Pressure

The well flow line is provided with a Pressure Transmitter 00-PT-111 upstream of the choke valve, which provides indication on the DCS via Pressure Indicator 00-PI-111.

The well flow line is provided with a Pressure Transmitter 00-PT-112 downstream of the choke valve, which provides indication and high and low pressure alarms on the DCS via Pressure Indicator 00-PIA-112.

Pressure Transmitter 00-PT-120 downstream of the choke valve, provides a high pressure trip to the PSD via Pressure Indicator 00-PIA-120.

Pressure Transmitter 00-PT-121 downstream of the choke valve, provides a low pressure trip to the PSD via Pressure Indicator 00-PIA-121.

4.1.2 Flow

Fluid flow through the well flow line is monitored by Flow Transmitter 00-FT-102 downstream of the choke valve, which provides totalised flow indication on the DCS via Flow Totaliser 00-FQI-102.

Corrosion inhibitor flow to the well flow line is monitored by Flow Transmitter 00-FT-101, which is displayed on the DCS via Flow Indicator 00-FIA-101. Flow Indicator 00-FIA-101 is provided with a low flow alarm.

4.1.3 Temperature

Temperature Transmitter 00-TT-101 upstream of the choke valve provides temperature indication through 00-TI-101 on the DCS.

The well flow line is provided with a Temperature Transmitter 00-TT-102 downstream of the choke valve, which provides temperature indication and a low temperature alarm on the DCS via Temperature Indicator 00-TIA-102. Temperature Indicator 00-TIA-102 is provided with a low temperature alarm.

4.1.4 Choke Valve

The choke valve position is indicated on the wellhead control panel by Position Indicator 00-ZI-104B. The choke position is repeated on the DCS through Position Indicator 00-ZI-104A.

For choke valve control refer to Paragraph 4.2 Wellhead Control Panel 111-30-~~5~~S-001.

4.2 Wellhead Control Panel 111-30-S-001

Refer to P&ID: PHM-111-FE-001 Wellhead Control Panel and SA/06/WHCP-B101C/4-1 Vendor WHCP Schematic Diagram.

4.2.1 Pressure

The HP hydraulic SCSSV supply pressure is monitored by Pressure Transmitter PTH-3, which provides indication on the PSS via Pressure Indicator Alarm 30-PIA-101. Pressure Indicator Alarm 30-PIA-101 generates a low-pressure alarm and a low-pressure trip signal for the ESD System.

The MP hydraulic SSV supply pressure is monitored by Pressure Transmitter PTH-2, which provides indication on the PSS via Pressure Indicator Alarm 30-PIA-102. Pressure Indicator Alarm 30-PIA-102 generates a low-pressure alarm and a low-pressure trip signal for the ESD System.

The MP hydraulic SDV and choke valve supply pressure is monitored by Pressure Transmitter PTH-1, which provides indication on the PSS via Pressure Indicator Alarm 30-PIA-103. Pressure Indicator Alarm 30-PIA-103 generates a low-pressure alarm and a low-pressure trip signal for the ESD System.

The LP hydraulic control supply pressure is monitored by Pressure Transmitter PTL-1, which provides indication on the PSS via Pressure Indicator Alarm 30-PIA-104. Pressure Indicator Alarm 30-PIA-104 generates a low-pressure alarm and a low-pressure trip signal for the ESD System.

The fusible plug loop pressures for zone 1 and zone 2 are monitored by Pressure Switches PS-2 and PS-3 respectively, which provide indication on the PSS via Pressure Indicator Alarm 80-PIA-101. Pressure Indicator Alarm 80-PIA-101 generates a low low-pressure trip signal for the ESD System.

The following local pressure indicators are provided on the front panel of the WHCP:

- PF-5 – HP Hydraulic Header Pressure
- PF-4 – MP Hydraulic Header Pressure
- PF-3 – Choke Valve/SDV MP Hydraulic Header Pressure
- PE-1 – LP Hydraulic Header Pressure
- PE-2 – Fusible Plug Loop Zone 1 Pressure
- PE-3 – Fusible Plug Loop Zone 2 Pressure

4.2.2 Differential Pressure

The hydraulic reservoir suction strainer differential pressure is measured by Pressure Differential Transmitter PAD-1 and indicated on the DCS by Pressure Differential Indicator 30-PDIA-101, which provides a high differential pressure alarm.

The HP pump discharge filter differential pressure is measured by Pressure Differential Transmitter PAD-3 and indicated on the DCS by Pressure Differential Indicator 30-PDIA-102, which provides a high differential pressure alarm.

The MP pump discharge filter differential pressure is measured by Pressure Differential Transmitter PAD-2 and indicated on the DCS by Pressure Differential Indicator 30-PDIA-103, which provides a high differential pressure alarm.

4.2.3 Level

The level in the hydraulic oil reservoir is monitored by Level Transmitter PAE-1 and indicated on the PSS via Level Indicator Alarm 30-LIA-101. Level Indicator Alarm 30-LIA-101 provides a low-level trip signal for the ESD System.

Local level indication at the hydraulic oil reservoir is provided by Level Gauges PV-1 and PV-2.

4.2.4 Motor Control

The Motor Controls are located left of centre in the front of the WHCP in two groups one for the HP system and one for the MP system. The groups include the following indicators, pushbuttons and selector switches:

Indicators			
XA-PD-1	HP Duty Pump Remote	XA-PD-2	HP Duty Pump Local
XA-PD-3	HP Pump Fault	XA-PD-4	HP Pump Running
XA-PD-5	HP Standby Pump Remote	XA-PD-6	HP Standby Pump Local
XA-PD-7	HP Standby Pump Fault	XA-PD-8	HP Standby Pump Running
XA-PD-9	MP Duty Pump Remote	XA-PD-10	MP Duty Pump Local
XA-PD-11	MP Pump Fault	XA-PD-12	MP Pump Running
XA-PD-13	MP Standby Pump Remote	XA-PD-14	MP Standby Pump Local
XA-PD-15	MP Standby Pump Fault	XA-PD-16	MP Standby Pump Running
Push Buttons			
PB-PC-1	HP Duty Pump Start	PB-PC-2	HP Duty Pump Stop
PB-PC-3	HP Standby Pump Start	PB-PC-3	HP Standby Pump Stop
PB-PC-4	MP Duty Pump Start	PB-PC-5	MP Duty Pump Stop
PB-PC-6	MP Standby Pump Start	PB-PC-7	MP Standby Pump Stop
Selector Switches			
SEL-PAF-1	HP Pump Duty/Standby	SEL-PAF-2	HP Pump Local/Remote
SEL-PAF-3	MP Pump Duty/Standby	SEL-PAF-4	MP Pump Local/Remote

4.2.5 Master Section

The Master section of the WHCP is located above the pump section and includes the following indicators and pushbuttons:

Indicators			
XA-PD-15	Prod Manifold Pres. Lo-Lo	XA-PD-16	Common Start-up Bypass Ind
XA-PD-17	ESD Activated	XA-PD-18	PSD Activated
XA-PD-19	USD Activated	XA-PD-20	Fusible Plug Loop Zone 1
XA-PD-21	Fusible Plug Loop Zone 2	XA-PD-22	C/V Hyd Pressure Lo-Lo
XA-PD-23	LP Hdr. Pressure Lo-Lo	XA-PD-24	MP Hdr Pressure Lo-Lo
XA-PD-25	HP Hdr. Pressure Lo-Lo		

Push Buttons			
PB-PC-9	Total Surface SD	PB-PC-10	Total Sub-Surface SD
PB-PC-11	Lamp Test		
00-HS2-125	ESD Pushbutton (WHCP)	00-HS1-125	ESD Pushbutton (GPP)
00-HS2-124	PSD Pushbutton (WHCP)	00-HS1-124	PSD Pushbutton (GPP)
PB-PC-14	USD Pushbutton/Reset	PB-PC-15	Prod Manifold Start-up Bypass

4.2.6 Well Control Modules

Each well slot has a module in the WHCP which has two parts, the upper part being a gauge panel and the lower part housing the controls and indicators for the tree valves and choke controls The well module are located on the left side of the WHCP front panel. The following indicators, pushbuttons and selector switches are provided on each of the well control modules.

Pressure Indicators:

- ME-4 – SCSSV Hydraulic Pressure
- ME-3 – SSV Hydraulic Pressure
- ME-2 – Wing Valve Hydraulic Pressure
- ME-1 – Choke Valve Hydraulic Pressure

Indicator Lamps			
XA-MD-1	Flowline Pressure Hi-Hi	XA-MD-2	Flowline Pressure Lo-Lo
XA-MD-3	WSD Status	MM-1	Choke Valve Position Indicator
Push Buttons			
PB-MB-1	SCSSV Open	PB-MB-2	SCSSV Close
PB-MB-3	SSV Open	PB-MB-4	SSV Close
PB-MB-5	Wing Valve Open	PB-MB-6	Wing Valve Close
00-HS-126	Well Shutdown	PB-MB-8	Well Shutdown Reset
PB-MB-9	Choke Valve Step Open	PB-MB-10	Choke Valve Step Close
PB-MB-11	Flowline Start-up Bypass		

Selector Switch:

SEL-MC-1 – Local/Remote Choke Valve Step Control, this selector switch is lockable in the Local position.

The following status indications are repeated on the DCS:

30-XI-101 – SCSSV Status (DCS)

30-XI-102 – SSV Status (DCS)

30-XI-103 – Wing Valve Status (DCS)

Well Control

The 6barg control oil supply is made available for operation of the tree valves when the ESD button PP1 has been reset and the fusible plug loop has been pressurised to reset the pilot valve PU2. Loss of pressure in the control loop results in closure of all tree valves and SCSSVs. This action opens pilot valves PU4 and PU5 on the control supply to the SSV and SCSSV in preparation for opening.

The hydraulic supply to the SCSSV is switched by Solenoid Valve MF-3, which supplies control oil to the Pilot Valve MG-3, which supplies HP oil to the actuator. The Solenoid Valve MF-3 can be operated remotely or from the pushbutton on the associated well control module.

When the SCSSV is open sensed by Pressure Switch MM3, the SSV can be opened, The hydraulic supply to the SSV is switched by Solenoid Valve MF-2, which supplies control oil to the Pilot Valve MG-2 which supplies MP oil to the actuator. The Solenoid Valve MF-2 can be operated remotely or from the pushbutton on the associated well control module.

When the SSV is open sensed by Pressure Switch MM2, the WV can be opened, The hydraulic supply to the WV is switched by Solenoid Valve MF-1, which supplies control oil to the Pilot Valve MG-1 which supplies MP oil to the actuator. The Solenoid Valve MF-1 can be operated remotely or from the pushbutton on the associated well control module.

To control the closing sequence for the production well on an ESD or fusible loop failure the control oil line to the pilot valves is depressurised.

The pilot valve MG1 for the wing valve closes immediately and vents the WV actuator to close the valve.

The pilot valve MG2 for the SSV closes following closure of pilot valve PU4 after a 10-20 seconds time delay set by PD1 and vents the SSV actuator to close the valve.

The pilot valve MG3 for the SCSSV closes following closure of pilot valve PU5 after a 21-30 seconds time delay set by PD2 and vents the SSV actuator to close the valve.

4.2.7 Choke Control

The choke valve is set by a hydraulic motor which drives the choke in either the open or closed direction. The direction of travel is selected through Solenoid Valves 00-XV-104A or B which direct the hydraulic supply to the selected side of the actuator. Control of the choke can be selected to be from the well module or remotely from the DCS through a switch on the well module. Indication of valve position is provided on the well module and on the DCS.

4.2.8 Fusible Plug Loops

The fusible plug loops provide fire detection for the Wellpad B. Following activation the loop must be repaired and it is quickly pressurised by pressing and holding of the Three-way Valve PR-1 until the required pressure is achieved in the loop indicated by the associated pressure gauge and pressure status indicator. The Pressure Regulator PU-1 provides pressure make up through a restriction orifice.

If the loop is damaged, nitrogen is lost from the loop and if the loss rate is greater than the make up rate pressure in the loop will fall and a shutdown of the wells is initiated through PU2 Fusible loop pressure is monitored by Pressure Transmitter PTL-2 which provides a signal to the shutdown system.

4.3 Portable Test Separator 111-00-S-007

Refer to P&ID: PHM-111-FE-004 Production Header.

The test separator will be provided by the vendor that is contracted to do well testing. Reference should be made to the relevant vendor documentation for details of the test separator.

4.4 Wellpad B Export Flow Line and Pig Launcher 111-62-V-003

Refer to P&ID: PHM-111-FE-005 Pig Launcher Wellpad B.

4.4.1 Pressure

The pressure in the export flow line upstream of 62-SDV-101 is monitored by Pressure Transmitter 00-PT-114 which provides indication on the DCS through 00-PIA-114. Pressure Indicator Alarm 00-PIA-114 generates high and low-pressure alarms.

The pressure in the export flow line upstream of 62-SDV-101 is also monitored by Pressure Transmitter 00-PT-116 which provides indication on the SDS through 00-PIA-116. Pressure Indicator Alarm 00-PIA-116 generates a low pressure trip signal to the SDS which initiates executive actions as described in the cause and effect charts.

4.4.2 Temperature

The Temperature in the export flow line upstream of 62-SDV-101 is monitored by Temperature Transmitter 00-TT-103 which provides indication on the DCS through 00-TI-103.

4.4.3 Pig Launcher Valve Sequencing

To ensure safe operation of the pig launcher a key interlock system is provided to control the sequence of operation of the process isolation, drain and vent valves and opening of the pig launcher closure. Operation of the interlock system is described in the operating procedures.

4.5 Wellpad A Import Flow Lines and Pig Receiver from Wellpad B 113-62-V-005

Refer to P&ID: PHM-113-FE-006 Pig Receivers.

4.5.1 Pressure

The pressure in the import flow line from Wellpad B downstream of 62-SDV-102 is monitored by Pressure Transmitter 00-PT-117 which provides indication through 00-PI-117 on the DCS.

4.5.2 Temperature

The Temperature in the flow line from Wellpad B downstream of 62-SDV-102 is monitored by Temperature Transmitter 00-TT-104 which provides indication on the DCS through 00-TI-104.

4.5.3 Pig Receiver Valve Sequencing

To ensure safe operation of the pig receiver a key interlock system is provided to control the sequence of operation of the process isolation, drain and vent valves and opening of the pig receiver closure. Operation of the interlock system is described in the operating procedures.

5.0 ENVIRONMENTAL, HEALTH AND SAFETY REQUIREMENTS

5.1 General EHS Requirements

5.1.1 Chemicals

The following chemical is used in this system, or may be present under upset conditions:

- Corrosion inhibitor
- Methanol
- Hydraulic oil

Personnel should ensure that they are fully familiar with the Material Safety Data Sheet (MSDS) for each chemical, which details precautions and the protective apparel and equipment necessary when handling the chemicals. The precautions detailed must be adhered to at all times.

5.1.2 Hazardous Sources

Table 1B-1.6 – Hazardous Sources lists potential hazardous sources that may be present under upset conditions affecting the Process Facilities.

Table 1B-1.6 – Hazardous Sources

Hazard	Source	Hazardous Event	Effect	Control
Liquid hydrocarbons under pressure	Wellheads, production flowlines and manifolds	Potential for injury due to contact with hazardous liquids	Potential for personnel injury	Inspection and maintenance routines
		Loss of containment and release of flammable liquids	Unignited liquid release and potential for gas release and fire/explosion	Fire and gas detection
Methanol and corrosion inhibitor under pressure	Wellheads	Potential for injury due to contact with hazardous liquids	Potential for personnel injury	Inspection and maintenance routines
		Loss of containment and release of flammable liquids	Unignited liquid release and potential for fire/explosion	Fire detection
Hydrocarbon gas under pressure	Wellheads, production flowlines and manifolds	Potential for injury due to contact with hazardous liquids	Potential for personnel injury	Inspection and maintenance routines
		Loss of containment and release of flammable gas	Unignited gas release and potential for fire/explosion	Fire and gas detection
Hydraulic oil under pressure	SCSSVs, SSVs Wing Valves, Choke Valves, Shutdown Valves, WHCP, HIPPS Valves and HPU	Potential for injury due to contact with liquids under pressure	Potential for personnel injury	Inspection and maintenance routines

5.2 Specific Health and Safety Requirements

The correct use of Personal Protective Equipment (PPE) is fundamental in securing a safe and healthy place of work for all personnel. PPE shall be used in conjunction with appropriate health, environment and safety procedures that are designed to minimise the potential risk of harm or injury to personnel, while also promoting safe working practices.

5.3 Specific Environmental Requirements

To prepare the production facilities for the introduction of hydrocarbon gas, it is necessary to remove all air from the system. Nitrogen may be utilized for this purpose. Similarly, when preparing equipment for maintenance, nitrogen may be used to purge hydrocarbons from the system before breaking containment and introducing air.

When purging the system of air prior to introduction of hydrocarbons, the atmoPig in the system should be tested with an oxygen content analyzer to determine the level of oxygen remaining in the purged system.

When purging is being performed to remove hydrocarbons, a suitable test instrument, which uses thermal conductivity or infra-red absorption, capable of detecting hydrocarbons in nitrogen must be used. Pelister type instruments cannot be used, as they require at least 13% oxygen to operate.

WARNING: NITROGEN IS AN ASPHYXIANT, AND IS COLOURLESS AND ODOURLESS: RAPID AND UNRECOGNISED LOSS OF CONSCIOUSNESS CAN OCCUR IN PERSONS EXPOSED TO A NITROGEN-ENRICHED ATMOPIG. WHEN USING NITROGEN, CARE SHOULD BE TAKEN TO ENSURE THAT NITROGEN ESCAPES ARE DISPERSED AND NOT ALLOWED TO COLLECT IN ENCLOSED AREAS.

6.0 REFERENCE INFORMATION

6.1 Company Documentation

Document Number	Document Title
PH-10-OP-SOP-00001B	System Operations Procedure Wellpad B
PH-10-OP-SOP-00001B-01	Standard Operating procedure Operation of The Wellpad B Process Facilities
–	–

6.2 Vendor Documentation

Document Number	Document Title
SA/06/WHCP-B101C/4-1	WHCP Schematic Diagram
SA/06/WHCP-C101C/5-1	WHCP General Arrangement (2 Sheets)
SA/06/WHCP-C102C/6-1	WHCP General Arrangement (2 Sheets)
SA/06/WHCP-C102C/2-1	WHCP Module Details

6.3 Engineering Drawings (PFDs, UFDs and P&IDs)

Drawing Number	Drawing Title
PHM-111-FP-001	Sinphuhorm Wellpad B PFD – Wells and Production Header
PHM-111-FE-001	Sinphuhorm Wellpad B P&ID – Wellhead Control Panel
PHM-111-FE-002	Sinphuhorm Wellpad B P&ID – Wellhead Details
PHM-111-FE-004	Sinphuhorm Wellpad B P&ID – Production Header
PHM-111-FE-005	Sinphuhorm Wellpad B P&ID – Pig Launcher
PHM-113-FE-006	Sinphuhorm Wellpad A P&ID – Pig Receiver from Wellpad B

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WELLPAD B PROCESS UTILITIES

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1.0 INTRODUCTION

1.1 System Purpose/Function

The Processing Utilities on Wellpad B are provided to support production from the production wells on the site and include chemical injection and flaring of any excess gas.

1.2 Primary Components

Wellpad B is comprised of the following Primary Components:

Tag No	Equipment Title/Description
111-64-T-001	Corrosion Inhibitor Tank
111-64-T-002	Hydrate Inhibitor Tank
111-64-PM-001	Corrosion Inhibitor Injection Pump
111-64-PM-010	Hydrate Inhibitor Injection Pump
–	Vent System

1.3 Primary Interfaces

Input interfaces:

- PCSS System (refer to SOP Volume 14 Process Control and Safety System)
- Glycol Regeneration (refer to Section 3.0 of this manual)
- Wellpad B Process (refer to Section 1.0B of this manual)

Output interfaces:

- Wellpad B Process (refer to Section 1.0B of this manual)

2.0 SYSTEM DESCRIPTION

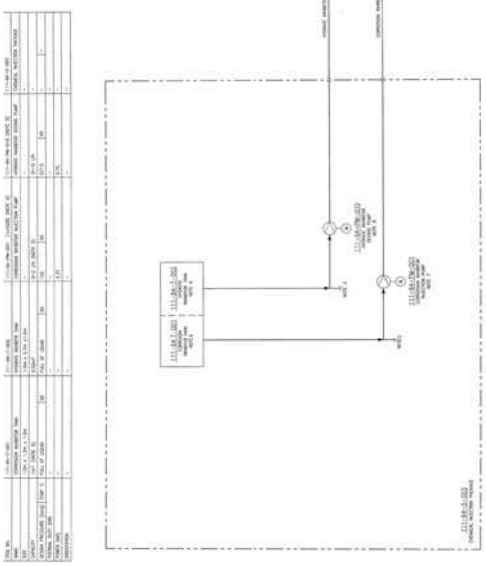
2.1 System Overview

Refer to Figure 1B-2.1 – Chemical Injection Simplified Overview Schematic and Figure 1B-2.2 – Vent System Simplified Overview Schematic.

Wellpad B is equipped with corrosion inhibitor injection facilities to control corrosion in the flow lines and hydrate inhibitor injection facilities to prevent hydrate formation as the fluids flow through the choke.

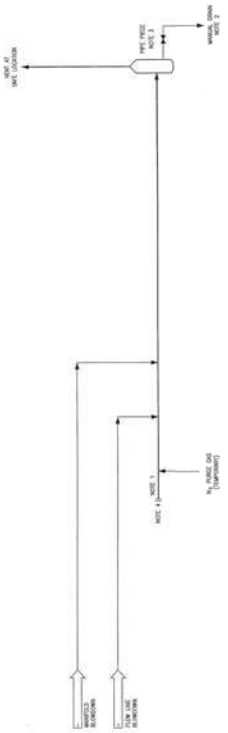
Wellpad B is also equipped with a Vent System for disposal of gas at a safe location when operating the pig launchers and receivers or when sections of the process facilities is being depressurised.

Figure 1B-2.1 – Chemical Injection Simplified Overview Schematic



Derived from PHM-111-FP-010 Rev. 4

Figure 1B-2.2 – Vent System Simplified Overview Schematic



Derived from PHM-111-FP-011 Rev.5

2.2 Primary Flow Description

Refer to the following P&IDs:

- PHM-111-FE-007 Chemical Injection
- PHM-111-FE-008 Vent System

2.2.1 Systems

For the purposes of this document, Wellpad B process utilities are separated into sections as follows:

- Chemical injection
- Vent System

2.2.2 Chemical Injection

Corrosion Inhibitor

The corrosion inhibitor is stored in the corrosion Inhibitor Tank 111-64-T-001 which holds 1m^3 of chemical sufficient to treat 14 days of production. The tank is filled from chemical drums through a filling line on top of the tank.

Chemical flows from a nozzle in the base of the tank to the suction of the injection pump through a suction strainer.

The chemical is pumped to the injection point on the well flowline downstream of the choke valve for by dedicated electric motor driven Metering Pump 111-64-PM-001 at a rate of up to 2l/hr. The injection rate is set by manual adjustment of the pump stroke.
A calibration pot is provided on the pump suction line to enable the injection rate to be checked for accuracy. A pulsation damper is installed on the pump discharge to reduce surges at the injection point.

To prevent the back flow of reservoir fluids to the chemical injection facility two non-return valves are installed close to the injection point. To avoid problems due to common mode failure the non-return valves are of different type.

Hydrate Inhibitor

The hydrate inhibitor is stored in the hydrate Inhibitor Tank 111-64-T-002 which holds 0.52m^3 of chemical sufficient to start one production well. The tank is filled from chemical drums through a filling line on top of the tank.

Chemical flows from a nozzle in the base of the tank to the suction of the injection pump through a suction strainer.

The chemical is pumped to the injection point on the well flowline upstream of the choke valve, by a dedicated electric motor driven Metering Pump 111-64-PM-010 at a rate of up to 10l/hr. The injection rate is set by manual adjustment of the pump stroke. A calibration pot is provided on the pump suction to enable the injection rate to be checked for accuracy. A pulsation damper is installed on the pump discharge to reduce surges at the injection point.

An interlock is provided with the choke valve and the controls for the pump to prevent operation when the choke is closed.

2.2.3 Vent System

Gas vented from the pig launchers and receivers or during depressurisation of the process facilities flows into the 80mm vent header and on to the vent stack.

At the base of the vent stack there is a large diameter vertical pipe piece where liquid is separated from the gas. The liquid collects in the bottom of the pipe piece and the gas flows to

the vent stack for disposal. The collected liquids are manually drained to a drained pit and transferred to a road tanker, which transports the liquids to a disposal point.

A nitrogen purge point is provided at the extreme end of the vent header for snuffing purposes if the vent is ignited during blowdown. As there is normally no flow to the vent system there is no requirement for a continuous nitrogen purge. When the vent is required, the header and vent stack is purged with nitrogen before hydrocarbon gas is routed to the vent.

On completion of venting, the vent pipe piece is drained, the vent header, vent pipe piece and vent stack are inerted using nitrogen.

3.0 EQUIPMENT DESCRIPTION

3.1 Corrosion Inhibitor Tank 111-64-T-001

Refer to P&ID: PHM-111-FE-007 Chemical Injection.

3.1.1 Function

Corrosion Inhibitor Tank 111-64-T-001 is provided to store sufficient chemical for 14 days of operation at the well site. A tank will be provided for each well as the wells are installed.

3.1.2 Technical Data

For details of the design and operating parameters, refer to Table 1B-2.1 – Design and Operating Parameters Corrosion Inhibitor Tank 111-64-T-001.

Table 1B-2.1 – Design and Operating Parameters Corrosion Inhibitor Tank 111-64-T-001

Parameter	Design	Operating
Pressure	Liquid full	ATM
Temperature	65°C	Ambient
Capacity	1m^3	–

3.1.3 Technical Description

The Corrosion Inhibitor Tank 111-64-T-001 is a rectangular stainless steel tank 1.0m wide, 1.3m long, 1.0m high located on a support frame just above ground level. The tank is located in a drip tray along with the pumps.

The tank is provided with an inspection hatch (hand hole), connection for filling and a vent with flame arrestor, all located on top of the tank.

Indication of the level in the tank is provided by a local Level Gauge 64-LG-101.

3.2 Corrosion Inhibitor Injection Pump 111-64-PM-001

Refer to P&ID: PHM-111-FE-007 Chemical Injection.

3.2.1 Function

Corrosion Inhibitor Injection Pump 111-64-PM-001 delivers chemicals to the production flowline downstream of the choke valve. Provision has been made for a total of four pumps as the wells are installed in the future.

3.2.2 Technical Data

For details of the design and operating parameters, refer to Table 1B-2.2 – Design and Operating Parameters Corrosion Inhibitor Injection Pump 111-64-PM-001.

Table 1B-2.2 – Design and Operating Parameters Corrosion Inhibitor Injection Pump 111-64-PM-001

Parameter	Design	Operating
Pressure	105barg	50 to 92barg
Temperature	65°C	Ambient
Capacity	0 to 2l/h	–
Stroke rate	80 strokes per minute	–
Power	0.37kW	–

3.2.3 Technical Description

Corrosion Inhibitor Injection Pump 111-64-PM-001 is a LEWA Type LDB1, positive displacement, variable stroke diaphragm pump capable of delivering an accurately metered quantity of chemical to the injection point. Adjustment to discharge flow is made through a calibrated hand wheel on the pump.

The pump is fitted with a suction strainer, a calibration gauge and a discharge pulsation damper. The wetted parts of the pumps are manufactured from stainless steel and the diaphragms are of PTFE.

The pump is driven through gearing by an electric motor which is operated through controls positioned at the pump.

Discharge pressure for Corrosion Inhibitor Injection Pump 111-64-PM-001 is indicated locally on local Pressure Gauge 64-PG-101.

For details of the injection pump control and protection, refer to Paragraph 4.0 Instrumentation and Control.

3.3 Hydrate Inhibitor Tank 111-64-T-002

Refer to P&IDs: PHM-111-FE-007 Chemical Injection.

3.3.1 Function

Hydrate Inhibitor Tank 111-64-T-002 is provided to store sufficient chemical for start up of a single well at the well site.

3.3.2 Technical Data

For details of the design and operating parameters, refer to Table 1B-2.3 – Design and Operating Parameters Hydrate Inhibitor Tank 111-64-T-002.

Table 1B-2.3 – Design and Operating Parameters Hydrate Inhibitor Tank111-64-T-002

Parameter	Design	Operating
Pressure	Liquid Full	ATM
Temperature	65°C	Ambient
Capacity	0.52m^3 for one well start-up	–

3.3.3 Technical Description

The Hydrate Inhibitor Tank 111-64-T-002 is a rectangular stainless steel tank 1.0m wide, 0.7m long, 1.0m high located on a support frame just above ground level. The tank is located in a drip tray along with the pump.

The tank is provided with an inspection hatch (hand hole), connection for filling and a vent with flame arrestor all located on top of the tank.

Indication of the level in the tank is provided by a local Level Gauge 64-LG-102.

3.4 Hydrate Inhibitor Injection Pump 111-64-PM-010

Refer to P&ID: PHM-111-FE-007 Chemical Injections.

3.4.1 Function

Hydrate Inhibitor Injection Pump 111-64-PM-010 delivers methanol to the production flowline upstream of the choke during start-up of the well.

3.4.2 Technical Data

For details of the design and operating parameters, refer to Table 1B-2.4 – Design and Operating Parameters Hydrate Inhibitor Injection Pump 111-64-PM-010.

Table 1B-2.4 – Design and Operating Parameters Hydrate Inhibitor Injection Pump 111-64-PM-010

Parameter	Design	Operating
Pressure	227.5barg	100 to 200barg
Temperature	65°C	Ambient
Capacity	0 to 10l/h	
Stroke rate	112 strokes per minute	
Power	0.75kW	

3.4.3 Technical Description

The Hydrate Inhibitor Injection Pump 111-64-PM-010 is a LEWA Type LDC1, positive displacement, variable stroke diaphragm pump capable of delivering an accurately metered quantity of chemical to the injection point. Adjustment to discharge flow is made through a calibrated hand wheel on the pump.

The pump is fitted with a suction strainer, a calibration gauge and a discharge pulsation damper. The wetted parts of the pump are manufactured from stainless steel and the diaphragm is of PTFE.

The pump is driven through gearing by an electric motor, which is operated through controls positioned at the pump.

Discharge pressure is indicated locally on local Pressure Gauge 64-PG-102.

For details of the injection pump control and protection, refer to Paragraph 4.0 Instrumentation and Control.

3.5 Vent System

Refer to P&ID: PHM-111-FE-008 Vent System.

3.5.1 Function

The vent pipe piece receives the fluids from the vent header. The gas vapours are routed to the vent stack, and the collected liquids are manually drained from the vent pipe piece to a sump for disposal.

3.5.2 Technical Description

The vent pipe piece is a vertical vessel with a diameter of 0.5m and has a height of 1.65m, tan to tan. The 150mm nominal bore vent stack is mounted on top of the vent pipe piece, positioning the vent tip 10m above the ground.

Fluids, primarily gas, from the vent header enter the vent pipe piece through a 150mm inlet nozzle on the side of the vessel.

The gas leave the pipe piece through a 150mm outlet nozzle located on the top of the vessel and flows directly into the vent stack. The stack directs the gas through a vertical 150mm line to the vent tip.

The liquids leave the vessel under manual control through a 50mm outlet nozzle located on the bottom of the vessel and flow to a drain sump.

A 50mm purge point is provided on the dead end of the vent header, which has fittings and isolation valve for connection to a temporary nitrogen supply. The vent header slopes towards the vent pipe piece to ensure pockets of liquid do not collect anywhere in the collection system.

Level Gauge 16-LG-101 provides local indication of the liquid level.

For details of the pipe piece control and protection, refer to Paragraph 4.0 Instrumentation and Control.

4.0 INSTRUMENTATION AND CONTROL

4.1 Corrosion Inhibitor Tank 111-64-T-001

Refer to P&ID: PHM-111-FE-007 Chemical Injections.

4.1.1 Level Monitoring and Protection

Level Switch 64-LS-102 on the corrosion inhibitor tank provides a low level trip to the SDS to stop the pump.

4.2 Corrosion Inhibitor Injection Pump 111-64-PM-001

Refer to P&ID: PHM-111-FE-007 Chemical Injections.

4.2.1 Pump Controls

The Corrosion Inhibitor Injection Pump is operated manually using the stop/start pushbutton at the pump. Low level in the tank will trip the pump at the MCC.

4.2.2 Pressure Protection

The discharge line of the pump is protected against overpressure due to blocked outlet by a single Relief Valve 64-PSV-101, which is set to relieve back to the tank at 105barg.

4.3 Hydrate Inhibitor Tank 111-64-T-002

Refer to P&IDs: PHM-111-FE-007 Chemical Injections.

4.3.1 Level Monitoring and Protection

Level Switch 64-LS-104 on the hydrate inhibitor tank provides a low level trip to the SDS to stop the pump.

4.4 Hydrate Inhibitor Injection Pump 111-64-PM-010

Refer to P&ID: PHM-111-FE-007 Chemical Injections.

4.4.1 Pump Controls

The hydrate inhibitor injection pump is operated manually using the stop/start pushbuttons at the pump. Low level in the tank will trip the pump at the MCC.

An interlock with the choke closed position transmitter prevents the pump from being started until the choke valve is cracked open.

4.4.2 Pressure Protection

The discharge side of the pump is protected against overpressure due to blocked outlet by a single Relief Valve 64-PSV-102 which is set to relieve back to the tank at 227.5barg.

4.5 Vent System

Refer to P&ID: PHM-111-FE-008 Vent System.

4.5.1 Level Monitoring and Protection

Level Switch 16-LS-101 on the vent pipe piece provides a high level alarm, which is audible and visible at the well site.

5.0 ENVIRONMENTAL, HEALTH AND SAFETY REQUIREMENTS

5.1 General EHS Requirements

5.1.1 Chemicals

The following chemical is used in this system, or may be present under upset conditions:

Corrosion inhibitor

Methanol

Personnel should ensure that they are fully familiar with the Material Safety Data Sheet (MSDS) for each chemical, which details precautions and the protective apparel and equipment necessary when handling the chemicals. The precautions detailed must be adhered to at all times.

5.1.2 Hazardous Sources

Table 1B-2.5 – Hazardous Sources lists potential hazardous sources that may be present under upset conditions affecting the Process Utilities System.

Table 1B-2.5 – Hazardous Sources

Hazard	Source	Hazardous Event	Effect	Control
Methanol and corrosion inhibitor under pressure	Chemical Injection pumps	Potential for injury due to contact with hazardous liquids Loss of containment and release of flammable liquids	Potential for personnel injury Flammable liquid release and potential for fire/explosion	Inspection and maintenance routines
Hydrocarbon gas	Vent system	Loss of containment and release of flammable gas	Flammable gas release potential for fire/explosion	Inspection and maintenance routines
Explosive mixture in the vent system	Vented gas	Explosion in the vent system	Potential for personnel injury potential for fire/explosion	Purge vent system completely before/after venting gas

5.2 Specific Health and Safety Requirements

The correct use of Personal Protective Equipment (PPE) is fundamental in securing a safe and healthy place of work for all personnel. PPE shall be used in conjunction with appropriate health, environment and safety procedures that are designed to minimise the potential risk of harm or injury to personnel, while also promoting safe working practices.

5.3 Specific Environmental Requirements

To prepare the vent system for the introduction of hydrocarbon gas, it is necessary to remove all air from the system. Nitrogen is utilized for this purpose. Similarly, when preparing equipment for maintenance, nitrogen may be used to purge hydrocarbons from the system before breaking containment and introducing air.

When purging the system of air prior to introduction of hydrocarbons, the atmoPig in the system should be tested with an oxygen content analyzer to determine the level of oxygen remaining in the purged system.

When purging is being performed to remove hydrocarbons, a suitable test instrument, which uses thermal conductivity or infra-red absorption, capable of detecting hydrocarbons in nitrogen must be used. Pelister type instruments cannot be used, as they require at least 13% oxygen to operate.

WARNING: NITROGEN IS AN ASPHYXIANT, AND IS COLOURLESS AND ODOURLESS: RAPID AND UNRECOGNISED LOSS OF CONSCIOUSNESS CAN OCCUR IN PERSONS EXPOSED TO A NITROGEN-ENRICHED ATMOPIG. WHEN USING NITROGEN, CARE SHOULD BE TAKEN TO ENSURE THAT NITROGEN ESCAPES ARE DISPERSED AND NOT ALLOWED TO COLLECT IN ENCLOSED AREAS.

CASE OF BREAKING OF CONTAINMENT, MERCURY DRAGGER TUBE SHOULD BE USED TO VERIFY TRACE OF MERCURY. IF THE TRACE IS ABOVE 0.05MG/M3,

PROTECTION MUST BE WORN. REFER TO PH-10-HS-SWP-00029; SAFE WORK PRACTICES FOR MERCURY CONTAMINATED MATERIAL.

6.0 REFERENCE INFORMATION

6.1 Company Documentation

Document Number	Document Title
PH-10-OP-SOP-00001B	System Operations Procedure Wellpad B
PH-10-OP-SOP-00001B-02	Standard Operating Procedure Operation of Wellpad B Process Utilities
–	–
–	–
–	–

6.2 Vendor Documentation

Document Number	Document Title
LA05-2620-DS-204-04	Pump Data Sheets
LA05-2620-DS-204-03	Pump Data Sheets
LA05-2620-DS-202-01	Tank Data Sheets
LA05-2620-DS-202-02	Tank Data Sheets
LA05-2620-PID-100-03	Wellpad B P&ID – Chemical Injection

6.3 Engineering Drawings (PFDs, UFDs and P&IDs)

Drawing Number	Drawing Title
PHM-111-FP-010	Sinphuhorm Wellpad B PFD – Chemical injection System
PHM-111-FP-011	Sinphuhorm Wellpad B PFD – Vent System
PHM-111-FE-007	Sinphuhorm Wellpad B P&ID – Chemical Injection
PHM-111-FE-008	Sinphuhorm Wellpad B P&ID – Vent System

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WELLPAD B UTILITIES

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1.0 INTRODUCTION

1.1 System Purpose/Function

The Utilities on Wellpad B are provided to provide power, process control and limited life support on the site.

1.2 Primary Components

Wellpad B utilities are comprised of the following Primary Components:

Tag No	Equipment Title/Description
111-ET-51-1101	22kV to 400V, 160kVA Transformer
111-ES-51-1101	400 Volt Motor Control Centre
111-EG-52-1101	109kW, 400V, 3 phase Emergency Diesel Generator
111-ER-52-1301	10kVA, 230V, 1 phase UPS
111-17-T-001	Service Water Tank

1.3 Primary Interfaces

Input interfaces:

- PCSS System (refer to SOP Volume 14 Process Control and Safety System)

Output interfaces:

- Wellpad B Process (refer to Section 1.0B of this manual)
- PCSS System (refer to SOP Volume 14 Process Control and Safety System)

2.0 SYSTEM DESCRIPTION

2.1 System Overview

Refer to Figure 1B-3.1 – Wellpad B Electrical Schematic.

Electric power is supplied to Sinphuhorm Wellpad B by overhead provincial power grid cable supplying 22kVolts. Three phase at a frequency of 50Hz.

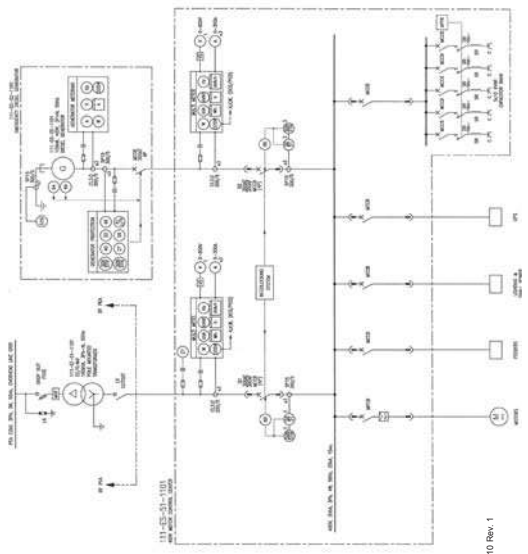
The incoming electrical power from the overhead lines is passed through a 160kVA transformer to step the voltage down from 22kVolts to 400 volts.

The emergency generation facilities are provided to ensure the continued operation of emergency systems in the event of loss of the main electrical power supply.
The generator is connected to the same bus as the main imported power. An interlock is provided on the generator breaker and the transformer incomer breaker to ensure both breakers are not closed at one time.

A UPS system is provided to maintain power to the automation and safety systems during transient power outages for a period of two hours.

The control facilities for Wellpad B are an extension of the system located in the Gas Processing Plant.
The service water system provides water for the toilets and wash basins in the control building.

Figure 1B-3.1 – Wellpad B Electrical Schematic



2.2 Primary Flow Description

2.2.1 Systems

For the purposes of this document, Wellpad B utilities are separated into sections as follows:

- Power generation and distribution
- Control facilities
- Service water

2.2.2 Power Generation and Distribution Facilities

Refer to PHM-111-ED-010 – Wellpad PH3 Overall Single Line Diagram.

In normal operation electricity is supplied via overhead power cables to the Wellpad B by the Provincial Electricity Authority (PEA) in Thailand from the grid. PEA supplies the electrical power at 22kV, 3 phase, and 50Hz. On entering the wellpad area the electricity is fed through a drop out fuse and metering facility, and connects to the Step down Transformer 111-ET-51-1101, which reduces the voltage from 22kV to 400V.

The overhead lines are provided with a lightening arrestor to protect the supply to the gas plant. The above equipment is provided by PEA.

From the transformer the power at 400V is fed to the 400V Motor Control Centre 111-ES-51-1101, which has a single bus.

In the event of a power failure on the Provincial Electricity Authority grid system or power import facility an Emergency Diesel Generator 111-EG-52-1101 has been installed.

The generator is rated at 109kW, 400V, 3 phases with a neutral and 50Hz. The generator is a self contained unit which includes a diesel day tank that can hold sufficient diesel for eight hours running on full load.

On loss of power to the 400V MCC, the emergency generator is started automatically and the generator breaker is closed. The associated interlock opens the incomer breaker on the imported supply as the emergency generator breaker closes to isolate the bus from the normal supply.

Where an interruption to supply is not acceptable for systems such as safety and control systems the system is supplied from a battery backed UPS.

2.2.3 Control Facilities

The control facilities for Wellpad B are housed in the MCC/Technical Room located in a building on the West side of the site. The building also includes the battery room, emergency generator room and the wellhead control panel room along with HVAC system toilet and shower.

The facilities at the Wellpad are monitored and controlled through a Remote-Sensing –Process Control and Safety System (RS-PCSS) which connects to the PCSS at the gas processing plant located approximately 64km from the site. Communication for the control system is via a data link between the GPP and the wellpad.

Signals to and from equipment on site are connected to the RS-PCSS at the Marshalling Cabinet 111-EK-75-0100. A system cable connects the marshalling cabinet to the PCSS System Cabinet 111-EC-75-0101, which holds the control cards and communications facilities for the PCSS. The PCS system is provided with power from the 230V AC UPS.

Status information from the MCC is communicated through a serial link to the System Cabinet for display on site and at the GPP.

Control signals are provided to the MCC and the WHCP from the Marshalling Cabinet through hard wired connections. The signals to initiate USD, PSD and ESD at the WHCP are included in these signals.

2.2.4 Service Water

Service water for use on the site is stored in an elevated Service Water Tank 111-17-T-001. From the tank water is routed to the toilet, washbasins and shower.

When required, the tank is filled from a tanker through a fill connection line at the wellpad B main gate to the tank.

3.0 EQUIPMENT DESCRIPTION

3.1 Transformer

Refer to PHM-111-ED-010 – Wellpad PH3 Overall Single Line Diagram.

3.1.1 Function

The function of the transformer is to transform the voltage supplied to Wellpad B from 22kV to 400V.

3.1.2 Technical Data

For details of the design and operating parameters, refer to Table 1B-3.1 – Design and Operating Parameters Transformer 111-ET-51-1101.

Table 1B-3.1 – Design and Operating Parameters Transformer 111-ET-51-1101

Parameter	Design	Operating
Power	160kVA	Up to 160kVA
Incoming Voltage	22kV	22kV
Outgoing Voltage	400V	400V

3.1.3 Technical Description

The transformer is a, three phase 'Delta' connected primary and 'Y' connected secondary dry type transformer is rated at 160kVA which is pole mounted at the site boundary.

To enable the incoming circuit to be isolated there is an HV Disconnecting Chamber fitted with an air insulated fuse load break disconnecting switch, provided on the primary side of the transformer.

An externally operated tap changer for off circuit operation is provided on the primary windings of the transformer, all tappings are rated for full power. The tap changer allows a ±5% change of transformer output voltage in 2.5% steps.

3.2 400V Motor Control Centre 111-ES-51-1101

Refer to PHM-111-ED-010 PH3 Overall Single Line Diagram.

3.2.1 Function

The 400V Motor Control Centre receives the 400V, 3 Phase supply from the import transformer and distributes the power to the various feeders, motor control circuits, lighting and small power distribution.

3.2.2 Technical Data

For details of the operating parameters, refer to Table 1B-3.2 – Design and Operating Parameters 400V MCC.111-ES-51-1101.

Table 1B-3.2 – Design and Operating Parameters 400V MCC 111-ES-51-1101

Parameter	Design	Operating
Voltage	1000V	400V
Current	300A	–
Short Circuit Current	25kA for 1 second	–
Control Supply	110V DC, 230V AC, 400 V AC	–

3.2.3 Technical Description

The 400V Motor Control Centre 111-ES-51-1101 is a steel cabinet sectionalised into separate compartments which house the breakers, switches and protection devices required to control distribution of power. The MCC is located in the MCC/Technical Room.

Three pole Air Circuit Breakers (ACBs) are used to switch the incoming supplies from the step down transformer and the emergency generator.

The ACBs are withdrawable and provided with safety interlocks so that it is not possible to withdraw or insert when the switching device is closed. Each ACB is provided with a lock off facility to padlock the breaker in the off or isolate position.

The two incomer breakers are provided with metering panels in addition to protection devices.

An electrical interlock is fitted to control operation of the transformer incomer and emergency generator breaker.

A 110V DC supply is provided throughout the switchboard for operation of the following:

- Breaker Tripping and Closing
- Protection and Control circuits
- Breaker Spring Charging

In addition there is a 230V AC single phase supply bus for the space heaters and control devices.

Moulded Case Circuit Breakers (MCCBs) and Motor Protection Circuit Breakers (MPCBs) are providing to switch power to the various loads on the MCC section of the panel.

In general the three poles, fuse-free, MCCBs are provided to switch power to the small power distribution boards and control panels. An MCCB of rating below 400AV for a feeder is equipped with thermal and magnetic trip units. If the MCCB is rated above 400V it is equipped with an adjustable electronic solid-state trip device with monitoring, ammeter readout, complete test facilities and protective features.

The MPCBs are used for motor feeders and include an adjustable magnetic trip unit for short circuit protection. The Motor Starters cater for 'Direct-on-Line' with full voltage start or 'Soft Start' which provides a reduced voltage for motor start. Provisions are also made for Star-delta switching and Variable Speed Drives (VSD).

In order to attempt to maintain the power factor within the range of 1 to 0.8 when the emergency generator is in use, an Automatic Power Factor Regulator (APFR) is installed connected to Bus. The APFR switches five banks of capacitors to increase the power factor as the load becomes

inductive. A coil is included in the connection to each capacitor bank to reduce the current surge as the bank is switched in and out of service.

3.3 Emergency Generator 111-EG-52-1101

3.3.1 Function

Refer to:

PHM-111-ED-010 PH3 Overall Single Line Diagram
PHM-111-ED-010

In the case of a power failure on the imported electricity supply an Emergency Generator 111-EG-52-1101 starts automatically to supply power to the MCC.

This emergency generator is rated at 109KW, 400V, 3 Phase and neutral at 50Hz. When the emergency generator is used to energise the MCC power from the import transformer must be disconnected.

3.3.2 Technical Data

For details of the design and operating parameters, refer to Table 1B-3.3 – Design and Operating Parameters Emergency Generator 111-EG-52-1101.

Table 1B-3.3 – Design and Operating Parameters Emergency Generator 111-EG-52-1101

Parameter	Design	Operating
Engine Output	106kW (142bhp)	–
Fuel Consumption	26l/hr	–
Fuel Tank Capacity	340 litre	–
Speed	1500rpm	–
Voltage Output	400V, 3 Phase 50Hz	–
Power Output	109kW	–

3.3.3 Technical Description

The diesel engine driver is manufactured by Cummins and is a Model 6BTA5.9-G2 unit, which is a four stroke engine with six cylinders in line. The engine is aspirated by an exhaust driven turbochargers provided with water cooled after coolers. A rig-saver device is provided on the air intake to shut off the combustion air supply to the engine on engine over speed.

Fuel for the engine is stored in a 340 litre fuel tank in the base of the generator package. The injector pumps are controlled electrically from the governor and supplied with fuel by a low pressure fuel pump. The fuel is filtered and passed through a water separator before flowing to the suction of the pump. Excess fuel from returned through a back pressure valve to the day tank.

This engine is water cooled, and has an engine driven air blast cooler to cool the circulating coolant. The coolant is circulated by an engine driven pump.

The engine has wet sump lubrication with an engine driven pump provided to feed lube oil under pressure to the bearings.

A battery powered electric start motor starts the diesel engine. The Valve Regulated Lead Acid batteries in the battery pack are charged by a battery charger powered from the emergency switchboard or alternatively from a small alternator mounted on the engine. The batteries provide sufficient capacity to perform six consecutive 15 second cranking cycles with a 15 second rest between each crank.

The engine drives a Stamford UCi274G alternator, which is directly coupled to the engine. The alternator is a synchronous AC generator with rotary brush less excitation system and Permanent Magnet Generator (PMG) pilot exciter. The alternator generates three phase power at 400V, and with a frequency of 50Hz. Cooling is provided by forcing air through the alternator using a fan mounted on the rotor.

The voltage output from the alternator is controlled by a MX321 Automatic Voltage Regulator, which controls the current in the rotating field coils on the rotor. The alternator is rated for an output of 109kW with a power factor of 0.8.

3.4 UPS 111-ER-52-1301-A/B

3.4.1 Function

Refer to:

PHM-111-ED-010 PH3 Overall Single Line Diagram
PHM-111-ED-040 10kVA, 230V, 1 Phase UPS Single Line Diagram

The UPS is a battery backed power source which provides power to critical systems in the plant which can not tolerate a break in supply. When main and emergency power is lost, the batteries continue to provide power to the inverters in the UPS, maintaining the AC supply without interruption.

3.4.2 Technical Data

For details of the design and operating parameters, refer to Table 1B-3.4 – Design and Operating UPS 111-ER-52-2301-A/B.

Table 1B-3.4 – Design and Operating Parameters UPS 111-ER-52-2301-A/B

Parameter	Design	Operating
Supply Voltage	400V AC, 3 phase, 50Hz	–
Output Voltage	230V AC, 1 phase, 50Hz	–
Operating Time on Battery	2 hours	–
Inverter Rated Output	10kVA (each)	–
Bypass Rated Output	10kVA	–
Fault Tolerance	50kA rms for 1 sec	–
Frequency Tolerance	+0.1%	–
Voltage Tolerance	±1%	–
Battery Volts	220V	–
Battery Capacity	2V 200 Ah/10h @ 20°C	–

3.4.3 Technical Description

The AC UPS system is provided by Gutor Electronics and has a 230V ac single phase output. The UPS is located in the MCC/Technical Room and is comprised of two 100% UPS systems and a single 100% bypass transformer. The output from the UPS is fed to the 230V AC UPS Distribution Board 111-ES-52-2301 which supplies power to the various users.

Each UPS unit consists of:

- Rectifier/Charger
- Inverter

- 100% Battery Bank

The bypass facility consists of:

- Bypass Transformer
- Static Bypass Switch
- Manual Bypass Switch

In each UPS the Rectifier/Charger receives three phase power from the Emergency Bus Bar at 400V ac which is rectified to produce a 220V dc which is to provide dc power for the inverter and to charge the associated 220V battery pack.

The inverter converts the 220V dc to a 230V ac single phase 50Hz supply and has a rated output of 40kVA.

If the main input to the rectifier/charger fails the battery continues to supply the 220V DC power to the inverter to maintain the 230V ac output for at least 2 hours without interruption. When main power is restored the dc power to the inverter is again supplied from the rectifier/charger and at the same time the batteries are recharged.

The bypass transformer also receives three phase power from the Emergency Bus Bar at 400V ac and produces a 230V ac single phase 50Hz output rated at 10kVA.

The two inverters are continuously synchronised with the bypass transformer, sensing being through the static switch. If there is a fault affecting the two 100% inverters, the supply is automatically switched to the bypass transformer by the static switch within a quarter cycles. The static switch is a high speed solid state switch which can transfer the load between inverters and bypass transformer without noticeable effect on the supply.

The static switch also monitors inverter performance and for alarm conditions and will perform a transfer to protect the UPS from damage caused by a current fault or a short circuit.

The two 100% battery packs are located in a battery room on the end of the substation are sized for HOLD Ah and comprised of valve regulated lead acid batteries. Each battery pack can be isolated from the associated rectifier/charger and inverter by a MCCB fitted with a shunt trip to allow remote tripping of the batteries.

The manual by pass switch allows the two inverters and static switch to be totally isolated from the bypass transformer for maintenance purposes.

The AC distribution board is consists fully insulated bus bars with miniature circuit breakers (MCB) and moulded case circuit breaker (MCCB) feeders. On the distribution board the main circuit breaker has over current and earth fault monitoring with auxiliary contacts to indicate operation of the device. These contacts are wired to the UPS display diagnostic system.

3.5 Service Water Tank 111-17-T-001

3.5.1 Function

Refer to P&ID: PHM-111-FE-010 Wellpad B Service Water and Power Generation.

The service water tank is provided to hold water on the site for washing and sanitary purposes.

3.5.2 Technical Data

For details of the design and operating parameters, refer to Table 1B-3.5 – Design and Operating Parameters for Service Water Tank 111-17-T-001.

Table 1B-3.5 – Design and Operating Parameters Service Water Tank 111-17-T-001

Parameter	Design	Operating
Capacity	$2m^3$	–
Elevation Above Ground	2.5m	–
Dimensions L/W/H	1.5m/1.5m/1.5m	–

3.5.3 Technical Description

The service water tank is a steel tank lined with bitumen 1.5m wide, 1.5m deep and 1.5m high supported on a concrete structure which raises the base of the tank to 2.5m above the ground.

The tank is filled from a tanker through a fill nozzle fitted with a non return valve and hose connection.

Water leaves the vessel through a 50mm line fitted with an isolation valve.

An overflow line with a 300mm water seal is provided from the side of the tank.

Level in the tank is indicated locally on a Level Gauge 17-LG-101 on the side of the tank.

4.0 INSTRUMENTATION AND CONTROL

4.1 400V Motor Control Centre 111 -ES-51-1101

Refer to PHM-111-ED-010 PH3 Overall Single Line Diagram.

4.1.1 Power Metering and Protection

The incomer breaker and the emergency generator breaker each have a metering panel which displays the following:

- Power (kW)
- Resistive Power (kVA)
- Reactive Power (kVAR)
- Power Factor (Cos Φ)
- Frequency (Hz)
- Current (per phase)(A)
- Voltage (per phase through a selector switch) (V)
- Watt hours (Wh)
- Hours (h)
- Reactive kVAR hours (kVARh)

The current readings of power, voltage and amperes are repeated in the control room on the DCS.

Overcurrent and earth fault detection devices are provided on the bus side of each incomer breaker to trip the associated breaker if a fault is detected.

An interlock is provided on the incomer breakers from the transformer and emergency generator which allows only one of the breakers to be closed at any time.

4.1.2 Motor Control

Each motor supply cubicle is provided with a Starter Control Unit (SCU) which is energised from the 110V dc supply and communicates with other SCUs and the DCS through a Modbus RTU. The SCU controls the start of the motor through a starter which can be either a Direct on Line starter or provide a soft start through an Auto transformer. The starter is also connected to the On/Off/Auto switch located by the motor in the field.

4.2 Emergency Generator

Refer to PHM-111-ED-010 PH3 Overall Single Line Diagram.

4.2.1 Emergency Generator Control Panel

The emergency generator is controlled from a control cabinet located in the substation.

Mounted in the front of the control cabinet is the Power Command Controller PCC2100 which is a microprocessor-based generator set monitoring, metering, and control system. The controller provides an operator interface to the generator set, voltage regulation, governing, and protective functions. Control power for the controller is derived from the UPS.

The operator panel includes a series of LEDs to allow the operator to view the general status of the generator set. The functions displayed include:

- **Green LEDs to indicate:**
  - Generator set running operating at rated voltage and frequency
  - Remote start signal received
- **Red LEDs to indicate:**
  - Not-in-Auto mode (flashing)
  - Common shutdown
  - Low Oil Pressure Shutdown
  - Overspeed Shutdown
- **Amber LEDs to indicate:**
  - Common warning
  - Low Oil Pressure Warning
  - High Engine Temperature Warning
  - Fail To Start

The following Switches are provided on the controller:

Off/Manual/Auto Mode Control Switch – When the switch is selected to Manual or off, the 'Not In Auto' lamp on the panel flashes. If Auto mode is selected, the generator set can be started automatically when power is lost on Normal Bus Bar.

Manual Run/Stop Control Switch – When the mode control switch is in the Manual position and the Manual Run /Stop switch is pressed, the Generator set will start, immediately. If the generator set is running in the Manual mode, pressing the Run/Stop switch will cause the generator set to shut down after a cool down at idle period.

Panel Lamp/Lamp Test Control Switch – Depressing the panel lamp switch will cause the panel illumination to operate for approximately 10 minutes. Pressing and holding the switch will sequentially illuminate all LEDs on the panel to confirm proper operation of these components.

Emergency Stop Button – Pressing the emergency stop button causes the generator set to shut down immediately. The generator set is prevented from running or cranking with the switch pressed in.

The control panel is equipped with an AC metering panel composed of a series of LED's configured in bar graphs for each function. The LED's are colour coded, with green indicating normal range values, amber for warning levels, and red for shutdown conditions. Scales for each function are in % of nominal rated values.

- **The nine bar-graphs provide the following displays from left to right:**
  - Simultaneous Current in each phase (3 bars)
  - Power (1 bar)
  - Power Factor (1 bar)
  - Frequency (1 bar)
  - Simultaneous Voltage on each phase (3 bars)

The control panel is also provided with an alphanumeric display capable of displaying two lines of data with approximately 20 characters per line. The display is accompanied by a set of six membrane switches, three each side of the display, that are used by the operator to navigate through control menus, and to make control adjustments.
All adjustments to volts, frequencies etc are made via the display panel.

All data on the display can be viewed by scrolling through screens with the navigation keys. The display shows all active fault conditions, active and inactive, with the latest displayed first.

The display panel has a screen-saver timer that turns off the display after 30 minutes of inactivity. Touching any key will turn the screen back on.

4.2.2 Engine Control

Remote Start Mode – On loss of power at the switchboard the controller automatically starts the generator set immediately and accelerates the unit to rated speed and voltage by careful control of the engine fuel system and alternator excitation system.

Data Logging – The controller maintains a record of manual control operations, warning and shutdown conditions, and other events. The control also stores critical engine and alternator data before and after a fault occurs, for use in evaluating the root causes for the fault condition.

Cycle Cranking – The controller limits the number of start attempts to be made, the duration of each crank and the duration of the rest period between cranks. The number of start attempts and durations are configurable.

Time Delay Stop (Cool-down) – Configurable for time delay of 0-10 minutes prior to ramp to idle or shut down after signal to stop in normal operation modes.

Engine Governing

The integrated digital governor drives the engine fuel control valve. The following features are available in the governing system:

Isochronous Governing – Controls engine speed within plus or minus 0.25% for any steady state load from no load to full load. Frequency drift will not exceed plus or minus 0.5% for a 60°F (33°C) change in ambient temperature over an 8 hour period

Temperature Dynamics – Modifies the engine fuel system (governing) control parameters as a function of engine temperature. Allows engine to be more responsive when warm, and more stable when operating at lower temperature levels

Smart Idle Mode – Engine governing can be regulated at an idle speed for a programmed period on automatic stop of the engine or in manual mode. In an automatic mode, the control will bypass the idle period if the engine at a low load level for sufficient duration for cool-down. During idle mode engine protective functions are adjusted for the lower engine speed, and alternator function and protections are disabled. Idle speed can be initiated by the operator when the generator set is running in the manual mode

4.2.3 Alternator Control

The controller includes an integrated 3-phase line-to-neutral sensing voltage regulation system, which performs the following functions:

Digital Output Voltage Regulation – Regulates output voltage to within 0.5% for any loads between no load and full load. On engine starting, or sudden load application, voltage is controlled to a maximum of 5% overshoot over nominal level

Fault Current Regulation – Regulates the output current on any phase to a maximum of 3 times rated current under fault conditions for both single phase and three phase faults. The regulation system will drive a permanent magnet generator (PMG) to provide 3 times rated current on all phases for motor starting and short circuit coordination purposes

4.3 UPS 111-ER-52-2301A/B

Refer to PHM-111-ED-010 PH4 Overall Single Line Diagram.

4.3.1 UPS Control Panel

The controls for the UPS are located in a panel located in the front door of the UPS cabinet. The panel is divided into four sections.

The top left section is the system panel, which shows the current operation status of the major components of the system on a schematic of the system.

The top centre section is the Operations section which includes buttons for turning the system on and off and a lamp test button for checking if all LED indications function properly.

The top right section is the display unit which consist of a LC display, an alarm LED, an acoustic alarm and a key-pad. With this the operator can set following operational parameters, obtain a list of measurement data, and get access to the event and alarm log.

The lower section of the panel is the alarm indication panel the respective LED lights up, when an alarm has occurred. The following alarm LEDs are included:

- Rectifier Mains Failure
- Rectifier Failure
- DC Out of Tolerance
- Battery Operation
- Battery Discharged
- Battery Disconnected
- Inverter Fault
- Overload Inverter/Bypass
- Inverter Fuse Blown
- Asynchronous
- Bypass Mains Fault
- Manual Bypass ON
- Over-temperature
- Fan Failure
- EA Inhibited
- EN Inhibited
- Power Supply Fault

5.0 ENVIRONMENTAL, HEALTH AND SAFETY REQUIREMENTS

5.1 General EHS Requirements

5.1.1 Electrical Safety

Only qualified and authorised personnel can work on or near exposed energised parts of electrical equipment that operate at voltages of more than 50V ac and/or 110V dc. The personnel must be trained for the task to be performed.

Personnel working on or near to electrical equipment shall adhere to the following:

Only qualified and authorised personnel must perform isolation/de-isolation of electrical equipment

Adhere to the Electrical Safety Rules and Procedures

Have knowledge of the construction and operation of specific electrical equipment and the hazards involved

Proper use and maintenance of test instruments and knowledge of their rating limits

Appropriate alerting techniques, such as signs, tags, and barricades for warning and protecting other personnel from electrical hazards.

All incidents or accidents of an electrical nature shall be reported to the supervisor of the work who shall ensure that it is investigated and reported.

All potentially dangerous situations or conditions involving electricity, and all cases of electrical equipment suspected of being in an unsafe condition, must be reported immediately to the Supervisor for investigation.

In all cases, any electrical equipment that gives rise to a dangerous or potentially dangerous situation shall be removed from service, isolated, and tagged 'Do Not Use'.

The equipment shall remain out of service until it has been investigated and deemed safe by an Authorised Electrical Person.

5.1.2 Chemicals

Personnel should ensure that they are fully familiar with the Material Safety Data Sheet (MSDS) for each chemical, which details precautions and the protective apparel and equipment necessary when handling the chemicals.

The precautions detailed must be adhered to at all times.

5.1.3 Hazardous Sources

Table 1B-3.6 – Hazardous Sources lists potential hazardous sources that may be present under upset conditions affecting the Utilities System.

Table 1B-3.6 – Hazardous Sources

Hazard	Source	Hazardous Event	Effect	Control
High and Low voltage electricity (50V to 22kV)	Switchboards, transformers, UPS and generator	Incorrect operation of equipment	Electric shock Equipment damage	Restricted access (operation of electrical equipment by AEPs)

Hazard	Source	Hazardous Event	Effect	Control
Static electricity	UPS	Failure to ensure that equipment is fully discharged prior to maintenance	Electric shock Equipment damage	Restricted access (operation of electrical equipment by AEPs)
Diesel oil	Storage tank and diesel lines	Loss of containment Oil mist	Slip hazard, potential for personnel injury Equipment damage	Routine inspections Preventive maintenance
Equipment with moving/rotating parts	Diesel engine driven generator	Loss of control Missing guards	Potential for personnel injury	Routine inspections Preventative maintenance
Hot engine exhausts	Diesel engine driven generator	Contact with hot surfaces	Potential for serious burns	Insulation policy Use of personal protective equipment

5.2 Specific Health and Safety Requirements

The correct use of Personal Protective Equipment (PPE) is fundamental in securing a safe and healthy place of work for all personnel. PPE shall be used in conjunction with appropriate health, environment and safety procedures that are designed to minimise the potential risk of harm or injury to personnel, while also promoting safe working practices.

5.3 Specific Environmental Requirements

There are no specific environmental requirements for the Power Generation and distribution Systems.

6.0 REFERENCE INFORMATION

6.1 Company Documentation

Document Number	Document Title
2002-DS-1671-01	AC UPS Data Sheet
2002-SP-1671-01	Specification for AC UPS
2002-SP-1697-01	Specification for Diesel Engine Generator
2002-SP-1654-01	Specification for LV Switchgear and MCC
PH-10-OP-SOP-00001B	System Operations Procedure Wellpad B
PH-10-OP-SOP-00001B-03	Standard Operating Procedure Operation of the Wellpad B Utilities

6.2 Vendor Documentation

Document Number	Document Title
–	Descriptive Information for Cummins Generator and Controls

6.3 Engineering Drawings (PFDs, UFDs and P&IDs)

Drawing Number	Drawing Title
PHM-111-ED-010	Wellpad PH3 Overall Single Line Diagram
PHM-111-ED-020	400V MCC 111 -ES-51-1101 Single Line Diagram
PHM-111-ED-040	230VAC UPS Single Line Diagram
PHM-111-FE-010	P&ID Service Water and Power Generation

SECTION 1.0 C-1
WELLPAD C PROCESS FACILITIES AND MAIN PIPELINE

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1.0 INTRODUCTION

1.1 System Purpose/Function

The Processing facilities on Wellpad C are designed to produce gas from three wellheads and export the fluids to the Gas Processing Plant (GPP) via the manifold facilities at Wellpad A. There is provision for a total of five wellheads at Wellpad C.

1.2 Primary Components

Wellpad C is located at the north end of the field and is comprised of the following Primary Components:

Tag No	Equipment Title/Description
112-00-Z-001	PH4 Wellhead
112-00-Z-002	PH6 Wellhead (Future)
112-00-Z-003	PH10 Wellhead
112-30-S-001	Wellhead Control Panel (WHCP)
112-00-S-007	Portable Test Separator
112-62-V-001	Wellpad C Pig Launcher
113-62-V-004	Pig Receiver from Wellpad C – Located at Wellpad A
–	Gathering Pipeline to Wellpad A

1.3 Primary Interfaces

Input interfaces:

- PCSS System (refer to SOP Volume 14 Process Control and Safety System)
- Power Generation System (refer to SOP Volume 1C-3 (Doc No: PH-10-OP-SOP-00001C-03))
- Chemical Injection (refer to SOP Volume 1C-2 (Doc No: PH-10-OP-SOP-00001C-02))

Output interfaces:

- Wellpad A (refer to Section 1.0 A of this manual)
- Vent System (refer to SOP Volume 1C-2 (Doc No: PH-10-OP-SOP-00001C-02))

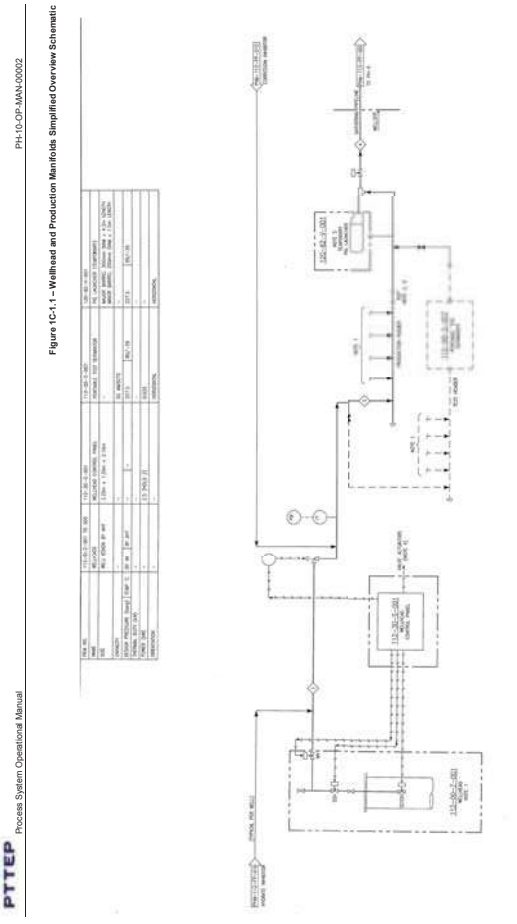
2.0 SYSTEM DESCRIPTION

2.1 System Overview

Refer to Figure 1C-1.1 – Wellhead and Production Manifolds Simplified Overview Schematic. Wellpad C is equipped with two production wellheads with corrosion inhibitor/hydrate inhibitor injection facilities and a wellhead control panel for control and shutdown requirements. Provision has been made for two future wells. There is also provision for a portable test separator.

A pig launcher is provided for pigging of the gathering pipeline from Wellpad C to Wellpad A where a pig receiver is located.

Figure 1C-1.1 – Wellhead and Production Manifolds Simplified Overview Schematic



2.2 Primary Flow Description

Refer to the following P&IDs:

- PHM-112-FE-002 Wellhead PH4 Details
- PHM-112-FE-011 Wellhead PH6 Details
- PHM-112-FE-012 Wellhead PH10 Details
- PHM-112-FE-001 Wellhead Control Panel
- PHM-112-FE-004 Production Header
- PHM-112-FE-005 Pig Launcher
- PHM-113-FE-006 Pig Receiver- Located at Wellpad A

2.2.1 Production

Production Wellhead

The Wellpad has three (3) Production Wellheads 112-00-Z-001/2/3 with provision for a total of five (5) wellheads. For the purpose of clear description tag numbers associated with Wellhead 113-00-Z-001 and 112-00-Z-003 are used in this document.

At the well, the reservoir fluids are produced to surface through 4 ½" diameter production tubing to the Production Wellheads 112-00-Z-001/2/3.

Each production wellhead is equipped with the following:

- Hydraulically operated Surface Controlled Subsurface Safety Valve (SCSSV)
- Manually operated master valve
- Hydraulically operated Surface Safety Valve (SSV)
- Hydraulically operated Wing Valve (WV)
- Hydraulically operated wellhead choke (CV)
- Chemical injection lines for injection of hydrate inhibitor and Corrosion inhibitor

The first isolation valve in each production string is the SCSSV, which is located in the production tubing string at approximately 53-56mRT distance below the surface. The valve is operated hydraulically from the WHCP from a high-pressure hydraulic supply and fails closed on loss of hydraulic pressure.

The wellhead houses a manual block valve and then the SSV, which is the second hydraulically controlled valve. The SSV valve is operated hydraulically from the WHCP from a medium pressure supply and fails closed on loss of hydraulic pressure. The final valve on the tree is the hydraulically controlled Wing Valve (WV), which is also controlled hydraulically from the WHCP.

The produced fluids flow through a then the hydraulically adjustable choke valve, which is used to maintain back pressure on the well and set the flow from the well.

The choke valve is also used to bring a well into production in a controlled manner to avoid damage to the well and upset of downstream equipment.

The produced fluids flow from the wellhead via 6" diameter well flow line to the production manifold.

Alternatively, if well testing is to be performed, the flow line has a facility to divert flow to 6" diameter test manifold, which connects to a portable test separator on site. Following well testing, the fluids from the test separator are routed back to the production manifold. The operator can manually align valves to direct the output of the well to the test header.

Production Manifold

The purpose of the production manifold is to collect produced fluids from the wells and route them via 8" diameter production header to the gathering pipeline to Wellpad A.

The production manifold at Wellpad A routes the fluids to the main pipeline for processing at the Gas Processing Plant (GPP).

Chemical Injection

There is the facility to inject hydrate inhibitor of the choke valve. There is also a corrosion inhibitor injection point downstream of the choke.

Wellhead Control

Wellhead Control Panel 112-30-S-001 houses the wellhead controls for the well. The wellhead control panel is provided with hydraulic reservoirs, pumps, filters, piping, instruments, control logic and controls to provide high, medium and low pressure hydraulic fluid to operate surface safety valve, subsurface safety valve, wing valve and choke valve.

Control of the wellhead valves can be carried out locally at the WHCP or remotely via the Remote Sensing- Process Control and Safety System (RS-PCSS). The WHCP control panel logic sends and receives signals to/from the GPP Process Control and Safety System (PCSS).

2.2.2 Gathering Pipeline to Wellpad A

The 250mm diameter 5.9km long gathering pipeline exports production fluids from Wellpad C. The gathering pipeline has a hydraulically operated outlet shutdown valve operated via the WHCP and has the provision to use a pig launcher for inspection, maintenance and cleaning operations.

At Wellpad A, the gathering pipeline has a hydraulically operated inlet shutdown valve operated via the WHCP and has the provision to use a pig receiver.

3.0 EQUIPMENT DESCRIPTION

3.1 Wellheads 112-00-Z-001/2/3

- Refer to P&IDs:
- PHM-112-FE-002 Wellhead PH4 Details
- PHM-112-FE-011 Wellhead PH6 Details (Future)
- PHM-112-FE-012 Wellhead PH10 Details

Note: There is provision made for a total of five wellheads, two typical Wellheads 112-00-Z-001 and 112-00-Z-003 is described below.

3.1.1 Function

Wellhead 112-00-Z-001 allows for isolation of production well and the flow control of the produced fluids from the well.

3.1.2 Technical Data

For details of the design and operating parameters, refer to Table 1C-1.1 – Design and Operating Parameters Wellhead 112-00-Z-001.

Table 1C-1.1 – Design and Operating Parameters Wellhead 112-00-Z-001

Parameter	Design	Operating
Pressure	85-227.5 barg	40 to 227.5barg
Temperature (max/min)	-	34°C to 66°C
Capacity	-	–
Size	7" to 13 3/8" CSG	–

3.1.3 Technical Description

The wellhead supports the casing strings and production tubing and provides the mounting for the xmas tree.

The Wellhead Control Panel (WHCP) 112-30-S-001 controls Surface Controlled Subsurface Safety Valve 00-SCSSV-101, Surface Safety Valve 00-SSV-102, Wing Valve 00-WV-103 and Choke Valve 00-CV-104. The WHCP is described in Paragraph 3.2 Wellhead Control Panel 113-30-S-001.

The SCSSV is a hydraulically operated shutdown valve located in the production string and is a self-equalising, full bore valve designed to avoid any restriction to flow. The valve is opened and held in the open position by hydraulic pressure supplied by the WHCP. If hydraulic pressure is lost or the operator initiates closure of the SCSSV, the spring in the actuator forces the valve to the closed position.

The hydraulic control line to the SCSSV enters the casing through the wellhead and is attached to the exterior of the production tubing. Closure of the SCSSV isolates the well from the surface facilities.

The next valve in the flow path is the master valve, which is the lower valve in the Xmas tree. This valve is a full bore manual block valve located directly below the Surface Safety Valve (SSV).

The SSV is a hydraulically operated shutdown valve located above the master valve in the xmas tree. The SSV is a full bore valve, which is opened and held in the open position by hydraulic pressure supplied by the WHCP. On loss of hydraulic pressure the valve is moved to the closed position by a spring in the actuator.

At the top of the tree there is a swab valve which is full bore manual isolation valve which has a threaded section and a screw cap on the flange above the valve. This valve is only used when access is required to the well bore to perform wire line or other invasive operations.

The well fluids leave the tree through the wing valve, which is mounted on the side of the tree above the SSV. The wing valve is a hydraulically operated gate valve controlled by hydraulic pressure supplied by the WHCP and is used to isolate the xmas tree from the production facilities.

Control of the well pressure and flow to the production manifold is through the hydraulically operated choke valve, which is located down stream of the wing valve. The choke valve position is set by a hydraulic stepping type actuator, which can drive the valve in small increments in either direction. Hydraulic pressure for the actuator is supplied by the WHCP and direction of travel is controlled by a four-way solenoid valve.

3.1.1-1 Function

Wellhead 112-00-Z-003 (SPH10) allows for isolation of production well and the flow control of the produced fluids from the well.

3.1.2-1 Technical Data

For details of the design and operating parameters, refer to Table 1C-1.1-1 – Design and Operating Parameters Wellhead 112-00-Z-003. (SPH10)

Table 1C-1.1-1 – Design and Operating Parameters Wellhead 112-00-Z-003

Parameter	Design	Operating
Pressure	85-227.5 barg	40 to 227.5barg
Temperature (max/min)	-	34°C to 66°C
Capacity	-	–
Size	7" to 13 3/8" CSG	–

3.1.3 Technical Description

The wellhead supports the casing strings and production tubing and provides the mounting for the xmas tree.

The Wellhead Control Panel (WHCP) 112-30-S-001 the Controls Surface Controlled Subsurface Safety Valve 00-SCSSV-301, Surface Safety Valve 00-SSV-302, Wing Valve 00-WV-303 and Choke Valve 00-CV-304. The WHCP is described in Paragraph 3.2 Wellhead Control Panel 113-30-S-001.

The SCSSV is a hydraulically operated shutdown valve located in the production string and is a self-equalising, full bore valve designed to avoid any restriction to flow. The valve is opened and held in the open position by hydraulic pressure supplied by the WHCP.

If hydraulic pressure is lost or the operator initiates closure of the SCSSV, the spring in the actuator forces the valve to the closed position.

The hydraulic control line to the SCSSV enters the casing through the wellhead and is attached to the exterior of the production tubing. Closure of the SCSSV isolates the well from the surface facilities.

The next valve in the flow path is the master valve, which is the lower valve in the Xmas tree. This valve is a full bore manual block valve located directly below the Surface Safety Valve (SSV).

The SSV is a hydraulically operated shutdown valve located above the master valve in the xmas tree. The SSV is a full bore valve, which is opened and held in the open position by hydraulic pressure supplied by the WHCP. On loss of hydraulic pressure the valve is moved to the closed position by a spring in the actuator.

At the top of the tree there is a swab valve which is full bore manual isolation valve which has a threaded section and a screw cap on the flange above the valve. This valve is only used when access is required to the well bore to perform wire line or other invasive operations.

The well fluids leave the tree through the wing valve, which is mounted on the side of the tree above the SSV. The wing valve is a hydraulically operated gate valve controlled by hydraulic pressure supplied by the WHCP and is used to isolate the x-mas tree from the production facilities.

Control of the well pressure and flow to the production manifold is through the hydraulically operated choke valve, which is located down stream of the wing valve. The choke valve position is set by a hydraulic stepping type actuator, which can drive the valve in small increments in either direction. Hydraulic pressure for the actuator is supplied by the WHCP and direction of travel is controlled by a four-way solenoid valve.

3.2 Wellhead Control Panel 112-30-S-001

Refer to P&ID: PHM-112-FE-001 Wellhead Control Panel and SA/06/WHCP-B101C/4-1 Vendor WHCP Schematic Diagram.

3.2.1 Function

The Wellhead Control Panel 112-30-S-001 houses the control logic for operation of the Surface Safety Valves (SSVs), Surface Controlled Subsurface Safety Valves (SCSSVs) Wing Valves (WV), Choke Valves and Pipeline Shutdown Valves. The skid contains the hydraulic reservoir, accumulators, pumps, filters, piping, and instruments and provides the high, medium and low pressure hydraulic supplies to operate the actuators on the valves.

The panel also supplies the nitrogen for the Zone 1 and 2 Fusible Plug Loops for fire protection of the wellpad.

3.2.2 Technical Data

For details of the design and operating parameters, refer to Table 1C-1.2 – Design and Operating Parameters Wellhead Control Panel 112-30-S-001.

Table 1C-1.2 – Design and Operating Parameters Wellhead Control Panel 112-30-S-001

Parameter	Design	Operating
Reservoir Capacity	100 Lter or 0.1 m^3	–
Accumulator Capacity	38l each	–
Accumulator Pressure	413barg each	–
MAWP High	413barg	–
MAWP Medium	413barg	–
MAWP Low	200barg	–
Size	3.25m x 1.2m x 2.10M	

3.2.3 Technical Description

The WHCP contains the electronic control equipment, hydraulics and nitrogen supply for protection, operation and control of the production wells. Each well has its own well control panel slot.

The well control panel performs the following functions:

- Provides a HP 350 barg hydraulic supply for operation of the SCSSVs which can be opened and closed individually from the WHCP
- Provides an MP300 barg hydraulic supply for operation of the SSVs and WVs which can be opened and closed individually from the WHCP
- Performs the logic governing the sequence of operation of the SCSSV, SSV and WV
- Provide 190 barg hydraulic pressures for operation of the choke valves. Individual well choke valves can be stepped open and closed individually from the WHCP or remotely from the DCS
- Provide 190 barg hydraulic pressures for operation of the gathering pipeline shutdown valves and main pipeline shutdown valves
- Provide 6.0barg low pressure hydraulic control supply for the pilots who switch the supply to the SCSSVs, SSVs and WVs
- Provide nitrogen at a pressure of 8.0 barg for operation of the Zone 1 and 2 fusible plug loops
- Provide for selection and control of the HP and MP hydraulic pumps

The electronic controls are linked to the Distributed Control System (DCS) and the Process Safety System (PSS). DCS and PSS inputs and outputs are transmitted to and from the WHCP.

The high pressure and medium pressure hydraulic pumps are housed in the WHCP together with associated filters and safety relief valves. These provide hydraulic pressure for the high, medium and low hydraulic systems. The hydraulic fluid reservoir is equipped with an atmospheric vent.

Hydraulic oil for the WHCP is held in a reservoir. The reservoir is partitioned to segregate the returns from the SDVs, SSVs and WVs from the returns from the SCSSV which may be contaminated with reservoir fluids.

The two high pressure 100% electric motor driven hydraulic pumps, operating in a duty/standby configuration take suction from the bottom of the fluid supply reservoir and raises the pressure of the hydraulic fluid. Each pump discharge is protected by a pressure safety valve set at a pressure to 420barg releasing excess pressure to the hydraulic return header.

The two medium pressure 100% electric motor driven hydraulic pumps, operating in a duty/standby configuration take suction from the bottom of the fluid supply reservoir and delivers raises the pressure of the hydraulic fluid. Each pump discharge is protected by a pressure safety valve set at a pressure to 415barg releasing excess pressure to the hydraulic return header.

Both the HP and MP hydraulic supply pumps are backed up by a manual hydraulic pump, which can be lined up to either the HP or MP system.

A pre-charged accumulator is provided on each of the HP and MP hydraulic supply headers to provide capacity and prevent constant stopping and starting of the pumps. The accumulators are pre-charged with nitrogen to 240 barg for HP, 210 barg. for MP

On the MP supply line downstream of the MP accumulator there are two tie-ins. The first is routed via a self-regulating pressure control valve set at 150barg which is the supply for the gathering pipeline shutdown valve. The second tie in is routed via a pair of self regulating pressure control valves set at 6.0barg and goes to supply the low pressure control supply for operation of the SCSSVs, SSVs and WVs.

Nitrogen bottles in the WHCP supply the Zone 1 and 2 fusible plug loops via a self-regulating pressure control valve set at 6.0barg.

3.3 Portable Test Separator 112-00-S-007

Refer to P&ID: PHM-112-FE-004 Production Header.

3.3.1 Function

Portable Test Separator 112-00-S-007 is a three-phase separator which separates the oil, produced water and gas in the well stream, in a similar manner to the production separator. The flow in each phase is measured during well testing to enable the performance of the well to be monitored.

3.3.2 Technical Data

For details of the design and operating parameters, refer to Table 1C-1.3 – Design and Operating Parameters Portable Test Separator 112-00-S-007.

Table 1C-1.3 – Design and Operating Parameters Portable Test Separator 112-00-S-007

Parameter	Design	Operating
Pressure	227.5barg	40 to 95barg
Temperature (max/min)	-29/85°C	17 to 66°C
Capacity	50mmscfd	

3.3.3 Technical Description

The test separator will be provided by the vendor that is contracted to do well testing. Reference should be made to the relevant vendor documentation for details of the test separator.

3.4 Pig Launcher 112-62-V-001

Refer to P&ID: PHM-112-FE-005 Pig Launcher.(Wellpad C)

3.4.1 Function

Pig Launcher 112-62-V-001 is provided to launch pigs, including intelligent pigs, for inspection, maintenance and cleaning of the gathering pipeline from Wellpad C to Wellpad A. The pig launcher is normally isolated from the export line, depressurised and drained. When in service the operating pressure is dependent upon pipeline pressure.

3.4.2 Technical Data

For details of the design and operating parameters, refer to Table 1C-1.4 – Design and Operating Parameters Pig Launcher 112-62-V-001.

Table 1C-1.4 – Design and Operating Parameters Pig Launcher 112-62-V-001

Parameter	Design	Operating
Pressure	227.5barg	35 to 85barg
Temperature (Max/Min)	-29/85°C	17 to 50°C
Capacity	50mmscfd	

3.4.3 Technical Description

The launcher is comprised of a horizontal, carbon steel, cylindrical barrel fitted with an end closure, which is interlocked to prevent opening prior to complete depressurisation and draining of the launcher. The major barrel has an external diameter of 300mm and length of 4.3 m. The minor barrel has an external diameter of 250mm and length of 1.5 m. The minor barrel has an internal diameter to match the inside diameter of the gathering pipeline.

To ensure safe operation of the vents, drain and line valves when performing pig loading and launching operations, the sequence of operation of the following valves and door release are controlled by a key interlock system on the following items:

- SP-003 – End closure
- 62-BV-001 – Pig launcher outlet valve
- 62-BV-002 – Pig launcher outlet valve
- 00-BV-011 – Pig launcher bypass valve
- V1(PG-336) – Kicker line
- V2(PG-339) – Kicker line bypass valve
- V4(PG-501) – Kicker line
- V6(PG-510) – Rear drain valve
- V8(PG-513) – Forward drain valve
- V10(PG-502) – Vent to vent header
- V12(PG-506) – Atmospheric vent
- V13(PG-505) – Atmospheric vent
- V14(PG-508) – Purge point

Local Instrumentation

Local Pressure Indicators 62-PG-101 and 62-PG-102 are provided on the launcher barrel equalisation line to indicate the pressure in the launcher. Pressure Indicator 62-PG-101 is a low range gauge with overpressure protection provided to indicate pressure when the launcher has been depressurised prior to opening.

Local Intrusive Pig Signaller 62-ZI-101 is provided to indicate passage of the pig through the minor barrel of the launcher.

3.5 Pig Receiver from Wellpad C- Located at Wellpad A 113-62-V-004

Refer to P&ID: PHM-113-FE-006 Pig Receivers.

3.5.1 Function

A pig receiver 113-62-V-004, which can be connected to the Wellpad C gathering pipeline to receive pigs passing through the pipelines is provided at Wellpad A.

The pig receiver can receive pigs, for intelligent pigs for cleaning and inspection, of the gathering pipelines from Wellpads C. The pig receiver is normally isolated from the export line, depressurised and drained. When in service the operating pressure is dependent upon pipeline pressure.

3.5.2 Technical Data

For details of the design and operating parameters, refer to Table 1C-1.5 – Design and Operating Parameters Pig Receiver 113-62-V-004 from Wellpad C- Located at Wellpad A

Table 1C-1.5 – Design and Operating Parameters Pig Receiver 113-62-V-004

Parameter	Design	Operating
Pressure	227.5barg	35 to 85barg
Temperature (Max/Min)	-29/85°C	17 to 50°C
Capacity	50mmscfd	

3.5.3 Technical Description

The receiver is comprised of a horizontal, carbon steel, cylindrical barrel fitted with an end closure, which is interlocked to prevent opening prior to complete depressurisation of the receiver. The major barrel has an external diameter of 300mm and length of 4.5m. The minor barrel has an external diameter of 250mm and length of 4.3m. The minor barrel has an internal diameter to match the inside diameter of the gathering pipeline.

To ensure safe operation of the vents, drain and line valves when performing pig retrieval and receiving operations, the sequence of operation of the following valves and door release are controlled by a key interlock system on the following items:

Pig Receiver 113-62-V-004 in Wellpad C receiving position

- SP-007 – End closure
- 00-BV-007 – Pig receiver inlet valve
- 02-BV-008 – Pig receiver inlet valve
- 00-BV-012 – Pig receiver bypass valve
- V1(PG-411) – Kicker line
- V2(PG-407) – Kicker line bypass valve
- V4(PG-521) – Kicker line
- V6(PG-527) – Rear drain valve
- V8(PG-524) – Forward drain valve
- V10(PG-518) – Vent to flare
- V12(PG-522) – Atmospheric vent
- V13(PG-523) – Atmospheric vent
- V14(PG-520) – Purge point

Local Instrumentation

Local Pressure Indicators 62-PG-103 and 62-PG-105 are provided on the receiver barrel equalisation line to indicate the pressure in the receiver. Pressure Indicator 62-PG-105 is a low range gauge with overpressure protection provided to indicate pressure when the receiver has been depressurised prior to opening.

Local Intrusive Pig Signaller 62-ZI-103 is provided to indicate passage of the pig through the minor barrel of the receiver.

4.0 INSTRUMENTATION AND CONTROL

4.1 Wellheads 112-00-Z-001/2/3

Refer to P&IDs:

- PHM-112-FE-002 Wellhead SPH4 Details
- PHM-112-FE-011 Wellhead SPH6 Details (Future)
- PHM-112-FE-012 Wellhead SPH10 Details

Note: There is provision made for a total of five Wells at Wellpad C. A typical Wellhead 112-00-Z-001 and 112-00-Z-003 is described below.

Tag No. associated with Wellheads 112-00-Z-002/3 are altered by changing only the last three number sequence in the Tag eg 00-PT-111 becomes 00-PT-211 or 00-PT-311 see relevant P&ID for details.

4.1.1 Pressure

The well flow line is provided with a Pressure Transmitter 00-PT-111 upstream of the choke valve, which provides indication on the DCS via Pressure Indicator 00-PI-111.

The well flow line is provided with a Pressure Transmitter 00-PT-112 downstream of the choke valve, which provides indication and high and low pressure alarms on the DCS via Pressure Indicator 00-PIA-112.

Pressure Transmitter 00-PT-120 downstream of the choke valve, provides a high pressure trip to the PSD via Pressure Indicator 00-PIA-120.

Pressure Transmitter 00-PT-121 downstream of the choke valve, provides a low pressure trip to the PSD via Pressure Indicator 00-PIA-121.

4.1.2 Flow

Fluid flow through the well flow line is monitored by Flow Transmitter 00-FT-102 downstream of the choke valve, which provides totalised flow indication on the DCS via Flow Totaliser 00-FQI-102.

Corrosion inhibitor flow to the well flow line is monitored by Flow Transmitter 00-FT-101, which is displayed on the DCS via Flow Indicator 00-FIA-101. Flow Indicator 00-FIA-101 is provided with a low flow alarm.

4.1.3 Temperature

Temperature Transmitter 00-TT-101 upstream of the choke valve provides temperature indication through 00-TI-101 on the DCS.

The well flow line is provided with a Temperature Transmitter 00-TT-102 downstream of the choke valve, which provides temperature indication and a low temperature alarm on the DCS via Temperature Indicator 00-TIA-102. Temperature Indicator 00-TIA-102 is provided with a low temperature alarm.

4.1.4 Choke Valve

The choke valve position is indicated on the wellhead control panel by Position Indicator 00-ZI-104B. The choke position is repeated on the DCS through Position Indicator 00-ZI-104A.

For choke valve control refer to Paragraph 4.2 Wellhead Control Panel.

4.2 Wellhead Control Panel 112-30-S-001

Refer to:

P&ID PHM-112-FE-001 Wellhead Control Panel

SA/06/WHCP-B101C/4-1 Vendor WHCP Schematic Diagram

4.2.1 Pressure

The HP hydraulic SCSSV supply pressure is monitored by Pressure Transmitter PTH-3, which provides indication on the PSS via Pressure Indicator Alarm 30-PIA-101. Pressure Indicator Alarm 30-PIA-101 generates a low-pressure alarm and a low-pressure trip signal for the ESD System.

The MP hydraulic SSV supply pressure is monitored by Pressure Transmitter PTH-2, which provides indication on the PSS via Pressure Indicator Alarm 30-PIA-102. Pressure Indicator Alarm 30-PIA-102 generates a low-pressure alarm and a low-pressure trip signal for the PSD System.

The MP hydraulic SDV and choke valve supply pressure is monitored by Pressure Transmitter PTH-1, which provides indication on the PSS via Pressure Indicator Alarm 30-PIA-103. Pressure Indicator Alarm 30-PIA-103 generates a low-pressure alarm and a low-pressure trip signal for the PSD System.

The LP hydraulic control supply pressure is monitored by Pressure Transmitter PTL-1, which provides indication on the PSS via Pressure Indicator Alarm 30-PIA-104. Pressure Indicator Alarm 30-PIA-104 generates a low-pressure alarm and a low-pressure trip signal for the ESD System.

The fusible plug loop pressures for zone 1 and zone 2 are monitored by Pressure Switches PS-2 and PS-3 respectively, which provide indication on the PSS via Pressure Indicator Alarm 80-PIA-101. Pressure Indicator Alarm 80-PIA-101 generates a low low-pressure trip signal for the ESD System.

The following local pressure indicators are provided on the front panel of the WHCP:

- PF-5 – HP Hydraulic Header Pressure
- PF-4 – MP Hydraulic Header Pressure
- PF-3 – Choke Valve/SDV MP Hydraulic Header Pressure
- PE-1 – LP Hydraulic Header Pressure
- PE-2 – Fusible Plug Loop Zone 1 Pressure
- PE-3 – Fusible Plug Loop Zone 2 Pressure

4.2.2 Differential Pressure

The hydraulic reservoir suction strainer differential pressure is measured by Pressure Differential Transmitter PAD-1 and indicated on the DCS by Pressure Differential Indicator 30-PDIA-101, which provides a high differential pressure alarm.

The HP pump discharge filter differential pressure is measured by Pressure Differential Transmitter PAD-3 and indicated on the DCS by Pressure Differential Indicator 30-PDIA-102, which provides a high differential pressure alarm.

The MP pump discharge filter differential pressure is measured by Pressure Differential Transmitter PAD-2 and indicated on the DCS by Pressure Differential Indicator 30-PDIA-103, which provides a high differential pressure alarm.

4.2.3 Level

The level in the hydraulic oil reservoir is monitored by Level Transmitter PAE-1 and indicated on the PSS via Level Indicator Alarm 30-LIA-101. Level Indicator Alarm 30-LIA-101 provides a low-level trip signal for the ESD System.

Local level indication at the hydraulic oil reservoir is provided by Level Gauges PV-1 and PV-2.

4.2.4 Motor Control

The Motor Controls are located left of centre in the front of the WHCP in two groups one for the HP system and one for the MP system. The groups include the following indicators, pushbuttons and selector switches:

Indicators			
XA-PD-1	HP Duty Pump Remote	XA-PD-2	HP Duty Pump Local
XA-PD-3	HP Pump Fault	XA-PD-4	HP Pump Running
XA-PD-5	HP Standby Pump Remote	XA-PD-6	HP Standby Pump Local
XA-PD-7	HP Standby Pump Fault	XA-PD-8	HP Standby Pump Running
XA-PD-9	MP Duty Pump Remote	XA-PD-10	MP Duty Pump Local
XA-PD-11	MP Pump Fault	XA-PD-12	MP Pump Running
XA-PD-13	MP Standby Pump Remote	XA-PD-14	MP Standby Pump Local
XA-PD-15	MP Standby Pump Fault	XA-PD-16	MP Standby Pump Running
Push Buttons			
PB-PC-1	HP Duty Pump Start	PB-PC-2	HP Duty Pump Stop
PB-PC-3	HP Standby Pump Start	PB-PC-3	HP Standby Pump Stop
PB-PC-4	MP Duty Pump Start	PB-PC-5	MP Duty Pump Stop
PB-PC-6	MP Standby Pump Start	PB-PC-7	MP Standby Pump Stop
Elector Switches			
SEL-PAF-1	HP Pump Duty/Standby	SEL-PAF-2	HP Pump Local/Remote
SEL-PAF-3	MP Pump Duty/Standby	SEL-PAF-4	MP Pump Local/Remote

4.2.5 Master Section

The Master section of the WHCP is located above the pump section and includes the following indicators and pushbuttons:

Indicators			
XA-PD-15	Prod Manifold Pres. Lo-Lo	XA-PD-16	Common Start-up Bypass Ind
XA-PD-17	ESD Activated	XA-PD-18	PSD Activated
XA-PD-19	USD Activated		
XA-PD-20	Fusible Plug Loop Zone 1	XA-PD-21	Fusible Plug Loop Zone 2
XA-PD-22	C/V Hyd Pressure Lo-Lo	XA-PD-23	LP Hdr Pressure Lo-Lo
XA-PD-24	MP Hdr Pressure Lo-Lo	XA-PD-25	HP Hdr Pressure Lo-Lo

Push Buttons			
PB-PC-9	Total Surface SD	PB-PC-10	Total Sub-Surface SD
PB-PC-11	Lamp Test		
00-HS2-125	ESD Pushbutton (WHCP)	00-HS1-125	ESD Pushbutton (GPP)
00-HS2-124	PSD Pushbutton (WHCP)	00-HS1-124	PSD Pushbutton (GPP)
PB-PC-14	USD Pushbutton/Reset	PB-PC-15	Prod Manifold Start-up Bypass

4.2.6 Well Control Modules

Each well slot has a module in the WHCP which has two parts, the upper part being a gauge panel and the lower part housing the controls and indicators for the tree valves and choke controls The well module are located on the left side of the WHCP front panel. The following indicators, pushbuttons and selector switches are provided on each of the well control modules:

Pressure Indicators:

- ME-4 – SCSSV Hydraulic Pressure
- ME-3 – SSV Hydraulic Pressure
- ME-2 – Wing Valve Hydraulic Pressure
- ME-1 – Choke Valve Hydraulic Pressure

Indicator Lamps			
XA-MD-1	Flowline Pressure Hi-Hi	XA-MD-2	Flowline Pressure Lo-Lo
XA-MD-3	WSD Status	MM-1	Choke Valve Position Indicator
Push Bottons			
PB-MB-1	SCSSV Open	PB-MB-2	SCSSV Close
PB-MB-3	SSV Open	PB-MB-4	SSV Close
PB-MB-5	Wing Valve Open	PB-MB-6	Wing Valve Close
00-HS-126	Well Shutdown (PH4)	PB-MB-8	Well Shutdown Reset
00-HS-226	Well Shutdown (PH6)		
00-HS-326	Well Shutdown (PH10)		
PB-MB-9	Choke Valve Step Open	PB-MB-10	Choke Valve Step Close
PB-MB-11	Flowline Start-up Bypass		

Selector Switch:

SEL-MC-1 – Local/Remote Choke Valve Step Control, this selector switch is lockable in the Local position.

The following status indications are repeated on the DCS:

30-XI-101 – SCSSV (PH4) Status (DCS)

30-XI-102 – SSV (PH4) Status (DCS)

30-XI-103 – Wing Valve (PH4) Status (DCS)

30-XI-201 – SCSSV (PH6) Status (DCS)

30-XI-202 – SSV (PH6) Status (DCS)

30-XI-203 – Wing Valve (PH6) Status (DCS)

30-XI-301 – SCSSV (PH10) Status (DCS)

30-XI-302 – SSV (PH10) Status (DCS)

30-XI-303 – Wing Valve (PH10) Status (DCS)

Well Control

The 6barg control oil supply is made available for operation of the tree valves when the ESD button PP1 has been reset and the fusible plug loop has been pressurised to reset the pilot valve PU2. Loss of pressure in the control loop results in closure of all tree valves and SCSSVs. This action opens pilot valves PU4 and PU5 on the control supply to the SSV and SCSSV in preparation for opening.

The hydraulic supply to the SCSSV is switched by solenoid Valve MF-3, which supplies control oil to the pilot Valve MG-3, which supplies HP oil to the actuator. The solenoid Valve MF-3 can be operated remotely or from the pushbutton on the associated well control module.

When the SCSSV is open sensed by pressure switch MM3, the SSV can be opened, The hydraulic supply to the SSV is switched by solenoid Valve MF-2, which supplies control oil to the pilot Valve MG-2 which supplies MP oil to the actuator. The solenoid Valve MF-2 can be operated remotely or from the pushbutton on the associated well control module.

When the SSV is open sensed by pressure switch MM2, the WV can be opened, the hydraulic supply to the WV is switched by solenoid Valve MF-1, which supplies control oil to the pilot Valve MG-1 which supplies MP oil to the actuator. The solenoid Valve MF-1 can be operated remotely or from the pushbutton on the associated well control module.

To control the closing sequence for the production well on an ESD or fusible loop failure the control oil line to the pilot valves is depressurised.

The pilot valve MG1 for the wing valve closes immediately and vents the WV actuator to close the valve.

The pilot valve MG2 for the SSV closes following closure of pilot valve PU4 after a 10 to 20 seconds time delay set by PD1 and vents the SSV actuator to close the valve.

The pilot valve MG3 for the SCSSV closes following closure of pilot valve PU5 after a 21 to 30 seconds time delay set by PD2 and vents the SSV actuator to close the valve.

4.2.7 Choke Control

The choke valve is set by a hydraulic motor which drives the choke in either the open or closed direction. The direction of travel is selected through Solenoid Valves 00-XV-104A or B which direct the hydraulic supply to the selected side of the actuator. Control of the choke can be selected to be from the well module or remotely from the DCS through a switch on the well module. Indication of valve position is provided on the well module and on the DCS.

4.2.8 Fusible Plug Loops

The fusible plug loops provide fire detection for the Wellpad C. Following activation the loop must be repaired and it is quickly pressurised by pressing and holding of the Three-way Valve PR-1 until the required pressure is achieved in the loop indicated by the associated pressure gauge and pressure status indicator. The Pressure Regulator PU-1 provides pressure make up through a restriction orifice.

If the loop is damaged, nitrogen is lost from the loop and if the loss rate is greater than the make up rate pressure in the loop will fall and a shutdown of the wells is initiated through PU2 Fusible

loop pressure is monitored by Pressure Transmitter PTL-2 which provides a signal to the shutdown system.

4.3 Portable Test Separator 112-00-S-007

Refer to P&ID: PHM-112-FE-004 Production Header.

The test separator will be provided by the vendor that is contracted to do well testing. Reference should be made to the relevant vendor documentation for details of the test separator.

4.4 Wellpad C Export Flow Line and Pig Launcher 111-62-V-001

Refer to P&ID: PHM-112-FE-005 Pig Launcher.

4.4.1 Pressure

The pressure in the export flow line upstream of 62-SDV-101 is monitored by Pressure Transmitter 00-PT-114 which provides indication on the DCS through 00-PIA-114. Pressure Indicator Alarm 00-PIA-114 generates high and low-pressure alarms on the DCS. The pressure in the export flow line upstream of 62-SDV-101 is also monitored by Pressure Transmitter 00-PT-116 which provides indication on the SDS through 00-PIA-116. Pressure Indicator Alarm 00-PIA-116 generates a low pressure trip signal to the PSD SPH4, 10 which initiates executive actions as described in the cause and effect charts.

4.4.2 Temperature

The Temperature in the export flow line upstream of 62-SDV-101 is monitored by Temperature Transmitter 00-TT-103 which provides indication on the DCS through 00-TI-103.

4.4.3 Pig Launcher Valve Sequencing

To ensure safe operation of the pig launcher a key interlock system is provided to control the sequence of operation of the process isolation, drain and vent valves and opening of the pig launcher closure. Operation of the interlock system is described in the operating procedures.

4.5 Wellpad A Import Flow Lines and Pig Receiver 113-62-V-004

Refer to P&ID: PHM-113-FE-006 Pig Receivers.

4.5.1 Pressure

The pressure in the import flow line from Wellpad C downstream of 62-SDV-103 is monitored by Pressure Transmitter 00-PT-119 which provides indication through 00-PI-119 on the DCS.

4.5.2 Temperature

The Temperature in the flow line from Wellpad C downstream of 62-SDV-103 is monitored by Temperature Transmitter 00-TT-105 which provides indication on the DCS through 00-TI-105.

4.5.3 Pig Receiver Valve Sequencing

To ensure safe operation of the pig receiver a key interlock system is provided to control the sequence of operation of the process isolation, drain and vent valves and opening of the pig receiver closure. Operation of the interlock system is described in the operating procedures.

5.0 ENVIRONMENTAL, HEALTH AND SAFETY REQUIREMENTS

5.1 General EHS Requirements

5.1.1 Chemicals

The following chemical is used in this system, or may be present under upset conditions:

Corrosion inhibitor

Methanol

Hydraulic oil

Personnel should ensure that they are fully familiar with the Material Safety Data Sheet (MSDS) for each chemical, which details precautions and the protective apparel and equipment necessary when handling the chemicals. The precautions detailed must be adhered to at all times.

5.1.2 Hazardous Sources

Table 1C-1.6 – Hazardous Sources lists potential hazardous sources that may be present under upset conditions affecting the Process Facilities.

Table 1C-1.6 – Hazardous Sources

Hazard	Source	Hazardous Event	Effect	Control
Liquid hydrocarbons under pressure	Wellheads, production flowlines and manifolds	Potential for injury due to contact with hazardous liquids Loss of containment and release of flammable liquids	Potential for personnel injury Unignited liquid release and potential for gas release and fire/explosion	Inspection and maintenance routines Fusible loop system
Methanol and corrosion inhibitor under pressure	Wellheads	Potential for injury due to contact with hazardous liquids Loss of containment and release of flammable liquids	Potential for personnel injury Unignited liquid release and potential for fire/explosion	Inspection and maintenance routines Fusible loop system
Hydrocarbon gas under pressure	Wellheads, production flowlines and manifolds	Potential for injury due to contact with hazardous liquids Loss of containment and release of flammable gas	Potential for personnel injury Unignited gas release and potential for fire/explosion	Inspection and maintenance routines Fusible loop system
Hydraulic oil under pressure	SCSSVs, SSVs Wing Valves, Choke Valves, Shutdown Valves, WHCP, HIPPS Valves and	Potential for injury due to contact with liquids under pressure	Potential for personnel injury	Inspection and maintenance routines

Hazard	Source	Hazardous Event	Effect	Control
	HPU			

5.2 Specific Health and Safety Requirements

The correct use of Personal Protective Equipment (PPE) is fundamental in securing a safe and healthy place of work for all personnel. PPE shall be used in conjunction with appropriate health, environment and safety procedures that are designed to minimise the potential risk of harm or injury to personnel, while also promoting safe working practices.

5.3 Specific Environmental Requirements

To prepare the production facilities for the introduction of hydrocarbon gas, it is necessary to remove all air from the system. Nitrogen may be utilized for this purpose. Similarly, when preparing equipment for maintenance, nitrogen may be used to purge hydrocarbons from the system before breaking containment and introducing air.

When purging the system of air prior to introduction of hydrocarbons, the atmoPig in the system should be tested with an oxygen content analyzer to determine the level of oxygen remaining in the purged system.

When purging is being performed to remove hydrocarbons, a suitable test instrument, which uses thermal conductivity or infra-red absorption, capable of detecting hydrocarbons in nitrogen must be used. Pelister type instruments cannot be used, as they require at least 13% oxygen to operate.

WARNING: NITROGEN IS AN ASPHYXIANT, AND IS COLOURLESS AND ODOURLESS: RAPID AND UNRECOGNISED LOSS OF CONSCIOUSNESS CAN OCCUR IN PERSONS EXPOSED TO A NITROGEN-ENRICHED ATMOPIG. WHEN USING NITROGEN, CARE SHOULD BE TAKEN TO ENSURE THAT NITROGEN ESCAPES ARE DISPERSED AND NOT ALLOWED TO COLLECT IN ENCLOSED AREAS.

CASE OF BREAKING OF CONTAINMENT, MERCURY DRAGGER TUBE SHOULD BE USED TO VERIFY TRACE OF MERCURY. IF THE TRACE IS ABOVE 0.05MG/M3, PROTECTION MUST BE WORN. REFER TO PH-10-HS-SWP-00029; SAFE WORK PRACTICES FOR MERCURY CONTAMINATED MATERIAL.

6.0 REFERENCE INFORMATION

6.1 Company Documentation

Document Number	Document Title
PH-10-OP-SOP-00001C	System Operations Procedure Wellpad C
PH-10-OP-SOP-00001C-01	Standard Operating Procedure Operation of the Wellpad C Process Facilities
–	

6.2 Vendor Documentation

Document Number	Document Title
SA/06/WHCP-B101C/4-1	WHCP Schematic Diagram
SA/06/WHCP-C101C/5-1	WHCP General Arrangement (2 Sheets)
SA/06/WHCP-C102C/6-1	WHCP General Arrangement (2 Sheets)
SA/06/WHCP-C102C/2-1	WHCP Module Details

6.3 Engineering Drawings (PFDs, UFDs and P&IDs)

Drawing Number	Drawing Title
PHM-112-FP-001	Sinphuhorm Wellpad C PFD – Wells and Production Header
PHM-112-FE-001	Sinphuhorm Wellpad C P&ID – Wellhead Control Panel
PHM-112-FE-002	Sinphuhorm Wellpad C P&ID – Wellhead SPH4 Details
PHM-112-FE-004	Sinphuhorm Wellpad C P&ID – Production Header
PHM-112-FE-005	Sinphuhorm Wellpad C P&ID – Pig Launcher
PHM-112-FE-011	Sinphuhorm Wellpad C P&ID – Wellhead SPH6 Details
PHM-112-FE-012	Sinphuhorm Wellpad C P&ID – Wellhead SPH10 Details
PHM-113-FE-006	Sinphuhorm Wellpad A P&ID – Pig Receivers

SECTION 1.0 C-2
WELLPAD C PROCESS UTILITIES

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1.0 INTRODUCTION

1.1 System Purpose/Function

The Processing Utilities on Wellpad C are provided to support production from the production wells on the site and include chemical injection and flaring of any excess gas.

1.2 Primary Components

Wellpad C is comprised of the following Primary Components:

Tag No	Equipment Title/Description
112-64-T-001	Corrosion Inhibitor Tank
112-64-T-002	Hydrate Inhibitor Tank
112-64-PM-001/2/3	Corrosion Inhibitor Injection Pump
112-64-PM-010	Hydrate Inhibitor Injection Pump
–	Vent System

1.3 Primary Interfaces

Input interfaces:

- PCSS System (refer to SOP Volume 14 Process Control and Safety System)
- Power Generation System (refer to Section 3.0 of this manual)
- Wellpad C Process (refer to Section 1.0 of this manual)

Output interfaces:

- Wellpad C Process (refer to Section 1.0 of this manual)

2.0 SYSTEM DESCRIPTION

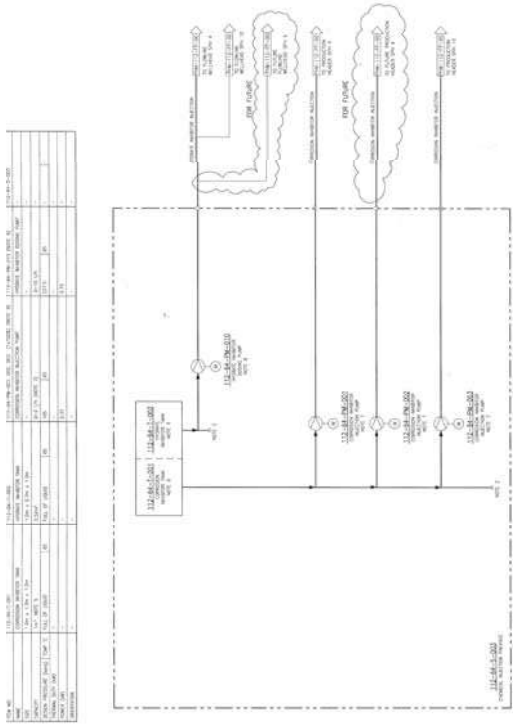
2.1 System Overview

Refer to Figure 1C-2.1 Chemical Injection Simplified Overview Schematic and Figure 1C-2.2 Vent System Simplified Overview Schematic.

Wellpad C is equipped with corrosion inhibitor injection facilities to control corrosion in the flow lines and hydrate inhibitor injection facilities to prevent hydrate formation as the fluids flow through the choke.

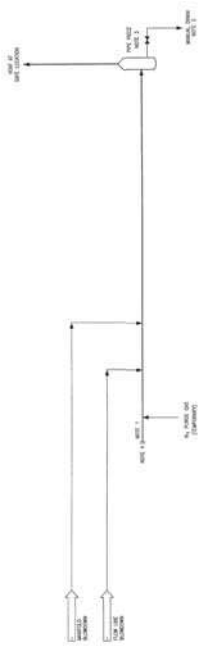
Wellpad C is also equipped with a Vent System for disposal of gas at a safe location when operating the pig launchers and receivers or when sections of the process facilities is being depressurised.

Figure 1C-2.1 – Chemical Injection Simplified Overview Schematic



Derived from PHM-112-FP-010 Rev.6

Figure 1C-2.2 – Vent System Simplified Overview Schematic



Derived from PHM-112-FP-011 Rev. 5

2.2 Primary Flow Description

Refer to the following P&IDs: PHM-112-FE-007, PHM-112-FE-017 Chemical Injection and PHM-112-FE-008 Vent System.

2.2.1 Systems

For the purposes of this document, Wellpad C process utilities are separated into sections as follows:

Chemical injection

Vent System

2.2.2 Chemical Injection

Corrosion Inhibitor

The corrosion inhibitor is stored in the Corrosion Inhibitor Tank 112-64-T-001 which holds 1m^3 of chemical sufficient to treat 14 days of production. The tank is filled from chemical drums through a filling line on top of the tank.

Chemical flows from a nozzle in the base of the tank to the suction of the injection pump through a suction strainer.

The chemical is pumped to the injection point on the well flowline downstream of the choke valves for SPH4, SPH6 (Future) and SPH10 wells, by dedicated Electric Motor Driven Metering Pumps 112-64-PM-001, 112-64-PM-002 (Future) and 112-64-PM-003. at a rate of up to 2l/hr. The injection rate is set by manual adjustment of the pump stroke. A calibration pot is provided on each of the pump suction lines to enable the injection rate to be checked for accuracy. Pulsation dampers are installed on the pump discharges to reduce surges at the injection point.

To prevent the back flow of reservoir fluids to the chemical injection facility two non-return valves are installed close to the injection points on each of the flowlines. To avoid problems due to common mode failure the non-return valves are of different type.

Hydrate Inhibitor

The hydrate inhibitor is stored in the Hydrate Inhibitor Tank 112-64-T-002 which holds 0.52m^3 of chemical sufficient to start one production well. The tank is filled from chemical drums through a filling line on top of the tank.

Chemical flows from a nozzle in the base of the tank to the suction of the injection pump through a suction strainer.

The chemical is pumped to the injection point on the well flowlines upstream of the choke valve, by a dedicated Electric Motor Driven Metering Pump 112-64-PM-010 at a rate of up to 10l/hr. The injection rate is set by manual adjustment of the pump stroke. A calibration pot is provided on the pump suction to enable the injection rate to be checked for accuracy. A pulsation damper is installed on the pump discharge to reduce surges at the injection point.

Interlocks are provided with the choke valves and the controls for the pump to prevent operation when the chokes are closed.

2.2.3 Vent System

Gas vented from the pig launchers or during depressurisation of the process facilities flows into the 80mm vent header and on to the vent stack.

At the base of the vent stack there is a large diameter vertical pipe piece where liquid is separated from the gas. The liquid collects in the bottom of the pipe piece and the gas flows to the vent stack for disposal. The collected liquids are manually drained to a drained pit and transferred to a road tanker, which transports the liquids to a disposal point.

A nitrogen purge point is provided at the extreme end of the vent header for snuffing purposes if the vent is ignited during blowdown. As there is normally no flow to the vent system there is no requirement for a continuous nitrogen purge. When the vent is required, the header and vent stack is purged with nitrogen before hydrocarbon gas is routed to the vent.

On completion of venting, the vent pipe piece is drained, the vent header, vent pipe piece and vent stack are inerted using nitrogen.

3.0 EQUIPMENT DESCRIPTION

3.1 Corrosion Inhibitor Tank 112-64-T-001

Refer to P&IDs: PHM-112-FE-007 and PHM-112-FE-017 Chemical Injection.

3.1.1 Function

Corrosion Inhibitor Tank 112-64-T-001 is provided to store sufficient chemical for 14 days of operation at the well site. A tank will be provided for each well as the wells are installed.

3.1.2 Technical Data

For details of the design and operating parameters, refer to Table 1C-2.1 – Design and Operating Parameters Corrosion Inhibitor Tank 112-64-T-001.

Table 1C-2.1 – Design and Operating Parameters Corrosion Inhibitor Tank 112-64-T-001

Parameter	Design	Operating
Pressure	Liquid Full	ATM
Temperature	65°C	Ambient
Capacity	1m^3	–

3.1.3 Technical Description

The Corrosion Inhibitor Tank 112-64-T-001 is a rectangular stainless steel tank 1.0m wide, 1.3m long, 1.0m high located on a support frame just above ground level. The tank is located in a drip tray along with the pumps.

The tank is provided with an inspection hatch (hand hole), connection for filling and a vent with flame arrestor all located on top of the tank.

Indication of the level in the tank is provided by a local Level Gauge 64-LG-101.

3.2 Corrosion Inhibitor Injection Pumps 112-64-PM-001/2/3

Refer to P&IDs: PHM-112-FE-007 and PHM-112-FE-017 Chemical Injection.

3.2.1 Function

Corrosion Inhibitor Injection Pumps 112-64-PM-001/2 (Future)/3 are identical and deliver chemical to the production flowlines for SPH4, SPH6 (Future) and SPH10 wells respectively downstream of the choke valves. Provision has been made for a total of five pumps as the wells are installed in the future.

3.2.2 Technical Data

For details of the design and operating parameters, refer to Table 1C-2.2 – Design and Operating Parameters Corrosion Inhibitor Injection Pumps 112-64-PM-001/2 (Future)/3.

Table 1C-2.2 – Design and Operating Parameters Corrosion Inhibitor Injection Pumps 112-64-PM-001/2(Future)/3

Parameter	Design	Operating
Pressure	105barg	50 to 92barg
Temperature	65°C	Ambient
Capacity	0 to 2l/h	–
Stroke rate	80 strokes per minute	–
Power	0.37kW	–

3.2.3 Technical Description

Corrosion Inhibitor Injection Pumps 112-64-PM-001/2 (Future)/3 are LEWA Type LDB1, positive displacement, variable stroke diaphragm pump capable of delivering an accurately metered quantity of chemical to the injection point. Adjustment to discharge flow is made through a calibrated hand wheel on the pump.

Each of the pumps is fitted with a suction strainer, a calibration gauge and a discharge pulsation damper. The wetted parts of the pumps are manufactured from stainless steel and the diaphragms are of PTFE.

The pumps are driven through gearing by electric motors which are operated through controls positioned at the pump.

Discharge pressures for Corrosion Inhibitor Injection Pumps 112-64-PM-001/2 (Future)/3 are indicated locally on local Pressure Gauges 64-PG-101, 64-PG-201 (Future) and 64-PG-301 respectively.

For details of the injection pump control and protection, refer to Paragraph 4.0 Instrumentation and Control.

3.3 Hydrte Inhiitor Tank 112-64-T-002

Refer to P&IDs: PHM-112-FE-007 Chemical Injection.

3.3.1 Function

Hydrate Inhibitor Tank 112-64-T-002 is provided to store sufficient chemical for start up of a single well at the well site.

3.3.2 Technical Data

For details of the design and operating parameters, refer to Table 1C-2.3 – Design and Operating Parameters Hydrate Inhibitor Tank 112-64-T-002.

Table 1C-2.3 – Design and Operating Parameters Hydrate Inhibitor Tank 112-64-T-002

Parameter	Design	Operating
Pressure	Liquid Full	ATM
Temperature	65°C	Ambient
Capacity	0.52m^3	–

3.3.3 Technical Description

The Hydrate Inhibitor Tank 112-64-T-002 is a rectangular stainless steel tank 1.0m wide, 0.7m long, 1.0m high located on a support frame just above ground level. The tank is located in a drip tray along with the pump.

The tank is provided with an inspection hatch (hand hole), connection for filling and a vent with flame arrestor all located on top of the tank.

Indication of the level in the tank is provided by a local Level Gauge 64-LG-102.

3.4 Hydrate Inhibitor Injection Pump 112-64-PM-010

Refer to P&ID: PHM-112-FE-007 Chemical Injections.

3.4.1 Function

Hydrate Inhibitor Injection Pump 112-64-PM-010 delivers methanol to the production flowlines for SPH4, SPH6 (Future) and SPH10 wells upstream of the choke during start-up of each of the wells.

3.4.2 Technical Data

For details of the design and operating parameters, refer to Table 1C-2.4 – Design and Operating Parameters Hydrate Inhibitor Injection Pump 112-64-PM-010.

Table 1C-2.4 – Design and Operating Parameters Hydrate Inhibitor Injection Pump 112-64-PM-010

Parameter	Design	Operating
Pressure	227.5barg	100 to 200barg
Temperature	65°C	Ambient
Capacity	0 to 10l/h	–
Stroke rate	112 strokes per minute	–
Power	0.75kW	–

3.4.3 Technical Description

The Hydrate Inhibitor Injection Pump 112-64-PM-010 is a LEWA Type LDC1, positive displacement, variable stroke diaphragm pump capable of delivering an accurately metered quantity of chemical to the injection point. Adjustment to discharge flow is made through a calibrated hand wheel on the pump.

The pump is fitted with a suction strainer, a calibration gauge and a discharge pulsation damper. The wetted parts of the pump are manufactured from stainless steel and the diaphragm is of PTFE.

The pump is driven through gearing by an electric motor, which is operated through controls positioned at the pump.

Discharge pressure is indicated locally on local Pressure Gauge 64-PG-102. For details of the injection pump control and protection, refer to Paragraph 4.0 Instrumentation and Control.

3.5 Vent System

Refer to P&ID: PHM-112-FE-008 Vent System.

3.5.1 Function

The vent pipe piece receives the fluids from the vent header. The gas vapours are routed to the vent stack, and the collected liquids are manually drained from the vent pipe piece to a sump for disposal.

3.5.2 Technical Description

The vent pipe piece is a vertical vessel with a diameter of 0.5m and has a height of 1.65m, tan to tan. The 150mm nominal bore vent stack is mounted on top of the vent pipe piece, positioning the vent tip 10m above the ground.

Fluids, primarily gas, from the vent header enter the vent pipe piece through a 150mm inlet nozzle on the side of the vessel.

The gas leave the pipe piece through a 150mm outlet nozzle located on the top of the vessel and flows directly into the vent stack. The stack directs the gas through a vertical 150mm line to the vent tip.

The liquids leave the vessel under manual control through a 50mm outlet nozzle located on the bottom of the vessel and flow to a drain sump.

A 50mm purge point is provided on the dead end of the vent header, which has fittings and isolation valve for connection to a temporary nitrogen supply. The vent header slopes towards the vent pipe piece to ensure pockets of liquid do not collect anywhere in the collection system.

Level Gauge 16-LG-101 provides local indication of the liquid level.

For details of the pipe piece control and protection, refer to Paragraph 4.0 Instrumentation and Control.

4.0 INSTRUMENTATION AND CONTROL

4.1 Corrosion Inhibitor Tank 112-64-T-001

Refer to P&IDs: PHM-112-FE-007 and PHM-112-FE-017 Chemical Injection.

4.1.1 Level Monitoring and Protection

Level Switch 64-LS-102 on the corrosion inhibitor tank provides a low level trip to the SDS to stop the pump.

4.2 Corrosion Inhibitor Injection Pumps 112-64-PM-001/2(Future)/3

Refer to P&IDs: PHM-112-FE-007 and PHM-112-FE-017 Chemical Injection.

4.2.1 Pump Controls

The Corrosion Inhibitor Injection Pumps are operated manually using the stop/start pushbuttons at the pumps. Low level in the tank will trip the pumps at the MCC.

4.2.2 Pressure Protection

Each of the discharge lines of the pumps 1, 2 and 3 is protected against overpressure due to blocked outlet by a single relief valve 64-PSV-101, 64-PSV-201 (Future) and 64-PSV-301 respectively which are set to relieve back to the tank at 105barg.

4.3 Hydrate Inhibitor Tank 112-64-T-002

Refer to P&IDs: PHM-112-FE-007 Chemical Injection.

4.3.1 Level Monitoring and Protection

Level Switch 64-LS-104 on the hydrate inhibitor tank provides a low level trip to the SDS to stop the pump.

4.4 Hydrate Inhibitor Injection Pump 112-64-PM-010

Refer to P&ID: PHM-112-FE-007 Chemical Injection.

4.4.1 Pump Controls

The hydrate inhibitor injection pump is operated manually using the stop/start pushbuttons at the pump. Low level in the tank will trip the pump at the MCC.

An interlock with the choke closed position transmitter prevents the pump from being started until the choke valve is cracked open.

4.4.2 Pressure Protection

The discharge side of the pump is protected against overpressure due to blocked outlet by a single Relief Valve 64-PSV-102 which is set to relieve back to the tank at 227.5barg.

4.5 Vent System

Refer to P&ID: PHM-112-FE-008 Vent System.

4.5.1 Level Monitoring and Protection

Level Switch 16-LS-101 on the vent pipe piece provides a high level alarm, which is audible and visible at the well site.

5.0 ENVIRONMENTAL, HEALTH AND SAFETY REQUIREMENTS

5.1 General EHS Requirements

5.1.1 Chemicals

The following chemical is used in this system, or may be present under upset conditions:

Corrosion inhibitor

Methanol

Personnel should ensure that they are fully familiar with the Material Safety Data Sheet (MSDS) for each chemical, which details precautions and the protective apparel and equipment necessary when handling the chemicals. The precautions detailed must be adhered to at all times.

5.1.2 Hazardous Sources

Table 1C-2.5 – Hazardous Sources lists potential hazardous sources that may be present under upset conditions affecting the Process Utilities System.

Table 1C-2.5 – Hazardous Sources

Hazard	Source	Hazardous Event	Effect	Control
Methanol and corrosion inhibitor under pressure	Chemical Injection pumps	Potential for injury due to contact with hazardous liquids Loss of containment and release of flammable liquids	Potential for personnel injury Flammable liquid release and potential for fire/explosion	Inspection and maintenance routines FLM

Hazard	Source	Hazardous Event	Effect	Control
Hydrocarbon gas	Vent system	Loss of containment and release of flammable gas	Flammable gas release potential for fire/explosion	Inspection and maintenance routines
Explosive mixture in the vent system	Vented gas	Explosion in the vent system	Potential for personnel injury potential for fire/explosion	Purge vent system completely before/after venting gas

5.2 Specific Health and Safety Requirements

The correct use of Personal Protective Equipment (PPE) is fundamental in securing a safe and healthy place of work for all personnel. PPE shall be used in conjunction with appropriate health, environment and safety procedures that are designed to minimise the potential risk of harm or injury to personnel, while also promoting safe working practices.

5.3 Specific Environmental Requirements

To prepare the vent system for the introduction of hydrocarbon gas, it is necessary to remove all air from the system. Nitrogen is utilized for this purpose. Similarly, when preparing equipment for maintenance, nitrogen may be used to purge hydrocarbons from the system before breaking containment and introducing air.

When purging the system of air prior to introduction of hydrocarbons, the atmoPig in the system should be tested with an oxygen content analyzer to determine the level of oxygen remaining in the purged system.

When purging is being performed to remove hydrocarbons, a suitable test instrument, which uses thermal conductivity or infra-red absorption, capable of detecting hydrocarbons in nitrogen must be used. Pelister type instruments cannot be used, as they require at least 13% oxygen to operate.

WARNING: NITROGEN IS AN ASPHYXIANT, AND IS COLOURLESS AND ODOURLESS: RAPID AND UNRECOGNISED LOSS OF CONSCIOUSNESS CAN OCCUR IN PERSONS EXPOSED TO A NITROGEN-ENRICHED ATMOPIG. WHEN USING NITROGEN, CARE SHOULD BE TAKEN TO ENSURE THAT NITROGEN ESCAPES ARE DISPERSED AND NOT ALLOWED TO COLLECT IN ENCLOSED AREAS.

CASE OF BREAKING OF CONTAINMENT, MERCURY DRAGGER TUBE SHOULD BE USED TO VERIFY TRACE OF MERCURY. IF THE TRACE IS ABOVE 0.05MG/M3, PROTECTION MUST BE WORN. REFER TO PH-10-HS-SWP-00029; SAFE WORK PRACTICES FOR MERCURY CONTAMINATED MATERIAL.

6.0 REFERENCE INFORMATION

6.1 Company Documentation

Document Number	Document Title
PH-10-OP-SOP-00001C	System Operations Procedure Wellpad C
PH-10-OP-SOP-00001C-02	Standard Operating Procedure Operation of Wellpad C Process Utilities
–	–
–	–

6.2 Vendor Documentation

Document Number	Document Title
LA05-2620-DS-204-04	Pump Data Sheets
LA05-2620-DS-204-03	Pump Data Sheets
LA05-2620-DS-202-01	Tank Data Sheets
LA05-2620-DS-202-02	Tank Data Sheets
LA05-2620-PID-100-03	Wellpad C P&ID – Chemical Injection

6.3 Engineering Drawings (PFDs, UFDs and P&IDs)

Drawing Number	Drawing Title
PHM-112-FP-010	Sinphuhorm Wellpad C PFD – Chemical injection System
PHM-112-FP-011	Sinphuhorm Wellpad C PFD – Vent System
PHM-112-FE-007	Sinphuhorm Wellpad C P&ID – Chemical Injection
PHM-112-FE-008	Sinphuhorm Wellpad C P&ID – Vent System
PHM-112-FE-017	Sinphuhorm Wellpad C P&ID – Chemical Injection

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WELLPAD C UTILITIES

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1.0 INTRODUCTION

1.1 System Purpose/Function

The Utilities on Wellpad C are provided to provide power, process control, and limited life support on the site.

1.2 Primary Components

Wellpad C utilities are comprised of the following Primary Components:

Tag No	Equipment Title/Description
112-ET-51-2101	22kV to 400V, 160 kVA Transformer
112-ES-51-2101	400V Motor Control Centre
112-EG-52-2101	109 kW, 400V, 3 phase Emergency Diesel Generator
112-ER-52-2301	10 kVA, 230V, 1 phase UPS
112-17-T-001	Service Water Tank

1.3 Primary Interfaces

Input interfaces:

- PCSS System (refer to SOP Volume 14 Process Control and Safety System)

Output interfaces:

Wellpad C Process (refer to Section 1.0 of this manual)

- PCSS System (refer to SOP Volume 14 Process Control and Safety System)

2.0 SYSTEM DESCRIPTION

2.1 System Overview

Refer to Figure 1C-3.1 – Wellpad C Electrical Schematic.

Electric power is supplied to Sinphuhorm Wellpad C by overhead provincial power grid cable supplying 22kVolts. 3 phase at a frequency of 50Hz.

The incoming electrical power from the overhead lines is passed through a 160 kVA transformer to step the voltage down from 22kVolts to 400 volts.

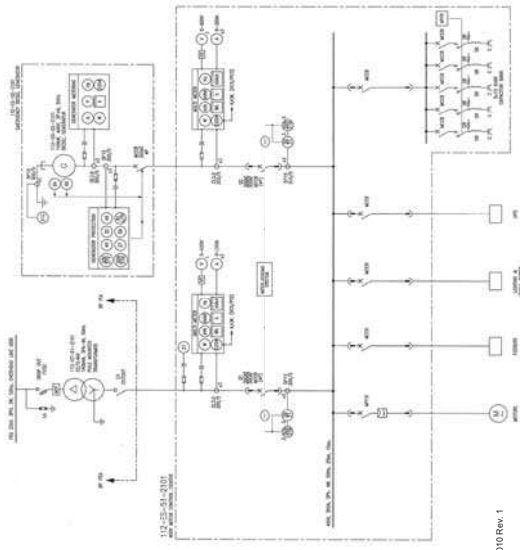
The emergency generation facilities are provided to ensure the continued operation of emergency systems in the event of loss of the main electrical power supply. The generator is connected to the same bus as the main imported power. An interlock is provided on the generator breaker and the transformer incomer breaker to ensure both breakers are not closed at one time.

A UPS system is provided to maintain power to the automation and safety systems during transient power outages for a period of two hours.

The control facilities for Wellpad C are an extension of the system located in the Gas Processing Plant.

The service water system provides water for the toilets and wash basins in the control building.

Figure 1C-3.1 – Wellpad C Electrical Schematic



Derived from PHM-112-ED-010 Rev. 1

2.2 Primary Flow Description

2.2.1 Systems

For the purposes of this document, Wellpad C utilities are separated into sections as follows:

- Power generation and distribution
- Control Facilities
- Service water

2.2.2 Power Generation and Distribution Facilities

Refer to PHM-112-ED-010 – Wellpad SPH4 Overall Single Line Diagram.

In normal operation electricity is supplied via overhead power cables to the Wellpad C by the Provincial Electricity Authority (PEA) in Thailand from the grid. PEA supplies the electrical power at 22kV, 3 phase, and 50Hz. On entering the wellpad area the electricity is fed through a drop out fuse and metering facility, and connects to the step down Transformer 112-ET-51-2101, which reduces the voltage from 22kV to 400V.

The overhead lines are provided with a lightening arrestor to protect the supply to the gas plant. The above equipment is provided by PEA.

From the transformer the power at 400V is fed to the 400V Motor Control Centre 112-ES-51-2101 which has a single bus.

In the event of a power failure on the Provincial Electricity Authority grid system or power import facility an Emergency Diesel Generator 112-EG-52-2101 has been installed.

The generator is rated at 109 kW, 400V, 3 phases with a neutral and 50Hz. The generator is a self-contained unit which includes a diesel day tank that can hold sufficient diesel for eight hours running on full load.

On loss of power to the 400V MCC, the emergency generator is started automatically and the generator breaker is closed. The associated interlock opens the incomer breaker on the imported supply as the emergency generator breaker closes to isolate the bus from the normal supply.

Where an interruption to supply is not acceptable for systems such as safety and control systems the system is supplied from a battery backed UPS.

2.2.3 Control Facilities

The control facilities for Wellpad C are housed in the MCC/Technical Room located in a building on the West side of the site. The building also includes the battery room, emergency generator room and the wellhead control panel room along with HVAC system toilet and shower.

The facilities at the Wellpad are monitored and controlled through a Remote Site PCSS which connects to the PCSS at the gas processing plant located approximately 64 km from the site. Communication for the control system is via a data link between the GPP and the wellpad.

Signals to and from equipment on site are connected to the RS- PCSS at the Marshalling Cabinet 112-EK-75-0100. A system cable connects the marshalling cabinet to the PCSS System Cabinet 112-EC-75-0101, which holds the control cards and communications facilities for the PCSS. The PCSS system is provided with power from the 230V AC UPS.

Status information from the MCC is communicated through a serial link to the System Cabinet for display on site and at the GPP.

Control signals are provided to the MCC and the WHCP from the Marshalling Cabinet through hard wired connections. The signals to initiate USD, PSD and ESD at the WHCP are included in these signals.

2.2.4 Service Water

Service water for use on the site is stored in an elevated Service Water Tank 112-17-T-001. From the tank water is routed to the toilet, washbasins and shower.

When required, the tank is filled from a tanker through a fill connection on top of the tank on top of the tank.

3.0 EQUIPMENT DESCRIPTION

3.1 Transformer

Refer to PHM-112-ED-010 – Wellpad SPH4 Overall Single Line Diagram.

3.1.1 Function

The function of the transformer is to transform the voltage supplied to Wellpad C from 22kV to 400V.

3.1.2 Technical Data

For details of the design and operating parameters, refer to Table 1C-3.1 – Design and Operating Parameters Transformer 112-ET-51-2101.

Table 1C-3.1 – Design and Operating Parameters Transformer 112-ET-51-2101

Parameter	Design	Operating
Power	160 kVA	Up to 160 kVA
Incoming Voltage	22kV	22kV
Outgoing Voltage	400V	400V

3.1.3 Technical Description

The transformer is a, three phase 'Delta' connected primary and 'Y' connected secondary dry type transformer is rated at 160 kVA which is pole mounted at the site boundary.

To enable the incoming circuit to be isolated there is an HV Disconnecting Chamber fitted with an air insulated fuse load break disconnecting switch, provided on the primary side of the transformer.

An externally operated tap changer for off circuit operation is provided on the primary windings of the transformer, all tappings are rated for full power. The tap changer allows a ±5% change of transformer output voltage in 2.5% steps.

3.2 400V Motor Control Centre 112-ES-51-2101

Refer to PHM-112-ED-010 PH4 Overall Single Line Diagram.

3.2.1 Function

The 400V Motor Control Centre receives the 400V, 3 Phase supply from the import transformer and distributes the power to the various feeders, motor control circuits, lighting and small power distribution.

3.2.2 Technical Data

For details of the operating parameters, refer to Table 1C-3.2 – Design and Operating Parameters 400V MCC. 112-ES-51-2101

Table 1C-3.2 – Design and Operating Parameters 400V MCC 112-ES-51-2101

Parameter	Design	Operating
Voltage	1000V	400 V
Current	300A	–
Short Circuit Current	25kA for 1 second	–
Control Supply	110V DC and 230V AC	–

3.2.3 Technical Description

The 400V Motor Control Centre 112-ES-51-2101 is a steel cabinet sectionalised into separate compartments which house the breakers, switches and protection devices required to control distribution of power. The MCC is located in the MCC/Technical Room.

Three pole Air Circuit Breakers (ACBs) are used to switch the incoming supplies from the step down transformer and the emergency generator.

The ACBs are withdrawable and provided with safety interlocks so that it is not possible to withdraw or insert when the switching device is closed. Each ACB is provided with a lock off facility to padlock the breaker in the off or isolate position.

The two incomer breakers are provided with metering panels in addition to protection devices.

An electrical interlock is fitted to control operation of the transformer incomer and emergency generator breaker.

A 110V DC supply is provided throughout the switchboard for operation of the following:

Breaker Tripping and Closing

Protection and Control circuits

Breaker Spring Charging

In addition there is a 230V AC single phase supply bus for the space heaters and control devices.

Moulded Case Circuit Breakers (MCCBs) and Motor Protection Circuit Breakers (MPCBs) are provided to switch power to the various loads on the MCC section of the panel.

In general the three pole, fuse-free, MCCBs are provided to switch power to the small power distribution boards and control panels. An MCCB of rating below 400A for a feeder is equipped with thermal and magnetic trip units. If the MCCB is rated above 400V it is equipped with an adjustable electronic solid-state trip device with monitoring, ammeter readout, complete test facilities and protective features.

The MPCBs are used for motor feeders and include an adjustable magnetic trip unit for short circuit protection. The Motor Starters cater for 'Direct-on-Line' with full voltage start or 'Soft Start'

which provides a reduced voltage for motor start. Provisions are also made for Star-delta switching and Variable Speed Drives (VSD).

In order to attempt to maintain the power factor within the range of 1 to 0.8 when the emergency generator is in use, an Automatic Power Factor Regulator (APFR) is installed connected to Bus. The APFR switches five banks of capacitors to increase the power factor as the load becomes inductive. A coil is included in the connection to each capacitor bank to reduce the current surge as the bank is switched in and out of service.

3.3 Emergency Generator 112-EG-52-2101

3.3.1 Function

Refer to PHM-112-ED-010 SPH4 Overall Single Line Diagram and PHM-112-ED-010.

In the case of a power failure on the imported electricity supply an emergency generator 112-EG-52-2101 starts automatically to supply power to the MCC.

This emergency generator is rated at 109 kW, 400V, 3 Phase and neutral at 50Hz. when the emergency generator is used to energise the MCC power from the import transformer must be disconnected.

3.3.2 Technical Data

For details of the design and operating parameters, refer to Table 1C-3.3 – Design and Operating Parameters Emergency Generator 112-EG-52-2101.

Table 1C-3.3 – Design and Operating Parameters Emergency Generator 112-EG-52-2101

Parameter	Design	Operating
Engine Output	106kW (142bhp)	–
Fuel Consumption	26l/hr	–
Fuel Tank Capacity	340 litre	–
Speed	1500rpm	–
Voltage Output	400V, 3 Phase 50Hz	–
Power Output	109 kW	–

3.3.3 Technical Description

The diesel engine driver is manufactured by Cummins and is a Model 6BTA5.9-G2 unit, which is a four stroke engine with six cylinders in line. The engine is aspirated by an exhaust driven turbochargers provided with water cooled after coolers. A rig-saver device is provided on the air intake to shut off the combustion air supply to the engine on engine overspeed.

Fuel for the engine is stored in a 340 litre fuel tank in the base of the generator package. The injector pumps are controlled electrically from the governor and supplied with fuel by a low pressure fuel pump. The fuel is filtered and passed through a water separator before flowing to the suction of the pump. Excess fuel from returned through a back pressure valve to the day tank.

This engine is water cooled, and has an engine driven air blast cooler to cool the circulating coolant. The coolant is circulated by an engine driven pump.

The engine has wet sump lubrication with an engine driven pump provided to feed lube oil under pressure to the bearings.

A battery powered electric start motor starts the diesel engine. The Valve Regulated Lead Acid batteries in the battery pack are charged by a battery charger powered from the emergency switchboard or alternatively from a small alternator mounted on the engine. The batteries provide sufficient capacity to perform six consecutive 15 second cranking cycles with a 15 second rest between each crank.

The engine drives a Stamford UCi274G alternator, which is directly coupled to the engine. The alternator is a synchronous AC generator with rotary brush less excitation system and Permanent Magnet Generator (PMG) pilot exciter. The alternator generates three-phase power at 400V, and with a frequency of 50Hz. Cooling is provided by forcing air through the alternator using a fan mounted on the rotor.

The voltage output from the alternator is controlled by a MX321 Automatic Voltage Regulator, which controls the current in the rotating field coils on the rotor. The alternator is rated for an output of 109 kW with a power factor of 0.8.

3.4 UPS 112-ER-52-2301-A/B

3.4.1 Function

Refer to PHM-112-ED-010 PH4 Overall Single Line Diagram and PHM-112-ED-040 230VAC UPS Single Line Diagram.

The UPS is a battery backed power source which provides power to critical systems in the plant which can not tolerate a break in supply. When main and emergency power is lost, the batteries continue to provide power to the inverters in the UPS, maintaining the AC supply without interruption.

3.4.2 Technical Data

For details of the design and operating parameters, refer to Table 1C-3.4 – Design and Operating UPS 112-ER-52-2301-A/B.

Table 1C-3.4 – Design and Operating Parameters UPS 112-ER-52-2301-A/B

Parameter	Design	Operating
Supply Voltage	400V AC, 3 phase, 50Hz	–
Output Voltage	230V AC, 1 phase, 50Hz	–
Operating Time on Battery	2 hours	–
Inverter Rated Output	10kVA (each)	–
Bypass Rated Output	10kVA	–
Fault Tolerance	50kA rms for 1 sec	–
Frequency Tolerance	+0.1%	–
Voltage Tolerance	±1%	–
Battery Volts	220V	–
Battery Capacity	2V 200 Ah/10h @ 20°C	–

3.4.3 Technical Description

The AC UPS system is provided by Gutor Electronics and has a 230V AC single phase output. The UPS is located in the MCC/technical Room and is comprised of two 100% UPS systems and a single 100% bypass transformer. The output from the UPS is fed to the 230V AC UPS distribution board 112-ES-52-2301 which supplies power to the various users.

- **Each UPS unit consists of:**
- Rectifier/Charger
- Inverter
- 100% Battery Bank
- The bypass facility consist of:
- Bypass Transformer
- Static Bypass Switch
- Manual Bypass Switch

In each UPS the Rectifier/Charger receives three phase power from the Emergency Bus Bar at 400Volts AC which is rectified to produce a 225V DC which is to provide DC power for the inverter and to charge the associated 220V battery Pack.

The inverter converts the 220V DC to a 230V AC single phase 50Hz supply and has a rated output of 40kVA.

If the mains input to the rectifier /charger fails the battery continues to supply the 220V DC power to the inverter to maintain the 230V AC output for at least 2 hours without interruption. When main power is restored the DC power to the inverter is again supplied from the rectifier/charger and at the same time the batteries are recharged.

The bypass transformer also receives three phase power from the Emergency Bus Bar B at 400Volts AC and produces a 230V AC single phase 50Hz output rated at 10kVA.

The two inverters are continuously synchronised with the bypass transformer, sensing being through the static switch. If there is a fault affecting the two 100% inverters, the supply is automatically switched to the bypass transformer by the static switch within a quarter cycles. The static switch is a high speed solid state switch which can transfer the load between inverters and bypass transformer without noticeable effect on the supply.

The static switch also monitors inverter performance and for alarm conditions and will perform a transfer to protect the UPS from damage caused by a current fault or a short circuit.

The two 100% battery packs are located in a battery room on the end of the substation are sized for HOLD Ah and comprised of valve regulated lead acid batteries. Each battery pack can be isolated from the associated rectifier/charger and inverter by a MCCB fitted with a shunt trip to allow remote tripping of the batteries.

The manual by pass switch allows the two inverters and static switch to be totally isolated from the bypass transformer for maintenance purposes.

The AC distribution board is consists fully insulated bus bars with miniature circuit breakers (MCB) and moulded case circuit breaker (MCCB) feeders. On the distribution board the main circuit breaker has over current and earth fault monitoring with auxiliary contacts to indicate operation of the device. These contacts are wired to the UPS display diagnostic system.

3.5 Service Water Tank 112-17-T-001

3.5.1 Function

Refer to P&ID: PHM-112-FE-010 Wellpad C Service Water and Power Generation.

The service water tank is provided to hold water on the site for washing and sanitary purposes.

3.5.2 Technical Data

For details of the design and operating parameters, refer to Table 1C-3.5 – Design and Operating Parameters for Service Water Tank 112-17-T-001.

Table 1C-3.5 – Design and Operating Parameters Service Water Tank 112-17-T-001

Parameter	Design	Operating
Capacity	$2m^3$	–
Elevation Above Ground	2.5m	–
Dimensions L/W/H	1.5m/1.5m/1.5m	–

3.5.3 Technical Description

The service water tank is a steel tank lined with bitumen 1.5 m wide/1.5m deep and 1.5m high supported on a concrete structure which raises the base of the tank to 2.5m above the ground.

The tank is filled from a tanker through a fill nozzle fitted with a non-return valve and hose connection.

Water leaves the vessel through a 50mm line fitted with an isolation valve.

An overflow line with a 300mm water seal is provided from the side of the tank.

Level in the tank is indicated locally on a Level Gauge 17-LG-101 on the side of the tank.

4.0 INSTRUMENTATION AND CONTROL

4.1 400V Motor Control Centre 112-ES-51-2101

Refer to PHM-112-ED-010 SPH4 Overall Single Line Diagram.

4.1.1 Power Metering and Protection

The incomer breaker and the emergency generator breaker each have a metering panel which displays the following:

- Power (kW)
- Resistive Power (kVA)
- Reactive Power (kVAR)
- Power Factor (Cos Φ)
- Frequency (Hz)
- Current (per phase)(A)
- Voltage (per phase through a selector switch)(V)
- Watt hours (Wh)
- Hours (h)
- Reactive kVA hours (kVARh)

The current readings of power, voltage and amperes are repeated in the control room on the DCS.

Overcurrent and earth fault detection devices are provided on the bus side of each incomer breaker to trip the associated breaker if a fault is detected.

An interlock is provided on the incomer breakers from the transformer and emergency generator which allows only one of the breakers to be closed at any time.

4.1.2 Motor Control

Each motor supply cubicle is provided with a Starter Control Unit (SCU) which is energised from the 110V DC supply and communicates with other SCUs and the DCS through a Modbus RTU. The SCU controls the start of the motor through a starter which can be either a Direct on Line starter or provide a soft start through an Auto transformer. The starter is also connected to the On/Off/Auto switch located by the motor in the field.

4.2 Emergency Generator

Refer to PHM-112-ED-010 SPH4 Overall Single Line Diagram.

4.2.1 Emergency Generator Control Panel

The emergency generator is controlled from a control cabinet located in the substation.

Mounted in the front of the control cabinet is the Power Command Controller PCC2100 which is a microprocessor-based generator set monitoring, metering, and control system. The controller provides an operator interface to the generator set, voltage regulation, governing, and protective functions. Control power for the controller is derived from the UPS.

The operator panel includes a series of LEDs to allow the operator to view the general status of the generator set. The functions displayed include:

- **Green LEDs to indicate:**
- Generator set running operating at rated voltage and frequency
- Remote start signal received
- **Red LEDs to indicate:**
- Not-in-Auto mode (flashing)
- Common shutdown
- Low Oil Pressure Shutdown
- Overspeed Shutdown
- **Amber LEDs to indicate:**
- Common warning
- Low Oil Pressure Warning
- High Engine Temperature Warning
- Fail To Start

The following Switches are provided on the controller:

Off/Manual/Auto Mode Control Switch – When the switch is selected to Manual or Off, the 'Not In Auto' lamp on the panel flashes. If Auto mode is selected, the generator set can be started automatically when power is lost on Emergency Bus B.

Manual Run/Stop Control Switch – When the mode control switch is in the Manual position and the Manual Run /Stop switch is pressed, the Generator set will start, immediately. If the generator set is running in the Manual mode, pressing the Run/Stop switch will cause the generator set to shut down after a cool down at idle period.

Panel Lamp/Lamp Test Control Switch – Depressing the panel lamp switch will cause the panel illumination to operate for approximately 10 minutes. Pressing and holding the switch will sequentially illuminate all LED's on the panel to confirm proper operation of these components.

Emergency Stop Button – Pressing the emergency stop button causes the generator set to shut down immediately. The generator set is prevented from running or cranking with the switch pressed in.

The control panel is equipped with an AC metering panel composed of a series of LED's configured in bar graphs for each function. The LED's are colour coded, with green indicating normal range values, amber for warning levels, and red for shutdown conditions. Scales for each function are in % of nominal rated values.

The nine bar-graphs provide the following displays from left to right:

Simultaneous Current in each phase (3 bars)

Power (1 bar)

Power Factor (1 bar)

Frequency (1 bar)

Simultaneous Voltage on each phase (3 bars)

The control panel is also provided with an alphanumeric display capable of displaying two lines of data with approximately 20 characters per line. The display is accompanied by a set of six membrane switches, three each side of the display, that are used by the operator to navigate through control menus, and to make control adjustments. All adjustments to volts, frequency etc are made via the display panel.

All data on the display can be viewed by scrolling through screens with the navigation keys. The display shows all active fault conditions, active and inactive, with the latest displayed first.

The display panel has a screen-saver timer that turns off the display after 30 minutes of inactivity. Touching any key will turn the screen back on.

4.2.2 Engine Control

Remote Start Mode – On loss of power at the switchboard the controller automatically starts the generator set immediately and accelerates the unit to rated speed and voltage by careful control of the engine fuel system and alternator excitation system.

Data Logging – The controller maintains a record of manual control operations, warning and shutdown conditions, and other events. The control also stores critical engine and alternator data before and after a fault occurs, for use in evaluating the root causes for the fault condition.

Cycle Cranking – The controller limits the number of start attempts to be made, the duration of each crank and the duration of the rest period between cranks. The number of start attempts and durations are configurable.

Time Delay Stop (Cool-down) – Configurable for time delay of 0-10 minutes prior to ramp to idle or shut down after signal to stop in normal operation modes.

Engine Governing

The integrated digital governor drives the engine fuel control valve. The following features are available in the governing system:

Isochronous Governing – Controls engine speed within plus or minus 0.25% for any steady state load from no load to full load. Frequency drift will not exceed plus or minus 0.5% for a 60°F (33°C) change in ambient temperature over an 8 hour period

Temperature Dynamics – Modifies the engine fuel system (governing) control parameters as a function of engine temperature. Allows engine to be more responsive when warm, and more stable when operating at lower temperature levels

Smart Idle Mode – Engine governing can be regulated at an idle speed for a programmed period on automatic stop of the engine or in manual mode. In an automatic mode, the control will bypass the idle period if the engine at a low load level for sufficient duration for cool-down. During idle mode engine protective functions are adjusted for the lower engine speed, and alternator function and protections are disabled. Idle speed can be initiated by the operator when the generator set is running in the manual mode

4.2.3 Alternator Control

The controller includes an integrated 3-phase line-to-neutral sensing voltage regulation system, which performs the following functions:

Digital Output Voltage Regulation – Regulates output voltage to within 0.5% for any loads between no load and full load. On engine starting, or sudden load application, voltage is controlled to a maximum of 5% overshoot over nominal level

Fault Current Regulation – Regulates the output current on any phase to a maximum of 3 times rated current under fault conditions for both single phase and three phase faults. The regulation system will drive a Permanent Magnet Generator (PMG) to provide 3 times rated current on all phases for motor starting and short circuit coordination purposes

4.3 UPS 112-ER-52-2301A/B

Refer to PHM-112-ED-010 SPH4 Overall Single Line Diagram.

4.3.1 UPS Control Panel

The controls for the UPS are located in a panel located in the front door of the UPS cabinet. The panel is divided into four sections.

The top left section is the system panel, which shows the current operation status of the major components of the system on a schematic of the system.

The top centre section is the Operations section which includes buttons for turning the system on and off and a lamp test button for checking if all LED indications function properly.

The top right section is the display unit which consist of a LC display, an alarm LED, an acoustic alarm and a key-pad. With this the operator can set following operational parameters, obtain a list of measurement data, and get access to the event and alarm log.

The lower section of the panel is the alarm indication panel the respective LED lights up, when an alarm has occurred. The following alarm LEDs are included:

- Rectifier Mains Failure
- Rectifier Failure
- DC Out of Tolerance
- Battery Operation
- Battery discharged
- Battery disconnected
- Inverter Fault
- Overload Inverter/Bypass
- Inverter Fuse Blown
- Asynchronous

- Bypass Mains Fault
- Manual Bypass ON
- Over-temperature
- Fan Failure
- EA inhibited
- EN inhibited
- Power Supply Fault

5.0 ENVIRONMENTAL, HEALTH AND SAFETY REQUIREMENTS

5.1 General EHS Requirements

5.1.1 Electrical Safety

Only qualified and authorised personnel can work on or near exposed energised parts of electrical equipment that operate at voltages of more than 50V AC and/or 110V DC. The personnel must be trained for the task to be performed.

Personnel working on or near to electrical equipment shall adhere to the following:

Only qualified and authorised personnel must perform isolation/de-isolation of electrical equipment

Adhere to the Electrical Safety Rules and Procedures

Have knowledge of the construction and operation of specific electrical equipment and the hazards involved

Proper use and maintenance of test instruments and knowledge of their rating limits

Appropriate alerting techniques, such as signs, tags, and barricades for warning and protecting other personnel from electrical hazards.

All incidents or accidents of an electrical nature shall be reported to the supervisor of the work who shall ensure that it is investigated and reported.

All potentially dangerous situations or conditions involving electricity, and all cases of electrical equipment suspected of being in an unsafe condition, must be reported immediately to the Supervisor for investigation.

In all cases, any electrical equipment that gives rise to a dangerous or potentially dangerous situation shall be removed from service, isolated, and tagged 'Do Not Use'.

The equipment shall remain out of service until it has been investigated and deemed safe by an Authorised Electrical Person.

5.1.2 Chemicals

Personnel should ensure that they are fully familiar with the Material Safety Data Sheet (MSDS) for each chemical, which details precautions and the protective apparel and equipment necessary when handling the chemicals.

The precautions detailed must be adhered to at all times.

5.1.3 Hazardous Sources

Table 1C-3.6 – Hazardous Sources lists potential hazardous sources that may be present under upset conditions affecting the Utilities System.

Table 1C-3.6 – Hazardous Sources

Hazard	Source	Hazardous Event	Effect	Control
High and Low voltage electricity (50V to 22kV)	Switchboards, transformers, UPS and generator	Incorrect operation of equipment	Electric shock Equipment damage	Restricted access (operation of electrical equipment by AEPs)
Static electricity	UPS	Failure to ensure that equipment is fully discharged prior to maintenance	Electric shock Equipment damage	Restricted access (operation of electrical equipment by AEPs)
Diesel oil	Storage tank and diesel lines	Loss of containment Oil mist	Slip hazard, potential for personnel injury Equipment damage	Routine inspections Preventive maintenance
Equipment with moving/ rotating parts	Diesel engine driven generator	Loss of control Missing guards	Potential for personnel injury	Routine inspections Preventative maintenance
Hot engine exhausts	Diesel engine driven generator	Contact with hot surfaces	Potential for serious burns	Insulation policy Use of personal protective equipment

5.2 Specific Health and Safety Requirements

The correct use of Personal Protective Equipment (PPE) is fundamental in securing a safe and healthy place of work for all personnel. PPE shall be used in conjunction with appropriate health, environment and safety procedures that are designed to minimise the potential risk of harm or injury to personnel, while also promoting safe working practices.

5.3 Specific Environmental Requirements

There are no specific environmental requirements for the Power Generation and distribution Systems.

6.0 REFERENCE INFORMATION

6.1 Company Documentation

Document Number	Document Title
2002-DS-1671-01	AC UPS Data Sheet
2002-SP-1671-01	Specification for AC UPS
2002-SP-1697-01	Specification for Diesel Engine Generator
2002-SP-1654-01	Specification for LV Switchgear and MCC
PH-10-OP-SOP-00001C	System Operations Procedure Wellpad C
PH-10-OP-SOP-00001C-03	System Operations Procedure for the Wellpad C Utilities

6.2 Vendor Documentation

Document Number	Document Title
–	Descriptive Information for Cummins Generator and Controls

6.3 Engineering Drawings (PFDs, UFDs and P&IDs)

Drawing Number	Drawing Title
PHM-112-ED-010	Wellpad PH4 Overall Single Line Diagram
PHM-112-ED-020	400V MCC 112-ES-51-2101 Single Line Diagram
PHM-112-ED-040	220V AC UPS Single Line Diagram
PHM-112-FE-010	P&ID Service Water and Power Generation

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Gas Process metering and Export

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1.0 INTRODUCTION

1.1 System Purpose/Function

The Gas Processing, Metering and Export System is designed to process the gas produced from the wells to provide gas of the required specification for export to the PTT plant.

1.2 Primary Components

The Gas Processing, Metering and Export System is located in the North West section of the plant and is comprised of the following Primary Components:

Tag No	Equipment Title/Description
115-00-Z-001	Slug Catcher
115-00-V-003	Inlet Coalescing Filter Separator
115-00-H-002	Inlet Heater
115-00-V-004	Mercury Adsorber
115-00-W-001	Dust Filter
115-13-V-003	Glycol Contactor
115-13-H-003	Glycol Cooler
115-00-H-004	Gas/Gas Exchanger
115-00-V-010	Low Temperature Separator
115-00-S-001	Sales Gas Metering Package

1.3 Primary Interfaces

Input Interfaces:

- Wellpads A, B, C and Main Pipeline (refer to Section 1.0A of this OPM)
- Glycol Regeneration (refer to Section 3.0 of this OPM)
- PCSS System (refer to Section 14.0 of this OPM)
- Heating Medium (refer to Section 9.0 of this OPM)
- Instrument Air System (refer to Section 10.0 of this OPM)

Output Interfaces:

- Glycol Regeneration (refer to Section 3.0 of this OPM)
- Condensate Treatment, Storage and Export (refer to Section 4.0 of this OPM)
- Fuel Gas System (refer to Section 7.0 of this OPM)

2.0 SYSTEM DESCRIPTION

2.1 System Overview

Refer to Overview Figures 2.1, 2.2 and 2.3.

The slug catcher receives gas and liquids from the production well heads via a 400mm pipeline from the manifold Center at SPH5. The well pads, pipeline and pig receiver are included in

Section 1A of this volume. In the slug catcher gas is separated from the liquid and flows overhead to the inlet coalescing filter separator where entrained liquid droplets are removed from the gas stream.

Next the gas is heated and enters the mercury adsorber where mercury is removed from the gas before the gas flows to the glycol contactor. The gas stream leaving the mercury adsorber will contain dust picked up as it passes through the adsorbent bed in the mercury adsorber. A filter is provided downstream of the adsorber to remove the dust from the gas stream.

At the glycol contactor the water dew point of the gas is reduced by contact with lean glycol supplied from the glycol regeneration system.

The gas with a reduced water dew point is chilled against cold gas and condensate leaving the low temperature separator before passing through a Joule Thomson (JT) valve into the low temperature separator. At the JT valve, the gas temperature is reduced by the Joule Thomson effect, so that hydrocarbons in the gas stream are condensed and separated from the gas in the low temperature separator.

Finally the gas is metered for custody transfer in a fiscal metering package before leaving the site and flowing through a pipeline to the PTT site and EGAT power plant.

Figure 2.1 – Pig Receiver and Slug Catcher Overview

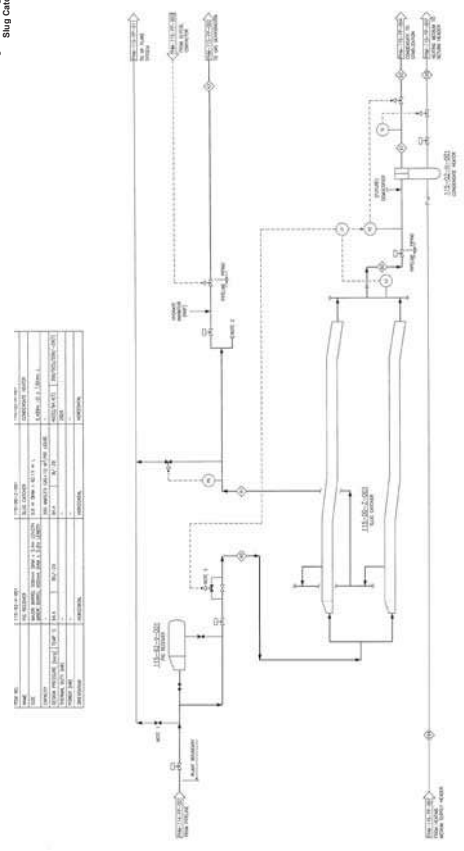


Figure 2.2 – Gas Dehydration Overview

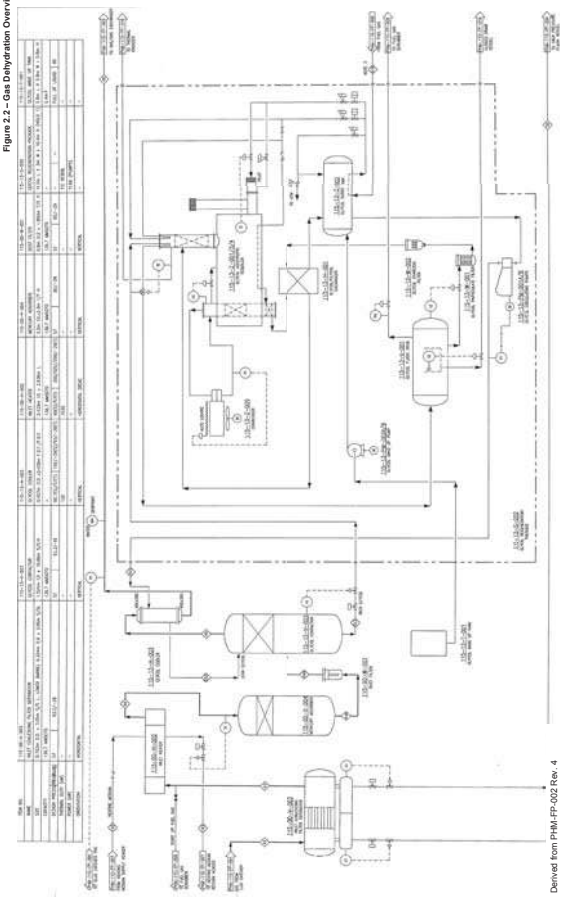
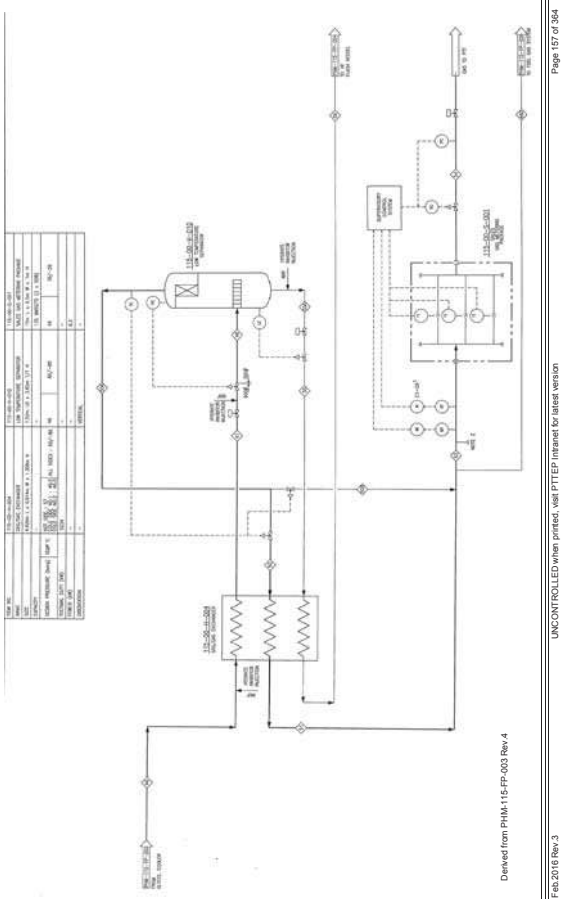


Figure 2.3 – Hydrocarbon Dewpointing and Metering Overview



2.2 Primary Flow Description

Refer to the following P&IDs: PHM-115-FE-002 Slug Catcher, PHM-115-FE-003 Inlet Filter Coalescer and Heater, PHM-115-FE-004 Mercury Removal Unit Dust Filter, PHM-115-FE-005 Glycol Contactor, PHM-115-FE-008 Gas/Gas Exchanger,PHM-115-FE-009 LT Separator and PHM-115-FE-010 Sales Gas Metering and Export.

The Slug Catcher, 115-00-Z-001 operates at a pressure of between 50barg and 70barg and separates bulk liquids from the produced gas stream imported from the three well locations via the 400mm pipeline. The maximum throughput is 200MMscfd of gas with 110M^3/hr of liquids, however other equipment in the train is limited to 200 MMscfd. In addition the slug catcher can tolerate a 26m^3 slug from normal operating level to the high level alarm point.

The fluids from the pipeline enters a manifold which directs the fluids to the two finger sections of the slug catcher. The fingers have a downward slope from the inlet so that liquids collect in the lower end of the slug catcher and flow into a manifold with a nozzle which connects to the condensate treatment system.

The liquids are drawn off under level control and flow to the Condensate treatment facility, refer to SOP Volume 4 Condensate Treatment, Storage and Export (Doc No: PH-10-OP-SOP-00004).

The gas leaves the slug catcher from each finger through a manifold above the high end of the slug catcher, with a liquid content of less than 0.0144mL/Nm^3 liquid in the gas stream.

The pressure of the saturated gas leaving the slug catcher is reduced in pressure to between 46barg and 48barg by the Pressure Control Valves 13-PCV-101A/B and flows to the Inlet Coalescing Filter Separator 115-00-V-003. The pressure control valves have staggered control ranges to provide a 30%/70% split so that only one valve opens when slug catcher pressure is high.

The inlet coalescing filter separator has a capacity of 136.7 MMscfd and removes any entrained liquid droplets, condensed at the pressure reduction valves. The gas enters the inlet compartment of the vessel through a diffuser, which prevents gas impinging directly onto the coalescing cartridges, located in the inlet compartment.

Entrained droplets carried in the gas stream are separated by gravity in the first compartment and the gas flows through the coalescing cartridges, to the second compartment. In the coalescing cartridges small droplets still present in the gas stream, coalesce into larger droplets and are carried into the second compartment. Solid particles present in the gas stream are filtered out by the coalescing cartridges.

In the second compartment the gas flows through a mist eliminator before leaving the inlet coalescing filter separator vessel. The mist eliminator removes the droplets from the gas stream to provide liquid free gas at the outlet.

A bypass with a single isolation valve is provided around the inlet coalescing filter separator. Liquids collected in each compartment are collected in a liquid boot, also with two compartments, and flow under level control to the HP flash vessel in the condensate treatment system.

The saturated gas leaving the inlet coalescing filter separator is heated against heating medium in the Inlet Heater 115-00-H-002 before flowing to the Mercury Adsorber 115-00-V-004. The heater provides a small amount of superheat, between 1°C and 5°C, to the feed gas entering the mercury removal vessel to avoid liquids condensing in the vessel.

The gas enters the mercury adsorber through a nozzle with a diverter which distributes the gas flow evenly over the top of the adsorbent bed. The mercury adsorber has a capacity of 136.7 MMscfd .

Mercury removal is achieved in the mercury adsorber vessel by contact with an activated carbon adsorbent; HgFree. Gas flows down through the adsorbent bed and out of the bottom of the

vessel to the Dust Filter 115-00-W-001. The mercury content is reduced to less than 0.1 microgram/Nm^3.

The filter removes dust by Dust Filter, created by the adsorbent in the mercury removal unit, of a size greater than 10 microns from the gas stream leaving the mercury removal unit.

Then, gas stream flows to the Glycol Contactor 115-13-V-003.

The gas enters the glycol contactor at a pressure of 47barg through a distributor, located below the packed section, and flows up through the packing counter current to the Tri-ethylene Glycol (TEG) flowing down through the packing. The glycol absorbs the water in the gas to lower the water dew point to the required level to meet the gas export specification.

The gas specification calls for of less than 7lb of water per MMscf if oxygen content is less than 0.2 mole % and carbon Dioxide content is less than 10%. If oxygen content is between 0.2 and 0.4 mole % and carbon Dioxide content is between 10 and 15%, the gas specification calls for of less than 4lb of water per MMscf.

The wet (rich) glycol collects in the base of the glycol contactor and flows under level control to the Glycol Regeneration Package where the glycol is dried to a quality of 99.7% TEG by weight before re-entering the contactor through a distributor above the packed section as lean glycol.

Any hydrocarbon condensate, which collects on the wet glycol in the base of the contactor can be skimmed off using the internal skimming bucket and manually dumped to closed drain.

The gas leaving the contactor is used to cool the hot lean glycol from glycol regeneration in the Glycol Cooler 115-13-H-003. In the cooler the gas is heated to around 34°C.

The dehydrated gas is chilled to a temperature of -27°C against cold gas at -35°C and condensate at -40.14°C leaving the Low Temperature Separator, 115-00-V-010 and flows through one of the two 100% JT valves 00-PCV-111A/B to the low temperature separator. The pressure is reduced from 46barg to 28barg across the pressure control valve, which results in a reduction in temperature to -35°C due to the Joule Thomson effect. The low temperature results in the condensation of hydrocarbons from the gas stream.

The gas enters the low temperature separator through an inlet diffuser, which reduces the inertia of the gas and condensate stream and assists in the separation of the condensate from the gas. The condensate collects in the bottom of the low temperature separator and flows to the high pressure flash vessel via the gas/gas exchanger.

The dry gas passes through a vane type demister before leaving the low temperature separator to reduce the free liquid in the gas stream to less than 0.1Usgal/MMscf (133ppm).

Any condensate collected in the demister flows through a down pipe to the base of the vessel. The gas flows to the Sales Gas Metering Package via the gas/gas exchanger and on to the export pipeline to the PTT site.

3.0 EQUIPMENT DESCRIPTION

3.1 Slug Catcher 115-00-Z-001

Refer to P&ID: PHM-115-FE-002 Slug Catcher.

3.1.1 Function

Slug Catcher 115-00-Z-001 provides two-phase separation of reservoir fluids arriving through the import line at the gas plant. The slug catcher has additional capacity to cope with slugs of liquid swept in front of the pig during pipeline pigging operations and during start-up.

3.1.2 Technical Data

For details of the design and operating parameters, refer to Table 2.1 – Design and Operating Parameters Slug Catcher 115-00-Z-001.

Table 2.1 – Design and Operating Parameters Slug Catcher 115-00-Z-001

Parameter	Design	Operating
Pressure	94.4barg	50 to 70barg
Temperature (Max/Min)	85°C/-29°C	15°C to 45°C
Capacity	200MMscfd and 110m^3/h liquid	145 MMscfd (Max)
Volume	42m^3	
Slug Capacity	26m^3 between NLL and HLL	
Max Liquid Carryover	0.1USgal/MMscf	
Normal Liquid Level	HOLDmm above bottom	

3.1.3 Technical Description

Slug Catcher 115-00-Z-001 is a horizontal two phase separator constructed from pipe with an inside diameter of 0.91m. The vessel is a finger type slug catcher comprised of two 62,179mm lengths of pipe on sloping supports with a 400mm manifold at the upper end and a 900mm manifold at the lower end where the liquids collect.

The fluids enter the slug catcher inlet manifold through a Shutdown Valve 00-SDV-101. A level control facility is provided for use during pigging operations to restrict flow into the slug catcher when necessary to prevent flooding.

The lower end of the slug catcher is provided with a 200mm liquid offtake where condensate is taken from the slug catcher under level/flow control to feed the condensate treatment facility. Refer to SOP Volume 4 Condensate Treatment, Storage and Export (Doc No: PH-10-OP-SOP-00004) for details.

Gas collects in a 400mm manifold above the slug catcher and flows to the gas treatment facility under pressure control to maintain the required pressure downstream of the contactor.

A pressure control facility is provided for use during pigging operations to maintain the pressure in the slug catcher by venting gas to flare. A Shutdown Valve 00-SDV-102 is provided on the slug catcher gas outlet.

Level Gauge 00-LG-101 provides local indication of the liquid level.

3.2 Inlet Coalescing Filter Separator 115-00-V-003

Refer to P&ID: PHM-115-FE-003 Inlet Coalescing Filter Separator.

3.2.1 Function

Inlet Coalescing Filter Separator 115-00-V-003 is provided to remove free liquids from the gas stream leaving the slug catcher condensed following pressure reduction.

3.2.2 Technical Data

For details of the design and operating parameters, refer to Table 2.2 – Design and Operating Parameters Inlet Coalescing Filter Separator 115-00-V-003.

Table 2.2 – Design and Operating Parameters Inlet Coalescing Filter Separator 115-00-V-003

Parameter	Design	Operating
Pressure	57barg	45 to 49 barg
Temperature (Max/Min)	93.3°C/-29°C	13°C to 33°C
Capacity	136.7 MMscfd	145 MMscfd *
No of Coalescing Elements	18	
Solids Removal Efficiency	1 micron particles	
Liquid Removal Efficiency	100% of 1 micron droplets	

* An increased capacity test performed in 2012 has proven that the plant can operate at 145 MMscfd

3.2.3 Technical Description

The Inlet Coalescing Filter Separator 115-00-V-003 is comprised of two horizontal cylindrical vessels, a coalescing filter separator with a liquid boot located below.

The coalescing filter separator has an OD of 0.762m and is 3.05m in length, seam to seam. The liquid boot has an OD of 0.324m and is also 3.05m in length, seam to seam.

The coalescing filter separator vessel has a man-way in the inlet end to allow access to the 18 coalescing elements.

The coalescing filter separator is divided into two compartments by a vertical partition on which are mounted the pipes which support the coalescing elements located in the inlet compartment.

The wet gas enters the coalescing filter separator through a nozzle in the side of the vessel. The gas carrying the coalesced liquid droplets flows into the second compartment through the coalescing elements where it passes through a double pocket vane pack to remove droplets and exits via a 300mm nozzle in the end of the vessel.

The smaller diameter lower vessel is also divided into two separate compartments.
The first compartment collects the liquids recovered by the coalescing elements, which flow under level control to the HP flash drum in the condensate treatment facility. This line has a shutdown valve, 00-SDV-104 upstream of the level control valve.

The second compartment collects the liquids recovered by the vane pack, which also flows under level control to the HP flash drum. This line has a shutdown valve, 00-SDV-103 upstream of the level control valve.

Level Gauges 00-LG-103 and 00-LG-102 provides local indication of the liquid level in the two compartments of the liquid boot.

Pressure Gauge 00-PG-104 provides local indication of the pressure at the inlet end of the inlet coalescing filter separator.

Temperature Gauge 00-TG-105 provides local indication of the temperature of the gas leaving the inlet coalescing filter separator.

3.3 Inlet Heater 115-00-H-002

Refer to P&ID: PHM-115-FE-003 Inlet Coalescing Filter Separator.

3.3.1 Function

Inlet Heater 115-00-H-002 superheats the gas stream to avoid liquids condensing in the mercury adsorber, which will contaminate the adsorbent.

3.3.2 Technical Data

For details of the design and operating parameters, refer to Table 2.3 – Design and Operating Parameters Inlet Heater 115-00-H-002.

Table 2.3 – Design and Operating Parameters Inlet Heater 115-00-H-002

Parameter	Design	Operating
Pressure shell side	40barg	8barg
Pressure tube side	57barg	45 to 49barg
Temperature shell side	200°C to 0°C	150°C (in) 100°C (out)
Temperature tube side	200°C to -29°C	15.2°C (in) to 28°C (out)
Capacity	136.7 MMscfd	Up to 145 MMscfd
Temperature Differential		1 to 5°C
Heater Duty	1030kW	1030kW

3.3.3 Technical Description

Inlet Heater 115-00-H-002 comprises a horizontal shell and tube exchanger with fixed tube sheets.

Inlet and outlet ends, located one at each end of the shell, each have a 300mm inlet and outlet nozzle to route the produced gas through the tube bundle.

Heating medium enters and leaves the shell through 80mm nozzles located on opposite sides of the shell, at opposite ends and close to the end of the shell.

The shell is constructed from NACE certified carbon steel and has an outside diameter of approximately 0.457m and a length of approximately 3.936m. The tube bundle has 215 tubes constructed from NACE certified carbon steel 19.05mm plane tubing with a fixed carbon steel tube sheet at each end.

The gas outlet pressure is indicated locally on pressure gauge 00-PG-103.

The gas inlet temperature is indicated locally on temperature gauge 00-TG-105.

Heating medium inlet temperature is indicated locally on temperature gauge 00-TG-106.

Heating medium outlet temperature is indicated locally on temperature gauge 00-TG-104

3.4 Mercury Adsorber 115-00-V-004

Refer to P&ID: PHM-115-FE-004 Mercury Removal Unit.

3.4.1 Function

Mercury Adsorber 115-00-V-004 is provided to remove mercury from the gas stream to protect the materials used in the downstream gas/gas exchanger and to meet the export gas specification of 50 micro grams per cubic meter.

3.4.2 Technical Data

For details of the design and operating parameters, refer to Table 2.4 – Design and Operating Parameters Mercury Adsorber 115-00-V-004.

Table 2.4 – Design and Operating Parameters Mercury Adsorber 115-00-V-004

Parameter	Design	Operating
Pressure	57barg to Full Vacuum	48barg
Temperature (Max/Min)	85°C/-29°C	20°C to 36°C
Capacity	136.7 MMscfd	145 MMscfd (Max) *
Volume	15.3m^3	
Pressure drop	Less than 0.8bar	
Mercury in Feed Gas	29µgm/Nm^3	
Mercury Adsorbent	HgFree	
Mercury in Treated Gas	Less than 0.1µgm/Nm^3	

* An increased capacity test performed in 2012 has proven that the plant can operate at 145 MMscfd

3.4.3 Technical Description

The mercury removal bed is a vertical cylindrical vessel, which holds the adsorbent required to remove mercury from the gas stream. The vessel has an inside diameter of 2.2m and a height of 3.3m, tan to tan. The vessel is supported on a skirt such that the height of the adsorbent removal hatch is 2m above grade.

The adsorbent bed of HgFree is supported on a screen located at the lower end of the vessel. The screen is designed to support the adsorbent bed and tolerate the dynamic load due to gas flow.

The gas inlet is located on the flanged top of the vessel above the adsorbent bed.
The nozzle has a diverter inside the vessel, which directs the gas stream upwards into the top of the vessel so that the gas stream does not impinge directly onto the top of the adsorbent bed and the possibility of 'channelling' through the bed is removed.

The treated gas leaves the vessel through a nozzle in the centre of the semi ellipsoidal end at the base of the vessel. So that flow is not concentrated from one point in the bottom of the bed, a distributor is installed at the nozzle to ensure gas flows evenly from all areas of the bed.

Two man-ways are provided, one on the top of the vessel and one on the side of the vessel to provide access for adsorbent change out.

Four sample points are provided at 550mm intervals on the side of the vessel starting from 550mm above the lower tan line. This allows gas to be sampled as it passes through the bed to determine the effectiveness of the adsorbent.

Pressure Gauge 00-PG-105 provides local indication of the pressure above the bed.

3.5 Dust Filter 115-00-W-001

Refer to P&ID: PHM-115-FE-004 Mercury Removal Unit.

3.5.1 Function

Dust Filter 115-00-W-001 is provided to remove dust carried over in the gas stream from the mercury adsorber to prevent fouling in the downstream equipment.

3.5.2 Technical Data

For details of the design and operating parameters, refer to Table 2.5 – Design and Operating Parameters Dust Filter 115-00-W-001.

Table 2.5 – Design and Operating Parameters Dust Filter 115-00-W-001

Parameter	Design	Operating
Pressure	57barg	48barg
Temperature (Max/Min)	85°C/-29°C	20°C to 36°C
Capacity	136.7 MMscfd	145 MMscfd (Max) *
Pressure drop	Less than 0.8bar	
Number of Cartridges	12	
Efficiency	100% of particles >10µm	

* An increased capacity test performed in 2012 has proven that the plant can operate at 145 MMscfd

3.5.3 Technical Description

The Dust filter is a cartridge type filter comprised of a vertical carbon steel cylindrical vessel, 0.8m OD and 1.815m high, seam to seam, fitted with a band lock closure at the top to allow internal inspection and access to the filter element. The inside of the vessel is coated with epoxy resin to protect against corrosion.

The vessel is provided with a bypass and double block and bleeds isolation in the inlet and outlet. To enable controlled pressurization following maintenance, a 50mm pressurization bypass is provided around the inlet isolation valves.

The filter vessel holds 12 filter elements.

Pressure Gauge 00-PG-108 provides local indication of the pressure at the inlet to the filter.

3.6 Glycol Contactor 115-13-V-003

Refer to P&ID: PHM-115-FE-005 Glycol Contactor.

3.6.1 Function

Glycol Contactor 115-13-V-003 is provided to reduce the water dew point of the gas stream prior to the gas flowing to the LT separator.

3.6.2 Technical Data

For details of the design and operating parameters, refer to Table 2.6 – Design and Operating Parameters Glycol Contactor 115-13-V-003.

Table 2.6 – Design and Operating Parameters Glycol Contactor 115-13-V-003

Parameter	Design	Operating
Pressure	57barg	46barg
Temperature (Max/Min)	93.3°C/-29°C	16°C to 40°C
Capacity	136.7 MMscfd	145 MMscfd (Max) *
Max Water Content	0.2lbs/MMscf	1 lb/MMscf (Guaranteed)
Glycol Carryover	15 ltr/MMNm^3	<10 ltr/MMNm^3
Glycol Circulation Rate	25USgpm	25USgpm

* An increased capacity test performed in 2012 has proven that the plant can operate at 145 MMscfd

3.6.3 Technical Description

The glycol contactor is a vertical cylindrical killed carbon steel vessel 1.524m internal diameter and 10.66m high, tan to Tan. The vessel has a packed section packed with stainless steel structured packing from above the gas inlet.

The wet gas enters the glycol contactor through a 300mm nozzle located below the packed section.

The deflector also aids removal of any remaining free liquids in the gas stream, which fall to the bottom of the contactor along with the glycol.

A shielded hydrocarbon condensate skimming compartment is installed in the bottom of the vessel to enable manual skimming in the event of a hydrocarbon condensate layer build-up on top of the rich glycol. The compartment is emptied manually with the liquids flowing to the closed drain.

The lean glycol enters the glycol contactor through a distributor located above the packed section, which distributes the incoming lean glycol evenly across the packing.

A demister is installed in the top of the vessel below the gas outlet to restrict carryover to less than 10 ltr/MMscf.

A man-way is provided above and below the packed section on the side of the vessel to provide access and maintenance purposes.

Pressure Gauge 13-PG-103 provides local indication of the pressure at the contactor gas outlet.

Level Gauge 13-LG-101 provides local indication of the level in the base of the contactor.

Level Gauge 13-LG-102 provides local indication of the level in the oil skimmer bucket.

3.7 Glycol Cooler 115-13-H-003

Refer to P&ID: PHM-115-FE-005 Glycol Contactor.

3.7.1 Function

Glycol Cooler 115-13-H-003 cools the glycol entering the glycol contactor down to the temperature of the gas leaving the contactor.

3.7.2 Technical Data

For details of the design and operating parameters, refer to Table 2.7 – Design and Operating Parameters Glycol Cooler 115-13-H-003.

Table 2.7 – Design and Operating Parameters Glycol Cooler 115-13-H-003

Parameter	Design	Operating
Pressure shell side	60.7barg	47barg
Pressure tube side	57barg	46barg
Temperature shell side	149 to -29°C	40°C to 65°C
Temperature tube side	93°C to -29°C	17 to 40°C
Capacity	135 MMscfd	Up to 145 MMscfd *
Heater Duty	120kW	120kW

* An increased capacity test performed in 2012 has proven that the plant can operate at 145 MMscfd

3.7.3 Technical Description

Glycol Cooler 115-13-H-003 comprises a vertical shell and tube exchanger with fixed tube sheets.

Inlet and outlet ends, located one at each end of the shell each have a 300mm nozzle to route the gas through the tube bundle.

Lean glycol enters and leaves the shell through 50mm nozzles located on opposite sides of the shell, at opposite ends and close to the end of the shell.

The shell is constructed from duplex steel and has an outside diameter of approximately 0.457M and a length of approximately 3.426m between face of flanges. The tube bundle has HOLD tubes constructed from duplex steel tubing with a duplex steel tube sheet at each end.

The gas outlet pressure is indicated locally on pressure gauge 13-PG-102.

3.8 Gas/Gas Exchanger 115-00-H-004

Refer to P&ID: PHM-115-FE-008 Gas/Gas Exchanger.

3.8.1 Function

Gas/Gas Exchanger 115-00-H-004 cools the gas flowing to the JT valves against the cold gas and liquids leaving the low temperature separator.

3.8.2 Technical Data

For details of the design and operating parameters, refer to Table 2.8 – Design and Operating Parameters Gas/Gas Exchanger 115-00-H-004.

Table 2.8 – Design and Operating Parameters Gas/Gas Exchanger 115-00-H-004

Parameter	Design	Operating
Pressure contactor gas path	57barg	45.9barg
Pressure LT Sep gas path	46barg	27 to 30barg

Pressure LT Sep liquid path	46barg	8barg
Temperature contactor gas path	65°C to -80°C	38.56°C (in)/ -27°C (out)
Temperature LT Sep gas path	65°C to -80°C	-35°C (in)/ 33.43°C (out)
Temperature LT Sep liquid path	65°C to -80°C	-40.14°C (in)/ 35.56°C (out)
Capacity contactor/LT Sep gas paths	135MMscfd each	Up to 145 MMscfd
Capacity LT Sep liquid path	725.3 kg/hr	708 kg/hr
Max Differential Pressure	Not Applicable	Up to gas throughput
Heater Duty	5220kW	5220kW

3.8.3 Technical Description

Gas/Gas Exchanger 115-00-H-004 is a three stream, finned plate exchanger constructed from aluminium.

The two main streams, warm gas from the glycol contactor and cold gas from the low temperature separator enter and leave the exchanger through 300mm nozzles while the smaller cold condensate stream enters and leaves via 50mm nozzles.

The exchanger is a stack of corrugated plates, each plate separated by a parting sheet and sealed along the edges by side bars.

Each plate is assigned to one of the three streams and the plates are arranged in the stack to alternate between the hot gas stream and the cold gas and liquid streams. Most of the plates are assigned to the two gas streams as these have the greatest flow.

The inlet header for each stream directs the fluids to the plates, which are assigned to carry the fluids through the exchanger. The fluids from the plates are collected in the outlet header.

The plates of the exchanger are brazed together to form a rigid heat exchanger block and the headers are welded onto the block.

A bypass is provided to route hot gas around the exchanger and to allow tie in of a gas/gas exchanger in the future. The inlet isolation valves have a pressurizing bypass to facilitate controlled pressurization of the exchanger and low temperature separator.

A strainer is provided upstream of the hot gas inlet. The strainer is a basket type strainer with a 2000micron element constructed of 304 SS for removing particles prior to entry to the exchanger.

A chemical injection point is provided on the hot gas inlet of the exchanger to allow injection of hydrate inhibitor.

The hot gas stream inlet pressure is indicated locally on Pressure Gauge 00-PG-109. And the differential pressure for the steam A is indicatied via 00-PDT-111 and DCS monitor via 00-PDIA-111

The cold gas from LT separator is worm up via Gas/Gas Exchanger steam B and outlet temperature are indicated on temperature transmitter 00-TT-109, DCS monitor via 00-TI-109 and the differential pressure for the steam B are indicated via 00-PDT-112 and DCS monitor via 00-PDIA-112

The low temperature separator liquid inlet and outlet temperatures are indicated locally on Temperature Gauges 00-TG-108 and 00-TG-109 respectively and the differential pressure for the steam C are indicated via 00-PDT-113 and DCS monitor via 00-PDIA-113

3.9 Low Temperature Separator 115-00-V-010

Refer to P&ID: PHM-115-FE-009 LT Separator.

3.9.1 Function

The Low Temperature Separator 115-00-V-010 separates liquid from the process gas, cooled in the gas/gas exchanger and by the Joule Thomson effect at 00-PCV-111A/B, before the gas flows to sales gas metering.

3.9.2 Technical Data

For details of the design and operating parameters, refer to Table 2.9 – Design and Operating Parameters Low Temperature Separator 115-00-V-010.

Table 2.9 – Design and Operating Parameters Low Temperature Separator 115-00-V-010

Parameter	Design	Operating
Pressure	46barg	27-30barg
Temperature	65 to -80°C	16 to -35°C
Capacity	136.5MMscfd	Up to 145 MMscfd *
Normal Liquid Level	520mm	
Liquid Removal Efficiency	0.1Usgal/MMscfd	< 0.1Usgal/MMscfd

* An increased capacity test performed in 2012 has proven that the plant can operate at 145 MMscfd

3.9.3 Description

Low Temperature Separator 115-00-V-010 is a vertical, stainless steel, two phase separator with an inside diameter of 1.52m and has a height of 3.65m, tan to tan. A manway is provided on the side of the vessel.

Gas enters the vessel through a 350mm inlet nozzle in the upper half of the vessel. A vane type inlet diffuser is provided at the nozzle to reduce the inertia of the gas entering the vessel enabling entrained droplets to leave the stream.

To ensure liquid droplets are not carried over in the gas stream, a vane type mist extractor is provided inside the vessel at the gas outlet. The 400mm gas outlet is on the top of the vessel. Liquids removed from the gas stream are collected below the mist extractor and flow to the bottom of the vessel through a down pipe.

Separated liquid leaves the vessel through a 50mm nozzle at the lowest point in the semi-ellipsoidal end of the vessel. The outlet is fitted with a vortex breaker.

Level Gauge 00-LG-111 provides local indication of the liquid level in the vessel.

For details of the gas cooling and export control and protection, refer to Paragraph 4.0 Instrumentation and Control.

3.10 Sales Gas Metering Package 115-00-S-001

Refer to P&ID: PHM-115-FE-010 Sales Gas Metering and Export.

3.10.1 Function

The Sales Gas Metering Package 115-00-S-001 is provided to measure to Fiscal Standards the gas export quantity and quality of the gas entering the export flow line to the PTT plant.

3.10.2 Technical Data

For details of the design and operating parameters, refer to Table 2.10 – Design and Operating Parameters Sales Gas Metering Package 115-00-S-001.

Table 2.10 – Design and Operating Parameters Sales Gas Metering Package 115-00-S-001

Parameter	Design	Operating
Pressure	46barg	27 to 28.6barg
Temperature	65 to -29°C	21 to 31°C
Meter System Capacity	Max of 84.375 MMscfd each	Up to 80 MMscfd each
Number of Meter Streams	3 x 50%	3 x 50%

3.10.3 Description

Sales Gas Metering Package 115-00-S-001 is comprised of three 50% meter streams, a chromatograph, calorimeter and a moisture analyzer.

The facilities for the three metering streams are the same. The following text is for Run A.

Gas enters the meter from the inlet header through a manual ball valve, which is used to isolate the meter stream for maintenance. Similarly, the metered gas leaves the meter flowing into the outlet header through a second manual ball valve, which is closed to take the meter off-line and to isolate the meter stream for maintenance.

The flow is measured by two differential pressure transmitters, one high range and one low range, which measure the pressure drop across an orifice plate, 00-FE-102. The transmitters provide outputs representing flow to the flow computer in the Supervisory Control System. The flow computer selects the transmitter which is within its calibrated range.

To ensure smooth flow without swirl through the orifice meter there is a flow straightener located 10 diameters upstream of the orifice plate.

The temperature and pressure at the orifice plate are measured by the respective temperature and pressure transmitters, 00-PT-117 A/B (B for back up) and 00-TT-115 A/B (B for back up), which provide signals to the flow computer in the supervisory control system.

Local indicators are provided on each meter run to indicate temperature and pressure.

These signals are used to compensate the measured flow to provide indication of instantaneous flow under standard conditions on 00-FI-102.

A sample of the sales gas is passed to a chromatograph 00-AT-102 or 00-AT-103 which provides detail of the sales gas composition in MOLE% on 00-AI-102 or 00-AI-103 in the DCS.

Density is computed automatically from the chromatograph results and fed into the Supervisory Control System to be used to calculate standard volume flow which is indicated on 00-FI-105.

The components measured by the chromatograph are C_1 to C_{10} are used to compute the heating value of the sales gas, which is displayed on Gross Heating Value Indicator 00-AI-106 and 00-AI-106s.

The supervisory computer also uses the volume flow and gross heating value to calculate the Energy Flow which is displayed on 00-FI-106.

A second sample of the sales gas is passed to a moisture analyzer 00-MT-101 which provides indication of water content on 00-MIA-101 in the DCS and at a display on the PTT site.

Disposal of the gas sample from 00-AI-102 or 00-AI-103 and 00-MIA-101 is to the LP flare header.

Selected data from the supervisory computer is made available for the customer at the PTT site through a serial link.

4.0 INSTRUMENTATION AND CONTROL

4.1 Slug Catcher 115-00-Z-001

Refer to P&ID: PHM-115-FE-002 Slug Catcher.

4.1.1 Pressure

In normal operation, when gas is flowing to export, with pressure downstream of the glycol contactor controlled by 13-PICA-101 acting on the 30% and 70% capacity Pressure Control Valves 13-PCV-101A/B at the Slug Catcher gas outlet, the pressure in the slug catcher floats on pipeline pressure. For details of the controller 13-PICA-101 refer to Paragraph 4.6.1.

The pressure in the slug catcher is controlled by 00-PICA-102 by venting the excess gas to the HP flare header through pressure control valve 00-PCV-102. The pressure controller also provides a high and low pressure alarm on the DCS. Use of this valve is restricted due to the tight flare consent.

Pressure Controller 00-PICA-102 can also be used to depressurize the flow line. For this operation, the controller is used in Manual mode and flow to flare is monitored on the HP flare Flow Indicator 16-FI-102. It should be noted that the plant must remain pressurized to ensure a supply of fuel gas for the flare pilots during this operation.

Shutdown valves 62-SDV-101 and 00-SDV-101 are provided on the pipeline upstream of the slug catcher. The valves fail closed and the control air to the valves is switched by solenoid valves controlled from the SDS.

A shutdown valve 00-SDV-102 is provided on the gas line from the slug catcher. The valve fails closed and the air to the valve is switched by a solenoid valve controlled from the SDS system.

A blowdown valve 00-BDV-113 is provided on the slug catcher to depressurize the slug catcher to the HP flare header to reduce inventory in an emergency.

The valve fails open and the air to the valve is switched by a solenoid valve controlled from the ESD system. Flow to the flare header is restricted by an Orifice Plate 00-RO-102 in the line to the flare.

Overpressure protection against fire case is provided by Pressure Relief Valve 00-PSV-101 set to relieve at 94.4barg. A depressurizing bypass with double block valve isolation and a restricting orifice, 00-RO-104, is provided around the relief valve.

4.1.2 Liquid Level

The liquid level in the slug catcher is maintained by Level Controller 00-LICA-101A, which controls the flow of liquid from the slug catcher to the Condensate Treatment facility described in Section 4 of this manual.

Using the level control output to set the flow controller set point ensures a steady flow of liquids to the down stream system.

During pigging operations, the Level Controller 00-LICA-101B modulates Level Control Valve 00-LCV-101 on the slug catcher inlet to throttle flow from the pipeline, when necessary, to prevent overfilling the slug catcher.

Protection against high level is provided by Level Transmitter 00-LT-105, which provides a high level trip signal through 00-LIA-105 for the SDS system to close 00-SDV-101,00-SDV-102 13-PCV-101A and B.

Protection against low level is provided by Level Switch 00-LS-102, which provides a low level trip signal through 00-LA-102 the SDS system to close 02-SDV-101.

The SDS system performs the necessary executive actions identified on the cause and effect charts.

A shutdown valve 02-SDV-101 is provided on the liquid outlet from the slug catcher. The valve fails closed and the air to the valve is switched by a solenoid valve controlled from the SDS system.

4.1.3 Flow

The flow of gas from the slug catcher is measured by Flow Transmitter 00-FT-101, which measures the differential pressure across Flow Element 00-FE-101.

The flow signal is corrected for temperature and pressure using signals from 00-PT-102 and 00-TT-104 respectively to provide indication of flow at standard conditions on 00-FIA-101 in the DCS. The flow indicator also provides a high and low flow alarm on the DCS.

4.1.4 Temperature

Temperature Transmitter 00-TT-104 provides gas outlet temperature indication through 00-TI-104 on the DCS.

The temperature of the gas leaving the slug catcher is indicated locally on 00-TG-102.

4.2 Inlet Coalescing Filter Separator 115-00-V-003

Refer to P&ID: PHM-115-FE-002 Slug Catcher and PHM-115-FE-003 Inlet Coalescing Filter Separator.

4.2.1 Pressure

The pressure in the inlet coalescing filter separator is set by the pressure downstream of the glycol contactor controlled by 13-PICA-101 acting on the 30% and 70% capacity Pressure Control Valves 13-PCV-101A and B at the Slug Catcher gas outlet.

The pressure of the gas stream entering the inlet coalescing filter separator is monitored by 00-PT-104 which provides indication and a high and low pressure alarm on the DCS through Pressure Indicator 00-PIA-104.

High pressure protection for the inlet coalescing filter separator and downstream gas processing facilities is provided by Pressure Transmitters 00-PT-107A, B and C which are used to generate a high pressure trip signal through 00-PIA-107A, B and C. The three signals are voted two out of three and the resulting signal is sent to the SDS System, which performs the necessary executive actions identified on the cause and effect charts.

Overpressure protection against blocked outlet on the line to the inlet coalescing filter separator is provided by Pressure Relief Valves 00-PSV-102A/B set to relieve at 57barg. One of the valves must be on-line when the vessel is in operation the second valve is in reserve.

Overpressure protection against fire case on the inlet coalescing filter separator is provided by Pressure Relief Valve 00-PSV-105 set to relieve at 57barg. A depressurizing bypass with double block valve isolation and a restricting orifice, 00-RO-103, is provided around the relief valve.

The differential pressure across the coalescing elements in the inlet coalescing filter separator is monitored by 00-PDT-101, which provides indication and a high differential pressure alarm on the DCS through Pressure Indicator 00-PDIA-101.

4.2.2 Liquid Level

The liquid level in the coalescer sump is maintained by Level Controller 00-LICA-104, which modulates Control Valve 00-LCV-104 on the liquid outlet.

Protection against high level is provided by Level Transmitter 00-LT-115, which is used to generate a trip signal through 00-LIA-115 for the SDS System to close 00-SDV-102,13-PCV-101A and B.

Protection against low level is provided by Level Transmitter 00-LT-117, which is used to generate a trip signal through 00-LIA-117 for the SDS System to close 00-SDV-104.

The SDS system performs the necessary executive actions identified on the cause and effect charts.

A shutdown valve 00-SDV-104 is provided on the liquid outlet from the coalescer sump. The valve fails closed and the air to the valve is switched by a solenoid valve controlled from the SDS system.

The liquid level in the separator sump is maintained by Level Controller 00-LICA-103, which modulates Control Valve 00-LCV-103 on the liquid outlet.

Protection against high level is provided by Level Transmitter 00-LT-116, which is used to generate a trip signal through 00-LIA-116 for the SDS System to close 00-SDV-102,13-PCV-101A and B.

Protection against low level is provided by Level Transmitter 00-LT-118, which is used to generate a trip signal through 00-LIA-118 for the SDS System to close 00-SDV-103.

A shutdown valve 00-SDV-103 is provided on the liquid outlet from the separator sump. The valve fails closed and the air to the valve is switched by a solenoid valve controlled from the SDS system.

4.2.3 Temperature

The gas outlet temperature is indicated locally on 00-TG-105.

4.3 Inlet Heater 115-00-H-002

Refer to P&ID: PHM-115-FE-003 Inlet Coalescing Filter Separator.

4.3.1 Pressure

High pressure protection for the heating medium return from the heater is provided by Pressure Transmitter 00-PT-105 which is used to generate a high pressure trip signal through 00-PIA-105. The signal is sent to the SDS System to close 00-SDV-105 heating medium return shutdown valve, which performs the necessary executive actions identified on the cause and effect charts.

A shutdown valve 00-SDV-105 is provided on the heating medium return. The valve fails closed and the air to the valve is switched by a solenoid valve controlled from the SDS system.

Overpressure protection for the shell for fire case and contingency to protect the shell on tube rupture is provided by Pressure Relief Valve 00-PSV-107, which is set to relieve at 40barg. A depressurizing bypass with double block valve isolation and a restricting orifice, 00-RO-105, is provided around the relief valve.

4.3.2 Temperature

The temperature of the gas leaving the heater is normally controlled by the Temperature Controller, 00-TICA-102, which modulates control valve 00-TCV-102 on the heating medium return. The controller also provides a high and low temperature alarm on the DCS. The control signal to the valve passes through a high select relay 00-TY-102A which also receives the output from temperature controller 00-TICA-14 on the gas export line. This arrangement allows more heat to be put into the gas stream if the gas export temperature is low.

Temperature protection for the gas stream is provided by Temperature Transmitter 00-TT-103 on the gas outlet of the heater, which is used to generate a high temperature trip signal through 00-TIA-103. The signal is sent to the SDS System to close 00-SDV-105 heating medium return

shutdown valve, which performs the necessary executive actions identified on the cause and effect charts.

4.4 Mercury Adsorber 115-00-V-004

Refer to P&ID: PHM-115-FE-004 Mercury Removal Unit.

4.4.1 Pressure

The pressure in the mercury adsorber is set by the pressure downstream of the glycol contactor controlled by 13-PICA-101 acting on the 30% and 70% capacity Pressure Control Valves 13-PCV-101A/B at the Slug Catcher gas outlet.

Overpressure protection against fire case for the mercury adsorber is provided by Pressure Relief Valve 00-PSV-108 set to relieve at 57barg. A depressurizing bypass with double block valve isolation and a restricting orifice, 00-RO-107, is provided around the relief valve.

The differential pressure across the mercury adsorber is monitored by 00-PDT-102, which provides indication and a high differential pressure alarm on the DCS through Pressure Indicator 00-PDIA-102.

4.5 Dust Filter 115-00-W-001

Refer to P&ID: PHM-115-FE-004 Mercury Removal Unit.

4.5.1 Pressure

The pressure in the Dust Filter is set as for the mercury adsorber.

Overpressure protection against fire case for the dust filter is provided by Pressure Relief Valve 00-PSV-109 set to relieve at 57barg. A depressurizing bypass with double block valve isolation and a restricting orifice, 00-RO-108, is provided around the relief valve.

The differential pressure across the dust filter is monitored by 00-PDT-103, which provides indication and a high differential pressure alarm on the DCS through Pressure Indicator 00-PDIA-103.

4.6 Glycol Contactor 115-13-V-003

Refer to P&ID: PHM-115-FE-005 Glycol Contactor.

4.6.1 Pressure

The pressure in the glycol contactor is monitored by Pressure Transmitter 13-PT-101 located downstream of the glycol cooler which provides the process variable to the pressure controller 13-PICA-101. The controller modulates the 30% and 70% capacity Pressure Control Valves 13-PCV-101A/B at the Slug Catcher gas outlet. If the slug catcher pressure is above 46.5barg, the relay 13-PY-101 only allows 13-PCV-101A to open. This is to prevent high flow through the process system when there is a high differential pressure across 13-PCV-101A/B. In this situation there will be an increased Joule Thomson effect at the valves so methanol should be injected to reduce the risk of hydrate formation.

The pressure controller also provides a high and low pressure alarm on the DCS.

Overpressure protection against fire case for the glycol contactor is provided by Pressure Relief Valve 13-PSV-101 set to relieve at 57barg. A depressurizing bypass with double block valve isolation and a restricting orifice, 13-RO-101, is provided around the relief valve.

The differential pressure across the packed section of the glycol contactor is monitored by 13-PDT-101, which provides indication and a high differential pressure alarm on the DCS through Pressure Indicator 13-PDIA-101.

A blowdown valve 13-BDV-104 is provided on the glycol contactor to depressurize the vessel to the HP flare header to reduce inventory in an emergency.

The valve fails open and the air to the valve is switched by a solenoid valve controlled from the ESD system. Flow to the flare header is restricted by an Orifice Plate 13-RO-102 in the line to the flare.

4.6.2 Liquid Level

The liquid level in the glycol contactor is maintained by Level Controller 13-LICA-101, which modulates Control Valve 13-LCV-101 on the rich glycol outlet.

Protection against high level is provided by Level Transmitter 13-LT-102, which is used to generate a high level trip signal through 13-LIA-102.

Protection against low level is provided by Level Transmitter 13-LT-103, which is used to generate a trip signal through 13-LIA-103.

The trip signals are sent to the SDS which performs the necessary executive actions identified on the cause and effect charts.

A shutdown valve 13-SDV-102 is provided on the rich glycol outlet from the glycol contactor. The valve fails closed and the air to the valve is switched by a solenoid valve controlled from the Shutdown System (SDS).

4.6.3 Gas Quality

The dry gas leaving the glycol contactor is sampled by a Moisture Analyzer, 13-MT-101 to determine the water dew point of the treated gas. Indication and a high dew point alarm are provided on the DCS through 13-MIA-101.

4.7 Glycol Cooler 115-13-H-003

Refer to P&ID: PHM-115-FE-005 Glycol Contactor.

4.7.1 Temperature

The temperature of the gas flowing to the glycol cooler from the glycol contactor is measured by Temperature Transmitter 13-TT-101, which provides gas temperature indication through 13-TI-101 on the DCS.

The temperature of the gas flowing from the glycol cooler to the gas/gas exchanger is measured by Temperature Transmitter 13-TT-104, which provides gas temperature indication through 13-TI-104 on the DCS.

The temperature of the hot lean glycol flowing to the glycol cooler from glycol regeneration is measured by Temperature Transmitter 13-TT-103, which provides lean glycol temperature indication through 13-TI-103 on the DCS.

The temperature of the cool lean glycol flowing from the glycol cooler to the contactor is measured by Temperature Transmitter 13-TT-102, which provides lean glycol temperature indication through 13-TI-102 on the DCS.

4.8 Gas/Gas Exchanger 115-00-H-004

Refer to P&ID: PHM-115-FE-008 Gas/Gas Exchanger.

4.8.1 Pressure

The pressure in the gas stream leaving the gas/gas exchanger upstream of the JT valves is monitored by Pressure Transmitter 00-PT-110 which provides pressure indication through 00-PI-110 on the DCS. The differential pressure across the strainer in the gas stream from the glycol contactor is monitored by 00-PDT-110, which provides indication and a high differential pressure alarm on the DCS through Pressure Indicator 00-PDIA-110.

The differential pressure across the exchanger for the gas stream from the glycol contactor is monitored by 00-PDT-111, which provides indication and a high differential pressure alarm on the DCS through Pressure Indicator 00-PDIA-111.

Overpressure protection against fire case for the gas stream from the glycol contactor is provided by Pressure Relief Valve 00-PSV-111 set to relieve at 57barg. A depressurizing bypass with double block valve isolation and a restricting orifice, 00-RO-111, is provided around the relief valve.

The differential pressure across the exchanger for the liquid stream from the LT separator to HP flash vessel is monitored by 00-PDT-113, which provides indication and a high differential pressure alarm on the DCS through Pressure Indicator 00-PDIA-113.

Overpressure protection against thermal expansion for the liquid stream from the LT separator is provided by Pressure Relief Valve 00-PSV-114 set to relieve at 46barg. A depressurizing bypass with double block valve isolation is provided around the relief valve.

The differential pressure across the exchanger for the gas stream from the LT separator to Sale gas metering is monitored by 00-PDT-112, which provides indication and a high differential pressure alarm on the DCS through Pressure Indicator 00-PDIA-112.

Overpressure protection against thermal expansion for the gas stream from the LT separator is provided by Pressure Relief Valve 00-PSV-112 set to relieve at 46barg. A depressurising bypass with double block valve isolation and a restricting orifice, 00-RO-112, is provided around the relief valve.

4.8.2 Temperature

The temperature of the gas stream leaving the gas/gas exchanger and flowing to the LT separator is monitored by Temperature Transmitter 00-TT-110 which provides temperature indication through 00-TI-110 on the DCS.

The temperature of the gas stream leaving the gas/gas exchanger and flowing to the sales gas metering is monitored by Temperature Transmitter 00-TT-109 which provides temperature indication through 00-TI-109 on the DCS.

Temperature protection for the liquid stream flowing to the condensate treatment facilities is provided by Temperature Transmitter 00-TT-108, which is used to generate a low temperature trip signal through 00-TIA-108. The signal is sent to the SDS, which performs the necessary executive actions identified on the cause and effect charts.

4.9 Low Temperature Separator 115-00-V-010

Refer to P&ID: PHM-115-FE-009 LT Separator.

4.9.1 Pressure

The pressure in the low temperature separator is monitored by Pressure Transmitter 00-PT-111 located on the vessel, which provides the process variable to the pressure controller 00-PICA-111. The controller modulates one of the two 100% capacity Joule Thomson (JT) Pressure Control Valves 00-PCV-111A or B, operated one duty and one standby, on the gas stream flowing to the LT separator. Selection of the duty valve is through 00-HS-111 in the DCS. In addition there is an interlock system to allow only one downstream isolation valve to be open at any time. The pressure controller also provides a high and low pressure alarm on the DCS.

High pressure protection for the low temperature separator is provided by Pressure Transmitters 00-PT-113 which is used to generate a high pressure trip signal through 00-PIA-113. The signal is sent to the SDS, which performs the necessary executive actions identified on the cause and effect charts.

A shutdown valve 00-SDV-110 is provided on the gas supply from the gas/gas exchanger to the LT separator. The valve fails closed and the air to the valve is switched by a solenoid valve controlled from the SDS.

A blowdown valve 00-BDV-115 is provided on the LT separator to depressurize the vessel to the HP flare header to reduce inventory in an emergency. The valve fails open and the air to the valve is switched by a solenoid valve controlled from the SDS. Flow to the flare header is restricted by an Orifice Plate 00-RO-114 in the line to the flare.

4.9.2 Liquid Level

The liquid level in the LT separator is maintained by Level Controller 00-LICA-111, which modulates Control Valve 00-LCV-111 on the cold liquid outlet. The level controller also provides a high and low level alarm on the DCS.

Protection against high level is provided by Level Transmitter 00-LT-110, which is used to generate a high level trip signal through 00-LIA-110.

Protection against low level is provided by Level Transmitter 00-LT-109, which is used to generate a trip signal through 00-LIA-109.

The trip signals are sent to the SDS which performs the necessary executive actions identified on the cause and effect charts.

A shutdown valve 00-SDV-111 is provided on the cold liquid outlet from the LT separator. The valve fails closed and the air to the valve is switched by a solenoid valve controlled from the SDS.

4.9.3 Temperature

The temperature of the gas leaving the LT separator is normally controlled by the Temperature Controller, 00-TICA-111, which modulates control valves 00-TCV-111A and B. The control valves are split range with 00-TCV-111A directing gas to the gas/gas exchanger and 00-TCV-111B directing gas to the gas/gas exchanger bypass. This arrangement controls the temperature of the gas flowing to the LT separator, which is then cooled by the Joule Thomson effect across 00-PCV-111A or B. Any change in the amount of cooling by the Joule Thomson effect is compensated for by the temperature controller. The controller also provides a high and low temperature alarm on the DCS.

4.10 Sales Gas Metering Package 115-00-S-001 and Export Facility

Refer to P&ID: PHM-115-FE-010 Sales Gas Metering and Export.

4.10.1 Pressure

The sales gas pressure is monitored by Pressure Transmitter 00-PT-114 located upstream of the shutdown valve on the gas export line, which provides the process variable to the pressure controller 00-PICA-114. The pressure controller also provides a high and low pressure alarm on the DCS.

Pressure Controller 00-PICA-114 provides the set point for Flow Controller 00-FIC-105 through Selector Switch 00-HS-103 the flow controller receives a signal representing total volume flow from the Supervisory Computer and modulates the Pressure Control Valve 00-PCV-114 on the export gas flow line to control flow to maintain the pressure at the plant outlet.

The second input to Selector Switch 00-HS-103 is from Pressure Controller 61-PIC-101 (which is located in the PTT site) to control the pressure at the PTT site. When this signal is selected as the set point for 00-FIC-105, the controller modulates the Pressure Control Valve 00-PCV-114 on the export gas flow line to control the arrival pressure at the PTT site.

High and low pressure protection for the sales gas export line is provided by Pressure Transmitters 00-PT-115 and 00-PT-116, which are used to generate a high pressure and low

pressure trip signal through 00-PIA-115 and 00-PIA-116 respectively. The signals are sent to the SDS, which performs the necessary executive actions identified on the cause and effect charts.

A shutdown valve 00-SDV-112 is provided on the sales gas line close to the GPP boundary. The valve fails closed and the air to the valve is switched by a solenoid valve controlled from the SDS.

4.10.2 Flow

The flow of gas to export is measured to fiscal standards in the Sales Gas Metering Package 115-00-S-001.

The package consists of four FloBoss 600 flow computers. There is a flow computer for each meter run that inputs to the one master flow computer which in turn interfaces with the DCS.

Each meter run computer is provided input from the individual run's flow, temperature and pressure transmitters as follows:

Meter Run A from 00-PT-117A/B, 00-FT-102A/B, 00-TT-115A/B

Meter Run B from 00-PT-118A/B, 00-FT-103A/B, 00-TT-116A/B

Meter Run C from 00-PT-119A/B, 00-FT-104A/B, 00-TT-117A/B

Note. Pressure transmitter B and Temperature Transmitter B for the back up sale gas.

Each meter run computer will automatically select between the A/B high and low flow transmitters when the switch up and switch down values are measured.

The measured data from the meter run computers are then fed to the master flow computer.

The master flow computer also receives input from gas chromatograph 00-AT-102 or 00-AT-103 and moisture analyser 00-MT-101 to provide composite flow calculations.

The master flow computer provides the following DCS indications for each meter run:

Standard Volume Flow Rate

In Use Pressure

Previous Daily Average Pressure

In Use Temperature

Previous Daily Average Temperature

Current Daily Averaged H_2S

Current Daily Averaged CO_2

Previous Daily Average Specific Gravity

Previous Daily Average Water Content

Previous Daily Average Actual Gross Heating Value

Previous Daily Run Time

Previous Daily Standard Volume Total

Cumulative Standard Volume Total

The master flow computer provides the following DCS composite indications for the gas processing plant:

In Use Normalised Methane

In Use Normalised Ethane

In Use Normalised Propane

In Use Normalised I-Butane

In Use Normalised N-Butane

In Use Normalised I-Pentane

In Use Normalised N-Pentane

In Use Normalised Hexane

In Use Normalised Heptane

In Use Normalised Octane

In Use Normalised Nonane

In Use Normalised Decane

In Use Normalised CO2

In Use Normalised N2

Current Gross Heating Value

In Use Normalised H2O

Current Standard Volume Flow Rate

Current Energy Flow Rate

Flow controller 00-FIC-105 receives a total volumetric flow as its process variable from the master flow computer. The controller provides a control signal to the pressure control valve 00-PCV-114 (Refer to Paragraph 4.10.1 for details). The flow controller restricts flow to the capacity of the gas plant.

4.10.3 Temperature

The sales gas temperature is monitored by temperature transmitter 00-TT-114, which provides the process variable for Temperature Controller 00-TICA-114. The output of the temperature controller is transmitted to the low select relay, 00-TY-102A, which also receives a control signal from 00-TICA-102 on the gas outlet of the inlet heater. If the sales gas temperature is too low, 00-TICA-114 is selected to modulate control valve 00-TCV-102 on the heating medium from the inlet heater to raise the gas temperature.

The temperature controller 00-TICA-114 also provides a high and low temperature alarm on the DCS.

4.10.4 Gas Quality

The sales gas at the inlet to the metering package is sampled by a moisture analyzer, 00-MT-101 and a gas chromatograph 00-AT-102 or 00-AT-103.

The moisture analyzer, 00-MT-101 determines the water dew point of the sales gas to provide indication on the DCS through 00-MI-101.

The Gas Chromatograph, 00-AT-102 or 00-AT-103 quantifies the components C_1 to C_{10} of the sales gas to provide indication in MOLE% on the DCS through 00-AI-102 or 00-AI-103

5.0 ENVIRONMENTAL, health and safety REQUIREMENTS

5.1 General EHS Requirements

5.1.1 Chemicals

The following chemical is used in this system, or may be present under upset conditions:

Methanol

Tri-ethylene Glycol

Heating Medium (50% in Tri-ethylene Glycol)

Personnel should ensure that they are fully familiar with the Material Safety Data Sheet (MSDS) for each chemical, which details precautions and the protective apparel and equipment necessary when handling the chemicals. The precautions detailed must be adhered to at all times.

5.1.2 Hazardous Sources

Table 2.11 – Hazardous Sources lists potential hazardous sources that may be present under upset conditions affecting the Gas Processing, Metering and Export System.

Table 2.11 – Hazardous Sources

Hazard	Source	Hazardous Event	Effect	Control
Hydrocarbon gas under pressure	Throughout system	Potential for injury due to contact with hazardous liquids Loss of containment and release of flammable gas	Potential for personnel injury Un-ignited gas release and potential for fire/explosion	Gas Processing, Metering and Export Fire and Gas Detection
Liquid hydrocarbons under pressure	Slug Catcher, Inlet Coalescing Filter Separator, Glycol Contactor and LT Separator	Potential for injury due to contact with hazardous liquids Loss of containment and release of flammable liquids	Potential for personnel injury Un-ignited liquid release and potential for gas release and fire/explosion	Gas Processing, Metering and Export Fire and Gas Detection
Low temperature Lines and vessels	LT Separator, Gas/Gas Exchanger	Potential for injury due to contact with cold surfaces (-35°C)	Potential for personnel injury	Lagging for personnel protection
High temperature Lines and vessels	Glycol Contactor and Glycol Cooler	Potential for injury due to contact with hot surfaces (65°C)	Potential for personnel injury	Lagging for personnel protection
Hot Glycol under pressure	Glycol Contactor and Glycol Cooler	Potential for injury due to contact with hot contaminated glycol	Potential for personnel injury	Gas Processing, Metering and Export

Hazard	Source	Hazardous Event	Effect	Control
Methanol under pressure	Slug Catcher, gas outlet Gas/Gas Exchanger LT Separator gas inlet, liquid outlet	Potential for injury due to contact with hazardous liquids Loss of containment and release of flammable liquids	Potential for personnel injury Un-ignited liquid release and potential for fire/explosion	Gas Processing, Metering and Export Fire and Gas Detection

5.2 Specific Health and Safety Requirements

The correct use of Personal Protective Equipment (PPE) is fundamental in securing a safe and healthy place of work for all personnel. PPE shall be used in conjunction with appropriate health, environment and safety procedures that are designed to minimise the potential risk of harm or injury to personnel, while also promoting safe working practices.

5.3 Specific Environmental Requirements

To prepare the Gas Processing, Metering and Export System for the introduction of hydrocarbon gas, it is necessary to remove all air from the system. Nitrogen may be utilized for this purpose through the dedicated purge points which are provided with the necessary isolation valves and a non return valve. Similarly, when preparing equipment for maintenance, nitrogen may be used to purge hydrocarbons from the system before breaking containment and introducing air.

When purging the system of air prior to introduction of hydrocarbons, the atmoPig in the system should be tested with an Oxygen Content Analyzer to determine the level of oxygen remaining in the purged system.

When purging is being performed to remove hydrocarbons, a suitable test instrument which uses thermal conductivity or infra-red absorption, capable of detecting hydrocarbons in nitrogen must be used. Pelister type instruments cannot be used, as they require at least 13% oxygen to operate.

WARNING **NITROGEN IS AN ASPHYXIANT, AND IS COLOURLESS AND ODOURLESS: RAPID AND UNRECOGNISED LOSS OF CONSCIOUSNESS CAN OCCUR IN PERSONS EXPOSED TO A NITROGEN-ENRICHED ATMOPIG. WHEN USING NITROGEN, CARE SHOULD BE TAKEN TO ENSURE THAT NITROGEN ESCAPES ARE DISPERSED AND NOT ALLOWED TO COLLECT IN ENCLOSED AREAS.**

6.0 REFERENCE INFORMATION

6.1 Company Documentation

Document Number	Document Title
2002-PDS-115-00-H-002-014	Inlet Heater Mechanical Data Sheet
2002-PDS-115-00-V-004-003-1	Mercury Adsorber Process Data Sheet
2002-DS-0840-02	Mercury Adsorber Data Sheet
2002-PDS-115-00-W-001-006-1	Dust Filter Process Data Sheet

Document Number	Document Title
2002-PDS-115-13-S-003-004-1	Glycol Dehydration Unit and Glycol Regeneration Process Data Sheet
2002-PDS-115-00-H-004-002-0	Gas/Gas Exchanger Process Data Sheet
2002-PDS-115-00-V-010-032-1	Low Temperature Separator Process Data Sheet
2002-DS-0840-03	Low Temperature Separator Mechanical Data Sheet
PH-10-OP-SOP-00002	Standard Operating Procedure for Gas Process,Metering and Export

6.2 Vendor Documentation

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6.3 Engineering Drawings (PFDs, UFDs, P&IDs)

Drawing Number	Drawing Title
PHM-120-FP-002	Sinphuhorm GPP PFD – Overall Process Schematic
PHM-120-FP-003	Sinphuhorm – Overall Gas Processing Plant Schematic
PHM-115-FP-001	Sinphuhorm GPP PFD – Pig Receiver and Slug Catcher
PHM-115-FP-002	Sinphuhorm GPP PFD – Gas Dehydration
PHM-115-FP-003	Sinphuhorm GPP PFD – Hydrocarbon Dew Pointing and Metering
PHM-115-FE-002	Sinphuhorm GPP P&ID – Slug Catcher
PHM-115-FE-003	Sinphuhorm GPP P&ID – Inlet Coalescing Filter Separator and Heater
PHM-115-FE-004	Sinphuhorm GPP P&ID – Mercury Removal Unit
PHM-115-FE-005	Sinphuhorm GPP P&ID – Glycol Contactor
PHM-115-FE-008	Sinphuhorm GPP P&ID – Gas/Gas Exchanger
PHM-115-FE-009	Sinphuhorm GPP P&ID – LT Separator
PHM-115-FE-010	Sinphuhorm GPP P&ID – Gas Metering and Export

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GLYCOL REGENERATION SYSTEM

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1.0 INTRODUCTION

1.1 System Purpose/Function

The Glycol Regeneration System is designed to dry the gas to the required water dew point specification for export to the PTT plant.

1.3 Primary Components

The Glycol Regeneration System is located in the North West section of the plant and is comprised of the following Primary Components:

Tag No	Equipment Title/Description
115-13-V-001	Glycol Flash Drum
115-13-W-001	Glycol Particulate Filter
115-13-W-002	Glycol Charcoal Filter
115-13-PM-001A/B	Glycol Circulating Pumps
115-13-Z-005	Condenser
115-13-Z-001/3/4	Glycol Azeotropic Reboiler
115-13-Z-002	Glycol Surge Tank
115-13-Z-006	Octane Make-up Tank
115-13-H-001A/B	Glycol/Glycol Exchanger A/B
115-13-P-002	Glycol Make-up Pumps
115-13-V-003	Gas Glycol Contactor (See Note)
115-13-H-003	Gas Glycol Exchanger (See Note)

Note: These two items of equipment interface directly with the glycol regeneration facilities but are described in Section 2.0 of the OPM, and the operating procedures can be found in SOP Volume 2 Gas Processing, Metering and Export (Doc No: PH-10-OP-SOP-00002).

1.4 Primary Interfaces

Input interfaces:

- Gas Processing, Metering and Export (refer to Section 2.0 of this OPM)
- Fuel Gas System (refer to Section 7.0 of this OPM)
- Heating Medium (refer to Section 9.0 of this OPM)
- Instrument Air System (refer to Section 10.0 of this OPM)
- PCSS System (refer to Section 14.0 of this OPM)

Output Interfaces:

- Condensate Treatment, Storage and Export (refer to Section 4.0 of this OPM)
- Closed Drains System (refer to Section 8.0 of this OPM)

- Flare Systems (refer to Section 6.0 of this OPM)
- Produced Water Treatment (refer to Section 5.0 of this OPM)

2.0 SYSTEM DESCRIPTION

2.1 System Overview

Refer to Figure 3.1 – Glycol Regeneration System Simplified Overview Schematic.

The function of the glycol regeneration system is to remove the water and any hydrocarbon condensate from the rich glycol passing from the glycol contactor to the system and return lean glycol with a concentration of 99.75% to the glycol contactor.

A lean glycol is used to absorb moisture from the wet process gas to produce a very dry gas stream suitable for further processing to remove hydrocarbon condensate and finally export. In the gas drying process, the glycol becomes 'rich' or laden with water as water is absorbed via counter current contact with wet gas in a glycol contactor tower.

The rich glycol is then regenerated so that it can be circulated back through the contactor to dehydrate more gas. Glycol regeneration involves the following processes:

Flashing (reducing pressure to remove absorbed hydrocarbons from the rich glycol)

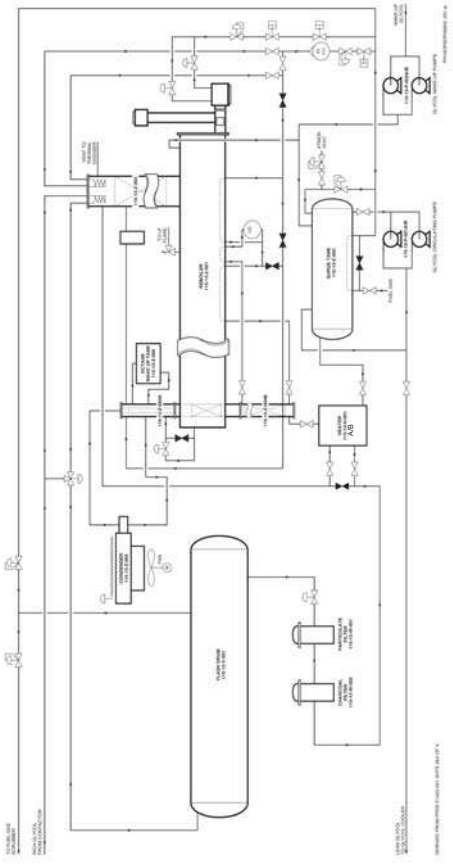
Filtration (removing particulate and hydrocarbon contaminates from the rich glycol)

Steam stripping in a regeneration still column to remove the bulk of the absorbed water

Gas stripping in a supplementary stripping column to remove virtually all the remaining water. High dew point depression TEG dehydration units require very concentrated glycol solutions (99.9%+) in order to achieve very stringent water dew point depression objectives

After regeneration, the glycol is considered 'lean' and is cooled prior to storage in the glycol surge tank for re-circulation through the glycol dehydration process.

Figure 3.1 – Glycol Regeneration System Simplified Overview Schematic



2.2 Primary Flow Description

The wet (rich) glycol collects in the base of the glycol contactor and flows under level control to the Glycol Regeneration Package where the glycol is dried before re-entering the contactor through a distributor above the packed section as lean glycol.

The glycol used as the drying agent is Triethylene Glycol (TEG) which following regeneration has a quality of 99.97% TEG by weight. Triethylene Glycol provides good dehydration combined with minimal loss from vaporisation and degradation.

In the Regeneration Package the rich glycol from the glycol contactor flows through a coil in the top of glycol reboiler 115-13-Z-003 where it provides cooling to the vapours in the column and is itself heated in the process.

The warm rich glycol then enters the Glycol Flash Drum 115-13-V-001, which is a three phase separator, where vapour is released through pressure reduction and any hydrocarbon condensate is separated from the rich glycol and forms an interface.

When there is insufficient gas being released to maintain pressure in the glycol flash drum, fuel gas make-up is provided via self-regulating Pressure Control Valve 115-13-PCV-113 set at 4.48barg. Gas released in the drum flows to the fuel gas scrubber through self-regulating Pressure Control Valve 115-13-PCV-112 set at 6.2barg.

The rich glycol leaving the flash drum under level control is filtered to remove solids before flowing through the Lean/Rich Glycol Exchanger 115-13-H-001 A or B to the packed section of the Glycol Still Column 115-13-Z-003. In the lean/rich glycol exchanger the rich glycol is heated against hot lean glycol leaving the reboiler on its return to the glycol surge drum.

The hot rich glycol is directed to the top of the still column, for primary regeneration.

The preheated rich glycol flows down the still column, which is equipped with a packed section, counter-current with reboiled glycol and water vapors from the reboiler and the heat from this contact strips the water from the down flowing desiccant. The packing ensures good contact between rich glycol and the glycol and water vapors. The vaporized water rises up the still column and is directed to a thermal oxidizer.

The now lean glycol exits the bottom of the still column and enters the Glycol Reboiler 115-13-Z001 where it is heated indirectly to 192 to 200°C by a gas fired burner to develop the overhead vapors required in the still column reaction.

The lean glycol level is controlled by a weir in the reboiler which allows flow to the glycol stripping column 115-13-Z-004B. The stripping column is mounted vertically through the reboiler so that the stripping column is immersed in hot liquid desiccant to make up for heat lost in the process of vaporizing further water with hot octane stripping vapor in the stripping column.

The lean glycol enters the top of the stripping column, which is equipped with a packed section, and flows down, counter-currently contacting rising hygroscopic stripping gas, which absorb most of the remaining traces of water in the glycol, which then exits the bottom of the stripper.

The Stripping Gas Operation System

1) Establish stripping gas flow into the stripping gas system by setting the stripping gas regulator to aprox.5 psi (The supply shutdown valve should be opened as the reboiler is up and running), then open the supply and return ball valves to the stripping gas reflux coil (the bypass should be closed) and open the grobe valve and set a modest initial flowrate through the octane vaporization coils. All vapour coil bypass valves should be closed to maximize the stripping gas temperature attained through the coil.Open both stripping gas column inlet ball valves half way to implement a split flow to the two striping sections.
2) The hot stripping gas enters the stripping column and rise up through the packed sections, effecting intimate contact with the down flowing glyol. The hot moisture laden stripping gas the flow up the annulus of the octane/water separator and through the octane condenser where it is cooled to (99.3-121C). The warm stripping gas the enters the octane/water separator and exits out the non-condensable gas outlet and floe to still column, firat blowing the liquid seal of the still olumn seal pot.

3) The warm moisture laden stripping gas rises up the still column and pass through the packed reflux section and over the reflux cooling coils at the top of column. Here the stripping gas is cooled to from (79.4 to 93.3 C) and reflux water is generated from the gas and stream at the top of still column. The reflux water flows down into the packed reflux section and contact rising TEG vapors and condence them back down to the process. The reflux water thus generated should constitute about 25% of the total stream produced in order to keep glycol equilibrium losses in the reboiler overheads to a minimum.

4) The warm saturated stripping gas and stream the exit the stram outlet connection of the still column for venting or incineration.

Lean glycol then flows from the stripping column to the lean/rich glycol exchanger, where it is cooled against rich glycol, and on through to the Glycol Surge Tank 115-13-Z-002. Lean glycol then flows from the surge tank to the suction of the Glycol Circulation Pumps 115-13-PM-001A/B which reinject the lean glycol into the top of the glycol contactor, thus completing a full regeneration circuit. The surge drum provides the glycol circulation system with surge volume to ensure a steady flow of lean glycol to the contactor under normal operating conditions.

The glycol surge tank is provided with a fuel gas blanket through Pressure Regulator 115-13-PCV-116 which is set to maintain a pressure of at least 2inch Water Column in the vessel. Excess pressure is vented to safe location through a second Pressure Regulator 115-13-PCV-115 which is set to open if the pressure rises to 4inch Water Column.

3.0 EQUIPMENT DESCRIPTION

3.1 Glycol Flash Drum 115-13-V-001

Refer to P&ID: PHM-115-FE-006 Glycol Regeneration Package.

3.1.1 Function

Glycol Flash drum 115-13-V-001 is provided to release entrained gas and separate any entrained hydrocarbon condensate from the rich glycol.

3.1.2 Technical Data

For details of the design and operating parameters, refer to Table 3.1 – Design and Operating Parameters Glycol Flash drum 115-13-V-001.

Table 3.1 – Design and Operating Parameters Glycol Flash Drum 115-13-V-001

Parameter	Design	Operating
Pressure	10.35barg	4.48 to 6.2barg
Temperature (Max/Min)	93.3°C/-29°C	31 to 41.4°C
Volume	0.75m^3	–

3.1.3 Technical Description

Glycol Flash drum 115-13-V-001 is a horizontal three phase separator vessel constructed from carbon steel with an inside diameter of 1.22 m and a length of 3.05m. The rich glycol enters the vessel through a nozzle in the end of the vessel, which has a diffuser to reduce the energy in the fluid stream. A bucket is provided fixed inside the vessel to collect the hydrocarbon condensate skimmed from above the rich glycol.

Flash gas leaves the vessel through a 2 inch nozzle with a mist pad to reduce liquid carry over.

Rich glycol leaves the vessel under level control flowing to the glycol filters.

Level Gauge 115-13-LG-111 provides local indication of the condensate level in the bucket.

Level Gauge 115-13-LG-112 provides local indication of the rich glycol level.

Pressure Gauge 115-13-PG-111 provides local indication of the glycol flash drum pressure.

Temperature indicator 115-13-TG-111 provides local indication of the rich glycol temperature.

3.2 Glycol Particulate Filter 115-13-W-001

Refer to P&ID: PHM-115-FE-006 Glycol Regeneration Package.

3.2.1 Function

Glycol Particulate Filter 115-13-W-001 is provided to remove particles of 5 micron nominal from the rich glycol stream leaving the flash drum.

3.2.2 Technical Data

For details of the design and operating parameters, refer to Table 3.2 – Design and Operating Parameters Glycol Particulate Filter 115-13-W-001.

Table 3.2 – Design and Operating Parameters Glycol Particulate Filter 115-13-W-001

Parameter	Design	Operating
Pressure	10.35barg	3.8barg
Temperature (Max/Min)	93.3°C/-29°C	31 to 41°C
Capacity	5m^3/h	5m^3/h
Solids Removal Efficiency	5 micron particles	

3.2.3 Technical Description

The Glycol Particulate Filter 115-13-W-001 comprises of a vertical cylindrical filter-housing vessel containing five Jonell PM-336 elements.

The particulate filter has an OD of 0.324m and is 1.067m in length, seam to seam.
Pressure Transmitter 13-PDIT-111 provides indication of the pressure difference over the filter.

Pressure Safety Valve 115-13-PSV-113 provides protection inlet to the filters.

3.3 Glycol Charcoal Filter 115-13-W-002

Refer to P&ID: PHM-115-FE-006 Glycol Regeneration Package.

3.3.1 Function

Glycol Charcoal Filter 115-13-W-002 is provided to eliminate most foaming problems by removing the hydrocarbons, well treating chemicals, compressor oils and other troublesome impurities from the glycol.

3.3.2 Technical Data

For details of the design and operating parameters, refer to Table 3.3 – Design and Operating Parameters Glycol Charcoal Filter 115-13-W-002.

Table 3.3 – Design and Operating Parameters Glycol Charcoal Filter 115-13-W-002

Parameter	Design	Operating
Pressure	10.35barg	3barg
Temperature (Max/Min)	93.3°C/-29°C	31 to 41°C
Capacity	5m^3/h	5m^3/h

3.3.3 Technical Description

Glycol Charcoal Filter 115-13-W-002 is a vertical housing containing three Jonell FA8038AACE canisters.

The charcoal filter has an OD of 0.406m and is 1.067m in length, seam to seam. Pressure Transmitter 115-13-PDIT-112 provides indication of the pressure difference over the filter.

3.4 Glycol/Glycol Exchanger 115-13-H-001A / B (2 x 100%)

Refer to P&ID: PHM-115-FE-007 Glycol Regeneration Package.

3.4.1 Function

Glycol /Glycol Exchanger 115-13-H-001A/B (2x100%) are provided to heat the rich glycol coming from the flash drum, via the filters en-route to the reboiler still. The heat increase is by way of heat interchange with the hot lean glycol coming from the reboiler enroute to the surge tank.

3.4.2 Technical Data

For details of the design and operating parameters, refer to Table 3.4 – Design and Operating Parameters Glycol/Glycol Exchanger 115-13-H-001A/B

Table 3.4 – Design and Operating Parameters Glycol/Glycol Exchanger 115-13-H-001

Parameter	Design	Operating
Pressure (Hot/Cold)	10.3barg/10.3barg	0.5barg/3barg
Temperature (Hot/Cold)	232°C/232°C	204°C to 43°C
Capacity (hot and Cold)	5m^3/h	5m^3/h
Thermal Duty	483kW.	–

3.4.3 Technical Description

The Glycol/Glycol Exchanger is a Viex 'Viexbloc' model VCP-30 welded plate exchanger. The exchanger is comprised of a stack of corrugated plates held between an upper and lower head. A baffle plate in the middle of the stack separates outward flow from inward flow.

The sides of the plate stack are sealed by four plates opposing plates being held in place by tie bolts. Each pair of opposing plates has a blank plate which links the plate stacks above and below the baffle and a nozzle plate with the inlet and outlet nozzles for the pass.

The temperature of the rich glycol leaving the exchanger is indicated locally on 115-13-TG-118.

3.5 Glycol Azeotropic Distillation Reboiler 115-13-Z-001

Refer to P&ID: PHM-115-FE-007 Glycol Regeneration Package.

3.5.1 Function

Glycol Azeotropic Distillation Reboiler 115-13-Z-001 is provided to reduce the water and hydrocarbon content of the rich glycol stream to produce lean glycol by increasing the temperature of the liquid to boil off the water.

3.5.2 Technical Data

For details of the design and operating parameters, refer to Table 3.5 – Design and Operating Parameters Glycol Azeotropic Distillation Reboiler 115-13-Z-001.

Table 3.5 – Design and Operating Parameters Glycol Azeotropic Distillation Reboiler 115-13-Z-001

Parameter	Design	Operating
Pressure	1.03barg	Atmos
Temperature	232°C	192 to 200°C
Capacity	–	5m^3/h
Total Glycol Capacity	18927ltr	–
Octane Capacity	832.8ltr	–
Glycol Loss	0.1USgal/MMscf	< 0.1USgal/MMscf
Octane Loss	0.1USgal/MMscf	< 0.1USgal/MMscf
TEG Concentration	99.99% TEG	>99.99% TEG
Glycol Circulation Rate	5.7m^3/h	5m^3/h

3.5.3 Technical Description

The Glycol Azeotropic Distillation Reboiler 115-13-Z-001 is in four main parts:

Glycol Accumulator

Glycol Reboiler

Gas Stripping Column

Regeneration Still Column

The Glycol Reboiler 115-13-Z-001 is a horizontal cylindrical vessel closed at the outlet end and fitted with a flanged closure at the inlet end. The flanged closure is part of the gas fired heater and flue. The burner and flame U tube are located below the normal glycol level and the vertical flue is taken from the higher end of the U tube outside of the reboiler. A flanged nozzle is provided on the top of the reboiler to mount the still column.

A 2in fill connection is provided on top of the vessel for initial fill and top-up of the system.

The Glycol Still 115-13-Z-003 is a vertical cylindrical column mounted on the flange located on top of the reboiler vessel. The still has an irregularly packed section defined by a perforated plate at the top and bottom of the section which support and retain the packing.

The packing used is stainless steel Pall Rings. The preheated rich glycol flows into the still through a distributor located in the packed section just below the top plate.

A reflux coil and a heating coil are located between the top of the packed section and the vapour outlet section. The reflux coil is used to control column top temperature using cold rich glycol as the coolant, the heating coil is used to heat fuel gas to be used in the stripping column. The overhead temperature in the glycol still is controlled by adjusting the flow through the coils by routing some cool rich glycol and fuel gas through bypasses around the coil.

The nozzle for the vapour outlet is located on the side of the column near to the top A demister pad is provided below the vapour outlet to restrict liquid carryover.

The stripping column is vertical cylindrical column, passing through the reboiler at the opposite end to the heater. The stripping column has two parts, a Gas Stripping Column 115-13-Z-004A and a Stripping Medium Water Separator 115-13-Z-004B.

The top of Gas Stripping Column 115-13-Z-004A is sets the level in the reboiler to maintain a level sufficient to cover the reboiler heaters. The gas stripping column has two packed sections and protrudes from the bottom of the reboiler vessel terminating with a nozzle for the stripping gas comprised of fuel gas and azeo-octane vapour.

The Stripping Medium Water Separator 115-13-Z-004B is a vertical cylindrical column with a central cylinder forming an annulus. The vapour from the gas stripping column flows up through the inner column to the condenser.

Returning liquids from the condenser enter the annulus and separation of the water and the liquid octane takes place. The water leaves through a 1½inch nozzle flowing to the reboiler under level control. The octane overflows through a 1¼inch nozzle flowing under gravity to the heating coils in the reboiler to be vaporised and reused in the stripping process. A balance line is provided between the still and the stripping medium water separator to assist gravity flow.

The lean glycol flows from a 3 inch nozzle at the bottom of the stripping column flowing to the glycol surge tank.

The temperature of the glycol in the reboiler is indicated locally on 115-13-TG-117.

The level of octane build up in the vaporiser is indicated locally on 115-13-LG-117.

The level in the seal pot on the balance line to the stripping medium water separator is indicated locally on 115-13-LG-116.

The level in the stripping medium water separator is indicated locally on 115-13-LG-115.

3.6 Condenser 115-13-Z-005

Refer to P&ID: PHM-115-FE-007 Glycol Regeneration Package.

3.6.1 Function

The condenser is used to cool the vapours from the top of the Gas Stripping Column so that they condense.

3.6.2 Technical Data

For details of the design and operating parameters, refer to Table 3.6 – Design and Operating Parameters Condenser 115-13-Z-005.

Table 3.6 – Design and Operating Parameters Condenser 115-13-Z-005

Parameter	Design	Operating
Pressure	1barg @ 232°C	0
Temperature	232°C	90°C
Cooling Duty	966060 BTU/hr	–
Electric Motor	5.6kW	–

3.6.3 Technical Description

The condenser is finned tube cooler with air cooling provided by an electric motor driven constant speed fixed pitch fan. The finned tubes are in parallel and connect to a inlet and outlet header box at each end.

Temperature control is provided by an adjustable louver in the air stream, downstream of the cooling coils.

3.7 Octane Make-up Tank 115-13-Z-006

Refer to P&ID: PHM-115-FE-007 Glycol Regeneration Package.

3.7.1 Function

The Octane Make-up Tank stores the Azeo Octane liquid for make up of the circulating fluid in the gas stripping column.

3.7.2 Technical Data

For details of the design and operating parameters, refer to Table 3.7 – Design and Operating Octane Make-up Tank 115-13-Z-006.

Table 3.7 – Design and Operating Parameters Octane Make-up Tank 115-13-Z-006

Parameter	Design	Operating
Pressure	1 barg	Atmospheric
Temperature (Max/Min)	150°C	90°C
Capacity	0.5m^3	–

3.7.3 Technical Description

The octane make-up tank is a carbon steel horizontal cylindrical vessel 0.914m OD and 1.219m long. The tank has a 1½in nozzle on top for a balance line to the stripping medium water separator and a 1½in nozzle on the bottom as make up outlet to the stripping medium water separator. A hatch is provided on top of the vessel to enable liquid to be added and to facilitate inspection.

A local level gauge LG-113 is provided on the tank.

3.8 Glycol Surge Tank 115-13-Z-002

Refer to P&ID: PHM-115-FE-007 Glycol Regeneration Package.

3.8.1 Function

To absorb surges in the system prior to being pumped to the glycol contactor.

3.8.2 Technical Data

For details of the design and operating parameters, refer to Table 3.8 – Design and Operating Parameters Glycol Surge Tank 115-13-Z-002.

Table 3.8 – Design and Operating Parameters Glycol Surge Tank 115-13-Z-002

Parameter	Design	Operating
Pressure	1barg	Zero
Temperature	150°C	75 to 85°C
Capacity	2m^3	–

3.8.3 Technical Description

The surge tank is constructed from carbon steel and is 3.05m in length with a 1.22m diameter. The tank is lagged for personnel protection.

A 2in fill connection is provided on top of the vessel for initial fill and top-up of the system.

A cooling coil is provided in the base of the vessel through which cool fuel gas flows to preheat the fuel gas and provide some cooling of the lean glycol in the vessel.

The lean glycol leaves the vessel flowing to the circulation pumps through a 4in nozzle fitted with a vortex breaker in the bottom of the tank.

A minimum flow recycle line from the pump discharge directs lean glycol to the surge tank through a 2in nozzle on top of the tank to maintain minimum flow through the pump.

A local level gauge 13-LG-114 is provided on the tank.

3.9 Glycol Circulation Pumps 115-13-PM-001A/B

Refer to P&ID: PHM-115-FE-006 Glycol Regeneration Package.

3.9.1 Function

The glycol circulation pumps transfer the glycol from the surge tank to the glycol contactor at a rate sufficient to dry the wet gas to the required specification.

3.9.2 Technical Data

For details of the design and operating parameters, refer to Table 3.9 – Design and Operating Parameters Glycol Circulation Pumps 115-13-PM-001A/B.

Table 3.9 – Design and Operating Parameters Glycol Circ Pumps 115-13-PM-001A/B

Parameter	Design	Operating
Operating Pressure	57barg	49barg
Temperature	116°C	43°C to 85 °C
Capacity	6.02 m³/hr	5.68 m³/hr
Motor Rating	14.9kW	–
Pump Speed	1500rpm	Variable

3.9.3 Technical Description

The two 100% glycol circulation pumps are Rotor-Tech Model GS3314 pumps operated as one duty and one standby. The pumps are gear type pumps each driven by an electric motor at 1500rpm to achieve the required capacity.

Pressure Gauges 115-13-PG-115/116 provide local indication of the pressure at the pumps discharge.

3.10 Glycol Make-up Pumps 115-13-PM-002

Refer to P&ID: PHM-115-FE-007 Glycol Regeneration Package.

3.10.1 Function

The Glycol makeup pumps are used to top up the system at the reboiler or glycol surge tank through a hard piped connection with fresh glycol when needed.

3.10.2 Technical Data

For details of the design and operating parameters, refer to Table 3.10 – Design and Operating Parameters Glycol Make-up Pumps 115-13-PM-002

Table 3.10 – Design and Operating Parameters Glycol Make-up Pumps 115-13-PM-002

Parameter	Design	Operating
Pressure	1.5barg	–
Temperature	57°C	Ambient
Capacity	2.3m³/hr at 1.5barg	2.3m³/hr

3.10.3 Technical Description

The Glycol Make-up Pumps 115-13-PM-002 is Diaphragm type pump operated manually with one as required. The pumps are Diaphragm pumps, each driven by the instrument air.

4.0 INSTRUMENTATION AND CONTROL

4.1 Glycol Flash Drum 115-13-V-001

Refer to P&ID: PHM-115-FE-006 Glycol Regeneration Package.

4.1.1 Pressure

The pressure in the glycol flash tank is controlled at 6.2barg by a self regulating Pressure Control Valve 115-13-PCV-112, which vents excess gas to the fuel gas scrubber for use as fuel gas.

Should the pressure in the glycol flash tank fall then self regulating Pressure Control Valve 115-13-PCV-113 will open at 4.48barg to maintain the gas blanket in the glycol flash tank with gas from the fuel gas system.

Pressure in glycol flash tank is indicated locally on 115-13-PG-111.

Pressure in the glycol flash tank is indicated on the DCS by 115-13-PIA-111, which provides a high-pressure alarm on the DCS.

Overpressure protection for the glycol flash drum is provided by Pressure Relief Valve 115-13-PSV-111 set to relieve at 10.34barg to the LP Flare.

4.1.2 Liquid Level

The rich glycol level in the glycol flash drum is controlled by 115-13-LICA-112 acting on 115-13-LCV-112. The level transmitter 115-13-LT-112 is installed in a still tube. The level controller also generates high and low level alarms on the DCS and a low level trip signal which is sent to the SDS System, which performs the necessary executive actions identified on the cause and effect charts.

The hydrocarbon condensate level in the skimming bucket is controlled by 115-13-LICA-111 acting on 115-13-LCV-111. The level controller also generates high and low level alarms on the DCS. A manual bypass is provided around the level control valve to facilitate manual draining of the condensate bucket.

4.2 Glycol Particulate Filter 115-13-W-001

Refer to P&ID: PHM-115-FE-006 Glycol Regeneration Package.

4.2.1 Pressure

Differential pressure across the filter is measured by 115-13-PDIT-111 which also provides indication and a high DP alarm on the DCS through 115-13-PDIA-111.

Overpressure protection for the glycol particulate and charcoal filters on blockage of the filters is provided by Pressure Relief Valve 115-13-PSV-113 set to relieve at 2.07barg to the charcoal filter outlet.

4.3 Glycol Charcoal Filter 115-13-W-002

Refer to P&ID: PHM-115-FE-006 Glycol Regeneration Package Unit.

4.3.1 Pressure

Differential pressure across the filter is measured by 115-13-PDIT-112 which also provides indication and a high DP alarm on the DCS through 115-13-PDIA-112.

Also refer to Paragraph 4.2.1.

4.4 Glycol Azeotropic Distillation Reboiler, Still and Stripping Column 115-13-Z-001/003/004A/B

Refer to P&ID: PHM-115-FE-007 Glycol Regeneration Package.

4.4.1 Pressure

There is no pressure control for the reboiler but 115-13-PSV-112 provides overpressure protection set at 1.0 barg.

The fuel gas pressure for the burner pilot is set by pressure regulator 115-13-PCV-114 which has a set point of 0.2 barg.

4.4.2 Liquid Level

Level in the reboiler is controlled by lean glycol overflowing a weir into the stripping column. A low level alarm and trip signal for reboiler level is provided by 115-13-LIA-114.

The trip signal is sent to the SDS System, which performs the necessary executive actions identified on the cause and effect charts.

The level in the stripping medium water separator 115-13-Z-004B is controlled by 115-13-LC-115 modulating 115-13-LCV-115.

4.4.3 Temperature

Temperature in the reboiler is controlled by 115-13-TICA-115, which controls the flow of fuel gas to the burner via the Burner Management System (BMS) 115-13-BM-111 and 115-13-TCV-115.

The BMS can trip the supply of fuel gas to the burner under fault conditions by tripping the 115-13-TCV-115 and closing the Fuel Supply Shutdown Valves 115-13-SDV-112A and 115-13-SDV-112B and the shutdown valve 115-13-SDV-112D on the stripping gas supply.

The Shutoff valves and shutdown valve are also closed on USD by de-energising the Solenoids 115-13-SDY-112A, 115-13-SDY-112B and 115-13-SDY-112D.

The controller also provides a high temperature alarm on the DCS. A second Temperature Transmitter 115-13-TT-116 provides indication through 115-13-TIA-116.

The transmitter also provides a high and low temperature Trip Signal TAHH-116 and TALL-116 to the SDS System, which performs the necessary executive actions identified on the cause and effect charts.

4.5 Condenser 115-13-Z-005

Refer to P&ID: PHM-115-FE-007 Glycol Regeneration Package.

4.5.1 Temperature

Temperature Controller 115-13-TIC-117 controls the air flow through the fin fan cooler by adjusting the louvers on the condenser. The temperature controller also provides a high and low Temperature Alarm 13-TAH-117 and 13- TAL-117 on the DCS.

4.5.2 Motor Control

The fan motor is stopped and started a local panel or remote operation through from DCS using the start and stop pushbuttons 115-13-HSH-117 and 115-13-HSL-117 respectively. The fan can also be selected for remote operation through Local/Remote Switch 115-13-HSS-117.

The fan can also be stopped on a USD signal; from the SDS.

Running, Fault and Stopped status is indicated on 115-13-YLH-117, 115-13-XA-117 and 115-13-YLL-117 respectively.

4.6 Glycol Surge Tank 115-13-Z-002

Refer to P&ID: PHM-115-FE-007 Glycol Regeneration Package.

4.6.1 Liquid Level

Level in the glycol surge tank is measured by a Level Transmitter 115-13-LT-113, located in a still tube. The transmitter provides level indication on 115-13-LIA-113 and a low level alarm on the DCS. The indicator also generates a trip signal which is transmitted to the SDS to initiate executive actions as described in the cause and effect charts.

4.6.2 Temperature

The temperature of the lean glycol in the surge tank is measured by Temperature Transmitter 115-13-TT-119 which provides indication and a high temperature alarm on the DCS.

4.7 Glycol Circulation Pumps 115-13-PM-001A/B

Refer to P&ID: PHM-115-FE-006 Glycol Regeneration Package.

4.7.1 Pressure

There is no pressure control for the pumps but 115-13-PSV-114/15 provides overpressure protection set at 60.68barg.

4.7.2 Flow

Discharge flow is monitored by Flow Element 115-13-FE-111 in the common discharge which provides the process variable to the Flow Controller 115-13-FIC-111. The Flow controller provides a speed control signal to the speed controllers for the A and B pumps 115-13-SC-115/116 which control the variable speed drives for the pump motors to control flow.

4.7.3 Motor Control

The A and B pump motors are stopped and started from a local panel using the start and stop pushbuttons 115-13-HSH-115/116 and 115-13-HSL-115/116 respectively.
The pumps can also be selected for remote operation through Local/Remote Switches 115-13-HSS-115/116.

The pumps can also be stopped on a USD signal from the SDS.

Running, Fault and Stopped status is indicated on 115-13-YLH-115/116, 115-13-XA-115/115 and 115-13-YLL-115/116 respectively.

4.8 Glycol Make-up Pumps 115-13-PM-002

Refer to P&ID: PHM-115-FE-007 Glycol Regeneration Package.

4.8.1 Motor Diaphragm Pump Instrument Air Control

The Diaphragm pump is stopped and started manually from a local by close or open the instrument air supply to the pump.

5.0 ENVIRONMENTAL, HEALTH AND SAFETY REQUIREMENTS

5.1 General EHS Requirements

5.1.1 Chemicals

The following chemical is used in this system, or may be present under upset conditions:

Tri-ethylene Glycol

pH Neutraliser

Defoamer

Personnel should ensure that they are fully familiar with the Material Safety Data Sheet (MSDS) for each chemical, which details precautions and the protective apparel and equipment

necessary when handling the chemicals. The precautions detailed must be adhered to at all times.

5.1.2 Hazardous Sources

Table 3.11 – Hazardous Sources lists potential hazardous sources that may be present under upset conditions affecting the Glycol Regeneration System.

Table 3.11 – Hazardous Sources

Hazard	Source	Hazardous Event	Effect	Control
High temperature Lines and vessels	Throughout system	Potential for injury due to contact with hot surfaces (200°C)	Potential for personnel injury	Lagging for personnel protection
Hot Glycol under pressure	Glycol Contactor and Glycol Cooler	Potential for injury due to contact with hot contaminated glycol	Potential for personnel injury	Glycol Regeneration control

5.2 Specific Health and Safety Requirements

The correct use of Personal Protective Equipment (PPE) is fundamental in securing a safe and healthy place of work for all personnel. PPE shall be used in conjunction with appropriate health, environment and safety procedures that are designed to minimise the potential risk of harm or injury to personnel, while also promoting safe working practices.

5.3 Specific Environmental Requirements

In addition to absorbing water from the gas, glycol also absorbs carcinogenic aromatics from the gas stream. These include benzine, toluene, ethylbenzine and xylene. As a result, care should be taken to avoid contact with glycol when sampling or when draining and flushing the system to allow maintenance.

To prepare the Glycol Regeneration System for the introduction of Glycol, it is necessary to remove all air from the system. Nitrogen maybe utilized for this purpose through the dedicated purge points that are provided with the necessary isolation valves and a non-return valve.

Similarly, when preparing equipment for maintenance, nitrogen maybe used to purge hydrocarbons from the system before breaking containment and introducing air.

When purging the system of air prior to introduction of hydrocarbons, the atmoPig in the system should be tested with an Oxygen Content Analyser to determine the level of oxygen remaining in the purged system.

When purging is being performed to remove hydrocarbons, a suitable test instrument, which uses thermal conductivity or infra-red absorption, capable of detecting hydrocarbons in nitrogen. Pelister type instruments cannot be used, as they require at least 13% oxygen to operate.

WARNING: NITROGEN IS AN ASPHYXIANT, AND IS COLOURLESS AND ODOURLESS: RAPID AND UNRECOGNISED LOSS OF CONSCIOUSNESS CAN OCCUR IN PERSONS EXPOSED TO A NITROGEN-ENRICHED ATMOPIG. WHEN USING NITROGEN, CARE SHOULD BE TAKEN TO ENSURE THAT NITROGEN ESCAPES ARE DISPERSED AND NOT ALLOWED TO COLLECT IN ENCLOSED AREAS.

6.0 REFERENCE INFORMATION

6.1 Company Documentation

Document Number	Document Title
2002-PDS-115-13-S-003-004-1	Glycol Dehydration Unit and Glycol Regeneration Package Process Data Sheet
PH-10-OP-SOP-00003	Standard Operating Procedure for the Glycol Regeneration System

6.2 Vendor Documentation

Document Number	Document Title
E1455-041 Sht 1 of 4	Gas TEG Azeotropic Dehydration Unit
E1455-041 Sht 2 of 4	Gas TEG Azeotropic Dehydration Unit
E1455-041 Sht 3 of 4	Gas TEG Azeotropic Dehydration Unit
E1455-041 Sht 4 of 4	Gas TEG Azeotropic Dehydration Unit
E1455-04	Operations Manual

6.3 Engineering Drawings (PFDs, UFDs and P&IDs)

Drawing Number	Drawing Title
PHM-115-FP-002	Sinphuhorm GPP PFD – Gas Dehydration
PHM-115-FE-005	Sinphuhorm GPP P&ID – Glycol Contactor
PHM-115-FE-006	Sinphuhorm GPP P&ID – Glycol Regeneration package
PHM-115-FE-007	Sinphuhorm GPP P&ID – Glycol Regeneration package

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CONDENSATE TREATMENT, STORAGE AND EXPORT

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1.0 INTRODUCTION

1.1 System Purpose/Function

The Condensate Treatment, Storage and Export System is designed to carry out the following two main processes:

Remove any entrained water from the condensate and route the water to the Produced Water System for further processing

Stabilize the condensate for on-site storage and subsequent onward transportation using road tankers. The condensate export facilities include the fiscal metering of the condensate prior to loading of the road tankers

1.2 Primary Components

Tag No	Equipment Title/Description
115-02-H-001	Condensate Heater
115-02-V-004	High Pressure Flash Vessel
115-02-V-005	Low Pressure Flash Vessel
115-02-PM-002A/B	Condensate Pumps
115-02-H-002A/B	Condensate Cooler
115-02-T-001A/B	Condensate Storage Tanks
115-02-PM-001A/B	Condensate Loading Pumps
115-02-S-015	Condensate Loading Package

1.3 Primary Interfaces

Input Interfaces:

Gas Treatment, Metering and Export (refer to Section 2.0 of this document)

Fuel Gas System (refer to Section 7.0 of this document)

PCSS System (refer to Section 14.0 of this document)

Output Interfaces:

Fuel Gas System (refer to Section 7.0 of this document)

Produced Water Treatment (refer to Section 5.0 of this document)

Closed and Open Drains (refer to Section 8.0 of this document)

2.0 SYSTEM DESCRIPTION

2.1 System Overview

Refer to Overview Figure 4.1.

Liquids let down from Slug Catcher 115-00-Z-001 are passed through the Condensate Heater 115-02-H-001 in order to raise the temperature of the liquids and thereby avoiding any potential hydrate occurrences when the pressure is dropped across the flow control valves before entering the high pressure (HP) flash drum.

The warmed incoming liquids pass into the HP Flash Vessel 115-02-V-004 together with the liquid let down from Inlet Coalescing Filter Separator 115-00-V-003. Within the HP flash vessel sufficient retention time is provided to allow the condensate to separate from the water and develop a water/condensate interface. The condensate passes over the internal weir in the HP flash vessel under level control to the LP flash vessel. The separated water within the HP flash drum is passed under level control to the Produced Water System, with the gas evolved within the vessel passed forward under pressure control to the Fuel Gas System.

Within the LP Flash Vessel 115-02-V-005 sufficient retention time is provided to allow the gas to be separated from the condensate, with the gas evolved passed under pressure control to Thermal Oxidiser 115-27-Z-001 for safe disposal by burning. The condensate is now stabilised enough to be passed forward for storage in Condensate Storage Tanks 115-02-T-001A/B.

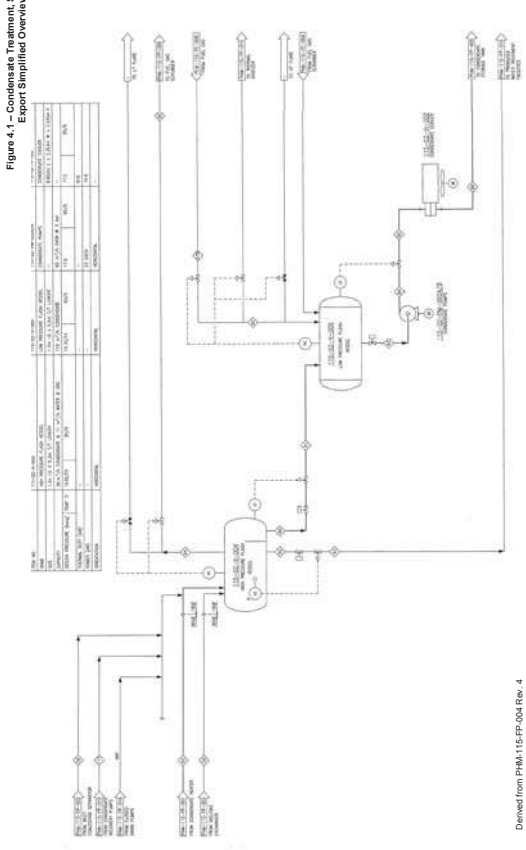
The condensate is pumped from the LP flash vessel to the storage tanks by the Condensate Pumps 115-02-PM-002A/B under level control, firstly passing through Condensate Cooler 115-02-H-002A/B provided to lower the temperature of the condensate prior to entering the storage tanks.

The condensate remains in the storage tanks until such time as there is sufficient quantity for it to be exported. While it remains in the tanks, any remaining vapours are weathered off to a safe location, further helping to stabilise the condensate.

The condensate is pumped to the Condensate Loading Package 115-02-S-015 by Condensate Loading Pumps 115-02-PM-001A/B.

The condensate loading package comprises a loading bay with two loading arms each with its own metering and batch loading system. The system is designed to safely load bottom-loading tankers, and to meter the quantity of stabilised condensate exported to the road tankers to fiscal standards.

Figure 4.1 – Condensate Treatment, Storage and Export Simplified Overview Schematic



Derived from PHM-115-FP-004 Rev. 4

2.2 Primary Flow Description

Refer to P&IDs:

PHM-115-FE-002 Slug Catcher

PHM-115-FE-003 Inlet Coalescing Filter Separator and Heater

PHM-115-FE-011 Condensate Heater

PHM-115-FE-012 High Pressure Flash Vessel

PHM-115-FE-013 Condensate Storage Tanks

PHM-115-FE-014 Condensate Loading and Transfer

PHM-115-FE-018 Low Pressure Flash Vessel

PHM-115-FE-019 Condensate Pumps and Cooler

Slug Catcher 115-00-Z-001 operates at a pressure of between 35barg and 85 barg and separates bulk liquids from the produced gas stream imported from the three well locations via the 400mm pipeline. The maximum throughput is 200MMscfd of gas with 110m^3/hr of liquids.

The liquid level in the slug catcher is maintained by Level Controller 00-LICA-101,which provides to control Flow Control Valves 115-02-FCV-101A/B, which controls the flow of liquid from the slug catcher through the Condensate Heater 115-02-H-001 to the HP Flash Vessel 115-02-V-004. Flow Control Valves 115-02-FCV-101A/B with a 15% and 85% split between the two valves to handle a flow of up to 110m^3/h. Using the level control output to set the flow controller set point ensures a steady flow of liquids to the downstream condensate treatment facilities.

Condensate Heater 115-02-H-001 raises the temperature of the liquids to approximately 60°C upstream of Flow Control Valves 02-FCV-101A/B, by using heating medium passing through the exchanger shell to control the temperature of the liquid outlet.

Downstream of the flow control valves, the warmed liquid enters HP Flash Vessel 115-02-V-004 together with condensate letdown from the Inlet Coalescing Filter Separator 115-00-V-003. The HP flash vessel operates at approximately 7.0barg which results in the entrained gas in the liquids to be released, passing out of the vessel through a demister pad to the Fuel Gas System.

Liquids entering the HP flash vessel pass through a vane pack diffuser device and into the base of the vessel where the liquids pass through perforated baffles and an inclined plate coalescing pack to aid condensate water separation. Water is drawn off upstream of a weir under the level control of Level Control Valve 115-02-LCV-102 and fed forward to the produced water treatment facility for further processing. Refer to Section 5.0 of this volume for further details. The condensate overflows the weir and exits the vessel under split range level control using Level Control Valves 115-02-LCV-104A/B and is fed forward to the LP Flash Vessel 115-02-V-005. Level Control Valves 115-02-LCV-104A/B have a 15% and 85% split range to handle a slug flow of up to 110 m^3/h.

The LP flash vessel operates at approximately 0.25barg, which encourages any remaining vapours in the condensate to be released from the condensate and passed to Thermal Oxidiser 115-27-Z-001 where it is incinerated as waste gas. The stabilised condensate within the LP flash drum exits the vessel under split range level control using Level Control Valves 115-02-LCV-105A/B and is pumped by Condensate Pumps 115-02-PM-002A/B to the Condensate Storage Tanks 115-02-T-001A/B. Prior to entering the storage tanks the condensate is cooled to approximately 45°C by the fan assisted Condensate Cooler 115-02-H-002 A/B.

Condensate Storage Tanks 115-02-T-001A/B are maintained at between 10 and 20mbarg by self-actuating pressure control valves, which either vent excess breakout gas to a safe location, or permit gas from the Fuel Gas System to enter the storage tanks to maintain the vapour spaces inert when insufficient gas is derived from the stored condensate.

The condensate remains in the storage tanks until there is sufficient quantity for export. At this time it is pumped under operator control by Condensate Loading Pumps 115-02-PM-001A/B to the Condensate Loading Package 115-02-S-015.

The condensate loading package comprises a single loading bay with two loading arms while measuring to fiscal standards the condensate quantity being exported to the bottom loading tankers. After coupling up to the loading tanker(s) the condensate loading package start-up is initiated by the tanker driver, and working in conjunction with the on-site operator loads the road tanker(s).

The system operates under a batch controller, which requires the loading operator to identify himself via a card reader and log-on system for security purposes. The batch controller and flow controllers are linked to the Terminal Automation System (TAS), located in the loading bay which monitors, logs and controls the condensate export operations.

3.0 EQUIPMENT DESCRIPTION

3.1 Condensate Heater Strainers SP-115-28/67

Refer to PHM-115-FE-011 Condensate Heaters.

3.1.1 Function

The condensate heater strainers remove solid particles greater than 2000micron from the condensate flowing from the slug catcher prior to entering the condensate heater, which could otherwise possibly damage or clog the condensate heater tubes.

The strainers operate on a duty/standby basis using manual valve isolation. The duty unit is changed over to the standby unit by the operator when it requires to be cleaned.

3.1.2 Technical Data

For details of the design and operating parameters, refer to Table 4.1 – Design and Operating Parameters Condensate Heater Strainers SP-115-28/67.

Table 4.1 – Design and Operating Parameters Condensate Heater Strainers SP-115-28/67

Parameter	Design	Operating
Pressure	94.4barg	35 to 70barg
Temperature (Max/Min)	–29 to 85°C	15 to 45°C

3.1.3 Technical Description

The condensate heater strainers are vertical vessels constructed from carbon steel, each with a bolted top flange for access to the internals. Double block and bleed valves are located at the inlet, the outlet and on the drain line. The drain line is also fitted with a normally open spectacle blind.

3.2 Condensate Heater 115-02-H-001

Refer to PHM-115-FE-011 Condensate Heater.

3.2.1 Function

Condensate Heater 115-02-H-001 heats the condensate flowing from the slug catcher to eliminate the possibly hydrate formation when the wet condensate flashes across the flow control valves from the slug catcher to the HP flash vessel. The heater is also used to raise the

temperature in order to stabilize the condensate in conjunction with the pressure drop across the flow control valves.

3.2.2 Technical Data

For details of the design and operating parameters, refer to Table 4.2 – Design and Operating Parameters Condensate Heater 115-02-H-001.

Table 4.2 – Design and Operating Parameters Condensate Heater 115-02-H-001

Parameter	Design	Operating
Pressure Shell Side	40barg	7 to 8.0barg
Pressure Tube Side	94.4barg	46 to 70barg
Temperature Shell Side	200°C to 0°C	150°C (in) 100°C (out)
Temperature Tube Side	200°C to -29°C	15.9°C (in) 65°C (out)
Capacity	110m^3/h	Up to 110m^3/h
Temperature Differential		49°C
Heater Duty	2826kW	

3.2.3 Technical Description

Condensate Heater 115-02-H-001 comprises a horizontal steel shell with a semi hemispherical end and a flanged end. A 'U' shaped tube bundle is inserted into the vessel with the tube sheet clamped against the flanged end by a partitioned bonnet.

The bonnet has a 150mm inlet and outlet nozzle to route the condensate through the tube bundle separation of inlet and outlet being by the partition in the bonnet.

Heating medium enters and leaves the vessel through 80mm nozzles located diametrically opposite and close to the end of the shell. The heating medium makes a single pass along the length of the vessel.

The shell is constructed from carbon steel, has an inside diameter of approximately 489mm and has a length of approximately 7675mm. The tube bundle has 278 tubes constructed from stainless steel alloy tubing with a steel tube sheet. Condensate inlet temperature is indicated locally on Temperature Gauge 115-02-TG-103.

Heating medium inlet and outlet temperatures are indicated locally on Temperature Gauges 115-02-TG-104 and 115-02-TG-107 respectively.

For details of the condensate heater control and protection, refer to Paragraph 4.3 Instrumentation and Control.

3.3 High Pressure Flash Vessel 115-02-V-004

Refer to P&ID: PHM-115-FE-012 High Pressure Flash Vessel.

3.3.1 Function

High Pressure Flash Vessel 115-02-V-004 provides three-phase separation of the condensate let down from the slug catcher, the inlet filter coalescing, condensate recovered from the low temperature separator and produced water separator.

The separated condensate is forwarded to the low pressure flash vessel; produced water is routed to the produced water separator and off gas is sent to the fuel gas system.

3.3.2 Technical Data

For details of the design and operating parameters, refer to Table 4.3 – Design and Operating Parameters High Pressure Flash Vessel 115-02-V-004.

Table 4.3 – Design and Operating High Pressure Flash Vessel 115-02-V-004

Parameter	Design	Operating
Pressure	10.35barg to Full Vacuum	7barg
Temperature (Max/Min)	95°C/0°C	30 to 75°C
Capacity	99m^3/h condensate and 11m^3/h water/gas	Capacity
Normal Liquid Level (water)	0.45m	
Normal Liquid Level (condensate)	0.8m	

3.3.3 Technical Description

High Pressure Flash Vessel 115-02-V-004 is a horizontal vessel with an inside diameter of 1.9m and has a length of 6.3m, tan to tan. The vessel is constructed from carbon steel with a glass flake epoxy resin internal coating. The vessel is provided with two 600mm manways, one at either end, for maintenance and inspection purposes.

Condensate from the condensate heater together with streams from the inlet filter coalescing separator, condensate recovery pumps, and the condensate loading pump enters the vessel through an 200mm inlet nozzle. A vane pack diffuser device is provided to reduce the inlet velocity and assist in the separation process. Recovered condensate from the low temperature separator via the gas/gas exchanger enters the vessel through a 50mm inlet nozzle.

The condensate enters the vessel on the upstream side of a weir water separates from the condensate due to gravity. To aid in the condensate/water separation, the condensate flows through perforated baffles and an inclined plate coalescing pack upstream of the weir.

The separated water exits from the vessel via a 150mm nozzle upstream of the weir, while the condensate overflows the weir and exits the vessel through a 200mm nozzle. Both nozzles are provided with vortex breakers.

Gas given off from the condensate exits from the vessel through a demister pad via an 80mm nozzle on the top of the vessel.

The vessel is provided with a 50mm water connection at the base for sand jetting, cleaning purposes.

Level Gauge 115-02-LG-101 provides local indication of the water/condensate interface level.

Level Gauge 115-02-LG-102 provides local indication of the condensate level.

Pressure Gauge 115-02-PG-109 provides local indication of the pressure in the vessel.

Temperature Gauge 115-02-TG-102 provides local indication of the temperature in the vessel.

For details of the high pressure flash vessel control and protection, refer to Paragraph 4.3 Instrumentation and Control.

3.4 Low Pressure Flash Vessel 115-02-V-005

Refer to P&ID: PHM-115-FE-018 Low Pressure Flash Vessel.

3.4.1 Function

Low Pressure Flash Vessel 115-02-V-005 provides two-phase separation of received condensate from the high pressure flash vessel, recovered condensate from the fuel gas scrubber and the minimum flow line from the condensate pumps.

Gas given off from the condensate is sent to the thermal oxidiser and the condensate is forwarded to the condensate storage tanks by the condensate pumps.

3.4.2 Technical Data

For details of the design and operating parameters, refer to Table 4.4 – Design and Operating Parameters Low Pressure Flash Vessel 115-02-V-005.

Table 4.4 – Design and Operating Low Pressure Flash Vessel 115-02-V-005

Parameter	Design	Operating
Pressure	10.35barg to Full Vacuum	0.25barg
Temperature (Max/Min)	95°C/0°C	60°C
Capacity	110m^3/h condensate	
Normal Liquid Level (condensate)	0.65m	

3.4.3 Technical Description

Low Pressure Flash Vessel 115-02-V-005 is a horizontal vessel with an inside diameter of 1.7m and a length of 5.5m, tan to tan. The vessel is constructed from carbon steel with a glass flake epoxy resin internal coating. The vessel is provided with two 600mm manways, one at either end, for maintenance and inspection purposes.

Condensate from the high pressure flash vessel enters the vessel through an 200mm inlet nozzle and an inlet diffuser device is to assist in the separation process. Recovered condensate from the fuel gas scrubber and the minimum flow from the condensate pumps enter the vessel through an 80mm inlet nozzle.

The condensate exits the vessel via a vortex breaker through a 200mm nozzle.

Gas given off from the condensate exits from the vessel through a100mm nozzle on the top of the vessel via a demister pad.

Level Gauge 115-02-LG-104 provides local indication of the condensate level.

Pressure Gauge 115-02-PG-111 provides local indication of the pressure in the vessel.

Temperature Gauge 115-02-TG-105 provides local indication of the temperature in the vessel.

For details of the low pressure flash vessel control and protection, refer to Paragraph 4.4 Instrumentation and Control.

3.5 Condensate Pump Strainers SP-115-64/65

Refer to P&ID: PHM-115-FE-019 Condensate Pumps and Cooler.

3.5.1 Function

Condensate Pump Strainers SP-115-64/65 removes any solid particles greater than 2000micron from the condensate flowing from the slug catcher prior to entering the pump suction.

3.5.2 Technical Data

For details of the design and operating parameters, refer to Table 4.5 – Design and Operating Parameters Condensate Pump Strainers SP-115-64/65.

Table 4.5 – Design and Operating Parameters Condensate Pump Strainers SP-115-64/65

Parameter	Design	Operating
Pressure	17.5barg	0.25barg
Temperature (Max/Min)	0 to 95°C	65°C

3.5.3 Technical Description

The condensate pump strainers are vertical vessels constructed from carbon steel, each with a bolted top flange for access to the internals. Double block and bleed valves are located at the inlet, the outlet and on the drain line. The drain line is also fitted with a normally open spectacle blind.

3.6 Condensate Pumps 115-02-PM-002A/B

Refer to P&ID: PHM-115-FE-019 Condensate Pumps and Cooler.

3.6.1 Function

Condensate Pumps 115-02-PM-002A/B forward the separated condensate from the LP flash vessel to the condensate storage tanks via the condensate cooler.

3.6.2 Technical Data

For details of the design and operating parameters, refer to Table 4.6 – Design and Operating Parameters Condensate Pumps 115-02-PM-002A/B.

Table 4.6 – Design and Operating Parameters Condensate Pumps 115-02-PM-002A/B

Parameter	Design	Operating
Suction Pressure	–	0.25barg
Discharge Pressure	17.5barg	6.0barg
Temperature (Max/Min)	95°C/0°C	60°C
Capacity	60m^3/h @ 5barg	
Power	22kW	

3.6.3 Technical Description

Condensate Pumps 115-02-PM-002A/B are 100% duty, electrically-driven, centrifugal pumps operating on a duty/standby basis.

The pumps are provided with a minimum flow line, which returns to the low pressure flash vessel.

A manual isolation valve is fitted to each pump suction line upstream of the suction strainer. To clean the strainer, the pump must be shut down and isolated before the strainer can be removed.

A manual isolation valve is fitted to each pump discharge line downstream of a check valve, together with a 'normally-open' spectacle blind and removable spool piece for maintenance purposes.

Pressure Gauges 115-02-PG-112A/B provides local indication of pump 115-02-PM-002A/B suction pressure respectively.

Pressure Gauges 115-02-PG-113A/B provides local indication of pump 115-02-PM-002A/B discharge pressure respectively.

For details of the condensate pump control and protection, refer to Paragraph 4.5 Instrumentation and Control.

3.7 Condensate Cooler 115-02-H-002A/B

Refer to P&ID: PHM-115-FE-019 Condensate Pumps and Cooler.

3.7.1 Function

Condensate Cooler 115-02-H-002A/B is used to cool the condensate discharged from the condensate pumps prior to entering the condensate storage tanks.

3.7.2 Technical Data

For details of the design and operating parameters, refer to Table 4.7 – Design and Operating Parameters Condensate Cooler 115-02-H-002A/B.

Table 4.7 – Design and Operating Parameters Condensate Cooler 115-02-H-002

Parameter	Design	Operating
Pressure	18barg	2.0barg
Temperature Air	95°C to 0°C	60°C
Temperature Tube	95°C to 0°C	64.3°C (in) 30 to45°C (out)
Capacity	110m^3/h	Up to 110m^3/h
Power	14.9kW	
Cooler Duty	916kW	

3.7.3 Technical Description

Condensate Cooler 115-02-H-002A/B is a fin fan cooler 3.553m wide, 8.852m long and 3.245m in height, which uses an electrically driven fan to cool the condensate passing through the tubes. The cooler tube bundle consists of 214 tubes of 25.4mm diameter with 4 passes.

Removable spool pieces are provided on the cooler inlet and outlet lines for isolation purposes.

Temperature Gauges 115-02-PG-106/108 provides local indication of cooler inlet and outlet temperatures respectively.

For details of the condensate cooler control and protection, refer to Paragraph 4.6 Instrumentation and Control.

3.8 Condensate Storage Tanks 115-02-T-001A/B

Refer to P&ID: PHM-115-FE-013 Condensate Storage Tanks.

3.8.1 Function

Condensate Storage Tanks 115-02-T-001A/B receive and store the condensate produced in the condensate system prior to being exported to the condensate loading package by the condensate loading pumps.

3.8.2 Technical Data

For details of the design and operating parameters, refer to Table 4.8 – Design and Operating Parameters Condensate Storage Tanks 115-02-T-001A/B.

Table 4.8 – Design and Operating Parameters Condensate Storage Tanks 115-02-T-001A/B

Parameter	Design	Operating
Pressure	Full of liquid -0.006barg/+0.056barg	ATM
Temperature	95°C	34°C to 54°C
Capacity	3510 bbl (558m^3 working) , 4050 bbl(645m^3 total)	

3.8.3 Technical Description

Condensate Storage Tanks 115-02-T-001A/B are vertical, cone-roofed, carbon steel tanks, 9.144m inside diameter and 9.8m high with epoxy resin internal coating.

Each tank is fitted with a 600mm shell manway, a 600mm roof manway and an access stairs with handrail. The shell/roof joint is a frangible type joint for fire case. Both tanks are the same and the following description is for both tanks.

The main condensate 150mm inlet nozzle is fitted with a vertical riser with a sleeve to cause minimal disturbance of the tank contents when filling. The minimum flow line from the condensate loading pumps enters the tank via an 80mm nozzle. The condensate exits the tank via a 200mm nozzle to the suction of the condensate loading pumps.

Off gas from the tank exits via an 80mm nozzle in the top of the tank and is routed to a vent at a safe location fitted with a flame arrestor. This nozzle is also use to provide a gas blanket to the tank supplied from the fuel gas system.

The tank is provided with two sample connections at different levels. The tank base is sloped downwards towards the centre at 1:100 to allow any entrained solids to collect in the drain sump. The drain sump is used for water drain off, the outlet of which is routed to a vacuum suck out tank located within the tank bund for cleaning purposes.

The tanks are within bunded areas, which can be manually drained to the storm water drains.

Pressure Gauges 115-02-PG-101A/B provides local indication of Tanks 115-02-T-001A/B vapour pressure respectively.

Temperature Gauges 115-02-TG-109A/B provide local indication of Tanks 115-02-T-001A/B temperature respectively.

Level Indicators 115-02-LI-109A/B provides local indication of Tanks 115-02-T-001A/B condensate level respectively.

Level Gauges 115-02-LG-103A/B provides local indication of Tanks 115-02-T-001A/B condensate/water interface level respectively.

For details of the condensate storage tanks control and protection, refer to Paragraph 4.7 Instrumentation and Control.

3.9 Condensate Loading Pump Strainers SP-115-033/34

Refer to P&ID: PHM-115-FE-014 Condensate Loading and Transfer.

3.9.1 Function

Condensate Loading Pump Strainers SP-115-033/34 removes any solid particles greater than 2000microns from the condensate flowing from the condensate storage tanks prior to entering the pump suction.

3.9.2 Technical Data

For details of the design and operating parameters, refer to Table 4.9 – Design and Operating Parameters Condensate Loading Pump Strainers SP-115-033/34.

Table 4.9 – Design and Operating Parameters Condensate Loading Pump Strainers SP-115-033/34

Parameter	Design	Operating
Pressure	17.5barg	1barg
Temperature (Max/Min)	0 to 95°C	34 to 54°C

3.9.3 Technical Description

The condensate loading pump strainers are vertical vessels constructed from carbon steel, each with a bolted top flange for access to the internals. Double block and bleed valves are located at the inlet, the outlet and on the drain line. The drain line is also fitted with a normally open spectacle blind.

3.10 Condensate Loading Pumps 115-02-PM-001A/B

Refer to P&ID: PHM-115-FE-014 Condensate Loading and Transfer.

3.10.1 Function

Condensate Loading Pumps 115-02-PM-001A/B forward the condensate from the condensate storage tanks to the condensate loading package.

3.10.2 Technical Data

For details of the design and operating parameters, refer to Table 4.10 – Design and Operating Parameters Condensate Loading Pumps 115-02-PM-001A/B.

Table 4.10 – Design and Operating Parameters Condensate Loading Pumps 115-02-PM-001A/B

Parameter	Design	Operating
Discharge Pressure	18.0barg	8.0barg
Temperature (max/min)	95°C/0°C	54°C/34°C
Capacity	80m^3/h	
Power	45kW	

3.10.3 Technical Description

Condensate Loading Pumps 115-02-PM-001A/B are 100% duty, electrically-driven, centrifugal pumps, which are manually operated.

The pumps are provided with a minimum flow line, which returns to the condensate storage tanks. Provided on the common discharge from the pumps is a normally closed return line to the HP flash vessel to re-run off-spec condensate from the storage tank for further processing.

A manual isolation valve is fitted to each pump suction line upstream of the suction strainer. To clean the strainer, the pump must be shut down and isolated before the strainer can be removed.

A manual isolation valve is fitted to each pump discharge line downstream of a check valve, together with a 'normally-open' spectacle blind and removable spool piece for maintenance purposes.

Pressure Gauges 115-02-PG-103A/B provides local indication of pump 115-02-PM-001A/B suction pressure respectively.

Pressure Gauges 115-02-PG-102A/B provides local indication of pump 115-02-PM-001A/B discharge pressure respectively.

For details of the condensate loading pump control and protection, refer to Paragraph 4.8 Instrumentation and Control.

3.11 Condensate Loading Package 115-02-S-015

Refer to P&ID: PHM-115-FE-014 Condensate Loading and Transfer.

3.11.1 Function

The Condensate Loading Package 115-02-S-015 is provided to measure to Fiscal Standards the condensate quantity being exported to the road tankers.

3.11.2 Technical Data

For details of the design and operating parameters, refer to Table 4.11 – Design and Operating Parameters Condensate Loading Package 115-02-S-015.

Table 4.11 – Design and Operating Parameters Condensate Loading Package 115-02-S-015

Parameter	Design	Operating
Discharge Pressure	18.0barg	8.0barg
Temperature (Max/Min)	95°C/0°C	54°C/34°C
Capacity	80m^3/h	
Power	13.5kW	

3.11.3 Technical Description

Condensate Loading Package 115-02-S-015 comprises a single loading bay using bottom loading tankers. The Condensate Loading and Metering System (CLMS) is provided with the following equipment:

Two, meter runs of fiscal quality including an Inlet automatic isolation valve, turbine flow meter, flow control valve, strainer flow straightener, pressure and temperature instruments and local gauges

Two bottom loading arms

Two arm parks and adaptors with limit switch to detect when loading arm is in parked position

Vapour recovery hose with quick release coupling

Tanker grounding system

Overfill protection, compatible with bottom loading tankers

Local batch controller

Card reader, non contact type

Emergency stop button

Terminal Automation System (TAS)

Computer hardware and software for order entry, monitoring of loading operation and Bill of Lading (BOL)

Serial link cables, connectors and interface devices connecting the loading package to the control room and guardhouse

TAS workstation and printers

Condensate Loading Package 115-02-S-015 is comprised of a lading bay containing two identical loading arms each with a meter stream.

Pressure Gauge 115-02-PG-104 provides local indication of the pressure in the vapour recover hose vent line.

Flow Totaliser 115-02-FQI-112 provides local indication of the instantaneous and flow totals.

For details of the condensate loading package control and protection, refer to Paragraph 4.9 Instrumentation and Control.

3.12 Condensate Prover

Existing Condensate Prover is the lease unit from SGS. Refer to procedure : PH-10-OP-PRO-00040: Condensate Meter Calibration.

4.0 INSTRUMENTATION AND CONTROL

4.1 Condensate Heater Strainers SP-115-028/67

Refer to PHM-115-FE-011 Condensate Heater.

4.1.1 Differential Pressure

The differential pressure across the condensate heater strainers is indicated on the DCS Differential Pressure Indicator 115-02-DPIA-102, which provides a high differential pressure alarm at the DCS.

4.2 Condensate Heater 115-02-H-001

Refer to PHM-115-FE-011 Condensate Heater.

4.2.1 Pressure

High pressure protection on the heating medium outlet is provided by Pressure Indicator 115-02-PIA-103 which is used to generate a high pressure trip signal for the Shutdown System (SDS).

Shutdown Valve 115-02-SDV-102 is located on the heating medium outlet. The valve fails closed and the air to the valve is switched by a solenoid valve controlled from the SDS.

Overpressure protection for the tube bundle for a thermal expansion case is provided by Pressure Relief Valve 115-02-PSV-101, which is set to relieve at 94.4barg.

Overpressure protection for the shell for a tube rupture case is provided by Pressure Relief Valves 115-02-PSV-102A/B, which are set to relieve at 40barg. These pressure relief valves are organized in a duty/standby configuration using upstream and downstream isolation valve interlocks.

4.2.2 Temperature

The temperature of the condensate leaving the heater is controlled by the Temperature Controller 115-02-TICA-102, which provides temperature control by modulating the flow of heating medium through the exchanger shell by modulating 'split range' Temperature Control Valves 115-02-TCV-102A/B. Temperature Control Valves 115-02-TCV-102A/B are sized for a peak condensate flow of 110m^3/h with a split of 15% (vol) and 85% (vol) between the A and B

valves. Temperature Controller 115-02-TICA-102 provides high and low temperature alarms on the DCS.

Temperature protection for the condensate stream is provided by Temperature Transmitter 115-02-TT-101 on the condensate outlet, which is used to generate a high temperature trip signal through 115-02-TIA-101 in the SDS.

Shutdown Valve 115-02-SDV-102 is located on the condensate heater heating medium outlet. The valve fails closed and the air to the valve is switched by a solenoid valve controlled from the SDS.

4.2.3 Flow

The condensate flow leaving the condensate heater is controlled by Level Controller 115-00-LICA-101 (on the slug catcher), which provides the set point for control modulates 'split range' Flow Control Valves 115-02-FCV-102A/B. Flow Control Valves 115-02-FCV-102A/B are sized for a peak condensate flow of 110m^3/h with a split of 15% (vol) and 85% (vol) between the A and B valves. Flow Controller 115-02-FIC-101 provides high and low flow alarms on the DCS.

Restriction Orifice 115-02-RO-102 is installed downstream of Flow Control Valves 115-02-FCV-102A/B to limit gas blow-by to the HP flash vessel.

Shutdown Valve 115-02-SDV-101 is located on the slug catcher liquid outlet. The valve fails closed and the air to the valve is switched by a solenoid valve controlled from the SDS.

Level Controller 00-LICA-101 is described in Section 2 of this manual – Gas Treatment, Metering & Export System.

4.3 High Pressure Flash Vessel 115-02-V-004

Refer to P&ID: PHM-115-FE-012 High Pressure Flash Vessel.

4.3.1 Pressure

The pressure in the high pressure flash vessel is controlled at 7.0barg by Pressure Controller 115-02-PICA-105 modulating Pressure Control Valve 115-02-PCV-105A, which lets down to the fuel gas system. If the pressure in the vessel continues to rise, Pressure Controller 115-02-PICA-105 will open Pressure Control Valve 115-02-PCV-105B at 7.5barg and release the excess gas to the LP Flare System. Pressure Controller 115-02-PICA-105 provides high and low pressure alarms on the DCS.

High pressure protection is provided by Pressure Transmitter 115-02-PIA-106 which is used to generate a high pressure trip signal for the SDS.

Shutdown Valve 115-02-SDV-108 is located on the gas outlet to the Fuel Gas System. The valve fails closed and the air to the valve is switched by a solenoid valve controlled from the SDS.

Overpressure protection for gas blow-by case is provided by Pressure Relief Valves 115-02-PSV-103A/B set to relieve at 10.35barg. These pressure relief valves are organized in a duty/standby configuration using upstream and downstream isolation valve interlocks.

4.3.2 Liquid Level

The liquid level control in the high pressure flash vessel is split between condensate level control and condensate/water interface level control.

The condensate level in the vessel level is maintained by Level Controller 115-02-LICA-104, which modulates 'split range' Level Control Valves 115-02-LCV-104A/B. Level Control Valves 115-02-LCV-104A/B are sized for a peak condensate flow of 110m^3/h with a split of 15% (vol)

and 85% (vol) between the A and B valves. Level Controller 115-02-LICA-104 provides high and low flow alarms on the DCS.

The condensate/water interface level in the separator level is maintained by Level Controller 115-02-LICA-102, which modulates Level Control Valve 115-02-LCV-102 to let the water down to the produced water separator. Level Controller 115-02-LICA-102 also provides high and low level alarms to the DCS.

Protection against high condensate level is provided by Level Transmitter 115-02-LT-103, which is used to generate a high level trip signal through 115-02-LIA-103 in the SDS.

Protection against low condensate level is provided by Level Transmitter 115-02-LT-108, which is used to generate a low level trip signal through 115-02-LIA-108 in the SDS.

Protection against low condensate/water interface level is provided by Level Transmitter 115-02-LT-101, which is used to generate a low level trip signal through 115-02-LIA-101 in the SDS.

A shutdown valve 115-02-SDV-103 is provided on the water outlet from the high pressure flash vessel. The valve fails closed and the air to the valve is switched by a solenoid valve controlled from the SDS.

A shutdown valve 115-02-SDV-104 is provided on the condensate outlet from the high pressure flash vessel. The valve fails closed and the air to the valve is switched by a solenoid valve controlled from the SDS.

4.3.3 Flow

The gas flow leaving the high pressure flash vessel to the fuel gas system is indicated on the DCS by Flow Indicator 115-02-FI-102, which provides high and low flow alarms. Flow totaliser 115-02-FQI-102 displays the total quantity of gas sent to the Fuel Gas System.

The condensate flow leaving the high pressure flash vessel is indicated on the DCS by Flow Indicator 115-02-FI-103.

4.3.4 Temperature

The condensate temperature leaving the high pressure flash vessel is indicated on the DCS by Temperature Indicator 115-02-TIA-106, which provides a low temperature alarm on the DCS.

4.4 Low Pressure Flash Vessel 115-02-V-005

Refer to P&ID: PHM-115-FE-018 Low Pressure Flash Vessel.

4.4.1 Pressure

The pressure in the low pressure flash vessel is controlled by Pressure Controllers 115-02-PICA-111A/B/C to pressure control valves 115-02-PCV-106, 115-02-PCV-107 and 115-02-PCV-108 respectively.

The pressure in the low pressure flash vessel is normally controlled at 0.3barg by Pressure Controller 115-02-PICA-111B modulating Pressure Control Valve 115-02-PCV-106, which lets down to the thermal oxidiser. If the pressure in the vessel continues to rise above 0.3barg, Pressure Controller 115-02-PICA-111C will open Pressure Control Valve 115-02-PCV-108 at 0.5barg and release the excess gas to the LP Flare System. If for any reason the pressure falls in the low pressure flash vessel 115-02-PICA-111A will open Pressure Control Valve 115-02-PCV-107 at 0.20barg to provide a gas blanket to the vessel from the Fuel Gas System.

Pressure Indicator 115-02-PIA-111 provides High 1, High 2 and low pressure alarms on the DCS.

High pressure protection is provided by Pressure Indicator 115-02-PIA-112 which is used to generate a high pressure trip signal for the SDS.

Shutdown Valve 115-02-SDV-110 is located on the gas outlet. The valve fails closed and the air to the valve is switched by a solenoid valve controlled from the SDS.

Overpressure protection for fire case is provided by Pressure Relief Valve 115-02-PSV-106 set to relieve at 10.35barg.

4.4.2 Liquid Level

The condensate level in the vessel is maintained by Level Controller 115-02-LICA-111, which modulates 'split range' Level Control Valves 115-02-LCV-105A/B located down stream of the condensate pumps. Level Control Valves 115-02-LCV-105A/B are sized for a peak condensate flow of 110m^3/h with a split of 15% (vol) and 85% (vol) between the A and B valves. Level Controller 115-02-LICA-111 provides High 1, High 2 and low pressure alarms on the DCS.

Protection against high condensate level is provided by Level Transmitter 115-02-LT-112, which is used to generate a high level trip signal through 115-02-LIA-112 in the SDS.

Protection against low condensate level is provided by Level Transmitter 115-02-LT-113, which is used to generate a low level trip signal through 115-02-LIA-113 in the SDS.

Shutdown Valve 115-02-SDV-109 is provided on the condensate outlet from the low pressure flash vessel. The valve fails closed and the air to the valve is switched by a solenoid valve controlled from the SDS.

4.4.3 Flow

The gas flow leaving the low pressure flash vessel to the thermal oxidiser is indicated on the DCS by Flow Indicator 115-02-FI-109, which provides high and low flow alarms. Flow totaliser 115-02-FQI-109 displays the total quantity of gas sent to the thermal oxidiser.

4.4.4 Temperature

The condensate temperature leaving the low pressure flash vessel is indicated on the DCS by Temperature Indicator 115-02-TI-107, which provides a low temperature alarm.

4.5 Condensate Pumps 115-02-PM-002A/B

Refer to P&ID: PHM-115-FE-019 Condensate Pumps and Cooler.

4.5.1 Pressure

Pump discharge pressure indication on the DCS is provided by Pressure Indicator 115-02-PIA-113, which initiates high and low pressure alarms.

4.5.2 Flow

The pumps are provided with a minimum flow line which returns to the low pressure flash vessel. The flow through the minimum flow line is controlled by Flow Controller 115-02-FICA-105, which receives a signal from Flow Transmitter 115-02-FT-105 in the common discharge line and modulates Flow Control Valve 115-02-FCV-105 in the return line.

4.5.3 Start Stop

The pumps are started and stopped locally or via the DCS using a hand switch with local run/stop and remote selection. Local run/stop indicators are provided and run/stop indications and fault alarms are provided on the DCS.

The standby pump will automatically start when 115-02-LAH2-111 is reached in the LP flash vessel.

4.6 Condensate Cooler 115-02-H-002

Refer to P&ID: PHM-115-FE-019 Condensate Pumps and Cooler.

4.6.1 Pressure

Overpressure protection for the tube bundle for a thermal expansion case is provided by Pressure Relief Valve 115-02-PSV-105 set at 17.5 barg.

4.6.2 Vibration

The cooler motor is provided with Vibration Switches 115-02-VS-101A/B, which provide High Vibration Alarms 115-02-VAH-101A/B on the DCS.

Protection against high vibration is provided by 115-02-VA-101A/B, which is used to generate a high trip signal through the SDS.

4.6.3 Start Stop

The cooler is started and stopped locally or via the DCS (command to stop only) using a hand switch with local run/stop and remote selection. Local run/stop indicators are provided and run/stop indications and fault alarms are provided on the DCS.

4.7 Condensate Storage Tanks 115-02-T-001A/B

Refer to P&ID: PHM-115-FE-013 Condensate Storage Tanks.

The following text describes Condensate Storage Tank 115-02-T-001A with the corresponding instrumentation tag numbers for Condensate Storage Tank 115-02-T-001B shown in parenthesis.

4.7.1 Pressure

The gas in the condensate storage tank is controlled between 10 and 20mbarg by Pressure Control Valves 115-02-PCV-101A (B) and 115-02-PCV-102A (B), which are regulated by a control line from the top of the tank. Pressure Control Valve 115-02-PCV-101A (B) opens at pressures below 10mbarg to allow in gas blanketing from the Fuel Gas System and115-02-PCV-102A (B) opens at 20mbarg to relieve excess pressure to the atmospheric vent.

Pressure indication on the DCS is provided by Pressure Indicator 115-02-PIA-107A (B), which initiates high and low pressure alarms.

Overpressure, under-pressure protection is provided by Pressure Vacuum Relief Valve 115-02-PVRV-101A (B) set to relieve at 30mbarg (pressure) and -3mbarg (vacuum).

4.7.2 Liquid Level

The condensate level in the tank is indicated on the DCS by Level Indicator 115-02-LIA-106A (B), which receives a signal from Level Transmitter 115-02-LT-106A (B) and initiates high and low level alarms. Low level alarm 115-02-LAL-106A (B) inhibits the start of condensate loading pumps.

Protection against high condensate level is provided by Level Transmitter 115-02-LT-105A (B), which is used to generate a high level trip signal through 115-02-LIA-105A (B) in the SDS.

Shutdown Valve 115-02-SDV-105A (B) is located on the condensate inlet to the storage tank. The valve fails closed and the air to the valve is switched by a solenoid valve controlled from the SDS.

A high level indication on either 15-02-LT-105A (B) or 115-02-LIA-106A (B) will trip inlet Shutdown Valve 115-02-SDV-105A (B).

Shutdown Valve 115-02-SDV-106A (B) is located on the condensate outlet to the condensate loading pumps. The valve fails closed and the air to the valve is switched by a solenoid valve controlled from the SDS.

Shutdown Valve 115-02-SDV-106A (B) is located within the tank bund area and has a manual reset to open the valve when the low level alarm is clear.

Shutdown Valve 115-02-SDV-106A (B) is interlocked with the condensate loading and metering system and has a local open function to allow for priming of the condensate loading pumps.

Shutdown Valve 115-02-SDV-107A (B) is located on the condensate inlet from the condensate loading pumps minimum flow line. The valve fails closed and the air to the valve is switched by a solenoid valve controlled from the SDS.

Shutdown Valve 115-02-SDV-107A (B) is interlocked with the operation of Shutdown Valve 115-02-SDV-106A (B).

The condensate/water interface level in the tank is indicated on the DCS by Level Indicator 115-02-LIA-107A (B), which initiates a high interface level alarm.

4.8 Condensate Loading Pumps 115-02-PM-001A/B

Refer to P&ID: PHM-115-FE-014 Condensate Loading and Transfer.

4.8.1 Pressure

Pump discharge pressure indication on the DCS is provided by Pressure Indicator 115-02-PIA-109, which initiates high and low pressure alarms.

4.8.2 Flow

The pumps are provided with a minimum flow line, which returns to the condensate storage tanks. The flow through the minimum flow line is controlled by Flow Controller 115-02-FIA-104 which receives a signal from Flow Transmitter 115-02-FT-104 in the common discharge line and modulates Flow Control Valve115-02-FCV-104 in the return line.

Flow indication of the normally closed, return line to the HP flash vessel is shown on the DCS by 115-02-FI-108.

4.8.3 Start Stop

The pumps are started and stopped locally or via the DCS (command to stop only) using a hand switch with local run/stop and remote selection. Local run/stop indicators are provided and run/stop indications and fault alarms are provided on the DCS.

4.9 Condensate Loading Package 115-02-S-015

Refer to P&ID: PHM-115-FE-014 Condensate Loading and Transfer.

Condensate Loading Package 115-02-S-015 is comprised of a lading bay containing two identical loading arms each with a meter stream.

The following text is for Loading Arm 1.

Condensate enters the meter from the condensate loading pumps passing through an automatic inlet isolation valve, which is opened and closed when tanker loading operations are started and stopped.

The flow is measured by turbine flow meter, which provides an output signal to the local batch controller and the flow computer in the Terminal Automation System (TAS).

To ensure smooth flow without swirl through the meter there is a flow straightener upstream of the meter. Any dirt in the condensate entering the meter stream, which may build up and effect the accuracy of the meter, is removed by a filter located upstream of the flow straightener.

The temperature and pressure of the condensate passing through the meter run is measured by temperature and pressure elements, which provide signals to the flow computer in the TAS. These signals are used to compensate the measured flow for flow under standard conditions.

Signals forms the TAS are sent to the local batch controller to control the operation of the flow control valve. The batch controller is a microprocessor based controller with EEPROM memory to prevent any loss of configured data during power failure, dedicated to its own loading arm.

Flow into the tanker is through the loading arm connection, which is fitted with a limit switch to ensure that the loading arm is in the correct position. Vapours from the tanker are routed to a vent at a safe location via a vapour recover hose, which is provided with a flame arrestor, a check valve and a manual isolation valve.

Flow to the tanker is only permitted when the following conditions have be satisfied:

The loading operator has logged on to the batch controller and entered the correct password and volume to be loaded

The loading arm is properly attached to the tanker

The vapour recover hose is attached to the tanker

The overfill and earthing systems are connected

5.0 ENVIRONMENTAL, HEALTH AND SAFETY REQUIREMENTS

5.1 General EHS Requirements

5.1.1 Chemicals

The following chemical is used in this system, or may be present under upset conditions:

Methanol

Heating Medium (50% Tri-ethylene Glycol, 50% Demin Water)

Tri-ethylene Glycol

Personnel should ensure that they are fully familiar with the Material Safety Data Sheet (MSDS) for each chemical, which details precautions and the protective apparel and equipment necessary when handling the chemicals. The precautions detailed must be adhered to at all times.

5.1.2 Hazardous Sources

Table 4.12 – Hazardous Sources lists potential hazardous sources that may be present under upset conditions affecting the Condensate Treatment, Storage and Export System.

Table 4.12 – Hazardous Sources

Hazard	Source	Hazardous Event	Effect	Control
Liquid hydrocarbons under pressure	Condensate Heater Throughout system	Potential for injury due to contact with hazardous liquids Loss of containment and release of flammable liquids	Potential for personnel injury Un-ignited liquid release and potential for gas release and fire/explosion	Fire and Gas Detection
Hydrocarbon gas under pressure	Throughout system	Potential for injury due to contact with hazardous liquids Loss of containment and release of flammable gas	Potential for personnel injury Un-ignited gas release and potential for fire/explosion	Burner Flame Detection Fire and Gas Detection

Hazard	Source	Hazardous Event	Effect	Control
High temperature lines and vessels	Condensate Heater	Potential for injury due to contact with hot surfaces	Potential for personnel injury	Lagging for personnel protection
Hot heating medium under pressure	Condensate Heater	Potential for injury due to contact with heating medium	Potential for personnel injury	Monitoring Maintenance procedures
Hydrocarbon gas under pressure	Throughout system	Potential for injury due to contact with hazardous liquids Loss of containment and release of flammable gas	Potential for personnel injury Un-ignited gas release and potential for fire/explosion	Burner Flame Detection Fire and Gas Detection
High temperature lines and vessels	Condensate Heater	Potential for injury due to contact with hot surfaces	Potential for personnel injury	Lagging for personnel protection
Hot heating medium under pressure	Condensate Heater	Potential for injury due to contact with heating medium	Potential for personnel injury	Monitoring Maintenance procedures
Lube oil	Condensate Pumps Condensate Loading Pumps	Loss of containment	Potential for personnel injury Spills Fire Contamination	Monitoring Maintenance procedures Secontary bund
Nitrogen	Purging operations	Exposure to	Potential for personnel asphyxiation	Safety procedures

5.2 Specific Health and Safety Requirements

The correct use of Personal Protective Equipment (PPE) is fundamental in securing a safe and healthy place of work for all personnel. PPE shall be used in conjunction with appropriate health, environment and safety procedures that are designed to minimise the potential risk of harm or injury to personnel, while also promoting safe working practices.

5.3 Specific Environmental Requirements

To prepare the Condensate Treatment, Storage and Export System for the introduction of hydrocarbon liquids, it is necessary to remove all air from the system. Nitrogen maybe utilized for this purpose. Similarly, when preparing equipment for maintenance, nitrogen maybe used to purge hydrocarbons from the system before breaking containment and introducing air.

When purging the system of air prior to introduction of hydrocarbons, the atmoPig in the system should be tested with an Oxygen Content Analyzer to determine the level of oxygen remaining in the purged system.

When purging is being performed to remove hydrocarbons, a suitable test instrument, which uses thermal conductivity or infra-red absorption, capable of detecting hydrocarbons in nitrogen. Pelister type instruments cannot be used, as they require at least 13% oxygen to operate.

WARNING: NITROGEN IS AN ASPHYXIANT, AND IS COLOURLESS AND ODOURLESS: RAPID AND UNRECOGNISED LOSS OF CONSCIOUSNESS CAN OCCUR IN PERSONS EXPOSED TO A NITROGEN-ENRICHED ATMOPIG. WHEN USING NITROGEN, CARE SHOULD BE TAKEN TO ENSURE THAT NITROGEN ESCAPES ARE DISPERSED AND NOT ALLOWED TO COLLECT IN ENCLOSED AREAS.

6.0 REFERENCE INFORMATION

6.1 Company Documentation

Document Number	Document Title
PDS-115-02-H-001-013	Condensate Heater Process Data Sheet
PDS-115-02-H-002-042	Condensate Cooler Process Data Sheet
PDS-115-02-PM-001-011	Condensate Loading Pump Process Data Sheet
PDS-115-02-PM-002-043	Condensate Pump Process Data Sheet
PDS-115-02-S-015-019	Condensate Loading Package Process Data Sheet
PDS-115-02-T-001-012	HP Condensate Flash Vessel Process Data Sheet
PDS-115-02-V-005-041	LP Condensate Flash Vessel Process Data Sheet
SP-1514-01	Condensate Loading and Metering Package Specification
PH-10-OP-SOP-00004	Standard Operating Procedure Condensate Treatment,Storage and Export

6.2 Vendor Documentation

Document Number	Document Title
–	–

6.3 Engineering Drawings (PFDs, UFDs and P&IDs)

Drawing Number	Drawing Title
PHM-115-FP-004	Sinphuhorm GPP UFD – Condensate Stabilisation and Storage
PHM-115-FP-005	Sinphuhorm GPP UFD – Condensate Loading and Transfer
PHM-115-FE-002	Sinphuhorm GPP P&ID – Slug Catcher

Drawing Number	Drawing Title
PHM-115-FE-003	Sinphuhorm GPP P&ID – Inlet Coalescing Filter Separator and Heater
PHM-115-FE-011	Sinphuhorm GPP P&ID – Condensate Heater
PHM-115-FE-012	Sinphuhorm GPP P&ID – High Pressure Flash Vessel
PHM-115-FE-013	Sinphuhorm GPP P&ID – Condensate Storage Tanks
PHM-115-FE-014	Sinphuhorm GPP P&ID – Condensate Loading and Transfer
PHM-115-FE-018	Sinphuhorm GPP P&ID – Low Pressure Flash Vessel
PHM-115-FE-019	Sinphuhorm GPP P&ID – Condensate Pumps and Cooler

SECTION 5.0
PRODUCED WATER TREATMENT

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1.0 INTRODUCTION

1.1 System Purpose/Function

The Produced Water System is designed to collect process and safely dispose of produced water removed from the fluids in the gas and condensate processing trains. Condensate present in the water is separated and returned to the condensate processing train. The water is then forwarded to Hold Up Tank where the Produced Water will be stored in closed containment and then go to Produced Water Evaporator to boil off. The boiling vapour which may contain BTEX will be sent to Thermal Oxidizer to be incinerated at high temperature.

1.2 Primary Components

Tag No	Equipment Title/Description
115-27-V-005	Produced Water Separator
115-27-PM-002A/B	Condensate Recovery Pumps
115-27-PM-003A/B	Produced Water Transfer Pumps
115-27-T-001	Emergency Produced Water Storage Pond
115-27-PM-004	Emergency Produced Water Pump
115-27-Z-001	Thermal Oxidiser
115-27-T-002	Brine Evaporation Pond
115-27-T-004	Emergency Produced Water Storage Pond
115-27-PM-007	Emergency Produced Water Storage Pond Transfer Pump
115-27-PM-006	Water Disposal Pump
115-27-T-005	Hold Up Tank
115-27-H-001	Produced Water Evaporator
115-27-PM-008A/B	PW Pumps

1.3 Primary Interfaces

Input Interfaces:

Glycol Regeneration (refer to Section 3.0 of OPM)

Condensate Treatment, Storage and Export (refer to Section 4.0 of this OPM)

PCSS System (refer to Section 14.0 of this OPM)

Output Interfaces:

Condensate Treatment, Storage and Export (refer to Section 4.0 of this OPM)

Closed and Open Drains (refer to Section 8.0 of this OPM)

2.0 SYSTEM DESCRIPTION

2.1 System Overview

Refer to Figure 5.1 – Produced Water System Simplified Overview Schematic.

The system receives produced water with entrained condensate from the High Pressure Flash Vessel 115-02-V-004.

The condensate is gravity separated from the produced water in Produced Water Separator 115-27-V-005, which is then returned to the HP flash vessel by the Condensate Recovery Pumps 115-27-PM-002A/B.

Liquid liberated within the Produced Water Separator is passed to Hold Up Tank (115-27-T-005) by Produced Water Transfer Pumps (115-27-PM-003A/B).

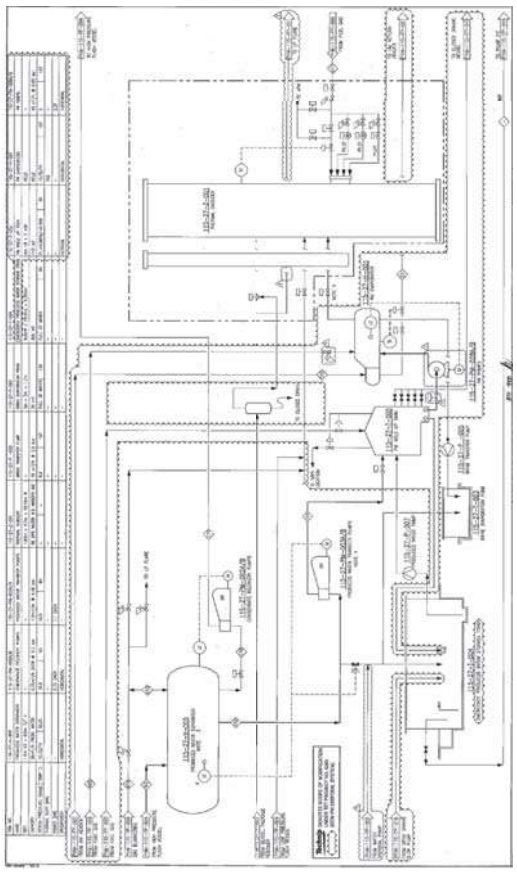
Within the Hold Up Tank the remaining condensate can be skimmed and diverted to Closed Drain Vessel. Produced water is then forwarded to Produced Water Evaporator (115-27-H-001) by Produced Water Pumps (115-27-PM-008A/B). The water temperature is raised to boiling point by Heating Medium. The resultant steam generated in the Evaporator is passed to Thermal Oxidizer (115-27-Z-001) in order to incinerate BTEX at 700 C.

The Thermal Oxidiser (115-27-Z-001) also uses gas fuelled burners to incinerate the blanket gas/flash gas liberated in the LP Flash Vessel, together with the gas produced in the Produced Water Separator and waste gas from the Glycol Regeneration Package. The combustion system utilised in the Thermal Oxidiser ensures that the waste gasses are thoroughly incinerated.

IT IS VERY IMPORTANT THAT THE THERMAL OXIDIZER HAS TO BE STARTED UP FIRST BEFORE GASES BEING INTRODUCED INTO IT. THIS IS TO PREVENT THE CASE OF UNBURNT VAPOUR COULD THAT MAY CAUSE FLASH FIRE.

In the event of Thermal Oxidizer unit shutdown for any reasons, Produced Water Evaporator will be shutdown due to interlock that will close the Heating Medium Supply valve, causing no heat input into Evaporator. Blanket gas/flash gas from Produced Water Separator and LP Flash Vessel will be diverted to LP Flare by their own PCVs. The last line of Off Gas from Glycol Reboiler will be diverted by the 3-way Shutdown Valve to LP Flare.

Figure 5.1 – Produced Water Simplified Overview Schematic



2.2 Primary Flow Description

Refer to P&IDs:

PHM-115-FE-021 Produced Water Separator

PHM-115-FE-022 Produced Water Transfer Pumps

PHM-115-FE-023 Thermal Oxidiser

PHM-115-FE-092 Emergency Produced Water Storage Pond

PHM-115-FE-093 Hold Up Tank

2.2.1 Normal Operation

The produced water with entrained condensate is letdown under level control from the High Pressure Flash Vessel (115-02-V-004), which operates at a pressure of 7.0 barg. This liquid enters the Produced Water Separator (115-27-V-005), which operates at a pressure of 0.25-0.3 barg, the lower operating pressure resulting in the entrained gas being released.

Gas given off from the condensate exits the top of vessel through a self-regulating pressure control valve at 0.3 barg, which is vented to the Thermal Oxidiser (115-27-Z-001). To ensure that no air enters the vessel the gas outlet is also used to supply blanket gas to the separator when there is insufficient evolved gas pressure.

The liquid inlet nozzle is fitted with an impingement device to reduce the inlet velocity and aid the entrained gas to separate from the liquids. The liquids collect in the base of the separator on the upstream side of a weir where the condensate separates from the water due to gravity and retention time. To aid the condensate water separation, the produced water flows through an inclined plate pack upstream of the weir.

The separated produced water exits the separator upstream of the weir while the condensate overflows the weir, exits the separator and is pumped back to the HP flash vessel by the Condensate Recovery Pumps 115-27-PM-002A/B. The condensate level in the separator level is maintained by a level controller, which operates the condensate recovery pumps by start/stop control action. The pump throughput can be adjusted manually using a stroke setting.

Produced water from Produced Water Separator is pumped to Hold Up Tank 115-27-T-005 by the Produced Water Transfer Pumps 115-27-PM-003 A/B. The produced water level in separator is maintained by a level controller, which operates the transfer pumps by start/stop control action. The pump throughput can be adjusted manually using stroke setting.

The Hold Up Tank is equipped with 5 skimming tray (manual) for skimming remaining condensate out and flow to closed drain vessel, and blanked by fuel gas. The produced water is then pumped to Produced Water Evaporator 115-27-H-001 and rose up the temperature to boiling point using Heating Medium. The resultant steam generated in the Evaporator is passed to Thermal Oxidizer (115-27-Z-001) in order to incinerate BTEX at 700 C.

The Thermal Oxidiser uses fuel gas burners to incinerate waste gas from the produced water separator, the Low Pressure Flash Vessel and the output from the Glycol Regeneration Reboiler still column with the flow of fuel gas to the burners being controlled under temperature control from the Thermal Oxidiser's stack.

2.2.2 Alternative Operation

When the Hold Up Tank 115-27-T-005 or Produced Water Evaporator 115-27-H-001 is shutdown for cleaning or maintenance, and when the level at the condensate/water interface level Produced Water Separator 115-27-V-005 is high , produced water route will be manual controlled by opening the 'normally closed' shutdown valve 115-27-SDV-106 via DCS to the Emergency Produced Water Storage Pond 115-27-T-004.

3.0 EQUIPMENT DESCRIPTION

3.1 Produced Water Separator 115-27-V-005

Refer to P&ID: PHM-115-FE-021 Produced Water Separator.

3.1.1 Function

Produced Water Separator 115-27-V-005 provides for two-phase liquid separation of the produced water. The separated produced water is forwarded to the Hold Up tank and then to Produced Water Evaporator. Boiling vapour will be sent to Thermal Oxidiser for disposal, while the separated condensate is returned to the HP Flash Vessel.

3.1.2 Technical Data

For details of the design and operating parameters, refer to Table 5.1 – Design and Operating Parameters Produced Water Separator 115-27-V-005.

Table 5.1 – Design and Operating Parameters Produced Water Separator 115-27-V-005

Parameter	Design	Operating
Pressure	10.35barg to Full Vacuum	0.3 barg
Temperature (Max/Min)	95°C/0°C	60°C
Capacity	36m^3/h	0 to 5m^3/h

3.1.3 Technical Description

Produced Water Separator 115-27-V-005 is a horizontal vessel with an inside diameter of 1.8m and has a length of 6.0m, tan to tan. The vessel is constructed from carbon steel with an epoxy resin internal coating. The vessel is provided with two 600mm manways, one at either end, for maintenance and inspection purposes.

Produced water from the HP flash vessel enters the vessel through an 100mm inlet nozzle via an impingement device to reduce the inlet velocity.

The produced water enters the vessel via a 100mm inlet nozzle and an inlet impingement device, to reduce the velocity, on the upstream side of a weir where the condensate separates from the water due to gravity. To aid in the condensate water separation, the produced water flows through an inclined plate pack upstream of the weir. The separated water exits from the vessel via a 100mm nozzle upstream of the weir, while the condensate overflows the weir and exits the vessel through a 50mm nozzle. Both nozzles are provided with vortex breakers.

Gas given off from the condensate exits from the vessel through an 80mm nozzle on the top of the vessel. This nozzle is also be used to supply blanket gas to the separator when required.

Level Gauge 115-27-LG-101 provides local indication of the water/condensate interface level

Level Gauge 115-27-LG-102 provides local indication of the condensate level

Pressure Gauge 115-27-PG-101 provides local indication of the pressure in the vessel

Temperature Gauge 115-27-TG-101 provides local indication of the temperature in the vessel

For details of the produced water control and protection, refer to Paragraph 4.0 Instrumentation and Control.

3.2 Condensate Recovery Pumps 115-27-PM-002A/B

Refer to PHM-115-FE-021 Produced Water Separators.

3.2.1 Function

Condensate Recovery Pumps 115-27-PM-002A/B return the recovered condensate from the Produced Water Separator 115-27-V-005 to the HP Flash Vessel 115-02-V-004.

3.2.2 Technical Data

For details of the design and operating parameters, refer to Table 5.2 – Design and Operating Parameters Condensate Recovery Pumps 115-27-PM-002A/B.

Table 5.2 – Design and Operating Parameters Condensate Recovery Pumps 115-27-PM-002A/B

Parameter	Design	Operating
Suction Pressure	16.0barg	0.73barg
Discharge Pressure	16.0barg	9.3barg
Temperature	95°C	60°C
Capacity	0.35m3/h @ 9.3barg	
Power	0.75kW for each	

3.2.3 Technical Description

Condensate Recovery Pumps 115-27-PM-002A/B are 100% duty, electrically-driven, piston cylinder, horizontal reciprocating pumps fitted with suction and discharge pulsation dampeners. The pumps operate on a duty/standby basis and start/stop level control action. The pump throughput can be adjusted manually using a stroke setting.

A manual isolation valve and spectacle blind is fitted to each pump suction line upstream of an inline strainer. The strainer removes all particles greater than 180µm from the suction flow, which could otherwise damage the pump internals. To clean the strainer, the pump must be shut down and isolated before the strainer can be removed.

A manual isolation valve is fitted to each pump discharge line downstream of a check valve, together with a 'normally-open' spectacle blind and removable spool piece for maintenance purposes.

Pressure Gauges 115-27-PG-102A/B provide local indication of pump 115-27-PM-002A/B suction pressure respectively

Pressure Gauges 115-27-PG-104A/B provide local indication of pump 115-27-PM-004A/B discharge pressure respectively

For details of the condensate recovery pump control and protection, refer to Paragraph 4.0 Instrumentation and Control.

3.3 Produced Water Transfer Pumps 115-27-PM-003A/B

Refer to PHM-115-FE-022 Produced Water Transfer Pumps.

3.3.1 Function

Produced Water Transfer Pumps (115-27-PM-003A/B) forward the separated produced water from the Produced Water Separator (115-27-V-005) to Hold Up Tank (115-27-T-005) as storage

for produced water.

3.3.2 Technical Data

For details of the design and operating parameters, refer to Table 5.3 – Design and Operating Parameters Produced Water Transfer Pumps 115-27-PM-003A/B.

Table 5.3 – Design and Operating Produced Water Transfer Pumps 115-27-PM-003A/B

Parameter	Design	Operating
Suction Pressure	16.0barg	0.5barg/ATM
Discharge Pressure	16.0barg	4.18barg
Temperature	95°C	60°C
Capacity	1.0m^3/h @ 4.18barg	
Power	1.1kW	

3.3.3 Technical Description

Produced Water Transfer Pumps 115-27-PM-003A/B are 100% duty, electrically-driven, piston cylinder, horizontal reciprocating pumps fitted with suction and discharge pulsation dampeners. The pumps operate on a duty/standby basis and start/stop level control action. The pump throughput can be adjusted manually using a stroke setting.

A manual isolation valve is fitted to each pump suction line upstream of a strainer.

A manual isolation valve and spectacle blind is fitted to each pump suction line upstream of an inline strainer. The strainer removes all particles greater than 180µm from the suction flow, which could otherwise damage the pump internals. To clean the strainer, the pump must be shut down and isolated before the strainer can be removed.

A manual isolation valve is fitted to each pump discharge line downstream of a check valve, together with a 'normally-open' spectacle blind and removable spool piece for maintenance purposes.

Pressure Gauges 115-27-PG-105A/B provide local indication of pump 115-27-PM-005A/B suction pressure respectively

Pressure Gauges 115-27-PG-103A/B provide local indication of pump 115-27-PM-003A/B discharge pressure respectively

For details of the produced water transfer pumps control and protection, refer to Paragraph 4.0 Instrumentation and Control.

3.4 Emergency Produced Water Storage Pond 115-27-T-004

3.4.1 Function

Emergency Produced Water Storage Pond 115-27-T-004 is provided to collect produced water from the Produced Water Separator 115-27-V-005 when the water is unable to be forwarded to Hold Up Tank 115-27-T-005, during shutdown for maintenance or excessive rates of water production. The water is diverted to the pond by activation of Shutdown Valve 27-SDV-106. The emergency produced water pond is also utilised during pigging operations of the gathering line.

Emergency Produced Water Pump 115-27-PM-007 is located within the emergency produced water pond. Refer to Paragraph 3.5 for details of this pump.

3.4.2 Technical Data

For details of the design and operating parameters, refer to Table 5.4 – Design and Operating Parameters Emergency Produced Water Storage Pond 115-27-T-004

Table 5.4 – Design and Operating Parameters Emergency Produced Water Storage Pond 115-27-T-004

Parameter	Design	Operating
Pressure	Full of water	ATM
Temperature	95°C	Ambient
Capacity	300 m^3	Up to 300 m^3

3.4.3 Technical Description

Emergency Produced Water Storage Pond 115-27-T-004 is a reinforced concrete structure of 9 m width x 16 m length x 2.35m dept, and is designed for 270 days of production at a produced water rate of 70 BPD. The pond is partially buried below grade.

The pond is bunded to minimize surface water ingress and is provided with a transparent cover complete with ridge rain covers.

The pond contains a weir to collect any condensate. The condensate can be drained off to the Pump Pit via the open hazardous drains header using a manually operated valve.

For details of the emergency produced water storage pond control and protection, refer to Paragraph 4.0 Instrumentation and Control.

3.5 Emergency Produced Water Pump 115-27-PM-007

Refer PHM-115-FE-092 Produced Water Pond.

3.5.1 Function

Emergency Produced Water Pump 115-27-PM-007 is used to transfer water from the Emergency Produced Water Storage Pond to the Hold Up tank 115-27-T-005.

3.5.2 Technical Data

For details of the design and operating parameters, refer to Table 5.5 – Design and Operating Parameters Emergency Produced Water Pump 115-27-PM-004.

Table 5.5 – Design and Operating Parameters Emergency Produced Water Pump 115-27-PM-004

Parameter	Design	Operating
Discharge Pressure	5.0barg	2.0barg
Temperature	65°C	Ambient
Capacity	5.0M^3/h @ 2.0barg (hold)	
Power	4.0kW (hold)	

3.5.3 Technical Description

Emergency Produced Water Pump 115-27-PM-007 is an electrically driven, vertical submersible pump located within the Emergency Produced Water Storage Pond water compartment. The drive motor and discharge head are connected to the pump by line shaft.

A manual isolation valve is fitted to the pump discharge line downstream of a check valve, together with a 'normally-open' spectacle blind and removable spool piece for maintenance purposes. From the discharge line, a minimum flow line (with flow orifice) returns a portion of the fluids to back to the pond.

3.6 Hold Up Tank 115-27-T-005

Refer to PHM-115-FE-093 Hold Up Tank.

3.6.1 Function

Hold Up Tank 115-27-T-005 receives water from the Produced Water Transfer Pumps. Its main function is buffer storage from produced water.

3.6.2 Technical Data

For details of the design and operating parameters, refer to Table 5.6 – Design and Operating Parameters Hold Up Tank 115-27-T-005.

Table 5.6 – Design and Operating Parameters Hold Up Tank 115-27-T-005

Parameter	Design	Operating
Pressure	0.056 barg/ -0.006 barg	0.010-0.020 barg
Temperature	95°C/-20°C	Ambient
Capacity	113 M^3 (80% full)	
Thermal Duty	none	

3.6.3 Technical Description

Hold Up Tank 115-27-T-005 is an enclosed tank, API 650 Fix Roof Design, of dimensions 6 m diameter by 5 m high and is constructed from carbon steel.

It will be used as buffer capacity for Produced Water. This is sized to take the maximum slug when pigging (found to be max in 2010 Pigging at 606 bbls or 96 m3), plus 1 day normal Produced Water production (15.5 m3).The intention is to contain Produced Water in closed containment. This is to prevent unwanted BTEX emission and acute smell to plant personnel.

Overpressure/Vacuum relief is managed by 4" PVRV for normal breathing. A Fire Case relief is managed by 18" Emergency Relief Valve, ERV, which is sized with wetted area requirement by API 2000.

Guided Wave Level Transmitter, 27-LT-115, is installed on top of the tank and will register LAHH at 4 meter level (this is at the 113 m3 working volume) and LALL at 1 meter level. There are 3 level gauges (115-27-LG-112/113/114) that is lined up along vertical direction of the tank for manual indication of level.

There are 5 manual skimmed valves. These valves are only be used when slug arrives from Pigging Activity, to skim usable Condensate back to Closed Drain Vessel (via gravity drain). In case of enormous amount of slug comes in, the whole tank can also be drained into Emergency Produced Water Storage Pond (115-27-T-004). There is also a revert line that go from the pond here back into the tank. However, it will be manual control and will be used when water slug is needed to be managed. In normal operation, Emergency Produced Water Pond should be dry.

From bottom of Hold Up Tank, PW Pump (115-27-PM-008A/B) will send the Produced Water to PW Evaporator (115-27-H-001). The Kettle Evaporator will be operated in batch where PW is filled up to Level High, evaporating until reach Level Low, then the pump will kick on again. This operation is similar to old Boil Off Tank (whereby at the very end the old BOT was totally manually operated).

For details of the Hold Up Tank control and protection, refer to Paragraph 4.0 Instrumentation and Control.

For details of the method to remove the brine slurry from the Hold Up Tank, refer to the SOP Paragraph 11.0 Supplementary Procedures.

3.7 Produced Water Pump 115-27-PM-008A/B

Refer to PHM-115-FE-093 Hold Up Tank.

3.7.1 Function

The Produced Water Pump 115-27-PM-008A/B is used to transfer produced water from Hold Up Tank to Produced Water Evaporator.

3.7.2 Technical Data

For details of the design and operating parameters, refer to Table 5.7 – Design and Operating Parameters Produced Water Pump 115-27-PM-008A/B.

Table 5.7 – Design and Operating Parameters Produced Water Pump 115-27-PM-008A/B

Parameter	Design	Operating
Discharge Pressure	5 barg	0.65 barg
Temperature	107°C	40° C
Capacity	11 M^3/h @ 0.68 barg	

3.7.3 Technical Description

The Produced Water Pump is centrifugal pump, 0.75 kW motor driven. It is used to transfer produced water from Hold Up Tank to Produced Water Evaporator. The motor is intended to start and stop up to the level of Produced Water Evaporator, i.e. it will start once Evaporator's level is low, making up level to level high, then the pump will stop.

3.8 Produced Water Evaporator 115-27-H-001

Refer to P&ID: PHM-115-FE-023 Produced Water Evaporator.

3.8.1 Function

The Produced Water Evaporator function is to evaporate produced water to complete vapour, using heat input from Heating Medium. The boiling vapour, mixed with blanket gas, will be routed to Thermal Oxidizer in order to ensure complete incineration of BTEX.

3.8.2 Technical Data

For details of the design and operating parameters, refer to Table 5.8 – Design and Operating Parameters Produced Water Separator 115-27-H-001.

Table 5.8 – Design and Operating Parameters Produced Water Evaporator 115-27-H-001

Parameter	Design	Operating
Pressure	Shell : 10.35 barg / FV Tube: 40 barg / FV	Shell : 0.005 barg Tube : ~7 barg

Parameter	Design	Operating
Temperature (Max/Min)	Shell: 200°C/-29°C Tube : 200°C/-29°C	Shell : 107°C Tube : 150°C
Capacity	644 kg/h of Produced Water (15.5 m3 per day)	
Heat Duty	455 kW	

3.8.3 Technical Description

Produced Water Evaporator (115-27-H-001), design capacity of 15.5 m3 per day (455 kW), uses heat from Heating Medium to evaporate PW. Vapour from evaporation is routed to Thermal Oxidizer (TOX) to incinerate the left-over BTEX contents.

It is design to ASME Section VIII Pressure Vessel with 10.34 barg Design Pressure on Shell Side, and 40 barg Design Pressure on Tube Side where contains Heating Medium. The exchanger is Kettle Type with removable tube bundle. Internal Sparger is provided for cleaning with potable service water. Overpressure protection on Shell Side is 1½" x 3" PSV, G Orifice, designed for Fire Case. Tube Side is full rated protection by Heating Medium system.

Guided Wave Level Transmitter, 27-LT-110 and 27-LT-111, is installed on vessel's bridle. The 27-LT-110 is used for control purpose while 27-LT-111 is for unit shutdown.

On pressure side, the vessel is blanketed by fuel gas through 27-PCV-119 at 5 mbarg which will vent into TOX, way below the design pressure of 10.34 barg. However, due to possible pressure trapped if 27-SDV-109 partially blocked or fully closed, 27-PI-108 will register alarm to Control Room Operator. In such an event, Operator will have very long time to response since pressure will rise from few hundreds mbarg to 10,350 mbarg (10.35 barg). In ultimate case, 27-PSV-107, which set at Design Pressure will be final protection.

Main purpose for Produced Water Evaporator is to evaporate Produced Water by heat from Heating Medium.

However, since this evaporation potentially contained hydrocarbon – including fuel gas that is used for blanketing, it has to be operation when TOX is ready.

IT IS VERY IMPORTANT THAT THE THERMAL OXIDIZER HAS TO BE STARTED UP FIRST BEFORE GASES BEING INTRODUCED INTO IT. THIS IS TO PREVENT THE CASE OF UNBURNT VAPOUR COULD THAT MAY CAUSE FLASH FIRE. DO NOT BYPASS OR OVERIDE 27-SDV-109.

The Produced Water Evaporator will require cleaning sometimes (default monthly) as well as draining concentrate brine. Internal spargers will inject clean water to flush out debris and sticky brine and drain into Brine Pond (115-27-T-003).

3.9 Brine Transfer Pump 115-27-PM-005

Refer to PHM-115-FE-023 Produced Water Evaporator.

3.9.1 Function

The Brine Transfer Pump 115-27-PM-005 is used during cleaning operations to transfer slurry from the Produced Water Evaporator to the Brine Evaporation Pond 115-27-T-002.

3.9.2 Technical Data

For details of the design and operating parameters, refer to Table 5.7 – Design and Operating Parameters Brine Transfer Pump 115-27-PM-005.

Table 5.7 – Design and Operating Parameters Brine Transfer Pump 115-27-PM-005

Parameter	Design	Operating
Discharge Pressure	8.6barg	3.5barg
Temperature	107°C	100°C
Capacity	10M^3/h @ 3.5barg	

3.9.3 Technical Description

The brine transfer pump is an air driven, diaphragm pump. Instrument air is supplied to the pump via a self regulating pressure control valve.

The pump discharge line is provided with a non-return valve and a carriage sealed open manual isolation hand valve, the suction line is also provided with and a carriage sealed open manual isolation hand valve.

3.10 Brine Evaporation Pond 115-27-T-002

Refer to P&ID: PHM-115-FE-092 Produced Water Pond.

3.8.1 Function

Brine Evaporation Pond 115-27-T-002 collects brine/slurry from drained liquid from Produced Water Evaporator during cleaning operations. The slurry is allowed to evaporate and the dried residue is collected from the pond for disposal.

3.8.2 Technical Data

For details of the design and operating parameters, refer to Table 5.8 – Design and Operating Parameters Brine Evaporation Pond 115-27-T-002.

Table 5.8 – Design and Operating Parameters Brine Evaporation Pond 115-27-T-002

Parameter	Design	Operating
Pressure	Full of water	ATM
Temperature	120°C	100°C
Capacity	30m^3	Up to 30m^3

3.8.3 Technical Description

Brine Evaporation Pond 115-27-T-002 is a concrete constructed pond of 5.0m width X 5.0m length X 1.7m depth with a capacity of 30m^3. The tank has a cover, which allows natural evaporation to take place and is bunded to minimize water ingress.

3.11 Thermal Oxidizer 115-27-Z-001

Refer to PHM-115-FE-023 Thermal Oxidizer.

3.11.1 Function

Thermal Oxidiser 115-27-Z-001 utilises fuel gas to incinerate the waste gas produced in the LP Flash Vessel 115-02-V-005 together with the gas produced in the. Produced Water Separator 115-27-V-005 and destroys Benzene, Toluene, Ethylbenzene, Xylene. BTEX compounds emitted from the Glycol Regeneration Reboiler Still Column.

The design of the thermal oxidizer (a closed chamber incinerator) is such that it is unaffected by winds and produces high temperatures to efficiently burn the hydrocarbon waste gasses and vaporize the produced water.

A cold vent stack is provided to safely dispose of waste gas from the glycol reboiler when thermal

Oxidiser is not on line.

3.11.2 Technical Data

For details of the design and operating parameters, refer to Table 5.9 – Design and Operating Parameters Thermal Oxidiser 115-27-Z-001.

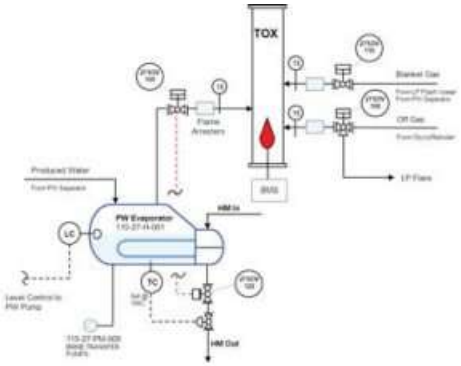
Table 5.9 – Design and Operating Parameters Emergency Thermal Oxidiser 115-27-Z-001

Parameter	Design	Operating
Pressure	Atmospheric	Atmospheric
Temperature	Max 1,300°C	900 - 700°C
Capacity	68 bpd and 0.5 mmscf gas	

3.11.3 Technical Description

Thermal Oxidiser 115-27-Z-001 is a vertical incinerator unit of 1.83m outside diameter and 12.19m in height. The unit is manufactured by QTI.

The stack is refractory lined to withstand the high temperatures required to efficiently burn rich gas and has combustion air induction ports at the base. The thermal oxidiser is provided with two inlet nozzles for waste gas, and one nozzle for vapour from Produced Water Evaporator. Below simplified schematic shows the SDVs connected to Thermal Oxidizer.



The blanket gas/flashed hydrocarbon from the Produced Water Separator and Low Pressure Flash Vessel is routed into TOX via Shutdown Valve 115-27-SDV-110 and a flame arrestor.

Waste gas (Off Gas) from the Glycol Reboiler is routed to the thermal oxidiser via a KO Pot that was designed to remove any condensate from the steam prior to entering the Thermal Oxidizer. This stream enters via three-way diverter Shutdown Valve 115-27-SDV-108 which diverts the waste gas to the LP Flare System when the thermal oxidiser is off line.

The last one waste gas stream is boiling vapour from Produced Water Evaporator that goes through 27-SDV-109.

TOX was upgraded on February 2013 to use SIL 2 PLC (Allan Bradley) with self-diagnose function. When TOX is not in service, all three SDVs around TOX will be in closed positions (SDV-109, SDV-108, and SDV-110), which will cause following consequences,

1. 27-SDV-108 Closed:

This one is the 3-way valves that will either route Off Gas from Glycol Reboiler to TOX or to LP Flare (when TOX is out of service).

2. 27-SDV-110 Closed:

This valve isolates TOX from vent header of blanket gas of LP Flash Vessel and PW Separator Vessel. The bleed PCVs at the outlet of both vessels are set to 300 milibarg to bleed out to TOX when these two vessels have flash hydrocarbon vapor. When the SDV is closed, diverting PCVs on both vessels will bleed the trapped pressure of above 1 barg to LP Flare.

3. 27-SDV-109 Closed:

This valve isolates TOX from boiling vapor of PW Evaporator. It is also interlocked to Heating Medium Valve that supplies heat to Produced Water Evaporator (27-SDV-122). When this valve is closed, there will be no heat input to Produced Water Evaporator. Therefore, Produced Water Evaporator will not be able to operate.

IT IS VERY IMPORTANT THAT THE THERMAL OXIDIZER HAS TO BE STARTED UP FIRST BEFORE GASES BEING INTRODUCED INTO IT. THIS IS TO PREVENT THE CASE OF UNBURNT VAPOUR COULD THAT MAY CAUSE FLASH FIRE.

In operation, the SIL2 PLC will execute Burner Management sequence in a very safety manner. First, the purge air valve will be open to purge possible trapped hydrocarbon out from the stack for 10 minutes (5 times air replacement of stack volumn). Plant air will be used as air purge. After this sequence is finished, pilot #1 will start to light up (and time-out if fails) and ensure flame exists and stable (time-out if fails). Then pilot #2 will follow the sequence, then pilot #3. When all is ready, the Main Gas will introduce fuel gas with control valve at Low Fire Position (stable fire, but low heat). Each of time-out, failed temperature, failed confirmation of flame will cause the PLC to trip and run Purge Sequence over again.

After fire in TOX is stable and temperature reaches 700 C, the blanket gas from Produced Water Separator and LP Flash Vessel will be introduced through 27-SDV-110 (due to highest heating value of 3 streams). Then the 27-SDV-108 from Glycol Reboiler will be open, introduced Off Gas into TOX. The last one will be 27-SDV-109 which leads the boiling vapour from Produced Water Evaporator into TOX. All SDVs here will be be open manually at local panel and require Operator to oversee the whole vicinity prior to open the each valve in order to ensure safe operation.

4.0 INSTRUMENTATION AND CONTROL

4.1 Produced Water Separator 115-27-V-005

Refer to P&ID: PHM-115-FE-021 Produced Water Separator.

4.1.1 Pressure

The pressure in the separator is controlled at 0.3barg by a self regulating Pressure Control Valve 115-27-PCV-101C, which lets down to the thermal oxidizer. If the pressure in the separator continues to rise, self regulating Pressure Control Valve 115-27-PCV-101B will open at 1.0barg and release the excess gas to the LP Flare System.

If the pressure in the separator falls then self regulating Pressure Control Valve 115-27-PCV-101A will open at 0.25barg to maintain the gas blanket from the fuel gas system.

Pressure in the produced water separator is indicated locally on 115-27-PG-101.

Pressure in the produced water separator is indicated on the DCS by 115-27-PIA-101, which provides high and low pressure alarms.

High pressure protection is provided by Pressure Transmitter 115-27-PIA-102 which is used to generate a high pressure trip signal for the SDS System, which performs the necessary executive actions identified on the cause and effect charts.

Overpressure protection for fire case is provided by Pressure Relief Valves 115-27-PSV-101 set to relieve at 10.35barg.

4.1.2 Liquid Level

The liquid level control in the separator consists of condensate level control and condensate/water interface level control.

The condensate level in the separator level is maintained by Level Controller 115-27-LICA-104, which controls Condensate Recovery Pumps 115-27-PM-002A/B by an on/off 'gap action' control signal. Level Controller 115-27-LICA-104 also provides high and low level alarms to the DCS.

The condensate/water interface level in the separator level is maintained by Level Controller 115-27-LICA-101. The initial control is to Produced Water Transfer Pumps 115-27-PM-003A/B and is carried out by modulating the pump variable frequency drive motors to speed up or slow down the pumping rate as required. If the level continues to rise above the desired setpoint, an output signal is sent to 'normally closed' Shutdown Valve 115-27-SDV-106, which will open and dump excess level to the emergency produced water storage pond or the produced water pond. Level Controller 115-27-LICA-101 also provides high and low level alarms to the DCS.

Protection against high condensate level is provided by Level Transmitter 115-27-LT-103, which is used to generate a high level trip signal through 115-27-LIA-103.

Protection against low condensate level is provided by Level Transmitter 115-27-LT-105, which is used to generate a low level trip signal through 115-27-LIA-105.

Protection against low condensate/water interface level is provided by Level Transmitter 115-27-LT-102, which is used to generate a low interface level trip signal through 115-27-LIA-102.

The level trip signals are sent to the SDS System, which performs the necessary executive actions identified on the cause and effect charts.

Shutdown Valve 115-27-SDV-102 is positioned on the condensate outlet from the produced water separator. The valve fails closed and the air to the valve is switched by a solenoid valve controlled from the SDS System.

4.1.3 Flow

The cumulative flow of produced water from the produced water separator is metered at the DCS by 27-FQI-101.

4.2 Condensate Recovery Pumps 115-27-PM-002A/B

Refer to P&ID: PHM-115-FE-021 Produced Water Separator.

4.2.1 Pressure

Pressure in the Condensate Recovery Pumps 115-27-PM-002A/B common discharge line is indicated on the DCS by 115-27-PIA-104, which provides a high pressure alarm.

Overpressure protection of each pump discharge for blocked outlet is provided by Pressure Relief Valves 27-PSV-102A/B respectively, set to relieve back to the produced water separator at 15barg.

4.2.2 Pump On/Off Control

The Condensate Level Controller 115-27-LICA-104 in the produced water separator controls the starting and stopping of the condensate recovery pumps.

4.3 Produced Water Transfer Pumps 115-27-PM-003A/B

Refer to P&ID: PHM-115-FE-022 Produced Water Transfer Pumps.

4.3.1 Pressure

Pressure in the Produced Water Transfer Pumps 115-27-PM-003A/B common discharge line is indicated on the DCS by 115- 27-PIA-101, which provides a high pressure alarm.

Overpressure protection of each pump discharge for blocked outlet is provided by Pressure Relief Valves 27-PSV-103A/B respectively, set to relieve back to the produced water separator at 15barg.

4.3.2 Pump Speed Control (Interface Level Control)

Condensate/Water Interface Level Controller 115-27-LICA-101 controls the speed of the variable frequency drive motor for the respective produced water transfer pumps.

4.4 Emergency Produced Water Storage Pond 115-27-T-001

Refer to P&ID: PHM-115-FE-092 Produced Water Pond.

4.4.1 Level

A high level alarm on the DCS for the Emergency Produced Water Storage Pond 115-27-T-001 is provided by Level transmitter 115-27-LT-106 which when activated annunciates as 115-27-LA-106.

4.5 Emergency Produced Water Pump 115-27-PM-004

Refer to P&ID: PHM-115-FE-092 Produced Water Pond.

4.5.1 Flow

Discharge flow from the Emergency Produced Water Pump 115-27-PM-004 is indicated on the DCS by Flow Indicator 115-27-FIA-102, which also provides a high flow alarm.

4.6 Hold Up Tank 115-27-T-005

Refer to PHM-115-FE-093 Hold Up Tank.

4.6.1 Level

Tank level is controlled by Level Controller 27-LT-115 which provides On/Off control to Shutdown Valves 27-SDV-124 (inlet) and 27-SDV-126 (outlet) and provides high and low level and alarms on the DCS. At low level, it also trips the pump.

4.6.2 Temperature

Tank has no heat source and will be at ambient all time. Day/night temperature will cause tank breathing which will subsequently cause pressure/vacuum variation. This will be managed by 4" PVRV on top of the tank.

4.6.3 Pressure

Hold Up Tank will be blanketed with fuel gas. The blanket gas is padded to keep slight positive pressure at 10-20 mbarg operation pressure. Inlet PCV (27-PCV-117) is set to pad in 10 mbarg and outlet PCV (27-PCV-118) will release pressure above 20 mbarg to atmosphere, at safe location. Flame Arrester (flat bottom) is installed at this end to protect unwanted ignition.

Design pressure and vacuum is the same as Condensate Tank i.e. 30 mbarg Pressure and -3 mbarg Vacuum.

PVRV is sized to open on normal breathing. ERV is sized up to Fire Case which is the extreme governing case for pressure relief.

These PVRV and ERV are weight-loaded type which is the most simple and reliable type. Pressure/vacuum case does not require Operator's attention.

4.6.4 Unit Operation

The main and only function of the Hold Up Tank is to be Produced Water buffer for the plant.

From bottom of Hold Up Tank, PW Pump (115-27-PM-008A/B) will send the Produced Water to PW Evaporator (115-27-H-001). The Kettle Evaporator will be operated in batch where PW is filled up to Level High, evaporating until reach Level Low, then the pump will kick on again. This operation is similar to old Boil Off Tank (whereby at the very end the old BOT was totally manually operated).

4.7 Produced Water Pump 115-27-PM-008A/B

Refer to PHM-115-FE-093 Hold Up Tank.

4.7.1 Pressure

The pump discharge pressures can be seen by 27-PT-107 (Suction is close to Hold Up Tank and only pressure gauges are provided). In case of outlet block and combination of thermal expansion, the 27-PSV-108 will release over pressure back to Hold Up Tank.

4.7.2 Start/Stop

The pump is started and stopped by level control of Produced Water Evaporator, 27-LT-110. When level is low, due to produced water evaporated, the Level Control Low will send signal to start the pump, making up level to Level Control High. Then the pump will stop until the next batch required.

In the event of level high high or level low low in Produced Water Evaporator (due to lost of containment or heating medium leak into shell side), the other redundant Level Transmitter, 27-LT-111 will send signal to trip the pump.

4.8 Produced Water Evaporator 115-27-H-001

Refer to P&ID: PHM-115-FE-023 Produced Water Evaporator.

4.1.1 Pressure

The pressure in the PW Evaporator is just slightly above ambient so the blanket gas is set by 27-PCV-118 at 5 mbarg. In normal operation, the valve to TOX, 27-SDV-109, is fully open therefore there will be atmospheric pressure.

The operating pressure is atmospheric while the Evaporator itself is designed to 10.35 barg. Only concerns is when 27-SDV-109 is blocked, partially blocked, or close-in by intention, it may see pressure rise. In this event, 27-PT-108 will register alarm to Control Room. The case of fully close of 27-SDV-109 by any means will also close 27-SDV-122 on Heating Medium supply side too. This will cut the heat input, therefore no boiling occurs. With no boiling the chance of pressure rise will not happen. This is the same case when tube side leak and let the Heating Medium into shell side too. The level control will close 27-SDV-109 (to prevent liquid entering to TOX), which in turn, close 27-SDV-122 and cut all heat input.

Overpressure protection for fire case is provided by Pressure Relief Valves 27-PSV-107 set to relieve at 10.35 barg to LP Flare System.

4.1.2 Liquid Level

In fact, level low will not cause damage due to hot spot since Heating Medium design temperature is 200 C (the boiling point is around 250 C). However, the efficiency will drop due to unutilized heat.

Level high may cause by tube leakage and Heating Medium breaches into the exchanger. If this happens, Level High High will trip 27-SDV-109 to protect TOX from liquid break-in. Level Transmitter 27-LT-111 will issue alarm to Control Room. Pressure will build up due to 27-SDV-109 closed, however, with 7 barg operating pressure of Heating Medium (centrifugal pumps) it will stabilize and only fill the exchanger with liquid. In extreme scenario, the 27-PSV-107 will pop open, sending all liquid to LP Flare system. The closing of 27-SDV-109 will always shut the Heating Medium Supply valve, 27-SDV-122, in order to preclude unwanted heat.

4.1.3 Flow

Flow of liquid is from 27-PM-108A/B and has no direct effect to Evaporator (level does). Flow of blanket gas in control by 27-PCV-118 that is set at 5 mbar padding.

4.9 Brine Transfer Pump 115-27-PM-004

Refer to PHM-115-FE-023 Thermal Oxidiser.

4.9.1 Pressure

The pump suction and discharge pressures can be seen locally on Pressure Gauges 115-27-PG-112B and 115-27-PG-112A respectively.

4.9.2 Start/Stop

The pump is started and stopped locally.

4.10 Brine Evaporation Pond 115-27-T-003

Refer to P&ID: PHM-115-FE-092 Produced Water Pond.

There are no control facilities associated with the brine evaporation pond.

4.11 Thermal Oxidizer 115-27-Z-001

Refer to PHM-115-FE-023 Thermal Oxidizer.

Note: The tag numbers for the controls described below have been taken from Vendor P&ID.

4.11.1 Temperature

Temperature control of the thermal oxidizer is provided by Temperature Controller 115-27-TIA-101, which modulates Temperature Control Valve 115-27-TCV-101 in the fuel gas supply line. Temperature Controller 115-27-TIA-101 provides high and low temperature alarms and a high temperature trip via the BMS logic to the SDS system. Temperature Controller 115-27-TIA-101also provides temperature indication to the DCS.

Protection against high temperature in the upper stack region is provided by Temperature Transmitter 115-27-TT-102, which is used to generate a high temperature trip signal through. The temperature trip signal is sent to the BMS logic, and to the SDS System which performs the necessary executive actions, identified on the cause and effect charts.

4.11.2 Pressure (Fuel Gas)

The pressure of the fuel gas to the main burner is controlled at 390mbarg by self-regulating Pressure Control Valve 115-27-PCV-115.

The pressure of the fuel gas to the three pilot burners is controlled at 75mbarg by self-regulating Pressure Control Valves 115-27-PCV116.

The fuel gas pressure is indicated locally by Pressure Gauges 115-27-PG-110 and 115-27-PG-112 for main fuel gas to main burner,115-27-PG-114 fo fuel gas supply to main pilot burner, 115-27-PG-115 for the pilot 1 burner, 115-27-PG-116 for the pilot 2 burner and 115-27-PG-117 for the pilot 3 burner.

The fuel gas pressure is also indicated by Pressure Indicator Alarms 115-27-PIA-108 and 115-27-PIA-109, which provide respectively low and high pressure trip signals. The pressure trip signals are sent to the BMS logic, and to the SDS System which performs the necessary executive actions identified on the cause and effect charts.

The burners are provided with Fuel Gas Shutdown Valves 115-27-SDV-114,115-27-SDV-115(Main Burner) and 115-27-SDV-116,115-27-SDV- 117(Pilot 1 Burner). 115-27-SDV- 118, 115-27-SDV- 119 (Pilot 2 burners) and 115-27-SDV- 120,115-27-SDV- 121(Pilot 3 burners). These valves are automatically controlled by the logic within the Thermal Oxidiser Profire 1100 Burner Management System, and fail in the closed position.

The burners are also provided with Blowdown Valves 115-27-BDV-122 to vent the fuel gas. These valves are also automatically controlled by the logic within the Thermal Oxidiser Profire 1100 Burner Management System, and fail in the closed position.

4.11.3 Flame Detection

The thermal oxidizer main burner flame is detected by three flame detectors, namely 'Flame Fail No. 1, 2 and 3. Refer to the BMS Cause and Effect Chart for the thermal oxidizer for executive actions in the event that one and two, then all three detectors activate.

4.11.4 Waste Gas Supply

There are 3 waste gas streams into TOX,

- The blanket gas/flashed hydrocarbon from the Produced Water Separator and Low Pressure Flash Vessel is routed into TOX via Shutdown Valve 115-27-SDV-110 and a flame arrestor.
- Waste gas (Off Gas) from the Glycol Reboiler is routed to the thermal oxidiser via a KO Pot that was designed to remove any condensate from the steam prior to entering the Thermal Oxidiser. This stream enters via three-way diverter Shutdown Valve 115-27-SDV-108 which diverts the waste gas to the LP Flare System when the thermal oxidiser is off line.
- Boiling vapour from Produced Water Evaporator that goes through 27-SDV-109.

4.11.5 Unit Operation

The main and pilot burners are controlled by the Thermal Oxidiser Profire 1100 Burner Management System, which is a PLC control unit. The control unit uses dual flame sensing modes for safety, Ionization loop with thermocouple backup.

Operator information displayed on a blue LED display on the front of the unit and includes, thermocouple temperature, flame status, valve status and operation modes. The unit front panel

has buttons for control of pilot, main valve, spark, operation modes, configuration and an ESD button.

4.11.6 Level

The level in the condensate liquid traps on the waste gas inlets to the thermal oxidiser can be seen locally on Level Gauges 115-27-LG-103. These have combined Level Switches115-27-LS-103 which provide high level alarms to the DCS.

4.12 Emergency Produced Water Storage Pond 115-27-T-004

Refer to P&ID: PHM-115-FE-092 (H) Emergency Produced Water Storage Pond.

4.12.1 Level

The level at the Produced Water Storage Pond 115-27-T-004 is monitor via 115-27-LT-109, which provide high and low level alarms to DCS via 115-27-LIA-109.

4.13 Emergency Produced Water Storage Pond Transfer Pump 115-27-PM-007

Refer to P&ID: PHM-115-FE-092 (H) Produced Water Pond.

4.13.1 Pressure

The discharge pressure is locally monitor via 115-27-PG-109

4.14 Water Disposal Pump 115-27-PM-006 (To be considered)

Refer to P&ID: PHM-115-FE-092 (H) Produced Water Pond.

No the pressure indicator for this skid.

5.0 ENVIRONMENTAL, HEALTH AND SAFETY REQUIREMENTS

5.1 General EHS Requirements

5.1.1 Chemicals

It is possible that pipeline corrosion inhibiter will be present in the water phase during normal or upset conditions.

5.1.2 Hazardous Sources

Table 5.10 – Hazardous Sources lists potential hazardous sources that may be present under upset conditions affecting the Produced Water System.

Table 5.10 – Hazardous Sources

Hazard	Source	Hazardous Event	Effect	Control
Liquid hydrocarbons under pressure	Produced Water Separator Condensate Recovery Pumps	Potential for injury due to contact with hazardous liquids Loss of containment and release of flammable liquids	Potential for personnel injury Un-ignited liquid release and potential for gas release and fire/explosion	Fire and Gas Detection

Hazard	Source	Hazardous Event	Effect	Control
Hydrocarbon gas under pressure	Throughout system	Potential for injury due to contact with hazardous liquids Loss of containment and release of flammable gas	Potential for personnel injury Un-ignited gas release and potential for fire/explosion	Burner Flame Detection Fire and Gas Detection
Lube oil	Condensate Recovery Pumps Produced Water Transfer Pumps	Loss of containment	Potential for personnel injury • Spills • Fire • Contamination	Monitoring Maintenance procedures
High temperature steam	Boil-off Tank	Loss of containment	Potential for personnel injury	Monitoring Maintenance procedures
Nitrogen	Purging operations	Exposure to	Potential for personnel asphyxiation	Safety procedures

5.2 Specific Health and Safety Requirements

The correct use of Personal Protective Equipment (PPE) is fundamental in securing a safe and healthy place of work for all personnel. PPE shall be used in conjunction with appropriate health, environment and safety procedures that are designed to minimise the potential risk of harm or injury to personnel, while also promoting safe working practices.

5.3 Specific Environmental Requirements

To prepare the Produced Water System for the introduction of hydrocarbon liquids, it is necessary to remove all air from the system. Nitrogen maybe utilized for this purpose. Similarly, when preparing equipment for maintenance, nitrogen maybe used to purge hydrocarbons from the system before breaking containment and introducing air.

When purging the system of air prior to introduction of hydrocarbons, the atmoPig in the system should be tested with an Oxygen Content Analyzer to determine the level of oxygen remaining in the purged system.

When purging is being performed to remove hydrocarbons, a suitable test instrument should be used, which is capable of detecting hydrocarbons in nitrogen.

WARNING: NITROGEN IS AN ASPHYXIANT, AND IS COLOURLESS AND ODOURLESS: RAPID AND UNRECOGNISED LOSS OF CONSCIOUSNESS CAN OCCUR IN PERSONS EXPOSED TO A NITROGEN-ENRICHED ATMOPIG. WHEN USING NITROGEN, CARE SHOULD BE TAKEN TO ENSURE THAT NITROGEN ESCAPES ARE DISPERSED AND NOT ALLOWED TO COLLECT IN ENCLOSED AREAS.

6.0 REFERENCE INFORMATION

6.1 Hess Corporation Company Documentation

Document Number	Document Title
2002-PDS-115-27-V-005-018	Produced Water Separator Process Data Sheet
2002-PDS-115-27-PM-003AB-021	Produced Water Transfer Pumps Process Data Sheet
2002-PDS-115-27-PM-002AB-020	Condensate Recovery Pumps Process Data Sheet
2002-PDS-115-27-Z-001-005	Thermal Oxidiser Process Data Sheet
2002-DS-115-0840-06	Produced Water Separator Mechanical Data Sheet
PH-10-OP-SOP-00005	Standard Operating Procedure for Produced Water Treatment

6.2 Vendor Documentation

Document Number	Document Title
Construction Mechanical Vendor 115-27-Z-001	QTI Q1000 Thermal Oxidizer Operating Instructions
2002-PO-4116-01 REC015	QTI Boil-Off Tank Operating Instructions
Q1000-1004-010	Q1000 Thermal Oxidizer – Cause and Effect Diagram
Q1000-1004-050	Boil-Off Tank - Cause and Effect Diagram
68701 P&ID-001	QTI P&ID – Boil-Off Tank
68701 P&ID-002	QTI P&ID – Incinerator

6.3 Engineering Drawings (PFDs, UFDs and P&IDs)

Drawing Number	Drawing Title
PHM-115-FP-010	Sinphuhorm GPP UFD – Produced Water Treatment Facilities
PHM-115-FE-021	Sinphuhorm GPP P&ID – Produced Water Separator
PHM-115-FE-022	Sinphuhorm GPP P&ID – Produced Water Transfer Pumps
PHM-115-FE-023	Sinphuhorm GPP P&ID – Thermal Oxidiser
PHM-115-FE-092	Sinphuhorm GPP P&ID – Produced Water Pond

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FLARE SYSTEMS

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1.0 INTRODUCTION

1.1 System Purpose/Function

The Flare System is designed to collect continuous and emergency flaring loads, knock out any entrained liquids and subsequently dispose of the hydrocarbon gases via the LP and HP flare stacks. The flares collection network is split to segregate high pressure (HP) and low pressure (LP) sources.

1.2 Primary Components

Tag No	Equipment Title/Description
115-16-V-006	LP Flare KO Vessel
115-16-Z-001	LP Flare Stack
115-16-Z-003	LP Flare Tip
115-16-V-007	HP Flare KO Vessel
115-16-Z-002	HP Flare Stack
115-16-Z-004	HP Flare Tip
115-16-S-004	Flare Ignition Panel common to both the LP and HP Flare Tips

1.3 Primary Interfaces

Input interfaces:

Wellpads A, B, C and Main Pipeline (refer to Section 1.0A of this OPM)

Gas Process, Metering and Export (refer to Section 2.0 of this OPM)

Glycol Regeneration (refer to Section 3.0 of this OPM)

Condensate Treatment, Storage and Export (refer to Section 4.0 of this OPM)

Produced Water Treatment (refer to Section 5.0 of this OPM)

Fuel Gas System (refer to Section 7.0 of this OPM)

Heating Medium (refer to Section 9.0 of this OPM)

Instrument Air System (refer to Section 10.0 of this OPM)

PCSS System (refer to Section 14.0 of this OPM)

Output Interfaces:

Condensate Treatment, Storage and Export (refer to Section 4.0 of this OPM)

Closed and Open Drains (refer to Section 8.0 of this OPM)

2.0 SYSTEM DESCRIPTION

2.1 System Overview

Refer to Figure 6.1 – Flare System Simplified Overview Schematic.

2.1.1 LP Flare System

The LP Flare System receives fluids from the following process facilities:

- Fuel Gas Scrubber 115-15-V-001
- Produced Water Separator
- LP Flash Vessel
- HP Flash Vessel
- LP Vent Header
- Heating Medium Package
- Glycol Regeneration Package
- Gas Metering Skid (From upsteam sale gas metering sampling connection)

The fluids flow into the LP flare KO vessel, a description of the separation process within the flash vessel is provided in Paragraph 2.2.1.

2.1.2 HP and Cold Flare System

The HP Flare System receives fluids from the following process facilities:

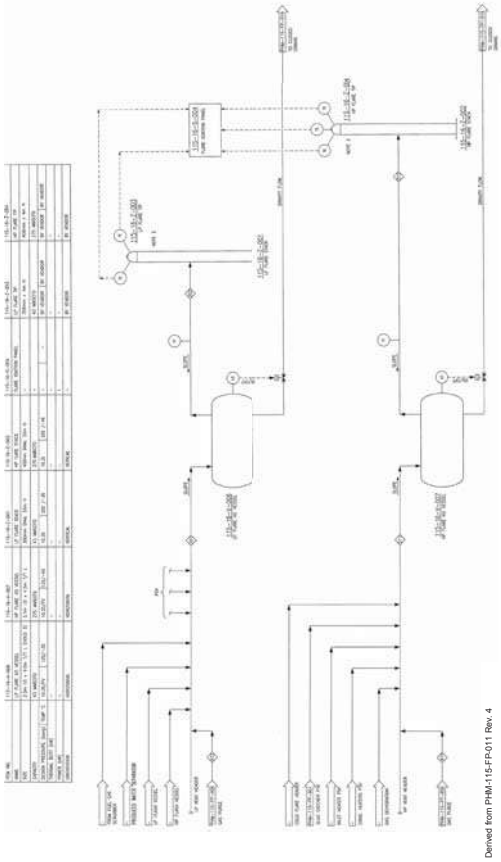
- Pig Receiver
- Slug Catcher
- Inlet Coalescing Filter Separator
- MRU
- Dust Filter
- Inlet Heater
- Condensate Heaters
- Gas Dehydration – Glycol Contactor
- Fuel Gas Heater
- Gas/Gas Exchanger
- Sale Gas Metering Vent to HP flare header

The Cold Flare Header passes into the HP Flare System and receives fluids from the following process facilities:

- Low Temperature Separator (LTS)
- Gas/Gas Exchanger

The fluids flow into the HP flare KO vessel, a description of the separation process within the flash vessel is provided in Paragraph 2.2.2.

Figure 6.1 – Flare System Simplified Overview Schematic



Derived from PHM-115-FP-011 Rev. 4

2.2 Primary Flow Description

2.2.1 LP Flare Facilities

Refer to P&IDs:

PHM-115-FE-033 LP Flare Header Collection

PHM-115-FE-034 LP Flare KO Vessel

PHM-115-FE-035 HP and LP Flare Stacks

The fluids from the facilities listed in Paragraph 2.1.1 pass into LP Flare KO Vessel 115-16-V-006, where the liquids collect and are passed to the Closed Drains System. The LP flare collection header slopes downwards towards the KO drum in order to permit the free draining of condensed vapours to the KO drum. The LP flare header is normally purged with hydrocarbon gas direct from the Fuel Gas System.

The hydrocarbon vapours from within the vessel discharge to the LP flare stack where they are safely disposal by burning at the flare tip. The two LP flare pilots are continuously supplied with fuel gas and are lit by high-energy igniters controlled from a local panel.

2.2.2 HP and Cold Flare Facilities

Refer to P&IDs:

PHM-115-FE-031 HP Flare Header Collection

PHM-115-FE-032 HP Flare KO Vessel

PHM-115-FE-035 HP and LP Flare Stacks

The fluids from the facilities listed in Paragraph 2.1.2 pass into the HP Flare KO Vessel 115-16-V-007, where the liquids collect and are passed to the Closed Drains System. The HP and cold flare collection headers slope downwards towards the KO drum in order to permit the free draining of condensed vapours to the KO drum. The HP flare header and the cold flare header are normally purged with hydrocarbon gas direct from the Fuel Gas System.

The hydrocarbon vapours from within the vessel discharge to the HP flare stack where they are safely disposal by burning at the flare tip. The two HP flare pilots are continuously supplied with fuel gas and are lit by high-energy igniters controlled from a local panel.

3.0 EQUIPMENT DESCRIPTION

3.1 LP Flare KO Vessel 115-16-V-006

Refer to P&ID: PHM-115-FE-034 LP Flare KO Vessel.

3.1.1 Function

The LP flare KO vessel receives the fluids from the LP collection header. The gas vapours are routed to the LP flare stack, with the collected liquids routed to the closed drains vessel.

3.1.2 Technical Data

For details of the design and operating parameters, refer to Table 6.1 – Design and Operating Parameters LP Flare KO Vessel 115-16-V-006.

Refer to Table 6.1 on the following page.

Table 6.1 – Design and Operating Parameters LP Flare KO Vessel 115-16-V-006

Parameter	Design	Operating
Pressure	10.35barg/Full Vacuum	ATM
Temperature (Max/Min)	125°C/-35°C	0°C to 20°C
Gas Flow Capacity	43MMscfd	Up to 43MMscfd

3.1.3 Technical Description

The LP flare KO vessel is a horizontal vessel with an inside diameter of 2.3m and has a length of 4m, tan to tan.

The fluids from the LP collection header enter the vessel through a 300mm inlet nozzle on the inlet end of the vessel.

The liquids leave the vessel through an 80mm outlet nozzle with vortex breaker located on the bottom of the vessel. Liquids Outlet Shutdown Valve 115-16-SDV-103 is positioned on the outlet line to the Closed Drains System.

The hydrocarbon vapours leave the vessel through a 300mm outlet nozzle located on the top of the vessel and the opposite end from the fluids inlet. There is no demister pad fitted to the vapour outlet.

A 600mm man way on the side of the vessel provides access to the internals for inspection and maintenance.

Level Gauge 115-16-LG-103 provides local indication of the liquid level.

Pressure Gauge 115-16-PG-102 provides local indication of the pressure in the vessel.

For details of the LP flare KO vessel control and protection, refer to Paragraph 4.0 Instrumentation and Control.

3.2 HP Flare KO Vessel 115-16-V-007

Refer to P&ID: PHM-115-FE-032 HP Flare KO Vessel.

3.2.1 Function

The HP flare KO vessel receives the fluids from the HP collection header. The gas vapours are routed to the HP flare stack, with the collected liquids routed to the closed drains vessel.

3.2.2 Technical Data

For details of the design and operating parameters, refer to Table 6.2 – Design and Operating Parameters HP Flare KO Vessel 115-16-V-007.

Refer to Table 6.2 on the following page.

Table 6.2 – Design and Operating Parameters HP Flare KO Vessel 115-16-V-007

Parameter	Design	Operating
Pressure	10.35barg/Full Vacuum	0-5barg
Temperature (Max/Min)	125°C to -45°C	0 to 30°C
Gas Flow Capacity	275MMscfd	Up to 275MMscfd

3.2.3 Technical Description

HP flare KO vessel is a horizontal vessel with an inside diameter of 3.1m and has a length of 4.5m, tan to tan.

Fluids from the HP collection header enter the vessel through a 400mm inlet nozzle on the inlet end of the vessel.

The liquids leave the vessel through an 80mm outlet nozzle with vortex breaker located on the bottom of the vessel. Liquids Outlet Shutdown Valve 115-16-SDV-102 is positioned on the outlet line to the Closed Drains System.

The hydrocarbon vapours leave the vessel through a 400mm outlet nozzle located on the top of the vessel and the opposite end from the fluids inlet. There is no demister pad fitted to the vapour outlet.

A 600mm manway on the side of the vessel provides access to the internals for inspection and maintenance.

Level Gauge 115-16-LG-102 provides local indication of the liquid level.

Pressure Gauge 115-16-PG-101 provides local indication of the pressure in the vessel.

For details of the HP Flare KO Vessel control and protection, refer to Para 4.0 Instrumentation and Control.

3.3 LP Flare Stack 115-16-Z-001

Refer to P&ID: PHM-115-FE-035 HP and LP Flare Stacks, and to Zeeco vendor P&ID: YA-900 Sht 1 of 1.

3.3.1 Function

The LP flare stack receives the hydrocarbon vapours from the LP flare KO drum and safely disposes of the vapours by burning at the flare tip.

3.3.2 Technical Data

For details of the design and operating parameters, refer to Table 6.3 – Design and Operating Parameters LP Flare Stack 115-16-Z-001.

Refer to Table 6.3 on the following page.

Table 6.3 – Design and Operating Parameters LP Flare Stack 115-16-Z-001

Parameter	Design	Operating
Pressure	10.35barg	Atmospheric
Temperature	320°C to -35°C	Ambient
Gas Flow Capacity	43MMscfd	Up to 43MMscfd

3.3.3 Technical Description

The 33meters high, 300mm diameter LP flare stack is located in the restricted access flare area to the North-east of the site and is provided to safely dispose of the flared gas by burning at its flare tip.

The LP flare tip is designed for smokeless operation.

Each of the two LP flare tip pilots is fitted with a venturi, located below the respective pilot, designed to induce the proportionate amount of air into the gas stream. A spark plug is positioned in the gas/air mixture at each pilot to ignite the mixture through a high-energy spark.

For details of the control and protection of the LP flare stack and the Local Control Panel 115-16-S-004 for flare ignition refer to Para 4.0 Instrumentation and Control.

3.4 HP Flare Stack 115-16-Z-002

Refer to P&ID: PHM-115-FE-035 HP and LP Flare Stacks, and to Zeeco vendor P&ID: YA-900 Sht 1 of 1.

3.4.1 Function

The HP flare stack receives the hydrocarbon vapours from the HP flare KO drum and safely disposes of the vapours by burning at the flare tip.

3.4.2 Technical Data

For details of the design and operating parameters, refer to Table 6.4 – Design and Operating Parameters HP Flare Stack 115-16-Z-002.

Table 6.4 – Design and Operating Parameters HP Flare Stack 115-16-Z-002

Parameter	Design	Operating
Pressure	10.35barg	0 to 3barg
Temperature	320°C to –46°C	Ambient
Gas Flow Capacity	275MMscfd	Up to 275MMscfd

3.4.3 Technical Description

The 33meter high, 400mm diameter HP flare stack is located in the restricted access flare area to the North-east of the site and is provided to safely dispose of the flared gas by burning at its flare tip. The HP flare tip is designed for smokeless operation.

Each of the two HP flare tip pilots is fitted with a venturi, located below the respective pilot, designed to induce the proportionate amount of air into the gas stream. A spark plug is positioned in the gas/air mixture at each pilot to ignite the mixture through a high-energy spark.

For details of the control and protection of the HP flare stack and the Local Control Panel 115-16-S-004 for flare ignition refer to Para 4.0 Instrumentation and Control.

4.0 INSTRUMENTATION AND CONTROL

4.1 LP Flare Collection Header and KO Vessel 115-16-V-006

Refer to P&ID: PHM-115-FE-033 LP Flare Collection Header and PHM-115-FE-034 LP Flare KO Vessel.

4.1.1 Pressure

There is no pressure control on the LP flare KO vessel as the pressure ‘floats’ on the pressure in the LP flare header.

4.1.2 Level Control and Protection

The LP Flare KO Vessel is fitted with Level Transmitter 115-16-LT-103. The signal from the transmitter is used to indicate the level on the DCS and to generate a low (LAL), high1(LAH1) and high 2(LAH2) level alarm at 37.64%, 50% and 86.84% respectively.

The liquid level in the vessel is controlled by the open/shut operation of 115-16-SDV-103. The process variable signal from Level Indicator Controller 115-16-LICA-103 will open liquids outlet

115-16-SDV-103 at a level of 50% (LAH), and close the SDV when the level falls to 37.64% (LAL).

Protection against Low liquid level is provided by Level Transmitter 115-16-LT-104, which is used to generate a low-level trip signal through 115-16-LIA-104 at 31.49%.

Protection against high liquid level is provided by Level Transmitter 115-16-LT-106, which is used to generate a high-level trip signal through 115-16-LIA-106 at 75%. (Now this transmitter using for monitor only)

The level trip signal is sent to the SDS system, which performs the necessary executive actions identified on the cause and effect charts. The alarm is repeated on the DCS.

4.1.3 Flow Monitoring

The flow of vapour leaving the LP Flare KO Vessel is measured by non-intrusive Flow Transmitter 115-16-FT-104 with the flow is indicated on the DCS as115-16-FI-104.

4.1.4 LP Flare Collection Header Purge Flow Monitoring

The LP flare collection header is purged from two points and the purge flow is monitored on Flow Indicators 115-16-FI-103 and 115-16-FI-107. The flow of purge gas to the LP flare collection header is controlled by the operator manually setting the purge gas supply globe valves to attain a purge gas flow rate of 15kg/hr. The valves are positioned immediately downstream of local Flow Indicators 115-16-FI-103 and 115-16-FI-107.

4.2 HP Flare Collection Header and KO Vessel 115-16-V-007

Refer to P&ID: PHM-115-FE-031 HP Flare Collection Header and PHM-115-FE-032 HP Flare KO Vessel.

4.2.1 Pressure

There is no pressure control on the HP flare KO vessel as the pressure ‘floats’ on the pressure in the HP flare header.

4.2.2 Level Control and Protection

The HP Flare KO Vessel is fitted with Level Transmitter 115-16-LT-102. The signal from the transmitter is used to indicate the level on the DCS and to generate a low (LAL), high 1(LAH1) and high2 (LAH2) level alarm at 35%, 50% and 92.99% respectively.

Opening and shutting 115-16-SDV-102 controls the liquid level in the vessel. The process variable signal from Level Indicator Controller 115-16-LICA-102 will open liquids outlet 115-16-SDV-102 at a level of 50% (LAH1), and close the SDV when the level falls to 35% (LAL).

Protection against Low liquid level is provided by Level Transmitter 115-16-LT-101, which is used to generate a low-level trip signal through 115-16-LIA-101 at 31.49%.

Protection against high liquid level is provided by Level Transmitter 115-16-LT-105, which is used to generate a high-level trip signal through 115-16-LIA-105 at 75%. (Now this transmitter using for monitor only)

The level trip signal is sent to the SDS system, which performs the necessary executive actions identified on the cause and effect charts. The alarm is repeated on the DCS.

4.2.3 Flow Monitoring

The flow of vapour leaving the HP Flare KO Vessel is measured by non-intrusive Flow Transmitter 115-16-FT-102 with the flow is indicated on the DCS as 115-16-FI-102.

4.2.4 HP Flare Collection Header Purge Flow Monitoring

The HP flare collection header is purged from three points and the purge flow is monitored on Flow Indicators 115-16-FI-101 and 115-16-FI-106. The flow of purge gas to the HP flare collection header is controlled by the operator manually setting the purge gas supply globe valves to attain a purge gas flow rate of 15kg/hr. The valves are positioned immediately downstream of local Flow Indicators 115-16-FI-101 and 115-16-FI-106.

4.2.5 Cold Flare Collection Header Purge Flow Monitoring

The flow of purge gas to the cold flare collection header is controlled by the operator manually setting the purge gas supply globe valve to attain a purge gas flow rate of 15kg/hr. The valve is positioned immediately downstream of local Flow Indicator 115-16-FI-105.

4.3 LP Flare Tip 115-16-Z-003

Refer to P&ID: PHM-115-FE-035 HP and LP Flare Stacks, Zeeco vendor P&ID: YA-900 Sht 1 of 1.

There is no pressure or flow control instrumentation provided on the LP flare tip.

4.3.1 LP Flare Tip Pilot Temperature Monitoring and Protection

The operation of the LP flare tip pilot is monitored by Temperature Elements 115-16-TE-103 and 115-16-TE-104. The elements are thermocouples positioned at the flare tip, which send the temperature signals to Flare Ignition Panel 115-16-S-004.

Indication that the two LP pilots have extinguished is by activation of the Low Temperature Switches 115-16-TSL-103 and 115-16-TSL-104. Pilot extinguish annunciation is at the flare ignition panel.

For further details of the flare ignition panel refer to Paragraph 4.5.

4.4 HP Flare Tip 115-16-Z-004

Refer to P&ID: PHM-115-FE-035 HP and LP Flare Stacks, Zeeco vendor P&ID: YA-900 Sht 1 of 1.

There is no pressure or flow control instrumentation provided on the HP flare tip.

4.4.1 HP Flare Tip Pilot Temperature Monitoring and Protection

The operation of the HP flare tip pilot is monitored by Temperature Elements 115-16-TE-106/107/108. The elements are thermocouples positioned at the flare tip, which send the temperature signals to Flare Ignition Panel 115-16-S-004.

Indication that the two HP pilots have extinguished is by activation of the Low Temperature Switches 115-16-TSL-105 and 115-16-TSL-106. Pilot extinguish annunciation at the flare ignition panel.

For further details of the flare ignition panel refer to Paragraph 4.5.

4.5 Flare Ignition Package 115-16-S-004

Refer to P&ID: PHM-115-FE-035 HP and LP Flare Stacks, Zeeco vendor P&ID: YA-900 Sht 1 of 1.

4.5.1 Pilot Gas Supply Pressure Control, Monitoring and Protection

The fuel gas supply pressure to the flare ignition package is controlled at 1.5barg by Pressure Controller 115-16-PICA-103 modulating Pressure Control Valve 115-16-PCV-103. Pressure Controller 115-02-PICA-103 also provides high and low pressure alarms on the DCS.

Local Pressure Indicator 115-16-PG-103 is located downstream of 115-16-PCV-104, with the gauge displayed on the panel front.

4.5.2 Operation of the Flare Ignition Package

The Flare Ignition Package has the following operational design features:

Flame Detection (temperature detectors at the flare tips)

Automatic Re-ignition System

Remote Ignition System

Internal Combustion Detector

The two HP and LP flare pilots are continuously supplied with fuel gas at the correct pressure, and subsequently mixed with air at the pilot venturies. They can be lit by the following high-energy igniters controlled via the local panel:

LP Flare Tip Pilot Ignitors HEI-103 and HEI-104

HP Flare Tip Pilot Ignitors HEI-105 and HEI-106

5.0 ENVIRONMENTAL, HEALTH AND SAFETY REQUIREMENTS

5.1 General EHS Requirements

5.1.1 Chemicals

Personnel should ensure that they are fully familiar with the Material Safety Data Sheet (MSDS) for each chemical, which details precautions and the protective apparel and equipment necessary when handling the chemicals. The precautions detailed must be adhered to at all times.

5.1.2 Hazardous Sources

Table 6.5 – Hazardous Sources lists potential hazardous sources that may be present under upset conditions affecting the Flare System.

Table 6.5 – Hazardous Sources

Hazard	Source	Hazardous Event	Effect	Control
Liquid hydrocarbons	HP and LP KO Vessels	Potential for injury due to contact with hazardous liquids Loss of containment and release of flammable liquids	Potential for personnel injury Un-ignited liquid release and potential for gas release and fire/explosion	Fire and Gas Detection
Hydrocarbon gas under pressure	Throughout system	Potential for injury due to contact with hazardous liquids Loss of containment and release of flammable gas	Potential for personnel injury Un-ignited gas release and potential for fire/explosion	Fire and Gas Detection

5.2 Specific Health and Safety Requirements

The correct use of Personal Protective Equipment (PPE) is fundamental in securing a safe and healthy place of work for all personnel. PPE shall be used in conjunction with appropriate health, environment and safety procedures that are designed to minimise the potential risk of harm or injury to personnel, while also promoting safe working practices.

5.3 Specific Environmental Requirements

There may be a very small amount of cold venting until such time as the HP and LP headers are fully purged and the pilots have been ignited.

6.0 REFERENCE INFORMATION

6.1 Company Documentation

Document Number	Document Title
2002-PDS-115-16-V-007-025-1	HP Flare KO Drum Process Data Sheet
2002-PDS-115-16-Z-002-008	HP Flare Stack Data Sheet
2002-PDS-115-16-V-006-029-1	LP Flare KO Drum Process Data Sheet
2002-PDS-115-16-Z-001-022	LP Flare Stack Data Sheet
PH-10-OP-SOP-00006	Standard Operating Procedure for Flare Systems

6.2 Vendor Documentation

Document Number	Document Title
Zeeco Vendor P&ID YA-900 Sht 1 of 1	Gas Plant HP and LP Flares

6.3 Engineering Drawings (PFDs, UFDs and P&IDs)

Drawing Number	Drawing Title
PHM-115-FP-011	Sinphuhorm GPP PFD – HP and LP Flares
PHM-115-FE-031	Sinphuhorm GPP P&ID –HP Flare Header Collection
PHM-115-FE-032	Sinphuhorm GPP P&ID – HP Flare KO Vessel
PHM-115-FE-033	Sinphuhorm GPP P&ID – LP Flare Header Collection
PHM-115-FE-034	Sinphuhorm GPP P&ID – LP Flare KO Vessel
PHM-115-FE-035	Sinphuhorm GPP P&ID – HP and LP Flare Stacks

SECTION 7.0
FUEL GAS SYSTEM

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1.0 INTRODUCTION

1.1 System Purpose/Function

The Fuel Gas System is designed to provide clean fuel gas, of the required specification for use as follows:

- Fuel gas for the Glycol Regeneration package
- Fuel gas for the Heating Medium package
- Fuel gas for the Thermal Oxidiser
- Fuel gas for the Flare Pilots
- Purge gas for the HP and LP Flare Headers
- Blanket gas for the Condensate Storage Tank
- Blanket gas for the LP Flash Vessel
- Blanket gas for the Produced Water Separator

Gas for use as fuel gas is normally taken from the dry export gas leaving the Gas/Gas Exchanger 115-00-H-004 which is commingled with flash gas leaving the Glycol Regeneration Flash Drum. When insufficient gas is available from the normal sources, some gas is taken from e gas outlet of the High Pressure Flash Vessel 115-02-V-004 as the fuel gas pressure falls to supply the remaining demand.

1.2 Primary Components

The Fuel Gas System is located in the North West section of the plant and is comprised of the following Primary Components:

Tag No	Equipment Title/Description
115-15-V-001	Fuel Gas Scrubber
115-15-H-002	Fuel Gas Heater

1.3 Primary Interfaces

Input interfaces:

Gas Processing, Metering and Export (refer to Section 2.0 of this OPM)

Glycol Regeneration (refer to Section 3.0 of this OPM)

Condensate Treatment, Storage and Export (refer to Section 4.0 of this OPM)

PCSS System (refer to Section 14.0 of this OPM)

Heating Medium (refer to Section 9.0 of this OPM)

Instrument Air System (refer to Section 10.0 of this OPM)

Output interfaces:

Glycol Regeneration (refer to Section 3.0 of this OPM)

Condensate Treatment, Storage and Export (refer to Section 4.0 of this OPM)

Heating Medium (refer to Section 9.0 of this OPM)

Flare Systems (refer to Section 6.0 of this OPM)

Produced Water Treatment (refer to Section 5.0 of this OPM)

2.0 SYSTEM DESCRIPTION

2.1 System Overview

Refer to Figure 7.1 – Fuel Gas System Simplified Overview Schematic.

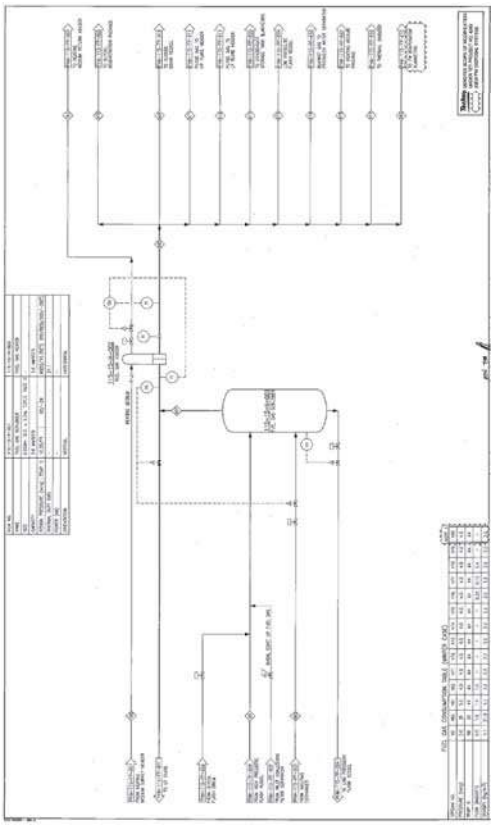
In normal operation, the Fuel Gas System receives saturated process gas from the outlet gas/gas exchanger is set at 4.5 barg via the pressure control valve 115-15-PCV-101B and the High Pressure Flash Vessel 115-02-V-004 is set at 5.5 barg via the pressure control valve115-02-PCV-105A which is combined with gas from the Glycol Regeneration Flash Drum and then routed through the Fuel Gas Scrubber 115-15-V-001 and Fuel Gas Heater 115-15-H-002 to produce superheated fuel gas at the required pressure and specification to be used as purge, blanket gas and fuel gas.

Gas from the high pressure flash vessel or outlet gas/gas exchanger is reduced in pressure and routed to the inlet of Fuel Gas Scrubber. In the fuel gas scrubber, liquids are separated from the gas stream and collect in the base of the vessel. The liquids then flow to the LP flash vessel.

The gas leaves the scrubber and flows through the heater before being metered and flowing to the end users. The gas is heated against heating medium to prevent it becoming saturated and condensing in the lines before reaching the end users.

Fuel gas is also supplied from the export gas taken from downstream of the Gas/Gas Exchanger 115-00-H-004.

Figure 7.1 – Fuel Gas System Simplified Overview



2.2 Primary Flow Description

Refer to P&ID: PHM-115-FE-017 Fuel Gas System.

2.2.1 Normal Operation

The saturated gas from the High Pressure Flash Vessel 115-02-V-004 operating pressure at 7.0barg is passed through a Pressure Control Valve 115-02-PCV-105A ,which regulates the pressure in the HP flash vessel to 7.0barg before entering to the Fuel Gas scrubber through an inlet nozzle. The pressure control valve has a manual bypass with double block and bleed valves.

The gas from gas/gas exchanger outlet at 28 barg is passed through a shutdown valve 115-15-SDV-101 than regulated by pressure control valve 115-15-PCV-101B which regulated pressure to 5.8barg before entering the fuel gas scrubber through an inlet nozzle.

The gas from the high pressure flash vessel and outlet gas/gas exchanger is joined by saturated flash gas from the Glycol Regeneration Flash Vessel which operates at a similar pressure.

The inlet nozzle is fitted with a vane pack inlet diffuser to absorb some of the energy from the gas stream and enable entrained liquids to separate. The scrubber has a capacity of 2.0MMscfd, sufficient to satisfy the fuel gas requirement.

The liquids collected in the base of the vessel are discharged under level control valve by 115-15-LCV-101 to the Low Pressure Flash Vessel 115-02-V-005. Shutdown Valve 115-15-SDV-102 is located on the fuel gas scrubber liquid outlet. The valve fails closed and the air to the valve is switched by a solenoid valve controlled from the SDS system.

The level trip signal is sent to the SDS system, which performs the necessary executive actions identified on the cause and effect charts. The alarm is repeated on the DCS.

The saturated gas leaves the fuel gas scrubber via a mist extractor, which removes any entrained droplets liquid from the gas stream, and flows, to the Fuel Gas Heater 115-15-H-002. The droplets are routed to the base of the vessel through a downcomer. The fuel gas heater raises the temperature of the fuel gas stream to superheat the gas by 20°C to prevent condensate forming as the gas temperature is reduced in the fuel gas distribution lines.

To reduce heat loss and prevent condensate forming in the fuel gas lines to the burners in the glycol regenerator, thermal oxidiser and heating medium heater, the lines are lagged for heat conservation.

The fuel gas passes through a flow meter downstream of the fuel gas heater, which provides actual totalised flow indication in the DCS.

Dry export gas from the Gas/Gas Exchanger 115-00-H-004 is used to supply the remaining fuel requirement. This gas is at a pressure of28barg and has a temperature of 20°C in winter 43°C in summer.

The flow of gas to the fuel gas scrubber is controlled by Pressure Control Valve,115- 15-PCV-101B which opens and regulates the pressure if the pressure in the scrubber falls to 5.8barg.

The dry gas enters the Fuel Gas scrubber through a second inlet nozzle, which does not have an inlet diffuser.

Shutdown Valve 115-15-SDV-101 is located on the fuel gas scrubber supply the dry gas from the outlet of the gas/gas exchanger to the scrubber. The valve fails closed and the air to the valve is switched by a solenoid valve controlled from the SDS system.

The pressure trip signal is sent to the SDS system, which performs the necessary executive actions identified on the cause and effect charts. The alarm is repeated on the DCS.

2.2.2 Cold Start-up

When the fuel gas system is to be started from cold, such as following an extended shutdown of the plant, there will be no dry or superheated fuel gas available until heating medium is up to temperature and the glycol regeneration system is operational to allow dry gas to be available from the contactor.

However fuel gas is required to fire the heaters in the glycol regeneration and heating medium systems.

To provide gas in a suitable condition the plant as far as the inlet to the gas/gas exchanger will be pressurised to approximately 5barg with gas from a single well whilst injecting methanol to prevent hydrate formation. Gas for use as fuel gas is taken through a start-up line located at the inlet coalescing filter separator upstream of the inlet heater.

The hydrocarbon condensate and any other liquids carried in the fuel gas stream will be knocked out in the fuel gas scrubber so that saturated gas flows forward to fuel gas users.

When fuel gas is available, purging of the flare headers can commence, the heating medium system can be started and heating and circulation of the glycol in the regeneration system can commence.

As the fuel gas heater is not operational until heat is available from the heating medium system, liquids will condense out in the fuel lines to the burners producing a risk of slugging through the burners and causing problems in the heaters. Until gas dehydration or heating medium is available the operator must be vigilant and drain any liquid build up from the fuel gas lines to maintain the burners free from liquid slugs.

When the flare is purged the pilots can be ignited allowing the plant to be pressurised. When heating medium is available and the circulating glycol is at a suitable temperature, processing of the gas can begin and fuel gas can be taken from the normal sources and the start up source can be isolated.

3.0 EQUIPMENT DESCRIPTION

3.1 Fuel Gas Scrubber 115-15-V-001

Refer to P&ID: PHM-115-FE-017 Fuel Gas System.

3.1.1 Function

Fuel Gas Scrubber 115-15-V-001 provides two-phase separation for the fuel gas taken from the HP Flash Vessel and glycol regeneration flash drum. As the alternative supply from the gas/gas exchanger is dry gas there will be no liquids present so the vessel is simply used as a conduit for this supply.

3.1.2 Technical Data

For details of the design and operating parameters, refer to Table 7.1 – Design and Operating Parameters Fuel Gas Scrubber 115-15-V-001.

Table 7.1 – Design and Operating Parameters Fuel Gas Scrubber 115-15-V-001

Parameter	Design	Operating
Pressure	10.35barg to Full Vacuum	5.8barg
Temperature (Max/Min)	95°C/-29°C	10°C to 35°C
Capacity	2.0MMscfd (1720Kg/h)	Up to 2.0MMscfd
Max Liquid Carry over	0.1USgal/MMscf ≈ 133ppm	–

3.1.3 Technical Description

Fuel Gas Scrubber 115-15-V-001 is a vertical two phase separator with an inside diameter of 0.508m and has a height of 2.2m, tan to tan. The lower end of the vessel has a semi-ellipsoidal end and the top has a flanged closure with a davit to provide access to the internals. The vessel is constructed from carbon steel with an epoxy resin internal coating and is supported on a steel skirt.

Gas from the HP flash vessel glycol flash drum enters the vessel through an 80mm inlet nozzle approximately half way up the side of the vessel. A vane pack diffuser is provided at the nozzle to reduce the inertia of the wet gas entering the vessel and assist in the separation process.

Gas from the start-up source or gas/gas exchanger enters the vessel through a 50mm inlet nozzle on the side of the vessel located just below the internal mist pad. The startup gas supply pressure is reduced to 5.0barg by Pressure Regulator 115-15-PCV-102 from the inlet coalescing filter separator upstream of the tie in the line from the gas/gas exchanger.

Fuel gas leaves the vessel through an 80mm nozzle on the lid of the vessel. To ensure liquid droplets are not carried over in the gas stream, a demister and downcomer are provided inside the vessel below the gas outlet.

Any liquids collected in the vessel leave through a 50mm nozzle on the center of the semi elliptical end of the vessel. The liquid outlet is fitted with a vortex breaker.

Level Gauge 115-15-LG-101 provides local indication of the liquid level.

Pressure Gauge 115-15-PG-101 provides local indication of the pressure in the vessel.

For details of the fuel gas control and protection, refer to Paragraph 4.0 Instrumentation and Control.

3.2 Fuel Gas Heater 115-15-H-002

Refer to P&ID: PHM-115-FE-017 Fuel Gas System.

3.2.1 Function

Fuel Gas Heater 115-15-H-002 heats the fuel gas, flowing from the fuel gas scrubber, so that the fuel gas is in a super heated state to avoid the condensing of liquids between the fuel gas system and end users. In particular the burners in the glycol regenerator, thermal oxidiser and heating medium heater.

3.2.2 Technical Data

For details of the design and operating parameters, refer to Table 7.2 – Design and Operating Parameters Fuel Gas Heater 115-15-H-002.

Table 7.2 – Design and Operating Parameters Fuel Gas Heater 115-15-H-002

Parameter	Design	Operating
Pressure shell side	40barg	7.0 to 8.0barg
Pressure tube side	10.35barg	5.0 to 6.0barg
Temperature shell side	200°C to 0°C	150°C (in) 100°C (out)
Temperature tube side	200°C to -29°C	30 to 50°C
Capacity	2.0MMscfd	Up to 2.0MMscfd
Temperature Differential		20°C
Heater Duty	21.1kW	21.1kW

3.2.3 Technical Description

Fuel Gas Heater 115-15-H-002 comprises a horizontal steel shell with a semi hemispherical end and a flanged end. A 'U' shaped tube bundle is inserted into the vessel with the tube sheet clamped against the flanged end by a partitioned bonnet.

The bonnet has a 50mm inlet and outlet nozzle to route the fuel gas through the tube bundle separation of inlet and outlet being by the partition in the bonnet.

Heating medium enters and leaves the vessel through 50mm nozzles located diametrically opposite and close to the end of the shell. A partition is provided in the shell to ensure that the heating medium flows over the length of the tube bundle.

The shell is constructed from carbon steel with low alloy and has an outside diameter of 2.02m and has a length of 1.299m. The tube bundle has 15 tubes in two passes constructed from 19.05mm tubing with a steel tube sheet.

Heating medium inlet temperature is indicated locally on Temperature Gauge 115-15-TG-101.

Heating medium outlet temperature is indicated locally on Temperature Gauge 115-15-TG-102.

4.0 INSTRUMENTATION AND CONTROL

4.1 Fuel Gas Scrubber 115-15-V-001

Refer to P&ID: PHM-115-FE-017 Fuel Gas System and PHM-115-FE-012 High Pressure Flash Vessel.

4.1.1 Pressure

Normally, when gas is supplied from the high pressure flash vessel and glycol regeneration flash drum, the pressure in the fuel gas scrubber depends upon the amount of gas flowing forward when the high pressure flash vessel drum pressure is being maintained at 7.0barg by Pressure Controller 115- 02-PICA-105 modulating Back Pressure Control Valve 115-02-PCV-105A.

If there is a shortfall in this supply the pressure in the Fuel Gas Scrubber is then maintained at 5.8bag by Pressure Controller 115-15-PICA-101 modulating Pressure Control Valve 115-15-PCV-101B to maintain the fuel gas supply. The process variable is provided by pressure transmitter 115-15-PT-101 on the fuel gas scrubber outlet. The controller 115-15-PICA-101 also provides and high and low pressure alarm which annunciate on the DCS.

If the pressure in the fuel gas scrubber pressure exceeds 8.4barg, the excess gas is vented to LP flare by Pressure Controller 115-15-PICA-101 modulating Pressure Control Valve 115-15-PCV-101A.

This arrangement ensures a continuous supply of fuel gas without the need for operator intervention.

Pressure in the fuel gas scrubber is indicated locally on 115-15-PG-101.

High pressure protection is provided by Pressure Transmitter 115-15-PIA-102 which is used to generate a high pressure trip signal for the Shutdown System (SDS) at 9.3barg. (Refer to Cause and Effect Details.)

A shutdown valve 115-15-SDV-101 is provided on the dry gas supply from the gas/gas exchanger to the fuel gas scrubber. The valve fails closed and the air to the valve is switched by a solenoid valve controlled from the SDS. (Refer to Cause and Effect Details.)

Overpressure protection against control valve failure is provided by Pressure Relief Valves 115-15-PSV-101A/B set to relieve at 10.35barg. One of the valves must be on-line when the scrubber is in operation; the second valve is in reserve.

4.1.2 Liquid Level

The liquid level in the scrubber is maintained by Level Controller 15-LICA-101 modulating Level Valve 15-LCV-101.

Protection against high level is provided by Level Transmitter 15-LT-102, which is used to generate a high level trip signal through 15-LIA-102 in the SDS. (Refer to Cause and Effect Details.)

Protection against low level is provided by Level Transmitter 15-LT-103, which is used to generate a low level trip signal through 15-LIA-103 in the SDS. (Refer to Cause and Effect Details.)

A shutdown valve 15-SDV-102 is provided on the liquid outlet from the fuel gas scrubber. The valve fails closed and the air to the valve is switched by a solenoid valve controlled from the SDS. (Refer to Cause and Effect Details.)

4.2 Fuel Gas Heater 115-15-H-002

Refer to P&ID: PHM-115-FE-017 Fuel Gas System.

4.2.1 Pressure

The pressure in the Fuel Gas Super Heater is regulated by the pressure in the fuel gas scrubber.

Overpressure protection for the shell for the thermal expansion case is provided by Pressure Relief Valve 115-15-PSV-107, which is set to relieve at 40barg.

4.2.2 Temperature

The temperature of the gas leaving the heater is controlled by the Differential Temperature Controller, 115-15-TDICA-101, which provides a control temperature by modulating the flow of heating medium through the exchanger shell.

The controller 115-15-TDICA-101 receives a signal from Temperature Transmitter 115-15-TT-101A on the gas inlet and Temperature Transmitter 115-15-TT-101B on the gas outlet. The controller is set to provide a temperature difference of 20°C between the gas inlet and outlet. The differential temperature controller also provides high and low differential temperature alarms on the DCS.

Temperature Transmitter 115-15-TT-102 provides gas outlet temperature indication through 115-15-TIA-102 on the DCS.

Local heating medium inlet temperature indication is provided 115-15-TG-101.

Local heating medium outlet temperature indication is provided 115-15-TG-102.

Temperature protection for the gas stream is provided by Temperature Transmitter 115-15-TT-102 on the gas outlet, which is used to generate a high temperature trip signal at 100°C through 15-TIA-102 in the SDS. (Refer to Cause and Effect Details.)

A shutdown valve 115-15-SDV-103 is provided on the heating medium outlet from the fuel gas heater. The valve fails closed and the air to the valve is switched by a solenoid valve controlled from the SDS. (Refer to Cause and Effect Details.)

4.2.3 Flow

The flow of fuel gas leaving the fuel gas heater is measured by an orifice plate and Flow Transmitter 115-15-FT-101. The uncorrected cumulative flow is indicated on 111-15-FQIA-101 on the DCS.

5.0 ENVIRONMENTAL, HEALTH AND SAFETY REQUIREMENTS

5.1 General EHS Requirements

5.1.1 Chemicals

The following chemical is used in this system, or may be present under upset conditions:

Tri-ethylene Glycol (50% in Heating Medium)

Ph control Chemical (~6.5)

Personnel should ensure that they are fully familiar with the Material Safety Data Sheet (MSDS) for each chemical, which details precautions and the protective apparel and equipment necessary when handling the chemicals. The precautions detailed must be adhered to at all times.

5.1.2 Hazardous Sources

Table 7.3 – Hazardous Sources lists potential hazardous sources that may be present under upset conditions affecting the Fuel Gas System.

Table 7.3 – Hazardous Sources

Hazard	Source	Hazardous Event	Effect	Control
Liquid hydrocarbons under pressure	Fuel gas scrubber	Potential for injury due to contact with hazardous liquids Loss of containment and release of flammable liquids	Potential for personnel injury Un-ignited liquid release and potential for gas release and fire/explosion	Fuel gas scrubber Fire and Gas Detection
Hydrocarbon gas under pressure	Throughout system	Potential for injury due to contact with hazardous liquids Loss of containment and release of flammable gas	Potential for personnel injury Un-ignited gas release and potential for fire/explosion	Fuel gas scrubber and Heater Fire and Gas Detection

5.2 Specific Health and Safety Requirements

The correct use of Personal Protective Equipment (PPE) is fundamental in securing a safe and healthy place of work for all personnel. PPE shall be used in conjunction with appropriate health, environment and safety procedures that are designed to minimise the potential risk of harm or injury to personnel, while also promoting safe working practices.

5.3 Specific Environmental Requirements

To prepare the Fuel Gas System for the introduction of hydrocarbon gas, it is necessary to remove all air from the system. Nitrogen maybe utilised for this purpose using the dedicated purge points which are provided with the necessary isolation valves and a non return valve. Similarly, when preparing equipment for maintenance, nitrogen maybe used to purge hydrocarbons from the system before breaking containment and introducing air.

When purging the system of air prior to introduction of hydrocarbons, the atmoPig in the system should be tested with an Oxygen Content Analyzer to determine the level of oxygen remaining in the purged system.

When purging is being performed to remove hydrocarbons, a suitable test instrument, which uses thermal conductivity or infrared absorption, capable of detecting hydrocarbons in nitrogen. Pelister type instruments cannot be used as they require at least 13% oxygen to operate.

WARNING: NITROGEN IS AN ASPHYXIANT, AND IS COLOURLESS AND ODOURLESS: RAPID AND UNRECOGNISED LOSS OF CONSCIOUSNESS CAN OCCUR IN PERSONS EXPOSED TO A NITROGEN-ENRICHED ATMOPIG. WHEN USING NITROGEN, CARE SHOULD BE TAKEN TO ENSURE THAT NITROGEN ESCAPES ARE DISPERSED AND NOT ALLOWED TO COLLECT IN ENCLOSED AREAS.

6.0 REFERENCE INFORMATION

6.1 Company Documentation

Document Number	Document Title
2002-PDS-115-15-H-002-015	Fuel Gas Heater Process Data Sheet
2002-PDS-115-15-V-001-007	Fuel Gas Scrubber Process Data Sheet
2002-DS-115-0840-05	Fuel Gas Scrubber Mechanical Data Sheet
PH-10-OP-SOP-00007	Standard Operating Procedure for the Fuel Gas System

6.2 Vendor Documentation

Document Number	Document Title
–	–

6.3 Engineering Drawings (PFDs, UFDs and P&IDs)

Drawing Number	Drawing Title
PHM-115-FP-006	Sinphuhorm GPP PFD – Fuel Gas System
PHM-115-FE-017	Sinphuhorm GPP P&ID – Fuel Gas System
PHM-115-FE-012	Sinphuhorm GPP P&ID –High Pressure Flash Vessel

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CLOSED AND OPEN DRAINS

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1.0 INTRODUCTION

1.1 System Purpose/Function

The drains facilities on the Gas Processing Plant are as follows:

- Closed Drains
- Open Drains
- Glycol and Heating Medium Drains

The Closed Drains System provides safe collection and disposal of drainage from the process facilities. The closed drains collect only hazardous liquids from process vessels, pumps and other equipment and are hard piped from the drain point. The collected fluids are directed to the Closed Drain Vessel.

The Open Drains Systems also provides safe collection and disposal of drainage from the process facilities. The open drains collect liquids from the bunds and drip trays within the process areas. The collected fluids are directed to the Pump Pit via the traps located in the sub-headers.

The Glycol and Heating Medium Drains provide safe collection and disposal of drainage from the Gas Dehydration/Glycol Regeneration Facilities and from the Heating Medium Package. The drainings are hard piped from the drain points and are directed to the Glycol and Heating Medium Drain Vessel.

The primary components of the systems are outlined within Paragraph 1.2 Primary Components.

1.2 Primary Components

Tag No	Equipment Title/Description
115-28-V-013	Closed Drains Vessel
115-28-PM-003A/B	Closed Drains Pumps
115-28-Z-001	Open Drains Pump Pit
115-28-T-005	Open Drains CPI
115-28-PM-015	Open Drains Slop Pump
115-28-V-014	Glycol and Heating Medium Drains Vessel

1.3 Primary Interfaces

Input interfaces:

- Gas Process, Metering and Export (refer to Section 2.0 of this OPM)
- Glycol Regeneration (refer to Section 3.0 of this OPM)
- Condensate Treatment, Storage and Export (refer to Section 4.0 of this OPM)
- Produced Water Treatment (refer to Section 5.0 of this OPM)
- Fuel Gas System (refer to Section 7.0 of this OPM)
- Heating Medium (refer to Section 9.0 of this OPM)
- Instrument Air System (refer to Section 10.0 of this OPM)
- Power Generation and Distribution (refer to Section 13.0 of this OPM)
- PCSS System (refer to Section 14.0 of this OPM)

Output interfaces:

- Condensate Treatment, Storage and Export (refer to Section 4.0 of this OPM)
- Flare Systems (refer to Section 6.0 of this OPM)

2.0 SYSTEM DESCRIPTION

2.1 System Overview

Refer to Figure 8.1 – Closed and Open Drains Simplified Overview Schematic.

In normal operation the Closed Drains System and the Glycol and Heating Medium Drains System should not receive any process fluids, whereas the Open Drains System receives waste process fluids, rainwater and washings from tundishes and bunds.

The Closed Drains System provides safe collection and disposal of drainage from the following process facilities:

- Glycol Flash Drum 115-13-V-001
- Condensate Pumps 115-02-PM-002A/B
- Low Pressure Flash Vessel 115-02-V-005
- Condensate Loading Pump 115-02-PM-002A/B
- Condensate Loading Pump Pressure Safety Valve O2-PSV-104
- Thermal Oxidizer 115-27-Z-001
- Glycol Contactor 115-13-V-003
- Condensate Cooler 115-02-H-002
- Gas/Gas Exchanger 115-00-H-004
- Fuel Gas Scrubber 115-15-V-001
- Produced Water Separator 115-27-V-005
- High Pressure Flash Vessel 115-02-V-004
- Condensate Heater 115-02-H-001
- Sales Gas Metering 115-00-S-001
- Inlet Heater 115-00-H-002
- Slug Catcher 115-00-Z-001
- LP Flare KO Drum 115-16-V-006
- Pig Receiver 115-62-V-001
- HP Flare KO Drum 115-16-V-007

The collected fluids are directed to the Closed Drain Vessel 115-28-V-013. A description of the separation process within the closed drains vessel is provided in Paragraph 2.2.1.

The Open Drains Systems provide safe collection and disposal of drainage from the following process facilities.

- Glycol Regeneration 115-13-S-002
- Condensate Pumps 115-02-PM-002A/B
- Glycol Contactor 115-13-V-003

- Emergency Produced Water Storage Pond and Pumps 115-27-T-001
- High Pressure Flash Vessel 115-02-V-004
- Condensate Heater 115-02-H-001
- Diesel Power Generation Area 115-EG-52-5101
- Diesel Storage Area 115-32-S-012
- Instrument Air Receiver Drain 115-20-V-009
- Low Pressure Flash Vessel 115-02-V-005
- Slug Catcher 115-00-Z-001
- Pig Receiver 115-62-V-001
- Condensate Recovery Pump Area 115-27-PM-002A/B
- Fuel Gas Scrubber Area 115-15-V-001
- Inlet Coalescing Filter Separator 115-00-V-003
- Low Temperature Separator 115-00-V-010

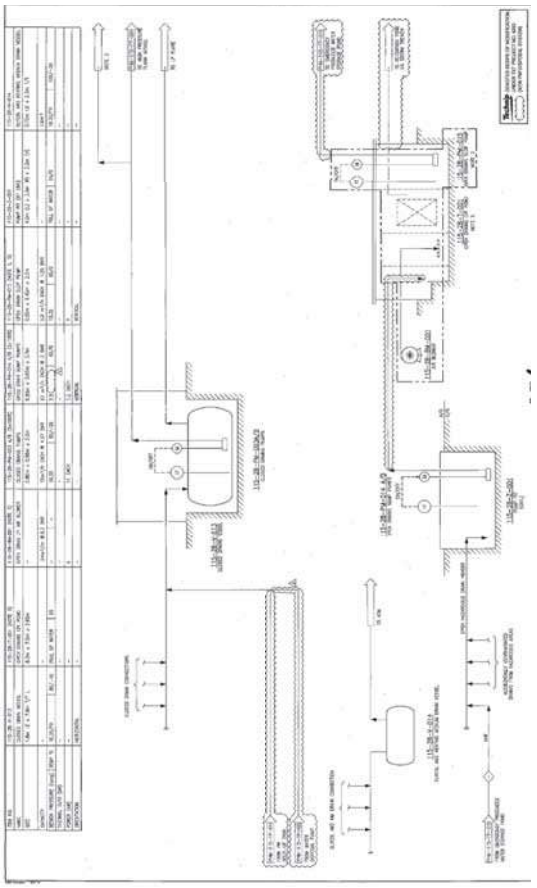
The open drains collect liquids from the bunds and drip trays within the process areas. The collected fluids are directed to the Pump Pit via the sub-header traps. A description of the separation process within the open drains vessels is provided in Paragraph 2.2.2.

The Glycol and Heating Medium Drains provide safe collection and disposal of drainage from the following areas.

- Gas/Gas Exchanger 115-00-H-004 (De-riming)
- Glycol Contactor 115-13-V-003
- Glycol Regeneration 115-13-V-003
- Inlet Heater 115-00-H-002
- Fuel Gas Heater 115-15-H-002
- Condensate Heater 115-02-H-001
- Heating Medium Package 115-19-S-001

The Glycol System and the Heating Medium Drain Vessel collects fluids directly from the process. A description of the separation process within the open drains vessels is provided in Paragraph 2.2.3.

Figure 8.1 – Closed and Open Drains Simplified Overview Schematic



2.2 Primary Flow Description

2.2.1 Closed Drains

Refer to P&IDs:

PHM-115-FE-081 Closed Drain Collection Header

PHM-115-FE-082 Closed Drain Vessel and Pumps

Liquids from the closed drains headers drain into the Closed Drain Vessel 115-28-V-013, where they are batch pumped out to the Produced Water Separator 115-27-V-005 by Closed Drain Pumps 115-28-PM-003A/B. Gas vapours present in the closed drains vessel are passed to the LP Flare.

2.2.2 Open Drains

Refer to P&IDs:

PHM-115-FE-085 Open Drain Collection Header

PHM-115-FE-086 Pump Pit

PHM-115-FE-087 Open Drains CPI

The liquids from the open drains headers drain into the Open Drain Pit 115-28-Z-001, where they are batch pumped out to the Open Drains CPI 115-28-T-005 by Open Drains Sump Pumps 115-28-PM-014A/B. The pump pit vents locally to atmoPig.

The liquid flows into the Open Drains CPI Package where the liquid is aerated by an air blower and is separated out into oily liquid and clean water using plate separator packs. The clean water overflows to the retention pond by gravity feed. The dirty slops enter the excess oil holding chamber where it is batch pumped by the Open Drain Slop Pump 115-28-PM-015 to the closed drain vessel. The Open Drains CPI Package vents locally to atmoPig.

2.2.3 Glycol and Heating Medium Drains

Refer to P&ID: PHM-115-FE-083 Glycol and Heating Medium Header and Vessel.

The liquids from the glycol and heating medium drains header drain into the Glycol and Heating Medium Drains Vessel 115-28-V-041 where it is stored. The tank is provided with a nozzle to allow for periodic emptying. Any gas vapours present in the vessel are discharged through a vent line with flame arrestor and bird screen to atmoPig.

3.0 EQUIPMENT DESCRIPTION

3.1 Closed Drains Vessel 115-28-V-013

Refer to P&ID: PHM-115-FE-082 Closed Drains Vessel and Pump.

3.1.1 Function

Closed Drains Vessel 115-28-V-013 provides a safe receptacle to receive drained down fluids from process equipment, normally prior to maintenance activities on the process equipment.

3.1.2 Technical Data

For details of the design and operating parameters, refer to Table 8.1 – Design and Operating Parameters Closed Drains Vessel 115-28-V-013.

Table 8.1 – Design and Operating Parameters Closed Drains Vessel 115-28-V-013

Parameter	Design	Operating
Pressure	10.35barg to Full Vacuum	ATM
Temperature (Max/Min)	85°C/-46°C	Ambient
Capacity	42.5m³	
Normal Liquid Level		40% to 60%

3.1.3 Technical Description

The closed drains vessel is a horizontal vessel with an inside diameter of 1.8m and has a length of 7m tan to tan. The bottom of the vessel has an extended dip tube boot to allow for vacuum removal of the vessel contents via external the dip tube.

Liquids from the drain collection header enter the vessel through a 200mm inlet nozzle on the top of the vessel. Condensate from KO drums and scrubbers enters the vessel through a 150mm inlet nozzle on the top of the vessel.

A 600mm manway on the top of the vessel provides access to the internals.

Two flanged openings are located on the top of the vessel to house the respective closed drains sump pumps. The drive motors are located on the outside of the vessel with the pumps submerged within the vessel. Refer to Paragraph 3.2 for further details.

Temperature Gauge 115-28-LG-101 provides local indication of the liquid level.

Pressure Gauge 115-28-PG-101 provides local indication of the pressure in the vessel.

For details of the closed drain control and protection, refer to Paragraph 4.0 Instrumentation and Control.

3.2 Closed Drains Pump 115-28-PM-003A/B

Refer to P&ID: PHM-115-FE-082 Closed Drain Vessel and Pumps.

3.2.1 Function

Closed Drains Pumps 115-28-PM-003A/B a re used to pump the fluids from the closed drain vessel to the Produced Water Separator.

3.2.2 Technical Data

For details of the design and operating parameters, refer to Table 8.2 – Design and Operating Parameters Closed Drain Pump 115-28-PM-003A/B.

Table 8.2 – Design and Operating Parameters Closed Drain Pump 115-28-PM-003A/B

Parameter	Design	Operating
Pressure	10.35barg	4.67barg
Temperature	85/-29°C	AMBIENT
Capacity	15m³/hr@ 4.67barg	Up to 15m³/h

3.2.3 Technical Description

The closed drains pumps are both shaft driven submersible pumps, powered by electrical motors. The pumps are located within the closed drains vessel with the electric motors positioned externally on the top of the closed drains vessel.

A 'normally open' spectacle blind is located on the discharge of each pump, upstream of the discharge valve. A removable spool is located at the pump outlet nozzle to facilitate pump removal for maintenance purposes.

A bypass round the vessel to the LP Flare KO Drum is provided to allow the pumps to be removed for maintenance.

Pressure Gauges 115-28-PG-105 and 115-28-PG-102 provide local indication of the pumps discharge pressure.

3.3 Open Drains Pit 115-28-Z-001

3.3.1 Function

Refer to P&ID: PHM-115-FE-086 Pump Pit.

Open Drains Pump Pit 115-28-Z-001 retains the open hazardous drain contents until the level is sufficient to pump out to the open drains CPI for further processing.

3.3.2 Technical Data

For details of the design and operating parameters, refer to Table 8.3 – Design and Operating Parameters Open Drains Pit 115-28-Z-001.

Table 8.3 – Design and Operating Parameters Open Drains Pump Pit 115-28-Z-001

Parameter	Design	Operating
Pressure	Full Of Water	Atmospheric
Temperature	65°C to 0°C	Ambient
Capacity	25.92m³	14.69

3.3.3 Technical Description

The open drains pump pit is a reinforced concrete structure, mostly buried below grade but with 150mm protruding above the ground. The pit is covered with a steel top, fitted with an atmospheric vent.

Centrifugal Pumps 115-28-PM-014A/B are mounted on the top of the tank to allow the contents to be pumped over to the CPI. Refer to Paragraph 3.4 for details.

3.4 Open Drains Sump Pumps 115-28-PM-014A/B

Refer to P&ID: PHM-115-FE-086 Pump Pit.

3.4.1 Function

Open drains sump pumps are used to periodically pump the contents of the pump pit over to the CPI.

3.4.2 Technical Data

For details of the design and operating parameters, refer to Table 8.4 – Design and Operating Parameters Open Drains Sump Pumps 115-28-PM-014A/B.

Table 8.4 – Design and Operating Parameters Open Drains Sump Pumps 115-28-PM-003A/B

Parameter	Design	Operating
Pressure	2.5barg	2.0barg
Temperature	65/0°C	Ambient
Capacity	57m³/hr@ 2.0barg	51.4m³/hr
Power (kW)	7.5 kW for each	

3.4.3 Technical Description

Open drains sump pumps are vertically mounted submersible type centrifugal pumps powered by 7.5kW for each electric motor. The pumps are located within the open drains vessel with the electric motors positioned externally on the tank top.

A 'normally open' spectacle blind is located on the discharge of each pump, upstream of the discharge valve. A removable spool is located at the pump outlet nozzle to facilitate pump removal for maintenance purposes.

Pressure Gauges 115-28-PG-103 and 115-28-PG-104 provide local indication of the pumps discharge pressure.

3.5 Open Drains CPI 115-28-T-005

3.5.1 Function

Refer to P&ID: PHM-115-FE-087 Open Drains CPI.

The open drain CPI is used to remove any solids and hydrocarbons from the water within the open drains system.

3.5.2 Technical Data

For details of the design and operating parameters, refer to Table 8.5 – Design and Operating Parameters Open Drains CPI 115-28-T-005.

Table 8.5 – Design and Operating Parameters Open Drains CPI 115-28-T-005

Parameter	Design	Operating
Pressure	Full of water	Atmospheric
Temperature	65°C/0°C	Ambient

3.5.3 Technical Description

The Open Drain CPI Package comprises of two horizontal tanks arranged side by side with interconnecting pipework for liquid transfer, and vent lines to a common vent at a safe location. Each tank is divided into two compartments.

The first tank comprises of the solid separation chamber receiving the feed from the open drains sump pump, and the excess oil holding chamber that contains the Open Drains Slop Pump 115-28-PM-015.

The second tank comprises of the pre aeration chamber receiving fluid from the solid separation chamber of the first tank. The chamber is provided with an aeration pipe at the base of the tank that is supplied with air from Air Blower 115-28-BM-001 and an overflow to the second compartment. The second compartment houses the Corrugated Plate Interceptor

(CPI) or fog oil floatation chamber consisting of corrugated separation plates and trouch skimmers that skim the oil separated by the plates and direct it to the excess oil holding chamber of the first tank.

Solid Separation Chamber (First Tank)

Oily water from the open drains sump pumps enters the inlet compartment where it is allowed to settle and accumulate and solids. Any entrained vapours are allowed to vent off to atmoPig at a safe location, and the liquids overflow to the pre aeration chamber compartment of the second tank.

Pre Aeration Chamber Compartment (Second Tank)

Liquids enter the pre aeration chamber compartment through an inlet near the top of the compartment and are allowed to settle. Air is supplied to a perforated pipe in the base of the compartment from the air blower. The liquids are aerated to further remove entrained vapours prior to entering the fog oil floatation chamber via an overflow pipe.

Fog Oil Floatation Chamber (Second Tank)

Liquids enter the fog oil floatation chamber through a down-comer such that they are encouraged to flow to the base of the corrugated separation plates and up the length of the plates allowing any large deposits of oil can rise freely to the surface.

The chamber comprises a series of corrugated separation plate packs, which form channels for the liquids to pass through. As the denser oily water passes down through the packs, the laminar flow conditions inside the channels allows oil globules to rise due to differential density and attach themselves to the underside of the plates. An oil film is formed and moves upward along each plate surface.

At the top of the plates, the oil film coalesces into a thick layer of oil that forms at the upper part of the chamber. The oil recovered forms is skimmed from the water by trouch skimmers and passed into the excess oil holding chamber in the first tank.

The water collected in the chamber passes via the clean water outlet to the storm trench where it drains by gravity to the retention pond.

Excess Oil Holding Chamber (First Tank)

This compartment houses the Open Drains Slops Pump 115-28-PM-015. The pump drive motor is mounted on the top of the tank with the pump located below the oil level within the tank. The slops (oil) is pumped out to the closed drains vessel.

3.6 Open Drains Slop Pump 115-28-PM-015

Refer to P&ID: PHM-115-FE-087 Open Drains CPI.

3.6.1 Function

The Open Drains Slop Pump 115-28-PM-015 is used to pump the slops within the CPI excess oil holding chamber back to the closed drains vessel.

3.6.2 Technical Data

For details of the design and operating parameters, refer to Table 8.6 – Design and Operating Parameters Open Drains Slop Pump 115-28-PM-015.

Table 8.6 – Design and Operating Parameters Open Drains Slop Pump 115-28-PM-015

Parameter	Design	Operating
Pressure	10.35barg	1.6barg
Temperature	65°C/0°C	AMBIENT
Capacity	5.0m³/hr@1.55barg	1.35m³/hr

3.6.3 Technical Description

Open Drains Slop Pump 115-28-PM-015 is a vertically mounted submersible pump located within the slops compartment, with the electric motor positioned externally on the tank top.

A 'normally open' spectacle blind is located on the discharge of the pump, upstream of the discharge valve. A removable spool is located at the pump outlet nozzle to facilitate pump removal for maintenance purposes.

Pressure Gauge 115-28-PG-106 provides local indication for the pumps discharge pressure.

3.7 Air Blower 115-28-BM-001

Refer to P&ID: PHM-115-FE-087 Open Drains CPI.

3.7.1 Function

The Air Blower 115-28-BM-001 is used to aerate the liquids in the pre aeration chamber of the second tank.

3.7.2 Technical Data

For details of the design and operating parameters, refer to Table 8.7 – Design and Operating Parameters Air Blower 115-28-BM-001.

Table 8.7 - Design and Operating Parameters Air Blower 115-28-BM-001

Parameter	Design	Operating
Pressure	–	0.294barg
Temperature	_	Ambient
Capacity	0.9m^3/hr	0.9m^3/hr
Power	4kW	–
Revolutions per minute	1000rpm	

3.7.3 Technical Description

Air Blower 115-28-BM-001 is Roots Blower type LT-50 revolution 1000 rpm, Delivery Dia 50mm., capacity 0.9 m^3/min., pressure 3000 mmAq., and driven by electric 3 phrases motor 4kW.

3.8 Glycol and Heating Medium Drain Vessel 115-28-V-014

Refer to P&ID: PHM-115-FE-083 Glycol And Heating Medium Drain Header and Vessel.

3.8.1 Function

Glycol and Heating Medium Drain Vessel 115-28-V-014 provides a safe receptacle to receive drained down fluids from the glycol and heating medium process equipment, normally prior to maintenance activities on the process equipment.

3.8.2 Technical Data

For details of the design and operating parameters, refer to Table 8.8 – Design and Operating Parameters Glycol and Heating Medium Drain Vessel 115-28-V-014.

Table 8.8 – Design and Operating Parameters Glycol and Heating Medium Drain Vessel 115-28-V-014

Parameter	Design	Operating
Pressure	10.35/Full Vacuum	Atmospheric
Temperature	150/-29°C	16 to 100°C
Capacity	1.0m³	–

3.8.3 Technical Description

The glycol and heating medium drain vessel is a horizontal vessel with an inside diameter of 0.75m and length of 2.5m tan to tan. The bottom of the vessel has an extended dip tube boot to allow for vacuum cleaning of the vessel via external the dip tube. A 600mm man way on the top of the vessel provides access to the internals.

Liquids from the heating medium and glycol system drains enter the vessel through a 100mm inlet nozzle on the top of the vessel; the gas outlet vent is also a 100mm nozzle.

There are no local instruments for this vessel.

For details of the glycol and heating medium drain vessel control and protection, refer to Paragraph 4.0 Instrumentation and Control.

4.0 INSTRUMENTATION AND CONTROL

4.1 Closed Drains Vessel 115-28-V-013

Refer to P&ID: PHM-115-FE-082 Closed Drains Vessel and Pumps.

4.1.1 Pressure

There is no pressure control on the closed drain vessel as it operates at atmospheric pressure. The pressure in the closed drain vessel floats on the pressure in the LP Flare KO Vessel.

4.1.2 Level Control and Protection

The closed drains vessel is fitted with a Level Transmitter 115-28-LT-101. The signal from this transmitter is used to indicate the level on the DCS and to generate a Low (LAL), High1 (LAH1) and High2 (LAH2) level alarm at 40%, 60% and 70% respectively.

The liquid level in the vessel is controlled by the on/off operation of Pumps 115-28-PM-003A/B. The process variable signal from Level Indicator Controller 115-28-LICA-101 will start the duty pump at a level of 60%(LAH1), and stop the pump when the level falls to 40%(LAL).

Should the level increase to 70%(LAH2) the standby pump will also start. Both pumps will stop when the level returns to 40%(LAL).

Protection against a low liquid level is provided by Level Transmitter 115-28-LT-102, which is used to generate a low level trip signal through 115-28-LIA-102 at 30%. The trip signal is sent to the SDS system, which performs the necessary executive actions identified on the cause and effect charts.

4.2 Closed Drains Pumps 115-28-PM-003A/B

Refer to P&ID: PHM-115-FE-082 Closed Drains Vessel and Pumps.

There is no pressure, temperature or flow control for the closed drains pumps.

4.2.1 Pump Operation

The pumps are selected to duty and standby at the DCS, thereafter the duty pump operates under the auto control of Closed Drains Vessel Level Indicator Controller 115-28-LICA-101.

4.3 Open Drains Pit 115-28-Z-001

Refer to P&ID: PHM-115-FE-086 Pump Pit.

4.3.1 Pressure

The pit is fitted with an atmospheric vent. There are no pressure controls.

4.3.2 Level Control and Protection

The Open Drains Pit is fitted with Level Transmitter 115-28-LT-104. The signal from this transmitter is used to indicate the level on the DCS and to generate a low (LAL), high1 (LAH1) and high 2(LAH2) level alarm at 16.66%, 80.90% and 95.20% respectively.

The liquid level in the vessel is controlled by the on/off operation of Open Drains Sump Pumps 115-28-PM-014A/B. The process variable signal from Level Indicator Controller 115-28-LICA-104 will start the duty pump at a level of 80.90%(LAH1), and stop the pump when the level falls to 16.66%(LAL).

Should the level increase to 95.20% (LAH2) the standby pump will also start. Both pumps will stop when the level returns to 16.66%.

Protection against low liquid level is provided by Level Transmitter 115-16-LT-103, which is used to generate a low-level trip signal through 115-16-LIA-103 at 11.9%. The level trip signal is sent to the SDS system, which performs the necessary executive actions identified on the cause and effect charts.

4.4 Open Drains Sump Pumps 115-28-PM-014A/B

Refer to P&ID: PHM-115-FE-086 Pump Pit.

There is no pressure, temperature or flow control for the closed drains pumps.

There is no flow control for these pumps but a restriction orifice plate is installed (115-28-RO-102/103) on the discharge line of each pump to prevent damage by running off their performance curve.

4.4.1 Pump Operation

The pumps are selected to duty and standby at the DCS, thereafter the duty pump operates under the auto control of Open Drains Pit Level Indicator Controller 115-28-LICA-104.

4.5 Open Drains CPI 115-28-T-005

Refer to P&ID: PHM-115-FE-087 Open Drains CPI.

4.5.1 Pressure

The open drains CPI operates at atmospheric pressure, there are no pressure controls.

4.5.2 Level Control and Protection

Overflow pipes control the level in the Open Drains CPI. The slops section of CPI is fitted with Level Transmitter 115-28-LT-106. The signal from this transmitter is used to indicate the level on the DCS and to generate a low at 30%(LAL) and high at 60%(LAH) level alarms.

The liquid level in the vessel is controlled by the on/off operation of Open Drains Slop Pump 115-28-PM-015. The process variable signal from Level Indicator Controller 115-28-LICA-106 will start the pump at a level of 60%(LAH), and stop the pump when the level falls to 30%(LAL).

Protection against low liquid level in the slops section is provided by Level Transmitter 115-16-LT-105, which is used to generate a low-level trip signal through 115-28-LIA-105 at 25%. The level trip signal is sent to the SDS system, which performs the necessary executive actions identified on the cause and effect charts.

4.6 Open Drains Slops Pump 115-28-PM-015

Refer to P&ID: PHM-115-FE-087 Open Drains CPI.

There is no pressure, temperature or flow control for the open drains slops pump.

There is no flow control for the pump but Restriction Orifice Plate 115-28-RO-101 is installed on the discharge line to prevent damage by running off its performance curve.

4.6.1 Pump Operation

The pump operates under the auto control of Open Drains CPI Level Indicator Controller 115-28-LICA-106.

4.7 Air Blower 115-28-BM-001

Refer to P&ID: PHM-115-FE-087 Open Drains CPI.

4.7.1 Start/Stop

The Air Blower 115-28-BM-001 is started and stopped manually, there is no auto control.

4.8 Glycol and Heating Medium Drain Vessel 115-28-V-014

Refer to P&ID: PHM-115-FE-083 Glycol And Heating Medium Drain Header and Vessel.

4.8.1 Pressure

The glycol and heating medium drain vessel operates at atmospheric pressure, there are no pressure controls.

4.8.2 Level Protection

The glycol and heating medium drain vessel is fitted with Level Transmitter 115-28-LT-109. The signal from this transmitter is used to indicate the level on the DCS and to generate a Low (LAL) and a High (LAH) level alarm at 4.41% and 77.94% respectively.

5.0 ENVIROMENTAL HEATH AND SAFETY REQUIRMENTS

5.1 General EHS Requirements

5.1.1 Chemicals

The following chemical may be present under upset conditions:

Tri-ethylene Glycol (50% in Heating Medium and up to 99% from the Glycol Regeneration Package)

Personnel should ensure that they are fully familiar with the Material Safety Data Sheet (MSDS) for each chemical, which details precautions and the protective apparel and equipment necessary when handling the chemicals. The precautions detailed must be adhered to at all times.

5.1.2 Hazardous Sources

Table 8.9 – Hazardous Sources lists potential hazardous sources that may be present under upset conditions affecting the Closed and Open Drains System.

Table 8.9 – Hazardous Sources

Hazard	Source	Hazardous Event	Effect	Control
Liquid hydrocarbons under pressure	Process drain points to the Closed Drains System	Potential for injury due to contact with hazardous liquids Loss of containment and release of flammable liquids	Potential for personnel injury Un-ignited liquid release and potential for gas release and fire/explosion	Fire and Gas Detection
Hydrocarbon gas under pressure	Process drain points to the Closed Drains System	Potential for injury due to contact with hazardous liquids Loss of containment and release of flammable gas	Potential for personnel injury Un-ignited gas release and potential for fire/explosion	Fire and Gas Detection

5.2 Specific Health and Safety Requirements

The correct use of Personal Protective Equipment (PPE) is fundamental in securing a safe and healthy place of work for all personnel. PPE shall be used in conjunction with appropriate health, environment and safety procedures that are designed to minimise the potential risk of harm or injury to personnel, while also promoting safe working practices.

5.3 Specific Environmental Requirements

There are no specific environmental requirements for the Closed and Open Drains Systems.

The open and closed drains facilities are designed to separate and return all liquid hydrocarbons to the process. Only cleaned water passes from the open drains CPI to the retention pond where it has no impact on the environment.

6.0 REFERENCE INFORMATION

6.1 Company Documentation

Document Number	Document Title
2002-PDS-115-28-PM-003A/B-039-2	Closed Drain Pumps Process Datasheet
2002-PDS-115-28-V-013-034-0	Closed Drain Vessel Process Datasheet
2002-PDS-115-28-V-014 -038-0	Glycol and Heating Medium Vessel Datasheet
2002-PDS-115-28-PM-014-028-0	Open Drains Sump Pump
2002-PDS-115-28-PM-015-035-0	Open Drains Slop Pump Process Datasheet

Document Number	Document Title
PH-10-OP-SOP-00008	Standard Operating Procedure for Closed and Open Drains

6.2 Vendor Documentation

-

6.3 Engineering Drawings (PFDs, UFDs and P&IDs)

Drawing Number	Drawing Title
PHM-115-FP-011	Sinphuhorm GPP PFD – HP and LP Flares
PHM-115-FP-016	Sinphuhorm GPP PFD – Open and Closed Drains
PHM-115-FE-081	Sinphuhorm GPP P&ID – Closed Drain Collection Header
PHM-115-FE-082	Sinphuhorm GPP P&ID – Closed Drain Vessel and Pumps
PHM-115-FE-083	Sinphuhorm GPP PFD – Glycol And Heating Medium Drain Header and Vessel
PHM-115-FE-085	Sinphuhorm GPP PFD – Open Drains Collection Header
PHM-115-FE-086	Sinphuhorm GPP PFD – Pump Pit
PHM-115-FE-087	Sinphuhorm GPP PFD – Open Drains CPI

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HEATING MEDIUM

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1.0 INTRODUCTION

1.1 System Purpose/Function

The purpose of the Heating Medium System is to provide process heating for the following users:

Inlet Heater 115-00-H-002

Condensate Heater 115-02-H-001

Fuel Gas Heater 115-15-H-002

1.2 Primary Components

Tag No	Equipment Title/Description
115-19-V-001	Heating Medium Expansion Vessel
115-19-PM-001A/B	Heating Medium Circulation Pumps
115-19-Z-001	Heating Medium Fired Heater
115-19-ZM-002	Heating Medium Blower
115-19-V-002	Heating Medium Make-up Tank
115-19-PM-002	Heating Medium Make-up Pump

1.3 Primary Interfaces

Input interfaces:

Fuel Gas (refer to Section 7.0 of this OPM)

Power Generation and Distribution (refer to Section 13.0 of this OPM)

PCSS System (refer to Section 14.0 of this OPM)

Instrument Air System (refer to Section 10.0 of this OPM)

Output interfaces:

Gas Process and Export (refer to Section 2.0 of this OPM)

Condensate Treatment, Storage and Export (refer to Section 4.0 of this OPM)

Fuel Gas (refer to Section 7.0 of this OPM)

2.0 SYSTEM DESCRIPTION

2.1 System Overview

Refer to Figure 9.1 – Heating Medium System Simplified Overview Schematic.

The heating medium is made up of a 50% mixture of Tri-Ethylene Glycol (TEG)/ Demineralised Water.

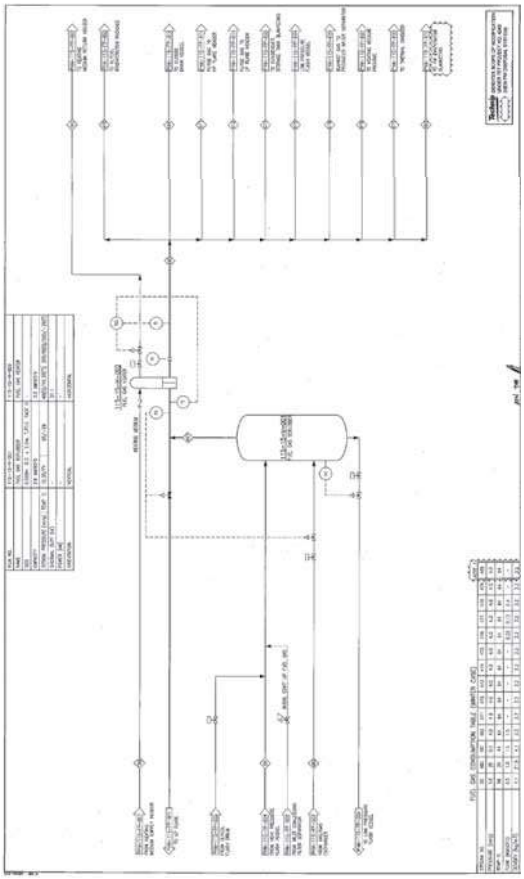
Heating Medium Circulation Pumps 115-19-PM-001A/B circulate the heating medium in the closed circuit system to the users, passing through the heating coils of the Heating Medium Fired Heater 115-19-Z-001 where the temperature is raised to the required value.

The heating medium fired heater burns fuel gas combined with combustion air supplied by Heating Medium Blower 115-19-ZM-002.

Heating Medium Expansion Vessel 115-19-V-001 acts as the system reservoir and provides for thermal expansion of the heating medium system. The heating medium expansion vessel is supplied with a gas blanket from the fuel gas system.

The supply and make-up of the heating medium is provided from the Heating Medium Make-up Tank 115-19-V-002 and Heating Medium Make-up Pump 115-19-PM-002.

Figure 9.1 – Heating Medium Simplified Overview Schematic



2.2 Primary Flow Description

Refer to P&IDs:

PHM-115-FE-015 Heating Medium Expansion Vessel and Pumps

PHM-115-FE-016 Heating Medium Fired Heater

2.2.1 Normal Operation

Heating medium returns from the users at a temperature of approximately 70°C and passes to the suction of the Heating Medium Circulation Pumps 115-19-PM-001A and B. The duty pump discharges the heating medium at a normal flowrate of 84m^3/h to the Heating Medium Fired Heater 115-19-Z-001 where the temperature of the heating medium is raised to 95°C before being passed to the users.

Minimum Flow Valve 115-19-FCV-101 located downstream of the fired heater ensures that a minimum flow of 67m^3/h is always attained. The minimum flow valve returns heating medium to the pump common suction line to protect the pumps on start up or when there is a turn down of the users.

3.0 EQUIPMENT DESCRIPTION

3.1 Heating Medium Expansion Vessel 115-19-V-001

Refer to P&ID: PHM-115-FE-015 Heating Medium Expansion Vessel and Pumps.

3.1.1 Function

Heating Medium Expansion Vessel 115-19-V-001 provides for storage and thermal expansion for the 50% Tri-Ethylene Glycol (TEG)/Demineralised water mixture heating medium. The vessel operates at approximately 5barg and is mounted above the circulation pumps to supply suction head. The vessel is provided with a gas blanket from the fuel gas system via a Pressure Control Valve 115-19-PCV-116 and excess gas is vented to the LP flare via a second Pressure Control Valve 115-19-PCV117.

3.1.2 Technical Data

For details of the design and operating parameters, refer to Table 9.1 – Design and Operating Parameters Heating Medium Expansion Vessel 115-19-V-001.

Table 9.1 – Design and Operating Parameters Heating Medium Expansion Vessel 115-19-V-001

Parameter	Design	Operating
Pressure	6.89barg	5.9barg/4.7barg
Temperature	343°C/-29°C	100°C
Capacity	5.68m^3	–

3.1.3 Description

Heating Medium Expansion Vessel 115-19-V-001 is a horizontal vessel with an outside diameter of 1.524m and has a length of 2.533m, seam to seam. The vessel is constructed from carbon steel. The vessel is provided with a 2in gas blanketing nozzle, a 3in fill connection and a 2in drain connection the glycol and heating medium drain vessel.

Heating medium returned from the users is open to the vessel through a 4in inlet nozzle and is supplied to the circulation pumps through a 4in outlet nozzle. The heating medium does not flow completely through the vessel as a bypass valve on the heating medium return line is set open.

Gas blanketing is supplied to the vessel through a 2in outlet nozzle provided with a carriage sealed open valve.

Level Gauge 115-19-LG-111 provides local indication of the heating medium level.

Pressure in the expansion vessel is indicated locally on 115-19-PG-116 located in the gas blanket line.

Pressure Relief Valve 115-19-PSV-113 is provided on the top of vessel with a carriage sealed open inlet isolation valve.

For details of the heating medium expansion vessel control and protection, refer to Paragraph 4.0 Instrumentation and Control.

3.2 Heating Medium Circulation Pumps 115-19-PM-001A/B

Refer to P&ID: PHM-115-FE-015 Heating Medium Expansion Vessel and Pumps.

3.2.1 Function

Heating Medium Circulation Pumps 115-19-PM-001A/B circulate the heating medium returned from the users to the distribution system via the heating medium fired heater.

3.2.2 Technical Data

For details of the design and operating parameters, refer to Table 9.2 – Design and Operating Parameters Heating Medium Circulation Pumps 115-19-PM-001A/B.

Table 9.2 – Design and Operating Parameters Heating Medium Circulation Pumps 115-19-PM-001A/B

Parameter	Design	Operating
Discharge Pressure	16.0barg	12.0barg
Temperature	200°C	100°C
Capacity	78.4m^3/h @ 7.0barg	
Power	30kW	
Speed	3000 RPM	

3.2.3 Description

Heating Medium Circulation Pumps 115-19-PM-001A/B are 100% duties, electrically driven single stage centrifugal pumps operating on a duty/standby basis.

A manual isolation gate valve is fitted to each pump suction line upstream of an inline basket strainer. The strainer removes all particles greater than 420µm from the suction flow, which could otherwise damage the pump internals. To clean the strainer, the pump must be shut down and isolated before the strainer can be removed.

The pump suction and discharge line are provided with stainless steel flexible hoses to allow for thermal expansion.

A manual isolation gate valve is fitted to each pump discharge line downstream of a check valve.

A minimum Flow Control Valve 115-19-FCV-101 is provided for the pumps on the heater outlet. The minimum flow valve returns heating medium to the pump common suction line to protect the pumps on start up or when there is a turn down of the users. The minimum flow valve is provided with upstream, downstream isolation valves and a bypass for maintenance purposes

Pressure Gauges 115-19-PG-120/118 provides local indication of pump 115-19-PM-001A/B suction pressures respectively.

Pressure Gauges 115-19-PG-119/117 provides local indication of pump 115-19-PM-001A/B discharge pressures respectively.

For details of the heating medium circulation pump control and protection, refer to Paragraph 4.0 Instrumentation and Control.

3.3 Heating Medium Fired Heater 115-19-Z-001

Refer to P&ID: PHM-115-FE-016 Heating Medium Fired Heater.

3.3.1 Function

Heating Medium Fired Heater 115-19-Z-001 raises the temperature of the heating medium from 70°C to approximately 95°C to supply the heating requirements of the users.

3.3.2 Technical Data

For details of the design and operating parameters, refer to Table 9.3 – Design and Operating Parameters Heating Medium Fired Heater 115-19-Z-001.

Table 9.3 – Design and Operating Parameters Heating Medium Fired Heater 115-19-Z-001

Parameter	Design	Operating
Pressure	40.0barg/Full Vacuum	12.0barg
Temperature	200°C/-29°C	70°C in 95°C
Thermal Duty	4099kW	

3.3.3 Description

Heating Medium Fired Heater 115-19-Z-001 is a helical coil type thermal fluid heater, which uses fuel gas combined with forced draft combustion air in the burner unit. The heater shell is a single cylinder, welded construction, internally lined with three inches ceramic fiber blanket insulation and is supplied with a stack for the emission of flue gasses. The end covers are fabricated, internally insulated with six inches of ceramic fibre blanket Insulation (the front also has a refractory combustion block made from 3000°F (1648.9°C) to 3300°F (1815.6°C) grade material), and rear viewing port. Seal plates are bolted on around the coil's entrance and exit. The removable end covers are sealed and bolted to the shell which allows for coil removal.

As the heating medium passes through the helical coil tube bundle its temperature is raised by the radiated energy produced by the combustion of the fuel gas and air mixture.

The burner arrangement of pilot and main burner is supplied from the Fuel Gas System. Fuel gas is supplied via a shutdown valve under pressure control to the burners and utilises a double block and vent system controlled by the heater's Burner Management System. The fuel gas supply line is provided with a manual isolation valve and a Y-type strainer that removes all particles greater than 152µm from the fuel gas.

The main burner is provided with Fuel Gas Shutdown Valves 115-19-SDV-111 and 115-19-SDV-112 for burner isolation. The main burner is provided with Blowdown Valve 115-19-BDV-111 to vent the fuel gas to a safe location.

Fuel gas is supplied to the main burner via Temperature Control Valve 115-19-TCV-116, which is provided with upstream and downstream isolation valves for maintenance purposes. The main burner is provided with an isolation valve for maintenance purposes.

The pilot burner is provided with Fuel Gas Shutdown Valves 115-19-SDV-113, and 115-19-SDV-114 for burner isolation. The pilot burner is provided with Blowdown Valve 115-19-BDV-112 to vent the fuel gas to a safe location.

Fuel gas is supplied to the pilot burner via self regulating Pressure Control Valve 115-19-PCV-115. The pilot gas train is provided with upstream and downstream isolation valves for maintenance purposes. The pilot burner is provided with an isolation valve for maintenance purposes.

The burner housing is fitted with top and bottom manual air dampers for flame adjustment.

The burners are controlled by the FIREYE Flame-Monitor System, a microprocessor based, burner management control system with self diagnostics, non-volatile memory and a vocabulary of 42 different messages which scroll out on the message center to provide the operator with status and failure mode information.

The flame-monitor system senses the burner main and pilot flames with an ultraviolet scanner and purges the firing chamber before firing. The system turns on the pilot for a pre-programmed time period, allows the main fuel valve to open only when it safe and shuts off fuel if there is not a flame present.

The heater controllers, switches and status lights are housed in an electrical panel at the side of the skid. The panel is air purged to meet UL and NEC safety standards. The air purge pressure is controlled by Pressure Control Valve 115-19-PCV-111.

For details of the heating medium fired heater control and protection, refer to Paragraph 4.0 Instrumentation and Control.

3.4 Heating Medium Blower 115-19-ZM-002

Refer to P&ID: PHM-115-FE-016 Heating Medium Fired Heater.

3.4.1 Function

Heating Medium Blower 115-19-ZM-002 provides forced draft purge and combustion air to the fired heater.

3.4.2 Technical Data

For details of the design and operating parameters, refer to Table 9.4 – Design and Operating Parameters Heating Medium Blower 115-19-ZM-002.

Table 9.4 – Design and Operating Parameters Heating Medium Blower 115-19-ZM-002

Parameter	Design	Operating
Pressure	16.0barg	Variable
Temperature	200°C	Ambient
Power	18.64kW	
Motor Speed	3000 RPM	

3.4.3 Description

Heating Medium Blower 115-19-ZM-002 is an electrically driven fixed speed forced draft fan provided with an inlet silencer and ducting to the heater burners. Air flow from the blower to the burners is governed by Temperature Control Valve 115-19-TCV-115, the opening of which is controlled by the heater's Burner Management System.

For details of the heating medium blower control and protection, refer to Paragraph 4.0 Instrumentation and Control.

3.5 Heating Medium Make-up Tank 115-19-V-002

Refer to P&ID: PHM-115-FE-015 Heating Medium Expansion Vessel and Pumps.

3.5.1 Function

Heating Medium Make-up Tank 115-19-V-002 is used for the storage of Tri-Ethylene Glycol (TEG) prior to mixing of the 50% TEG/Demin Water mixture heating medium and make up of the system.

3.5.2 Technical Data

For details of the design and operating parameters, refer to Table 9.5 – Design and Operating Parameters Heating Medium Make-up Tank 115-19-V-002.

Table 9.5 – Design and Operating Parameters Heating Medium Make-up Tank 115-19-V-002

Parameter	Design	Operating
Pressure	5.0barg	Atmospheric Pressure
Temperature	200°C	Ambient
Capacity	19m^3	–

3.5.3 Description

Heating Medium Make-up Tank 115-19-V-002 is a horizontal vessel with an outside diameter of 2.438m and has a length of 3.547m, seam to seam. The vessel is constructed from carbon steel. The tank is provided with a 3in fill connection and a 2in drain connection.

The tank is swan neck vented to atmoPig via a 2in vent, consequently there is no requirement for a pressure safety valve.

Level Gauge 115-19-LG-9-1 provides local indication of the liquid level.

3.6 Heating Medium Make-up Pump 115-19-PM-002

Refer to P&ID: PHM-115-FE-015 Heating Medium Expansion Vessel and Pumps.

3.6.1 Function

Heating Medium Make-up Pump 115-19-PM-002 delivers TEG from the make-up tank to the heating medium system.

3.6.2 Technical Data

For details of the design and operating parameters, refer to Table 9.6 – Design and Operating Parameters Heating Medium Make-up Pump 115-19-PM-002.

Table 9.6 – Design and Operating Parameters Heating Medium Make-up Pump 115-19-PM-002

Parameter	Design	Operating
Discharge Pressure	16.0barg	3.6barg
Temperature	200°C	Ambient
Capacity	2.73m^3/h @ 3.6barg	
Power	0.74kW	
Speed	1000 RPM	

3.6.3 Description

Heating Medium Make-up Pump 115-19-PM-002 is an electrically driven gear pump. The pump is supplied with an integral relief valve and drain valve.

A manual isolation gate valve is fitted to the pump suction line upstream of an inline Y-type strainer.

Manual isolation gate valves are fitted to the pump discharge downstream of a check valve and pressure safety valve on the return line to the tank and the fill line.

Pressure Gauge 115-19-PG-122 provides local indication of pump suction pressure.
Pressure Gauge 115-19-PG-121 provides local indication of pump discharge pressure.

For details of the heating medium make-up pump control and protection, refer to Paragraph 4.0 Instrumentation and Control.

4.0 INSTRUMENTATION AND CONTROL

4.1 Heating Medium Expansion Vessel 115-19-V-001

Refer to P&ID: PHM-115-FE-015 Heating Medium Expansion Vessel and Pumps.

4.1.1 Pressure

The pressure in the expansion vessel is controlled at 5.86barg by a self regulating Pressure Control Valve 115-19-PCV-117, which lets down to the LP flare. If the pressure in the expansion vessel falls then self regulating Pressure Control Valve 115-19-PCV-116 will open at 4.69barg to maintain the gas blanket from the fuel gas system.

Pressure protection is provided by Pressure Switch 115-19-PS-114, which provides a signal to the heater control logic to perform the necessary executive actions.

Overpressure protection is provided by Pressure Relief Valve 115-19-PSV-113, set to relieve at 7.0barg.

4.1.2 Liquid Level

There is no liquid level control in the expansion vessel, and level will only alter due to thermal expansion and contraction or if the system develops a leak.

Level Gauge 115-19-LG-111 provides local indication of the heating medium level.

Level protection is provided by Level Switch 115-19-LS-111 which provides a signal to the heater control logic to perform the necessary executive actions.

4.2 Heating Medium Circulation Pumps 115-19-PM-001A/B

Refer to P&ID: PHM-115-FE-015 Heating Medium Expansion Vessel and Pumps.

4.2.2 Flow

Flow Controller 115-19-FIC-111 controls Minimum Flow Control Valve 115-19-FCV-101. The minimum flow valve is located downstream of the fired heater and ensures that a minimum flow of 67m^3/h is always attained.

Flow Controller 115-19-FIC-111 also provides high and low flow alarms at the heater control panel and provides a signal to the heater control logic to perform the necessary executive actions.

4.2.2 Pump On/Off Control

Initiation of the pump starts is by the operator at the Heater Local Control Panel or start/stop via DCS by the control room operator. The logic will then automatically control the operation of the pump(s).

4.3 Heating Medium Fired Heater 115-19-Z-001

Refer to P&ID: PHM-115-FE-016 Heating Medium Fired Heater.

4.3.1 Pressure (Heater and Control Panel)

Fired heater fluid outlet pressure is indicated on the DCS by Pressure Indicator 115-19-PI-112.

Fired Heater fluid inlet pressure is indicated locally on Pressure Gauge 115-19-PG-115. Fired Heater fluid outlet pressure is indicated locally on Pressure Gauge 115-19-PG-114.

Overpressure protection for the heater tube bundle is provided by Pressure Relief Valve 115-19-PSV-112 set to relieve at 40barg for a thermal expansion case.

Air purge pressure to the heater control panel is controlled by self regulating Pressure Control Valve 115-19-PCV-111 at 0.4 inches WC (0.1Kpa). Pressure Gauge 115-19-PG-111 provides local indication of the air pressure and Pressure Switch 115-19-PS–111 provides a signal to the heater control logic to perform the necessary executive actions.

The control panel is protected against over pressure by providing a Pressure Relief Valve 115-19-PSV-111 set to relieve at 0.65 inches WC (0.165Kpa).

4.3.2 Temperature

Fired heater fluid inlet temperature is indicated on the DCS by Temperature Indicator 115-19-TI-115. Fired Heater fluid inlet temperature is indicated locally on Temperature Gauge 115-19-TG-112.

Temperature Indicator 115-19-TI-113B indicates tube temperature at the heater control panel. Temperature Indicator 115-19-TI-113B also outputs to the Burner Management System logic and from there to Temperature Indicator 115-19-TI-113A on the DCS.

Temperature Indicator 115-19-TI-112B indicates heater stack temperature at the heater control panel. Temperature Indicator 115-19-TI-112B also outputs to the Burner Management System logic and from there to Temperature Indicator 115-19-TI-112A on the DCS.

Temperature Indicator Controller 115-19-TI-114B controls fired heater fluid outlet temperature at 95°C. Temperature Indicator 115-19-TI-114B also outputs to the Burner Management System logic and from there to Temperature Indicator 115-19-TI-114A on the DCS.

The Burner Management System modulates Temperature Control Valves 115-19-TCV-115 and 115-19-TCV-116 in the combustion air and fuel gas lines to regulate the heater outlet temperature in line with the setpoint of 115-19-TI-114B. The open and closed limits of the temperature control valves are also relayed to the Burner Management System.

The fired heater fluid outlet is protected from high temperature by Temperature Indicator Switch High 115-19-TI-114D, set at 160°C. Temperature Indicator Switch 115-19-TI-114D also outputs to the Burner Management System logic and from there to Temperature Indicator 115-19-TI-114C on the DCS.

Fired Heater fluid outlet temperature is indicated locally on Temperature Gauge 115-19-TG-111.

The heater temperature control is programmed such that one temperature control modulates the burner to match the heat demand of the unit. A second output prevents the burner going to the high fire position until a predetermined temperature is obtained; this is commonly referred to as 'Low Fire Hold'. A third output switch turns the burner off and on when the demand is below the turndown of the burner.

4.3.3 Pressure (Fuel Gas)

Self-regulating Pressure Control Valve 115-19-PCV-114 controls the pressure of the fuel gas supply to the heater burner at 1.38barg.

Self-regulating Pressure Control Valve 115-19-PCV-115 controls the pressure of the fuel gas to the heater pilot burner at HOLD.

Pressure Indicator 115-19-PI-111 indicates the fuel gas pressure on the DCS.

The fuel gas pressure to the heater burner is indicated locally by Pressure Gauges 115-19-PG-112/113. The pilot gas pressure to the heater is indicated locally by Pressure Gauge 115-19-PG-3-1.

Pressure Switches 115-19-PS-112 and 113 (positioned upstream and downstream of Main Burner Fuel Gas Shutdown Valves 115-19-SDV-111 and 112 respectively) output signals to the Burner Management System logic.

The main burner fuel Gas Shutdown Valves are fail closed valves controlled from the Burner Management System.

The main burner is also provided with Blowdown Valve 115-19-BDV-111 to vent the fuel gas. This valve fails open and is controlled from the Burner Management System.

The pilot burner is provided with Fuel Gas Shutdown Valves 115-19-SDV-113 and 115-19-ESDV-114. These valves fail closed and are controlled from the Burner Management System.

The pilot burner is also provided with Blowdown Valve 115-19-BDV-112 to vent the fuel gas. This valve fails open and is controlled from the Burner Management System.

4.3.4 Flame Detection

A Flame Failure Alarm 115-19-BSLL-111 is sent from the UV sensor to the Burner Management System logic for system startup and trip functions. This alarm is repeated on the DCS and displayed as Burner Alarm Low 115-19-BALL-111.

An Ignition Failure Alarm 115-19-IGN-111 from the burner enclosure outputs to the Burner Management System logic.

4.3.5 Flue Gas Analysis

Flue gas Excess Oxygen Analyser Transmitter 19-AT-111 outputs to the Burner Management System for fuel gas/air ratio control.

4.3.6 Heater Control Panel Interface with the DCS

The heater control panel receives a shutdown signal from the ESD system and outputs Common Alarm 115-19-XA-111 and Unit Shutdown Alarm 115-19-XA-112 to the DCS.

4.3.7 Heater Start/Stop

Starting and stopping the heater is initiated by the operator at the local control panel.

Thereafter the heater will start and operate under the automatic control of the Burner Management System logic.

4.4 Heating Medium Blower 115-19-ZM-002

Refer to P&ID: PHM-115-FE-016 Heating Medium Fired Heater.

4.4.1 Pressure Differential

Pressure Differential Switch 115-19-PDS-111 measures the pressure differential across the heating medium blower. The switch, which is set at 2.5 inches WC, provides a signal to the Burner Management System logic to perform the necessary executive actions.

4.4.2 Temperature

The heating medium blower outlet temperature is displayed on the DCS via Temperature Indicator 115-19-TI-111 relayed from Temperature Transmitter 115-19-TT-111.

4.4.3 Flow

Air flow to the heater burner is controlled by the Burner Management System modulating Temperature Control Valve 115-19-TCV-115 downstream of the blower.

4.4.4 Blower Start/Stop

Starting and stopping the blower is carried out from the local control panel under the control of the Burner Management System sequence logic.

4.5 Heating Medium Make-up Tank 115-19-V-002

Refer to P&ID: PHM-115-FE-015 Heating Medium Expansion Vessel and Pumps.

There is no DCS control for the heating medium make-up tank.

4.6 Heating Medium Make-up Pump 115-19-PM-002

Refer to P&ID: PHM-115-FE-015 Heating Medium Expansion Vessel and Pumps.

4.6.1 Pressure

Overpressure protection for the Pump blocked outlet case is provided by Pressure Relief Valve 115-19-PSV-111 set to relieve at 6.9barg.

4.6.2 Start/Stop

The pump is started and stopped by the operator at the Heater Local Control Panel.

5.0 ENVIRONMENTAL, HEALTH AND SAFETY REQUIREMENTS

5.1 General EHS Requirements

5.1.1 Chemicals

Tri-ethylene Glycol is used throughout the Heating Medium System with 50% Tri-Ethylene Glycol (TEG)/Demineralised water mixture being used for the heating medium. Neat Tri-ethylene Glycol is used to fill system.

Personnel should ensure that they are fully familiar with the Material Safety Data Sheet (MSDS) for each chemical, which details precautions and the protective apparel and equipment necessary when handling the chemicals. The precautions detailed must be adhered to at all times.

5.1.2 Hazardous Sources

Table 9.7 – Hazardous Sources lists potential hazardous sources that may be present under upset conditions affecting the Heating Medium System.

Table 9.7 – Hazardous Sources

Hazard	Source	Hazardous Event	Effect	Control
High temperature Lines and vessels	Throughout system	Potential for injury due to contact with hot surfaces (150°C)	Potential for personnel injury	Lagging for personnel protection
Hot Heating Medium under pressure	Throughout system	Potential for injury due to contact with hot liquid	Potential for personnel injury	Monitoring Maintenance procedures
Hydrocarbon gas under pressure	Fuel Gas to heater burner	Potential for injury due to contact with hazardous liquids Loss of containment and release of	Potential for personnel injury Un-ignited gas release and potential for fire/explosion	Burner Flame Detection Fire and Gas Detection

Hazard	Source	Hazardous Event	Effect	Control
		flammable gas		
Lube oil	Heating Medium Circulation Pumps	Loss of containment	Potential for personnel injury Spills Fire Contamination	Monitoring Maintenance procedures
Nitrogen	Purging operations	Exposure to	Potential for personnel asphyxiation	Safety procedures

5.2 Specific Health and Safety Requirements

The correct use of Personal Protective Equipment (PPE) is fundamental in securing a safe and healthy place of work for all personnel. PPE shall be used in conjunction with appropriate health, environment and safety procedures that are designed to minimise the potential risk of harm or injury to personnel, while also promoting safe working practices.

5.3 Specific Environmental Requirements

To prepare the Heating Medium System for the introduction of hydrocarbon liquids, it is necessary to remove all air from the system. Nitrogen maybe utilized for this purpose. Similarly, when preparing equipment for maintenance, nitrogen maybe used to purge hydrocarbons from the system before breaking containment and introducing air.

When purging the system of air prior to introduction of hydrocarbons, the atmoPig in the system should be tested with an Oxygen Content Analyzer to determine the level of oxygen remaining in the purged system.

When purging is being performed to remove hydrocarbons, a suitable test instrument should be used, which is capable of detecting hydrocarbons in nitrogen.

WARNING: NITROGEN IS AN ASPHYXIANT, AND IS COLOURLESS AND ODOURLESS. RAPID AND UNRECOGNISED LOSS OF CONSCIOUSNESS CAN OCCUR IN PERSONS EXPOSED TO A NITROGEN-ENRICHED ATMOPIG. WHEN USING NITROGEN, CARE SHOULD BE TAKEN TO ENSURE THAT NITROGEN ESCAPES ARE DISPERSED AND NOT ALLOWED TO COLLECT IN ENCLOSED AREAS.

6.0 REFERENCE INFORMATION

6.1 Company Documentation

Document Number	Document Title
2002-PDS-115-19-S-001-001	Heating Medium Package Process Data Sheet
2002-PP-909	Commissioning Procedure for Heating Medium
PH-10-OP-SOP-00009	Standard Operating Procedure for Heating Medium System

6.2 Vendor Documentation

Document Number	Document Title
05358-PID	Vendor P&ID Heating Medium System
05358-PIPS	Vendor P&ID Heating Medium Expansion Vessel and Pumps
05358-PIHS	Vendor P&ID Heating Medium Fired Heater
05358-PIMTS	Vendor P&ID Heating Medium Make-up Tank and Pump
	Vendor Operation and Maintenance Guide for 'HCI' and 'VHCI' Heaters

6.3 Engineering Drawings (PFDs, UFDs and P&IDs)

Drawing Number	Drawing Title
PHM-115-FP-007	Sinphuhorm GPP UFD – Heating Medium System
PHM-115-FE-015	Sinphuhorm GPP P&ID – Heating Medium Expansion Vessel and Pumps
PHM-115-FE-016	Sinphuhorm GPP P&ID – Heating Medium Fired Heater

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INSTRUMENT AIR SYSTEM

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1.0 INTRODUCTION

1.1 System Purpose/Function

The Instrument Air System is provided to supply oil and water free air at 10barg to the instrumentation and for pneumatic valve operation around the gas processing plant.

The primary component of the instrument air system is outlined within Paragraph 1.2 Primary Components.

1.2 Primary Components

Tag No	Equipment Title/Description
115-20-S-008A/B	Instrument Air Compressor packages
115-20-H-002	Intercooler – intercoolers and aftercoolers are part of the instrument air compressor package
115-20-V-003A/B	Instrument Air Dryers
115-20-V-004A/B	Pre -filters
115-20-V-005A/B	After-filter
115-20-V-009	Instrument Air Receiver

1.3 Primary Interfaces

Input Interfaces:

- Power Generation and Distribution (refer to Section 13.0 of this OPM)
- PCSS System (refer to Section 14.0 of this OPM)

Output Interfaces:

- Wellpads, Gathering Lines and Main Pipeline A, B, C (refer to Section 1.0A/B/C of this OPM)
- Gas Process, Metering and Export (refer to Section 2.0 of this OPM)
- Glycol Regeneration (refer to Section 3.0 of this OPM)
- Condensate Treatment, Storage and Export (refer to Section 4.0 of this OPM)
- Produced Water Treatment (refer to Section 5.0 of this OPM)
- Flare Systems (refer to Section 6.0 of this OPM)
- Fuel Gas System (refer to Section 7.0 of this OPM)
- Closed and Open Drains (refer to Section 8.0 of this OPM)
- Heating Medium (refer to Section 9.0 of this OPM)
- Chemical Injection (refer to Section 11.0 of this OPM)
- Fire and Service Water System (refer to Section 12.0 of this OPM)
- Power Generation and Distribution (refer to Section 13.0 of this OPM)

2.0 SYSTEM DESCRIPTION

2.1 System Overview

Refer to Figure 10.1 – Instrument Air Simplified Overview Schematic.

The Instrument Air System comprises two 100% capacity compressors, a dessicant dryer package and an instrument air receiver.

The instrument air dryer package consists of 2 x100% dual tower desiccant heatless type air dryers. One set of driers will be in service with the other set on standby ready for use if required. The dryer unit operates with one tower on line the other regenerating. The dryers are regenerated by the dry air from the on line tower flowing in the opposite direction through the other bed and exhausting to atmoPig. The changeover is performed automatically.

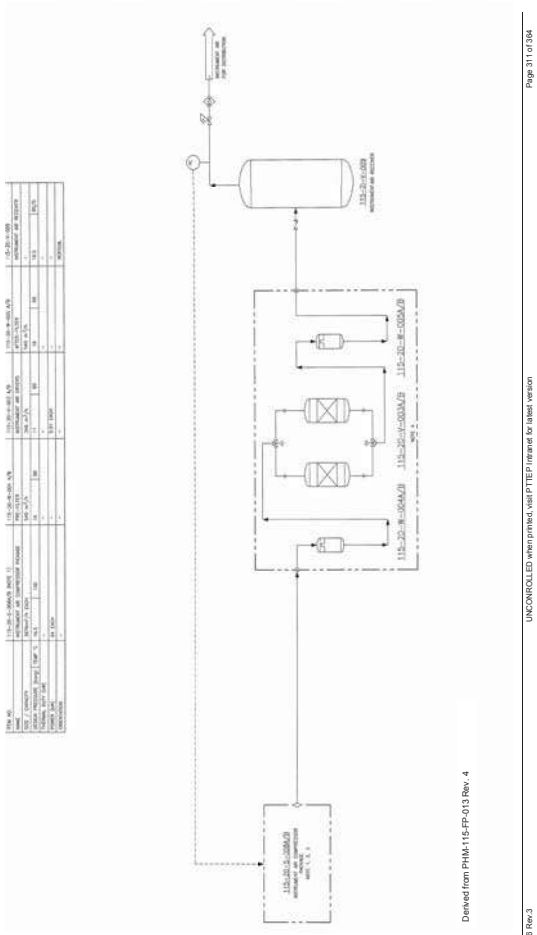
Air from the dryer package passes through an after-filter to remove any dust carried over in the air stream.

Dried air passes to the instrument air receiver from the drier package and then on to the distribution system.

The air quality specifications for the instrument air system are as follows:

- Oil content <0.01ppm wt
- Instrument air dew-point < -6°C from compressor and < -40°C from dryers
- Particles content< 0.005gm/Nm³
- The instrument air receiver has been sized for 15 minutes buffer storage, from 10barg to 5.5barg at continuous instrument usage rate.
- The operating pressure upstream of pressure regulation valves cycle between 7.5barg and 8.5barg as the compressors load and unload.

Figure 10.1 – Instrument Air Simplified Overview Schematic



Derived from PHM-115-FP-013 Rev. 4

2.2 Primary Flow Description

Refer to P&IDs:

PHM-115-FE-052 Instrument Air Receiver

PHM-115-FE-053 Instrument Air Distribution

Air is drawn through an inlet filter and an inlet throttle valve into the compressor where it is compressed to 10barg in two stages. The air from the first stage and second stages passes through an intercooler and after cooler respectively, upon exiting the coolers the compressed air passes through an air/water separator to remove condensed water from the air stream.

Air leaving the second stage of the compressor passes through two inlet filters on the dryer package, which removes oil droplets and particulates from the air stream. The filtered air is directed to the online tower of the dryer package by the three-way, pneumatically operated inlet valve. In the drying tower the moisture is absorbed by the desiccant bed and the air is dried to a target dew-point of -40°C.

The air leaving the drying tower is filtered to remove any desiccant dust carried over from the dryer before flowing to the instrument air receiver.

The instrument air receiver is used as a buffer device to remove pressure spikes from the system and to provide reserve capacity in the event of a compressor failure, to allow the safe shut down of the plant. From here the air is distributed to the plants instrumentation via a ring main.

Regeneration of the desiccant in the wet tower of the dryer is achieved by depressurising the tower and then flowing dry air, taken from the dryer outlet, through the desiccant bed and exhausting to atmoPig through a pneumatic exhaust valve which operates in conjunction with the three-way inlet routing valve. As the dry air flows through the bed water is released from the desiccant, absorbed by the dry air and carried to vent.

3.0 EQUIPMENT DESCRIPTION

3.1 Air Compressors 115-20-CM-001A/B

Refer to P&ID: PHM-115-FE-051 R Instrument Air Generation.

3.1.1 Function

The two 'oil free' Instrument Air Compressors 115-20-S-008A/B provide compressed air for use on instrumentation around the plant and for pneumatic valve operation.

3.1.2 Technical Data

For details of the design and operating parameters, refer to Table 10.1 – Design and Operating Parameters Air Compressors 115-20-S-008A/B.

Table 10.1 – Design and Operating Parameters Air Compressors 115-20-CM-001A/B

Parameter	Design	Operating
Pressure	16.5barg	7.5barg to 8.5barg
Temperature (Max/Min)	150°C	30-46°C
Main Motor	64kW	–
Fan Motor	3kW	–
Capacity	397Nm³/hr (2x100%)	

3.1.3 Technical Description

Each Atlas Copco ZT55-90-FF compressor is comprised of the following components housed in a steel enclosure.

Inlet-filter

Two stage compressor

Fin fan intercooler

Fin fan aftercooler

Finfan lube oil cooler

Air/Water Separators

Intake Filter

Air enters the compressor through an intake filter to prevent particulates entering the compressor. The filter is a corrugated fabric type filter element in a light metal container.

Compressors

The compressors are oil free, screw-type air compressors with two stages of compression and a variable speed drive. Air enters through a pneumatically controlled suction valve which shuts off air flow to the first stage compressor to unload the unit. The actuator of the suction valve also vents the air from the final compressor stage discharge when the compressor is unloaded.

Air is compressed by the first (LP) stage screw compressor, which has two intermeshing helicoidal rotors, one with four lobes, and the other with six flutes. A timing gear on the end of each rotor ensures there is no contact between the two rotors whilst maintaining clearances. Air is progressively compressed as it is forced along the casing by the rotors.

The second (HP) stage compressor is similar in design and operation to the LP compressor.

The two compressors are driven through a gear box, by a single variable speed electric motor. Varying the speed of the motor controls the throughput of the compressor.

Lubrication for the compressor rotor bearings is provided by a lube oil pump driven by the compressor motor, which draws oil from a sump. In addition to providing lubrication the oil is also used to cool the compressor casings.

Lube oil from the pump is passed through a cooler before flowing through the HP and LP compressor casings. A temperature control valve is provided to bypass the cooler when the oil is cold. Oil from the casings is fed through a filter before flowing to the rotor bearings. Pressure of the supply to the bearings is regulated by a pressure control valve, which dumps oil back to the sump. The bearing housings also drain directly back to the sump.

Coolers

Air from the discharge of the two stages passes through a fin fan cooler. The fin fan coolers are cooled with air provided by a fan driven by an electric motor. The unit has three separate coolers; an intercooler, aftercooler and lube oil cooler. Each cooler has finned tubes to provide maximum heat transfer. The hot air exhausts through a grill in the side of the compressor enclosure.

Liquid Separators

Cooled air from the intercooler and aftercooler pass to individual separators where condensed liquids are separated from the air stream. Each separator is fitted with an electronically controlled condensate drain.

For details of the instrument air control and protection, refer to Paragraph 4.0 Instrumentation and Control.

3.2 Instrument Air Dryer Package 115-20-V-003A/B

Refer to P&ID: PHM-115-FE-052 Instrument Air Receiver.

3.2.1 Function

The Atlas Copco, Model CD-140 Desiccant Dryer Package 115-20-V-003A/B is used to dry the compressed air from the compressors to reduce the water dew point to -40°C to meet the instrument air specification.

3.2.2 Technical Data

For details of the design and operating parameters, refer to Table 10.2 – Design and Operating Parameters Pre-Filters 115-20-W-004A/B.

Table 10.2 – Design and Operating Parameters Pre-Filters 115-20-W-004A/B

Parameter	Design	Operating
Pressure	16.0barg	5.9barg to 10.0barg
Temperature	66°C	30°C to 46°C
First Pre-filter efficiency	<0.5ppm oil and <1 micron solids	–
Second Pre-filter efficiency	<0.01ppm oil and <0.01 micron solids	–
Capacity	540m³/hr	–

For details of the design and operating parameters, refer to Table 10.3 – Design and Operating Parameters Instrument Air Dryers 115-20-V-003A/B.

Table 10.3 – Design and Operating Parameters Dryer Packages 115-20-V-003A/B

Parameter	Design	Operating
Pressure	11.0barg	5.8barg to 10.0barg
Temperature	60°C	30°C to 46°C
Capacity	346Nm³/hr	–
Power	0.01kW	–

For details of the design and operating parameters, refer to Table 10.4 – Design and Operating Parameters After-Filters 115-20-W-005A/B.

Table 10.4 – Design and Operating Parameters After-Filters 115-20-W-005A/B

Parameter	Design	Operating
Pressure	16.0barg	5.6barg to 10.0barg
Temperature	66°C	30°C to 46°C
Efficiency	<1.0 micron solids	–
Capacity	540m³/hr	–

3.2.3 Technical Description

Prefilters

The pre-filters consist of two stages of filtration. The first filter is a micro-fibre mat surrounded by a coalescing filter sheath that coalesces any liquid aerosols and oil present in the air stream.

The second filter is a cartridge type filter to remove any oil content down to less than 0.05mg/m^3. The two filters are mounted on the inlet piping at the dryer skid.

Dryers

Each dryer has two cylindrical drying towers rated for a throughput of 346Nm3/hr and having a design pressure of 11.0barg. The towers operate one on line drying and the second offline in the regeneration cycle.

Each tower has a desiccant bed supported on a grill within the tower. Wet air is routed to the bottom of the duty dryer by an actuated three-way valve.

The three-way valve is positioned by operation a one of two solenoid valves controlled from the dryer control panel. The dry air leaves the tower through a check valve and flows to the on skid after filter.

Air is taken from upstream of the check valve to be used as purge air and control air to actuate the valves in the package.

The wet tower is depressurised prior to regeneration by an exhaust valve on the inlet pipe at the bottom of the chamber. The exhaust valve is actuated pneumatically by air from the solenoid valve, which controls the three-way valve. The arrangement is such that the exhaust valve opens on the tower that is not selected as the drying tower.

The exhaust valve is opened by pressurising the diaphragm. To ensure that the exhaust valve is not opened before the three-way valve has closed the air inlet to the tower, there is a restrictor on the control air to the exhaust valve to delay operation. The restrictor has a bypass with a check valve to allow immediate closure when the signal is removed.

Control of the air dryers is through a local control panel.

After Filters

The after filters are a pair of duplex cartridge type filters provided to remove any desiccant fines from the air stream. The filters remove solid particles of a size greater than 1 micron. Change over is through a single lever, which operates two three-way valves.

3.3 Instrument Air Receiver 115-20-V-009

3.3.1 Function

Refer to P&ID: PHM-115-FE-052 Instrument Air Receiver.

Instrument Air Receiver 115-20-V-009 provides a buffer to maintain the supply of instrument air on loss of the compressors to enable the plant to be shut down safely.

3.3.2 Technical Data

For details of the design and operating parameters, refer to Table 10.5 – Design and Operating Parameters Instrument Air Receiver 115-20-V-009.

Table 10.5 – Design and Operating Parameters Instrument Air Receiver 115-20-V-009

Parameter	Design	Operating
Pressure	16.5barg	5.5barg to 10.0barg
Temperature	0°C / 90°C	30°C to 46°C
Capacity	31.6m³	–

3.3.3 Technical Description

The vessel is a vertical cylindrical vessel 2.8m inside diameter and a height from T/T of 4.2m. The vessel is constructed from carbon steel and has an epoxy lining to prevent corrosion, which could create solid deposits resulting in contamination of the instrument air. In the side of the vessel there is a 600mm man way to allow access for inspection.

Air enters the vessel through an 80mm nozzle on the side of the vessel and leaves through a 80mm nozzle on the top of the vessel. The vessel has a 50mm nozzle in the base to allow any collected liquid to be drained manually.

The vessel has a local Level Gauge 115-20-LG-101 to indicate presence of liquid in the vessel and a local Pressure Indicator, 115-20-PG-101 which indicates vessel pressure.

3.4 Instrument Air Distribution

3.4.1 Function

Refer to P&ID: PHM-115-FE-052 Instrument Air Receiver.

Instrument Air distribution system delivers air to the users around the plant at the required pressure.

3.4.2 Technical Description

Air flows into the distribution system from the air receiver through an 80mm line. The supply pressure is maintained at 7barg by Pressure Regulator 115-20-PCV-101.

A bypass is provided around the regulator to allow the valve to be removed from service for maintenance.

4.0 INSTRUMENTATION AND CONTROL

4.1 Instrument Air Compressor Package 115-20-S-008A/B

4.1.1 Instrument Air Compressor Control Panel

The Advanced Elektronikon Control and Monitoring System controls the operation of the instrument air compressors. The compressor and blower motors are normally operated automatically but can be operated manually from the local panel.

The start and stop signals for the compressor motor are generated by ESHH91 and KGL93 respectively. The blower motor is started through ESHH92 and stopped along with the compressor motor.

The Advanced Elektronikon Control communicates with the DCS to provide control and monitoring from the control room.

The controller has the following controls and indicators:

Liquid Crystal Display

The LCD presents data on four lines of characters:

Data Description

Data Reading

Status

F Key function for the three function buttons, F1, F2 and F3 located below the LCD

Stop/Start Pushbuttons

The Stop/Start Pushbuttons are located to the left of the LCD and allow a local stop or start from the control panel when the unit is selected for local manual operation.

Curser Keys

Three keys located to the right of the LCD can be used to make selections on the LCD.

4.1.2 Instrument Air Pressure Control

Refer to P&ID: PHM-115-FE-052 Instrument Receiver.

Automatic operation uses the signal from the pressure controller 115-20-PIC-101 monitors the air receiver pressure through two pressure transmitters, 20-PT-101A/B and controls the speed of the compressor motor to regulate the pressure in the receiver.

The controller also provides signals to stop and start the compressors if the pressure goes outside of the control range. The control signals and settings are as follows:

L1 set at 7.25barg starts the lead compressor

L2 set at 7.0barg starts the lag compressor if the pressure continues to fall due to failure of the lead compressor or excessive demand

H1 set at 9.25barg stops the lag compressor

H1 set at 9.9barg stops the lead compressor

4.1.3 Compressor Control and Monitoring

Refer to Atlas Copco Vendor Drawing ZT-55 – 90.

Inlet Differential Pressure Monitoring

The Differential Pressure across the compressor air inlet is monitored by PDIT-102 which provides local indication and indication with a low pressure alarm at the local panel.

1st and 2nd Stage Compressor Discharge Pressure Monitoring

The first and second stage compressor discharge pressures are monitored by PT-18, and the PT-29, respectively. The transmitters provide indication on the local panel.

1st and 2nd Stage Compressor Discharge Temperature Monitoring

The first and second stage compressor discharge temperatures are monitored by TT-18, TSH-18, TSHH-18 and TT-29, TSH-29, TSHH-29 respectively. The transmitters provide indication on the local panel and the switches provide high temperature alarm and trip signals to the local panel.

1st and 2nd Stage Compressor Casing Temperature Monitoring

The first and second stage compressor casing temperatures are monitored by TI-11, TSH-11, TSHH-11 and TI-21, TSH-21, TSHH-21 respectively. The transmitters provide indication on the local panel and the switches provide high temperature alarm and trip signals to the local panel.

1st and 2nd Stage Liquid Drain Device Level Monitoring

Control for the liquid drain devices is provided by LC-17 for the first stage and LC-28 for the second stage. The controllers also provide a high level alarm LSH-17 and LSH-28 at the local panel.

Oil Pressure Control Indication

Lube oil pressure is monitored by PT-45 which provides indication at the local panel. The transmitter signal is also used to generate a low pressure alarm, PSL-45, and a low pressure trip signal PSLL-45 at the local panel.

4.2 Dryer Package 115-20-V-003A/B

Refer to P&ID: PHM-115-FE-052 Instrument Air Receiver.

4.2.1 Dryer Control

The switching of the dryers is controlled through a timer in the local control panel, which controls the operation of the three-way valve and the exhaust valves.

Pressure transmitters PT-01 and PT-02 on the A and B provide indication at the local control panel as to which tower is on line.

4.2.2 Pre Filter and After Filter Differential Pressure Monitoring

The Differential Pressure across the Pre Filters is monitored by DP-01 and DP-02, which provides an alarm on high differential pressure.

The Differential Pressure across the After Filters is monitored by DP-03, which provides an alarm on high differential pressure.

4.2.3 Instrument Air Dew Point Monitoring

The air quality is monitored by dew point monitored by analyser 20-MT-102A/B which provides indication of dew point and a high dew point alarm of the DCS.

4.3 Instrument Air Receiver 115-20-V-009

Refer to P&ID: PHM-115-FE-052 Instrument Air Receiver.

4.3.1 Pressure

The pressure in the air receiver is monitored by pressure transmitters' 20-PT-101A/B which provide the signals for compressor pressure control. (See Paragraph 4.1.2).

Pressure transmitter 20-PT-103 provides a high pressure trip signal to the SDS to stop all air compressors on high system pressure.

Over pressure protection for the Instrument Air Receiver is provided by pressure relief valve 20-PSV-101 set to relieve to atmoPig at 16.5barg.

4.4 Instrument Air Distribution System

4.4.1 Pressure

The pressure in the instrument air distribution system is monitored by Pressure Transmitters 20-PT-102A, B and C.

The signals from the transmitters are used to generate low pressure trip signals in the SDS system, which applies 2oo3 voting to the signals and performs the necessary executive actions identified on the cause and effect charts.

5.0 ENVIRONMENTAL, HEALTH AND SAFETY REQUIREMENTS

5.1 General EHS Requirements

5.1.1 Chemicals

The environmental issues that are relevant to the Air System are primarily based around the disposal of spent absorbent media and the subsequent recharging of the columns.
The activated alumina adsorbent is not in itself dangerous but is should be handled according to the manufacturer's Material Data Sheet (MDS).

5.1.2 Hazardous Sources

Table 10.6 – Hazardous Sources lists potential hazardous sources that may be present under upset conditions affecting the Instrument Air System.

Table 10.6 – Hazardous Sources

Hazard	Source	Hazardous Event	Effect	Control
High noise	Driers	Blow-down	Potential for personnel injury	Silencers fitted to blow-downs

5.2 Specific Health and Safety Requirements

The correct use of Personal Protective Equipment (PPE) is fundamental in securing a safe and healthy place of work for all personnel. PPE shall be used in conjunction with appropriate health, environment and safety procedures that are designed to minimise the potential risk of harm or injury to personnel, while also promoting safe working practices.

5.3 Specific Environmental Requirements

There are no specific environmental requirements for the Instrument Air Systems.

The instrument air facility is designed to compress air and transport it to the process instruments and pneumatic valves, only dry oil-free air is used and it has no impact on the environment.

6.0 REFERENCE INFORMATION

6.1 Company Documentation

Document Number	Document Title
2002-PP-910	Instrument Air Commissioning Procedure
2002-PDS-115-20-S-008-036-2	Instrument Air Package Process Datasheet
2002-PDS-115-20-V-009-026-1	Instrument Air Receiver Process Datasheet
PH-10-OP-SOP-00010	Standard Operating Procedure for The Instrument Air System

6.2 Vendor Documentation

Document Number	Document Title
2002 PO 4119 01 REC 016	Atlas Copco Instrument Air Compressor and Air Dryer

6.3 Engineering Drawings (PFDs, UFDs and P&IDs)

Drawing Number	Drawing Title
PHM-115-FP-013	Sinphuhorm GPP PFD – Instrument Air System
PHM-115-FE-051	Sinphuhorm GPP P&ID – Instrument Air Generation
PHM-115-FE-052	Sinphuhorm GPP P&ID – Instrument Air Receiver
PHM-115-FE-053	Sinphuhorm GPP PFD – Instrument Air Distribution

SECTION 11.0
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1.0 INTRODUCTION

1.1 System Purpose/Function

The Hydrate Inhibitor Dosing System is designed to prevent and or remove hydrates in various sections of the process.

Hydrates are solid crystalline mixtures of water and small gas molecules, such as those found in natural gas. They are formed at low temperatures and high pressures typically in gas transportation or processing systems where water is present. It is the tendency of gas hydrates to cause blockages in pipelines that necessitates the addition of hydrate inhibitors to prevent hydrate formation.

The typical lower weight molecules that combine with water to form hydrates are:

Methane

Ethane

Propane

Butane

Isobutane

Methanol is the hydrate inhibitor utilised in the Hydrate Inhibitor Dosing System at Sinphuhorm. Methanol is a thermodynamic hydrate inhibitor, which acts by altering the chemical potential of the hydrate so that the hydrate formation range is shifted to lower temperatures and higher pressures.

1.2 Primary Components

Tag No	Equipment Title/Description
115-64-T-004	Hydrate Inhibitor Storage Tank
115-64-PM-008	Hydrate Inhibitor Dosing Pump
115-64-PM-009	Hydrate Inhibitor Dosing Pump

1.3 Primary Interfaces

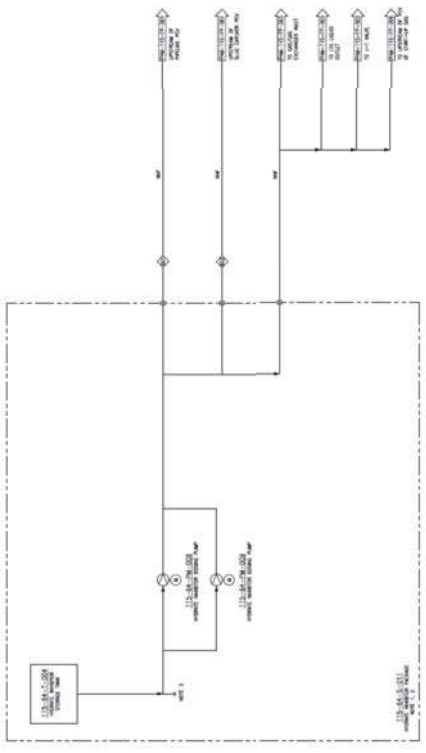
Input interfaces:

- PCSS System (refer to SOP Volume 14 Process Control and Safety System

Output interfaces:

- Gas Process, Metering and Export (refer to Section 2.0 of this OPM)

Figure 11.1 – Chemical Injection Overview Schematic



Derived from PHM-115-FP-015 Rev. 5

2.0 SYSTEM DESCRIPTION

2.1 System Overview

Refer to Figure 11.1 – Chemical Injection System Simplified Overview Schematic.

Hydrate inhibitor is stored in Hydrate Inhibitor Storage 115-64-T-004 and supplied to the following locations on the gas processing facilities by the Hydrate Inhibitor Dosing Pump 115-64-PM-008 and 64-PM-009:

Slug catcher gas outlet upstream of 115-00-PCV-102 to the flare header

Upstream of slugcatcher gas outlet upstream of 115-13-PCV-110A/B to the process

Upstream of JT Valves 115-00-PCV-111A/B

Upstream of Gas/Gas Exchanger 115-00-H-004

Internal Sparger of Gas/Gas Exchanger 115-00-H-004

The Low Temperature Separator 115-00-V-010 liquid outlet

2.2 Primary Flow Description

Refer to P&IDs:

PHM-115-FE-002 Slug Catcher

PHM-115-FE-008 Gas/Gas Exchanger

PHM-115-FE-009 LT Separator

PHM-115-FE-017 Fuel Gas System

PHM-115-FE-091 Hydrate Inhibitor Dosing System

Hydrate inhibitor is stored in Hydrate Inhibitor Storage Tank 115-64-T-004 and supplied at adjustable dosing rates by the Hydrate Inhibitor Dosing Pump 115-64-PM-008/009 at pressures between 40barg and 90barg to the dosing points listed in Paragraph 2.1 System Overview.

3.0 EQUIPMENT DESCRIPTION

3.1 Hydrate Inhibitor Storage Tank 115-64-T-004

Refer to P&ID: PHM-115-FE-091 Hydrate Inhibitor Dosing System.

3.1.1 Function

Hydrate Inhibitor Storage Tank 115-64-T-004 is designed for the safe storage of methanol.

3.1.2 Technical Data

For details of the design and operating parameters, refer to Table 11.1 – Design and Operating Parameters Hydrate Inhibitor Storage Tank 115-64-T-004.

Table 11.1 – Design and Operating Parameters Hydrate Inhibitor Storage Tank 115-64-T-004

Parameter	Design	Operating
Pressure	Liquid Full	ATM
Temperature	65°C	Ambient
Capacity	2.8m^3	

3.1.3 Technical Description

The Hydrate Inhibitor Storage Tank 115-64-T-004 is 1.5m wide x 1.5m long x 1.5m high and constructed from stainless steel material.

The tank is provided with an inspection hatch, a 'normally closed' drain valve and a vent with flame arrestor at a safe location.

A 50mm fill valve is positioned on the top of the tank, which is grade level.

An overflow is provided on the tank with a 300mm siphon breaker. The skid drain is led away to the open hazardous drain header.

The tank level can be viewed locally on Level Gauge 115-64-LG-101.

3.2 Hydrate Inhibitor Dosing Pump 115-64-PM-008/009

Refer to P&ID: PHM-115-FE-091 Hydrate Inhibitor Dosing System.

3.2.1 Function

Hydrate Inhibitor Dosing Pump 115-64-PM-008/009 supplies methanol to the slug catcher gas outlet upstream of 115-00-PCV-102, slug catcher gas outlet upstream of 115-13-PCV-110A/B, upstream of the JT valves 115-00-PCV-111A/B, inlet to the Gas/Gas Exchanger 115-00-H-004, Internal Sparger of Gas/Gas Exchanger 115-00-H-004 and the Low Temperature Separator 115-00-V-010 liquid outlet.

3.2.2 Technical Data

For details of the design and operating parameters, refer to Table 11.2 – Design and Operating Parameters Hydrate Inhibitor Dosing Pump 115-64-PM-008/009.

Table 11.2 – Design and Operating Parameters Hydrate Inhibitor Dosing Pump 115-64-PM-008/009

Parameter	Design	Operating
Pressure	94.4barg	40barg/90barg
Temperature	65°C	Ambient
Capacity	35 l/h	
Power	0.75kW	

3.2.3 Technical Description

Hydrate Inhibitor Dosing Pump 115-64-PM-008/009 is a motor driven, positive displacement, variable stroke diaphragm pump, which is started, stopped and with stroke length adjustment made locally at the pump.

The pump is fitted with a suction strainer, a calibration gauge, a discharge pulsation damper and is constructed stainless steel for pump material and carbon steel for the crankcase.

The pump discharge pressure can be viewed locally on Pressure Gauge 115-64-PG-101 for 115-64-PM-008 and Pressure Gauge 115-64-PG-102 for 115-64-PM-009.

For details of the hydrate inhibitor dosing pump control and protection, refer to Paragraph 4.0 Instrumentation and Control.

4.0 INSTRUMENTATION AND CONTROL

4.1 Hydrate Inhibitor Storage Tank 115-64-T-004

Refer to P&ID: PHM-115-FE-091 Hydrate Inhibitor Dosing System.

4.1.1 Level Monitoring and Protection

Low level protection is provided by Level Switch 115-64-LS-102 which initiates Level Alarm Low 115-64-LALL-102 in the Shutdown System (SDS). The low level alarm is repeated on the DCS.

4.2 Hydrate Inhibitor Dosing Pump 115-64-PM-008/009

Refer to P&ID: PHM-115-FE-091 Hydrate Inhibitor Dosing System.

4.2.1 Pressure Protection

Overpressure protection for pump blocked outlet case is provided by Pressure Relief Valve 115-64-PSV-101 set to relieve at 94.4barg, and returning the chemical to the storage tank.

4.2.2 Pump Operation

The pump is started and stopped locally; individually pump 115-64-PM-008 can manual stop via DCS and stroke length/injection rate is manually adjusted at the pump.

Level Alarm Low 115-64-LALL-102 in the storage tank will inhibit a start of the pump and will trip the pump if it is running.

5.0 ENVIRONMENTAL, HEALTH AND SAFETY REQUIREMENTS

5.1 General EHS Requirements

5.1.1 Chemicals

The following chemical is used in this system, or may be present under upset conditions:

Methanol

Personnel should ensure that they are fully familiar with the Material Safety Data Sheet (MSDS) for each chemical, which details precautions and the protective apparel and equipment necessary when handling the chemicals. The precautions detailed must be adhered to at all times.

5.1.2 Hazardous Sources

Table 11.3 – Hazardous Sources lists potential hazardous sources that may be present under upset conditions affecting the Condensate Treatment, Storage and Export System.

Table 11.3 – Hazardous Sources

Hazard	Source	Hazardous Event	Effect	Control
Liquid hydrocarbons under pressure	Dosing points	Potential for injury due to contact with hazardous liquids Loss of containment and release of flammable liquids	Potential for personnel injury Un-ignited liquid release and potential for gas release and fire/explosion	Fire and Gas Detection
Hydrocarbon gas under pressure	Dosing points	Potential for injury due to contact with hazardous liquids Loss of containment and release of flammable gas	Potential for personnel injury Un-ignited gas release and potential for fire/explosion	Fire and Gas Detection
Low temperature Lines and vessels	LT Separator, Gas/Gas Exchanger	Potential for injury due to contact with cold surfaces (-35°C)	Potential for personnel injury	Lagging for personnel protection
Methanol under pressure	Throughout system	Potential for injury due to contact with hazardous liquids Loss of containment and release of flammable liquids	Potential for personnel injury Un-ignited liquid release and potential for fire/explosion	Gas Treatment, Metering and Export Fire and Gas Detection
Lube oil	Hydrate Inhibiter Dosing Pump	Loss of containment	Potential for personnel injury • Spills • Fire • Contamination	Monitoring Maintenance procedures
Nitrogen	Purging operations	Exposure to	Potential for personnel asphyxiation	Safety procedures

5.2 Specific Health and Safety Requirements

The correct use of Personal Protective Equipment (PPE) is fundamental in securing a safe and healthy place of work for all personnel. PPE shall be used in conjunction with appropriate health, environment and safety procedures that are designed to minimise the potential risk of harm or injury to personnel, while also promoting safe working practices.

5.3 Specific Environmental Requirements

To prepare the Chemical Injection System for the introduction of methanol, it is necessary to remove all air from the system. Nitrogen maybe utilised for this purpose. Similarly, when preparing equipment for maintenance, nitrogen maybe used to purge the system before breaking containment and introducing air.

When purging the system of air prior to introduction of hydrocarbons, the atmoPig in the system should be tested with an Oxygen Content Analyzer to determine the level of oxygen remaining in the purged system.

When purging is being performed to remove hydrocarbons, a suitable test instrument, which uses thermal conductivity or infra-red absorption, capable of detecting hydrocarbons in nitrogen. Pelister type instruments cannot be used, as they require at least 13% oxygen to operate.

WARNING: NITROGEN IS AN ASPHYXIANT, AND IS COLOURLESS AND ODOURLESS: RAPID AND UNRECOGNISED LOSS OF CONSCIOUSNESS CAN OCCUR IN PERSONS EXPOSED TO A NITROGEN-ENRICHED ATMOPIG. WHEN USING NITROGEN, CARE SHOULD BE TAKEN TO ENSURE THAT NITROGEN ESCAPES ARE DISPERSED AND NOT ALLOWED TO COLLECT IN ENCLOSED AREAS.

6.0 REFERENCE INFORMATION

6.1 Company Documentation

Document Number	Document Title
PDS-115-64-S-011-040	Hydrate Inhibitor Package Process Data Sheet
PH-10-OP-SOP-00011	Standard Operating Procedure for The Chemical Injection

6.2 Vendor Documentation

Document Number	Document Title
–	–

6.3 Engineering Drawings (PFDs, UFDs and P&IDs)

Drawing Number	Drawing Title
PHM-115-FP-015	Sinphuhorm GPP UFD – Hydrate Inhibitor Dosing System
PHM-115-FE-002	Sinphuhorm GPP P&ID – Slug Catcher
PHM-115-FE-008	Sinphuhorm GPP P&ID – Gas/Gas Exchanger
PHM-115-FE-009	Sinphuhorm GPP P&ID – LT Separator
PHM-115-FE-017	Sinphuhorm GPP P&ID – Fuel Gas System
PHM-115-FE-091	Sinphuhorm GPP P&ID – Hydrate Inhibitor Dosing System

SECTION 12.0
FIRE AND SERVICE WATER SYSTEM

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1.0 INTRODUCTION

1.1 System Purpose/Function

The function of the Fire Water System is provided to control fires and provide cooling through fixed systems, and through equipment provided for intervention by the fire teams. The fire fighting system provides a supply of water through a ring main to various water deluge skids and a foam deluge skid. Monitors, hose reels and hydrants are situated throughout the site.

The function of the Service Water System is to provide a continuous supply of fresh water via the utility main to the CCR and Admin buildings, the warehouse and workshop.

The primary components of the systems are outlined within Paragraph 1.2 Primary Components.

1.2 Primary Components

Tag No	Equipment Title/Description
115-32-T-003	Fire Water Storage Tank
115-32-PM-005A	Electric Fire Water Pump
115-32-PM-005B	Diesel Fire Water Pump
115-32-PM-006	Fire Water Jockey Pump
115-17-PM-001A/B	Service Water Pumps
115-32-T-007(A-J)	3% Foam Concentrate Tanks Package

1.3 Primary Interfaces

This System must be in full operation before any process system is brought on line as it interfaces with all of the systems as follows:

- Wellpads, Gathering Lines and Main Pipeline A, B, C (refer to Section 1.0 A/B/C of this OPM)
- Gas Process, Metering and Export (refer to Section 2.0 of this OPM)
- Glycol Regeneration (refer to Section 3.0 of this OPM)
- Condensate Treatment, Storage and Export (refer to Section 4.0 of this OPM)
- Produced Water Treatment (refer to Section 5.0 of this OPM)
- Flare Systems (refer to Section 6.0 of this OPM)
- Fuel Gas System (refer to Section 7.0 of this OPM)
- Closed and Open Drains (refer to Section 8.0 of this OPM)
- Heating Medium (refer to Section 9.0 of this OPM)
- Instrument Air System (refer to Section 10.0 of this OPM)
- Chemical Injection (refer to Section 11.0 of this OPM)
- Power Generation and Distribution (refer to Section 13.0 of this OPM)

2.0 SYSTEM DESCRIPTION

2.1 System Overview

Refer to Overview Figure 12.1.

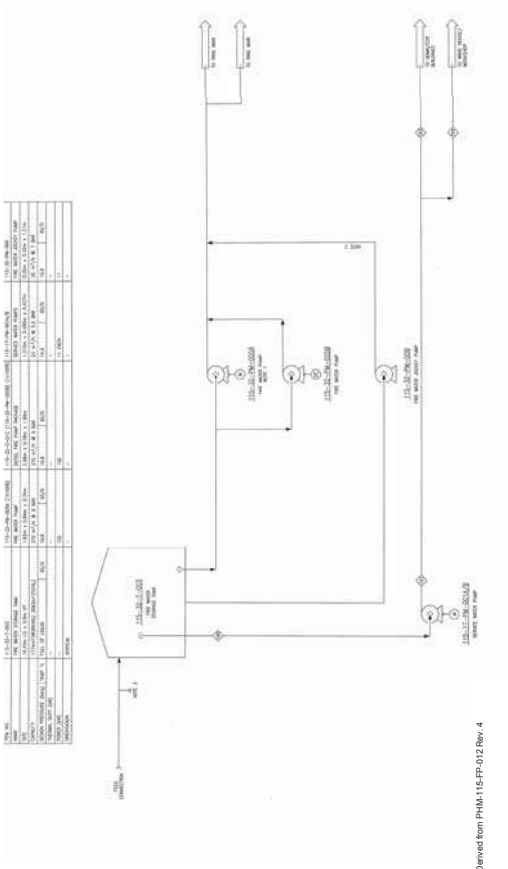
The Fire Water System is provided to fight and control fires automatically through fixed systems, and through equipment provided for intervention by the fire teams. The system provides a continuous available supply of water at a minimum pressure of 7barg through the ring main to the water deluge skids in the process areas.

Firewater monitors, hose reels and hydrants are similarly supplied from the firewater ring main and situated throughout the site. Foam monitors are also supplied with firewater from the fire main with foam induced from their respective local 3% AFFF concentrate tanks.

A 3% AFFF concentrate package provides foam for the condensate loading bays. Activation of this package is by manual operation by the operator/fire team member or by control room operator activated to spray the condensate loading bay deluge system via push button at the control room auxiliary console.

The Service Water System provides a continuous supply of fresh water at a pressure of 6.5barg to the service water users in the CCR and administration buildings, the warehouse, workshop and for site landscape watering.

Figure 12.1 – Fire and Service Water Overview



2.2 Primary Flow Description

2.2.1 Fire Water

Refer to P&IDs:

PHM-115-FE-039 Deluge Process Area and Slug Catcher

PHM-115-FE-041 Fire Water Storage

PHM-115-FE-042 Fire Water Pumps

PHM-115-FE-043 Fire Water Distribution

PHM-115-FE-044 Fire Water Jockey Pump

Fire water is drawn from Storage Tank 115-32-T-003 by Jockey Pump 115-32-PM-006 to maintain the fire water ring main pressure and thereby available to supply all areas of the site with Fire Water on demand. The main operates with a continuous pressure of 7barg by operation of the jockey pump and the minimum flow line aligned back to the storage tank. The minimum flow line is fitted with an orifice plate allowing a continuous flowrate of 3.8m^3/hr to return to storage.

The main fire water pumps operate in parallel with the jockey pump and will start on a pressure dip in the main. Electric Fire Water Pump 115-32-PM-005A is set to start at a fire main pressure of 5.5barg, if the pressure continues to fall to 5barg then the diesel driven Fire Water Pump 115-32-PM-005B will start. When a main fire water pump is running the fire water main pressure will be approximately 9barg.

2.2.2 Service Water

Refer to P&IDs:

PHM-115-FE-045 Service Water Pumps

PHM-115-FE-046 Service Water Distribution

Service water is drawn from the fire water storage tank by the duty selected Service Water Pump 115-17-PM-001A/B and is pumped to service water distribution header at a continuous pressure of 6.5barg for users. If the duty pump should fail then the standby pump will automatically start.

3.0 EQUIPMENT DESCRIPTION

3.1 Fire Water Storage Tank 115-32-T-003

Refer to P&ID: PHM-115-FE-041 Fire Water Storage.

3.1.1 Function

The fire water storage tank stores fresh water to supply the fire water and service water systems.

3.1.2 Technical Data

For details of the design and operating parameters, refer to Table 12.1 – Design and Operating Parameters Fire Water Storage Tank 115-32-T-003.

Table 12.1 – Design and Operating Parameters Fire Water Storage Tank 115-32-T-003

Parameter	Design	Operating
Pressure	Full of liquid	Atmospheric
Temperature (Max/Min)	65°C/0°C	Ambient
Capacity	2083m³	1774m³

3.1.3 Technical Description

The fire water storage tank is a cylindrical, vertical vessel with a cone roof, and a centrally raised cone shaped base. The tank has an inside diameter of 16.45m and has a height of 9.8m. The tank operates at atmospheric pressure.

A 200mm diameter vent is fitted to the top with a bird and insect screen. A 600mm man way on the top of the vessel provides access to the internals.

The tank can be filled by hose connection from road tanker at grade or from an alternate water supply source to the 150mm diameter inlet nozzle. The 300mm diameter fire water pump outlet is located 150mm up from the base of the tank.

The service water take off point is 100mm diameter and positioned 8000mm up from the base of the tank thereby preserving a minimum quantity of 1700m³ of water for the Fire Water System.

A 150mm diameter overflow is located 9150mm up from the base of the tank, and a 100mm diameter drain complete with 'locked closed' valve leads to the stormwater drain.

For details of the Fire Water Storage Tank Control and Protection, refer to Paragraph 4.0 Instrumentation and Control.

3.2 Fire Water Jockey Pump 115-32-PM-006

Refer to P&ID: PHM-115-FE-044 Fire Water Jockey Pump.

3.2.1 Function

Fire Water Jockey Pump 115-32-PM-006 is used to maintain the fire water main at a constant pressure of 7barg.

3.2.2 Technical Data

For details of the design and operating parameters, refer to Table 12.2 – Design and Operating Parameters Fire Water Jockey Pump 115-32-PM-006.

Table 12.2 – Design and Operating Parameters Jockey Pump 115-32-PM-006

Parameter	Design	Operating
Pressure	10.8barg	7.0barg
Temperature	0 to 65°C	Ambient
Capacity	30m³/hr @ 7.0barg	Up to 30m³/hr @ 7.0barg

3.2.3 Technical Description

The jockey pump is a vertical multi-stage pump manufactured by Aurora (USA), Model 395A-5, driven at 2880rpm by a 15hp electric motor. The motor is manufactured by US Motors, Type TEFC.

Jockey pump is meant to keep the ring main pressure above 7 barg and will shut off around 9 barg.

Pressure Gauges 32-PG-107 and 32-PG-106 provide local indication of the pump suction and discharge pressure respectively.

3.3 Fire Water Pumps 115-32-PM-005A/B

3.3.1 Function

Refer to P&ID: PHM-115-FE-042 Fire Water Pumps.

The function of the firewater pumps is to be available to start and supply a high volume of water on demand in the event of a fire situation.

3.3.2 Technical Data

For details of the design and operating parameters, refer to Table 12.3 – Design and Operating Parameters Fire Water Pumps 115-32-PM-005A/B.

Table 12.3 – Design and Operating Parameters Fire Water Pumps 115-32-PM-005A/B

Parameter	Design	Operating
Pressure	10.8barg	9.0barg
Temperature	0 to 65°C	Ambient
Capacity	370m³/hr each @ 9.0barg	–

3.3.3 Technical Description

Electrical Driven Pump

The pump is a horizontal split case single stage pump manufactured by Aurora (USA), Model 6-481-11HH, driven at 2950rpm by a 200hp electric motor. The motor is manufactured by US Motors, Type TEFC.

Diesel Driven Pump

The pump is a horizontal split case single stage pump manufactured by Aurora (USA), Model 6-481-18B, driven at 1750rpm by a 202hp diesel driver. The diesel engine driver is a 6-cylinder inline unit manufactured by Cummins, Model CFP83-F10.

The diesel engine is started by a battery powered electric start motor. The two sets of lead acid batteries (200Amp/hr) are charged by the engine driver's alternator when the driver is running, or the automatic battery charger powered from the emergency switchboard when on standby. The batteries provide sufficient capacity to maintain cranking speed through a 6-minute cycle (15 seconds cranking followed by 15 seconds rest in 12 consecutive cycles).

The diesel fuel oil storage tank for the driver has sufficient capacity to allow the diesel driver to run on full load for at least 8 hours.

General

A test line is positioned on the common discharge of both pumps routed back to the storage tank. The line is fitted with an orifice plate sized for a full pump flow during pump tests. Each fire water pump is provided with its own isolation valve to this line which is normally closed.

3.4 3% Foam Concentration Deluge Skid

3.4.1 Function

Refer to P&ID: PHM-115-FE-039 Deluge Process Area and Slug Catcher.

The foam concentrate deluge skid consists of a foam concentrate tank together with a foam proportioner supplied with firewater. When placed in operation the foam concentrate deluge skid provides a foam blanket to the Loading Bay.

3.4.2 Technical Data

For details of the design and operating parameters, refer to Table 12.4 – Design and Operating Parameters 3% Foam Concentration Deluge.

Table 12.4 – Design and Operating Parameters 3% Foam Concentration Deluge

Parameter	Design	Operating
Pressure	–	The Fire Ring Main Pressure
Temperature	Ambient	Ambient
Capacity	0.5m³	–

3.4.3 Technical Description

The 3% foam concentration storage tank is a horizontal tank with hemispherical ends. Access ways are located at each end, together with a manway on the top of the tank. The AFFF fill point to the internal bladder is positioned on the top manway.

The annulus area between the bladder and internal wall of the tank contains firewater which when the isolation valve from the fire ring main is opened will experience full fire ring main pressure to force out the foam concentrate to the proportioner. The tank is normally isolated from fire ring main pressure fluctuations by isolation of the valve from the fire ring main.

The isolation valves from the foam tank and between the foam tank and the proportioner are pinned in the normal operating positions.

Sight Glass 115-32-LG-101 is located on the side of the tank.

The tank is protected from over-pressurisation by Pressure Safety Valve 32-PVRV-101.

3.5 Fire Water Distribution

Refer to P&IDs:

PHM-115-FE-036 Admin/Warehouse Building

PHM-115-FE-037 Foam and Fire Monitor Process Area

PHM-115-FE-038 Deluge Process Area and Slug Catcher Inlet

PHM-115-FE-039 Deluge Process Area and Slug Catcher Outlet

PHM-115-FE-043 Fire Water Distribution.

Also refer to PHM-115-UO-001 Escape Route and Safety Equipment Layout Drawing.

3.5.1 Function

The fire water distribution system provides a supply of water through the ring main to various water deluge skids and a foam deluge skid, together with monitors, hose reels and hydrants situated throughout the site.

3.5.2 Technical Data

For details of the design and operating parameters, refer to Table 12.5 – Design and Operating Parameters Fire Water Distribution.

Table 12.5 – Design and Operating Parameters Fire Water Distribution

Parameter	Design	Operating
Pressure	9barg	7barg
Temperature	Ambient	Ambient

3.5.3 Technical Description

The Fire Water Ring Main

The 300mm diameter fire water ring main is sectionalised to allow the fire water supply to be maintained when a section of the ring main is damaged. Isolation of each section is by manual butterfly valves, which are normally locked open.

100mm diameter branch lines to provide fire water for the respective fire water monitors and hose reels.

150mm diameter branch lines supply fire water to the respective foam monitor.

250mm diameter branch lines provide fire water for the water spray deluges at the loading bay, condensate storage tanks, condensate flash vessel and hydrate inhibitor package, slug catcher and to the sprinkler system in the administration building and warehouse. The foam concentrate deluge skid provides a foam blanket to the Loading Bay and is described in Paragraph 3.4.

The pressure in the firewater branch line to the loading bay can be monitored locally on Pressure Gauge 32-PG-110.

The pressure in the firewater branch line to Condensate Tank 'A' can be monitored locally on Pressure Gauge 32-PG-108.

The pressure in the firewater branch line to Condensate Tank 'B' can be monitored locally on Pressure Gauge 32-PG-111.

The pressure in the firewater branch line to the condensate flash vessel and hydrate inhibitor package can be monitored locally on Pressure Gauge 32-PG-112.

The pressure in the firewater branch line to the slugcatcher inlet area can be monitored locally on Pressure Gauge 32-PG-113.

The pressure in the firewater branch line to the slugcatcher oulet area can be monitored locally on Pressure Gauge 32-PG-109.

Fire Water Monitors

The firewater nozzles are designed to provide differing spray patterns, which include straight stream, fog or a combination of the two depending on the specific application.

There are a total of 8 firewater monitors, 5 are fixed and 3 are the oscillating type.

Foam Monitors

A total of 9 foam monitors are provided to protect the slugcatcher, condensate storage tanks. Each foam monitor system consists of a dedicated foam skid/tank with a capacity of 1m³ except for the ones at the condensate storage tanks which are 1.8m³ Each foam monitor is of the self-inducting type and only requires the fire water inlet valve to be opened by the operator/fire team member to develop the foam, whereupon it can be directed onto the fire site as required.

Hose Reels

A total of 6 hose reels are provided. Each is fixed to the external wall of the buildings and consists of 100ft (30m) of 1.5in diameter hose.

Hydrants

A total of 18 hydrants are provided, equally spaced around the process areas and protected from damage from vehicles travelling on the site road nearby. Each hydrant consists of two 2.5in diameter hose reels of 100ft (30m) in length.

A weatherproof hose box for each hydrant is located nearby and contains 2 water nozzles with 1.5in diameter outlet nozzle rated at 28.5m³/hr, complete with inlet coupling and ball valve. 2 hydrant valve wrenches and 2 coupling spanners.

Each weatherproof hose box is made from GRP, and comes complete with door, ventilation grills and the necessary storage racks for the items described above.

3.6 Service Water Pumps 115-17-PM-001A/B

Refer to PHM-115-FE-045 Service Water Pumps.

3.6.1 Function

The function of the Service Water System is to provide a continuous supply of fresh water via the utility main to the CCR and Admin buildings, the warehouse and workshop.

3.6.2 Technical Data

For details of the design and operating parameters, refer to Table 12.6 – Design and Operating Parameters Service Water Pumps 115-17-PM-001A/B.

Table 12.6 – Design and Operating Parameters Service Water Pumps 115-17-PM-001A/B

Parameter	Design	Operating
Pressure	14barg	6.5barg
Temperature	65/0°C	Ambient
Capacity	23m³/hr	20.7m³/hr

3.6.3 Technical Description

The service water pumps are horizontal single stage centrifugal pumps powered by 11.0kW electric motors.

A minimum flow line is located on the common discharge of both pumps, downstream of the respective discharge butterfly valves. There is fitted with a restriction orifice plate allowing a minimum flow of 4.6m³/hr to the storage tank.

Pressure Gauges 17-PG-101A/B and 17-PG-102A/B provide local indication of the pumps suction and discharge pressure respectively.

4.0 INSTRUMENTATION AND CONTROL

4.1 Fire Water Storage Tank 115-32-T-003

Refer to P&ID: PHM-115-FE-041 Fire Water Storage.

4.1.1 Pressure

There is no pressure control on the fire water storage tank as it operates at atmospheric pressure.

4.1.2 Level Control and Protection

The firewater storage tank is fitted with Level Transmitters 115-32-LT-101 and 115-32-LT-103.

The signal from 115-32-LT-101 is used to indicate the level on the DCS and to generate low (LAL1) and (LAL2) alarms and high (LAH) level alarm. The signal from 115-32-LT-103 generates a low (LALL) level alarm at the SDS, which performs the necessary executive actions shutting down only Service Water Pumps 115-17-PM-001A/B and not Fire Water Jockey Pump 115-32-PM-006, Electric Fire Water Pump 115-32-PM-005A, and Diesel Fire Water Pump 115-32-PM-005B.

The settings are as follows:

Alarm	Service Water	Fire Water
LAH	–	9000mm (95%)
LAL	8300mm (LAL1) (90%)	–
LALL	8150mm (85.79%)	700mm (LAL2) (10%)

The liquid level in the tank is not controlled and the level is dependant on how much water is used by the fire water and service water systems. The tank is filled/topped up by the operator/fire team member as required from the public water supply or a road tanker.

4.2 Fire Water Jockey Pump 115-32-PM-006

Refer to P&ID: PHM-115-FE-044 Fire Water Jockey Pump.

4.2.1 Pressure Indication

There is no pressure control for the firewater jockey pump. Pressure Transmitter 32-PT-109 indicates the jockey pump discharge pressure on the DCS.

4.2.2 Pump Operation

Power is fed to the jockey pump from the emergency section of the 400V board.

The jockey pump maintains the fire water system pressure at 7barg, controlled by its Metron Control Panel, Model M15A-15.

A Common Fault Signal 32-XA-103 and Running Status Indicator 32-XI-102 are transmitted to the DCS from the control panel.

4.3 Electric Fire Water Pump 115-32-PM-005A

Refer to PHM-115-FE-042 Fire Water Pumps.

4.3.1 Operational Pressure Control

The electric fire water pump is designed to start when the fire water ring main pressure drops to 5.5barg as detected by Pressure Switch 32-PS-110A.

The electrically-driven fire pump is controlled by its Metron Control Panel, Model MP 430-200.

4.3.2 Control Panel

Power is fed to the electric fire water pump from the main 400V board.

The controller is a combined manual and automatic type, incorporating the following features:

Electric isolator switch

Time delay type circuit breaker set for 300% motor full load current

Star-delta motor starter capable of being energised automatically by the firewater main pressure switch or manually by the operator

The firewater pumps starts automatically from the pressure switch but requires being manually shutdown

Alarm relay to provide audible/visual alarm to indicate circuit breaker open or power failure when called upon to start automatically

Manual selector station, complete with 2-position switch on the enclosure marked 'Automatic' and 'Non-automatic'

A Common Fault Signal 32-XA-102A, Running Status Indicator 32-XI-101A and Not Auto Status Signal 32-XI-10A are transmitted to the DCS from the control panel.

4.4 Diesel Fire Water Pump 115-32-PM-005B

Refer to PHM-115-FE-042 Fire Water Pumps.

4.4.1 Operational Pressure Control

The diesel fire water pump is designed to start when the fire water ring main pressure drops to 5barg as detected by Pressure Switch 32-PS-110B.

The diesel driven fire pump is controlled by its Metron Control Panel, Model FD4-12V.

4.4.2 Engine Local Instrument Panel

The Engine Local Instrument Panel consists of the following features:

- An engine tachometer
- An hour meter for recording total time of engine operation
- Oil pressure and temperature gauge
- Cooling water temperature gauge
- Ammeter and voltmeter
- An 'Override Manual Start' for manually operating of the battery in the event of control circuit failure
- Crank Termination Alarm (engine refusal to start upon termination of cranking cycle)

4.4.3 Automatic Controller for Diesel Engine

The Automatic Controller for the diesel engine consists of the following features:

- Off/Manual/Automatic operation switch of the main fire pump set
- Battery Charger and Ammeter (see Paragraph 3.3.3 for details)
- Alarm and Control Status Indications as follows:
- Diesel driver running indication
- Controller main switch has been turned to the OFF position
- Controller main switch has been turned to the MANUAL position

- Any trouble alarm to the controller or the driver
- A Common Fault Signal 32-XA-102B, Running Status Indicator 32-XI-101B and Not Auto Status Signal 32-XI-10B are transmitted to the DCS from the control panel.

4.4.4 Other Diesel Engine Control Philosophy Features

In addition to the automatic and manual starting system, the controller provides a feature that enables the pump to be started independently from the automatic control circuit in case of failure of the latter.

If overheating or low oil pressure occurs, the diesel driver will continue to run until failure.

If the rated pump speed is exceeded by 20% the diesel driver will stop.

4.4.5 Common Fire Pump Control, Indication and Alarm Features

Stopping of the fire pump sets is only carried out manually and only from the fire pump controller at the fire pump location. No other means of stopping the fire pumps is provided.

Flow indication within the Common Test Line returning to the Storage Tank is provided at the DCS by 32-FI-101.

The firewater pump common discharge pressure is indicated on the DCS by Pressure Indicator 115-32-PIA-108, which initiates a low pressure alarm.

4.5 3% Foam Concentration Deluge Skid

Refer to P&ID: PHM-115-FE-039 Deluge Process Area and Slug Catcher.

There is no DCS level or pressure indication nor automatic control facilities associated with the 3% foam concentration deluge skid. The operation is manually controlled by the operator/fire team member.

4.6 Fire Water Distribution Main

Refer to P&IDs:

PHM-115-FE-036 Admin/Warehouse Building

PHM-115-FE-037 Foam and Fire Monitor Process Area

PHM-115-FE-038 Deluge Process Area and Slug Catcher Inlet

PHM-115-FE-039 Deluge Process Area and Slug Catcher Outlet

PHM-115-FE-043 Fire Water Distribution.

There is no DCS flow indication provided for the Fire Water Distribution Main.

4.6.1 Water and Foam Deluge Control

Each of the deluge valve skids operation is initiated individually via the fire and gas detection system.

Deluge Valve 32-DV-110, which provides the water spray to Condensate Tank A 02-T-001A can be opened using Hand Selector Switch 32-HS-110 at CCR ESD/F&G panel 115-EC-75-0104 or by the operator at the deluge valve using the manual valve at the local pypass valve.

Note: That the control of the foam concentrate skid is by local manual operation only.

Deluge Valve 32-SDV-113, which provides the water spray to Condensate Tank B 02-T-001B can be opened using Hand Selector Switch 32-HS-113 at CCR ESD/F&G panel 115-EC-75-0104 or by the operator at the deluge valve using the manual valve at the local pypass valve.

Note: That the control of the foam concentrate skid is by local manual operation only.

Deluge Valve 32-DV-111, which provides the water spray to the slugcatcher outlet area can be opened using Hand Selector Switch 32-HS-111 at CCR ESD/F&G panel 115-EC-75-0104 or by the operator at the deluge valve using the manual valve at the local pypass valve.

Deluge Valve 32-DV-112, which provides the water spray to the condensate loading bay can be opened using Hand Selector Switch 32-HS-112 at CCR ESD/F&G panel 115-EC-75-0104 or by the operator at the deluge valve using the manual valve at the local pypass valve.

Deluge Valve 32-DV-114, which provides the water spray to the condensate flash vessel and hydrate inhibitor package can be opened using Hand Selector Switch 32-HS-114 at at CCR ESD/F&G panel 115-EC-75-0104 or by the operator at the deluge valve using the manual valve at the local pypass valve.

Deluge Valve 32-DV-115, which provides the water spray to the slugcatcher inlet area, can be opened using Hand Selector Switch 32-HS-115 at at CCR ESD/F&G panel 115-EC-75-0104 or by the operator at the deluge valve using the manual valve at the local pypass valve.

4.6.2 Pressure Indication and Protection

The pressure in the firewater branch line to the loading bay is indicated on the DCS by Pressure Indicator 115-32-PIA-112, which initiates a high pressure alarm.

The pressure in the firewater branch line to the Condensate Tank 'A' is indicated on the DCS by Pressure Indicator 115-32-PIA-110, which initiates a high pressure alarm.

The pressure in the firewater branch line to the Condensate Tank 'B' is indicated on the DCS by Pressure Indicator 115-32-PIA-113, which initiates a high pressure alarm.

The pressure in the firewater branch line to the condensate flash vessel and hydrate inhibitor package is indicated on the DCS by Pressure Indicator 115-32-PIA-114, which initiates a high pressure alarm.

The pressure in the firewater branch line to the slug catcher inlet area is indicated on the DCS by Pressure Indicator 115-32-PIA-115, which initiates a high pressure alarm.

The pressure in the firewater branch line to the slug catcher oulet area is indicated on the DCS by Pressure Indicator 115-32-PIA-111, which initiates a high pressure alarm.

4.7 Service Water Pumps 115-17-PM-001A/B

Refer to PHM-115-FE-045 Service Water Pumps.

4.7.1 Pressure Indication and Protection

The service water pump common discharge pressure is indicated on the DCS by Pressure Indicator 115-17-PIA-101, which initiates high and low pressure alarms.

4.7.2 Pump Operation

The service water pumps are selected to local manual start or stop by the operator.

5.0 ENVIRONMENTAL, health and safety REQUIREMENTS

5.1 General EHS Requirements

5.1.1 Chemicals

Personnel should ensure that they are fully familiar with the Material Safety Data Sheet (MSDS) for each chemical, which details precautions and the protective apparel and equipment necessary when handling the chemicals. The precautions detailed must be adhered to at all times.

5.1.2 Hazardous Sources

Table 12.7 – Hazardous Sources lists potential hazardous sources that may be present under upset conditions affecting the Fire and Service Water Systems.

Table 12.7 – Hazardous Sources

Hazard	Source	Hazardous Event	Effect	Control
Water under pressure	Ring mains	Potential for injury due to contact with high pressure water	Potential for personnel injury	

5.2 Specific Health and Safety Requirements

The correct use of Personal Protective Equipment (PPE) is fundamental in securing a safe and healthy place of work for all personnel. PPE shall be used in conjunction with appropriate health, environment and safety procedures that are designed to minimise the potential risk of harm or injury to personnel, while also promoting safe working practices.

5.3 Specific Environmental Requirements

There are no specific environmental requirements for the Fire and Service Water Systems.

6.0 REFERENCE INFORMATION

6.1 Hess Corporation Company Documentation

Document Number	Document Title
2002-PDS-DL-015-1	Deluge Valves Process Datasheet
2002-PDS-115-32-PM-005A/B -023-2	Fire Water Pumps- Motor Driven and Diesel Engine Driven Process Datasheet
2002-PDS-115-32-PM-008-030-1	Fire Water Jockey Pump Process Datasheet
2002-PDS-115-32-T-003-024-1	Fire Water Storage Tank Process Datasheet
2002-SP-1925-01	Fire Fighting Equipment and FM 200 System Specification
2002-SP-0910-05	Specification for Jockey Pump
2002-SP-0910-04	Specification for Engine Driven Fire Water Pump
2002-DS-2520-02	Mechanical Datasheet for Fire Water Storage Tank
2002-SP-0910-08	Mechanical Datasheet for Motor Driven Fire Water Pump
PH-10-OP-SOP-00012	Standard Operating Procedure for the Fire ansd Service Water System

6.2 Vendor Documentation

Document Number	Document Title
2002-PO-0910-04-REC033	Electric Motor Driven Fire Pump
2002-PO-0910-04-REC033	Diesel Engine Driven Fire Pump
2002-PO-0910-04-REC033	Jockey Pump

6.3 Engineering Drawings (PFDs, UFDs and P&IDs)

Drawing Number	Drawing Title
PHM-115-FP-012	UFD GPP– Fire Water System
PHM-111-FE-010	Well Pad B (PH3) Service Water and Power Generation
PHM-113-FE-010	Well pad A (PH5) Service Water and Power Generation
PHM-115-FE-036	Admin/Warehouse Building
PHM-115-FE-037	Foam and Fire Monitor Process Area
PHM-115-FE-038	Deluge Process Area and Slug Catcher Inlet
PHM-115-FE-039	Deluge Process Area and Slug Catcher Outlet
PHM-115-FE-040	Sprinkler System for Admin and Warehouse Building
PHM-115-FE-041	Fire Water Storage
PHM-115-FE-042	Fire Water Pumps
PHM-115-FE-043	Fire Water Distribution
PHM-115-FE-044	Fire Water Jockey Pump
PHM-115-FE-045	Service Water Pumps
PHM-115-FE-046	Service Water Distribution
PHM-115-UO-001	Escape Route and Safety Equipment Layout Drawing

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POWER GENERATION AND DISTRIBUTION

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1.0 INTRODUCTION

1.1 System Purpose/Function

The purpose of the Power Generation and Distribution System is to power the various systems in the Gas Processing Plant. This is achieved by importing power on overhead lines. In the event of a loss of imported power an emergency generator is provided to supply the essential power requirement. Uninterruptible Power Supply, supplies systems were a disruption of power is not acceptable.

The primary components of the systems are outlined within Paragraph 1.2 Primary Components.

1.2 Primary Components

Tag No	Equipment Title/Description
115-ET-51-5101	22kV to 400V, 1250kVA Transformer
115-ES-51-5101	400 Volt Motor Control Centre
115-EG-52-5101	Emergency Diesel Generator
115-ER-52-5301	UPS

1.3 Primary Interfaces

This System must be in full operation before any process system is brought on line as it interfaces with all of the systems as follows:

- Wellpads, Gathering Lines and Main Pipeline (refer to Section 1.0 A/B/C of this manual)
- Gas Process, Metering and Export (refer to Section 2.0 of this manual)
- Glycol Regeneration (refer to Section 3.0 of this manual)
- Condensate Treatment, Storage and Export (refer to Section 4.0 of this manual)
- Produced Water Treatment (refer to Section 5.0 of this manual)
- Flare System (refer to Section 6.0 of this manual)
- Fuel Gas System (refer to Section 7.0 of this manual)
- Closed and Open Drains (refer to Section 8.0 of this manual)
- Heating Medium (refer to Section 9.0 of this manual)
- Instrument Air System (refer to Section 10.0 of this manual)
- Chemical Injection (refer to Section 11.0 of this manual)

2.0 SYSTEM DESCRIPTION

2.1 System Overview

Refer to Overview Figure 13.1 – Power Distribution Schematic.

Electric power is supplied to Phu Horn Gas Processing Plant by overhead Line Grid cable supplying 22kVolts. 3-phase at a frequency of 50Hz.

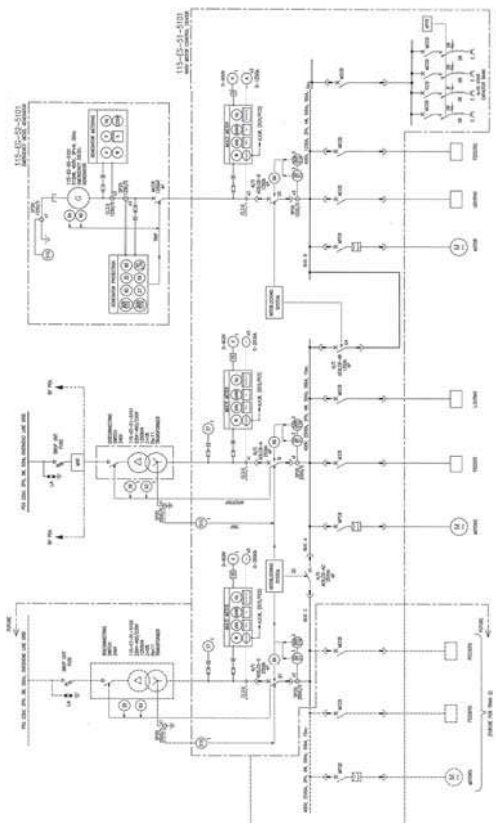
The incoming electrical power from the overhead lines is passed through a transformer to step the voltage down from 22kVolts to 400 Volts.

Bus A is supplied by the step-down transformer and is linked to Bus B if the interlocking system permits and from an integral part of the LV Switchboard and Motor Control Centre.

The emergency generation facilities are provided to ensure the continued operation of emergency systems in the event of loss of the main electrical power supply.

UPS systems are provided for systems were power interruptions are not acceptable.

Figure 13.1 – Power Distribution Schematic



Derived from PHM-115-ED-010 Rev. 2

2.2 Primary Flow Description

Refer to Single Line Drawing: Electrical – Gas Processing Plant Overall 400V.

In normal operation electricity is supplied via overhead power cables to the Gas Processing Plant by the Provincial Electricity Authority (PEA) in Thailand from the grid. PEA supplies the electrical power at 22kV, 3 phase, and 50Hz. On entering the gas processing plant the electricity is feed through a drop out fuse and metering facility, provided by PEA, and connects to the Step Down Transformer 115-ET-51-5101, which reduces the voltage from 22kV to 400V. The overhead lines are provided with a lightening arrestor to protect the supply to the gas plant.

Provision is made for future expansion, which will include a second feeder from PEA and a second step down transformer.

From the transformer the power at 400V is fed to the LV Switchboard and Motor Control Centre 115-ES-51-5101 of which Bus A, Bus B and Bus C(Future) are an integral part. As initially there is only one supply transformer the two bus bars Bus A and Bus C are linked together by the Bus Tie Breaker CB-AC which will be normally closed.

When the second power import facility is in operation the bus tie breaker CB-AC will be normally open and controlled by the interlock with the two incomer breakers CB-A and CB-B such that on loss of one of the Incomers, CB-AC will close to energise both bus A and C.

In the event of a power failure on the Provincial Electricity Authority grid system or power import facility an Emergency Diesel Generator 115-EG-52-5101 has been installed. The generator is rated at 512kW, 400V, 3 phases with a neutral and 50Hz. The generator is a self contained unit which includes a diesel day tank that can hold sufficient diesel for eight hours running on full load.

The Emergency Bus B in Motor Control Centre 115-ES-51-5101 is normally supplied from Bus A through the normally closed bus tie breaker CB-AB. On loss of power to the Emergency Bus B, the emergency generator is started automatically and the generator breaker is closed. The associated interlock opens the bus tie breaker CB-AB to isolate the emergency bus from the normal supply. The emergency generator only supplies Bus B.

Where an interruption to supply is not acceptable for example safety and control systems the system is supplied from a UPS.

The GPP Substation that houses the electrical switchgear noted above is cooled by two dedicated AHU.

3.0 EQUIPMENT DESCRIPTION

3.1 Transformer

Refer to PHM-115-ED-010 Single Line Drawing: Electrical – Gas Processing Plant Overall 400V.

3.1.1 Function

The function of the transformer is to transform the voltage supplied to the gas processing plant from 22kV to 400V.

3.1.2 Technical Data

For details of the design and operating parameters, refer to Table 13.1 – Design and Operating Parameters Transformer 115-ET-51-5101.

Table 13.1 – Design and Operating Parameters Transformer 115-ET-51-5101

Parameter	Design	Operating
Power	3150kVA	1250kVA
Incoming Voltage	22kV	22kV
Outgoing Voltage	400V	400V

3.1.3 Technical Description

The transformer is oil immersed, three phase 'Delta' connected primary and 'Y' connected secondary Dyn11, naturally air cooled (LNAN) type and is rated at 3150kVA.

Construction of the Transformer Tank is welded Steel Sheets reinforced with steel shapes and complete with a steel sheet cover.

The transformer is filled with a transformer insulating oil, which is of the less flammable type and does not contain any PCBs.

To enable the incoming circuit to be isolated there is an HV Disconnecting Chamber fitted with an air insulated fuse load break disconnecting switch, provided on the primary side of the transformer.

Connections to the transformer are made through either the Low Voltage Connection box or the High Voltage Connection Chamber.

An externally operated tap changer for off circuit operation is provided on the primary windings of the transformer, all tappings are rated for full power. The tap changer allow a ±5% change of transformer output voltage in 2.5% steps.

3.2 LV Switchboard and Motor Control Centre 115-ES-51-5101

Refer to PHM-115-ED-010 Single Line Drawing: Electrical – Gas Processing Plant Overall 400V.

3.2.1 Function

The LV Switchboard and Motor Control Centre receives the 400V, 3 Phase supply from the import transformer and distributes the power to the various feeders, motor control circuits, the two AHUs for the GPP substation, lighting and small power distribution.

3.2.2 Technical Data

For details of the operating parameters, refer to Table 13.2 – Design and Operating Parameters LV Switchboard and MCC. 115-ES-51-5101.

Table 13.2 – Design and Operating Parameters LV Swbd and MCC 115-ES-51-5101

Parameter	Design	Operating
Voltage	1000V	400V
Current	2500A	–
Short Circuit Current	50kA for 1 second	–
Control Supply	110V DC	–

3.2.3 Technical Description

The LV Switchboard and Motor Control Centre 115-ES-51-5101 is a steel cabinet sectionalised into separate compartments which house the breakers, switches and protection devices required to control distribution of power.

Three pole Air Circuit Breakers (ACBs) are used for the bus tie breakers and to switch the incoming supplies from the step down transformers and the emergency generator.

The ACBs are withdrawable and provided with safety interlocks so that it is not possible to withdraw or insert when the switching device is closed. Each ACB is provided with a lock off facility to padlock the breaker in the off or isolate position.

The three Incomer Breakers, CB-C (future), CB-A and CB-B are provided with metering panels in addition to protection devices.

An electrical interlock is fitted to control operation of the two Incomers Breakers CB-A and CB-C and the Bus Tie Breaker CB-AC. A similar interlock controls operation of the emergency generator Incomers Breaker CB-B and the Bus Tie Breaker CB-AB.

A 110V DC supply is provided throughout the switchboard for operation of the following:

Breaker Tripping and Closing

Protection and Control circuits

Breaker Spring Charging

In addition there is a 230V AC single phase supply bus for the space heaters and control devices.

Moulded Case Circuit Breakers (MCCBs) and Motor Protection Circuit Breakers (MPCBs) are provide to switch power to the various loads on the MCC section of the panel.

In general the three pole, fuse-free, MCCBs are provided to switch power to the small power distribution boards and control panels. An MCCB of rating below 400A for a feeder is equipped with thermal and magnetic trip units. If the MCCB is rated above 400V it is equipped with an adjustable electronic solid-state trip device with monitoring, ammeter readout, complete test facilities and protective features.

The MPCBs are used for motor feeders and include an adjustable magnetic trip unit for short circuit protection. The Motor Starters cater for 'Direct-on-Line' with full voltage start or 'Soft Start' which provides a reduced voltage for motor start. Provisions are also made for Star-delta switching and Variable Speed Drives (VSD).

In order to attempt to maintain the power factor within the range of 1 to 0.8 when the emergency generator is in use, an Automatic Power Factor Regulator (APFR) is installed connected to Bus B. The APFR switches banks of capacitors to increase the power factor as the load becomes inductive. A coil is included in the connection to each capacitor bank to reduce the current surge as the bank is switched in and out of service.

The following table (Table 13.3) identifies the loads which are energised from the Bus section A and B.

Table 13.3 – Motors and Feeders on LV Swbd and MCC 115-ES-51-5101

Busbar A		
Tag Number	**Description**	**Power Rating**
115-02-PM-001A	Condensate Loading Pump	45KW
115-02-PM-001B	Condensate Loading Pump	45KW
115-02-PM-002B	Condensate Pump	22KW
115-02-H-002A	Condensate Cooler	15KW
115-02-H-002B	Condensate Cooler	15KW
115-13-PM-001B	Glycol Circulating Pump	15KW
115-17-PM-001A	Service Water Pump	11KW
115-17-PM-001B	Service Water Pump	11KW
115-19-PM-001B	Heating Medium Circulation Pump	45KW
115-19-PM-001B	Heating Medium Make up Pump	0.75KW
115-27-PM-002A	Condensate Recovery Pump	15KW
115-27-PM-002B	Condensate Recovery Pump	15KW
115-27-PM-003A	Produced Water Transfer Pump	1.1KW
115-27-PM-003B	Produced Water Transfer Pump	1.1KW
115-27-Z-001B	Thermal Oxidiser	11KW
115-28-PM-003A	Closed Drain Pump	11KW
115-28-PM-003B	Closed Drain Pump	11KW
115-28-PM-014A	Open Drain Sump Pump	7.5KW
115-28-PM-014B	Open Drain Sump Pump	7.5KW
115-28-PM-015	Open Drain Slop Pump	4KW
–	Spare Starter	45KW
–	Spare Starter	22KW
–	Spare Starter	11KW
–	Spare Starter	11KW
–	Spare Feeder	N/A
115-ES-51-5501	Air Conditioning Panel (Admin Bldg)	38.5KW
115-32-PM-005A	Fire Water Pump	150KW
115-ES-51-5201	LTG and Small Power Dist (Sub Station Bldg)	15KW
115-ES-51-5202	LTG and Small Power Dist (Admin Bldg)	30KW

Table 13.3 – Motors and Feeders on LV Swbd and MCC 115-ES-51-5101 (cont'd)

Busbar A (Cont'd)		
Tag Number	**Description**	**Power Rating**
115-ES-51-5203	LTG and Small Power Dist (Warehouse)	30KW
115-CP-51-001	Cathodic Protection System	2.5KW
115-EW-51-01/02	Welding Receptacle	
115-EW-51-03/04	Welding Receptacle	
115-EW-51-05/06	Welding Receptacle	
115-EW-51-07/08	Welding Receptacle	
Busbar B		
115-73-YP-001	AHU Control Panel (Admin Bldg)	25KW
115-73-YP-002	AHU Control Panel (Substation)	32KW
115-ES-52-5901	Instrument Power Distribution Boards for Non-UPS Loads	5KW
115-ER-52-5301	230VAC UPS Supply-A	40KVA
115-ER-52-5301	230VAC UPS Supply-B	40KVA
115-ER-52-5301	230VAC UPS Supply-C	40KVA
115-ER-52-5201	Emergency Lighting and Small Power Distribution Board (Sub Station)	10KW
115-ER-52-5202	Emergency Lighting and Small Power Distribution Board (Admin Bldg)	10KW
115-ER-52-5203	Emergency Lighting and Small Power Distribution Board (Warehouse)	5KW
115-ER-52-5101	Electrical Power Distribution Board	15KW
115-02-PM-002A	Condensate Pump	22KW
115-13-PM-001A	Glycol Circulation Pump	15KW
115-19-PM-001A	Heating Medium Circulation Pump	45KW
115-19-ZM-002	Heating Medium Blower	18.5KW
115-32-PM-006	Fire Water Jockey Pump	11KW
115-27-Z-001A	Thermal Oxidiser	11KW
115-20-CM-001A	Instrument Air Compressor Package	65KW
115-20-CM-001B	Instrument Air Compressor Package	65KW
–	Spare Heater	N/A
–	Spare Starter	11KW
–	Spare Starter	22KW
–	Spare Starter	11KW

3.3 Emergency Generator 115-EG-52-5101

3.3.1 Function

Refer to PHM-115-ED-010 Single Line Drawing: Electrical – Gas Processing Plant Overall 400V.

In the case of a power failure on the imported electricity supply an Emergency Generator 115-EG-52-5101 starts automatically to supply power to essential and emergency loads through Busbar B.

This emergency generator is rated at 512KW, 400V, 3 Phase and neutral at 50Hz. The emergency generator is used to power BUSBAR B only with the interlock disconnecting Busbar B.

3.3.2 Technical Data

For details of the design and operating parameters, refer to Table 13.4 – Design and Operating Parameters Emergency Generator 115-EG-52-5101.

Table 13.4 – Design and Operating Parameters Emergency Generator 115-EG-52-5101

Parameter	Design	Operating
Engine Output	560kW (750bhp)	–
Fuel Consumption	140l/hr	–
Fuel Tank Capacity	1325 litre	–
Speed	1500rpm	–
Engine Idle	575 to 650rpm	–
Voltage Output	400V, 3 Phase 50Hz	–
Power Output	512kW	–

3.3.3 Technical Description

The diesel engine driver is manufactured by Cummins and is a Model VTA28-G5 unit, which is a four stroke engine with 12 cylinders in Vee configuration. The engine is aspirated by two exhaust driven turbochargers provided with water cooled aftercoolers. An electronic overspeed trip is provided.

Fuel for the engine is stored in a 1325 litre fuel tank in the base of the generator package. The injector pumps are controlled electrically from the governor and supplied with fuel by a low pressure fuel pump. The fuel is filtered and passed through a water separator before flowing to the suction of the pump. Excess fuel from returned through a back pressure valve to the day tank.

This engine is a water cooled, and has an engine driven air blast cooler to cool the circulating coolant. The coolant is circulated by an engine driven pump.

The engine has wet sump lubrication with an engine driven pump provided to feed lube oil under pressure to the bearings.

A battery powered electric start motor starts the diesel engine. The Valve Regulated Lead Acid batteries in the battery pack are charged by a battery charger powered from the emergency switchboard or alternatively from a small alternator mounted on the engine. The batteries provide sufficient capacity to perform six consecutive 15 second cranking cycles with a 15 second rest between each crank.

The engine drives a Stamford HC1634G alternator, which is directly coupled to the engine. The alternator is a synchronous AC generator with rotary brush less excitation system and Permanent Magnet Generator (PMG) pilot exciter. The alternator generates three phase power at 400V, and with a frequency of 50Hz. Cooling is provided by forcing air through the alternator using a fan mounted on the rotor.

The voltage output from the alternator is controlled by a MX321 Automatic Voltage Regulator which controls the current in the rotating field coils on the rotor. The alternator is rated for an output of 512kW with a power factor of 0.8.

3.4 UPS 115-ER-52-5301-A/B

3.4.1 Function

Refer to PHM-115-ED-040 Gas Plant 230V AC UPS Single Line Diagram Distribution Board 115-ES-52-5301.

The UPS is a battery backed power source which provides power to critical systems in the plant which can not tolerate a break in supply. When main power is lost, the batteries continue to provide power to the inverters in the UPS, maintaining the AC supply without interruption.

3.4.2 Technical Data

For details of the design and operating parameters, refer to Table 13.5 – Design and Operating UPS 115-ER-52-5301-A/B.

Table 13.5 – Design and Operating Parameters UPS 115-ER-52-5301-A/B

Parameter	Design	Operating
Supply Voltage	400V AC, 3 phase, 50Hz	–
Output Voltage	230V AC, 1 phase, 50Hz	–
Operating Time on Battery	6 hours	–
Inverter Rated Output	40kVA (each)	–
Bypass Rated Output	40kVA	–
Frequency Tolerance	+0.1%	–
Voltage Tolerance	±1%	–
Battery Volts	240V	–
Battery Capacity	600Ah	–
Supply Voltage	400V AC, 3 phase, 50Hz	–
Output Voltage	230V AC, 1 phase, 50Hz	–

Table 13.5 – Design and Operating Parameters UPS 115-ER-52-5301-A/B (cont'd)

Parameter	Design	Operating
Operating Time on Battery	6 hours	–
Inverter Rated Output	40kVA (each)	–
Bypass Rated Output	40kVA	–
Frequency Tolerance	+0.1%	–
Voltage Tolerance	±1%	–
Battery Volts	240V	–
Battery Capacity	600Ah	–

3.4.3 Technical Description

The AC UPS system is provided by Gutor Electronics and has a 230V AC Single phase output. The UPS is located in the substation and is comprised of two 100% UPS systems and a single 100% bypass transformer. The output from the UPS is fed to the 230V AC UPS Distribution Board 115-EB-52-5301 which supplies power to the various users.

Each UPS unit consists of:

- Rectifier/Charger
- Inverter
- 100% Battery Bank
- The bypass facility consist of:
- Bypass Transformer
- Static Bypass Switch
- Manual Bypass Switch

In each UPS the Rectifier/Charger receives three phase power from the Emergency Bus Bar B at 400Volts AC which is rectified to produce a 245V DC which is to provide DC power for the inverter and to charge the associated 240V battery Pack.

The inverter converts the 240V DC to a 230V AC single phase 50Hz supply and has a rated output of 40kVA.

If the mains input to the rectifier/charger fail the battery continues to supply the 240V DC power to the inverter to maintain the 230V AC output for at least 6 hours without interruption. When main power is restored the DC power to the inverter is again supplied from the rectifier/charger and at the same time the batteries are recharged.

The bypass transformer also receives three phase power from the Emergency Bus Bar B at 400Volts AC and produces a 230V AC single phase 50Hz output rated at 40kVA.

The two inverters are continuously synchronised with the bypass transformer, sensing being through the static switch. If there is a fault affecting the two 100% inverters, the supply is automatically switched to the bypass transformer by the static switch within a quarter cycle. The static switch is a high speed solid state switch which can transfer the load between inverters and bypass transformer without noticeable effect on the supply.

The static switch also monitors inverter performance and for alarm conditions and will perform a transfer to protect the UPS from damage caused by a current fault or a short circuit.

The two 100% battery packs are located in a battery room on the end of the substation are sized for 600Ah and comprised of valve regulated lead acid batteries. Each battery pack is made up of 110 cells. Each battery pack can be isolated from the associated rectifier/charger and inverter by a MCCB fitted with a shunt trip to allow remote tripping of the batteries.

The manual by pass switch allows the two inverters and static switch to be totally isolated from the bypass transformer for maintenance purposes.

The AC distribution board is consists fully insulated bus bars with Miniature Circuit Breakers (MCB) and Moulded Case Circuit Breaker (MCCB) feeders. On the distribution board the main circuit breaker has over current and earth fault monitoring with auxiliary contacts to indicate operation of the device. These contacts are wired to the UPS display diagnostic system.

4.0 INSTRUMENTATION AND CONTROL

4.1 Transformer

Refer to PHM-115-ED-010 Overall 400V SLD.

4.1.1 Pressure Protection

A pressure relief device and sensor is provided on the casing of the transformer, which will open the transformer disconnecting switch and secondary breaker on high pressure.

4.1.2 Temperature Monitoring

The temperature of the transformer liquid is monitored by a temperature switch, which will open the transformer disconnecting switch and secondary breaker on high temperature.

4.1.3 Earth Leakage Protection

An earth leakage detection device is provided on the earthed neutral point of the transformer secondary which will open the transformer secondary breaker if an earth fault is detected.

4.1.4 Under Voltage Protection

An under voltage detection device is provided on the output of the transformer secondary to raise an alarm in the switchboard.

4.2 LV Switchboard

Refer to PHM-115-ED-010 Overall 400V SLD.

4.2.1 Power Metering and Protection

The two Incomer Breakers CB-A and CB-C and the Generator Breaker CB-B each have a metering panel which displays the following:

- Power (kW)
- Resistive Power (kVA)
- Reactive Power (kVAR)
- Power Factor (Cos Φ)
- Frequency (Hz)
- Current (per phase)
- Voltage (per phase through a selector switch)
- Watt hours (Wh)

- Hours (h)
- Reactive kVA hours (kVArh)

The current readings of power, voltage and amperes are repeated in the control room on the DCS.

Overcurrent and earth fault detection devices are provided on the bus side of each incomer breaker to trip the associated breaker if a fault is detected.

An interlock is provided on Incomer Breakers CB-C, CB-A and Bus Tie Breaker CB-AC which allows only two of the three breakers to be closed at any time.

An interlock is provided on Generator Breaker CB-B and Bus Tie Breaker CB-AB which allows only one of the two breakers to be closed at any time.

4.2.2 Motor Control

Each motor supply cubicle is provided with a Starter Control Unit (SCU) which is energised from the 110V DC supply and communicates with other SCUs and the DCS through a Modbus RTU. The SCU controls the start of the motor through a starter which can be either a Direct on Line starter or provide a soft start through an Auto transformer. The starter is also connected to the On/Off/Auto switch located by the motor in the field.

4.3 Emergency Generator

Refer to PHM-115-ED-010 Overall 400V SLD.

4.3.1 Emergency Generator Control Panel

The emergency generator is controlled from a control cabinet located in the substation.

Mounted in the front of the control cabinet is the The PowerCommand Controller PCC2100 which is a microprocessor-based generator set monitoring, metering, and control system. The controller provides an operator interface to the generator set, voltage regulation, governing, and protective functions. Control power for the controller is derived from the UPS.

The operator panel includes a series of LEDs to allow the operator to view the general status of the generator set. The functions displayed include:

- Green LEDs to indicate:
- Generator set running operating at rated voltage and frequency)
- Remote start signal received
- Red LEDs to indicate:
- Not-in-Auto mode (flashing)
- Common shutdown
- Low Oil Pressure Shutdown
- Overspeed Shutdown
- Amber LEDs to indicate:
- Common warning
- Low Oil Pressure Warning
- High Engine Temperature Warning
- Fail To Start

The following Switches are provided on the controller:

Off/Manual/Auto Mode Control Switch – When the switch is selected to Manual or Off, the 'Not In Auto' lamp on the panel flashes. If Auto mode is selected, the generator set can be started automatically when power is lost on Emergency Bus B.

Manual Run/Stop Control Switch – When the mode control switch is in the Manual position and the Manual Run/Stop switch is pressed, the Generator set will start, immediately. If the generator set is running in the Manual mode, pressing the Run/Stop switch will cause the generator set to shut down after a cool down at idle period.

Panel Lamp/Lamp Test Control Switch – Depressing the panel lamp switch will cause the panel illumination to operate for approximately 10 minutes. Pressing and holding the switch will sequentially illuminate all LED's on the panel to confirm proper operation of these components.

Emergency Stop Button – Pressing the emergency stop button causes the generator set to shut down immediately. The generator set is prevented from running or cranking with the switch pressed in.

The control panel is equipped with an AC metering panel composed of a series of LED's configured in bar graphs for each function. The LED's are colour coded, with green indicating normal range values, amber for warning levels, and red for shutdown conditions. Scales for each function are in % of nominal rated values.

The nine bar-graphs provide the following displays from left to right:

Simultaneous Current in each phase (3 bars)

Power (1 bar)

Power Factor (1 bar)

Frequency (1 bar)

Simultaneous Voltage on each phase (3 bars)

The control panel is also provided with an alphanumeric display capable of displaying two lines of data with approximately 20 characters per line. The display is accompanied by a set of six membrane switches, three each side of the display, that are used by the operator to navigate through control menus, and to make control adjustments. All adjustments to volts, frequency, etc are made via the display panel.

All data on the display can be viewed by scrolling through screens with the navigation keys. The display shows all active fault conditions, active and inactive, with the latest displayed first.

The display panel has a screen-saver timer that turns off the display after 30 minutes of inactivity. Touching any key will turn the screen back on.

4.3.2 Engine Control

Remote Start Mode – On loss of power at the switchboard the controller automatically starts the generator set immediately and accelerates the unit to rated speed and voltage by careful control of the engine fuel system and alternator excitation system.

Data Logging – The controller maintains a record of manual control operations, warning and shutdown conditions, and other events. The control also stores critical engine and alternator data before and after a fault occurs, for use in evaluating the root causes for the fault condition.

Cycle Cranking – The controller limits the number of start attempts to be made the duration of each crank and the duration of the rest period between cranks. The number of start attempts and durations are configurable.

Time Delay Stop (Cool-down) – Configurable for time delay of 0-10 minutes prior to ramp to idle or shut down after signal to stop in normal operation modes.

Engine Governing

The integrated digital governor drives the engine fuel control valve. The following features are available in the governing system:

Isochronous Governing – Controls engine speed within plus or minus 0.25% for any steady state load from no load to full load. Frequency drift will not exceed plus or minus 0.5% for a 60F (33C) change in ambient temperature over an 8 hour period

Temperature Dynamics – Modifies the engine fuel system (governing) control parameters as a function of engine temperature. Allows engine to be more responsive when warm, and more stable when operating at lower temperature levels

Smart Idle Mode – Engine governing can be regulated at an idle speed for a programmed period on automatic stop of the engine or in manual mode. In an automatic mode, the control will bypass the idle period if the engine at a low load level for sufficient duration for cool-down. During idle mode engine protective functions are adjusted for the lower engine speed, and alternator function and protections are disabled. Idle speed can be initiated by the operator when the generator set is running in the manual mode

4.3.3 Alternator Control

The controller includes an integrated 3-phase line-to-neutral sensing voltage regulation system which performs the following functions:

Digital Output Voltage Regulation – Regulates output voltage to within 0.5% for any loads between no load and full load. On engine starting, or sudden load application, voltage is controlled to a maximum of 5% overshoot over nominal level

Fault Current Regulation - Regulates the output current on any phase to a maximum of 3 times rated current under fault conditions for both single phase and three phase faults. The regulation system will drive a permanent magnet generator (PMG) to provide 3 times rated current on all phases for motor starting and short circuit coordination purposes

4.4 UPS

Refer to PHM-115-ED-040 230V AC UPS SLD Distribution Board 115-ES-52-5301.

4.4.1 UPS Control Panel

The controls for the UPS are located in a panel located in the front door of the UPS cabinet. The panel is divided into four sections.

The top left section is the system panel, which shows the current operation status of the major components of the system on a schematic of the system.

The top centre section is the Operations section which includes buttons for turning the system on and off and a lamp test button for checking if all LED indications function properly.

The top right section is the display unit which consist of a LC display, an alarm LED,an acoustic alarm and a key-pad. With this the operator can set following operational parameters, obtain a list of measurement data, and get access to the event and alarm log.

The lower section of the panel is the alarm indication panel the respective LED lights up, when an alarm has occurred. The following alarm LEDs are included:

- Rectifier Mains Failure
- Rectifier Failure

- DC Out of Tolerance
- Battery Operation
- Battery discharged
- Battery disconnected
- Inverter Fault
- Overload Inverter/Bypass
- Inverter Fuse Blown
- Asynchronous
- Bypass Mains Fault
- Manual Bypass ON
- Over-temperature
- Fan Failure
- EA inhibited
- EN inhibited
- Power Supply Fault

5.0 ENVIRONMENTAL, health and safety REQUIREMENTS

5.1 General EHS Requirements

5.1.1 Electrical Safety

Only qualified and authorised personnel can work on or near exposed energised parts of electrical equipment that operate at voltages of more than 50V AC and/or 110V DC. The personnel must be trained for the task to be performed. Personnel working on or near to electrical equipment shall adhere to the following:

Only qualified and authorised personnel must perform isolation/de-isolation of electrical equipment

Adhere to the Electrical Safety Rules and Procedures

Have knowledge of the construction and operation of specific electrical equipment and the hazards involved

Proper use and maintenance of test instruments and knowledge of their rating limits

Appropriate alerting techniques, such as signs, tags, and barricades for warning and protecting other personnel from electrical hazards. All incidents or accidents of an electrical nature shall be reported to the supervisor of the work who shall ensure that it is investigated and reported. All potentially dangerous situations or conditions involving electricity, and all cases of electrical equipment suspected of being in an unsafe condition, must be reported immediately to the Supervisor for investigation.

In all cases, any electrical equipment that gives rise to a dangerous or potentially dangerous situation shall be removed from service, isolated, and tagged 'Do Not Use'. The equipment shall remain out of service until it has been investigated and deemed safe by an Authorised Electrical Person.

5.1.2 Chemicals

Personnel should ensure that they are fully familiar with the Material Safety Data Sheet (MSDS) for each chemical, which details precautions and the protective apparel and equipment necessary when handling the chemicals. The precautions detailed must be adhered to at all times.

5.1.3 Hazardous Sources

This section of the procedure identifies the potentially hazardous sources associated with the Power Generation and Distribution System and describes the adverse effects that may result from exposure to them.

The hazardous sources, which may be present under upset conditions, are detailed in Table 13.6 – Hazardous Sources.

Table 13.6 – Hazardous Sources

Hazard	Source	Hazardous Event	Effect	Control
High and Low voltage electricity (50V to 22kV)	Switchboardstransformers, UPS and generator	Incorrect operation of equipment	Electric shock Equipment damage	Restricted access (operation of electrical equipment by AEPs)
Static electricity	UPS	Failure to ensure that equipment is fully discharged prior to maintenance	Electric shock Equipment damage	Restricted access (operation of electrical equipment by AEPs)
Diesel oil	Storage tank and diesel lines	Loss of containment Oil mist	Slip hazard, potential for personnel injury Equipment damage	Routine inspections Preventive maintenance
Equipment with moving/ rotating parts	Diesel engine driven generator	Loss of control Missing guards	Potential for personnel injury	Routine inspections Preventive maintenance
Hot engine exhausts	Diesel engine driven generator	Contact with hot surfaces	Potential for serious burns	Insulation policy Use of personal protective equipment

5.2 Specific Health and Safety Requirements

The correct use of Personal Protective Equipment (PPE) is fundamental in securing a safe and healthy place of work for all personnel. PPE shall be used in conjunction with appropriate health, environment and safety procedures that are designed to minimise the potential risk of harm or injury to personnel, while also promoting safe working practices.

5.3 Specific Environmental Requirements

There are no specific environmental requirements for the Power Generation and distribution Systems.

6.0 REFERENCE INFORMATION

6.1 Hess Corporation Company Documentation

Document Number	Document Title
2002-DS-1671-01	AC UPS Data Sheet
2002-SP-1671-01	Specification for AC UPS
2002-SP-1697-01	Specification for Diesel Engine Generator
2002-SP-1641-01	Specification for Transformers
2002-SP-1654-01	Specification for LV Switchgear/MCC
PH-10-OP-SOP-00013	Standard Operating Procedure for the Power Generation and Distribution

6.2 Vendor Documentation

Document Number	Document Title
	Descriptive Information for Cummins Generator and Controls

6.3 Engineering Drawings (PFDs, UFDs and P&IDs)

Drawing Number	Drawing Title
PHM-115-ED-5101	Overall 400V Switchboard 115-ES-51-5101 SLD
PHM-115-ED-020 Sht 1 to 7	400V Switchboard 115-ES-51-5101 SLD
PHM-115-ED-030	Lighting and Small Power 115-ES-51-5201 SLD
PHM-115-ED-031	Lighting and Small Power 115-ES-51-5202 SLD
PHM-115-ED-032	Lighting and Small Power 115-ES-51-5203 SLD
PHM-115-ED-033	Lighting and Small Power 115-ES-51-5204 SLD
PHM-115-ED-034	Lighting and Small Power 115-ES-52-5201 SLD
PHM-115-ED-035	Lighting and Small Power 115-ES-52-5202 SLD
PHM-115-ED-036	Lighting and Small Power 115-ES-52-5203 SLD
PHM-115-ED-037	Electrical Power Dist Board 115-ES-52-5101 SLD
PHM-115-ED-038	Air Con 115-ES-51-5501 SLD
PHM-115-ED-040	240V AC UPS Dist Board 115-ES-52-5301 SLD
PHM-115-FE-071	P&ID Back-up Power Generation

เอกสารแนบ 2-23
เอกสารการดำเนินงานด้านความปลอดภัย

Sinphuhorm

Safety committee Meeting

No.7

26 July 2023

วาระการประชุม

วันที่ 26 กรกฎาคม พ.ศ. 2566 เวลา 11.00-12.00 น

ห้องประชุม ตึกแอดมิน

SSHE Moment

วาระที่ 1. เรื่อง รับรอง/ติดตามจากการประชุมครั้งที่ 6/2565

วาระที่ 2. เรื่อง ที่ประธานแจ้งให้ที่ประชุมทราบ

วาระที่ 3. เรื่อง แจ้งเพื่อทราบ

เรื่อง สถิติอุบัติเหตุประจำเดือน สรุป SPH SSHE KPIs

เรื่อง การตรวจสอบพื้นที่ด้านความปลอดภัย

วาระที่ 4. เรื่องเพื่อการพิจารณา

วาระที่ 5. เรื่องอื่น ๆ รอบโต๊ะ -แสดงความคิดเห็น

ปิดประชุม

SSHE Moment

SSHE
Moment

รณรงค์ทิ้งขยะประเภท แบตเตอรี่ 9 โวล์ โดยให้ แทปกาวพลาสติก ปิดที่ขั้วของแบตเตอรี่ก่อนทิ้งลงถังขยะ รวมทั้งการจัดเก็บ

ถ่านแบบนี้จะมีขั้วบวกและขั้วลบอยู่ใกล้กัน และมีแรงดันไฟถึง 9 โวลต์ หากมีโลหะสัมผัสที่ขั้วทั้งสองจะเกิดการลัดวงจร Short Circuit ทำให้เกิดความร้อนสะสม และอาจเป็นเหตุก่อให้เกิดอัคคีภัยในที่สุด แนะนำให้เก็บกลับในแพ็กเกจเดิมที่ซื้อมา เก็บในซองซิปยา หรือใช้เทปกาวปิดที่ขั้วบวกลบ เพื่อไม่ให้ขั้วถ่านสัมผัสกับโลหะ

ห้ามเก็บถ่านรวมกับ ฝอยเหล็กขัด Steel Wool, อลูมิเนียมฟอยล์ห่ออาหาร Aluminum Foil, ลูกกุญแจ, คลิปหนีบกระดาษ, เหรียญ, ปากกาโลหะ หรือถ่านชนิดอื่นๆ โดยที่ไม่ได้ปิดขั้วถ่านให้เรียบร้อย

http://fullwatt.blogspot.com/2018/04/9v.html

วาระที่ 1 รับรอง/ติดตามจากการประชุมครั้งที่ 6/2566

พื้นที่สูบบุหรี่ เดิม
ด้านหลังป้อม ปรภ

พื้นที่สูบบุหรี่ ใหม่
ริมบ่อน้ำฝน

วาระที่ 2 ประธานแจ้งให้ที่ประชุมทราบ

2023 SPH SSHE Performance as of 30 June 2023

LTIF *(Number/MMhrs)* **Base 0.13 - Stretch 0**	**YTD 0.00**
TRIR *(Number/MMhrs)* **Base 0.75 - Stretch 0.39**	**YTD 0.00**
Spill Rate *(Ton/MMt Production)* **Base 0.37 - Stretch 0**	**YTD 0.00**
Motor Vehicle Accident *(No. of HPI & TRIR IOGP 365-5* **Base 2 - Stretch 0**	**YTD 0**
SSHE Plan Completion **Base 100% - Stretch 100%**	**48.99%**

External Complaint *(Number)*	**YTD 0**
Security Incident *(Number)*	**YTD 0**
Occupational Illness *(Number)*	**YTD 0**

2023 Total Staff	2023 Total Contractor	2023 Total MH
64,195	291,802	355,997

Cumulative MH without LTI
4,758,010

Day without LTI 3,382
(Target 3,650)

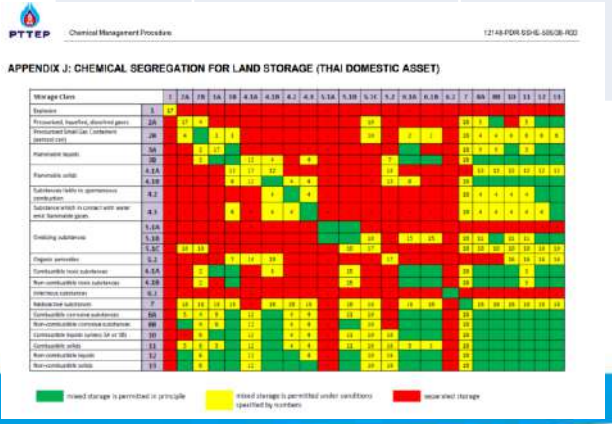
Last date of LTI 22 Apr 2014
(*set Zero on date join to PTTEP)

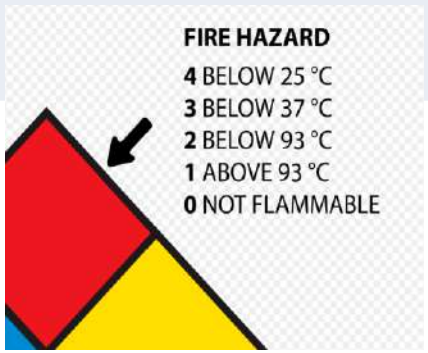
วาระที่ 3. เรื่องแจ้งเพื่อทราบ

2023 SPH SSHE integrated audit

Count of Finding descriptior	Column Labels				
Row Labels	High	Low	Medium	(blank)	Grand Total
BP				2	2
NC			2		2
OBS	2	5	3		10
OFI		2	1		3
Verbal		4	1		5
Grand Total	2	11	7	2	22

No.	Finding type	Finding Severity	Finding description
1	NC	Medium	During review the list of environmental aspect aspect in SPH environmental aspect inventory, found that aspects of some activities are not identified eg Pipeline repairing, Booster compressor installation, and food decomposor machine. Addtion, risk assesssment for Emergency condition has not been registered and re-assessed eg. hydrocarbon leak, fire events, spill, car accident, fire and emergency (Oct. 2017)
2	NC	Medium	During site observed at chemical storage area, it was found that 1. Hazard rating shown in NFPA Diamond Sign of Corr 11304A is not matched with its hazard. ~~2. The distance between CI (corrosion inhibitor) and Methanol is about 0.6 meter which is not in line with criteria stated in Chemical Management Procedure (12148-PDR-SSHE-505/38-R0)~~ 3.The Matrix of chemical storage management applied at chemical storage area was not in-line with metrix provided in Chemical Management Procedure (12148-PDR-SSHE-505/38-R0)





หมวดที่: 9. สมบัติทางกายภาพและเคมี

ลักษณะ	:	ของเหลว
สี	:	ใส
กลิ่น	:	แหลม, ฉุน, แสบ
จุดวาบไฟ	:	83 °C วิธีการ: ASTM D 93, ถ้วยปิดเพนสกี - มาร์เทนส์

No.	Finding type	Finding Severity	Finding description
1	OBS	Low	On 7thJune 2023, during observe pipe yard auditors found two staffs who were responsible for tree cutting and cleaning already sign out in the logbook show they leave pipe yard at 17.00 while the actual time being 15:45.
2	OBS	Medium	Found Oiler1 at temporary chemical storage for production activity (Wellpad A&C) SDS not available at the working area.
3	OBS	Low	At the pipe yard, the tubing support wooden blocks are worn out and deteriorated.

No.	Finding type	Finding Severity	Finding description
4	OBS	Medium	At the Wellpad A, inside the Switch Gear room, it was observed that the electrical control panel was not closed and locked, and there were no corresponding tags attached to the key that locks the backup system switch.
5	OBS	High	No evidence of FIFO system checks for medicines in the cabinet and removal of expired equipment before using new items, or items nearing expiration, was found.
6	OBS	Low	No evidence of proper management of infectious medical waste or medical waste disposal by the company or hospital was found.

วาระที่ 4. เสนอเพื่อการพิจารณาและเสนอแนะ

เกณฑ์การประเมิน บุคคลต้นแบบด้านความปลอดภัย มั่นคง อาชีวอนามัย และสิ่งแวดล้อม ระดับหัวหน้างาน Criteria for SSHE Role Model for Supervisor Level			
เกณฑ์การประเมิน	หลักฐาน/แหล่งข้อมูล	การทวนสอบข้อมูลโดย Site SSHE	หมายเหตุ สามารถเป็นหัวข้อมูลที่เพิ่มเติมได้ เช่น มีการดำเนินการมากกว่าที่กำหนด
❑ 1) เป็นแบบอย่างในการประเมินความเสี่ยง (Risk Assessment) และค้นหาอันตรายในงาน ผ่านการลงพื้นที่เพื่อตรวจตราอยู่เสมอ โดยรายงานสิ่งที่พบเห็นผ่านระบบที่มีการใช้งานอยู่ เช่น SOC, HRC, BBS Cards	หลักฐานของการทวนสอบคุณภาพของรายงาน (Quality Review Process) SOC HRC หรือ BBS Cards ที่รายงานสิ่งที่พบเห็นของ**หัวหน้างาน** โดย Site SSHE, ผู้บังคับบัญชาของหัวหน้างาน และ Area Authority **ในเดือนนั้น ๆ**	จัดให้มีกระบวนการทวนสอบคุณภาพรายงานสิ่งที่พบเห็นของหัวหน้างาน โดยสามารถอ้างอิงตัวอย่างเกณฑ์การพิจารณาคุณภาพของรายงานฯ (ตามแนบ)	JSA SD Package Lifting work
❑ 2) ส่งเสริมให้ทีมงานค้นหาอันตรายในงานอยู่เสมอ โดยสังเกตพฤติกรรมการทำงาน (ปลอดภัย/ไม่ปลอดภัย) ผ่าน SOC และสังเกตสภาพการณ์ที่ไม่ปลอดภัย ผ่าน HRC อย่างมีประสิทธิภาพ โดยเน้นย้ำและสื่อสารพฤติกรรมที่ไม่ปลอดภัยและสภาพการณ์ที่ไม่ปลอดภัยที่พบในกลุ่มงาน พร้อมทั้งมาตรการป้องกันและแก้ไข	**ในกลุ่มงานที่หัวหน้างานรับผิดชอบ** พิจารณาหลักฐานการส่งเสริมให้ทีมงานค้นหาอันตรายในงานและทวนสอบคุณภาพของรายงานในเชิงการป้องกันอุบัติเหตุ ดังนี้ • ทวนสอบข้อมูลแนวโน้มพฤติกรรม/สภาพการณ์ที่ไม่ปลอดภัย ที่ได้รับรายงาน • เน้นย้ำและกระตุ้นให้ทีมงานสังเกตอันตรายในพื้นที่หน้างาน ซึ่งสอดคล้องกับแนวโน้มพฤติกรรม/สภาพการณ์ที่ไม่ปลอดภัย ที่ได้รับรายงานนั้น • ทบทวนรายงาน SOC/HRC/BBS Cards ของทีมงาน พร้อมทั้งสื่อสารรายงานฯ ที่ช่วยป้องกันอุบัติเหตุ ให้กับทีมงานผ่าน SSHE Moment, daily/weekly/monthly meeting, routine toolbox talk เป็นต้น ดำเนินการ**อย่างน้อย 1 ครั้งต่อเดือน**	ลงพื้นที่เพื่อสังเกตการส่งเสริมและกระตุ้นทีมงานโดยหัวหน้างาน **หรือ** ทวนสอบหลักฐานการส่งเสริมให้ทีมงานค้นหาอันตรายฯ เช่น บันทึกการประชุม (Minutes of Meeting)	SOC=0 HRC=3
❑ 3) พูดคุย/สื่อสารข้อมูลด้าน SSHE เช่น SSHE Alert, บทเรียนจากอุบัติเหตุในอดีต Life Saving & Process Safety Rules, แผนฉุกเฉิน เบอร์โทรฉุกเฉิน และจุดรวมพล รวมถึงสื่อสารอันตรายและมาตรการป้องกันความปลอดภัยภายใน JSA และ PTW โดยเน้นย้ำการสื่อสารสามทางระหว่างทีมงาน	หลักฐานการสื่อสารข้อมูลด้าน SSHE ให้กับทีมงาน ผ่าน daily/weekly/monthly meeting, routine toolbox talk เช่น Minute of Meeting (MoM), Toolbox Talk Form ที่ระบุรายชื่อและหัวข้อของหัวหน้างานผู้ทำการสื่อสาร **มากกว่า 1 ครั้งต่อสัปดาห์**	ทวนสอบข้อมูลการสื่อสารและแชร์ข้อมูลกับทีมงาน ผ่าน Minute of Meeting (MoM), Toolbox Talk Form, หรือช่องทางการบันทึกในรูปแบบอื่นๆ	Toolbox talk permit
❑ 4) ส่งเสริมและเป็นแบบอย่างให้ทีมงานใช้สิทธิในการหยุดงาน (4 หยุด) เมื่อพบพฤติกรรมหรือสภาพการณ์ที่ไม่ปลอดภัย และนำทีมในการทำ Stop Work Exercise	ทำ Stop Work หากพบพฤติกรรม/สภาพการณ์ที่ไม่ปลอดภัย หรือ Stop Work Exercise เป็นตัวอย่างให้ทีมงาน **อย่างน้อย 2 ครั้งต่อเดือน**	ทวนสอบ STOP WORK Report หรือ SWA Exercise Forms หรือ สุ่มสัมภาษณ์ทีมงานภายใต้การดูแลของหัวหน้างาน 2-3 คน ว่าได้รับการสนับสนุนให้ทีมใช้สิทธิ์ STOP WORK หรือไม่	Toolbox talk permit
❑ 5) ตรวจเช็คสภาพ PPE ของทีมงาน และ/หรือ เครื่องมืออุปกรณ์ก่อนใช้งานและระหว่างใช้งานอย่างสม่ำเสมอ เพื่อให้มั่นใจว่ามีสภาพดี เช่น ผ่านการทำ Daily/Weekly/Monthly Equipment Inspection	หลักฐานการทวนสอบการตรวจเช็คอุปกรณ์/PPE ผ่าน Inspection Checklist โดยหัวหน้างาน **อย่างน้อย 2 ครั้งต่อเดือน**	ทวนสอบ Inspection Records หรือ สุ่มสัมภาษณ์ทีมงานภายใต้การดูแลของหัวหน้างาน 2-3 คน ว่าได้ให้คำแนะนำเรื่องการใช้ PPE หรืออุปกรณ์ ที่เหมาะสมกับงานหรือไม่	Toolbox talk permit

เกณฑ์การประเมิน บุคคลต้นแบบด้านความปลอดภัย มั่นคง อาชีวอนามัย และสิ่งแวดล้อม ระดับหัวหน้างาน
Criteria for SSHE Role Model for Supervisor Level

เกณฑ์การประเมิน	หลักฐาน/แหล่งข้อมูล	การทวนสอบข้อมูลโดย Site SSHE	หมายเหตุ สามารถบันทึกข้อมูลเพิ่มเติมได้ เช่น มีการดำเนินการมากกว่าที่กำหนด
☐ 6) ลงพื้นที่ ดูแล สังเกต และ/หรือ ทวนสอบ การปฏิบัติงานของทีมงาน ผ่านOnsite Verification Process เช่น PBED Verification, PTW/RTJ Audit, Walk through Talk through, Procedure Audit อยู่เสมอ	หลักฐานผลการทวนสอบ (Onsite Verification) เช่น PTW Audit, PBED Verification Results หรือ บันทึกการทวนสอบด้าน SSHE อื่นๆ (Other Verification Results) <u>มากกว่า 1 ครั้งต่อสัปดาห์</u>	ทวนสอบหลักฐานผลทวนสอบ (Verification Results) ที่ทำโดยหัวหน้างาน	SOC=0 HRC=3 Permit Audit =0
☐ 7) ถ่ายทอดองค์ความรู้ และสอนงาน ให้กับทีมงานปัจจุบัน หรือ พนักงานใหม่/เปลี่ยนงาน/ได้รับการเลื่อนตำแหน่ง/ย้ายมาจากที่อื่น เพื่อให้สามารถทำงานได้อย่างปลอดภัย	หลักฐาน: การถ่ายทอดความรู้และสอนงานให้กับทีมงาน เช่น Safe Work Practice, Knowledge Transfer, Familiarization Program, Short Service Employee (SSE) Program, หรือ Competency Assessment โดยหัวหน้างาน (<u>1 ครั้งต่อเดือน</u>)	สุ่มสัมภาษณ์ทีมงานภายใต้การดูแลของหัวหน้างาน 2-3 คน โดยให้อธิบายลักษณะงานที่หัวหน้างานสอนหรือแชร์ข้อมูล	Toolbox talk permit
Extra Point ☐ 8) แสดงออกซึ่งการสนับสนุนปรับปรุงแก้ไขประเด็นข้อเสนอแนะที่ได้จากทีมงาน ให้เป็นรูปธรรม	หลักฐานการดำเนินการปรับปรุงแก้ไขประเด็นหรือข้อเสนอแนะ ที่ได้รับจากรายงาน SOC, HRC, Audits เช่น pre & post action of improvement reports.	ทวนสอบผลการดำเนินการปรับปรุงแก้ไขตามประเด็นข้อเสนอแนะ	SOC=0 HRC=3 Permit Audit =0

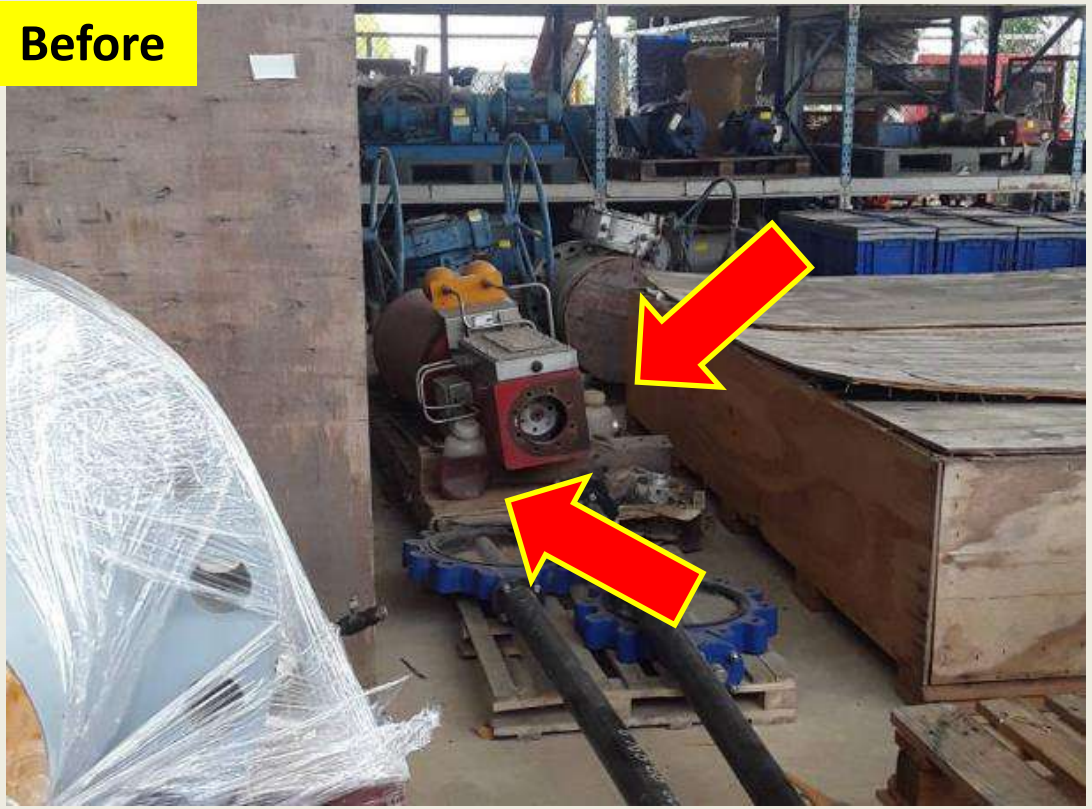
หมายเหตุ	• ผู้ผ่านเกณฑ์การประเมินทั้ง 7 ข้อ (1-7 ข้อ) และได้รับการทวนสอบข้อมูล โดย PTTEP Site SSHE และได้รับความเห็นชอบจาก Top Site Authority จะได้รับการคัดเลือกเป็น SSHE Role Model for Supervisor Level ประจำเดือน • ผู้ผ่านเกณฑ์การประเมิน เพิ่มเติมในข้อ 8 จะได้รับคะแนนพิเศษ (Extra Points) เพื่อเป็นข้อมูลประกอบการพิจารณารางวัลพิเศษ และ/หรือ SSHE Role Model for Supervisor Level ประจำปี ต่อไป • การส่งผลการประเมินตามเกณฑ์: สามารถส่งผลการประเมิน ที่ได้รับการทวนสอบโดย PTTEP Site SSHE และได้รับความเห็นชอบจาก Top Site Authority ผ่าน Microsoft Form มายัง CSA/O ภายในวันที่ 15 ของเดือนถัดไป
เดือนที่ประเมิน	

ชื่อหัวหน้างานที่ได้รับการประเมิน (Evaluated Person, Supervisor Name)	**แผนก/หน่วยงานที่สังกัด**	**ตำแหน่ง**	**บริษัท** .....
ชื่อผู้ประเมิน/ตรวจสอบ (PTTEP Site SSHE)	**ลายเซ็น**	**ตำแหน่ง**	**วันที่** ...../...../ 2566
ชื่อผู้ตรวจสอบ (PTTEP Top Site Authority)	**ลายเซ็น**	**ตำแหน่ง**	**วันที่** ...../...../ 2566

วาระที่ 5 เรื่องอื่น ๆ

พบกระปุกใส่น้ำมันไฮโดรลิค ไม่มีฉลากสารเคมี

Before



After

แก้ไขเรียบร้อย : จัดเก็บเรียบร้อย

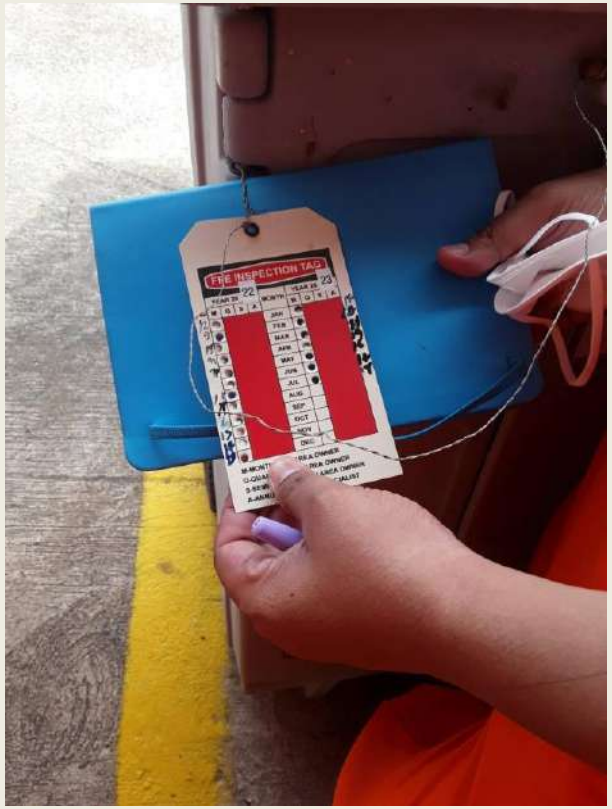
การจัดวางถัง 200 ลิตร ไม่มีกันการลื่นไถล เป็นหินก้อนเล็ก ๆ

Before

After

สายลวดคล้อง **Tag** ของอุปกรณ์ **Spill kit** บางส่วนใช้ลวดคล้อง มีความคม เสี่ยง บาด ขีดข่วนได้

Before



After

SSHE Inspection
On 23 Aug. 2023

1

แนะนำแก้ไข พื้นทางเดินที่มีการเทพื้นใหม่ มีความเสี่ยงสะดุด หกล้มได้

Before

After

2

แนะนำ เพื่อป้ายแสดงการตรวจสอบ และ วิธีการช่วยเหลือผู้บาดเจ็บโดยใช้ AED ที่ตำแหน่งการติดตั้งเพิ่ม

Before

After

แนะนำ ติดตั้งป้าย “ห้ามสูบบุหรี่” จุดอนุญาตสูบบุหรี่เดิมที่ย้ายได้ออกไป

Before

After

4

ตัดแต่งกิ่งต้นไม้ เพื่อ ลดความเสี่ยงสัตว์มีพิษ

Before

After

เอกสารแนบ 2-24

Permit to Work Standard

PTT Exploration and Production Public Company Limited

PTTEP Standard

Permit to Work Standard

Document No: SSHE-106-STD-510

Revision No: 3

PTT Exploration and Production Public Company Limited

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THIS DOCUMENT WILL BE REVIEWED 3 YEARS FROM DATE OF APPROVAL OR REVISED EARLIER IF NECESSARY

PTT Exploration and Production Public Company Limited

Revision History			
Rev	Description of Revision	Authorised by	Date
0	New document		Oct.2000
1	The revision includes: • Revised Document template / Structure / Code to be in line with SSHE Documentation Management Standard (SSHE-106-STD-330), ARIM and PEGS. • The document supersedes the Permit to Work procedure issued in October 2000. • The content has been updated and revised to ensure that it covers all PTTEP operations	CEO	Dec.2011
2	Revision to Permit validities and Naked Flame Hot Work requirements following discussions with offshore assets. Changes reflect feedback on application and clarification of previous requirements.	CEO	Nov.2012
3	Requirement for Permit location map added section 6.7, following GBN and GBS insurance surveys. Roles and responsibilities amended.	CEO	May 2013

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1.0 PURPOSE

A Permit to Work (PTW) system is a formal written system used to control certain types of work which are identified as potentially hazardous.

The Permit to Work system is a Safety Critical Element that is one of the main barriers used to prevent incidents and accidents. The purpose of the PTW system is to:

- Ensure work activities are coordinated such that conflicting work is controlled.
- Give permission for defined work to be performed on specified equipment or at a specified location, by authorized personnel.
- Ensuring the person in charge of a unit/plant/installation is aware of work taking place.
- Ensure hazards and safety precautions are identified and implemented before work starts.
- Providing a system of continuous control and records showing nature of work/precautions have been checked
- Ensure equipment is in a safe condition to be worked on.
- Providing a formal handover procedure when work extends beyond a shift and handback when work has been completed.
- Provide a means of safely suspending permits when work cannot continue.

A PTW system is an integral part of a safe system of work including risk assessment, and can be used to properly manage a wide range of activities.

The issue of a permit does not, by itself, make a job safe – that can only be achieved by those preparing for the work, those supervising the work and those carrying it out.

This Standard has been prepared with reference to international standards including OGP and the UK HSE.

This Standard fulfils the requirements of section 6.5.3 of the SSHE MS Manual.

2.0 SCOPE

This Standard shall be applied by Assets/Sites wherever work that may potentially adversely affect the safety of personnel, plant or the environment is to be performed.

The purpose of this Standard is to give high level requirements on PTW systems. Assets/Sites must prepare their own detailed PTW Procedures/Instructions that conform to the requirements of this Standard.

3.0 REFERENCES

3.1 PTTEP SSHE CONTROLLING DOCUMENTS

Document Number	Document Title
SSHE-106-MS-000	SSHE Management System Manual

3.2 OTHER REFERENCE DOCUMENTS

Document Number	Document Title
-	Guidelines on Permit to Work Systems, OGP, 1993
-	Guidance on Permit to Work Systems, UK HSE, 2005.

4.0 DEFINITIONS

Terminology	Description
-	-

4.1 LANGUAGE

In this document, the words may, should, and shall have the following meanings:

May	**Indicates a possible course of action**
Should	**Indicates a preferred course of action**
Shall	**Indicates a course of action with a mandatory status**

4.2 ORGANISATION AND DEPARTMENTS

In this document, the terms Corporate, Division and Asset have the following meanings:

Corporate	Refers to the PTTEP Business Groups hierarchically above Asset level, and located in the PTTEP headquarters, Bangkok.
Group	Refers to a corporate level Business Group. These may have associated Divisions, Departments, or operational Assets within their hierarchy.
Division	A Business Group may have one or more distinct groups within its hierarchy. These are referred to as Divisions, for example; within the EDE Group there is the Engineering & Construction and Maintenance Division (ENC), and the Field Development Planning Division (EFD), both of which also have associated Departments within their hierarchy.
Asset	Refers to an operational Asset, site, or location within a respective Business Group, for example; the DOA Group contains Bongkot Asset (DBA), S1 Asset (DSA), Arthit Asset (DAA) and the INA group contains IMA Myanmar Asset (IMA), Vietnam Joint Venture Asset (IVJ), Australasia Asset (IAA), Oman Assets (IOA) etc.
Department	A subgroup within a Business Group, Division or Asset.

4.3 COMMON ACRONYMS

Set out below are common specific terms presented in alphabetical order:

CEO	President & Chief Executive Officer
CSH	Safety , Security, Health and Environment Division
CSO	Safety Operation Department
DOA	Domestic Asset Group
EVP	Executive Vice President
PTW	Permit to Work
SVP	Senior Vice President
VP	Vice President

5.0 ROLES AND RESPONSIBILITIES

5.1 OWNERSHIP OF THE DOCUMENT

The owner of Permit to Work Standard is SVP, SSHE Division, with responsibilities for:

- Issuing Permit to Work Standard and its revisions
- Ensuring effective implementation of the standard

5.2 CUSTODIAN OF THE DOCUMENT

The custodian of Permit to Work Standard is VP, Loss Prevention Department, with responsibilities for:

- Identifying deficiencies or potential improvements
- Initiating periodic revision
- Maintaining revision history and document status register

5.3 KEY PERSONNEL ROLES AND RESPONSIBILITIES

CEO
• Enforce that SSHE is a line management responsibility. • Be a sponsor for effective SSHE MS implementation throughout PTTEP.

EVP's
• Endorse asset / site PTW procedures. • Ensure effective SSHE MS Implementation within their functional group.

SVP's
• Give directions to all subordinates in managing SSHE related issues. • Define SSHE responsibilities in project / asset / site.

VP's
• Approve project / asset / site PTW procedures. • Encourage + enforce SSHE MS implementation • Ensure SSHE risks are defined, conducted + mitigated.

Corporate SSHE Division
• Issue and periodically review the PTW Standard. • Identify, advise and provide PTW training courses as per Training and Competency Matrix. • Plan and conduct PTW audits as per annual audit plan.

Functional Group SSHE Manager / Asset SSHE Advisor
• Monitor effectiveness of the PTW system in use. • Ensuring PTW audits are conducted regularly. • Reporting PTW compliance as a SSHE KPI.

Site Managers (or Offshore Installation Managers, Site Superintendents)
• Overall responsibility for application of PTW Procedures/Instructions on-site. • Ensuring work that does not require a permit is identified, approved and listed. • Ensuring a Site PTW Procedure or Instruction is in place, following the requirements of this Corporate PTW Procedure. • Ensuring up-to-date training and competency assessment records are kept. • Approving the appointment in writing of competent persons to undertake PTW functions. • Participating in PTW audits and reviews. • Reviewing PTW system adequacy for peak activities and SimOps. Approving Naked Flame and any other permits with significant importance (e.g. some single valve isolations, heavy lifts, SimOps)

Site Personnel Reviewing/Preparing Work Sites/Issuing Permits
• The nature of work is fully described / understood. • All hazards have been identified and precautions specified/implemented (e.g. inhibits and isolations). • All personnel who may be affected by work have been informed. • Permits for tasks that may interact are cross-referenced. • Site checks are done before and after work completion. • Sufficient time is spent during shift handovers to discuss ongoing work/permits. • Participating in PTW audits and reviews. • Reinstating work sites after work has been completed (e.g. inhibit and isolation removal)

Persons Performing Work Under a Permit
• Work content has been discussed, and work team briefed on permit requirements (e.g. tool box talks). • Work does not start until a valid permit has been issued and received. • Permits are displayed at the worksite. • Permit conditions are complied with throughout work. • Work is stopped and permits suspended if work conditions change. • Revalidating permits when work extends beyond defined limits. • When suspending or on completion of work the site is made safe.

6.0 PTW REQUIREMENTS

6.1 APPLICATION

PTW shall be applied to work that may be potentially hazardous to people, the asset or the environment. They shall be used for:

- Non-routine work.
- Where two or more individuals or groups may be performing work.

- Where transfer of work between parties will occur.

However, not all work needs to be performed under the PTW system. A comprehensive list of work that does not require a permit to work shall be approved by the Site Manager and kept on-site. This work can include:

- Routine visual checks
- Work that is covered by specific procedures e.g operating instructions

During periods of peak activity (e.g. major construction or planned shutdowns) regular PTW requirements may not be sufficient to deal with the workload. In this case PTW arrangements shall be reviewed beforehand and alternatives proposed e.g. a Permit Coordinator may be justified.

Simultaneous Operations (SimOps) also require a prior review of PTW Procedures to ensure responsibilities and arrangements between different activities, and possibly different PTW systems, are agreed and defined.

Contractors and sub-contractors working on PTTEP operated sites must comply with the requirements of Site PTW Procedures/Instructions.

Although primarily intended as a paper-based system, electronic permit to work systems are acceptable. They must however, comply with the principles of this Standard.

It is recognized that some operational sites such as Logistics Bases do not have sufficiently high work related risks to justify implementing a full permit to work system. In these cases a simplified form of the PTW system may be implemented.

Appendix 1 gives details of 8 essential rules for permit to work.

6.2 TYPES OF PERMIT

Main Permits

Two types of Main Permit to Work shall be used:

Cold Main Permit – used for work that does not involve any potential source of ignition e.g painting, scaffolding, visual checking etc.

Hot Main Permit – used for any work that may provide a source of ignition e.g. use of non-intrinsically safe electrical equipment, heat treatment etc.

Note: In addition differentiation of Hot Main Permits for Naked Flame Work shall be made. Naked Flame Work involves work where an open flame as a source of ignition exists e.g. welding, burning, cutting etc. See Appendix 2 for Naked Flame work requirements.

Types of Complementary Permits or Certificates

The following Complementary Permits or Certificates shall be used to support the Main Permits, above. The selected Complementary Permits or Certificates used will depend upon the location and work done on a particular asset/site.

Process / Mechanical / ESD System Isolation Certificate – to be used whenever isolation of any of these systems is required in order to perform work safely. The Certificate is used to specify what isolations are required, that they are in place before work starts and can be removed once work has finished.

Electrical Isolation Certificate – used for safe isolation of electrical equipment.

Diving Permit – used for diving activities at marine locations.

Radiography Permit – used whenever radioactive sources are required.

Excavation Permit – used whenever excavations at land-based sites are required. Identification of existing underground services that may be affected is important.

Confined Space Entry Certificate – used for entry of personnel into confined spaces.

Anchoring – for any anchoring or mooring activities within 500m of an offshore installation.

Other types of complementary permits and certificates are permissible. Their use should be justified after specific analysis of site work conditions and requirements.

6.3 PERMIT TO WORK FORMAT

One of the main intentions of this Standard is to ensure that Permit to Work Forms with a high degree of commonality are used on PTTEP sites. Specific details (e.g. permit form layout) shall be agreed and developed on-site following the requirements below. The involvement in this review of all levels of site personnel involved in the PTW system shall be ensured.

Colour Coding

The following colour coding shall be used for permits and certificates;

Permit / Certificate	Colour
Cold Main Permit	Blue or blue edged
Hot Main Permit (1)	Red or red edged / striped
Process / Mechanical / ESD Isolation Certificate	Black edged
Electrical Isolation Certificate	Yellow or yellow edged
Diving Permit	White
Radiography Permit	White
Excavation Permit	White
Confined Space Entry Certificate	Green or green edged
Anchoring	White

(1) Hot Work Naked Flame permits shall be identified by use of a red stamp.

Table 1 Permit Colour Coding

Language

The main language used for procedures, permits and certificates shall be English. However, multi-language formats are permissible where this is justified.

Note: as permits are written documents an appropriate level of reading comprehension must be displayed by personnel involved.

Information Required

The following basic information shall be required on permits and certificates, which shall be designed to allow for the information to be recorded clearly:

- Unique permit reference number.
- Description of task to be done
- Description of exact location / plant number(s)
- Details of work party and tools to be used.
- Details of potential hazards.
- Details of precautions required, including isolations and PPE.
- Precautions necessary and actions in the event of an emergency.
- Other persons to notify / approve work.
- Date, time of issue and period of validity.
- Signature of person in charge of work.
- Signature of the person issuing the permit which confirms that the site has been checked and that equipment may be reinstated or left safely isolated and that the permit is cancelled.
- Signature(s) for handover of responsibilities between shifts.
- Cross-reference to other permits / certificates associated with the Main Permit.
- Declaration by person in charge of work that work is complete or incomplete and site has been left in a safe condition.
- Space for recording site checks, gas checks etc.

6.4 PERMIT VALIDITY

Permit and certificate validity is as follows:

Permit / Certificate	Validity
Cold Main Permit	7 days with re-validation every shift, up to a maximum of 14 shifts(1).
Hot Main Permit – Non Naked Flame	7 days with re-validation every shift, up to a maximum of 14 shifts(1(2)).
Hot Main Permit – Naked Flame	One day or two consecutive shifts (1)(2)(3)
Process/Mechanical/ESD Isolation Certificate	For duration of the isolation (3)
Electrical Isolation Certificate	For duration of the isolation (3)
Diving Permit	One shift (1) (2)
Excavation Permit	One shift (1) (2)
Confined Space Entry Permit	One shift (1) (2)
Anchoring	For duration of mooring / anchoring.

Notes

(1) Shift means up to a 12 hour work period.

(2) The authorized validity duration shall be mentioned in permit approval section.

(3) By default, the validity is 1 day or 2 consecutive shifts but can be extended as agreed by PTW meeting & highlighted in section 2 approval of hot main work permit. NFHW permit will lose automatically its validity upon anyone of the Field Manager, Production Authority or Safety Authority crew changing.

(4) Where isolation is required longer than the duration of the work permit (e.g. equipment major overhaul) the isolation permit remains valid but the main permit is cancelled. Such cases should be recorded in a Long Term Isolation Log Book kept in the Control Room.

Table 2 Permit Validity

Other types of permit not listed above that may be required on site shall have their validity determined as required.

6.5 PERMIT TO WORK ISSUING STEPS

Raising / Reviewing / Issuing / Completing Permits

The following steps shall be followed when applying the PTW procedure.

1. Raising the Main Permit

This must include a description of the work to be done, equipment to be worked on, location of work, tools to be used and number of workers involved.

2. Reviewing the Permit.

The permit shall be reviewed for work content and specifying what needs to be done to prepare the work site / equipment to make it safe to work on e.g. inhibits, isolations, venting, purging etc. Complementary permits / certificates are raised at this stage.

The permit shall also be reviewed in order to specify what safety precautions personnel working must follow e.g. PPE, standby man.

Potential interactions with other work shall be identified at this stage.

3. Implementing the Above Requirements.

The worksite must be prepared according to the requirements of the Main Permit and any supporting Complementary Permits/Certificates. This can include installing isolations etc.

Confirmation that the site has been prepared safely must be made by site visit and recorded on the Permit.

4. Checking the Site

A final check that the work site is safe shall be made before issuing the permit. This will include any gas check if required. (Note: site checks must be repeated during the performance of work, below)

5. Issuing the Permit.

Signatures for the issuing authority and person receiving the permit must be made. Copies of permits are distributed as required.

Permit issue shall **only** be authorized by the final signature of the Production (or Operation) authority on site. In certain cases an extra level of authorization is needed – this should be at Site Manager level for Hot Work Naked Flame permits and any other work with a potential significant impact e.g. heavy lifts, single valve isolations where process design does not permit alternatives etc.

Issue of a permit by / to the same person is prohibited.

6. Receiving the Permit.

The person receiving the permit must agree to follow all the conditions specified and communicate such conditions to the rest of the personnel in the work team. A copy of the permit must be displayed at the work site.

7. Performing Work as per Permit Requirements.

The safety precautions specified on the permit must be complied with fully by all in the work team. In case of any uncertainty stop work and ask for guidance from supervision/ safety.

8. Suspending work if conditions or work scope changes.

Permits will be suspended if:

- The conditions of work change from that described on the permit.
- An emergency situation is declared.

- In case of any uncertainty or question about the work planned.
- Spares are not available.
- There is a conflict with another work task.

Suspended permits must be kept in the PTW recording system. The condition in which plant / equipment is suspended must be checked and safe. The permit must be re-validated when work can commence again.

9. Re-validating the Permit (Handover).

Permits must be revalidated when they extend beyond their specified duration (typically a shift). Incoming shift personnel must be made aware of the work, its status and the status of plant/equipment. A PTW Log, file or display boards shall be used to record ongoing permits. Good communication during shift handovers is essential.

10. Completing Work and Re-instatement (Handback).

Once work is completed the work site can be re-instated to its normal condition (e.g. isolations and inhibits can be removed). Confirmation that work has been completed shall be made by the person to whom the permit was issued. The person in control of operational activities shall acknowledge on the permit that plant/equipment has been returned to operational responsibility.

Responsibilities

The above steps shall be the responsibility of the site departments / sections below.

Work Step	Responsibility (1)
Raising the Permit	Originator
Reviewing the Permit for Work/Safety Requirements	Production / Maintenance / Safety
Implementing Above Requirements	Production / Maintenance / Safety
Checking the Site	Production / Safety
Issuing the Permit	Production
Receiving the Permit	Permit User
Performing Work	Permit User and Work Team
Suspending Work	Permit User / Production
Re-Validating the Permit	Permit User / Production
Completing Work and Reinstatement	Permit User / Production

(1) Main responsibilities shown. Other such as Well Service, Construction can also apply.

Table 3 Responsibilities in Permit Process

6.6 WORK COORDINATION

There shall be a daily meeting to coordinate work on site. Permits for the following day's work should be submitted for review at this meeting. Note: only permits that are required for urgent work can be applied for on the day they are issued.

Attendees should be Operations/Production, Maintenance, Inspection, Logistics, Safety etc as appropriate to site circumstances.

6.7 PERMIT TRACKING AND DISPLAY

After issue, copies of permits shall be clearly displayed at:

- The work site, or in a recognized location near to the work site.
- In the central or main control room or permit coordination room, with additional copies at local control rooms.
- In addition, a copy of the permit should be kept with the issuing authority or with the area authority if that person is not located at the worksite or control room.
- Additional copies may be used as per site requirements.

A Permit Location Map shall be displayed in central control rooms. This shall be of a suitable size to show basic site layout (including deck levels) and equipment. The location where work is being carried out under Permits shall be shown using appropriate movable symbols. They can be colour coded as per Permit requirements e.g. white = cold work, red = hot work etc. The map shall be kept updated.

6.8 PERMITS AND RISK ASSESSMENT

The PTW system is connected with the risk assessment process. Risk assessments are used to identify hazards and risk reduction measures, which can be cross referenced to permits.

When a task is to be performed a check should be made to see if an existing Job Safety Analysis exists. If yes, this can be used as supporting documentation for the permit – providing review shows that the work conditions are the same.

If the work to be performed is a new task a Job Safety Analysis should be performed.

Some work may be outside the scope of a Job Safety Analysis and in these cases a specific risk assessment using other techniques may be used.

6.9 TRAINING, COMPETENCE AND APPOINTMENT

All personnel shall be briefed on PTW requirements when they attend the site safety induction.

Further detailed training and assessment of competence in PTW shall be provided for those personnel involved directly in raising, evaluating, filling out, issuing and completing permits.

Such personnel will be appointed in writing to fulfill their roles and responsibilities under the PTW system by the Site Manager after training has been completed and competence successfully assessed. An up to date list of such personnel shall be kept on site.

6.10 DOCUMENTATION

It is important that the PTW system is properly documented by assets / sites in the form of written Procedures or Instructions. The essential features are:

- Documentation should be controlled.
- Have a specific owner.
- Be accessible.
- Be periodically reviewed and amended if needed. 3 yearly is recommended unless there are other changes that require amendment sooner.
- Be a standard to be audited against.

Copies of used permits shall be retained on site for a period of 1 year prior to destruction.

6.11 AUDIT AND VERIFICATION

Verification

Verification that compliance with the PTW system is being achieved shall be regularly undertaken. This can be performed by Management and Supervision on-site. A weekly verification of PTW compliance is recommended, with a set % of Permits / certificates issued being verified (e.g. 10%). Deviations from the PTW procedure shall be corrected. Results should be recorded on a checklist and deviations corrected. See Appendix 3 for a verification checklist.

Audit

Systematic, detailed audits of PTW systems shall be undertaken. These should be done annually and included in the Asset SSHE Plan. Such audits should be performed by personnel not normally associated with the day-to-day running of the PTW system. See Appendix 4 for an audit checklist.

PTW audit/verification shall be used as a SSHE Performance Indicator (e.g. # of audits/verifications completed vs those planned; % of permits verified having defects/non-compliances).

7.0 APPENDICES

APPENDIX 1: PERMIT TO WORK 8 ESSENTIAL RULES

PERMIT TO WORK ESSENTIAL RULES

1. **All those involved in the permit to work system are trained and competent.**
2. **All risks have been removed or controls are in place.**
3. **The Performing Authority is aware of interactions with other permits, tasks, or simultaneous operations and these are cross-referenced on the permit.**
4. **The Performing Authority has visited the worksite prior to start of work.**
5. **The Performing Authority is satisfied that, where required, the integrity of isolations has been verified.**
6. **A toolbox talk has been conducted at the worksite involving all members of the work party.**
7. **For ongoing work, there has been a handover discussion at the worksite.**
8. **The work has been completed and handed back in a safe condition.**

If any of the above cannot be complied with or you are unsure, then stop work and ask.

APPENDIX 2: HOT WORK NAKED FLAME REQUIREMENTS

Note: the following requirements are taken from the "Hot Work Policy" memo PTTEP/300/M.190/06 dated 8 December 2006.

The purpose is to reduce as far as is reasonably practical the chances if ignition in case of a major hydrocarbon release. To achieve such a purpose the focus of attention shall be on finding "cold" solutions instead of having to employ hot work. If hot work does have to be performed then suitable additional precautions must be taken.

Naked Flame Hot Work (NFHW)

This covers any of the following activities:

- Welding.
- Use of regular grinding wheels / cutting wheels.
- Heat shrinking using naked flame or electric dryer.
- Pre-heating.
- Post weld heat treatment.
- Burning.
- Stud welding.
- Use of Zone 2 diesel driven engines in a classified zone (exhaust and turbo charger may remain hot after shutdown.

Note: hot tapping is a non-routine activity that shall be subject to specific risk assessments and studies before work commences. These shall address required safety precautions. Hot tap drilling is cold work but welding the saddle is Naked Flame Hot Work.

In addition to the above NFHW includes the use of any equipment or tools that constitute an effective ignition source which during normal use could ignite an explosive atmosphere and / or solids or liquids. In other words the ignition source emits high energy in the form of sparks, open flame, flame arc and / or has a surface temperature that is higher than the ignition temperature for the medium that might be exposed to ignition.

NFHW Within Any Hazardous / Classified Area

This type of work should be avoided during normal production operations and should be deferred to planned shutdowns.

NFHW in hazardous / classified areas shall only be done where:

- Alternative work methods have been evaluated, documented and found to be not practical **and**
- The risk of delaying the work to a shutdown is considered greater than undertaking the NFHW while production is ongoing.

A review shall be done within the modification process to check that the work being planned is really necessary and that the work itself does not add significant / unacceptable additional risk to the operation.

If the work is to go ahead then in addition to the normal precautions (gas checks…) all NFHW within a hazardous classified area on an operating hydrocarbon facility shall have the following precautions:

- Job Safety Analysis is performed.
- A habitat is erected and "pressurized" with air bought from a safer location.
- Hot Work Naked Flame permit to be approved by the Site Manager.
- A visit to the work site is made by the Production Authority and Performing Authority.
- Precautions for use of Zone 2 diesel driven engines in a classified zone shall be evaluated on a case-by-case basis by risk assessment. In practice erecting a habitat over the engine may be difficult.

NFHW Outside Hazardous / Classified Areas

Overall, the same basic precautions shall apply outside hazardous /classified areas for NFHW on an operating hydrocarbon facility except that the decision for a habitat shall be made on a case by case basis.

Non Naked Flame Hot Work

This covers any of the following:

- Sand / grit blasting.
- Use of needle gun.
- Opening of live junction boxes.
- Electrical isolation testing (mega metering).
- Use of copper bits.
- Use of camera with battery / flash / motor.
- Use of electrical / battery operated equipment.
- Instruments that are not certified in relation to the areas where they are being used.
- Use of rotating wire brushes.

Any of the above work shall be undertaken with a Hot Work Permit.

Temporary Equipment

Temporary equipment (PTTEP or contractor) that is to be used in an operating hydrocarbon producing facility (inside or outside hazardous / classified areas but outside pressurized areas) shall be certified for the Zone requirements or as a minimum to be Zone 2 standard.

Specialist advice shall be sought from Asset / Division SSHE personnel first, Corporate SSHE second, if this requirement cannot be met.

Permanent equipment that is to be installed shall comply with Management of Change requirements with respect to hazardous area classification as part of the modification process.

Emergency Situations

The Site Manager has the right to deviate from the above in emergency situations. Emergency in this case means a direct threat to the safety of people, the environment or the asset.

Notes

Hazardous / classified areas shall be defined by IP15.

Operating hydrocarbon facilities include any platform with "live" wells or "live" hydrocarbon production facilities. Offshore, separate Living Quarters platforms are not included, and bridges connecting platforms are included if they carry hydrocarbons.

APPENDIX 3: CHECKLIST FOR DAY TO DAY PERMIT MONITORING

Checklist for Day-to-Day Permit Monitoring		
Date:	**Time:**	**Active:**
Permit Type:	**Permit number:**	**Complete:**
Reviewer:	**Position:**	**Site:**
Attached Permits / Certificates (list):		

If any unsafe conditions are found, stop work and inform the performing authority.

Check	Yes	No	N/A
1. Is the work specified clearly?			
2. Are necessary risk assessments available for review?			
3. Are identified hazards listed on the permit to work?			
4. Are appropriate precautions listed on the permit to work?			
5. Is the operational time limit of the permit clear (extensions authorized)?			
6. Are attached permits / certificates completed properly?			
7. Are other area or systems activities cross-referenced on the permit?			
8. Are copies of permits, certificates and attachments legible?			
9. Are signatures legible and traceable?			
10. Are copies of permits / certificates displayed at correct locations?			
11. Are attachments, drawings etc held at correct locations?			
12. Are users briefed in permit to work, do they understand requirements?			
13. Do people know what to do in an emergency?			
14. Are isolations appropriate for work, clearly specified + implemented?			
15. Are common isolations cross-referenced?			
16. Are the right people aware of isolated equipment?			
17. Is the area authority aware of work?			
18. Is the work carried out in conformance with the permit?			
19. Are control measures and PPE appropriate for the task?			
20. Are tools and equipment suitable and in good condition?			
21. Is housekeeping satisfactory?			
Comments:			

Reviewer:	**Signature:**
Performing Authority:	**Signature:**

APPENDIX 4: PERMIT TO WORK ASSESSMENT AND AUDIT CHECKLIST

The checklist can be used when setting up a new permit system or auditing an existing one.

Item	Finding
Policy	
1. Is there a clearly laid down policy for risk assessment of high-hazard work and their control procedures?	
2. Are the objectives of the permit system clearly defined and understood?	
3. Is the permit system flexible enough to allow it to be applied to potentially hazardous work, apart from that which may have been identified when the system was established?	
Organising	
4. Are responsibilities for the following made clear: managing the permit system; permit form design and system scope; types of jobs subject to permit; contractor control?	
5. Are the types of work, or areas where permits must be used defined and understood by all concerned?	
6. Is it clearly specified who may issue permits?	
7. Is it clearly specified how permits should be obtained?	
8. Are people prevented from issuing permits to themselves?	
9. Is the permit system recognized throughout the asset / site as being essential for certain types of work?	
10. Are copies of permits issued for the same area / equipment displayed together?	
11. Is there a PTW display board in the control room and is it updated?	
12. Is there a means of coordinating all work activities to ensure potential interactions are identified?	
13. Is there provision on the permit to cross-reference other relevant permits / certificates?	
14. Is there a means to ensure other people who could be affected by the proposed work give their agreement before preparations / work starts?	

15. Where there are common isolations for more than one permit is there a procedure to prevent de-isolation before all permits have been signed off?	
16. If an electronic system is used is a valid means available to recover the coordination of work activities in the event of the system failing?	
Communication	
17. Does the permit system provide both for the recipient to retain the permit and for a record of live permits and suspended permits to be kept at the point of issue?	
18. Does the system require a copy of the permit to be displayed at the workplace?	
19. Do permits clearly specify the job to be done?	
20. Do permits clearly specify whom they are issued to?	
21. Do permits clearly specify the plant or area to which work must be limited?	
22. Does the recipient have to sign the permit to show that they have read and understood the hazards and control measures specified?	
23. Do permits clearly specify a time limit for renewal / expiry?	
24. Does the permit include a handover mechanism for work which extends beyond a shift or other work period, including work that has been suspended?	
25. Is a hand-back signature required when the job is complete?	
Training and Competence	
26. Is the permit system thoroughly covered during asset / site safety induction training?	
27. Are personnel who have designated responsibilities under the permit system properly trained and authorized?	
28. Do people have sufficient time to carry out their duties properly?	
29. Does the permit system require a formal assessment of personnel competence before they are given responsibilities under the system?	

30. Is a record of training and competence maintained?	
31. Do training and competence requirements include contractors with responsibilities under the permit system?	
32. Are individuals provided with written confirmation of completion of relevant training, and are these documents checked before appointments are made within the permit system?	
33. Do authorized issuers have sufficient knowledge about the hazards associated with relevant plant?	
Planning and Implementation	
34. Does the permit clearly specify the job to be done?	
35. Is there a set of properly documented isolation procedures for use when working on potentially hazardous items of plant and do they provide for long-term isolation?	
36. Is there a clear requirement for work being done under a permit to be stopped if site conditions change or any new hazards arise?	
37. Does the permit contain clear rules about how the job should be abandoned in the event of an emergency?	
38. Does the permit system require any potential hazards at the work site to be clearly recorded on the permit?	
39. Does the permit clearly specify the precautions to be taken by permit users and other responsible people?	
40. Is there a procedure to identify and monitor tasks which require inhibiting safety devices to ensure that contingency plans and precautions are in place?	
Measuring Performance	
41. Is there a monitoring procedure or are there scheduled spot checks to ensure that permits are being followed?	
Audit and Review	
42. Is there a procedure for reporting any incidents that have arisen during work carried out under a permit?	

43. Is the permit system audited as appropriate, preferably by people not normally employed at the asset / site?	
44. Is there a procedure for reviewing the permit system at defined intervals?	

เอกสารแนบ 2-25

SSHE Plan 2023

2023 SPH SSHE Plan

Element	Description	Frequency / Minimun Requirements	Action Party	Supporting Action Party	Deliverables / Evidence	2023 J	F	M	A	M	J	J	A	S	O	N	D	Score
1	**Leadership and Commitment** Theme - Strengthen Leadership & Commitment to SSHE by visible demonstration for continuous improvement																	70
1.1	Monthly SSHE meeting chaired by Management	12 Monthly	PTN,PSP/H	All	Minute of meeting	1	1	1	1	1	1	1	1	1	1	1	1	12
1.2	Contractor SSHE meeting chaired by Management	12 Monthly	PSP/H	BES,G4S and Yimsiam	Minute of meeting	1	1	1	1	1	1	1	1	1	1	1	1	12
1.3	Safety Committee Monthly meeting, walk about patrol	12 Monthly	PSP/H	SSHE Committee	Audit Report	1	1	1	1	1	1	1	1	1	1	1	1	12
1.4	Top management SSHE visit to demonstrate visible leadership and commitment.	2 Time(s)	SVP, VP	PSP/H	Audit Report				1							1		2
1.5	Collaborative Committee Meeting	2 Time(s)	PSP/H	PSP/H	Minute of meeting		1								1			2
1.6	Onsite walk about audit (PTW audit , promote BBS) by Team Lead	12 Monthly	Shift Sup, Maintenance Sup, SSHE Sup	All	Audit Report	1	1	1	1	1	1	1	1	1	1	1	1	12
1.7	Conduct STOP Work Authority (SWA) exercise (Lead by management and Supv.)	6 bi-monthly	Shift Sup, Maintenance Sup, SSHE Sup	PSP/HS	Exercise report		1		1		1		1		1		1	6
1.8	SPH Field Manager SSHE visit to demonstrate visible leadership and commitment	12 Monthly	PSP/H	PSP/HS	Audit Report	1	1	1	1	1	1	1	1	1	1	1	1	12
2	**Policy and Strategic Objectives** Theme - Policies known and implemented; strategic objectives clearly stated and understood																	1
2.1	Develop SSHE Plan/SSHE KPI in alignment and consistent with corporate SSHE, communicate to SPH member	1 Once	PSP/HS	PSP/H	SSHE Plan	1												1
3	**Organisation, Resources and documentation** Theme - SSHE Roles & Responsibilities known, accepted and implemented by all persons. SSHE legislations are updated, communicated & implemented.																	49
3.1	Achieve compulsory SSHE trainings as required by law and SSHE MS	12 As planned	PSP/HS	All	Training record	1	1	1	1	1	1	1	1	1	1	1	1	12
3.2	SPH SSHE Culture implementation follow-up and monthly progress update in SSHE meeting.	12 Monthly	PSP/HS	All	Improvement Plan	1	1	1	1	1	1	1	1	1	1	1	1	12
3.3	SSHE Culture Awards & Recognition	12 Monthly	PSP/HS	All	Record of Award	1	1	1	1	1	1	1	1	1	1	1	1	12
3.4	Review and update SPH SSHE documents in alignment of corporate SSHE standard	12 Monthly	PSP/HS	All	Document	1	1	1	1	1	1	1	1	1	1	1	1	12
3.5	Updated SPH Waste Management Plan	1 Once	PSP/HS	PSP/HS	Document issued for DMF reviewed								1					1
4	**Evaluation and Risk Management** Theme - SSHE risks identified and evaluated for activities, products and services. Risk reduction measures developed. SSHE cases updated																	25
4.1	Update e-JSA to cover all area, activities	12 Monthly	PSP/HS	All	Document	1	1	1	1	1	1	1	1	1	1	1	1	12
4.2	SPH Re-HAZOP (GPP and Wellpad)	1 5 Year	PSP/H	All	Document								1					1
4.3	Monitor the status of MAE prevention tool	12 Monthly	PSP/HS	All	Document	1	1	1	1	1	1	1	1	1	1	1	1	12
5	**Planning and Procedures** Theme - Control of work activities, including planning for changes and emergency response implemented																	37
5.1	Develop/Review contractor SSHE plan/ implementation and monthly progress update	12 Monthly	PSP/HS	BES,G4S and Yimsiam	SSHE CN	1	1	1	1	1	1	1	1	1	1	1	1	12
5.2	Annual Major Emergency Exercise (Tier2)	2 Time(s)	PSP/HS	CSA/S	Report			1					1					2
5.3	BCP table top exercise	1 Once	PSP/HS	HEM, CSA/S	Report						1							1
5.4	Major Spill Table Top Exercise	1 Once	PSP/HS	PTT , OLG	Report									1				1
5.5	Monthly Emergency Exercise (26 MAE and pre-fire plan)	12 Monthly	PSP/HS	All	Report	1	1	1	1	1	1	1	1	1	1	1	1	12
5.6	SSHE Support for 2022 Drilling, Well service and Construction to ensure SSHE performance and collaboration.	9 As Planned	PSP/H	OTN'O	Record of activities				1	1	1	1	1	1	1	1	1	9
6	**Implementation and Monitoring** Theme - SSHE Plans implemented & monitored. Strengthen staff SSHE Awareness through SSHE Campaign. Enforcement SSHE Learning from experiences to prevent accident from reocccurring																	38
6.1	Implement Walk & Talk program and promote SOC & HRC	12 Weekly	All	All	SOC/HRC Record	1	1	1	1	1	1	1	1	1	1	1	1	12
6.2	Completed SSHE related reports	12 Monthly	PSP/HS	All	Report	1	1	1	1	1	1	1	1	1	1	1	1	12
6.3	Implement Methane and LOPC Full Survey by FLR	1 Once	PSP/HS	PDO SSHE	Report				1									1
6.4	Implement Methane and LOPC Survey by Laser methane gun	12 Monthly	PSP/HP	PSP/HS	Report								12					12
6.5	Conduct 2023 SPH SSHE incident review and prevention workshop	1 Once	PSP/HP	PTN SSHE	Report								1					1
7	**Audit and review** Theme - Enforce SSHE audit, HRC to eliminate unsafe acts/conditions. Perform management system audit via internal & external parties (OHSAS18001 & ISO14001). Management review of SSHE MS for continuing effectiveness and continuous improvement																	28
7.1	Final PTW document audit	12 80% of Issue PTW monthly	PSP/HS	PSP/HP	Audit Record	1	1	1	1	1	1	1	1	1	1	1	1	12
7.2	Integrated SSHE MS Audit	1 Once	PSP/H	PDO SSHE	Audit Record				1									1
7.3	ISO14001/ ISO45001 external audit	1 Once	CPA/T	All	Audit Record								1					1
7.4	DMF Annual HSE and Waste Audit	1 Once	CPA/T	All	Audit Record												1	1
7.5	Clinic Audit and Hygiene Inspection (combile with SSHE integrated audit)	1 Once	CSH/M	All	Audit Record				1									1
7.6	Food & Hygiene audit to food provider	4 Time(s)	PSP/HS	PSP/HS	Audit Report			1			1			1			1	4
7.7	Independent Security Audit	4 Quarterly	PSP/HS	G4S	Audit Report		1			1			1			1		4
7.8	EIA compliance internal audit	2 Time(s)	3rd party (UAE)	All	Audit Report					1							1	2
7.9	Contractor SSHE MS Audit	2 Time(s)	PSP/HS	PDO SSHE	Audit Report				1					1				2
8	**Sustainable Development (SD)** Themes - Projects supporting the SSHE commitment / Corporate requirements & Sustainable Development																	12
8.1	Support and provide data for Environment Monitoring report to PTT/PTTEP	12 Monthly	PSP/HS	CEN'O	Data Base	1	1	1	1	1	1	1	1	1	1	1	1	12
9	**Special Projects** Themes - Projects supporting the SSHE Commitment / Corporate requirements & Sustainable Development																	38
9.1	SSHE and EPSPIRIT day	1 Once	PSP/HS	SPH Staff with Business Partner	Record of Event												1	1
9.2	Green Office Project	12 As Planned	PSP/HS	All	Certification	1	1	1	1	1	1	1	1	1	1	1	1	12
9.3	Implement and Monitor Biodiversity Action Plan (BAP)	12 Once	PSP/H	PMM/S	Action Plan identification completed	1	1	1	1	1	1	1	1	1	1	1	1	12
9.4	Waste Management Improvement Plan for Thai Domestic Onshore Asset to achieve zero waste to landfill	1 As Planned	PSP/H	CEN'O	Document		1											1
9.5	Implement Walk and Talk program by applying the concept of 4Cs roles for supervisors.	12 As planned	PSP/H	All	Record of Event	1	1	1	1	1	1	1	1	1	1	1	1	12
Total Score = 298																		

เอกสารแนบ 2-26

เอกสารแสดงแผนผังแสดงป้ายเตือน อุปกรณ์ล้างตาฉุกเฉิน และอุปกรณ์ดับเพลิง

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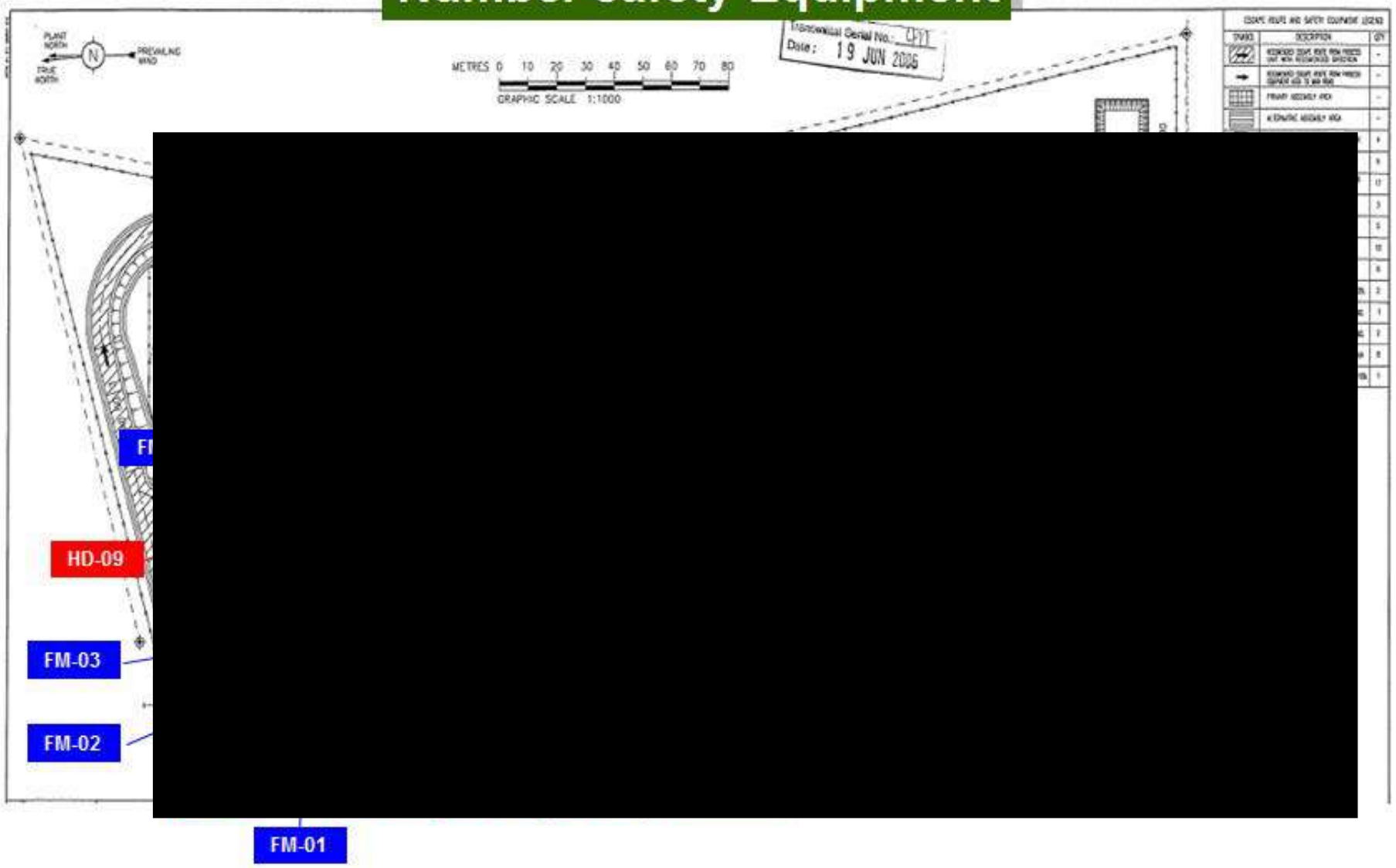

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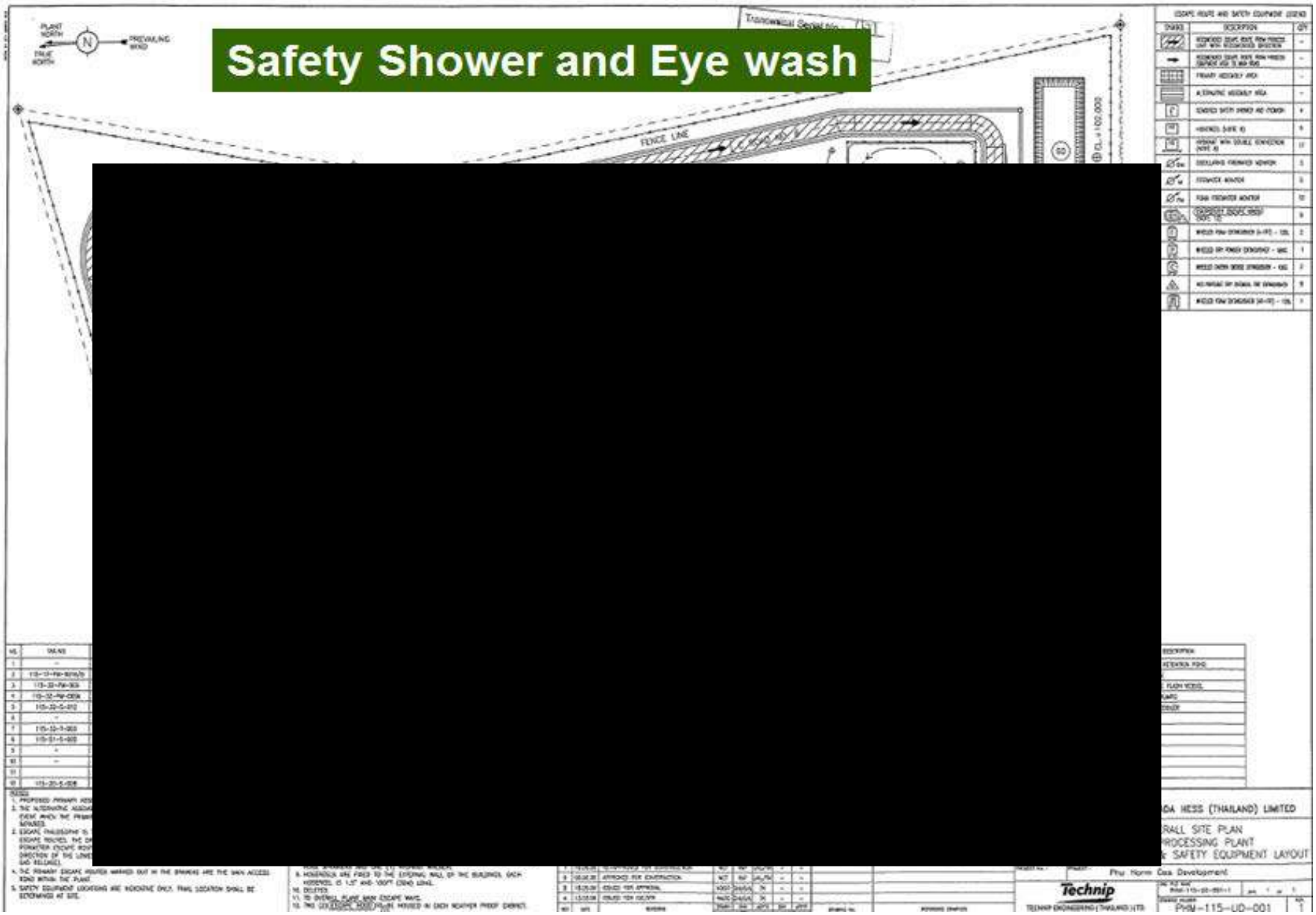

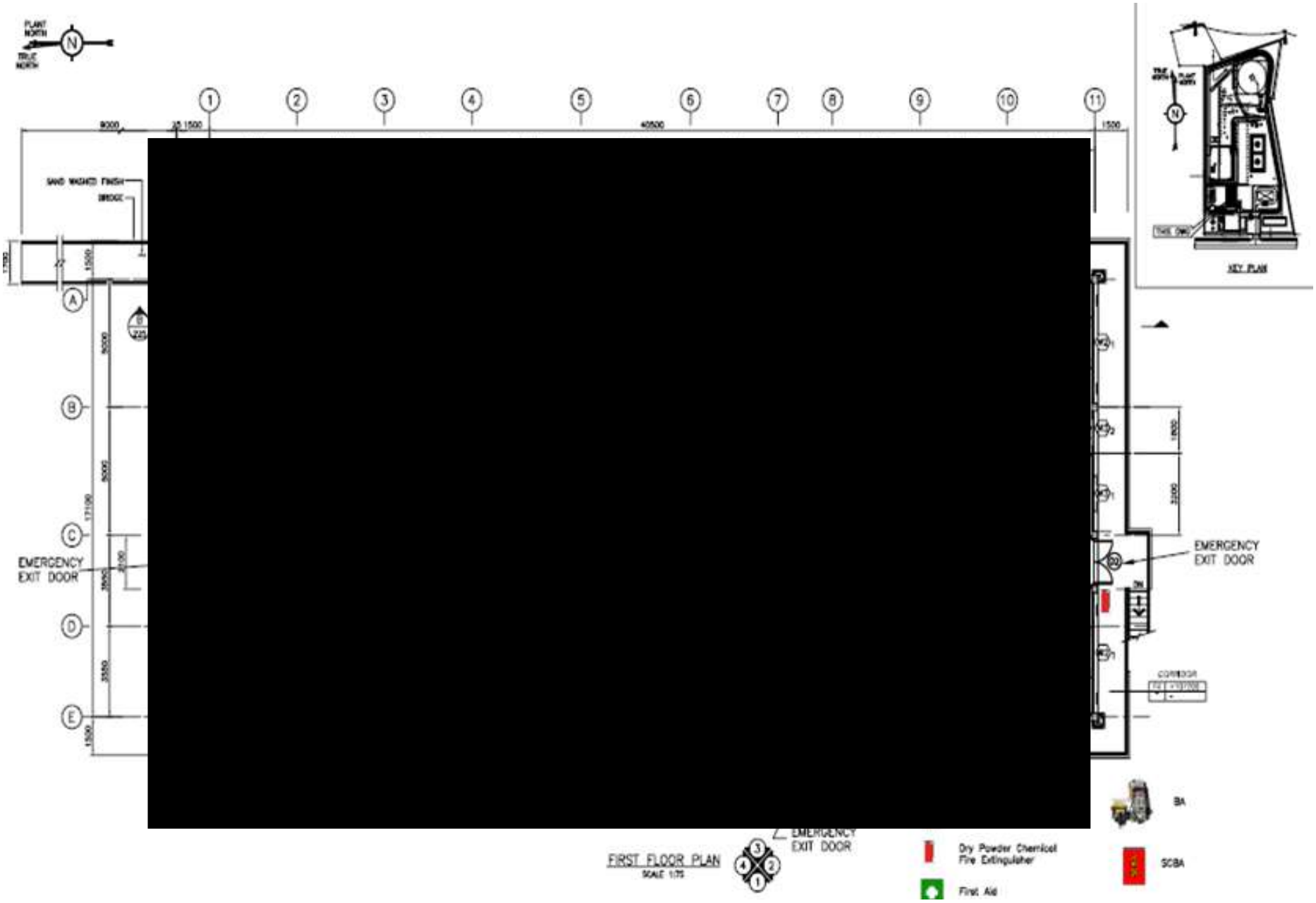
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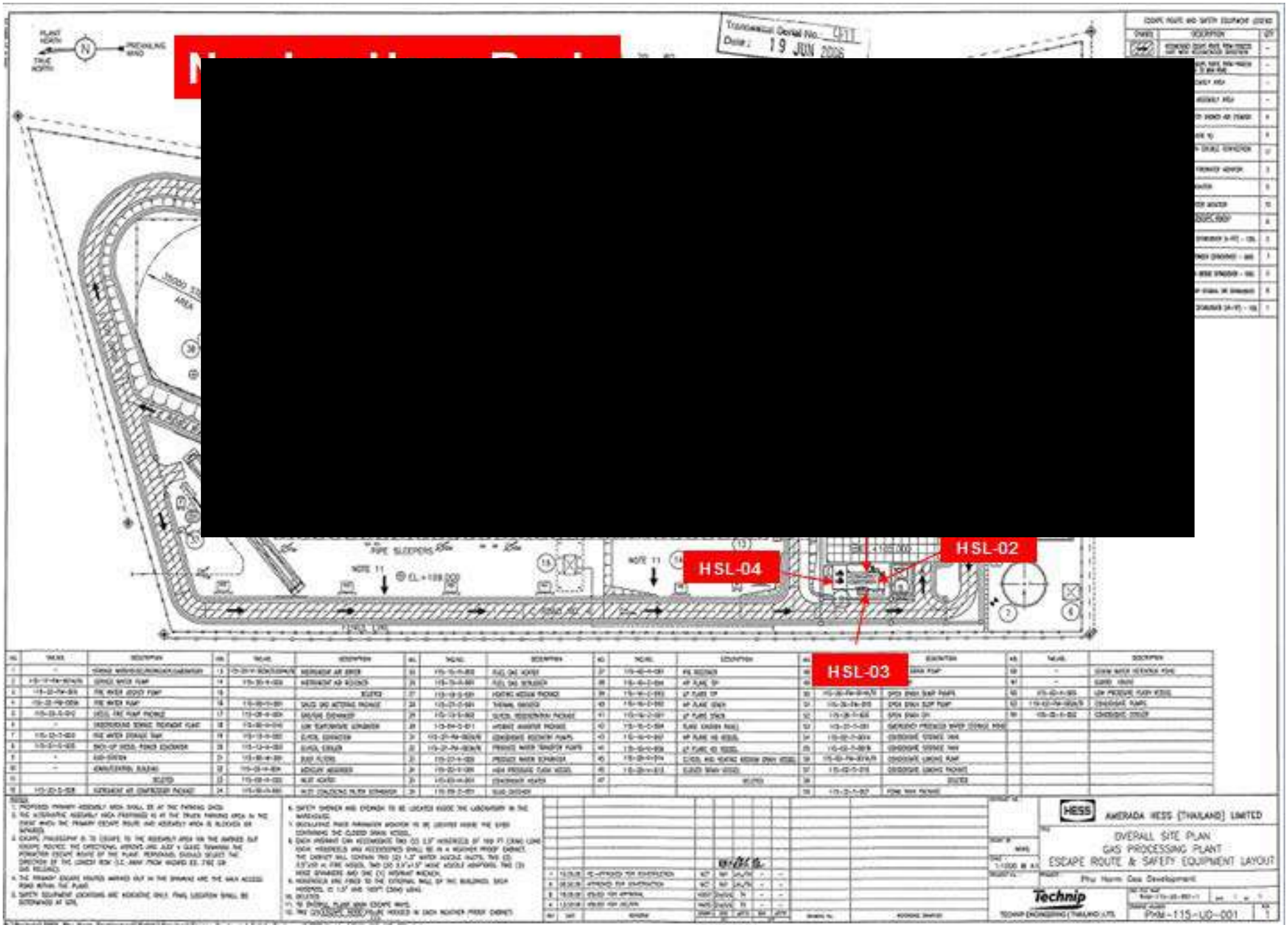
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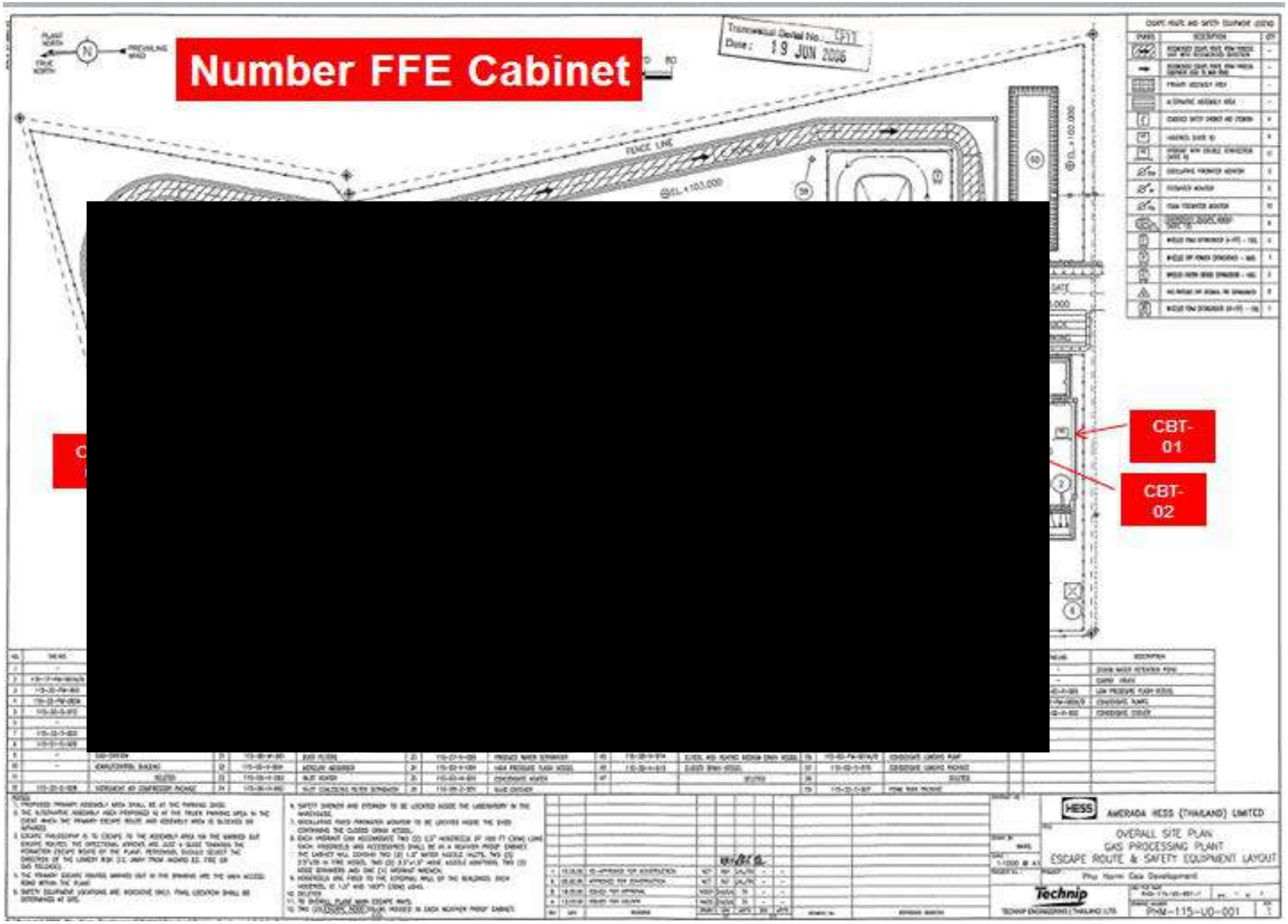
GAS PROCESSING PLANT
ESCAPE ROUTE & SAFETY EQUIPMENT LAYOUT
Phu Horm Gas Development
Technip
PHM-115-UD-001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OVERALL SITE PLAN
GAS PROCESSING PLANT
ESCAPE ROUTE & SAFETY EQUIPMENT LAYOUT
Technip
PHM-115-U0-001

หัวข้อที่ ๕ อุปกรณ์และระยะเวลาการฝึกซ้อม

๕.๑ อุปกรณ์การฝึกซ้อมเป็นอุปกรณ์ที่ใช้จริงอยู่ในสถานประกอบการที่มีความปลอดภัยและสามารถใช้งานได้ ได้แก่

(๑) เครื่องดับเพลิงแบบเคลื่อนย้ายได้

สายน้ำดับเพลิง 6 ชุด	ผ้าห่มดับเพลิง 7 ชุด	ถังดับเพลิงผงเคมีแห้ง 21 ถัง	ถังดับเพลิง Co2 52 ถัง

(๒) สายน้ำดับเพลิงและอุปกรณ์ประกอบ

ระบบ FM 200	ตู้เก็บชุด 2 ชุด	ระบบปั๊มน้ำดับเพลิง	ถังเก็บน้ำดับเพลิง
ไฟฉุกเฉิน 16 จุด	ระบบตรวจจับความร้อน	ระบบตรวจจับควัน	หัวฉีดน้ำดับเพลิง

(๓) อุปกรณ์ด้านการปฐมพยาบาล

ชุดปฐมพยาบาล	เตียงปฐมพยาบาล	ยาและเวชภัณฑ์	ห้องพยาบาล

เอกสารแนบ 2-27

Emergency Response Plan

PTTEP

PTT Exploration and Production Public Company Limited

SINPHUHORM FIELD

(PSH/F)

Emergency Response Plan

Document Code: 13249-PDR-SSHE-502.01-R02

Revision No: 2

May 2017

Approval Register	
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Document Owner	Kittisak Hiranyaprathip
Prepared by	Surakrit Bunruang

Document Custodian			
Name	Title	Signature	Date
Rachan Engchanil	Field Manager PSH/F	[redacted]	

T	
Name	

Name	
Document Owner	Kittisak Hira PSH
Approval Authority	Kittisak Hira PSH

This document will be reviewed every **5 years** from date of approval or revised earlier if necessary.

Revision History			
Rev.	Description of Revision	Authorized by	Date
0	Revised from Hess to be complied and in line with PTTEP Safe Work Practice for Breaking of Containment	VP	Jun 2016
1	Revised RAM to align with corporate procedure	VP	Jan 2017
2	Change contact numbers of Sinphuhorm	VP	May 2017

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1.0 PURPOSE

Primary purpose of the PTTEP SP Limited Emergency Response Plan is to cover all the strategy and objectives of the Emergency Response in the following order of priority:

I. Protection of People
II. Protection of Environment
III. Protection of Property/Asset
IV. Protection of the Business and Reputation

The purposes of PTTEP SP Limited Emergency Response Plan are to:

- Clearly provide background information on the concept of operations for responding to emergency and crisis, regardless of nature, severity, affecting the Sinphuhorm Operations. Although it is flexible in nature, acceptance and application of the concept should be viewed as a critical success factor in Asset ability to organize and manage emergency and crisis response operations, and to take all necessary actions to protect the people, environment, assets and the Company's reputation.
- This Plan also defines the role of the Site Emergency Response Team (ERT) during an actual or potential emergency that could create a crisis for the business. This plan:-
  - Describes the response strategies and the organization during an emergency
  - Sets out the roles and responsibilities of the key personnel involved
  - Contains internal and external notification procedures, community resources, response organization charts, resources and personnel
  - Describes how the ERT will establish communications to manage the immediate impacts of the emergency
  - Describes how local reputation and public issues will be addressed
  - Identifies the links with other third party or internal support networks for accessing additional support resources and developing response strategies

2.0 SCOPE

The plan covers all PTTEP SP Limited operated locations including the Gas Processing Plant, Block Valve Stations, Well Pads and Pipe Line routes. It also covers assistance to other parties as requested. The following events would be considered an emergency, but not limited to:

- Fire, Explosion, Gas Leak
- Natural Disaster (Earthquake, Flood)
- Transportation Emergency
- Environmental Emergency

- Mass Casualty / Fatality / Medical Evacuation
- Security Event: Bomb Threat / Terrorism / Civil Unrest
- Missing Personnel
- Other call for Emergency Supports from local authorities

3.0 REFERENCES

3.1 PTTEP SSHE CONTROLLING DOCUMENTS

Document Number	Document Title
SSHE-106-Manual-00	SSHE Management System Manual
SSHE-106-STD-400	SSHE Risk Management Plan
SSHE-106-STD-500	Emergency and Crisis Management Standard
SSHE-106-STD-590	Chemical Management Standard
SSHE-106-PDR-501	Crisis Management Plan
SSHE-106-PDR-502	Emergency Management Plan
SSHE-106-PDR-503	Corporate Spill Contingency Plan
SSHE-106-GDL-501	Medical Emergency Management Guideline
PTTEP-MS-E04-P001	Relative Response Team Emergency Response Plan
13077-GDL-004-R00	PTTEP Crisis Communication Manual

3.2 OTHER REFERENCE DOCUMENTS

Document Number	Document Title
P-ปภท.-111	PTT Crisis & Emergency Management Standard
	Khon Kaen Emergency Plan
	Udon Thani Emergency Plan

4.0 DEFINITIONS

4.1 GENERAL DEFINITIONS

Terminology	Description
Crisis	Is a major or catastrophic event (out of control emergency). A crisis could result in sustained national impacts over a prolonged period of time; almost immediately exceeds resources normally available to the company, local authorities and country in the impacted area; and significantly interrupts governmental operations and emergency services to such an extent that national security could be threatened. Crisis may challenge the ability and capacity of communities, company and country to achieve a timely recovery Crisis situations include terrorism that results in extraordinary levels of mass casualties, damage, or disruption severely affecting the population, infrastructure, environment, economy, company reputation, national morale, and/ or government functions. In PTTEP crisis situation is treated by a **Tier 3 response.**
Crisis Management Team (CMT) Leader	The President and Chief Executive Officer (CEO) of the company who has the top authority to overall manage a group/company impact related to any crisis situations. He has the authority to activate corporate Crisis Management Team (CMT) and work closely with Asset Emergency Management Team (EMT).
Emergency	Is an occurrence or event, natural or human caused, that requires an emergency response under determination of affected Asset Leader or Acting Person, to protect life, environment, property and reputation or to lessen or avert the threat of a major or catastrophe in any part of the company premises. The external assistance may or may not be needed to supplement the company efforts and capabilities to save lives, environmental, protect property.

Terminology	Description
	public health and safety. Emergency situations can, for example, include major disasters, emergencies, terrorist attacks, terrorist threats, fires, floods, oil and hazardous material spills, marine vessel and aircraft accidents, earthquakes, tropical storms, typhoon, war-related disasters, outbreak of diseases and medical emergencies, and etc. In PTTEP emergency situations can be evaluated and treated by using a tier 1 – 2 response level.
Incident Commander (IC)	Affected Asset's authorized person, who has overall authority and responsibility for supporting and providing tactical activities and action plans to the On Scene Commander (OSC), including the development of strategic objectives. Incident Commander also sets priorities and defines organization of the EMT and the overall action plans for the particular response. He/she has to work closely with Asset EMT.
On Scene Commander (OSC)	An individual responsible for the scene responses, to activate the onsite Emergency Response Team (ERT), to control the frontline emergency response teams and work together with the local authorities when they take over the OSC roles as required by law.

4.2 ORGANISATION AND DEPARTMENTS

Terminology	Description
Corporate	Refers to the PTTEP business groups hierarchically above asset level, and located in the PTTEP headquarters, Bangkok.
Function Group	Refers to a corporate level business group. These may have associated divisions, departments, or operational assets within their hierarchy.

Terminology	Description
Division	A business group may have one or more distinct groups within its hierarchy. These are referred to as divisions.
Asset	Refers to an operational asset, site, or location within a respective business group.
Department	A subgroup within a business group, division or asset.

4.3 LANGUAGE

May	Indicates a possible course of action
Should	Indicates a preferred course of action
Shall	Indicates a course of action with a mandatory status

4.4 COMMON ACRONYMS

CCT	Crisis Communication Team
CEO	President and Chief Executive Officer
CMT	Crisis Management Team
ECR	Emergency Control Room
EMT	Emergency Management Team
ERP	Emergency Response Plan
ERT	Emergency Response Team
IC	Incident Commander
OSC	On Scene Commander
PTTEP	PTT Exploration and Production Public Company Limited
RRT	Relative Response Team
SSHE	Safety Security Health and Environment
SVP	Senior Vice President
VP	Vice President

5.0 ROLES AND RESPONSIBILITIES

Responsibilities for responding to an emergency are divided among several parties. The primary responsibility of mitigating emergency is rested with the asset. The On Scene Commander (OSC) and site support teams are involved to assure that adequate arrangements are available and that an appropriate response is made to deal with an emergency.

The PTTEP SP Limited Emergency Response Team (ERT) is accountable for conducting the physical and tactical on-scene response to facility or asset related emergencies. The ERT also manages any ancillary issues arising from an emergency that have implications to the Company's personnel or operations at a specific Sinphuhorm operating location (operated by PTTEP SP Limited). The overall responsibilities of the ERT focus on:

- Ensure appropriate site control and site safety measures have been implemented;
- Coordinate the activities of the Intervention Team who conduct any physical response to an Emergency at the actual incident scene;
- Co-ordinate activities related to the resources present and available at the Emergency
- Co-ordinate with other responding entities (including local authorities, adjacent Facilities, government);
- Ensure the initial notifications and on-scene interactions with regulatory bodies are completed;
- Escalate the Stakeholder impacts and broader Emergency Response management concerns to the Emergency Management Team (EMT);
- Operationalize the objectives of the EMT, as appropriate.

The EMT will be activated if the emergency is classified as Tier 2 and above in order to provide supports to the ERT as required minimizing the impact to people, facilities, environment and the company reputation. The ERT will gather at the ECR, ERT members will consist of (but not limited to) the following positions:

- On Scene Commander
- Operations Section Shift duty
- Planning duty
- Site Safety Officer duty
- Logistics duty
- Liaison duty
- Intervention Team (Fire Fighting and Medical Team)
- Event Logger
- Administration duty

5.1 ON SCENE COMMANDER

Responsible Person: Field Manager
Role: Site Emergency Response Team Leader (Site OSC)
Report to: Asset Emergency Management Team Leader (at Bangkok)
Location to Report: Emergency Control Room
Emergency level: Tier 1 / 2 / 3
Basic Function: Overall response to any emergency at PTTEP SP Limited Sinphuhorm operations and is accountable for the safety of all personnel and responders and manage the ERT to support emergency activities

Responsibilities:

- Receive Emergency Notification, gather initial information, and provide initial assessment and analysis of the Emergency or Incident, including accountabilities for the incident and response
- Assume overall command of the emergency response
- Activate the Emergency Response Team as appropriate and mobilize the Emergency Control Room
- Establish and assign initial critical tactics to the Emergency Response Team
- Oversee the operation of the Fire/Rescue/Medical team(s) (this may be shared with the Shift supervisor/SSHE supervisor for complex multi-site incidents or incidents where there is a need to undertake emergency response activities for an extended period of time)
- Notify the EMT Incident Commander of the Emergency or Incident as appropriate
- Initiate other required emergency response mobilizations e.g. ambulance, fire police, mutual aid, local govt. etc. and make further notifications as appropriate.
- Ensure critical communication links are established (e.g. Intervention Teams, local authorities etc.)
- Ensure that personnel safety is accorded the highest priority during conduct of emergency or incident response operations, followed by environment and property
- Establish and maintain an organization that is capable of providing management direction to, and support for, at-the-scene tactical response operations
- Ensure emergency or incident response resources are being tracked and managed
- Establish the tactical objectives for the ERT and record them in the IAP
- Establish a communication schedule with the Asset EMT for regular situational updates, including the issuance of important events, commitments, decisions, etc., regarding the emergency status periodic Situation Status Reports (Site Reps)
- Ensure the ERT response is coordinated with other responding agencies
- Ensure any objectives of the asset EMT are implemented by the ERT

- Regularly reassess Incident Potential and worst case scenarios as the situation evolves and ensure objectives and action plans are adjusted as required
- Review ERT resources and ensure the adequacy and organization of the resources is appropriate
- Request assistance or support from the EMT as required
- Determine when it is appropriate to stand down the ERT and make the appropriate Notifications
- Seeking additional supports from internal and/ or external expertise if the situation requires
- Continual monitoring and identify the situation of the emergency and decide whether the situation is or likely to escalate to become a crisis
- Implement the Emergency Response Plan to identify, prioritize, and implement appropriate response to immediate situation
- Supervise and coordinate the ERT
- Call for "Timeout" whenever there seems to be conflicting situations in the ECR in order to update the followings:-
    - Exact status of the event at the accident scene & evacuation detail
    - Status of supports provided to the site, i.e., logistics & transportation, accommodations, Fire Fighting, Medevac, etc.
    - Urgent support required (internal/ external supports)
    - To brainstorm & resolve key issues
    - Make a note of all relevant information received and consequential activity performed and pass each note to Event Logger for logging
    - Set up teams to address the short-term reinstatement or permanent restoration, consider the need for personnel change over during the incident lifecycle
    - Ensure that a record is kept of all significant events, decisions, etc., (within own sphere) and passed to secretarial system (hourly collection)

Plus 1 hour:

- Ascertain what has happened?
- Are resources sufficient and have been notified?
- Is there sufficient field support?
- Where the media activity centre is?
- Are all sources of information being monitored?
- What are the emerging issues?
- Has a public release been made?
- Are we supporting the authorities sufficiently?

Plus 5 hours and beyond:

- Review what has happened
- Review resources (of ERT) and determine need to establish shifts
- Get update on emergency response strategy
- What is our media strategy and is the company being proactive?
- What are the key issues?
- What commitments have been made and are deadlines being met?

5.2 OPERATIONS SECTION CHIEF

Responsible Person: Shift Supervisor
Role: Operation Advisor (Acting as the principle link to the CRO's and INTERVENTION TEAM)
Report to: Site OSC
Location to Report: Emergency Control Room
Emergency level: Tier 1 / 2 / 3
Basic Function: Assist in the generation of plans for controlling the incident and tactical response operations. Full fill the role of the Site OSC in the absence of the Site OSC.

Responsibility:

- Account for all personnel at the scene of the incident and Initiate evacuation and head count if required
- Assess the situation and control overall plant operation
- Direct the control room operator and area operators on how best to eliminate or control the emergency situation utilising plant controls
- Make decision on plant emergency operation such as shutdown the unit, bypass equipment, etc.
- Assist in the preparation of initial response objectives from the OSC
- Advise the OSC on the potential escalation points of the operational support
- Assist Planning in preparing Tactical Response Plans by using plot plans/ maps to build up a picture of the emergency
- Establish and maintain communications with any tactical responders activated to respond to the incident
- Assess the field operational requirements – consider "worst case" and probable scenarios
- Ensure that response personnel involve in at-the-scene tactical response operations have all the necessary equipment, materials, and supplies needed to carry out those operations in a safe, effective and efficient manner

- Request for additional specific supports as required.
- Update the OSC to ensure effective support/ priorities are clearly understood
- Ensure resources are effectively utilized
- Check frequently with the Event Logger to ensure they are provided with accurate information
- Maintain a personal log of events of all activities undertaken during the incident life cycle
- Act as On Scene Commander in the absence of the Duty On Scene Commander (this is responsibility is especially critical for night/weekend operations where the Duty On Scene Commander may take anywhere up to an hour to physically arrive at the ECR)
- Consider the need for personnel change over during the incident lifecycle

5.3 PLANNING DUTY

Responsible Person: Maintenance Supervisor and Production Engineer
Role: Planning Advisor
Report to: Site OSC
Location to Report: Emergency Control Room
Emergency level: Tier 1 / 2 / 3
Basic Function: The Planning leader manages the planning process for the immediate tactical response operations. The Planning leader will work closely with the Operations Section Chief to develop the Tactical Response Plans. Planning is also responsible for the collection, display and distribution of all relevant incident information.

Responsibility

- When notified of an incident report, proceed to the ECR as per OSC requested
- Receive briefing from the OSC for an emergency event (Tier 1, 2 or 3)
- After receiving the situation briefing, assist in the preparation of **initial response objective** and **plan**.
- Facilitate collection and posting of information on nature and status of incident and incident response operations in ECR
- Collect input from the OSC and Operations Section Chief for inclusion in the initial Tactical Response Plan
- Facilitate preparation and distribution of further Tactical Response Plans and any other incident specific plans, reports, or other required documents to ERT Members and asset EMT
- For significant on-going incidents, provide periodic predictions on incident potential utilizing the Incident Potential Worksheet
- Consider the need for personnel change over during the incident lifecycle

5.4 SITE SAFETY OFFICER DUTY

Responsible Person: SSHE Supervisor
Role: SSHE Focal Point/Advisor
Report to: Site OSC
Location to Report: Emergency Control Room
Emergency level: Tier 1 / 2 / 3
Basic Function: Provide the OSC guidance on safety, security, health and environment matters.

Responsibility:

- When notified of an incident report, proceed to the ECR as per OSC requested
- Receive briefing from the OSC for an emergency event (Tier 1, 2 or 3)
- Assist Operation Section Chief for the head counting in Control Room
- Assist in the preparation of initial response objectives
- Assist OSC and provide the ERT and INTERVENTION TEAM with safety advice and guidance
- Advise the OSC on safety, security, health, and environment matters
- Provide technical advice on equipment and resources to be utilised to control any situation and contain its impact
- Provide technical data as is required by the site emergency response organization and the ERT
- Conduct initial Site Assessment and execute a plan for ongoing monitoring
- Evaluate emergency situation to determine occupational health and safety requirements for response personnel
- Establish Personal Protective Equipment requirements for all response operations and ensure compliance
- Work with Planning to develop a Site Safety Plan to address issues relating to site access and tactical response operations
- Evaluate an acquire monitoring and other technical equipment as required
- Establish status of personnel involved in the emergency including injuries and movements to other locations
- Ensure that having personnel are available to dispatch to reception points as required (hospitals) and maintain close communication with personnel at all times
- Ensure that any activated mutual aid resources (people and equipment) are aware of the site safety plan and conform to its requirements
- Maintain POB on site and the status of casualties
- Co-ordinate with hospitals for the treatment of injured persons, provide additional support of required

- Ensure appropriate legal advice is available for the OSC when making critical decisions
- Ensure that any activated mutual aid resources (people and equipment) are aware of the site safety plan and conform to its requirements
- Make a note of all relevant information received and consequential activity performed and pass each note to Event Logger for logging
- Call in or consult other members of the SSHE departments if required
- Advise of requirements under the various SSHE regulations and other statutory reporting requirements
- Ensure to have personnel available to dispatch to reception points as required (hospitals) and maintain close communication with personnel at all times
- When the emergency has been declared as finished, collect a copy of the Emergency Log, and originals of all other communications (e.g. other Log Sheets, Questionnaire Notes, Faxes, etc.) made by ERT members, for analysis and improvement of emergency preparedness.
- Consider the need for personnel change over during the emergency lifecycle

5.5 LOGISTICS DUTY

Responsible Person: CMMS and Planning officer
Role: Logistics Provider
Report to: Site OSC
Location to Report: Emergency Control Room
Emergency level: Tier 1 / 2 / 3
Basic Function: Obtain the personnel, equipment, materials, and supplies needed to mount and sustain emergency or incident response operations, and for providing the services necessary to ensure the emergency response operations are carried out in a safe and efficient fashion. Logistics will also be required to manage all the activities within a Staging Area (if activated).

Responsibility:

- When notified of an incident report, proceed to the ECR as per OSC requested
- Receive briefing from the OSC for an emergency event (Tier 1, 2 or 3)
- Assist Planning leader in preparation of response plans
- Work closely with the OSC, Operations & Planning functions to ensure that the supply of logistical support is effective
- Evaluate the emergency event and arrange for the provision of all logistical requirements to aid the emergency response as OSC's request e.g. ambulance, mutual aid, fire truck, vehicles of evacuate, etc.
- Ensure availability/ continuity of all services, materials, and modes of transport required

- Demobilize logistical support in accordance with the incident de-mobilization plan
- Consider mobilization of additional specialist logistical support depending on the emergency
- Provide information to OSC of logistics support status
- Maintain a personal log of events of all activities undertaken during the emergency life cycle.
- Consider the need for personnel change over during the emergency lifecycle

5.6 LIAISON DUTY

Responsible Person: Community Project Officer 1
Role: Liaison all concerned parties including all press related issues
Report to: Site OSC
Location to Report: Emergency Control Room
Emergency level: Tier 1 / 2 / 3
Basic Function: This individual advises management on how to respond to media and stakeholder inquiries. This person(s) consolidates facts and periodically releases status information to the public. This role reports to the Incident Commander and indirectly to management.

Responsibility:

- When notified of an incident report, proceed to the ECR as per OSC requested
- Receive briefing from the OSC for an emergency event (Tier 1, 2 or 3)
- Generate a list of assisting and cooperating local agencies and government departments, including name and contact information
- Keep agencies (Shareholders, Government and Local Authorities) supporting the incident aware of incident status
- Contact local police for aiding the emergency response as OSC's request
- Ensure that all required agency forms, reports and documents are completed
- Coordinate activities of visiting dignitaries
- In conjunction with the OSC, establish a pro-active media liaison and public affairs strategy
- Brief the OSC on media interest on issues developing and requests from the media for information
- Assist in developing/ delivering a response to the media as directed by the OSC
- Follow the Crisis Communication Manual (This may request from Corporate Crisis Communication Team (CCT))
- Provide a point of contact and advise on all press related issues
- Determine potential level of media interest and seek advice or assistance from Bangkok CCT Leader Duty as necessary
- Complete the Initial Media Holding Statement (Refer to Crisis Communication Manual)
- Begin work on developing the first press release (Refer to Crisis Communication Manual)

- Maintain a log of media activity identifying the line of questioning being adopted by the media and issues developing and pass this information to the IC and Bangkok CCT Leader Duty on a regular pre-agreed frequency
- Establish contact numbers where the media can call for information
- Pass any press releases to the Incident Commander (IC) and Corporate Emergency Management Team (EMT) Leader for approval.
- Once the press releases are approved ensure the EMT, Crisis Management Team (CMT), and Bangkok Crisis Communication Team (CTT) Leader Duty receive a copy
- Update the IC on all media and external affairs Issues
- Work with the Security if the press/ NGO's begin to show interest or arrive at the Sinphuhorm Facility
- Maintain communications with the Bangkok CCT Leader Duty and provide regular updates
- Maintain a personal log of events of all activities undertaken during the emergency life cycle and pass completed log sheets to the Event Logger
- Liaise closely with the Liaison Officer in the EMT to ensure consistent message is delivered to all external stakeholders (if required)
- Liaise with the IC and Corporate EMT Leader if there is a requirement to up front any press interviews/ conference
- Ensure there is a consistent and coordinated media response from all access points to the Sinphuhorm Facilities
- Consider the need for personnel change over during the emergency lifecycle

5.7 INTERVENTION TEAM

Responsible Persons:

1. Firefighting and Rescue Team responsible by assigned operation personnel and assigned maintenance personnel
2. Medic & Stretcher Team are responsible by on duty site nurse and assigned stretcher team

Role: Tactical Supporter
Report to: Site OSC
Location to Report: Emergency Control Room
Emergency level: Tier 1 / 2 / 3
Basic Function: Work at the Muster Station equipped with their response equipment awaiting further instruction to mobilize to the incident scene to physically carry out emergency response operations. Dependent of the nature of the incident, one or more of the tasks listed in the responsibilities below may be conducted

Responsibility:

- When notified of an incident report, proceed to the ECR as per OSC requested
- Receive briefing from the OSC for an emergency event (Tier 1, 2 or 3)
- Arrange fully equipped with necessary equipment, materials and supply, mobilize to incident location as ordered by Operations Section Chief
    - Set up a command point at a safe location and control all activities at the scene of emergency
    - Activate firefighting system or form firefighting team to tackle fire if it deems safe to do so
    - Isolate affected systems or equipment to minimize loss of containment or potential escalation of event
    - Maintain communication with Operations Section Chief and report the status of actions taken and results
- Carry out rescue operations and administer first aid treatment as necessary
- Request additional resources to support tactical response operations as required
- Integrate mutual aid resources into the Intervention Team
- Ensure site safety plan is conformed to at all times
- Establish radio contact with the Incident Commander (IC) and supply situation reports
- Account for all personnel at the scene of the emergency
- Control all rescue and first aid activities at the scene of the emergency
- Establish casualty control area when required
- Liaise with mutual aid focal point person when called
- Set up Hot Zone and assure personnel have proper PPE
- Request ambulance if needed and arrange for casualty treatment and evacuation

5.8 EVENT LOGGER

Responsible Person: Assistant Officer, SSHE Data Management
Role: Act as official recorder for ERT
Report to: Site OSC
Location to Report: Emergency Control Room
Emergency level: Tier 1 / 2 / 3
Basic Function: Keep logging the situation and actions on the Event Log Board which is clear and displayed to all.

Responsibility:

- When notified of an incident report, proceed to the ECR as per OSC requested
- Receive briefing from the OSC for an emergency event (Tier 1, 2 or 3)
- Upon assigned by the OSC, initiate Event Log on the event logging board and commence compiling a log of events, actions, decisions, and communications
- Prepare ERT status boards to be ready of use.
- Record all events are precisely and accurately as they occur especially incident type, location, date and times
- Take note all Event Data
- Check records for completeness and accuracy of information on the event logging board, write it down into paper.
- Take meeting notes after the emergency event, make a report, and obtain approval from IC / OSC prior to release it to all concerns including filing.
- Collect all emergency or incident event documentation and retain after the post investigation phase
- Perform documentation filing system
- Maintain a personal log of events of all activities undertaken during the emergency life cycle
- Consider the need for personnel change over during the emergency lifecycle

5.9 ADMINISTRATION (DOCUMENTATION/ADMINISTRATION/HR)

Responsible Person: Senior Document Control Support
Role: Handle the related administration jobs and act as a point of contact and advise on all Human Resource related issues
Report to: Site OSC
Location to Report: Emergency Control Room
Emergency level: Tier 1 / 2 / 3
Basic Function: Compile documentation and establishing and maintaining emergency or incident files, providing duplication and distribution services to the Emergency Response Team (ERT), and documenting ERT Meetings. They are also responsible for Human Recourse issues.

Responsibility:

- When notified of an incident report, proceed to the ECR as per OSC requested
- Receive briefing from the OSC for an emergency event (Tier 1, 2 or 3)
- Assist in the preparation of initial response objectives
- Follow the Response Plan as OSC's request.
- Assist OSC in checking list to do to response for emergency response plan
- Assist ERT members in ad-hoc secretarial duties such as printing, photocopying & etc.

- Make a note of all relevant information received and consequential activity performed and pass each note to Event Logger for logging personnel movement, estimate Time Departure and Estimate Time Arrival, etc.
- Ensure that catering for ERT members is prepared (being mindful of any particular deity or religious requirements).
- Ensure that all information displayed on the Emergency Control Room is accurate and up to date
- Ensure that funds are available for using in the emergency if required
- Ensure that all human resource supports are stood down following the emergency (as required)
- In the event of a serious injury or fatality, liaise closely with the OSC in determining suitable and timely notification to the Next of Kin
- Consider the need for personnel change over during the emergency lifecycle

5.10 WARDEN and MUSTER CHECKER

Responsible Person:

1. **Security Guards at each Guardhouse** will be responsible for checking a number of POBs who muster at station nearest to their Guardhouse.
2. **Assistant Officer -- Administration** will be responsible for (1) GPP WARDEN and (2) checking a number of POBs who muster at MUSTER POINT 1.

Role:
WARDEN:

- Encourage, direct, assist, and perform appropriate action to evacuate people from GPP building as safe and fast as practicable.
- Report a number of POBs at MUSTER POINT 1 to OSC.
- Correspond to OSC accordingly by Communicating, Cascading, and Deploying OSC commands down to POB at MUSTER POIN 1.

MUSTER CHECKER at the other points:

- Report a number of POBs at its own MUSTER POINT to OSC.
- Correspond to OSC accordingly by Communicating, Cascading, and Deploying OSC commands down to POB at its own MUSTER POINT

Report to: Site OSC
Location to Report: Muster Point
Emergency level: Tier 1 / 2 / 3
Basic Function: Ensure evacuation of that part of the building or area

Responsibility:

- When notified of an incident alarm, proceed to the muster point
- Should check all areas such as rooms, toilets and store rooms within their designated area
- Should encourage people to leave the building by the nearest available exit in an orderly manner and direct people to the appropriate muster point
- Report the amount of people in the muster point to Operation Duty
- Waiting for receiving order from Operation Duty to evacuation, ERT, Intervention Team, etc.
- Consider the need for personnel change over during the emergency lifecycle

5.11 SECURITY TEAM

Responsible Person: Security Guards
Role: Handle the related security at Sinphuhorm
Report to: Site OSC
Location to Report: Main Entrance or Exit Gate
Emergency level: Tier 1 / 2 / 3
Basic Function:

- When notified of an incident alarm, proceed the exit badge trays of employees and visitor to the muster point 1
- Gather at the muster point 2 and 3 and report the amount of people to Operation Duty
- Protect the site and site accesses control
- Control all traffic into and out of the areas
- Follow instructions of the OSC
- Coordinate with law enforcement as required
- Keep a log of all activities
- Liaise with the police for roadblocks outside property as required
- Restrict all entry to the areas
- Keep the emergency area free of all non-emergency vehicles and personnel
- Call in extra security guards as required.

5.12 SUBSTITUTION

Roles and Responsibilities account to each key personnel are stringently conformed. However, in the contingent circumstance that some functional personnel is unreachable or absent, Table 1 is developed to assist ERT to exercise appropriate action in response to this contingency. The Table guides **substituted person** for each roles for temporary use which will be decided by OSC.

After the right responsible person is resumed; decision will be remade by OSC whether to have the substituted person carry on its duty or transfer duty back to the right in-charge person.

Entitlement	Responsible Person	Substituted Person
5.1 ON SCENE COMMANDER	Field Manager	Shift Supervisor
5.2 OPERATIONS SECTION CHIEF	Shift Supervisor	-
5.3 PLANNING DUTY	Maintenance Supervisor	Maintenance Engineer
	Production Engineer	-
5.4 SITE SAFETY OFFICER DUTY	SSHE Supervisor	SSHE Senior Technician
5.5 LOGISTICS DUTY	CMMS and planning officer	Warehouse Team Leader
5.6 LIAISON DUTY	Community Project Officer 1	Community Project Officer 2
5.7 INTERVENTION TEAM	See 5.7	See 5.7
5.8 EVENT LOGGER	Assistant officer – Data Management SSHE	Senior Document Control Support
5.9 ADMINISTRATION (DOCUMENTATION/ADMINISTRATION/HR)	Senior Document Control Support	Assistant officer – Data Management SSHE
5.10 WARDEN and MUSTER CHECKER	Assistant Officer – Administration	Assistant Officer – Local Purchase
5.11 SECURITY TEAM	See 5.11	See 5.11

Table 1: Substitution of responsible person

6.0 EMERGENCY RESPONSE PLAN

6.1 CRISIS AND EMERGENCY CLASSIFICATION

This section provides an organizational structure of PTTEP Emergency and Crisis Management at 3-Tier response. The emergency situation may not be significant initially and may expand to require the additional resources. The structure also establishes a clear co-ordination and communication from the operational Site/ Field Level to Asset Level and finally to the Corporate Head Office Level.

3 - Tier response level helps the emergency team to consider the necessary response resources according to its severity and potential impact as follows:

Tier 1:

- Involves a serious problem which has limited impact and minimal potential for escalating, poses a serious threat to safety and the environment, poses no threat to the general public
- Can be handled by onsite Emergency Response Team (ERT) within a reasonable time frame

Tier 2:

- Involves an emergency with greater magnitude and major severity in nature or has the potential to escalate and continue for a significant period of time until the public may raise and concern
- May involve damage to PTTEP Facilities/ Assets and/ or impact to third parties and may pose a significant threat to safety, the environment and its facilities/ Assets
- May request an external assistant from local authorities in the impact area* i.e. the local municipalities or the nearby oil and gas operating asset etc.
- Results in activation of Emergency Management Team (EMT)

* When Provincial Authority ERP activated, organization will follow by law, asset OSC will be an assistant to support both official and corporate EMT.

EMT Members comprise the top management/ authorized person of each operational site/ Asset and other key positions from various disciplines, is defined in the EMP.

Tier 3:

- Involves a catastrophic scenario resulted in the multiple injuries, fatalities, major fires, environmental damage, toxic gas release, significant business interruption and poses a significant threat to the environment or damage to PTTEP Assets and finally bring in significant media attention

- Requests more external assistants *
- Results in activation of the Corporate CMT and EMT

* When Provincial Authority ERP activated, organization will follow by law, asset OSC will be an assistant to support both official and corporate EMT / CMT.

- Corporate CMT Members, consists of the top management at the Corporate Level and other supporting functions, their responsibilities and procedures, is defined in the Corporate CMP.
- Table 2 summarizes the relationships of emergency and crisis management team which are required for each level.

Tier Responses	Emergency and Crisis Organization Structure		
	Site ERT	EMT	Corporate CMT
Tier 1	X		
Tier 2	X	X	
Tier 3	X	X	X

Table 2: Emergency and Crisis organization structure related to the TIER RESPONSE

6.2 SINPHUHORM OPERATIONAL ASSET

Facility & Location	Picture
Sinphuhorm Gas Processing Plant Lat: 16º 40' 50" Long: 102º 44' 46"	
Sinphuhorm Gas Well Pad A (WP-A) (PH-5) Lat: 17º 6' 17" Long: 102º 42' 52"	

Facility & Location	Picture
Sinphuhorm Gas Well Pad B (WP-B) (PH-3) Lat: 17º 7' 24" Long: 102º 41' 47"	
Sinphuhorm Gas Well Pad C (WP-C) (PH-4, PH-10, PH-11) Lat: 17º 4' 56" Long: 102º 42' 23"	
Sinphuhorm Well Pad D (WP-D) (PH-1, PH-12) Lat: 17º 9' 40" Long: 102º 42' 41"	
Pipe Yard Lat: 17º 8' 24" Long: 102º 45' 47"	

6.2.1 GAS PROCESSING PLANT LAYOUT

This is the facility for the processing of well fluids to produce sales gas. The GPP was designed to produce up to 135 MMscfd of sales gas, 100 barrels per day (bbls/d) of produced water and 500 bbls/d of condensate as well as provide about 7,000 bbls of condensate storage capacity. Sales gas will be exported from the GPP via a tie-in point to the PTT Pipeline Operation & Maintenance Centre for onward transmission to the Nam Phong Power Plant and NGV Station via the gas supply pipeline

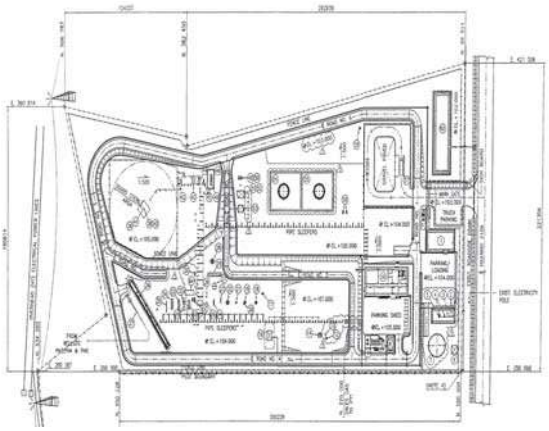


Figure 2 – Sinphuhorm Plant Layout

6.2.2 PIPELINE AND WELL PAD LOCATIONS

PTTEP SP Limited operates a pipeline system to transport well fluids from the infield facilities to the Gas Processing Plant (GPP). The pipeline is about 64 km long and has a nominal diameter of 16 inches.

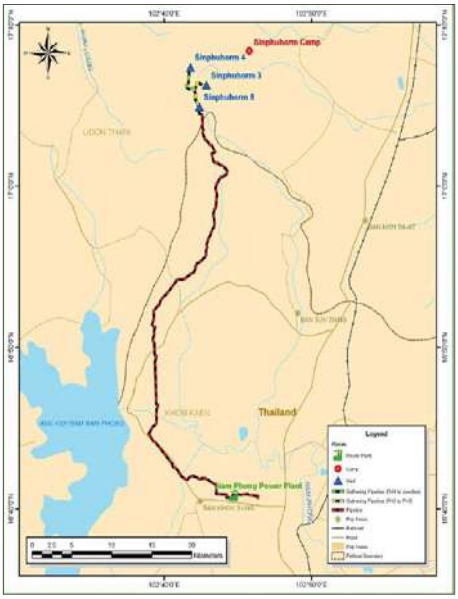


Figure 3 – Sinphuhorm Pipeline and Well Pads Location

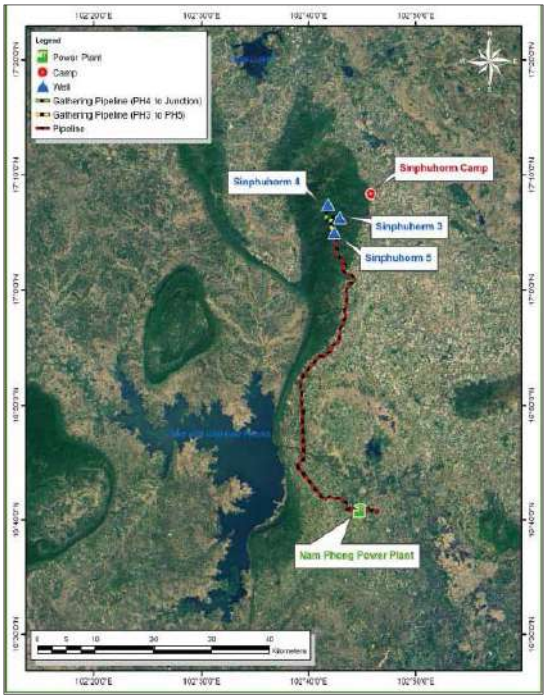


Figure 4 – Sinphuhorm Field Satellite map

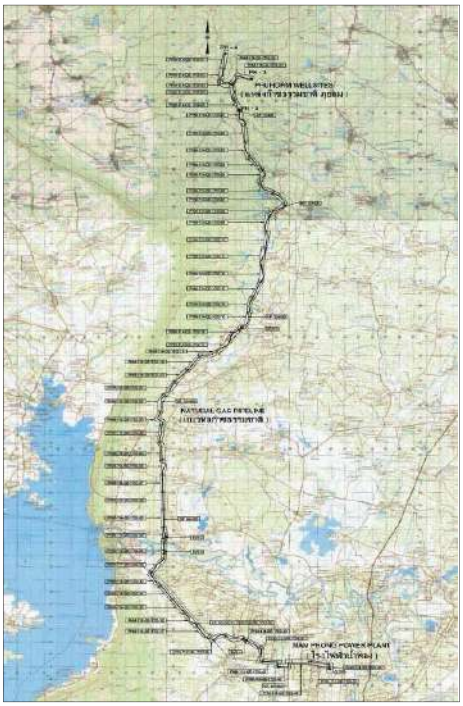


Figure 5 – Sinphuhorm Field map

6.3 EMERGENCY RESPONSE PROCESS

6.3.1 EMERGENCY RESPONSE PROCESS STEPS

The person discovering an incident is responsible for raising the alarm with the GPP control room. The GPP Control Room Operator will report to the Shift Supervisor and then determine the appropriate process controls to be implemented. All other personnel exclude Field Manager (default OSC), Shift Supervisor, Control Room Operator and SSHE Supervisor will muster at the designated muster location. If the Field Manager believes the incident is serious, the ERT will be activated and will assemble in the Control Room. The Intervention Team will be notified and muster in a safe location with their response equipment and await further instruction from the OSC. All other personnel still muster at the designated muster location.

The following flow chart illustrates the notification, mobilization and activation process for the Sinphuhorm ERT during the day. It must be stressed that due to the limited staffing levels at night, aggressive response operations are not possible. Passive response is the only option, utilizing fixed systems.

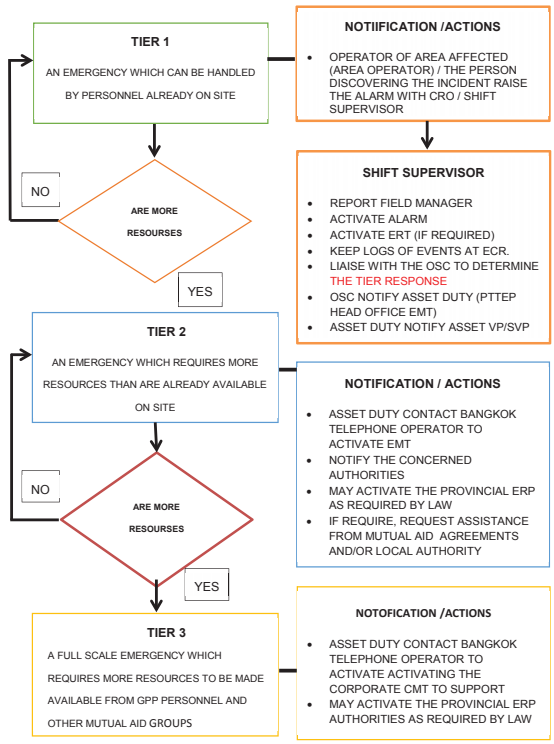
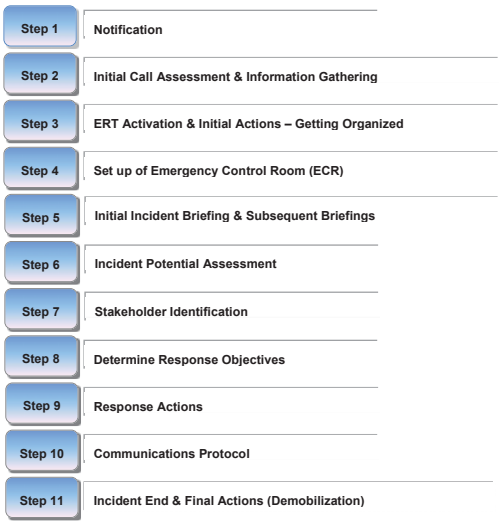


Figure 6 –Flow Chart for Sinphuhorm ERT

6.3.2 EMERGENCY RESPONSE PROCESS STEPS

In the event of an emergency or incident that leads to the activation and mobilization of the ERT, the ERT will follow the emergency response process as depicted in PTTEP SP Limited GPP ERT Emergency Response Steps below. The Emergency Response Process steps and procedures are outlined below, and should be followed in the event of an emergency or incident:



Step 1: Notification

The On-Scene Commander may be notified of an actual or impending emergency in the following ways:

- Through the Control Room / Shift Supervisor
- Through impacted persons (e.g. vehicle incident)
- Through External parties such as police, media or government

Step 2: Initial Call Assessment & Information Gathering

Upon receiving the emergency or incident call notification the On-Scene Commander (OSC) will gather initial information to assess the impact of the situation on Sinphuhorm Operations. Gathering the initial information should be focused on ***who, what, where, when, and why*** of the current situation. This information should include:

- Nature of incident
- Exact location of incident
- Affected asset(s)
- Description of the incident
- Status of personnel
- Status of response operations (if any already underway)
- Status of incident – escalating or under control
- Status of external involvement (government, media, stakeholders)
- Type and quantity of materials spilled or emitted

The nature and scale of the emergency or incident shall be assessed to determine:

→ PTTEP SP Limited accountabilities relating to the emergency or incident, to determine the appropriate leadership or support role required
→ Incident or crisis potential

The On-Scene Commander may consult with other key ERT members to analyze the initial information, the potential impact of the situation, and decide whether to activate the full ERT (including Intervention Team). The options for next actions are:

1) Activate the ERT,
2) Respond to specific INTERVENTION TEAM requests,
3) Monitor the situation

Initial Incident Notification Form

Purpose: Incident Notification Form to follow-up on verbal notification.

Responsible Party: ERT On Scene Commander

PTTEP	Initial Incident Notification Private & Confidential		URGENT
Impacted Area / Asset Name:			
Country:		Specific Location:	Lat Long
Date of Emergency: (DD/MM/YY)		Time of Emergency: (Local)	
Person Notifying:		Contact Number:	
Brief account of Emergency:			
People Impact (Employee, Contractor, Public, Fatality, Injury):			
Environmental Impact/Damage:			
Asset/Property Impact/Damage/Loss:			
Business Impact (Damage/Loss):			
External Agencies Involved:			
Media Coverage:			
What assistance has been requested:			
Person in charge of response:		Contact made with:	
Office Telephone:		Date & Time:	
Mobile Telephone:		Office Telephone:	
Home Telephone:		Mobile Telephone:	
		Home Telephone:	

Step 3: ERT Activation & Initial Actions – Getting Organized

Once it is decided by the Field Manager (day) or Shift Supervisor (night or weekend) to activate the ERT, they will:

1. **Assume the role of the On Scene Commander**
2. **Identify the ERT Members appropriate for the response**
3. **Assemble the ERT in the Emergency Control Room (ECR)**
4. **Notify Asset VP/SVP of ERT Activation accordingly**

The ERT On-Scene Commander will activate the appropriate ERT members to the ECR. Additionally, depending on the situation, they may deploy the Intervention Team to the incident site. As the emergency or incident evolves, the On-Scene Commander may decide to activate additional ERT members as appropriate if the situation escalates, or dismiss selected team members (including the INTERVENTION TEAM) if the role is no longer essential to the emergency or incident response.

A critical component of activating the ERT is getting all members up to speed on the initial information available. As ERT members enter the ECR, there may be differences between what they and the ERT On-Scene Commander know about the situation, and a lack of clarity over what the ERT On-Scene Commander wants them to focus on as they initiate the emergency response operations. These problems are addressed by conducting an Initial Incident Briefing.

Step 4: Set-up of Emergency Control Room (ECR)

The Emergency Control Room (ECR) is located in the Control Room of the Gas Processing Plant. The building is available 24 hours per day. The diagram below shows the ECR Room Layout for the ERT members.

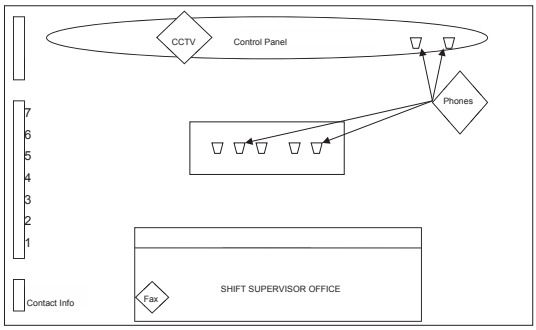


Figure 7 –GPP Emergency Control Room (ECR)

Status Boards References:

1 = Incident Facts

2 = Incident Facts Update

3 = Personnel and Casualty Information

4 = Safety and Health Considerations

5 = ERT Objectives

6 = Logistics Information

7 = Action Item Tracking

The Emergency Control Room is permanently set up in the Sinphuhorm Gas Processing Plant in the Control Room. Generally, the Event Logger will populate status boards and ERT members are needed to hand on the situation information to Event Logger.

When all ERT are at the ECR, it is advisable to complete and record the Incident Check-in / Check-out Form at the ECR. If any ERT members arrive at or depart from the ECR location, please report to OSC so that the On Scene Commander is made aware of who is and who is not available at the ECR. The Incident Check-in / Check-out Form is provided as follows:

- Copies of ERP, EMP, CMP
- Adequate phones and hotline which is ready to be called by Incident Commander and are capable of making a call outside the country
- Projector(s) / Computer(s) /Multifunction printers
- Maps and layouts of the site (GPP or Well Pads) / Emergency Forms
- P&ID and Cause & Effect diagram
- Emergency contact lists
- Stationery, White board(s) / flip chart(s) (if needed)

Where equipment is found to be defective or expired, it must be promptly repaired or replaced. Stock of such equipment shall be maintained. All records shall also be maintained for periodical review in order to determine whether the plans are adequately implemented.

PTTEP

Check - In / Check – Out List
(For ERT @ ECR)

EMERGENCY NAME: _____

Name	ERT Position	Time / Date In	Time / Date Out	COMMENTS

Step 5: Initial Incident Briefing & Subsequent Briefings

As ERT members sign in at the ECR, they will be looking for information that will allow them to move into a "proactive" mode of operations. This will be especially pertinent responses to incidents that occur outside work hours where a considerable amount of time may have elapses between the incident initiation and the ERT mobilization. The type of information they will need include:

- A description of the emergency or incident and its impacts
- A review of team assignments
- What their role is and where they fit into the overall organization?
- A description of physical / tactical response operations already being carried out by the INTERVENTION TEAM or the Government Agencies or Contractor
- What, so far, has been done to respond to the emergency or incident?
- What does the ERT on-Scene Commander want members to focus on during the initial stage of the emergency response operations?

The Initial Incident Briefing (IIB) is usually facilitated by the ERT On-Scene Commander and is to introduce members of the ERT and to ensure that all members understand the emergency or incident, what actions are being taken or planned, initial strategies and issues / action items that must be addressed or resolved. The ERT On-Scene Commander must ensure that any briefing is concise and effective. A recommended format and checklist of the initial incident briefing for the ERT is available in Appendix of this Plan.

Initial Incident Briefing Checklist

Purpose: As ERT members arrive in the ECR, the initial incident briefing is provided by the ERT On Scene Commander with basic information regarding the emergency or incident situation and resources allotted to the emergency or incident. Suitable for briefing individuals newly assigned to their roles and responsibilities in the ERT.

Responsible Party: ERT On Scene Commander

Subsequent Briefings

The best way to quickly and efficiently impart the relevant and critical information will be through the presentation of periodic, short briefings by the ERT On-Scene Commander, to the ERT members. Additional briefings will be given when new information is received that is of interest to the ERT members. This may be the receipt of significant information regarding the status of the emergency or incident to advise the ERT whenever there is a need to make a change in the response to the emergency or incident. This briefing is a "one way" communication for information purposes to the

ERT. Any questions which arise due to the information provided are to be taken outside of the Team Briefing.

Initial Incident Briefing Checklist – IIB 1-1
Incident Map
(Page 1 of 4)

Incident Name:	Date Prepared:
Incident Location:	Time Prepared:

REQUIRED FORMS ATTACHED:
☐ Incident Map (IIB 1-1) ☐ Resources Summary (IIB 1-3)
☐ Summary of Incident and Current Actions (IIB 1-2) ☐ Site Safety and Control (IIB 1-4)

INCIDENT MAP: (Insert graphic or type text.)

0 SCALE

WEATHER:
Temperature: Wind Chill:
Wind Speed: Wind Direction:
Precipitation (rain, etc.):
Sunrise Sunset:

LEGEND:
Incident Command Post
Heliport
Groups
Incident Area
Water (lakes, oceans)
Staging Area
Rivers
Containment Sites
Roads
Strike Teams
Above-ground Pipeline
Decontamination
Below-ground Pipeline
Boom
Control Zones

Prepared By:	ERT Position:	Phone:

Send a Copy To: ☐ ☐

Initial Incident Briefing Checklist – IIB 1-2
Summary of Incident and Current Actions
(Page 2 of 4)

Incident Name:	Date Prepared:
Incident Location:	Time Prepared:

DESCRIPTION OF INCIDENT:
Cause if known:
What Happened: ☐ Fire ☐ Gas Leak ☐ Explosion ☐ Spill ☐ Medical ☐ HAZMAT ☐ Other
Extent of Involvement:
Source: Name/Type:

DESCRIPTION OF SPILLED/ EMITTED MATERIAL:
Type: Quantity:

INCIDENT POTENTIAL:
☐ Incident Under Control.
☐ Incident currently not under control, but can be handled with available resources.
☐ Incident will require additional resources (e.g., contractors, mutual aid).
☐ Incident will likely generate significant public affairs/community relations issues.

SAFETY CONSIDERATIONS:
Injuries: Fatalities: Unaccounted:
Chemical Hazards:
Physical Hazards:
Level of PPE:

RESPONSE: GENERAL

PROBLEMS	SOLUTIONS

IMPACTS: ☐ Land ☐ People ☐ Property ☐ Environment ☐ Operations ☐ Community ☐ Water
Sensitive Areas Impacted or Threatened: ☐ Yes ☐ No
Location of Areas:

ASSISTANCE NEEDED:

Prepared By:	ERT position:	Phone:

Initial Incident Briefing Checklist – IIB 1-3
Resources Summary
(Page 3 of 4)

Incident Name:	Date Prepared:
Incident Location:	Time Prepared:

RESOURCES	HAVE			NEED	Destination/Location/ Assignment (Branch, Division, Task Force, Staging Area, etc.)
	En Route (ETA)	Staged/ Available	Assigned		

Step 6: Incident Potential Assessment

The ERT shall assess the potentiality of the incident, including worst case scenarios, to determine the ERT response objectives and initial notification requirements. Anticipating problems and identifying ways to avoid or mitigate them is an important aspect of a proactive response effort. As quickly as possible, the ERT Incident Commander and other section duties should consider incident potential in order to determine:

- Whether it is safe for Tactical response operations to be undertaken given the escalation potential of the incident and the available tactical response resources
- How long might tactical response operations last
- How many people will be needed to carry out the tactical response operations
- If there are missing personnel, what their condition might be when they are found
- If there are injured personnel, what type of treatment are they likely to need, and where can the treatment be obtained
- Whether hazards present at the incident scene are likely to grow in intensity
- How long it will take to bring the source of the incident under control?
- How long it will take to contain discharged materials?
- How far the discharged/emitted materials may spread prior to containment?

The recommended approach is for each member of the ERT to think about incident potential as they engage, and for the topic of incident potential to be discussed shortly after the initial incident briefing. At any point, the ERT Incident Commander can also instruct planning to work with other appropriate members of the ERT to prepare a more formal analysis using the ERT Worksheet for Determining Incident Potential.

The Incident Potential Worksheet (IPW) is provided to assist in determining incident potential.

- Operations Section chief
- Logistics
- Liaison officer
- Site Safety officer

ERT Incident Potential Worksheet

Date/Time:	
Completed by:	
Please define the potential geographic area subject to potential impacts:	
Checkmarks placed next to answers in *BOLD ITALIC CAPITAL* letters will need to be further considered.	
NOTE: The responses indicated on this worksheet reflect the preliminary views of the persons filling out the worksheet based on the information available and known to those persons as of the date and time shown above and are subject to modification as additional information is obtained.	
OPERATIONS SECTION CHIEF	
Source of Discharge	
Source of discharge?	☐ Known ☐ *UNKNOWN*
Source control status?	☐ Controlled ☐ *UNCONTROLLED*
If the source is controlled, what is the potential for loss of control?	☐ Low ☐ *MEDIUM* ☐ *HIGH*
Nature of uncontrolled source?	☐ Stabilized ☐ *GROWING*
Is special expertise needed to bring the source under control?	☐ *YES* ☐ No
Magnitude and Duration of Tactical / Emergency Response Operations	
Can the incident be managed solely by GPP resources?	☐ Yes ☐ *NO*
May response operations continue around the clock?	☐ *YES* ☐ No
Will emergency response operations go on for an extended period of time?	☐ *YES* ☐ No *HOW LONG?*
Materials Spilled/Emitted	
Nature of spilled/emitted materials known?	☐ Yes ☐ *NO*
Nature of release?	☐ Batch ☐ *CONTINUOUS*
Materials contained or uncontained?	☐ Contained ☐ *UNCONTAINED*
If materials are contained, what is the potential for loss of containment?	☐ None ☐ Low ☐ *MEDIUM* ☐ *HIGH*
What is the max probable quantity of spilled/emitted materials?	*bbls/mcf*
Is there a threat of an explosion?	☐ *YES* ☐ No
If there is an explosion, how large an area could be impacted?	
Are materials in a moving waterway such as river?	☐ *YES* ☐ No
Is special expertise needed to contain and recover the material?	☐ *YES* ☐ No
Impact on Normal Operations	
Is the affected facility shut down?	☐ *YES* ☐ No
Are critical processes in the affected facility shut down?	☐ *YES* ☐ No
Has the incident caused a shutdown or curtailment of normal operations?	☐ *YES* ☐ No; *If yes:* ☐ *SHUTDOWN* ☐ *CURTAILMENT*
How long is the shutdown/curtailment likely to last?	
What impact will the shutdown/curtailment have on other operations?	☐ None ☐ Minor (a few days) ☐ *MODERATE (approx. 1 week)* ☐ *SEVERE*

ERT Incident Potential Worksheet

Date/Time:	
Completed by:	
Please define the potential geographic area subject to potential impacts:	
Checkmarks placed next to answers in *BOLD ITALIC CAPITAL* letters will need to be further considered.	
NOTE: The responses indicated on this worksheet reflect the preliminary views of the persons filling out the worksheet based on the information available and known to those persons as of the date and time shown above and are subject to modification as additional information is obtained.	
LOGISTICS	
Will the incident require the acquisition of response resources from outside the immediate vicinity of the GPP?	☐ *YES* ☐ No
Are existing contractual arrangements in place for all service and resource providers who are likely to be engaged during the response?	☐ *YES* ☐ No

ERT Incident Potential Worksheet

Date/Time:	
Completed by:	
Please define the potential geographic area subject to potential impacts:	
Checkmarks placed next to answers in *BOLD ITALIC CAPITAL* letters will need to be further considered.	
NOTE: The responses indicated on this worksheet reflect the preliminary views of the persons filling out the worksheet based on the information available and known to those persons as of the date and time shown above and are subject to modification as additional information is obtained.	
LIAISON OFFICER	
Community Impacts	
Are communities impacted or threatened?	☐ *YES* ☐ No
What is the nature of the impact:	
Health and safety?	☐ *YES* ☐ No
Social?	☐ *YES* ☐ No
Cultural?	☐ *YES* ☐ No
Economic?	☐ *YES* ☐ No
Environmental?	☐ *YES* ☐ No
May it be necessary to evacuate all or a portion of a community?	All: ☐ *YES* ☐ No Portion: ☐ *YES* ☐ No
If yes, how big an area may need to be evacuated?	
Are roads, waterways, air space closed?	☐ *YES* ☐ No
If yes, how long will they be closed?	
What is the tenor of contacts with/from impacted/threatened communities?	☐ Cooperative ☐ *STRAINED* ☐ *ANTAGONISTIC*

ERT Incident Potential Worksheet

Date/Time:	
Completed by:	
Please define the potential geographic area subject to potential impacts:	
Checkmarks placed next to answers in *BOLD ITALIC CAPITAL* letters will need to be further considered.	
NOTE: The responses indicated on this worksheet reflect the preliminary views of the persons filling out the worksheet based on the information available and known to those persons as of the date and time shown above and are subject to modification as additional information is obtained.	
SITE SAFETY OFFICER	
Health and Safety	
Are hazards of spilled/emitted materials known?	☐ Yes ☐ *NO*
Are IDLH (Immediately Dangerous to Life and Health) conditions present at the incident scene?	☐ *YES* ☐ No
Will there be a need to enter an IDLH area?	☐ *YES* ☐ No
Are there significant, ongoing short-term or long-term threats to personnel or public safety?	Personnel ☐ *YES* ☐ No *If yes, term:* ☐ *Short* ☐ *Long* Public ☐ *YES* ☐ No *If yes, term:* ☐ *Short* ☐ *Long*
Is there a vapour or gas cloud moving from site of incident?	☐ *YES* ☐ No
If yes, does the cloud threaten employees or the public?	Employees: ☐ *YES* ☐ No Public: ☐ *YES* ☐ No
Has the facility been evacuated?	☐ *YES* ☐ No *If yes:* ☐ Partial ☐ Full
Is there a threat to mustered or sheltered personnel?	☐ *YES* ☐ No
Are there people missing?	☐ *YES* ☐ No ☐ *UNKNOWN*
How many?	
Affiliation?	☐ *EMPLOYEE* ☐ *CONTRACTOR* ☐ *OTHER:*____
Likelihood of rescue/survival?	☐ High ☐ *LOW* ☐ *UNKNOWN*
Are any people injured?	☐ *YES* ☐ No ☐ *UNKNOWN*
How many?	
Have the victims been identified?	☐ Yes ☐ *NO*
Affiliation?	☐ *EMPLOYEE* ☐ *CONTRACTOR* ☐ *OTHER:*____
Nature and severity of injuries?	☐ Not Life Threatening ☐ *LIFE THREATENING*
Have next-of-kin notifications been made?	☐ Yes ☐ *NO*
Are there any fatalities?	☐ *YES* ☐ No ☐ *UNKNOWN*
How many?	
Have the victims been identified?	☐ Yes ☐ *NO*

Affiliation?	☐ EMPLOYEE ☐ CONTRACTOR ☐ OTHER:____
Have the bodies been removed from incident scene?	☐ Yes ☐ NO
Have next-of-kin been notified?	☐ Yes ☐ NO
Security	
Is there a security threat?	☐ YES ☐ No
Can local Security resources handle the situation?	☐ Yes ☐ NO
Is there a potential need for:	
Sheltering-in-place?	☐ YES ☐ No
Evacuation?	☐ YES ☐ No

Step 7: Stakeholder Identification

The ERT shall identify relevant stakeholders and external agencies that may have a role in the response to, or require notification and information regarding the status of PTTEP SP Limited's emergency or incident response. It is critical to engage the key stakeholders in a timely fashion and develop an integrated response plan as required. To this end, the ERT Liaison Officer will work very closely with the EMT Liaison Officer to ensure that all relevant stakeholders have been identified and that a plan is in place for managing their needs and expectations. Key stakeholder contacts are located in Appendix of the ERP. The Key Stakeholders Impact Analysis Form is provided as follow.

Key Stakeholder Identification Form

Purpose: This form is to be used to identify the key stakeholders who must be informed or, and provided with updates regarding the emergency or incident response. An ERT member shall be assigned to maintain this Form.

Responsible Party: ERT Liaison Officer (with potential input from Planning)

Key Stakeholder Impact Analysis Form

Date:

Category	Stakeholders	Stakeholder Concern	Name & Contact Information	Specific Action Required	Person Assigned

Step 8: Determine Response Objectives

The ERT shall set objectives for the response. Objectives may evolve and change throughout the emergency or incident response and should reflect the characteristics of the emergency or incident and impact of the response actions. This is especially the case where the tactical response operations are ongoing for an extended period of time or where the incident is multi-faceted (e.g. A pipeline incident resulting in injuries to PTTEP SP Limited personnel and the public as well as environmental impact and damage to public property). It is essential to regularly review and assess the objectives. The response objectives will reflect PTTEP SP Limited's overall response priorities of:

- People
- Environment
- Asset / Property
- Reputation / Business

Response objectives that may be applicable to the ERT include:

- Accounting for all personnel
- Providing medical assistance to all injured

- Containing the spread of any spilled or emitted material
- Keeping the EMT Incident Commander informed about the nature and status of emergency response operations
- Ensuring that tactical response operations are carried out in a manner consistent with PTTEP SP Limited's core values, applicable Company policies and applicable laws and regulations

Step 9: Response Actions

Incident Action Plan (IAP)

The ERT On-Scene Commander shall establish an Incident Action Plan (IAP) that describes the key response actions which are within the scope of, and will be executed by the ERT. The IAP is derived from the response objectives, and identifies the activities to be completed to successfully manage and work towards mitigating the effects of the incident. Each ERT member has a responsibility for completing the IAP actions as assigned. ERT members can invoke a subsequent team to implement the actions as required.

Information Centre

It is important to continuously assess and analyze the situation as the emergency or incident evolves and as response actions are implemented. The ERT On-Scene Commander shall diligently monitor the key incident objectives and ensure the response actions are effective. The On-Scene Commander shall establish a schedule for subsequent meetings, including situation briefings to review the progress against the objectives and appropriate response actions. The objectives and IAP should be adjusted accordingly.

One of the challenges for the ERT On-Scene Commander and members of the ERT is to gain and maintain "*situational awareness*", especially when the incident is not located at the GPP. Obtaining accurate and up-to-date information on an emergency or incident, its impacts, and the nature and status of the tactical response operations and using this information to guide the team's work is a challenge that is addressed, in part, by having an Information Centre in the ECR that members refer to for "official" information.

An Information Centre is established and maintained by SSHE team member. The focal point of the Information Centre is a situation map that visually presents information on:

- Location of the source
- Location of spilled or emitted materials
- Location of incident-related facilities
- Location of the isolation perimeter and hot line
- Location of tasks underway

Some information about an emergency or incident, its impacts, and emergency response operations cannot be presented visually, through the use of prescribed situation map symbols, on the situation map. The Status Boards present information on the emergency or incident and other factors that may impact upon the safety, efficiency, or effectiveness of the tactical response operations. The Status Boards present information on the nature and status of emergency response operations. Although the Information Centre is established and maintained by Event Logger, it is the responsibility of all ERT members to continuously provide the information and maintain the accuracy of the Information Centre. Furthermore, all members of the EMT are empowered to physically update the status boards if Event Logger is unable to keep the information up to date and accurate.

Step 10: Communications Protocol

Effective and efficient communications between teams is critical for the overall management of the response to the emergency or incident. With this in mind all routine communications in and out of each team should follow controlled protocols. These protocols include:

- Initial agreement on method and timing of communication updates between teams
- Identification of single points of contact (if possible) to reduce duplication of information
- Agreement on back-up communication methods if primary systems fail
- Ensure communications involving sensitive information (names, fatalities etc.) are followed up with written confirmation (fax, e-mail etc.) where applicable
- Situational Status Reports (SitReps) are used to provide situational updates on the status of the emergency. Regular SitReps will be provided to the EMT. The ERT On-Scene Commander and EMT Incident Commander will identify appropriate intervals for situational updates. SitReps are provided in conjunction with a verbal update, as determined by the ERT On-Scene Commander and EMT Incident Commander. SitReps are not to be used for transmitting confidential information. IIB - 1 form can be used as the basis of the SitReps. The mode for broader internal communication distribution is via email. Depending on the specifics of the emergency or incident, this communication will usually be delegated to the EMT. A plan and schedule for regular updates shall be developed by the ERT On-Scene Commander in conjunction with the EMT Incident Commander.

Step 11: Incident End & Final Actions (Demobilization)

The OSC is the sole authority can decide to stand-down the ERT when an analysis reveals the emergency or incident has been resolved and the threat impact to the Sinphuhorm Operations has been mitigated.

The ERT On-Scene Commander will confirm:

- There are no objectives or response priorities that must be addressed by the Intervention Teams or the broader ERT
- There are no outstanding requests from the INTERVENTION TEAM or effected Contractor organization
- The ERT has closed out all action items
- The activities and procedures which must be undertaken to recover from an emergency, the OSC shall ensure the conducting of the following activities include, but are not limited to:
- The clean-up, maintenance and testing of equipment
- The re-commissioning of facilities, plant, and equipment
- The replenishment of stocks (such as, firefighting foam, spill clean-up materials, replacement parts).
- The accounting for all expenses incurred as a result of the incident
- The filing of insurance claims
- Preparation and dispatch of final reports to relevant Shareholders, Government and Local Authorities

Once a decision has been made that no further actions are outstanding and that an emergency is over, many issues need to be considered before standing down. There is a need to consider the following:

- Ascertain the current position of each team member as regards their role, responsibilities and any ongoing/ outstanding actions
- Identify and assign any outstanding actions including debriefing of interested external parties, such as partners
- Put in place a review procedure to ensure the completion of outstanding actions
- Liaise with EMT as necessary to ensure that they have no further requirements
- Understand any outstanding human resource issues and ensure that the necessary information is provided and the appropriate steps are being taken
- Ensure that all staff are aware of the emergency close out and update them regarding the short and long-term issues affecting the company (if known)
- Ensure that all information has been captured and recorded
- Have a Team Debrief before staff leave or return to normal duties
- Ensure to plan a future debrief time when all actions can be analyzed. This can usually be within 24 - 48 hours of emergency closed. Consider including the participation of an independent reviewer
- This review should also address the sensitivity of the report information and determine the most appropriate means of secure storage

- After the review, a Close-Out Report should be prepared. The report should cover the following:
- Understand and document the cause(s) of the emergency
- Document all involved parties and details of participating personnel
- Analyze the response and identify any learning points to be incorporated into the appropriate procedures and/or to be shared with other parts of the Business
- Incorporate a full picture of the costs incurred as a result of the incident
- Review the effectiveness of all actions taken

Emergency Investigation

It is the responsibility of the Affected Asset EVP to designate a team responsible for performing the appropriate investigation. All incidents, which have resulted in the activation of an emergency response, must be investigated.

Post Emergency Review

The company requires that a post-emergency review be conducted to examine the Company's response to the emergency.

The OSC shall convene a Review Meeting of the emergency. Those attending the Review Meeting shall include the ERT members, and all other Emergency Team members who participated in the emergency management. Minutes of the Review Meeting shall be recorded and archived for future analysis. The Review Meeting shall determine (but not limited to) the following:

- Were employees properly informed of company procedures?
- Did employees respond according to company procedures?
- Were employee's responses timely?
- Were the procedures adequate?
- What were problems encountered during the response activities?
- What can be improved?
- How can similar events be avoided in the future?
- If public emergency services were involved they shall be invited to participate in the critique.

Log Keeping

Log sheets within the ERT play an important role in ensuring information is formally and consistently recorded during the response phase of the emergency or incident. Many aspects of log keeping require discipline and practice by the end user to ensure the process is a useful tool rather than a burden on the individual members. Every member of the ERT will maintain his / her own log sheet

documenting the information received / sent and the actions taken in a chronological manner on the log sheet provided.

The purpose of the log sheets is to capture information on actions taken and events observed and will remain within the logbook of the log originator for future reference by the individual function and can be useful when the team or member need to handover to new personnel or incoming shift. Completed log sheets will then be filed away in the ERT filing system by Event Logger/SSHE team. These log sheets will act as a formal record of actions and/or messages throughout the response.

The ERT Individual Action Log Sheets located in Appendix 3 will be made available to all ERT members. Additionally, if an ERT member is not available to take calls, the log sheet can also serve as a message log sheet for messages to be recorded down for the intended recipient. When completing log sheets:

- Learn to paraphrase information onto the log sheet. Do not write down the conversation word by word
- Make sure all the boxes are filled in correctly
- The team should utilize one common clock in the room when recording the time
- Using individual wristwatches can lead to discrepancies when information was received
- Write neatly and legibly. If the information cannot be read by Event Logger and or the Action Party, he/she should return it to the relevant function for clarification/correction

Individual Log Form

Purpose: This Individual Action Log Sheet is used to log information on actions taken, events observed or record down messages for intended recipient. This Log Sheet is made available in carbon copy in which the top copy of the log sheet (Sheet 1) will be forwarded to the Event Logger to transfer information onto the Information Centre and filed accordingly. The second page is retained as reference by the log originator.

Responsible Party: All ERT members

Individual Action Log Sheet

Emergency Name:	Date Prepared:
Emergency Location:	Time Prepared:
Position:	Name:
Time	Information / Action / Event

Shift Change and Role Handover

It is not anticipated that the Sinphuhorm ERT will be faced with incidents of the type that will require extended response operations, however, it is prudent to ensure that a shift change and role handover process is understood in the unlikely event that an extended response is required.

The overall objective during a shift change / role handover is to ensure the continuity of the crisis management process. It is the transfer of a team member's responsibilities to another team member who will serve in the same or higher level position. Generally, the average duration of the working hours during the response operations is 12 hours before the shift change and role-handover process kicks in. However, the ERT On-Scene Commander will have the authority to make the decision to carry out the shift change process earlier than 12 hours if necessary. The incoming team member shall share equally in the responsibility for an effective transfer of emergency or incident information with the current team member in that position

- Shift change will generally take place at routine intervals in order to provide relief and an adequate rest cycle for team members
- Should be accomplished through face-to-face discussion

- Should include documentation that summarizes current events and any pending or outstanding action items
- An Incident Briefing may be held during a shift change (or immediately after) by the on-coming ERT On-Scene Commander to update the ERT on the issues and priorities for the next shift

6.4 COMMUNICATIONS DURING EMERGENCY

During an emergency, communications shall be by following methods.

Communication between IC and OSC:

- Mobile Phone
- Internal Phone

Communication of ERT:

- Mobile Phone
- Cascade Call System

Emergency Call Message:

- Tier 1 Emergency at ..... For information and standby
  (ขณะนี้มีเหตุการณ์ฉุกเฉิน ระดับ 1 ที่..... แจ้งเพื่อทราบ และเตรียมความพร้อม)
- Tier 2 Emergency at ..... Go to Emergency Control Room immediately.
  (ขณะนี้มีเหตุการณ์ฉุกเฉิน ระดับ 2 ที่..... กรุณามาที่ห้องจัดการภาวะฉุกเฉินด่วน)
- Tier 3 Emergency at ..... Go to Emergency Control Room immediately.
  (ขณะนี้มีเหตุการณ์ฉุกเฉิน ระดับ 3 ที่..... กรุณามาที่ห้องจัดการภาวะฉุกเฉินด่วน)
- Emergency is Over (ขณะนี้เหตุการณ์เข้าสู่ภาวะปกติ)
  - Emergency Management Structure & General Responsibilities
  - Structures of the Emergency & Crisis Management according to the Tier responses are demonstrated in the following Figure:

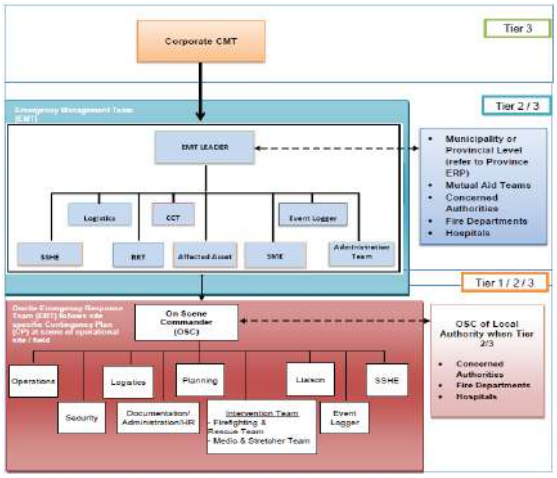


Figure 8: Structures of the Emergency & Crisis Management according to the Tier responses

6.5 TRINING AND EXERCISES

Training shall be regularly held to ensure that all emergency team members and other relevant personnel within PTTEP SP have knowledge and skills to implement the plan and carry out their roles and duties during the emergency or crisis situation.

Type and frequency of training provided to the team members is based upon the assigned roles and responsibilities and the annual evaluation of training needs. The training courses are provided in the training matrix attached in the SSHE Training and Competence Standard (SSHE-106-STD-340). The recommended training and exercise programs are shown the table below.

Training Courses	Recommended for	Frequency
Introduction to Sinphuhorm Emergency Response Plan	All new ERT members	When appointed
Basic Fire Fighting	* Refer to SSHE Training and Competence Standard (SSHE-106-STD-340)	
Basic First Aid		
On Scene Commander		
Advance Fire Fighting		
Intensive First Aid		
Emergency Exercises		
Weekly Practices / Drills / Exercises	On site personnel	Weekly
Tier 1/2/3	Selected from ERT Duty Roster personnel	Yearly

6.6 FIRE PREVENTION CAMPAIGN PLAN

Fire prevention campaign will be planned yearly in order to prevent fire accident in Sinphuhorm Project by building staff interest and promoting the fire prevention. The fire prevention campaign can be setup as separated plan or included in Sinphuhorm SSHE Plan. The fire prevention campaign including topics or activities of (but not limited to) the following

- 5S or housekeeping
- Smoking or tobacco reduction campaign
- Exhibition
- Medias using

6.7 KEY CONTACT PERSONS

The following are key contact details for the GPP Emergency Response Team

ERT Position	Name - Surname	Office Tel. No.
GPP Emergency Number		+66 43 232 933
GPP Emergency Fax Number		+66 43 232 976

ERT Position	Name - Surname	Office Tel. No.
On Scene Commander	Rachan Engchanil	+66 43 232 989
Operation Duty	Banleng Yaemkong Viranit Wutisan Kasem Saisang Manop Charoensuphong	+66 43 232 939
SSHE Supervisor	Surakrit Bunruang	+66 43 232 901
SSHE Senior Technician	Anchulee Phew-on	+66 43 232 963
Planning Duty	Apisak Sri-Amorntham Production Engineer	+66 43 232 928 +66 43 232 949
Liaison Duty	Theerakom Ayurawatana Yuttaphum Thongthangthai Pak Polachan	+66 43 232 956 +66 43 232 955 +66 43 232 954
Logistic Duty	Puthaporn Sookjit Waraporn Chaiyachat	+66 43 232 951 +66 43 232 946
Documentation/Administration	Khwanhathai Panomtronnichakul	+66 43 232 945
Event Logger	Piyachanog Phodprapai	+66 43 232 941
Warden	Sunantha Asawaphoom Narumol Kasemvilas	+66 43 232 998 +66 43 232 944
Security Guards		+66 43 232 959

6.8 RESOURCES AT RISK

Resources at Risk for Water, Community, Environmental and Wildlife have been identified within the Environmental Resource Management Manual that was prepared in October 2005. **Community** Below is a table showing the potential impacts to residents living near the operations.

Emergency Contact Listing		
CONTACT	PHONE	FAX
International SOS Medical Emergencies		
Bangkok	+66 2 205 7777	+66 2 256 7151
Medical Centre / Hospital		
Bangkok – Khon Kaen Hospital (For major medical treatment)	+66 43 042 828 Hotline 1719	
Nam Phong Hospital	+66 43 441 011-2	
Ubonrat Hospital	+66 43 446-112-3	
Nong Sang Hospital, Udon Thani (For basic medical treatment)	+66 42 397 111	
AEK Udon International Hospital (For major medical treatment)	+66 42 342 555	
Srinakarinth Hospital (For major medical treatment)	+66 43 348 360-2	
Khon Kaen Ram Hospital (For major medical treatment)	+66 43 336 788-9	
Police Station		
Nam Phong District	+66 43 431 443	
Ubonrat District	+66 43 446 125	
Nong Sang District	+66 42 396 277	
Fire Brigade		
Nam Phong	+66 43 441 000 Ext 119	
Ubonrat	+66 43 446 000	
Khon Kaen	+66 43 221 202	
OBT Kud Nam Sai	+66 43 373 432	
OBT Tub Kung	+66 42 396 234	
OBT Sang sawang	+66 42 396 117	
Amphur Kumphawapi	+66 42 331 366	
Non Sa-at Municipality	+66 42 392 696	
Nakorn Udon Thani	+66 42 325 176	
Hotels		
Avani Khon Kaen Hotel	+66 43 209 888	
Pullman Khon Kaen Hotel	+66 4332 2155	

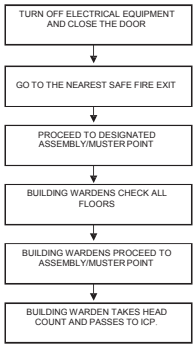
Name of School	Distance from GPP
Ban Kham Yai Pan Nam Chai School	0.5 km S
Ban Kut Nam Sai School	3 km NE
Wat Si Monkhon School	2.4 km NE
Muang Wan Phatthana Suksa School	3.6 km SE
Udom Phat School	3.5 km NW

Name of Monastery	Distance from GPP
Phutthasathan Kham Yai Priest Camp (or Wat Ban Kham Yai)	1.25 km NW
Wat Si Mongkhon (Temple)	2.4 km NE
Wat Thum Phon (Temple)	2.5 km SE
Wat Samakkhi Tham (Temple)	4.3 km NW
Wat Sa Kaew (Temple)	4.3 km SW
Wat Pa Phutthasathan Kham Hua Chang (Temple)	3.6 km SE
Wat Liab (Temple)	3.65 km ESE
Wat Burapha (Temple)	4.5 km N
Wat Boribun (Temple)	4.8 km S
Wat Non Sawan (Temple)	6.25 mNE

7.0 APPENDIX A: SCENARIOS AND EMERGENCY PLAN

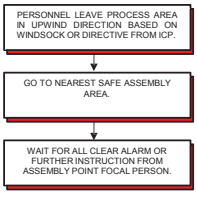
1) FIRE OR EXPLOSION

Building Fire	
Detecting Fire or Smoke	
✓	Sound the Fire Alarm
✓	Make PA announcement if safe to do so.
Worker	
✓	Stop work. Switch off electrical equipment.
✓	Go to muster point. Do not delay. Close all doors.
✓	Be prepared to follow instructions given by operation / safety or security personnel.
✓	Report to your foreman/supervisor at the designated assembly/muster point and remain there until permission to leave is given by OC.
Building Warden	
✓	Check the building/rooms as per assigned to ensure that the building has been totally evacuated.
✓	Proceed to assembly/muster point and take head count and report results to ICP.



Action for Building Evacuation

This is depending upon the nature of consequence which could be affected from the particular operational area that has experienced a fire or explosion. Stay in the building and wait for further instruction from Public Announcement made by ICP/CRO.



Process Plant Fire	
Detecting Fire or Smoke	
✓	Sound the Fire Alarm
Worker	
✓	Stop work. Switch off electrical equipment.
✓	Switch off mobile equipment, electrical equipment, vehicle engines (if times permits)
✓	Be prepared to follow instructions given by operation / safety or security personnel.
✓	Proceed to designated assembly/muster point and remain there until permission to leave is given by OC.
Security	
✓	Conduct head count (subordinates and team) then report to the Fire Warden at the Muster Point.
✓	Fire Warden at Muster Point reports results to ICP in a timely manner.
✓	Take action as Fire Warden requests.

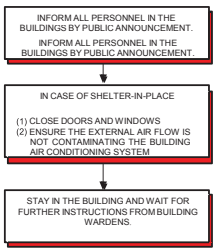
Fire / Explosion						
The following checklist identifies key items to consider						
		GPP ERT				Bangkok EMT
	Sinphuhorm Title	Field Manager Or Shift Supervisor	Senior Operator	Operator	CRO	
	Emergency Response Team Title	On Scene Comm	Emergency Tactical Team	Emergency Tactical Team	Source Control Group	
o	Accessing / closing manual isolation valves within process or product storage areas. Applying cooling water to vessels / equipment subject to flame impingement or radiant head in areas that are not protected by fixed water spray systems. Applying fire-fighting foam for fire/vapor control in areas. Supporting rescue or evacuation operations in fire- related emergencies. Providing sound advice/instructions	✓	✓			i
o	Ensure that up-to-date reports are circulated to all notified parties					✓
o	Complete ICS 201 forms	✓				
o	Establish communication between site and nearby plant or other effect area.	✓	✓	✓	✓	✓
o	Inform local authority and Department of Mitigation and Protection of Public Disaster			✓ (Liaison Officer)		✓
o	Ensure that statement to media has been prepared by External affair					✓

Notifications						
o	Medical Support	x				
o	Police / Fire / Forestry	x				
o	Local Authorities / Villages	x				
o	Department of Mineral Fuel					x
o	Partners					x
o	EGAT/PTT					x

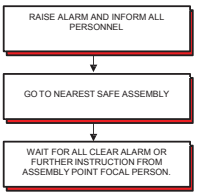
Legend					
Action Item	X	Who will make notification	i	Notification for informational purpose	

2) TOXIC GAS RELEASE

Toxic Gas Release – Building Areas
Level 1
On receiving/becoming aware of Toxic Gas Release incident, Shift Supervisor or CRO shall notify On Scene Commander.
Building Warden will prepare for evacuation in case of evacuation needed and wait for the further instruction from ICP.
Building needs to be kept updated on situation until situation is back to normal.
Level 2
On receiving notice that a Toxic Gas Release incident has become more serious and may affect the personnel in building, the On Scene Commander will activate Emergency Level 2
On-Scene Commander/Shift Supervisor will determine potential ERT members
ICP will co-ordinate with Building Warden via radio, or using a Public Announcement to inform personnel to either stay in the building or evacuate the building to the safe assembly area.
Building Warden will be informed of the current situation via ICP/OC at all time until the situation is back to normal.



Toxic Gas Release – In all other areas
Level 1
On receiving/becoming aware of Toxic Gas Release incident, Shift Supervisor or CRO shall notify On Scene Commander.
Shift Supervisor will inform the personnel in affected area via radio or Public Announcement (PA).
Personnel in the GPP area to be kept updated on situation until situation is back to normal.
Level 2
On receiving notice that a Toxic Gas Release incident has become more serious and may affect the personnel in building, the On Scene Commander will activate Emergency Level 2
On-Scene Commander/Shift Supervisor will determine potential ERT members
ERTL will evaluate the situation and co-ordinate with OSC/SS to have either personnel remains in the building or evacuate the personnel in that particular working area to the safe assembly area.
OC will be informed of the current situation via ERTL at all time until the situation is back to normal.



Toxic Gas release from both GPP and Neighboring Plant						
The following checklist identifies key items to consider						
		GPP ERT				Bangkok EMT
	Sinphuhorm Title	Field Manager Or Shift Supervisor	Senior Operator	Operator	CRO	
	Emergency Response Team Title	On Scene Commander	Emergency Tactical Team	Emergency Tactical Team	Source Control Group	
	Notifications					
o	Medical Support	x				
o	Police / Fire / Forestry	x				
o	Local Authorities / Villages	x				
o	Department of Mineral Fuel					x
o	Department of Mitigation and Protection of Public Disaster (Khon Kaen Branch) for Emergency Level 3			x (Liaison)		
o	PCD					x
o	Partners					x

Legend						
✓	Action Item	X	Who will make notification	i	Notification for informational purpose	

3) BOMB TREAT

Bomb threats will usually be made directly to the site, but may also be made through the news media, police or other third party.

Threats may come from:	
✓	Misguided practical jokers.
✓	Unhappy employee past or present employed by the Company or a Contractor deliberately causing inconvenience and disruption to production without sinister motivations for injury or damage.
✓	Extremist organizations operating primarily in the fields of local or national politics with malicious intent.

Threats are usually :	
✓	Telephone to the site
✓	Telephone to the local police or other authorities
✓	Communication to the local news media.
✓	Anonymous Letters

Personnel most likely to receive the bomb threat:	
✓	GPP Receptionist
✓	Production Superintendent / Operations Manager
✓	Shift Security Officer
✓	Control Room Operator

Note: Letters containing information on the alleged placing of a bomb should be handed to the police for any action they think is required. The letter should be handled as little as possible and by the minimum number of people.

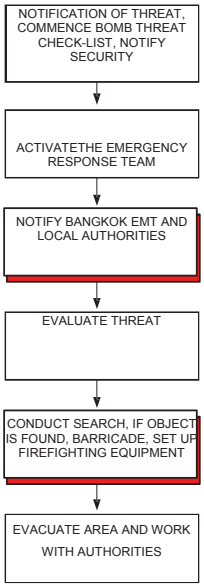
WARNING: NO BOMB THREAT CAN BE IGNORED

The decision to evacuate some or all personnel must rest with the IC/SS. The Bangkok EMT shall be notified on any bomb threat.

Bomb Threat Responsibilities

Personnel Receiving Bomb Threat:	
✓	Ask questions to the caller – Use Bomb Threat Checklist in Figure 5-1.
✓	Notify security

Security:	
✓	Notify Shift Supervisor – Activate the Emergency Response Team
✓	Notify local police



BOMB THREAT CHECKLIST

Name of Employee:	Date of call:
Company:	Time of call:

Questions to ask?

1. Has a bomb been placed or is the caller threatening to place one? _____
2. Where is the bomb right now? _____
3. Was it mailed? _____
4. When is the bomb due to go off? _____
5. What kind of bomb is it? _____
6. What does it look like? _____
7. Why are you making this threat? _____
8. Where are you calling from? _____

Write out the message using exact wording spoken

Caller Information

Caller's identify

___ Male ___ Female ___ Un identify Approximate age: _____

Original of call

___ Local ___ Long distance ___ Internal ___ Un identify

Language spoken

___ Excellence ___ Good ___ Fair ___ Poor

Speech

___ Fast ___ Normal ___ Slow

Accent

___ Foreign ___ Local ___ Un identify

Background noise

___ Animals ___ Airplanes ___ Music ___ Factory machines ___ Office machines

___ Mixed ___ Traffic ___ Train ___ Voices ___ Quiet Other _____

Voice characteristics

___ Loud ___ Soft ___ Intoxicated Other _____

Manner

___ Calm ___ Angry ___ Laughing ___ Emotional Other _____

Searching Procedures

When a decision has been made to search, the Emergency Response Team will designate the personnel most familiar with the target area to carry out a systematic search. Communications will be by wired-telephone or messenger (no radio to be used)

If a suspicious object is located then it must not be touched, its location conveyed to the On-Scene Commander and the area barricaded off, Fire- fighting equipment should be set up in strategic positions

OC/ICP will contact the local police or bomb disposal squads, if they are not already on site. Notify all staff

WARNING: UNDER NO CIRCUMSTANCES MUST PORTABLE RADIOS, BEEPERS OR MOBILE TELEPHONES BE USED.

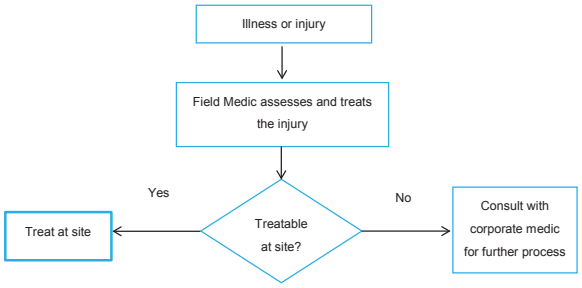
Mail Bomb Recognition Check-list

Mail bombs have exhibited unique characteristics, which should be helpful in identifying a suspect item. The following could be of assistance when opening mail:

Envelope:	
✓	Envelope will be lopsided or uneven in weight or packaging with possible cutting or pasting.
✓	Excessive use of securing materials such as sealing tape or string.
✓	Feelings of springiness or sponginess in the top, bottom or sides.
✓	Protruding wires, tinfoil or strings.
✓	Oily stains or discoloration ('Sweating' of plastic explosive)
✓	Peculiar odor. Sometimes smells like almonds
✓	Sloshing, buzzing or ticking sounds. Inks, particularly reds and blues may bleed, staining the envelope.
✓	Heavier than usual for the package size.
✓	Weight uneven or volume distribution uneven with possible bulging.
✓	Heavier than usual for its class of mail. (For example, an airmail envelope weighing more than 2 ounces)
✓	Greater than normal, particularly along its center length.

4) MEDICAL RESPONSE FLOWCHART

In cases of emergency involving medical response the Medical Emergency Response Plan must be followed:



5) HYDROGEN SULFIDE (H_2S) RELEASE

Hazards of Hydrogen Sulfide (H_2S)

H_2S normally enters the body through inhalation. It is a highly toxic gas with an odour of rotten eggs at low concentrations. The toxic effects of H_2S are rapid, and death can occur very quickly. Many liquid and gaseous hydrocarbons may contain H_2S in sufficient concentrations to present a potential hazard to personnel, and the environment. A small quantity of H_2S in the atmosphere (50ppm) is enough to render a victim unconscious, and can cause death if rescue does not take place immediately.

WARNING: 50% OF PEOPLE KILLED IN H_2S INCIDENTS ARE WOULD BE RESCUERS. THEREFORE ENSURE ALL PRECAUTIONS ARE TAKEN BEFORE ATTEMPTING ANY RESCUE OPERATIONS.

H_2S RELEASE GENERAL INFORMATION
The following checklist identifies key items and actions to consider during an event which a H_2S release occurs in or near the plant.
HAZARD INFORMATION
Primary hazards: Toxic, flammable gas. Respiratory hazard. Moderately irritating to eyes, mucous membranes.
Exposure Limit: ➢ PEL 10 ppm (8 hrs) ➢ STEL 20 ppm (10 min) ➢ IDLH level: 100 ppm A potentially hazardous volume of hydrogen sulfide is defined as one which could result in a ground level concentration of 100 ppm or higher where people are known or expected to be located. Concentrations of 300 ppm are immediately dangerous to life or health.
Fire hazards/special firefighting considerations: Flammable gas. (4% - 40% flammable range) **Note**: H2S concentration will be lethal at lower explosive limit, as 4% = 40,000 ppm. Gives off sulfur dioxide when burning. Wear positive pressure respiratory protection during Fire-fighting efforts involving H2S.
Spill/release considerations: Utilize hand-held gas detection to monitor H_2S levels.

Types of Leak

Types of Leak – Shift Supervisor will determine	
Minor leak (Level 1)	
✓	Unlikely to affect anyone outside the immediate area involved, and not require outside assistance
Major Leak (Level 2)	
✓	Likely to cause a spread of gas affecting surrounding plants and/or the public outside the GPP boundary, or requiring assistance from outside the area involved.

LEVEL 1 RESPONSE

Anytime a H_2S alarm is activated, except for a known test, the CRO will announce on the radio: ➢ Location of the alarm ➢ Concentration of the alarm ➢ Wind direction and speed
Personnel in the immediate area shall move upwind or crosswind of the release.
Concentrations above 10 ppm will require the use of SCBA with escape capability, to locate, isolate and/or repair the leak: ➢ Two personnel shall be utilized to accomplish the above task. Another person with SCBA shall be available as a backup/safety person. ➢ Assistance may be requested of other groups if necessary and manpower is available.

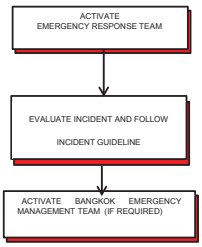
LEVEL 1 – ACTIVATION PROCEDURES	
SHIFT SUPERVISOR:	
✓	Activate additional ERT members, as appropriate.
✓	Monitor the severity of the incident and the potential for escalation.

LEVEL 2 RESPONSE

LEVEL 2 - H_2S RELEASE	
If the Field Manager or Shift Supervisor determines that the H_2S release has or may result in concentrations exceeding 100 ppm outside the fenced area, the following procedures will be followed:	
✓	The On-Scene Commander will be responsible for notifying neighboring facilities and the local police of the situation
✓	Notify production operations personnel. Give location of release, concentration, wind speed, and direction.
✓	Notify emergency personnel, as necessary.
✓	Notify the Bangkok Emergency Management Team
A release of hydrogen sulfide could require notification of governmental agencies.	

LEVEL 2– ACTIVATION PROCEDURES	
SHIFT SUPERVISOR:	
✓	Initiate the call-out of necessary ERT personnel and outside mutual aid resources to respond to the situation, and assign task group leaders to carry out critical activities: When the alarm is sounded, secure the source if safe to do so.
ON-SCENE COMMANDER:	
✓	Check for injured personnel. Move injured to a safe location, provide basic life support, and request local ambulance service.
✓	Advise and assist responding emergency personnel. Advise responding personnel regarding facility operations, shut-in procedures, etc. Assist Law Enforcement with crowd or traffic control, if requested. Provide MSDS sheets to Emergency Response personnel as requested.
✓	Do not attempt to approach a leaking valve, ruptured line, etc. to isolate or control a gas release.
✓	Initiate or assist evacuation of affected residences or businesses.

6) CONDENSATE / OIL / PIPELINE RELEASE



Pipeline Incident

The following checklist identifies key items to consider

		GPP ERT				Bangkok EMT
Sinphuhorm Title		**Field Manager Or Shift**	**Senior Operator**	**Operator**	**CRO**	
Emergency Response Team Title		**On Scene Comm**	**Emergency Tactical Team**	**Emerge ncy Tactica**	**Source Control Group**	
o	Mobilize Emergency Response Team if needed.	✓	✓			
o	Activate Emergency Response Group if person(s) are seriously / fatally injured or an evacuation	✓	✓			
o	Consider Immediately shut down	✓	✓		✓	
o	If gas leak, ensure that: o Consideration is given to a partial evacuation of local population. o The overall situation is monitored (worsening of the	✓	✓	✓		
o	Determine the integrity of pipeline.		✓	✓		
o	Arrange for transportation/evacuation			✓(Logistics)		✓
o	Ensure the ICS Form 201 is completed.	✓				✓
o	Ensure that up-to-date reports are circulated to all notified parties.	✓		✓ (Liaison)		✓
o	Ensure that statement to media has been prepared by					✓

Notifications					
Medical Support	X				
Police / Fire / Forestry	X				
Local Authorities / Villages	X				X
Department of Mineral Fuel					X
Department of Land Transportation					X
Department of Industrial works (Haz.Material Div.)					X
PCD					X
Partners					X
Contractors					X

Legend					
✓	**Action Item**	**X**	**Who will make notification**	**i**	**Notification for informational purpose**

Condensate Release

The following checklist identifies key items to consider

		GPP ERT				Bangkok EMT
Sinphuhorm Title		**Field Manager Or Shift Supervisor**	**Senior Operator**	**Operator**	**CRO**	
Emergency Response Team Title		**On Scene Commander**	**Emergency Tactical Team**	**Emergency Tactical Team**	**Source Control Group**	
o	Activate the appropriate alarm system and notify all personnel	✓				
o	Decide whether to mobilize the Emergency Response Team.	✓				
o	Evacuate nonessential personnel and secure all ignition sources. No road flares, smoking, or flames in hazard area. Consider wind direction, stay upwind and uphill, if possible. Evaluate the direction of product travel. Carefully contain and stop the source of the release, if safe to do so. Note: Do not flush down sewer or drainage systems. Protect bodies of water. The use of fire-fighting foam may be useful		✓			

Condensate Release

The following checklist identifies key items to consider

		GPP ERT				Bangkok EMT
Sinphuhorm Title		**Field Manager Or Shift Supervisor**	**Senior Operator**	**Operator**	**CRO**	
Emergency Response Team Title		**On Scene Commander**	**Emergency Tactical Team**	**Emergency Tactical Team**	**Sourc e Contr**	
o	Locate nearest hand portable or wheeled fire extinguishers to suppress incipient stage fires, if necessary. o Use deluge system if applicable. o Use fixed area monitors if applicable. o Use hose reels if applicable. A release of flammable liquid could require notification of local authority		✓	✓		
o	Mobilize recovery or clean-up equipment.	✓	✓			✓
o	Arrange for transportation /evacuation if required.			✓ **(Logistics)**		✓
o	Ensure the ICS Form 201 is completed.	✓				
o	Ensure that up-to-date reports are circulated to all notified parties.			✓ **(Liaison)**		✓

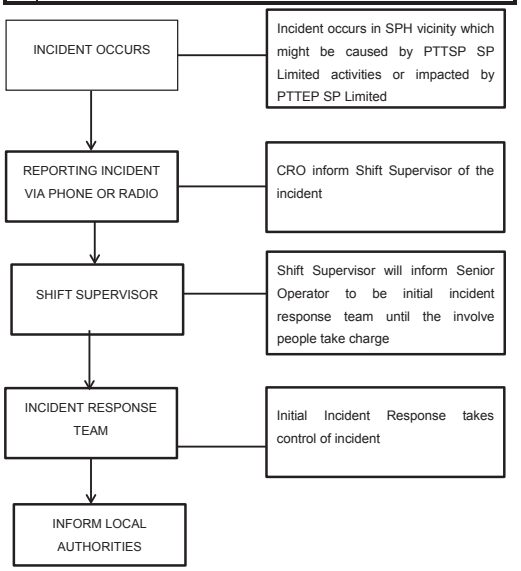
Notifications							
o	Medical Support	X					X
o	Police / Fire / Forestry			X (Liaison)			X
o	Local Authorities / Villages			X (Liaison)			X
o	Department of Mineral Fuel						X
o	PCD						X
o	Partners						X
o	Contractor Management						X

Legend					
✓	**Action Item**	**X**	**Who will make notification**	**i**	**Notification for informational purpose**

7) OFFSITE FACILITIES INCIDENTS IN SINPHUHORM

In the event of an emergency off site of PTTEP SP Limited, but within the vicinity of Sinphuhorm facilities which may have been caused by either PTTEP SP Limited related activities (i.e. Tanker accident, Fire). Additionally, this may simply be a road vehicle accident at the perimeter of the Sinphuhorm facility, where PTTEP SP Limited may be able to offer rapid assistance

☐	Inform Control Room Operator and Shift Supervisor
☐	Initiate Emergency Response Team, if required.
☐	Mobilize the Emergency Response Team, if required.
☐	Notify Responsible Party of incident.



8) CIVI UNREST / TERRORISM

Civil Unrest / Terrorism

The following checklist identifies key items to consider

		GPP ERT				Bangkok EMT
Sinphuhorm Title		**Field Manager Or Shift Supervisor**	**Senior Operator**	**Operator**	**CRO**	
Emergency Response Team Title		**On Scene Commander**	**Emergency Tactical Team**	**Emergency Tactical Team**	**Source Control Group**	
o	Decide whether to mobilize the Emergency Response Team.	✓				i
o	Establish the extent of potential immediate and long term effects.	✓				
o	Check POB information in ICP is up-to-date and complete.	✓	✓			
o	Mobilize Emergency Response Group Assistance.	✓	✓			i
o	Seek additional specialist information and advice from the Police via secure means of communication.	✓				✓
o	Advise field management according to instructions received from Police.	✓	✓			✓
o	Ensure the ICS Form 201 is completed.	✓				
o	All notifications and further actions will be carried out under the instructions of the Police.	✓				✓
o	Ensure the Duty Manager has sufficient information to prepare media response and relative response.					✓
o	Ensure that up-to-date reports are circulated to all notified parties.	✓				✓
	Notifications					
o	Police / Fire / Forestry	X				X
o	Local Authorities / Villages			X (Liaison)		X
o	Department of Mineral Fuel					X

Legend					
✓	Action Item	X	Who will make notification	i	Notification for informational purpose

Civil Unrest

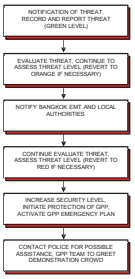
INCIDENT TYPE:	Mass demonstration at GPP site with potential unauthorized access to site a) endangering personnel safety b) damage to property
LOCATION:	Gas Production Plan (GPP)

EMERGENCY STEP	No	Response	Reference Document	By Who	Reporting to	Alert Level
Threat received	**1**	**Establish threat reporting**				
	1.1	Record and Report threat Green level	Threat Checklist	Shift Supervisor / SSHE	Field Manager (Asset VP)	
Threat Evaluation	**2**	**Initiate intelligence gathering (early warning & detection)**				
	2.1	Evaluate threat and collect information (and report).	Threat Checklist	G4S / CSR / Local Contacts	Field Manager (Asset VP)	
	3	**Continue to assess threat level**				
	3.1	If threat determined to be credible with possible demonstration at GPP, revert to Orange level	Threat Checklist	Field Manager	Asset VP	
	3.2	If threat determined to be credible with imminent demonstration at GPP, revert to Red level	Threat Checklist	Field Manager	Asset VP Asset SVP	

EMERGENCY STEP	No	Response	Reference Document	By Who	Reporting to	Alert Level
Execution (detection)	**4**	**Establish security detection measures and direct reporting requirements**				
	4.1	Post G4S security guard to Front gate and site road (with communication). Establish rotations.		G4S Head of Security	Field Manager (Asset VP)	
	4.2	Increase security staffing and establish rotations.		G4S Head of Security	Field Manager (Asset VP)	
	4.3	Increase security patrols (evening and day time).		G4S Head of Security	Field Manager (Asset VP)	
Execution (protection)	**5**	**Initiate protection of GPP (via process changes and equipment lockout)**				
	5.1	GPP Process: Minimise condensate production	SOPs - production	Shift Supervisor	Field Manager (Asset VP)	
	5.2	GPP Condensate Tanks: Lock tank bund entrance gates (4 locations)		Shift Supervisor	Field Manager (Asset VP)	
	5.3	GPP Road Gantry: Relocate "empty" tankers away from GPP.		Shift Supervisor	Field Manager (Asset VP)	

EMERGENCY STEP	No	Response	Reference Document	By Who	Reporting to	Alert Level
Execution (protection)	**6**	**Initiate response following confirmation of likely demonstration at GPP - activate GPP Emergency Plan roles and responsibilities etc.**				
	6.1	Relocate "GPP Van" to Evacuation Point (Kud Nam Sai),park at gate		Shift Supervisor	Field Manager (Asset VP)	
	6.2	Contact Police for possible assistance	GPP Emergency Plan	EHS	Field Manager (Asset VP)	
	6.3	Suspend tanker filling operations and if possible, remove from site or park tanker under gantry foam deluge.	GPP Emergency Plan	Shift Supervisor	Field Manager (Asset VP)	
	6.4	Suspend all maintenance activities and make safe	GPP Emergency Plan	Maintenance Supervisor	Shift Supervisor	
	6.5	CSR Team to greet Demonstration Crowd. - Depending upon crowd size and demands, may be possible to move crowd to Training Building. - Crowd may gain unauthorized access to site - attempt to contain and contact Field Manager/ SSHE	GPP Emergency Plan	CSR	Field Manager (Asset VP)	

EMERGENCY STEP	No	Response	Reference Document	By Who	Reporting to	Alert Level
	6.6	Field Manager (or Shift Supervisor - evening) and SSHE to meet Demonstration Crowd - Attempt to negotiate for crowd to move back outside site	GPP Emergency Plan	Field Manager / SSHE		
	6.7	GPP (non-production staffs and visitors) to evacuate and move to pick up point at Kud Nam Sai (with radio) via gate3 (Only production shift team remains on site).	GPP Emergency Plan	Administration	Field Manager (Asset VP)	
	6.8	Initiate ESD should: - Crowd gain entry past control room, OR - Crowd gain entry into Storage Tanks, OR - Crowd gains entry onto road gantry Spray deluge water at both condensate tanks		Shift Supervisor (or CRO)	Field Manager (Asset VP)	
	6.9	Production Team evacuates to Kud Nam Sai		Shift Supervisor	Field Manager (Asset VP)	
Execution (recovery)	7	**Follow Emergency Plan for recovery activities and ALL CLEAR**	GPP Emergency Plan	Shift Supervisor	Field Manager (Asset VP)	



9) FLAMMABLE GAS RELEASE

Flammable Gas Release

The following checklist identifies key items to consider

		GPP ERT				Bangkok EMT
Sinphuhorm Title		**Field Manager Or Shift Supervisor**	**Senior Operator**	**Operator**	**CRO**	
Emergency Response Team Title		**On Scene Commander**	**Emergency Tactical Team**	**Emergency Tactical Team**	**Source Control Group**	
o	Decide whether to mobilize the Emergency Response Team.	✓				i
o	Mobilize Emergency Response Group Assistance if person(s) is (are) seriously / fatally injured or an evacuation seems likely.	✓	✓			
o	Evacuate non-essential personnel and secure all ignition sources. No flares, smoking or flames in hazard area. Consider wind direction, stay upwind and uphill.	✓	✓			
o	Utilize process controls to instigate isolation and shutdown and depressurize of effected operation. Do not approach source of release until full depressurize has occurred and gas detectors show zero gas during approach.	✓			✓	
o	Complete ICS 201 Forms	✓	✓			✓
o	Ensure that up-to-date reports are circulated to all notified Partners	✓		✓ (Liaison)		✓
	Notifications					
o	Medical Support	X				X
o	Police / Fire / Forestry	X				X
o	Local Authorities / Villages	X		X (Liaison)		X
o	Department of Mineral Fuel					X
o	Contractor Management					X

Legend					
✓	Action Item	X	Who will make notification	i	Notification for informational purpose

10) FLAMMABLE GAS RELEASE

Loss or Damaged Radioactive Sources

The following checklist identifies key items to consider

		GPP ERT				Bangkok EMT
Sinphuhorm Title		**Field Manager Or Shift Supervisor**	**Senior Operator**	**Operator**	**CRO**	
Emergency Response Team Title		**On Scene Commander**	**Emergency Tactical Team**	**Emergency Tactical Team**	**Source Control Group**	
o	Evacuate, secure and restrict access for the affected area	✓				i
o	Decide whether to mobilize the Emergency Response Team.	✓				
o	Notify the OAEP (Office of Atomic Energy For Peace)office BKK and follow their safe work instruction, provide transportation for OAEP Officer	✓		✓ (Logistics)		✓
o	Ensure incident area is barricaded	✓		✓		
o	Evacuate employees to the muster point	✓				
o	Notify the Incident Commander.	✓				
o	Obtain status report regarding the nature of the loss or incident (e.g. exposure, loss in transit, loss during transfer to/from the installation or vessel, accident during logging operations, etc.) and the type of radioactive source.	✓				
o	Ensure that up-to-date reports are circulated to all.	✓				✓
o	Ensure that statement to media has been prepared by External affair					✓
	Notifications					
o	Department of Mineral Fuel					X
o	Department of Industrial Works (Khon Kaen Office)			X (Liaison)		X
o	Department of Welfare and Labor Protection (Khon Kaen)			X (Liaison)		X
o	OAEP (Office of Atomic Energy For Peace)					X

Legend					
✓	Action Item	X	Who will make notification	i	Notification for informational purpose

11) SHALLOW WELL BLOWOUT

Shallow Well Blowout						
The following checklist identifies key items to consider						
		GPP ERT				Bangkok EMT
Sinphuhorm Title		Field Manager Or Shift Supervisor	Senior Operator	Operator	CRO	
Emergency Response Team Title		On Scene Commander	Emergency Tactical Team	Emergency Tactical Team	Sour ce Contr	
o	Decide whether to mobilize the Emergency Response Team.	✓				i
o	Seek additional well control specialist advice via the well technology group in Bangkok.	✓				✓
o	Ensure that rig operations have been secured to limit the consequences as far as possible.	✓				
o	Shut in the well.	✓				
o	Ensure that abandon rig procedures have been implemented and that all non- essential personnel have been evacuated.	✓				
o	Ensure POB information is up-to-date and complete.	✓		✓ (Admin)		
o	Complete the ICS 201 forms.	✓				
o	Notify Bangkok EMT	✓				
Notifications						
o	Medical Services	X				

Legend					
✓	Action Item	X	Who will make notification	i	Notification for informational purpose

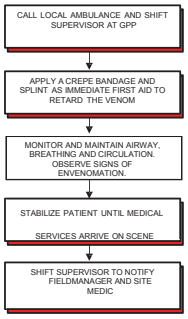
12) LOSS OF SECONDARY WELL CONTROL (BLOW OUT)

Loss of Secondary Well Control (Blow Out)						
The following checklist identifies key items to consider						
		GPP ERT				Bangkok EMT
Sinphuhorm Title		Field Manager Or Shift Supervisor	Senior Operator	Operator	CRO	
Emergency Response Team Title		On Scene Commander	Emergency Tactical Team	Emergency Tactical Team	Sourc e Contro	
o	Decide whether to mobilize the ERT.	✓				i
o	Seek additional Well Control specialist advice via the Well Technology group in Bangkok, including o Blow-out experts o Capping teams o Relief Well planning o Directional drilling experts	✓				
o	Check POB information at all sites are up-to-date and complete	✓		✓ (Admin)		
o	Arrange for transportation, fire- fighting and medical support as required	✓		✓ (Logistics)		
o	Complete ICS 201 Forms	✓				
o	Ensure that statement to media has been prepared by External affair					✓
Notification						
o	Local Authorities / Villages	X		X (Liaison)		
o	Department of Mineral Fuel					X
o	Partners					X
o	Contractor Management					X

Legend					
✓	Action Item	X	Who will make notification	i	Notification for informational purpose

13) SNAKE BITE

A victim of a snake bite in the Sinphuhorm operations has most probably suffered a bite from a King Cobra. This is a very venomous and dangerous snake which is widely distributed in the area of the GPP Pipeline and Well Pads. The King Cobra is the largest venomous snake in the world, and can inject an extremely large quantity of venom in one bite. A King Cobra snake bite signifies a true medical emergency. In this particular species, victims usually presents predominately with systemic neurologic manifestations. Drowsiness, neurological and neuromuscular symptoms may develop early; paralysis, respiratory failure or death often then ensues rapidly.



It is very important to ensure the following:

I. Keep the victim calm and reassured. Allow them to lie flat and avoid as much movement as possible. If possible, allow the bitten limb to rest at a level lower than the victim's heart.

II. Immediately wrap a large crepe bandage snugly around the bitten limb starting at the site of the bite and working proximally up the limb (the full length if possible). The bandage should be as tight as one might bind a sprained ankle.

III. Secure the splint to the bandaged limb to keep the limb as rigid and unmoving as possible. Avoid bending or moving the limb excessively while applying the splint.

DO NOT:
Remove the splint or bandages until the victim has reached the hospital and is receiving Anti-venom
Cut or incise the bite site
Apply ice to the bite site

Signs and Symptoms of Envenomation:
Drowsiness
Eyelid drooping
Respiratory paralysis
Different forms of paralysis
Convulsions
Head drooping
Headache
Sudden loss of consciousness
Stumbling walk

14) FATALITY / MEDICAL TREATMENT

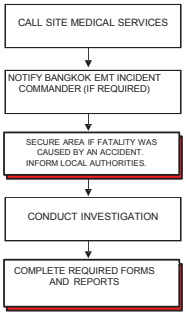
Depending upon the nature and number of casualties the Emergency Response Team and Bangkok Emergency Management Team will be activated to provide, maintain, and support medical and logistical requirements.

Due to the limited medical resources in the Sinphuhorm area of operations, local medical personnel shall develop a triage area to prioritize medical assistance and transportation.

If a situation involves mass casualty, the Bangkok Emergency Management Team shall be activated through the Incident Commander.

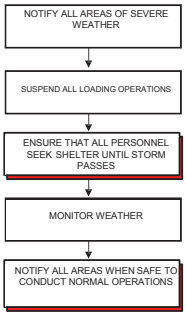
In the event of a death or a serious injury, the On-Scene Commander will notify the Incident Commander.

The Next of Kin notification will occur at the Liaison Officer, Human Relations office in Bangkok.

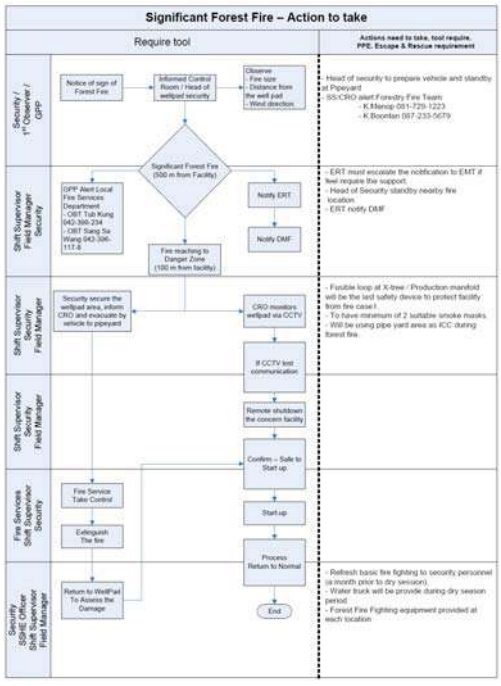


15) SEVERE WEATHER

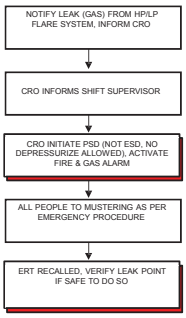
Severe Weather Checklist	
The following checklist identifies key items to consider during an event where severe weather could impact the facility.	
Weather Monitoring	
☐	Radios and the internet can be used to monitor severe weather reports provided by local emergency response authorities and radio stations.
☐	When severe weather approaches, radios should be turned on, tuned to local radio station / emergency services and monitored.
☐	All personnel should be notified of severe storms in the area. All personnel can then assist in the weather watch as they go about their regular duties.
Thunderstorms / Lighting / High Winds	
This checklist identifies actions to be taken when assets are threatened by thunderstorms, producing lightning or high winds.	
☐	Upon notification by weather monitoring of impending severe weather conditions, notify the well-sites and GPP personnel of the situation.
☐	The control room operator will broadcast a weather alert over the radio network. Personnel will be instructed to shut down all nonessential activities and take shelter inside a permanent building until the storm has passed.
☐	Immediately bring personnel off tanks, scaffolding, pipe racks, and other elevated work areas. Suspend product loading operations and close all tank openings.
☐	Take shelter until the storm has passed.



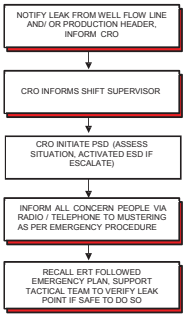
16) SIGNIFICANT FOREST FIRE



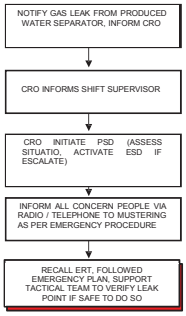
17) LOSS OF CONTAINMENT (GAS) FROM HP/LP FLARE SYSTEM AT GPP



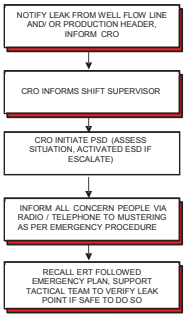
18) LOSS OF CONTAINMENT FROM WELL FLOW LINE AND PRODUCTION HEADER



19) LOSS OF CONTAINMENT FROM PRODUCE WATER SEPARATOR



20) LOSS OF CONTAINMENT FROM WELL FLOW LINE AND PRODUCTION HEADER



8.0 APPENDIX B: GAS FIRE FIGHTING EQUIPMENT LAYOUT

The layout of firefighting equipment is shown in GPP Fire Fighting Equipment layout below

GPP Head Count Procedures

The following procedure is employed in determining a head count for the GPP:

1) All personnel not involved in the emergency must go to the safe assembly/Muster area
2) Contractors are responsible for their own personnel

3) All personnel are responsible for their visitor.
4) It is the responsibility of the OSC to assign the person to do a head count of personnel involved in the emergency
5) It is the responsibility of the Emergency Response Team (if activated) to account for all personnel in the incident area
6) Security will provide the names of remaining personnel who are still in the gas processing plant during the emergency
7) Inform the OSC of the results of the head count and action taken

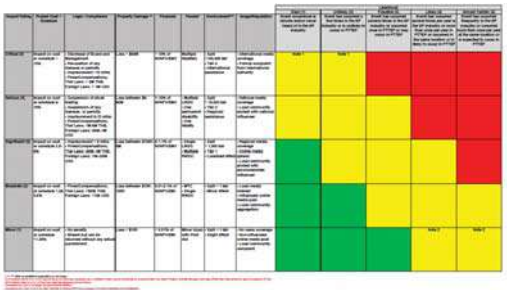
Muster Stations

1) Muster checker reports head counts from the Muster point area to OSC
2) Inform the OSC of the results of the head counts and action taken
3) When moving around between assembly areas always take into account the type of incident and the wind direction
4) Correspond to any personnel mobilized and report to OSC

9.0 APPENDIX C: PTTEP RISK ASSESSMENT MATRIX

* Depends on level of Media interest, i.e., if in very small group and can be handled at site, and then it is under Tier 1. However, if it is escalated & require corporate support it will be Tier 2.

** Depends on situations, for example, if there is people injury/ fatality or property damage without external support requirements, it will be Tier 2. However, if external supports are required or concerning international media, then it is Tier 3.



เอกสารแนบ 2-28

รายงานผลการฝึกซ้อมดับเพลิง และฝึกซ้อมอพยพหนีไฟ

ปตท.สผ
โครงการสินภูฮ่อม

รายงานการฝึกซ้อมดับเพลิงและฝึกซ้อมอพยพหนีไฟ ประจำปี พ.ศ. 2566

กรณีนายจ้างจัดให้มีการฝึกซ้อมเองตามกฎกระทรวงกำหนดมาตรฐาน ในการบริหาร จัดการ และดำเนินการด้านความปลอดภัย อาชีวอนามัย และสภาพแวดล้อมในการทำงานเกี่ยวกับการป้องกันและระงับอัคคีภัย พ.ศ.2555

ดำเนินการซ้อม 29 พฤศจิกายน พ.ศ. 2566

สถานที่ : อาคารบริหาร สถานีผลิตก๊าซธรรมชาติสินภูฮ่อม ตำบลกุดน้ำใส อำเภอน้ำพอง จังหวัดขอนแก่น

จัดทำโดย พีทีทีอีพี เอสพี ลิมิเต็ด

สถานีผลิตก๊าซธรรมชาติสินภูฮ่อม

323 หมู่ 1 ตำบลกุดน้ำใส อำเภอน้ำพอง จังหวัดขอนแก่น 40310

โทรศัพท์ 0-4323-2963

สรุป การซ้อมดับเพลิงและอพยพหนีไฟ

หน่วยงาน พีทีทีอีพี เอสพี ลิมิเต็ด (สถานีผลิตก๊าซธรรมชาติสินภูฮ่อม) **วันพุธที่ 29 พฤศจิกายน พ.ศ.2566**

ผู้ดำเนินการฝึกซ้อม พีทีทีอีพี เอสพี ลิมิเต็ด ร่วมกับหน่วยงานราชการในท้องถิ่น

<u>เหตุการณ์จำลอง</u>

วันพุธที่ 29 พฤศจิกายน พ.ศ. 2566 เวลา 10.00-12.00 น.

สถานที่ : อาคารบริหาร สถานีผลิตก๊าซธรรมชาติสินภูฮ่อม ตำบลกุดน้ำใส อำเภอน้ำพอง จังหวัดขอนแก่น

<u>ความรุนแรง</u>

การฝึกซ้อมระดับความรุนแรง 2 ไม่สามารถระงับเหตุได้ภายใน ต้องเรียกทีมสนับสนุนจากหน่วยงานภายนอก

<u>รายชื่อหน่วยงานราชการที่เชิญเข้าร่วมซ้อม</u>

1. รถดับเพลิงพร้อมทีมดับเพลิง เทศบาลตำบลกุดน้ำใส
2. รถดับเพลิงพร้อมทีมดับเพลิง เทศบาลตำบลม่วงหวาน
3. รถพยาบาลพร้อมทีมพยาบาล โรงพยาบาลน้ำพอง
4. รถตำรวจพร้อมเจ้าหน้าที่ตำรวจ สถานีตำรวจภูธรน้ำพอง

<u>รายชื่อหน่วยงานภาคเอกชนที่เชิญเข้าร่วมซ้อม</u>

1. รถดับเพลิงพร้อมทีมดับเพลิง โรงไฟฟ้าน้ำพอง
2. ทีมดับเพลิง เอ็กซอนโมบิล เอ็กซ์โพลเรชั่น แอนด์ โพรดักชั่น โคราช อิงค์
3. รถดับเพลิงพร้อมทีมดับเพลิง ศูนย์ปฏิบัติการเขต 4 บริษัท ปตท. จำกัด (มหาชน)

<u>สถานการณ์ฉุกเฉิน</u> :

เกิดกระแสไฟฟ้าลัดวงจร ที่ระบบปรับอากาศ สำหรับห้องอาหาร อาคารบริหาร แม่บ้านที่พบเห็นเหตุการณ์ โทรแจ้งเจ้าหน้าที่ห้องควบคุม (เบอร์ 33) พร้อมทั้งกดสัญญาแจ้งเหตุฉุกเฉิน (Manual Alarm Call point) เจ้าหน้าที่ห้องควบคุมแจ้งเหตุการณ์ที่เกิดขึ้นหัวหน้างานตามลำดับ พร้อมทั้งกดสัญญาณแจ้ง (Master drill) เพื่อให้ทุกคนไปรวมตัวกันที่จุดรวมพลที่ใกล้ที่สุด ผลการนับจำนวน พบพนักงาน สูญหาย 1 คน เป็นพ่อบ้าน ทีมดับเพลิงเข้าดับเพลิงในพื้นที่ เพื่อค้นหาผู้บาดเจ็บ และได้นำออกมายังจุดที่ปลอดภัย เพื่อรอรถพยาบาล

สถานการณ์ว่าไม่สามารถระงับเหตุการณ์ได้ จึง ขอการสนับสนุนจากหน่วยงานภายนอกทั้งทีมดับเพลิง ทีมพยาบาล และทีมอำนวยการจราจร เมื่อทีมดับเพลิงมาถึงได้ สลับสับเปลี่ยนกันฉีดน้ำดับเพลิง เพื่อ ควบคุมสถานการณ์ รถพยาบาลมารับผู้บาดเจ็บ แจ้งว่าพนักงาน ยังมีคืนสติ มีลมหายใจ เนื่องจากสำลักควัน จึงได้นำส่ง โรงพยาบาลน้ำพอง ในช่วงเวลาดังกล่าว มีประชาชนที่สัญจร ผ่านเส้นทาง ถ่ายภาพเหตุการณ์ ลงโซเชียลมีเดีย ทำให้จราจรติดขึ้นถนนด้านหน้าสถานี พร้อมทั้งนักข่าวเข้ามาทำข่าว ในลำดับต่อไปเพลิงได้เริ่มสงบลง โดยมีการแจ้งให้รถดับเพลิง ถอนกำลัง ดูสถานการณ์ พร้อมเจ้าหน้าที่ตำรวจเข้าตรวจสอบพื้นที่จุดเกิดเหตุ เพื่อเก็บหลักฐาน

เหตุการณ์จำลองและรายละเอียดในการฝึกซ้อม เป็นดังนี้

หน่วยงาน สถานีผลิตก๊าซธรรมชาติสินภูฮ่อม **วันพุธที่ 29 พฤศจิกายน พ.ศ.2566**

ผู้ดำเนินการฝึกซ้อม พีทีทีอีพี เอสพี ลิมิเต็ด

<u>เหตุการณ์จำลอง</u>

วันที่ 29 พฤศจิกายน พ.ศ. 2566 เวลา 10.00-12.00 น.

สถานที่ : ห้องอาหาร อาคารบริหาร สถานีผลิตก๊าซธรรมชาติสินภูฮ่อม ตำบลกุดน้ำใส อำเภอน้ำพอง จังหวัดขอนแก่น

<u>ความรุนแรง</u>

การฝึกซ้อม ระดับความรุนแรง 2 ไม่สามารถระงับเหตุได้ภายใน ต้องเรียกทีมสนับสนุนจากหน่วยงานภายนอก

<u>ทีมฉุกเฉิน</u>

1. วิรนิตย์ วุฒิสาร ตำแหน่ง หัวหน้าฝ่ายผลิต
2. พิชิต ประดับชาติ ตำแหน่ง เจ้าหน้าที่ห้องควบคุม
3. พงพันธ์ กามเทพ ตำแหน่ง พนักงานฝ่ายผลิต
4. สุริยา มีลาย ตำแหน่ง พนักงานฝ่ายผลิต

<u>สถานการณ์ฉุกเฉิน</u> :

ลำดับ	เวลา	กิจกรรม/สถานการณ์สมมติ	ผู้รับผิดชอบ/สื่อสาร
1	10.00 น.	เกิดกระแสไฟฟ้าลัดวงจร ที่ระบบปรับอากาศ สำหรับห้องอาหาร อาคารบริหาร	
2	10.01 น.	แม่บ้าน โทรแจ้งเตือนที่ CRO (เบอร์ 33) พร้อมทั้งกด Manual Alarm Call point	แม่บ้าน / โทร 33
3	10.02 น.	เจ้าหน้าที่ห้องควบคุม (CRO) แจ้งเหตุการณ์ที่เกิดขึ้นต่อ หัวหน้าฝ่ายผลิต (Shift Supervisor) พร้อมทั้งอนุญาตกด Master drill เพื่อให้ทุกคนไปรวมตัวกันที่จุดรวมพลที่ใกล้ที่สุด ผลขอากรนับจำนวน พบพนักงาน สูญหาย 1 คน เป็นพ่อบ้าน	เจ้าหน้าที่ห้องควบคุม (CRO)
4	10.03 น.	หัวหน้าฝ่ายผลิต (Shift Supervisor) แจ้งเหตุการณ์ ต่อ ผู้จัดการสถานีผลิต เพื่อให้ทีมดับเพลิง เข้าตรวจสอบพื้นที่พร้อม และเข้าระงับเหตุการณ์	หัวหน้าฝ่ายผลิต (Shift Supervisor)
5	10.05 น.	ทีมดับเพลิง แจ้งผ่านวิทยุ ว่าไม่สามารถระงับเหตุการณ์ได้ พร้อมทั้ง ระบบน้ำดับเพลิง (Springer) ทำงาน	ทีมดับเพลิง/ วิทยุ ช่อง 1
6	10.06 น.	ขอให้ทีมอพยพ พนักงาน CRO ที่ทำงานในอาคารบริหารทั้งหมด ไปยังอาคารฝึกอบรม	เจ้าหน้าที่ห้องควบคุม CRO
7	10.07 น.	เจ้าหน้าที่ห้องควบคุม (CRO) เตรียมพร้อมหากจำเป็นต้องหยุดระบบการผลิตฉุกเฉิน	หัวหน้าฝ่ายผลิต Shift Supervisor
8	10.15 น.	ที่ตึกอบรม ผู้จัดการสถานีผลิต ขอเรียกทีมฉุกเฉิน เพื่อตอบสนองเหตุการณ์ฉุกเฉินดังกล่าว	ผู้อำนวยการดับเพลิง On Scene Commander)

		หลังจากทีมฉุกเฉินมาพร้อมกัน ณ.จุดบัญชาการ ผู้จัดการสถานีผลิต (ขอใช้คำว่า ผู้อำนวยการดับเพลิง On Scene Commander) ขอให้ทีมฉุกเฉินประสานงานดังนี้ เจ้าหน้าที่กิจกรรมสัมพันธ์ CSR ประสานงาน - รถดับเพลิงจากหน่วยงานใกล้เคียง - รถพยาบาล (1669) - เจ้าหน้าที่ตำรวจให้ช่วยปิดถนน อำนวยการจราจร - หัวหน้าฝ่ายการผลิต Shift Supervisor - พนักงานฝ่ายผลิตและพนักงานซ่อมบำรุงพร้อมเครื่องตรวจวัดก๊าซ เตรียมการตรวจสอบพื้นที่เกิดเหตุ เจ้าหน้าที่ประสานงานคลังสินค้า - แจ้งประสานงานเตรียมรถ 3 คัน เพื่อนำส่งพนักงานไปยังอาคารฝึกอบรม	
9	10.25 น.	หัวหน้างานฝ่ายผลิต (Intervention team leader) ถึงจุดเกิดเหตุ รอรับการรายงานตัวจาก หน่วยงานภายนอก และอธิบายการเข้าทำหน้าที่ยังจุดต่าง ๆ ให้แก่เจ้าหน้าที่รัฐ และภาคเอกชน ● รถดับเพลิงจากเทศบาลตำบลกุดน้ำใสเข้ารายงานตัว แจ้งให้ฉีดน้ำเพื่อ ดับเพลิงอาคารบริหารในทิศเหนือลม (ฝั่งพระพรหม) ● รถดับเพลิงจากเทศบาลตำบลม่วงหวาน เข้ารายงานตัว แจ้งให้ฉีดน้ำเพื่อ ดับเพลิงอาคารบริหารในทิศเหนือลม (ฝั่งพระพรหม) ● รถดับเพลิงโรงไฟฟ้าน้ำพอง เข้ารายงานตัว แจ้งให้ฉีดน้ำเพื่อดับเพลิงอาคารบริหารในทิศเหนือลม (ฝั่งพระพรหม) ● รถดับเพลิง ปตท แนวท่อ เขต 4 เข้ารายงานตัว แจ้งให้ฉีดน้ำเพื่อดับเพลิงอาคารบริหารในทิศเหนือลม (ฝั่งพระพรหม) ● รถพยาบาลจากโรงพยาบาลน้ำพอง เข้ารายงานตัว ทำหน้าที่ ขนย้ายผู้บาดเจ็บที่หมดสติ เพราะ สำลักควัน ไปส่งโรงพยาบาล ● รถกู้ชีพ ของเทศบาลตำบล เข้ารายงานตัว ทำหน้าที่เป็นทีมพยาบาลกรณี เกิดเหตุการณ์ฉุกเฉิน กับทีมดับเพลิง ● เจ้าหน้าที่ตำรวจ ปิดกั้นถนนทางเข้าบริษัท และอำนวยการจราจรให้แก่รถสนับสนุนเพื่อเข้าทำการ ณ.จุดเกิดเหตุ	ผู้จัดการสถานีผลิต / หัวหน้าฝ่ายผลิต Shift Supervisor
10	10.30 น.	เพลิงไปลุกลามไปทั่ว อาคารบริหาร ครบคุมพื้นที่ของ ห้อง CRO และ ห้อง Equipment room รถดับเพลิง สลับสับเปลี่ยนกันฉีดน้ำดับเพลิง เพื่อควบคุมสถานการณ์	

11	10.50 น.	เพลิงได้เริ่มสงบลง โดยมีการแจ้งให้รถดับเพลิง ถอนกำลัง ดูสถานการณ์	
12	11.00 น.	รถพยาบาล แจ้งว่าพนักงาน ยังไม่ฟื้น คืนสติ จึงได้นำส่ง โรงพยาบาลขอนแก่น ในลำดับต่อไป	CSR / รพ.น้ำพอง
13	11.10 น.	เพลิง สงบลง ทีมดับเพลิง ทั้งหมด เตรียมรับคำสั่ง	
14		จบการซ้อม	

ข้อเสนอแนะ เพื่อการแก้ไข

หัวข้อ	ประเด็นที่ต้องปรับปรุงแก้ไข	หน่วยงานที่นำเสนอประเด็น	การดำเนินปรับปรุงแก้ไข
1	หน้ากาก ขนาดไม่ได้ ตามจำนวนทีมดับเพลิงและขนาดไม่เข้ากับหน้าของทุกคน ในทีมดับเพลิง	PTTEP	1. มีการทำ fit test เพื่อความเหมาะสม ของใบหน้าแต่ละคน กำหนดการแก้ไข 31 ธันวาคม 2566 2. สั่งซื้อสำหรับ จำนวนที่ต้องการ ของทีมดับเพลิง กำหนดการแก้ไข 30 มิถุนายน 2567
2	ไม่มีผู้ประสานงานผู้บาดเจ็บ ไปกับรถพยาบาล จึงไม่สามารถติดตามอาการผู้บาดเจ็บได้	PTTEP	1. กำหนดตัวบุคคล คือ ทีมเปล 1 ท่าน เป็นผู้ประสานงานไปกับรถพยาบาล กำหนดการแก้ไข 30 มกราคม 2567 2. แผนก SSHE ให้ข้อมูลรายละเอียด ต่าง ๆ ที่จำเป็นต้องติดต่อ เช่น เบอร์ติอต่อคุณหมอของบริษัท หรือกลุ่มไลน์ ติดต่อทีมแพทย์ กำหนดการแก้ไข 30 ธันวาคม 2566
3	พบความล่าช้า ที่ต้องเดินมารายงานตัว โดยการเดินจากห้องแต่งตัว มายัง จุดรายงานตัวเหตุฉุกเฉิน	PTTEP	ทีมดับเพลิง พร้อมทีมค้นหา ให้แต่งชุดดับเพลิง พร้อม SCBA และรออยู่รายงานทางวิทยุที่ ห้องชุดดับเพลิง กำหนดการแก้ไข 30 มกราคม 2567

รายชื่อหน่อยงานราชการร่วมฝึกซ้อม

SINPHUHORM NATURAL GAS FIELD

PTTEP

Topic: SPH Annual Emergency exercise (GPP)
Date: 29 Nov 2023

No	Name ชื่อ สกุล	Job Title ตำแหน่ง	Company บริษัท	Signature
1	SMO. โชคชัย ทศโชติกุล	รอง. สวป.	สภ. ปักธงชัย	
2	ดต.ท. ปรัชญา [illegible]	รอง. สวป.	สภ. หนองบุญมาก	
3	ดต.ท. ณัฐวัฒน์ [illegible]	"	"	
4	จ.ส.อ. รัฐพล [illegible]	"	รถดับเพลิง	
5	ดต.ท. ธีระพงษ์ [illegible]	"	"	
6	น.ส. [illegible]	นักประชาสัมพันธ์	ทสม. พิมายคลอง	
7	พ.ต.ท. [illegible]	รอง สวป.	ทล. ช่องสะเดา	
8	[illegible]	ผกก. สภ. [illegible]	ทล. ปักธงชัย	
9	พ.ต.ท. [illegible]	สวป. สภ. [illegible]	ทล. ปักธงชัย	
10	[illegible]	สวป. สภ. [illegible]	ทล. ปักธงชัย	
11	ทศาปรมัตถ์ สนั่นเทศ์	รองปลัด	ทม. กุดน้ำใส	
12	[illegible]	ผ.วิทยาการพลังงานฯ	โรงไฟฟ้าพลังงาน	
13	พ.ต.อ.หญิง [illegible]	ผกก. [illegible]	สภ. [illegible]	
14	[illegible]	นักบินกู้	สภ. [illegible]	
15	[illegible]	ผบ.ปภ.จังหวัด	ทต. กุดน้ำใส	
16	[illegible]	[illegible]	ทต. ปักธงชัย	
17	[illegible]	สวป. [illegible]	ทต. [illegible]	
18	[illegible]	[illegible]	ปภ. [illegible]	
19	[illegible]	[illegible]	ปภ. [illegible]	
20	[illegible]	พ.ง.ต. [illegible]	ปภ. - A	
21	[illegible]	รปภ. โรงไฟฟ้า[illegible]	โรงไฟฟ้า [illegible]	
22	[illegible]	รปภ. โรงไฟฟ้าเจ้าพอ	โรงไฟฟ้าเจ้าพอ	
23	[illegible]	รปภ. โรงไฟฟ้า[illegible]	โรงไฟฟ้า[illegible]	
24	[illegible]	รปภ. โรงไฟฟ้าเจ้าพอ	โรงไฟฟ้าเจ้าพอ	
25	[illegible]	รปภ. โรงไฟฟ้าเจ้าพอ	โรงไฟฟ้าเจ้าพอ	
26	[illegible]	รปภ. 1 โรงไฟฟ้า[illegible]	กฟผ. โรงไฟฟ้าเจ้าพอ	
27	[illegible]	OSM	BGS	
28	[illegible]	OSM	BGS	
29	[illegible]	OSM	BGS	
30	[illegible]	OSM	SGS	

SINPHUHORM NATURAL GAS FIELD

PTTEP

Topic: SPH Annual emergency exercise (OPP)
Date: 29 Nov 2023

No	Name ชื่อ สกุล	Job Title ตำแหน่ง	Company บริษัท	Signature ลายมือชื่อ
1		Store man	BES	
2		SSHE	BES	
3		Maintenance	PSL	
4		Driver.	GAS.	
5		Driver	GAS	
6		OBM	B.E.S	
7		CCR	PSL	
8		รปภ/ม	PTTEP	
9		Loader	BES	
10				
11		Public Affairs	PTTEP	
12		Admin	PSL	
13		Admin	PSL	
14		SSHE	PSL	
15		SSHE	PSL	
16		SSHE	PSL	
17		BSHE	PSL	
18		SSHE.	PTTEP.	
19		Driver	GAS	
20		Gardener	BES	
21		Gardener	B.E.S	
22		เจ้าหน้า	B.E.S.	
23		เจ้าหน้า	B.E.S.	
24		Gardener	B.E.S.	
25		ร.ว./ค	GAS	
26		รปภ.	GAS	
27		รปภ	GAS	
28		OPT	PTTEP	
29		OPT	PSL	
30		OPT	PTTEP	

PTTEP

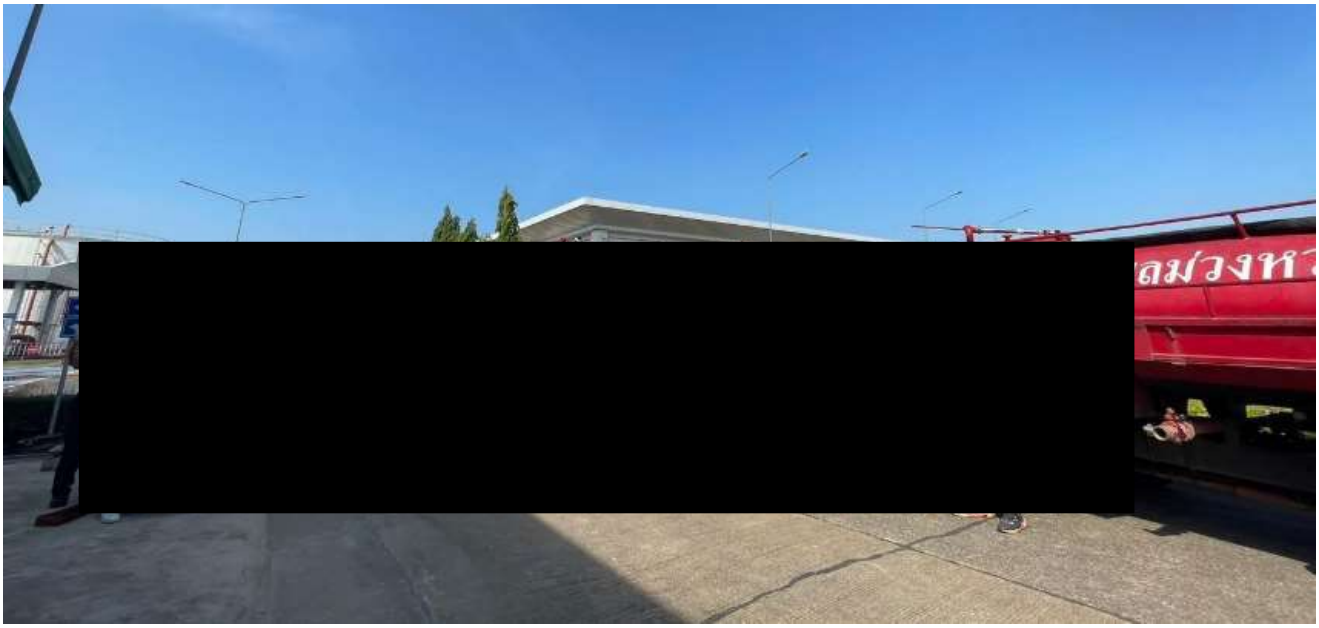
SINPHUHORM NATURAL GAS FIELD

Topic: SPH Annual Emergency exercise (SEP)

Date: 28 Nov 2025

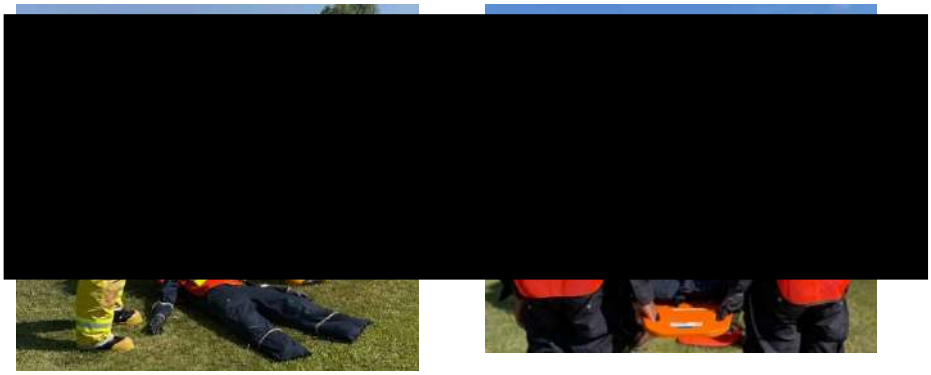
No	Name ชื่อ สกุล	Job Title ตำแหน่ง	Company บริษัท	Signature ลายมือชื่อ
1	Sutiya Meelai	Lead Opr	PTTEP	
2	PICHIT P	"	PTTEP	
3	Thanapat W.	MNT Eng	PSL	
4	Wilson L	PSP / H	PTTEP	
5	Chad J.	SSHE	BES	
6	Singkhong J.	Lead OPR	PTTEP	
7	Danai P	O&M Assist	BES	
8	Pongmai P.	O&M Assistant	BES	
9	KHEMMPLAS	MT	PSL	
10	Kriangsak P	MT	PSL	
11	Thongchai P.	O&M AS	B.E.S	
12	NOPPARAT	O&M	B.E.S	
13	Yongyuth K.	Gardener	B.E.S.	
14	Sombat W.	SS.	GAS	
15	Narumol K.	Admin	PSL	
16	Sanayuth N.	Gardener	B.E.S	
17	อนุพงศ์ [illegible]	วิศวกร	GAS	
18	Kasemta B.	Gardener	B.E.S	
19	Theerasak Maduthip	SSO	BES	
20	Sujitra Sichedum	nurse		
21				
22				
23				
24				
25				
26				
27				
28				
29				
30				

ภาพประกอบการฝึกซ้อม



ภาพหมู่

ภาพการช่วยเหลือผู้บาดเจ็บ



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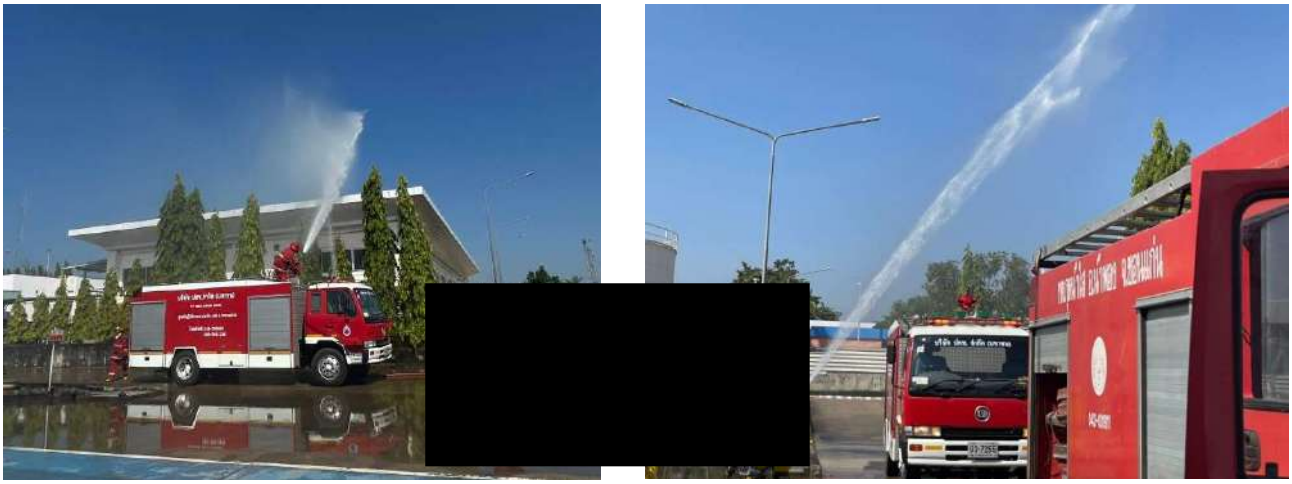
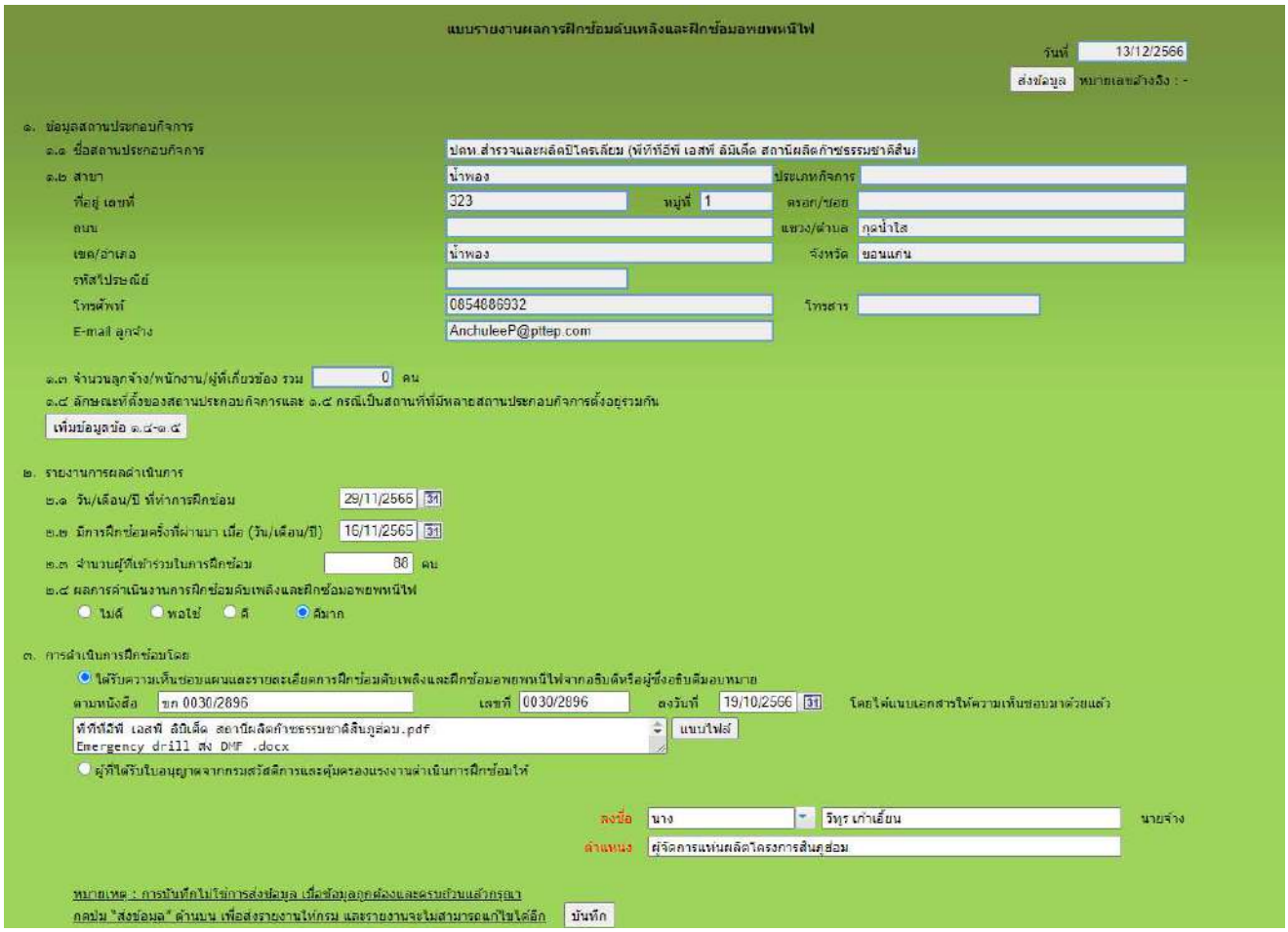


ส่งเล่มรายงานราชการ



เอกสารแนบ 2-29

Area Classification

PLANT NORTH

TRUE NORTH

124337

282939

FENCE LINE

℄ ROAD NO. 6

℄ ROAD NO. 3

60

59

1,103,000

[redacted]

FROM WELLPAD A,B,C

E. 200

N. 450 22

350228

N. 220 00

SALES GA TO PTT

HV POWER POLE

221300

Technip DENOTES SCOPE OF MODIFICATION UNDER TET PROJECT NO. 4243 (NEW PW DISPOSAL SYSTEM)

METRES 0 12 24 36 48

GRAPHIC SCALE 1:600

NOTES :

1. ALL DIMENSION SHOWN ON THE DRAWING ARE IN MM. UNLESS OTHERWISE NOTED.
2. HAZARDOUS AREA CLASSIFICATION IS BASED ON IP CODE PART 15.
3. FOR SECTION AND TYPICAL DETAIL OF HAZARDOUS AREA CLASSIFICATION SEE DWG. No. PHM-115-EW-131.
4. HAZARDOUS RADIUS REFER TO DOC.NO. 2002-CN-1920-01 (HAZARDOUS AREA SCHEDULE).
5. MECHANICAL VENTILATOR SHALL BE PROVIDED FOR BATTERY ROOM. IN ADDITION THE ALL ELECTRICAL EQUIPMENT IN THE BATTERY ROOM MUST BE SUITABLE FOR GROUP IIC, T1.
6. THE PIG RECEIVER TO BE PURGED WITH NITROGEN BEFORE OPENING.

LEGENDS :

ZONE 2, GROUP IIA, T3

ZONE 1, GROUP IIA, T3

ZONE 0, GROUP IIA, T3

NON-HAZARDOUS

REV	DATE	REMARKS	DRAWN	CHK	APP'R	CHK	APP'R	DRAWING No.	REFERENCE DRAWINGS
				PW					
				P.	SKD	Chak			
2	11/OCT/13	ISSUED FOR CONSTRUCTION (FOR 4243 PROJECT)	APH	PW/SKD	CNA				
2A	12/JUN/13	ISSUED FOR REVIEW (FOR 4243 PROJECT)	WNB	SKD	CNA				
1	15/MAR/07	AS-BUILT	SCM	WRB/ASS	SMA/TK				
0	29/MAY/06	APPROVED FOR CONSTRUCTION	SCM	BBH	SMA/TK			2002-CN-1920-01	HAZARDOUS AREA SCHEDULE
A	27/JAN/06	ISSUED FOR APPROVAL	SCM	BBH	SMA			PHM-115-EW-131	HAZARDOUS AREA CLASSIFICATION TYPICAL DETAIL

TET / AMEC

CONTRACT NO. : TH/PH-DEV/017

DRAWN BY: SCM

SCALE : 1:600

PROJECT NO. 2002

CONSULTANT: Technip TECHNIP ENGINEERING (THAILAND) LTD.

HESS AMERADA HESS (THAILAND) LIMITED

TITLE: ELECTRICAL GAS PROCESSING PLANT HAZARDOUS AREA CLASSIFICATION

PROJECT : Phu Horm Gas Development

CAD FILE NAME: PHM-115-EW-130.DWG SHT. 1 OF 1

DRAWING NUMBER: PHM-115-EW-130 REV. 2

P:\4243-New PW Disposal\01-DRAWINGS\SA\Hoc\Working\PHM-115-EW-130.dwg Last Update Oct 14, 2013 - 2:06pm By anupongh

เอกสารแนบ 2-30

ตัวอย่างเอกสาร Job Safety Analysis

Risk & Environmental Aspect Assessment

Act-0018-SSHE การตรวจวัด และการเก็บตัวอย่าง สภาพแวดล้อมในการทำงาน แสงสว่าง เสียง ความร้อน สารเคมีในบรรยากาศการทำงาน น้ำ น้ำใต้ดิน ดิน

Department : SSHE
Assesor team : anchuleep@pttep.com, piyachanogp@pttep.com,
Note :

Location : sin
Condition : Routine

Step 1) การเตรียมการสำหรับการเก็บตัวอย่าง

1.1) การเดินทางโดยรถยนต์ ไปเก็บตัวอย่าง

Hazard / Environmental Aspect Category : 33.Other
Description : การใช้ยานพาหนะ

Source of hazard / Envi. Aspect : 1. สภาพอากาศ เช่น ฝนตก พายุ ลมแรง หิมะหนา หมอกลงจัด 2. สภาพรถไม่พร้อมใช้งาน เช่น เครื่องยนต์ชำรุด แบตเตอรี่หมด ยางแบน 3. สภาพถนน เช่น ชำรุด มีหลุมบ่อ ขับขึ้นที่สูง 4. สภาพจราจร เช่น รถติด เกิดอุบัติเหตุบนท้องถนน
Top Event / Envi. Aspect : อุบัติเหตุรถยนต์

People	Environment	Asset	Reputation
4E	1E	2E	2E
2B	1B	1B	1B

Threat & Control :

- **พนักงานขับรถพักผ่อนไม่เพียงพอ**
  - สังเกตพฤติกรรม พยร
- **ไม่คุ้นเคยกับเส้นทาง**
  - ศึกษาเส้นทาง มีแผนที่ติดรถ และนำทางครั้งแรก โดยทีม SSHE
- **รถยนต์ไม่พร้อมใช้งาน**
  - ตรวจสอบรถก่อนใช้งานทุกครั้ง ตรวจเช็คตามรอบระยะเวลา
- **สภาพอากาศไม่เหมาะสมกับการเดินทาง**
  - ใช้ความเร็วไม่เกินกำหนด
  - ตรวจสอบสภาพอากาศก่อนเดินทาง
- **พนักงานไม่ชำนาญการขับรถ**
  - ไม่อนุญาตให้ ขับรถ และขอให้เปลี่ยนคนขับรถใหม่ ที่มีความชำนาญ

Consequence & Recovery :

- **หลับในขณะขับรถ**
  - Buddy System ช่วยสังเกต และเตือน
- **อ่อนเพลีย ง่วง หลับใน**
  - จอดรถพักผ่อน
- **หลงทางเสียเวลา**
  - มีเบอร์โทรฉุกเฉินติดรถไว้ติดต่อในกรณีฉุกเฉิน
- **งานล่าช้า ถึงจุดหมายช้า**
  - ติดต่อให้รถสำรองเพื่อเปลี่ยนกับรถที่มีปัญหา
- **อุบัติเหตุ**
  - ERP 1669
  - First aid kit
  - First Aid

Action Party : Admin and SSHE

Hazard / Environmental Aspect Category : 32.Environmental Aspect Category
Description : 32.04.Use of raw materials and natural resources

Source of hazard / Envi. Aspect : การใช้น้ำมันดีเซล/เบนซินในการเดินทางของรถยนต์
Top Event / Envi. Aspect : การสิ้นเปลืองพลังงาน

People	Environment	Asset	Reputation
4D	1D	2D	2D
2A	1A	1A	1A

Threat & Control :

- **ไม่คุ้นเคยกับเส้นทาง**
  - ศึกษาเส้นทาง มีแผนที่ติดรถ และนำทางครั้งแรก โดยทีม SSHE
- **รถยนต์ไม่พร้อมใช้งาน**
  - ตรวจสอบรถก่อนใช้งานทุกครั้ง ตรวจเช็คตามรอบระยะเวลา

Consequence & Recovery :

- **ระยะทางเพิ่ม สิ้นเปลืองพลังงานมากขึ้น**
  - Buddy System ช่วยสังเกต และเตือน
- **งานล่าช้า ถึงจุดหมายช้า สิ้นเปลืองพลังงานมากขึ้น**
  - ติดต่อให้รถสำรองเพื่อเปลี่ยนกับรถที่มีปัญหา

Action Party : Admin and SSHE

1.2) การเตรียมอุปกรณ์ เครื่องมือ สารเคมี

Hazard / Environmental Aspect Category : 08.Dynamic situation hazards
Description : 08.06.Use of knives, matcheles and other sharp objects

Source of hazard / Envi. Aspect : ความแหลมคมของอุปกรณ์เก็บตัวอย่าง
Top Event / Envi. Aspect : สัมผัสความแหลมคมของอุปกรณ์เก็บตัวอย่าง

People	Environment	Asset	Reputation
2E	1E	1E	1E
1B	1B	1B	1B

Threat & Control :

- **อุปกรณ์แหลมคม เช่น กรรไกร ขวดแก้ว**
  - การตรวจสอบอุปกรณ์ก่อนเริ่มงาน
  - การสวมถุงมือป้องกันก่อนการสัมผัสอุปกรณ์ เครื่องมือที่มีคม
- **การแตกของอุปกรณ์ที่เป็นแก้ว**
  - การตรวจสอบอุปกรณ์ก่อนเริ่มงาน
  - การสวมถุงมือป้องกันก่อนการสัมผัสอุปกรณ์ เครื่องมือที่มีคม

Consequence & Recovery :

- **ถูกบาดจากอุปกรณ์แหลมคม**
  - First aid kit

Action Party : Sinphuhorm SSHE <SPH.EHS@pttep.com>

Hazard / Environmental Aspect Category : 25.Ergonomic hazards
Description : 25.01.Manual materials handling

Source of hazard / Envi. Aspect : น้ำหนักของเครื่องมืออุปกรณ์
Top Event / Envi. Aspect : การแบกรับน้ำหนักมากเกินกำลัง

People	Environment	Asset	Reputation
2D	1D	1D	1D
1A	1A	1A	1A

Threat & Control :

- **ท่าทางในการยกเคลื่อนย้ายที่ไม่เหมาะสม**
  - Manual Handling Procedure PH-10-HS-SWP-00009
  - ใช้อุปกรณ์ช่วยยกกรณีของมีน้ำหนักมาก
  - SSHE Induction และอบรมท่าทางการยกเคลื่อนย้ายที่ถูกวิธี

Consequence & Recovery :

- **พนักงานได้รับบาดเจ็บ**
  - First aid kit and Nurse
- **อุปกรณ์ได้รับความเสียหาย**
  - จัดเตรียมอุปกรณ์สำรอง

Action Party : Sinphuhorm SSHE <SPH.EHS@pttep.com>

Hazard / Environmental Aspect Category : 33.Other
Description : ยานกระแทก

Source of hazard / Envi. Aspect : รถเก็บตัวอย่างเข้าพื้นที่
Top Event / Envi. Aspect : อุบัติเหตุจากรถเก็บตัวอย่างเข้าพื้นที่

People	Environment	Asset	Reputation
3D	2D	2D	1D
1A	1A	1A	1A

Threat & Control :

- **พนักงานไม่ชำนาญการเข้าสู่พื้นที่**
  - SSHE induction at site
  - คนนำทาง
- **สภาพรถไม่พร้อมใช้งาน**
  - การตรวจสอบสภาพความพร้อมของรถ และพนักงานขับรถก่อนเข้าพื้นที่
- **ไม่ปฏิบัติตามปายจราจรในพื้นที่ หรือใช้ความเร็วเกินกำหนด**
  - SSHE induction at site
  - SOC
- **มีแอลกอฮอล์ในลมหายใจ**
  - เป่าแอลกอฮอล์ก่อนเข้าทำงาน
- **สภาพร่างกายพนักงานขับรถ ไม่ fit to work**
  - การตรวจสอบสภาพความพร้อมของรถ และพนักงานขับรถก่อนเข้าพื้นที่

Consequence & Recovery :

- **พนักงานได้รับบาดเจ็บถึงขั้นเสียชีวิต**
  - First aid kit and Nurse
  - Emergency Response Plan
- **ทรัพย์สินเสียหาย**
  - Emergency Response Plan
  - มีการทำประกันภัย

Action Party : Sinphuhorm SSHE <SPH.EHS@pttep.com>

Hazard / Environmental Aspect Category : 09.Environment hazards
Description : 09.01.Weather

Source of hazard / Envi. Aspect : Weather
Top Event / Envi. Aspect : To have a stroke

People	Environment	Asset	Reputation
2D	1D	1D	1D
1A	1A	1A	1A

Threat & Control :

- **Hot weather**
  - Drink water
  - Set up working time with frequent breaking period.

Consequence & Recovery :

- **Personal Injury**
  - Wear PPE
  - Rescue team
  - First Aids by nurse

Action Party : Sinphuhorm SSHE <SPH.EHS@pttep.com>

Hazard / Environmental Aspect Category : 25.Ergonomic hazards
Description : 25.01.Manual materials handling

Source of hazard / Envi. Aspect : Tool & equipment
Top Event / Envi. Aspect : Worker may slip,trip,fall while lifting

People	Environment	Asset	Reputation
2D	1D	1D	1D
1A	1A	1A	1A

Threat & Control :

- **Working area is not secured**
  - Keep working area secured
- **สภาพพื้นที่ ต้นไม้ หญ้ารก**
  - มีการตัดหญ้าและต้นไม้โดยรอบพื้นที่เป็นประจำ

Consequence & Recovery :

- **Personal Injury (back pain, muscle pain)**
  - First Aids / Nurse
  - Wear proper PPE
- **อุปกรณ์ได้รับความเสียหาย**
  - จัดเตรียมอุปกรณ์สำรอง

Action Party : Sinphuhorm SSHE <SPH.EHS@pttep.com>

Hazard / Environmental Aspect Category : 33.Other
Description : สารเคมีที่ทำให้ตัวอย่างน้ำเจือจางสภาพ

Source of hazard / Envi. Aspect : สารเคมีที่ทำให้ตัวอย่างน้ำเจือจางสภาพ
Top Event / Envi. Aspect : สารเคมีที่ทำให้ตัวอย่างน้ำเจือจางสภาพ

People	Environment	Asset	Reputation
2D	1D	1D	1D
1B	1B	1B	1B

Threat & Control :

- **ภาชนะบรรจุชำรุด แตก**
  - การตรวจสอบอุปกรณ์ เครื่องมือ ก่อนเริ่มงาน
  - การสวมใส่อุปกรณ์ป้องกันอันตรายกับการทำงานกับสารเคมี
- **ฉลากไม่ชัดเจน**
  - การตรวจสอบอุปกรณ์ เครื่องมือ ก่อนเริ่มงาน

Consequence & Recovery :

- **พนักงานได้รับบาดเจ็บ**
  - First aid kit
- **ขยะของเสียอันตรายจำนวนเพิ่มมากขึ้น**
  - การจัดการขยะอันตราย ตามข้อกำหนดของสัญญา คือผู้รับเหมาต้องเป็นผู้รับผิดชอบ
  - มีภาชนะรองรับสารเคมีที่เป็นของเหลว

Action Party : Sinphuhorm SSHE <SPH.EHS@pttep.com>

Step 2) การเก็บตัวอย่าง

2.1) สภาพแวดล้อมในการทำงาน แสงสว่าง เสียง ความร้อน สารเคมีในบรรยากาศการทำงาน

Hazard / Environmental Aspect Category : 09.Environment hazards
Description : 09.01.Weather

Source of hazard / Envi. Aspect : Weather
Top Event / Envi. Aspect : To have a stroke

People	Environment	Asset	Reputation
2D	1D	1D	1D
1A	1A	1A	1A

Threat & Control :

- **Hot weather**
  - Drink water
  - Set up working time with frequent breaking period.

Consequence & Recovery :

- **Personal Injury**
  - Wear PPE
  - Rescue team
  - First Aids by nurse

Action Party : Sinphuhorm SSHE <SPH.EHS@pttep.com>

Hazard / Environmental Aspect Category : 25.Ergonomic hazards
Description : 25.01.Manual materials handling

Source of hazard / Envi. Aspect : Tool & equipment
Top Event / Envi. Aspect : Worker may slip,trip,fall while lifting

People	Environment	Asset	Reputation
2D	1D	1D	1D
1A	1A	1A	1A

Threat & Control :

- **Working area is not secured**
  - Keep working area secured
- **สภาพพื้นที่ ต้นไม้ หญ้ารก**
  - มีการตัดหญ้าและต้นไม้โดยรอบพื้นที่เป็นประจำ

Consequence & Recovery :

- **Personal Injury (back pain, muscle pain)**
  - First Aids / Nurse
  - Wear proper PPE
- **อุปกรณ์ได้รับความเสียหาย**
  - จัดเตรียมอุปกรณ์สำรอง

Action Party : Sinphuhorm SSHE <SPH.EHS@pttep.com>

2.2) การเก็บตัวอย่างบริเวณริมสระ

Hazard / Environmental Aspect Category : 33.Other
Description : จมน้ำ

Source of hazard / Envi. Aspect : สระน้ำ
Top Event / Envi. Aspect : ตกน้ำ

People	Environment	Asset	Reputation
2D	1D	1D	1D
1B	1B	1B	1B

Threat & Control :

- **พื้นที่บริเวณริมสระน้ำลื่น**
  - มีอุปกรณ์ช่วยในการเก็บตัวอย่าง ที่สามารถยืนลงไปในสระน้ำโดยที่พนักงานเก็บตัวอย่างอยู่ห่างจากขอบสระ
  - มีเจ้าหน้าของ PTTEP SP ดูแลและให้ข้อเสนอแนะพื้นที่ผ่าน Tool box talk
  - PTW and JSA
- **ไม่คุ้นชินในพื้นที่**
  - มีเจ้าหน้าของ PTTEP SP ดูแลและให้ข้อเสนอแนะพื้นที่ผ่าน Tool box talk
  - ทำงานเป็นทีม
- **วิธีการเก็บตัวอย่างไม่เหมาะสม**
  - มีอุปกรณ์ช่วยในการเก็บตัวอย่าง ที่สามารถยืนลงไปในสระน้ำโดยที่พนักงานเก็บตัวอย่างอยู่ห่างจากขอบสระ
  - PTW and JSA

Consequence & Recovery :

- **พนักงานตกน้ำ จมน้ำ**
  - สวมเสื้อชูชีพ
  - ห่วงชูชีพพร้อมใช้งาน
  - First Aid & Nurse

Action Party : Sinphuhorm SSHE <SPH.EHS@pttep.com>

Hazard / Environmental Aspect Category : 09.Environment hazards
Description : 09.01.Weather

Source of hazard / Envi. Aspect : Weather
Top Event / Envi. Aspect : To have a stroke

People	Environment	Asset	Reputation
2D	1D	1D	1D
1A	1A	1A	1A

Threat & Control :

- **Hot weather**
  - Drink water
  - Set up working time with frequent breaking period.

Consequence & Recovery :

- **Personal Injury**
  - Wear PPE
  - Rescue team
  - First Aids by nurse

Action Party : Sinphuhorm SSHE <SPH.EHS@pttep.com>

Hazard / Environmental Aspect Category : 25.Ergonomic hazards
Description : 25.01.Manual materials handling

Source of hazard / Envi. Aspect : Tool & equipment
Top Event / Envi. Aspect : Worker may slip,trip,fall while lifting

People	Environment	Asset	Reputation
2D	1D	1D	1D
1A	1A	1A	1A

Threat & Control :

- **Working area is not secured**
  - Keep working area secured
- **สภาพพื้นที่ ต้นไม้ หญ้ารก**
  - มีการตัดหญ้าและต้นไม้โดยรอบพื้นที่เป็นประจำ

Consequence & Recovery :

- **Personal Injury (back pain, muscle pain)**
  - First Aids / Nurse
  - Wear proper PPE
- **อุปกรณ์ได้รับความเสียหาย**
  - จัดเตรียมอุปกรณ์สำรอง

Action Party : Sinphuhorm SSHE <SPH.EHS@pttep.com>

Hazard / Environmental Aspect Category : 33.Other
Description : สารเคมีที่ทำให้ตัวอย่างนิวคงสภาพ

Source of hazard / Envi. Aspect : สารเคมีที่ทำให้ตัวอย่างนิวคงสภาพ
Top Event / Envi. Aspect : สารเคมีที่ทำให้ตัวอย่างนิวคงสภาพ

People	Environment	Asset	Reputation
2D	1D	1D	1D
1B	1B	1B	1B

Threat & Control :

- **ภาชนะบรรจุชำรุด แตก**
  - การตรวจสอบอุปกรณ์ เครื่องมือ ก่อนเริ่มงาน
  - การสวมใส่อุปกรณ์ป้องกันอันตรายกับการทำงานกับสารเคมี
- **ฉลากไม่ชัดเจน**
  - การตรวจสอบอุปกรณ์ เครื่องมือ ก่อนเริ่มงาน

Consequence & Recovery :

- **หนักงานได้รับบาดเจ็บ**
  - First aid kit
- **ขยะของเสียอันตรายจำนวนเพิ่มมากขึ้น**
  - การจัดการขยะอันตราย ตามข้อกำหนดของสัญญา คือผู้รับเหมาต้องเป็นผู้รับผิดชอบ
  - มีภาชนะรองรับสารเคมีที่เป็นของเหลว

Action Party : Sinphuhorm SSHE <SPH.EHS@pttep.com>

2.3) การเก็บตัวอย่างน้ำใต้ดิน

Hazard / Environmental Aspect Category : 09.Environment hazards
Description : 09.01.Weather

Source of hazard / Envi. Aspect : Weather
Top Event / Envi. Aspect : To have a stroke

People	Environment	Asset	Reputation
2D	1D	1D	1D
1A	1A	1A	1A

Threat & Control :

- **Hot weather**
  - Drink water
  - Set up working time with frequent breaking period.

Consequence & Recovery :

- **Personal Injury**
  - Wear PPE
  - Rescue team
  - First Aids by nurse

Action Party : Sinphuhorm SSHE <SPH.EHS@pttep.com>

Hazard / Environmental Aspect Category : 25.Ergonomic hazards
Description : 25.01.Manual materials handling

Source of hazard / Envi. Aspect : Tool & equipment
Top Event / Envi. Aspect : Worker may slip,trip,fall while lifting

People	Environment	Asset	Reputation
2D	1D	1D	1D
1A	1A	1A	1A

Threat & Control :

- **Working area is not secured**
  - Keep working area secured
- **สภาพพื้นที่ ต้นไม้ หญ้ารก**
  - มีการตัดหญ้าและต้นไม้โดยรอบพื้นที่เป็นประจำ

Consequence & Recovery :

- **Personal Injury (back pain, muscle pain)**
  - First Aids / Nurse
  - Wear proper PPE
- **อุปกรณ์ได้รับความเสียหาย**
  - จัดเตรียมอุปกรณ์สำรอง

Action Party : Sinphuhorm SSHE <SPH.EHS@pttep.com>

Hazard / Environmental Aspect Category : 33.Other
Description : สารเคมีที่ทำให้ตัวอย่างนิวคงสภาพ

Source of hazard / Envi. Aspect : สารเคมีที่ทำให้ตัวอย่างนิวคงสภาพ
Top Event / Envi. Aspect : สารเคมีที่ทำให้ตัวอย่างนิวคงสภาพ

People	Environment	Asset	Reputation
2D	1D	1D	1D
1B	1B	1B	1B

Threat & Control :

- **ภาชนะบรรจุชำรุด แตก**
  - การตรวจสอบอุปกรณ์ เครื่องมือ ก่อนเริ่มงาน
  - การสวมใส่อุปกรณ์ป้องกันอันตรายกับการทำงานกับสารเคมี
- **ฉลากไม่ชัดเจน**
  - การตรวจสอบอุปกรณ์ เครื่องมือ ก่อนเริ่มงาน

Consequence & Recovery :

- **หนักงานได้รับบาดเจ็บ**
  - First aid kit
- **ขยะของเสียอันตรายจำนวนเพิ่มมากขึ้น**
  - การจัดการขยะอันตราย ตามข้อกำหนดของสัญญา คือผู้รับเหมาต้องเป็นผู้รับผิดชอบ
  - มีภาชนะรองรับสารเคมีที่เป็นของเหลว

Action Party : Sinphuhorm SSHE <SPH.EHS@pttep.com>

Hazard / Environmental Aspect Category : 24.Biological hazards
Description : 24.03.Parasitic insects (pin worms, bed bugs, lice, fleas)

Source of hazard / Envi. Aspect : Poisoning of insect and animals
Top Event / Envi. Aspect : Personal exposure

People	Environment	Asset	Reputation
2D	1D	1D	1D
1B	1B	1B	1B

Threat & Control :

- **Poisonous Animal/Insect**
  - Toolbox talk
  - Site Safety induction by SSHE
  - Wear proper PPE
  - มีการกำจัดแมลง และสัตว์นำโรคในพื้นที่
- **สภาพพื้นที่ ต้นไม้ หญ้ารก**
  - ตัดหญ้า ต้นไม้ ในพื้นที่เป็นประจำ
- **มีรังแมลง สัตว์ มีพิษ ในพื้นที่**
  - มีการกำจัดแมลง และสัตว์นำโรคในพื้นที่

Consequence & Recovery :

- **Personal Injury**
  - First aid kit and Nurse
  - Rescue team
  - การนำเสนอของพยาบาลเรื่อง พิษของแมลง และงูพิษ

Action Party : Sinphuhorm SSHE <SPH.EHS@pttep.com>

2.4) การเก็บตัวอย่างไอระเหยของสารเคมี TOX

Hazard / Environmental Aspect Category : 10.Hot surfaces
Description : 10.03.Engine and turbine exhaust systems

Source of hazard / Envi. Aspect : ปล่อง TOX
Top Event / Envi. Aspect : สัมผัสความร้อน

People	Environment	Asset	Reputation
3D	1D	1D	1D
1A	1A	1A	1A

Threat & Control :

- **พื้นที่ทำงานจำกัด**
  - Tool box talks
  - Correct PPE associated with activities

Consequence & Recovery :

- **หนักงานได้รับบาดเจ็บ**
  - First aid kit and Nurse

Action Party : Sinphuhorm SSHE <SPH.EHS@pttep.com>

Hazard / Environmental Aspect Category : 20.Toxic gas
Description : 20.04.Benzene

Source of hazard / Envi. Aspect : ไอระเหยของสารเคมีจากปล่อง TOX
Top Event / Envi. Aspect : สัมผัสไอระเหยของสารเคมี

People	Environment	Asset	Reputation
2D	1D	1D	1D
1B	1B	1B	1B

Threat & Control :

- **พื้นที่การทำงานจำกัด**
  - สวมหน้ากาก ป้องกันอันตรายจากสารเคมี
  - อยู่ในทิศทางลมตรงกันข้ามกับการพัดพาของไอระเหย
- **ไม่คุ้นเคยในพื้นที่**
  - Tool box talk
  - การทำงานเป็นทีม

Consequence & Recovery :

- **หนักงานได้รับบาดเจ็บ**
  - สลับสับเปลี่ยนเพื่อลดระยะเวลาการสัมผัส
  - First aid kit and Nurse
  - Yearly medical check up

Action Party : Sinphuhorm SSHE <SPH.EHS@pttep.com>

Hazard / Environmental Aspect Category : 25.Ergonomic hazards
Description : 25.01.Manual materials handling

Source of hazard / Envi. Aspect : การเคลื่อนย้าย เครื่องอุปกรณ์
Top Event / Envi. Aspect : หนักงาน ลื่น สะดุด หกล้ม ระหว่างเคลื่อนย้าย

People	Environment	Asset	Reputation
2D	1D	1D	1D
1A	1A	1A	1A

Threat & Control :

- **พื้นที่ทำงานไม่เป็นระเบียบเรียบร้อย**
  - ทำการพูดคุยก่อนเริ่มงาน

Consequence & Recovery :

- **หนักงานได้รับบาดเจ็บ**
  - สวมใส่อุปกรณ์ความปลอดภัยครบถ้วนถูกต้อง
- **อุปกรณ์ได้รับความเสียหาย**
  - จัดเตรียมอุปกรณ์สำรอง

Action Party : Sinphuhorm SSHE <SPH.EHS@pttep.com>

Hazard / Environmental Aspect Category : 06.Hazards associated with differences in height
Description : 06.01.Personel at hight > 2 m

Source of hazard / Envi. Aspect : Platform และบันได
Top Event / Envi. Aspect : หนักงานพลัดตกจากที่สูง

People	Environment	Asset	Reputation
3D	1D	1D	1D
1A	1A	1A	1A

Threat & Control :

- **อุปกรณ์เครื่องมือที่ต้องเตรียมขึ้นไปทำงาน**
  - ปฏิบัติตามการทำงานในที่สูงตามเอกสาร PH-10-HS-SWP-00020_Rev3-Work at Height
  - ใช้วิธีการขนส่งอุปกรณ์โดยเชื่อก
- **Platform บันไดชำรุด**
  - ทำการตรวจสอบอุปกรณ์ก่อนใช้งาน
  - ทำการปฏิบัติงานในที่สูงตามเอกสาร PH-10-HS-SWP-00020_Rev3-Work at Height
  - Tool box talks

Consequence & Recovery :

- **หนักงานได้รับบาดเจ็บ**
  - สวมใส่ safety harness เมื่อขึ้นสูงกว่า 2 เมตร
  - มีชุดปฐมพยาบาล และ แผนฉุกเฉิน
  - First aid kit and Nurse

Action Party : Prod and SSHE

Hazard / Environmental Aspect Category : 09.Environment hazards
Description : 09.01.Weather

Source of hazard / Envi. Aspect : Weather
Top Event / Envi. Aspect : To have a stroke

People	Environment	Asset	Reputation
2D	1D	1D	1D
1A	1A	1A	1A

Threat & Control :

- **Hot weather**
  - Drink water
  - Set up working time with frequent breaking period.

Consequence & Recovery :

- **Personal Injury**
  - Wear PPE
  - Rescue team
  - First Aids by nurse

Action Party : Sinphuhorm SSHE <SPH.EHS@pttep.com>

2.5) การเก็บตัวอย่างเสียงรบกวน และสารเคมีในบรรยากาศ

Hazard / Environmental Aspect Category : 25.Ergonomic hazards
Description : 25.01.Manual materials handling

Source of hazard / Envi. Aspect : การเคลื่อนย้าย เครื่องอุปกรณ์
Top Event / Envi. Aspect : หนักงาน ลื่น สะดุด หกล้ม ระหว่างเคลื่อนย้าย

People	Environment	Asset	Reputation
2D	1D	1D	1D
1A	1A	1A	1A

Threat & Control :

- **พื้นที่ทำงานไม่เป็นระเบียบเรียบร้อย**
  - ทำการพูดคุยก่อนเริ่มงาน

Consequence & Recovery :

- **หนักงานได้รับบาดเจ็บ**
  - สวมใส่อุปกรณ์ความปลอดภัยครบถ้วนถูกต้อง
- **อุปกรณ์ได้รับความเสียหาย**
  - จัดเตรียมอุปกรณ์สำรอง

Action Party : Sinphuhorm SSHE <SPH.EHS@pttep.com>

Hazard / Environmental Aspect Category : 06.Hazards associated with differences in height
Description : 06.01.Personel at hight > 2 m

Source of hazard / Envi. Aspect : Platform และบันได
Top Event / Envi. Aspect : หนักงานพลัดตกจากที่สูง

People	Environment	Asset	Reputation
3D	1D	1D	1D
1A	1A	1A	1A

Threat & Control :

- **อุปกรณ์เครื่องมือที่ต้องเตรียมขึ้นไปทำงาน**
  - ปฏิบัติตามการทำงานในที่สูงตามเอกสาร PH-10-HS-SWP-00020_Rev3-Work at Height
  - ใช้วิธีการขนส่งอุปกรณ์โดยเชื่อก
- **Platform บันไดชำรุด**
  - ทำการตรวจสอบอุปกรณ์ก่อนใช้งาน
  - ทำการปฏิบัติงานในที่สูงตามเอกสาร PH-10-HS-SWP-00020_Rev3-Work at Height
  - Tool box talks

Consequence & Recovery :

- **หนักงานได้รับบาดเจ็บ**
  - สวมใส่ safety harness เมื่อขึ้นสูงกว่า 2 เมตร
  - มีชุดปฐมพยาบาล และ แผนฉุกเฉิน
  - First aid kit and Nurse

Action Party : Prod and SSHE

Hazard / Environmental Aspect Category : 09.Environment hazards
Description : 09.01.Weather

Source of hazard / Envi. Aspect : Weather
Top Event / Envi. Aspect : To have a stroke

People	Environment	Asset	Reputation
2D	1D	1D	1D
1A	1A	1A	1A

Threat & Control :

- **Hot weather**
  - Drink water
  - Set up working time with frequent breaking period.

Consequence & Recovery :

- **Personal Injury**
  - Wear PPE
  - Rescue team
  - First Aids by nurse

Action Party : Sinphuhorm SSHE <SPH.EHS@pttep.com>

2.6) การเก็บข้อมูลทางชีวภาพ

Hazard / Environmental Aspect Category : 09.Environment hazards
Description : 09.01.Weather

Source of hazard / Envi. Aspect : Weather
Top Event / Envi. Aspect : To have a stroke

People	Environment	Asset	Reputation
2D	1D	1D	1D
1A	1A	1A	1A

Threat & Control :

- **Hot weather**
  - Drink water
  - Set up working schedule to include frequent break time.

Consequence & Recovery :

- **Personal Injury**
  - Wear PPE
  - First kit

Action Party : Sinphuhorm SSHE <SPH.EHS@pttep.com>

Hazard / Environmental Aspect Category : 33.Other
Description : สภาพพื้นที่ป่า

Source of hazard / Envi. Aspect : สภาพพื้นที่ป่า
Top Event / Envi. Aspect : หลงป่า

People	Environment	Asset	Reputation
3C	1C	1C	1C
1B	1B	1B	1B

Threat & Control :

- **สภาพพื้นที่ป่า**
  - ศึกษาเส้นทาง มีแผนที่เส้นทางการทำงาน
- **ขาดความชำนาญพื้นที่**
  - ศึกษาเส้นทาง มีแผนที่เส้นทางการทำงาน
  - นำทางเข้าสู่พื้นที่การสำรวจโดยเจ้าหน้าที่ที่มีความชำนาญ

Consequence & Recovery :

- **การทำงานล่าช้า**
  - มีเบอร์โทรฉุกเฉินไว้ติดต่อในกรณีฉุกเฉิน
  - อุปกรณ์สนับสนุน เช่น GPS

Action Party : Sinphuhorm SSHE <SPH.EHS@pttep.com>

Hazard / Environmental Aspect Category : 24.Biological hazards
Description : 24.03.Parasitic insects (pin worms, bed bugs, lice, fleas)

Source of hazard / Envi. Aspect : Poisoning of insect and animals
Top Event / Envi. Aspect : Personal exposure

People	Environment	Asset	Reputation
2D	1D	1D	1D
1B	1B	1B	1B

Threat & Control :

- **Poisonous Animal/Insect**
  - Toolbox talk
  - Site Safety induction by SSHE
  - Wear proper PPE
  - มีการกำจัดแมลง และสัตว์นำโรคในพื้นที่
- **สภาพพื้นที่ ต้นไม้ หญ้ารก**
  - ตัดหญ้า ต้นไม้ ในพื้นที่เป็นประจำ
- **มีรังแมลง สัตว์ มีพิษ ในพื้นที่**
  - มีการกำจัดแมลง และสัตว์นำโรคในพื้นที่

Action Party : Sinphuhorm SSHE <SPH.EHS@pttep.com>

Hazard / Environmental Aspect Category : 32.Environmental Aspect Category
Description : 32.08.Physical attributes

Source of hazard / Envi. Aspect : การเข้าไปสำรวจในพื้นที่ป่า
Top Event / Envi. Aspect : พิษและแมลงมีสภาพชีวิตเปลี่ยนแปลงไปในวันที่เข้าไปทำการสำรวจ

People	Environment	Asset	Reputation
2D	1D	1D	1D
1B	1B	1B	1B

Threat & Control :

- **การเดินเหยียบ ต้นหญ้า ต้นไม้ ในพื้นที่สำรวจ**
  - การเดินสำรวจไปในพื้นที่ป่าตามเส้นทางที่เจ้าหน้าที่กำหนดให้เท่านั้น
- **การนำอุปกรณ์เครื่องมือ เช่น ไฟส่องสว่าง การตั้งเต็นส์พักในพื้นที่ป่า**
  - การนำอุปกรณ์ เครื่องมือ เข้าพื้นที่ป่าเท่าที่จำเป็น
  - ตั้งเต็นส์ที่พักในพื้นที่ที่เจ้าหน้าที่กำหนดให้เท่านั้น

Consequence & Recovery :

- **สภาพแวดล้อมในวันที่ทำการสำรวจเปลี่ยนแปลงไป จากสภาวะปกติ**
  - การปลูกป่าทดแทน
  - การสนับสนุนเงินทุนในกิจกรรมการปลูกป่าของป่าไม้ในพื้นที่สำรวจ
  - การเก็บเครื่องมือ อุปกรณ์ทุกประเภท ขยะ ออกจากพื้นที่ป่า ภายหลังการทำงาน

Action Party : Sinphuhorm SSHE <SPH.EHS@pttep.com>

Step 3) การจัดการขยะ ของเสีย หลังการเก็บตัวอย่าง

3.1) การจัดการขยะ ของเสีย หลังการเก็บตัวอย่าง

Hazard / Environmental Aspect Category : 32.Environmental Aspect Category
Description : 32.07.Waste and by-products

Source of hazard / Envi. Aspect : การใช้ สารเคมี อุปกรณ์ในการเก็บตัวอย่าง
Top Event / Envi. Aspect : ขยะ อุปกรณ์หลังการใช้งานเก็บตัวอย่าง

People	Environment	Asset	Reputation
1D	1D	1D	2D
1A	1A	1A	1A

Threat & Control :

- **การขาดความรู้ ความเข้าใจ จัดการสารเคมี และอุปกรณ์หลังการใช้งาน**
  - SSHE induction at site
- **ขวดสารเคมีแตก หรือ หก**
  - การตรวจสอบสภาพความพร้อมของอุปกรณ์เครื่องมือ และสารเคมีก่อนเริ่มงาน

Consequence & Recovery :

- **ขยะอันตรายปริมาณเพิ่มมากขึ้น**
  - นำขยะที่เกิดขึ้นกลับไปกำจัดยังบริษัทผู้รับเหมาที่ได้รับอนุญาต

Action Party : anchuleep@pttep.com

Risk & Environmental Aspect Assessment

Act-0016-SSHE อำนวยการจราจร กรณีเกิดอุบัติเหตุบนทางสาธารณะหน้าบริษัท

Department : SSHE
Assesor team : anchuleep@pttep.com, piyachanogp@pttep.com,
Note : กรณีเกิดเหตุฉุกเฉินหน้าบริษัท

Location : หน้าบริษัท
Condition : Emergency

Step 1) การอำนวยการจราจรกรณีเกิดเหตุการฉุกเฉินหน้าบริษัท

1.1) เตรียมอุปกรณ์

Hazard / Environmental Aspect Category : 25.Ergonomic hazards
Description : 25.01.Manual materials handling

Source of hazard / Envi. Aspect : อุปกรณ์ที่ต้องทำการเคลื่อนย้าย
Top Event / Envi. Aspect : หนักงานลื่นหกล้มระหว่างการเคลื่อนย้ายอุปกรณ์

People	Environment	Asset	Reputation
2C	1C	1C	1C
1A	1A	1A	1A

Threat & Control :

- **ความเร่งเร็ว**
  - การฝึกซ้อมเพื่อความคุ้นชินในการใช้เครื่องมือ
  - หัวหน้า รปภ /ผู้ได้รับมอบหมาย ตรวจสอบความพร้อมก่อนเข้าพื้นที่
- **ขาดทักษะในการใช้เครื่องมือ อุปกรณ์**
  - อบรมการอำนวยการจราจร
  - ทบทวนการใช้อุปกรณ์ โดยหัวหน้างาน
  - หัวหน้า รปภ /ผู้ได้รับมอบหมาย ตรวจสอบความพร้อมก่อนเข้าพื้นที่
- **สภาพอากาศไม่เหมาะสม**
  - หัวหน้า รปภ /ผู้ได้รับมอบหมาย ตรวจสอบความพร้อมก่อนเข้าพื้นที่

Consequence & Recovery :

- **ได้รับบาดเจ็บ**
  - First aid kit and Nurse
  - Emergency Response Plan
- **ทรัพย์สินเสียหาย**
  - Emergency Response Plan

Action Party : Sinphuhorm Security <SPH.SE@pttep.com>

1.2) เข้าพื้นที่เกิดเหตุเพื่ออำนวนการจราจร

Hazard / Environmental Aspect Category : 33.Other
Description : ถูกชนกระแทก

Source of hazard / Envi. Aspect : รถยนต์
Top Event / Envi. Aspect : อุบัติเหตุชำร้อนบนท้องถนน

People	Environment	Asset	Reputation
5C	1C	1C	2C
1A	1A	1A	1A

Threat & Control :

- **ยืนในตำแหน่งที่ไม่เหมาะสม**
  - อบรมการอำนวยการจราจร
  - ทบทวนการให้สัญญาณการจราจร โดยหัวหน้างาน
  - หัวหน้า รปภ /ผู้ได้รับมอบหมาย ตรวจสอบความพร้อมก่อนเข้าพื้นที่
- **ไม่สวมใส่ PPE เสื้อสะท้อนแสง**
  - อบรมการอำนวยการจราจร
  - ทบทวนการให้สัญญาณการจราจร โดยหัวหน้างาน
  - หัวหน้า รปภ /ผู้ได้รับมอบหมาย ตรวจสอบความพร้อมก่อนเข้าพื้นที่
- **ขาดทักษะในการอำนวยการจราจร**
  - อบรมการอำนวยการจราจร
  - ทบทวนการให้สัญญาณการจราจร โดยหัวหน้างาน
  - หัวหน้า รปภ /ผู้ได้รับมอบหมาย ตรวจสอบความพร้อมก่อนเข้าพื้นที่
- **ขาดอุปกรณ์ ในการแสดงขอบเขตที่ชัดเจน**
  - ทบทวนการให้สัญญาณการจราจร โดยหัวหน้างาน
  - หัวหน้า รปภ /ผู้ได้รับมอบหมาย ตรวจสอบความพร้อมก่อนเข้าพื้นที่
  - มีบันทึกการตรวจสอบอุปกรณ์ประจำวัน ประจำปอม
- **สภาพอากาศไม่เหมาะสม**
  - หัวหน้า รปภ /ผู้ได้รับมอบหมาย ตรวจสอบความพร้อมก่อนเข้าพื้นที่
- **ไหยมุง**
  - หัวหน้า รปภ /ผู้ได้รับมอบหมาย ตรวจสอบความพร้อมก่อนเข้าพื้นที่

Consequence & Recovery :

- **ได้รับบาดเจ็บถึงขั้นเสียชีวิต**
  - First aid kit and Nurse
  - Emergency Response Plan
- **ทรัพย์สินเสียหาย**
  - Emergency Response Plan

Action Party : Jirawan Pidfai <JirawanP@pttep.com>Sinphuhorm SSHE <SPH.EHS@pttep.com>

1.3) จัดเก็บอุปกรณ์

Hazard / Environmental Aspect Category : 25.Ergonomic hazards
Description : 25.01.Manual materials handling

Source of hazard / Envi. Aspect : อุปกรณ์ที่ต้องทำการเคลื่อนย้าย
Top Event / Envi. Aspect : หนักงานลื่นหกล้มระหว่างการเคลื่อนย้ายอุปกรณ์

People	Environment	Asset	Reputation
2C	1C	1C	1C
1A	1A	1A	1A

Threat & Control :

- **ความเร่งเร็ว**
  - การฝึกซ้อมเพื่อความคุ้นชินในการใช้เครื่องมือ
  - หัวหน้า รปภ /ผู้ได้รับมอบหมาย ตรวจสอบความพร้อมก่อนเข้าพื้นที่
- **ขาดทักษะในการใช้เครื่องมือ อุปกรณ์**
  - อบรมการอำนวยการจราจร
  - ทบทวนการใช้อุปกรณ์ โดยหัวหน้างาน
  - หัวหน้า รปภ /ผู้ได้รับมอบหมาย ตรวจสอบความพร้อมก่อนเข้าพื้นที่
- **สภาพอากาศไม่เหมาะสม**
  - หัวหน้า รปภ /ผู้ได้รับมอบหมาย ตรวจสอบความพร้อมก่อนเข้าพื้นที่

Consequence & Recovery :

- **ได้รับบาดเจ็บ**
  - First aid kit and Nurse
  - Emergency Response Plan
- **ทรัพย์สินเสียหาย**
  - Emergency Response Plan

Action Party : Jirawan Pidfai <JirawanP@pttep.com>Sinphuhorm SSHE <SPH.EHS@pttep.com>

เอกสารแนบ 2-31
นโยบายด้านความปลอดภัย

PTTEP

นโยบายความปลอดภัย มั่นคง อาชีวอนามัย และสิ่งแวดล้อม

ปตท.สผ. มุ่งมั่นสู่เป้าหมายการเป็นองค์กรที่ปราศจากอุบัติเหตุ ด้วยการบูรณาการความปลอดภัย มั่นคง อาชีวอนามัย และสิ่งแวดล้อม ซึ่งเป็นค่านิยมหลักขององค์กร เข้าไปในทุกขั้นตอนของการดำเนินธุรกิจ เพื่อป้องกันอุบัติเหตุที่อาจเกิดขึ้นจากการบาดเจ็บและเจ็บป่วยเนื่องจากการทำงานและอุบัติเหตุร้ายแรง ทั้งนี้ ปตท.สผ. ได้มุ่งเน้นปฏิบัติตามมาตรฐานความปลอดภัย มั่นคง อาชีวอนามัย และสิ่งแวดล้อมอย่างเคร่งครัด ทั้งในด้านความปลอดภัยในการปฏิบัติงานและกระบวนการผลิต การดูแลรักษาสิ่งแวดล้อม สุขภาพของบุคลากรและชุมชนโดยรอบพื้นที่ปฏิบัติงาน เพื่อให้เกิดการพัฒนาอย่างยั่งยืน

ปตท.สผ. ได้ดำเนินนโยบายด้านความปลอดภัย มั่นคง อาชีวอนามัย และสิ่งแวดล้อม ดังนี้

- ส่งเสริมการสร้างวัฒนธรรมองค์กรเชิงรุกอย่างต่อเนื่อง มุ่งเน้นการมีส่วนร่วมของบุคลากรและผู้รับเหมาในการนำระบบการบริหารจัดการด้านความปลอดภัย มั่นคง อาชีวอนามัย และสิ่งแวดล้อมไปปฏิบัติ โดยผู้บังคับบัญชาตามสายงานมีภาระหน้าที่รับผิดชอบต่อผลการปฏิบัติที่เกิดขึ้น
- ปฏิบัติงานภายใต้กฎหมาย ข้อบังคับ และมาตรฐานสากลที่เกี่ยวข้องกับความปลอดภัย มั่นคง อาชีวอนามัย และสิ่งแวดล้อม
- ส่งเสริมการบริหารจัดการด้านความปลอดภัยในการปฏิบัติงานและกระบวนการผลิต ซึ่งเป็นปัจจัยพื้นฐานที่สำคัญตามหลักปรัชญาและแนวปฏิบัติด้านความปลอดภัย มั่นคง อาชีวอนามัย และสิ่งแวดล้อม ด้วยการบริหารจัดการและควบคุมความเสี่ยงให้อยู่ในระดับต่ำที่สุดเท่าที่สามารถปฏิบัติได้
- ส่งเสริมให้บุคลากรและผู้รับเหมาตระหนักถึงหน้าที่และสิทธิในการหยุดปฏิบัติงานภายใต้สภาวะที่ไม่ปลอดภัย และเบี่ยงเบนจากแนวปฏิบัติด้านความปลอดภัย โดยทุกคนมีภาระหน้าที่รับผิดชอบด้านความปลอดภัย มั่นคง อาชีวอนามัย และสิ่งแวดล้อมของตนเอง เพื่อนร่วมงาน และชุมชนโดยรอบพื้นที่ปฏิบัติงาน
- สนับสนุนส่งเสริมสุขภาพของพนักงานให้เป็นส่วนหนึ่งของระบบบริหารจัดการด้านอาชีวอนามัยอย่างมีประสิทธิภาพ
- พัฒนาความสามารถของบุคลากรและผู้รับเหมา ผ่านระบบประเมินศักยภาพด้านความปลอดภัย มั่นคง อาชีวอนามัย และสิ่งแวดล้อม เพื่อรักษามาตรฐานการปฏิบัติงานอย่างปลอดภัยและมีประสิทธิภาพ
- กำหนดแผนบริหารจัดการภัยคุกคามด้านความมั่นคง ตอบสนองต่อสถานการณ์ฉุกเฉินและภาวะวิกฤติในเชิงรุก เพื่อลดผลกระทบที่จะเกิดขึ้น
- กำหนดวัตถุประสงค์และเป้าหมายในการปฏิบัติงานที่ชัดเจน ดำเนินการตรวจสอบและประเมินผล เพื่อให้เกิดการปรับปรุงอย่างต่อเนื่อง และมุ่งสู่การปฏิบัติงานที่เป็นเลิศ
- สื่อสารอย่างเปิดเผยและโปร่งใสตามหลักธรรมาภิบาล และถ่ายทอดการปฏิบัติงานที่มีประสิทธิภาพสูงสุด ทั้งภายในองค์กรและระหว่างองค์กร

ทั้งนี้ บุคลากรของ ปตท.สผ. ตั้งแต่ระดับผู้บริหารสูงสุดจนถึงระดับพนักงานในพื้นที่ปฏิบัติการและผู้รับเหมา มีเจตนารมณ์ร่วมกันในการปฏิบัติงาน เพื่อให้เกิดประสิทธิภาพสูงสุดต่อนโยบายด้านปลอดภัย มั่นคง อาชีวอนามัย และสิ่งแวดล้อม

[redacted]

เอกสารแนบ 2-32

Incident Report

Incident Investigation

Van No.1 to crash against the rear bumper of the front car (the result is minor damage, no injury person).
Event No.

PTTEP

Location : Public road, Udonthani
Date : 7 Feb 2023/ XX:XX hrs.

Content

- Investigation Team
- Incident Description
- Incident Timeline
- Identify Protection System
- Cause Tree Analysis
- Recommendations for Improvement

Investigation Team

1. K. Anchulee Phew-on	Senior Technician, SSHE
2. K. Sirinapa Buasap	Assistant Officer, Administration

Interviewee

1. K.Prajak Sirkanha	Driver

Incident Description

Incident Date & Time	11 Jan 2023/07:30 hrs.
Location	Khonkaen
Activity	Light vehicle transportation
Responsible party	TOSCO
Incident Description	After sent passenger to Khon Kaen Airport, the van driver(V1) stopped the car at intersection. He put in N gear while parking during red light however, the van ran into hit another car which parked in front of Van1 by accidentally. This cause the front bumper crashed against the rear bumper of front car, (The left bumper has minor damage and there is no injury person).
Why did it happen?	The left bumper (Van No.1) to crash against the rear bumper of the front car (the result is minor damage, no injury person).
Consequence/ Evidence	minor property damage
Any support required support from Head Office:	No
Incident Classification (if known):	Property damage (work related)

Incident Timeline

Time	Activity/Description
05.00	Depart from GPP to pick up staff at home (Khonkaen).
06.00	Depart from K.Kongpop's home to Khon Kaen Airport
07.00	Sent passenger to Khon Kaen Airport,
07.30	The van driver(V1) stopped the car at intersection, He put in N gear while parking during red light however, the van ran into hit another car which parked in front of Van1 by accidentally.

Evidence

Evidence

- DDC Training Certification

Certificate of Training

TECHNICAL PETROLEUM TRAINING INSTITUTE

This Certificate verifies that

Prajak Srikanha

Successfully completed a training course in

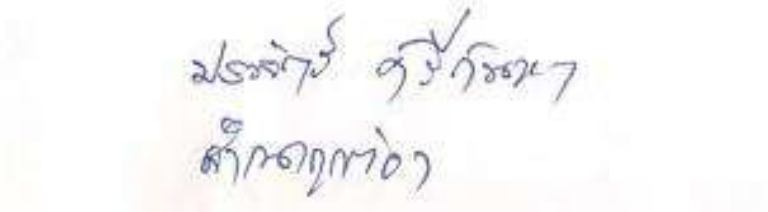
Defensive Driving (DDC)

Course Date : 27/01/2021 Certificate Number : 21LK-ID0020 Expiry Date : 26/01/2023

Trainer Name Mr. Mongkolchai Noiynongiew

Puangthip Silpasart
Executive Director
Technical Petroleum Training Institute

Driver license



Evidence

- Latest Physical check

Medical Check-up (การตรวจร่างกาย)

4.1 General Medical Check-up *

Parameter	Check-up Date (วันที่ตรวจร่างกายครั้งสุดท้าย)	Hospital (โรงพยาบาล)
MCU Result	23/08/2021	โรงพยาบาลกรุงเทพชลบุรี
Medical Questionnaires	-	-

4.2 Special tasks

Parameter	Check-up Date (วันที่ตรวจร่างกายครั้งสุดท้าย)	Hospital (โรงพยาบาล)
Confined Space Work		
Crane Oparator		
Professional Driver	23/08/2021	โรงพยาบาลกรุงเทพชลบุรี
Catering Work		
Other (อื่นๆ)		

Doctor

Status: (•) Approve ( ) Reject

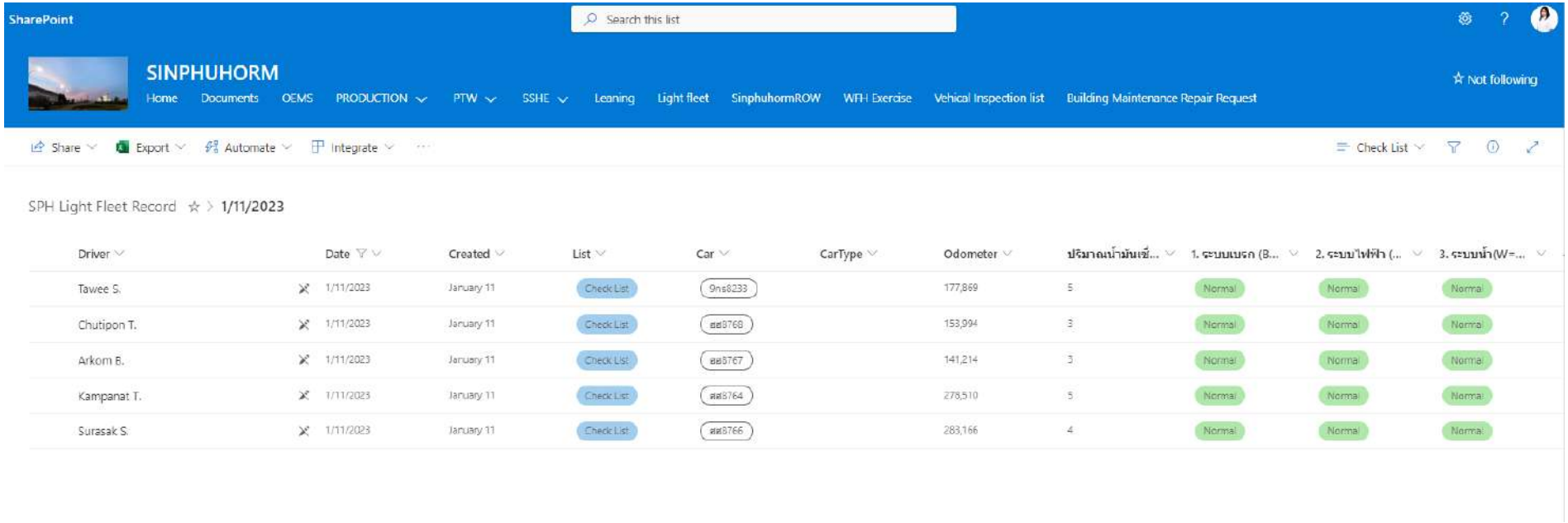
Fit For Special Task:
- [ ] Confined Space Work
- [ ] Crane Oparator
- [x] Professional Driver
- [ ] Catering Work
- [ ] Other (อื่นๆ)

Valid From: 23/08/2021 Valid To: 22/08/2022

Comment: Comment

Evidence

- Car inspection report on 11 Jan 2023/07:30 hrs.



Driver	Date	Created	List	Car	CarType	Odometer	ปริมาณน้ำมันเชื้...	1. ระบบเบรก (B...	2. ระบบไฟฟ้า (...	3. ระบบน้ำ(W=...
Tawee S.	1/11/2023	January 11	Check List	9ns8233		177,869	5	Normal	Normal	Normal
Chutipon T.	1/11/2023	January 11	Check List	ฆฆ8768		153,994	3	Normal	Normal	Normal
Arkom B.	1/11/2023	January 11	Check List	ฆฆ8767		141,214	3	Normal	Normal	Normal
Kampanat T.	1/11/2023	January 11	Check List	ฆฆ8764		278,510	5	Normal	Normal	Normal
Surasak S.	1/11/2023	January 11	Check List	ฆฆ8766		283,166	4	Normal	Normal	Normal

Evidence

- Work schedule on 30 May 2021

งานประจำวันที่ ..11./ ...พ.ค..../...2566...(พุธ)

9 กธ 8247	9 กธ 8241	9 กธ 8233	สส 8768			สส 8767			9 กธ 8224	สส 8766		สส 8764		รถเช่า	รถเช่า		
P4 08.00-17.00	P3 08.00-17.00	P2 08.00-17.00	เวลา	V4 06.00-17.00		เวลา	V3 06.00-17.00		P1 05.00-19.00	เวลา	V2D 04.00 - 13.00น.	เวลา	V1D 04.00 - 13.00น.	อื่นๆ	เวลารับ	Car rental (RT)	
ประเสริฐ รังสิโยกาส	สมศักดิ์ ทองทวี	ทวี สร้อยไพธิ์	ชูศิพณธ์ ทุมพัน			อาคม บุตรตราศรี			ไตรภูมิ ชินบุตร	สุรศักดิ์ แสนสงค์		กัมปนาท เทพสาร		CSR เช้า	พขร. คุณตั้ม 091 8672296		
SSHE	08.30 น. พา PH-INS	08.30 น. พา	7.00	แยกบ้านยาอารี	น้องโดนัส	7.00	บ้าน	K.แก้ว	K.วิรนิตย์ 5.40	5.00	K.อิท	5.10	K.สุริยะ	กระบะไป			น้องบีบ
8.00	ขึ้นภู	PH-MECH ขึ้นภู	7.13	โฟกัสคอนโด	K.วิทูร	7.03	หน้าบ้าน	K.คิ้บ	K.สรวิศ 5.45	5.05	K.ชาญวิทย์	5.20	K.อำนาจ	งานแนวท่อ			น้องพิมพ์
K.ชัด						7.05	บ้าน	K.ปา		5.15	K.บรรเจิด	5.50	K.หนุ่ม		7.00	หน้าโลตัสเล็ก ถ.กังสดาล	น้องบีบ
ไปภูล่อม						7.10	หน้าโลตัสเล็ก ถ.	K.บอล									น้องร็อกกี้
																	น้องโก้
															7.10	สะพานลอยหน้า รพ.ศรีฯ	น้องเฟิน
			09.00 น. พาCSR ไปสวัสดีปีใหม่อบต.						ไปภูล่อม						7.20	หน้านอร์ทพาร์ค คอนโด	K.เม
			บ้านคง,ไปร่วมงานบ้านท่าสีต่อ							ส่งกะกลับบ้าน		ส่งกะกลับบ้าน					
							Stand by			ส่งกะ	K.เอกวิทย์	ส่งกะ	K.บุญเลิศ			Stand by	
											K.รอเฉด						
											K.ณัฐพล	06.00 รับK.ก้องภพที่บ้าน->สนามบิน					
										K.บี บ้าน 07.10		10.40 รับK.แจ๊สที่บ้าน->สนามบิน					
										K.ลวัลย์ บ้าน 7.15							
										Stand by		Stand by					
P4 17.00	P3 17.00-19.00 น	P2 17.00	V4D 17.00-19.00 น.			V3D 17.00-19.00 น.			P1 18.00-19.00 น.	V2N 13.00-22.00น		V1N 13.00-22.00น			Car rental (RT) 17.00-19.00 น.		
										ชูศิเดช คาพาโย		ประจักร์ ศรีกันหา					
K.ลวัลย์		K.วิรนิตย์		โฟกัสคอนโด	K.วิทูร		หน้าโลตัสเล็ก ถ.	K.บอล		รับของชิ้นใหม่ช่า สาขา				มาเอง		สะพานลอยหน้า รพ.ศรีฯ	น้องเฟิน
K.บี				แยกบ้านยาอารี	น้องโดนัส		บ้าน	K.ปา		17.00	K.เอกวิทย์	17.00	K.บุญเลิศ	K.ศิวะเทพ			น้องพิมพ์
							หน้าบ้าน	K.คิ้บ			K.รอเฉด					หน้าโลตัสเล็ก ถ.กังสดาล	น้องบีบ
							บ้าน	K.แก้ว			K.ณัฐพล						น้องร็อกกี้
																	น้องโก้
																หน้านอร์ทพาร์ค คอนโด	K.เม

Van No.1 to crash against the rear bumper of the front car (the result is minor damage, no injury person).

Lack of camera record monitor by Owner and routine inspection by driver

VDO record replate every 10 minute
Camera in vehicle, Interview

No record
Camera in vehicle, Interview

Camera record
Camera in vehicle, Interview

Driver

Fit to drive
Medical check up record

Not found result of medical check
Medical check up record

Driver didn't yearly medical check
Medical check up record

Driver contact

Competency
Interview DDC certificate ,Diving license

Behavior and SSHE Awareness
Interview

Driver didn't aware of concrete barrier
Interview

SSHE Complacency

Vehicle condition

Light fleet inspection record
Light fleet record , Database

Not found light fleet online cheklist record on database
Database ,

Driver didn't Check daily light fleet online cheklist
Interwire

Lack of Light fleet online checklist monitor by owner and routine online checklist by driver

PM vehicle
PM record

Brake system and PM in good condition
PM record and Interview

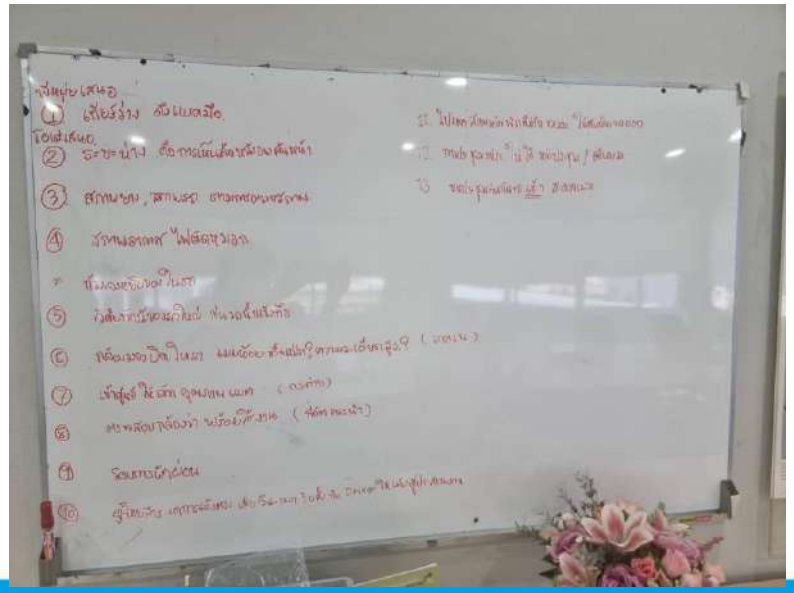
Road condition

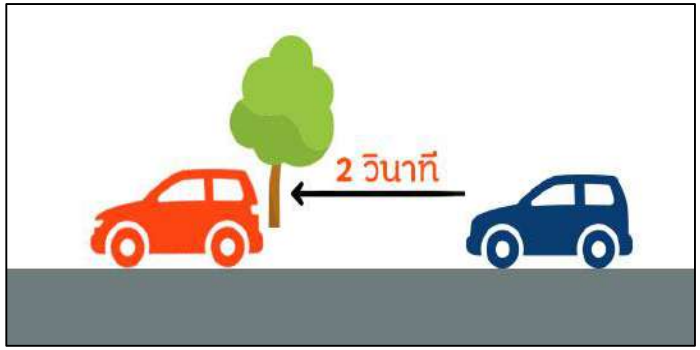
Road condition
Interview

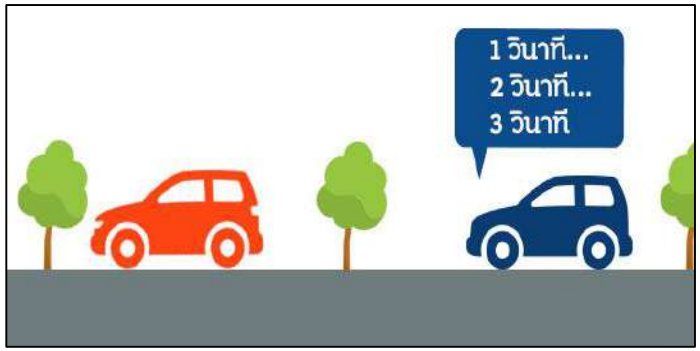
Summary of Root Causes and Recommendations

Root Cause	Recommendations	Action Party	Target Date
Human factor (Complacency with Overconfident and less awareness)	1. For any person who involved with "complacency" behavior, " I-commit " program shall be applied and kept record. Evidence : I-commit record.	SSHE / Admin	20-Feb -23
	2. Develop incident lesson learn and share to all concern parties Evidence : Acknowledge sign for sharing lesson learn.	Witoon /SSHE Completed	17 -Jan -23
Inadequate to inspection the camera record	1. Set up role and responsible person for camera record monitor by Owner Evidence : Role and responsible person	SSHE	30-Jan -23
	2. Add Camera inspection in Light fleet online checklist Evidence : Light fleet online checklist	Admin	30-Jan -23
Inadequate to monitor the vehicle routine online daily checklist by driver	1. Set up role and responsible person for Light fleet online checklist monitor Evidence : Role and responsible person	Admin	30-Jan -23
Inadequate to follow up the Driver contract and monitor the driver's medical checkup	1. Follow up action in New driver contract (all driver must pass the pre-work and annual medical check up). Evidence : Driver medical check up record and SSHE CN	Admin	20-Feb -23

Shared Lesson learn and Keys To Safe distance driving on 17 Jan 2023c







Thank you

Incident Investigation

YES Forklift 8 Ton to crash Steel Roof of Training Building Parking (the result is minor damage, no injury person).
Event No.

PTTEP

Location : Training Building Parking ,GPP Khonkaen
Date : 17 Oct 2023/16.20 hrs.

Content

- Investigation Team
- Incident Description
- Incident Timeline
- Identify Protection System
- Cause Tree Analysis
- Recommendations for Improvement

Investigation Team

1. K. Anchulee Phew-on	Senior Technician, SSHE
2. K. Rapeemart Potranan	Assistant Officer, Logistics Services
3. K. Boonlert Wongyai	Shift supervisor
4. K. Kanyapron Seesunam	Sernior Store man
5. K. Kriangsak Pakdeepong	Senior Technician, Mechanical

Interviewee

1. K.Saktawee Yongprom	Forklift Driver
2. K.Anawil Boodda	Team lead YES

Incident Description

Incident Date & Time	17 Oct 2023/16.20 hrs.
Location	Packing Training GPP Khonkaen
Activity	Material transportation by forklift
Responsible party	YES
Incident Description	
Why did it happen?	YES Forklift 8 Ton to crash Steel Roof of Training Building Parking (the result is minor damage, no injury person).
Consequence/ Evidence	minor property damage
Any support required support from Head Office:	No
Incident Classification (if known):	Property damage (work related) Steel roof

Incident Timeline

Time	Activity/Description
07.00-07.30	ตรวจสอบรถ forklift ก่อนเริ่มงาน
07.30-08.00	เปิดงาน และ ประชุม Toolbox talk
08.00-10.30	เริ่มงานขนย้าย อุปกรณ์ XX
10.30-10.45	พัก
10.45-12.00	เริ่มงานขนย้าย อุปกรณ์ XX
12.00-13.00	พักเที่ยง
13.00-15.00	เริ่มงานขนย้าย อุปกรณ์ XX
15.00-15.15	พัก
15.15-17.00	เริ่มงานขนย้าย อุปกรณ์ XX
17.10	

Evidence

PTTEP

CV ประวัติส่วนตัว

ชื่อ – นามสกุล	
วันเดือนปีเกิด	
ที่อยู่ปัจจุบัน	
ที่อยู่ตามบัตรประชา	
โทรศัพท์มือถือ	
สัญชาติ	
ศาสนา	
สถานภาพการสมรส	
ตำแหน่งงาน	
บริษัท	
ประวัติการศึกษา	
1	
ประวัติการทำงาน	
1	
2	
3	

inable Future

Driver license

CERTIFICATE OF SUCCESSFUL COMPLETION

THIS IS TO CERTIFY THAT ขอมอบวุฒิบัตรนี้ไว้เพื่อแสดงว่า

Mr. Sakthawee Yongprom

นาย ศักดิ์ทวี ยงพรหม

Has successfully completed the In-house training course assessment and examination for

COURSE: FORKLIFT OPERATIONS SAFETY TECHNIQUES

หลักสูตร เทคนิคการปฏิบัติงานรถโฟล์คลิฟท์อย่างปลอดภัย

Training Course Duration: ระยะเวลาฝึกอบรม 6.0 ชั่วโมง

Training Date : Nov 13_2022 วันที่อบรม: 13 พฤศจิกายน 2565

Mr. Adisak Tortee: นาย อดิศักดิ์ ท่อที

Instructor By : วิทยากรผู้บรรยาย

Issued Date: Nov 25_2022 วันที่ออกใบรับรอง 25 พฤศจิกายน 2565

Certificate Serial No ใบรับรองเลขที่: C031-32112022	Course No รหัสหลักสูตร: C-031

DDC license

Certificate of Training

This certificate verifies that

[redacted]

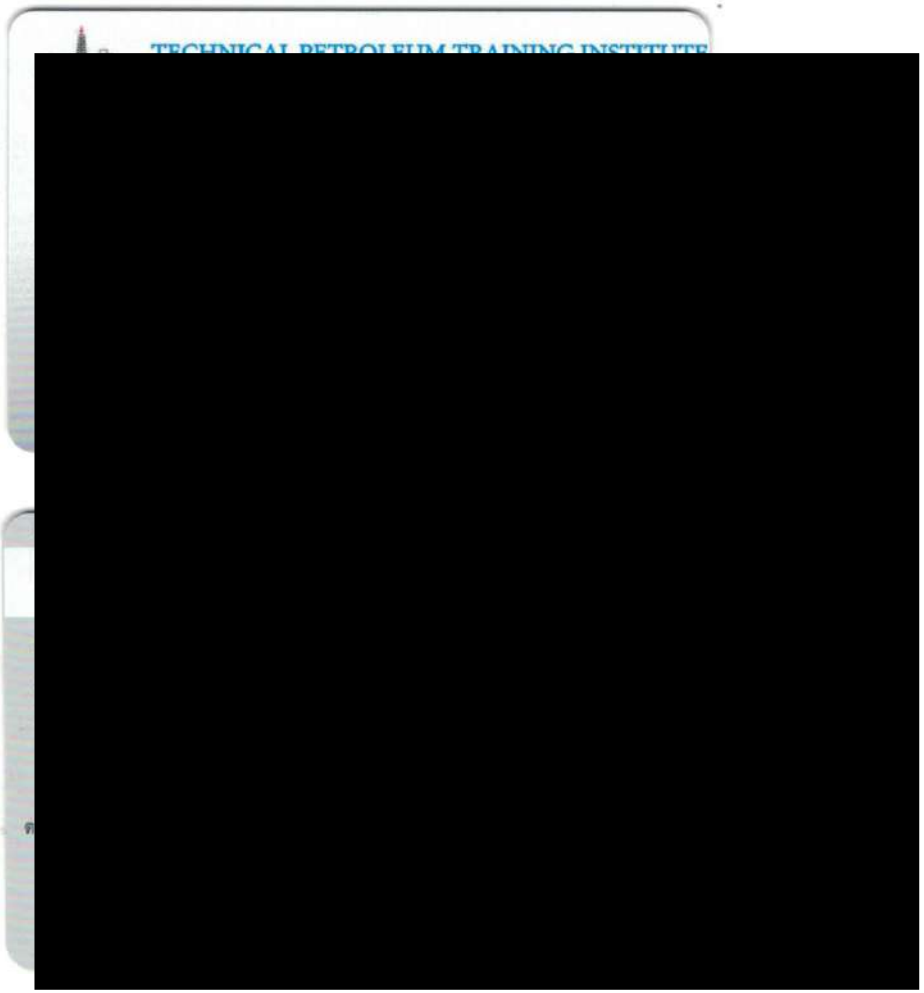
Course Dat

Trainer Nam

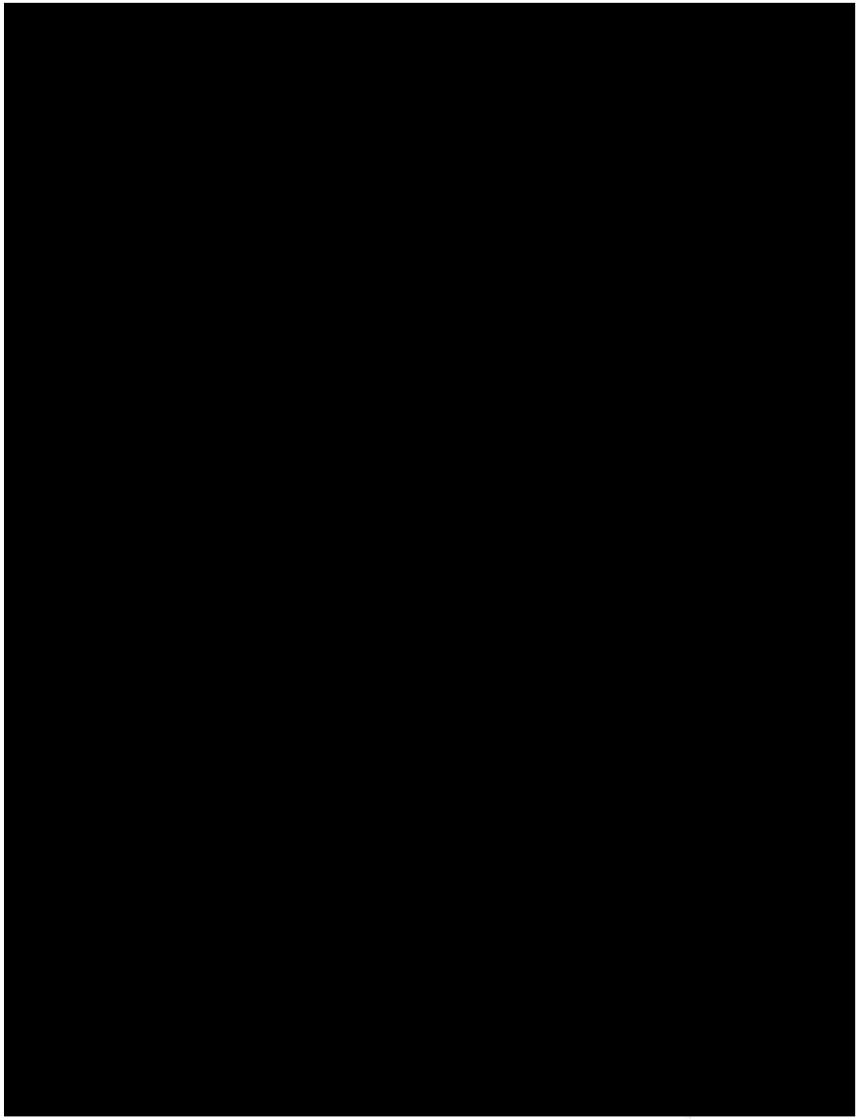
Technical Petroleum Training Institute

Evidence

- DDC Training Certification



Driver license



Evidence

- Latest Physical check

Doctor

Status Approve Reject

Fit For Special Task

- Confined Space Work
- Crane Oparator
- Professional Driver
- Catering Work
- Other (อื่นๆ)

Valid From 30/11/2022 **Valid To** 29/11/2023

Comment Comment

Select		Company Name	Request Name	Request No	Position	Asset (โครงการ)	Verification Status			
							Safety	Medical	Contract Holder	
☐	61.	YIM SIAM ENGINEERING CO., LTD., 2100001974	Thaworn Sonkhawong	2023000810	Rigger	SPH material handing	31/10/2025	28/11/2023	14/08/2023	
☐	62.	YIM SIAM ENGINEERING CO., LTD., 2100001974	Pamot Mahem	2023000815	Trailer Operator	SPH material handing	31/10/2025	29/11/2023	14/08/2023	
☐	63.	YIM SIAM ENGINEERING CO., LTD., 2100001974	Wirot Sridaket	2023000817	Water truck driver / Rigger	SPH material handing	31/10/2025	28/11/2023	14/08/2023	
☐	64.	YIM SIAM ENGINEERING CO., LTD., 2100001974	Kampan Namrat	2023000819	Operator Trailer	SPH material handing	31/10/2025	29/11/2023	29/11/2023	
☐	65.	YIM SIAM ENGINEERING CO., LTD., 2100001974	Sakthawee Yongprom	2023000821	Operator Forklift and Rigger	SPH material handing	31/10/2025	29/11/2023	14/08/2023	
☐	66.	YIM SIAM ENGINEERING CO., LTD., 2100001974	Kowit Nutawai	2023000827	Rigger	SPH material handing	31/10/2025	07/10/2023	14/08/2023	
☐	67.	YIM SIAM ENGINEERING CO., LTD., 2100001974	Anawil Budda	2023001046	Safety Officer Supervisor Level	SPH material handing	29/11/2023	29/11/2023	30/11/2023	

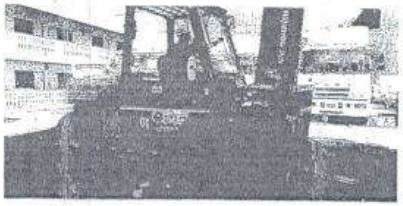
Evidence

- Forklift inspection report on 17 Oct 2023/07:30 hrs.

Company: Yim Siam Engineering Date: 17/10/66

Forklift Type: Komatsu Model/Serial No: FD80HD-8/46992

Crane License Number: Safe Working Load: 8 Tons



No.	Description	Inspection Result		
		Safe	Unsafe	Remark
1	**Tires**** are inflated and free of excessive wear or damage. Nuts are tight.	✓		
2	**Forklift and Mast**** are not bent, worn, or cracked.	✓		
3	**Back Rest**** is in place and not bent, cracked. Or loose.	✓		
4	**Overhead guard*** is not broken welds, mounted securely, no damage.	✓		
5	**Forklift body** is free of excessive lint, grease, or oil.	✓		
6	**Engine oil**** is full and free of leaks.	✓		
7	**Hydraulic oil**** is full and free of leaks.	✓		
8	**Radiator**** is full and free of leaks.	✓		
9	**Fuel level**** is OK and free of leaks.	✓		
10	**Battery connections** are tight.	✓		
11	**Covers over battery and other hazardous parts**** are in place and secure.	✓		
12	**Load rating plate*** is present and readable.	✓		
13	**Warning decals and operators manual** are present and readable.	✓		
14	**Seat belt or restraint**** is accessible and not damaged, oily or dirty.	✓		
15	**Engine**** runs smooth and quiet without leaks or sparks from the exhaust.	✓		
16	**Horn works.**	✓		
17	**Turn signal** (if equipped) operates smoothly.	✓		
18	**Lights*** (head, tail, and warning) work and are aimed correctly.	✓		
19	**Back Up Alarm** sounds when moving in reverse.	✓		
20	**Gauges and instruments** are working.	✓		
21	**Lift Control**** operates smoothly without excess drift.	✓		
22	**Tilt Control**** operates smoothly without excessive drift or chatter.	✓		
23	**Control levers** are labelled, not loose or binding and freely return to neutral.	✓		
24	**Steering Wheel**** is smooth and responsive, free of excessive play.	✓		
25	**Brakes**** work and function smoothly.	✓		
26	**Parking brake**** will hold the forklift on an incline.	✓		

Remarks : **Punch List A*** Thai Laws, **Punch List A**** Critical Parts

Note : **Punch list A* and A**** = Not accept for registration, **Punch lists B** = Shot term for registration (1 mount), correction within 1 month by report then will get registration that cover penod

☑ Accept อนุญาต 17/10/2023

☐ Accept but Correction อนุญาต แต่ต้องแก้ไขตามระยะเวลาที่กำหนด

☐ Not Accept ไม่อนุญาต

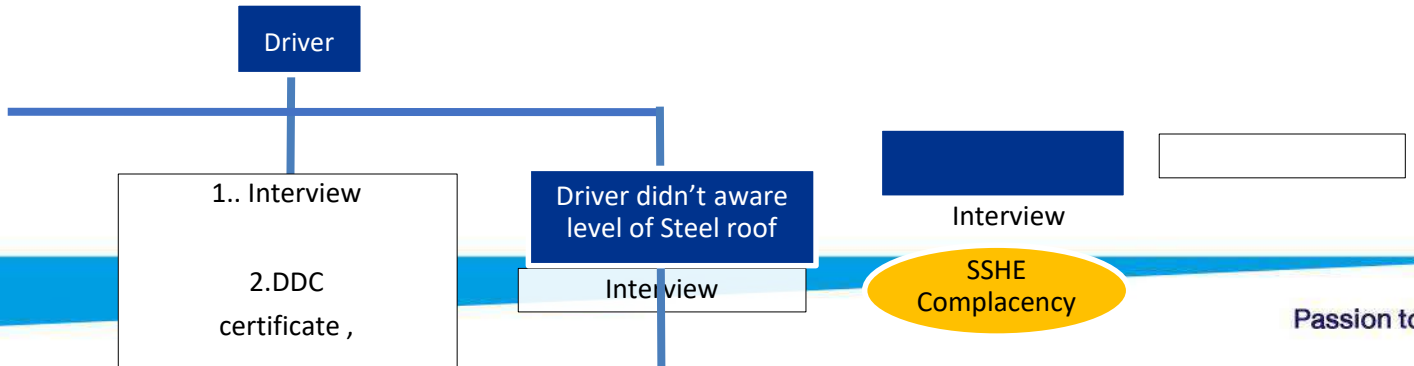
Inspected by ศักดิ์ชัย ยงมงคล บัลลังก์ ดวงปัทวี

ก่อน 6078

หลัง 6080

YES Forklift XX Ton to crash Steel Roof of Training Building Parking (the result is minor damage, no injury person).

- Driver
  - Fit to drive
    - 1.Medical check up record
    - 2. SSHE CN approve by company doctor
  - Competency
    - 1.. Interview
    - 2.DDC certificate ,
    - 3. Diving license
  - Behavior and SSHE Awareness
    - Interview
    - Driver didn't aware level of Steel roof
      - Interview
      - SSHE Complacency
- Vehicle condition
  - Forklift daily inspection record
    - 1.Daily check list record ,
  - PM vehicle
    - PM record
    - Brake system and PM in good condition
      - PM record and Interview
- Road condition
  - Road condition
    - Interview



Summary of Root Causes and Recommendations

Root Cause	Recommendations	Action Party	Target Date
Human factor (Complacency with Overconfident and less awareness)	1. For any person who involved with "complacency" behavior, " I-commit " program shall be applied and kept record. Evidence : I-commit record.	SSHE / Admin	20-Feb -23
	2. Develop incident lesson learn and share to all concern parties Evidence : Acknowledge sign for sharing lesson learn.	Witoon /SSHE Completed	17 -Jan -23
Inadequate to inspection the camera record	1. Set up role and responsible person for camera record monitor by Owner Evidence : Role and responsible person	SSHE	30-Jan -23
	2. Add Camera inspection in Light fleet online checklist Evidence : Light fleet online checklist	Admin	30-Jan -23
Inadequate to monitor the vehicle routine online daily checklist by driver	1. Set up role and responsible person for Light fleet online checklist monitor Evidence : Role and responsible person	Admin	30-Jan -23
Inadequate to follow up the Driver contract and monitor the driver's medical checkup	1. Follow up action in New driver contract (all driver must pass the pre-work and annual medical check up). Evidence : Driver medical check up record and SSHE CN	Admin	20-Feb -23

Shared Lesson learn and Keys To Safe distance driving on 17 Jan 2023c

ภาพประชุมทีม

ข้อกำหนดการยกงา

Thank you

เอกสารแนบ 2-33
แบบตรวจกระเป๋ายาของโครงการ

Well site Fire Fighting Equipment Check Sheet

MONTH : กรกฎาคม

Item	FIRST AID KID	Location	Date	List	Check Item	Equipment Check / Monthly			Remark
						Missing	*Damage*	*OK*	
1	TH-PHU-111-69-RFA-101	Wellpad A Guard House	7/4/2023	1	Box Condition			/	
				2	Medicine Expire			/	
				3	Fill Medicine			/	
				4	Tag			/	
2	TH-PHU-112-69-RFA-101	Wellpad B Guard House	7/12/2023	1	Box Condition			/	
				2	Medicine Expire			/	
				3	Fill Medicine			/	
				4	Tag			/	
3	TH-PHU-113-69-RFA-101	Wellpad C Guard House	19/7/2023	1	Box Condition			/	
				2	Medicine Expire			/	
				3	Fill Medicine			/	
				4	Tag			/	
4	TH-PHU-116-69-RFA-101	Wellpad D Guard House	26/7/2023	1	Box Condition			/	
				2	Medicine Expire			/	
				3	Fill Medicine			/	
				4	Tag			/	
5	Pipeyard	Pipeyard Guard House	26/7/2023	1	Box Condition			/	
				2	Medicine Expire			/	
				3	Fill Medicine			/	
				4	Tag			/	

Well site Fire Fighting Equipment Check Sheet

MONTH : สิงหาคม

Item	FIRST AID KID	Location	Date	List	Check Item	Equipment Check / Monthly			Remark
						Missing	*Damage*	*OK*	
1	TH-PHU-111-69-RFA-101	Wellpad B Guard House	8/2/2023	1	Box Condition			/	
				2	Medicine Expire			/	
				3	Fill Medicine			/	
				4	Tag			/	
2	TH-PHU-112-69-RFA-101	Wellpad C Guard House	8/9/2023	1	Box Condition			/	
				2	Medicine Expire			/	
				3	Fill Medicine			/	
				4	Tag			/	
3	TH-PHU-113-69-RFA-101	Wellpad A Guard House	16/8/2023	1	Box Condition			/	
				2	Medicine Expire			/	
				3	Fill Medicine			/	
				4	Tag			/	
4	TH-PHU-116-69-RFA-101	Wellpad D Guard House	23/8/2023	1	Box Condition			/	
				2	Medicine Expire			/	
				3	Fill Medicine			/	
				4	Tag			/	
5	Pipeyard	Pipeyard Guard House	23/8/2023	1	Box Condition			/	
				2	Medicine Expire			/	
				3	Fill Medicine			/	
				4	Tag			/	

Well site Fire Fighting Equipment Check Sheet

MONTH : กันยายน

Item	FIRST AID KID	Location	Date	List	Check Item	Equipment Check / Monthly			Remark
						Missing	*Damage*	*OK*	
1	**TH-PHU-111-69-RFA-101**	**Wellpad B Guard House**	**9/6/2023**	**1**	Box Condition			/	
				2	Medicine Expire			/	
				3	Fill Medicine			/	
				4	Tag			/	
2	**TH-PHU-112-69-RFA-101**	**Wellpad C Guard House**	**13/9/2023**	**1**	Box Condition			/	
				2	Medicine Expire			/	
				3	Fill Medicine			/	
				4	Tag			/	
3	**TH-PHU-113-69-RFA-101**	**Wellpad A Guard House**	**20/9/2023**	**1**	Box Condition			/	
				2	Medicine Expire			/	
				3	Fill Medicine			/	
				4	Tag			/	
4	**TH-PHU-116-69-RFA-101**	**Wellpad D Guard House**	**27/9/2023**	**1**	Box Condition			/	
				2	Medicine Expire			/	
				3	Fill Medicine			/	
				4	Tag			/	
5	**Pipeyard**	**Pipeyard Guard House**	**27/9/2023**	**1**	Box Condition			/	
				2	Medicine Expire			/	
				3	Fill Medicine			/	
				4	Tag			/	

Well site Fire Fighting Equipment Check Sheet

MONTH : กันยายน

Item	FIRST AID KID	Location	Date	List	Check Item	Equipment Check / Monthly			Remark
						Missing	*Damage*	*OK*	
1	**TH-PHU-111-69-RFA-101**	**Wellpad B Guard House**	**9/6/2023**	**1**	Box Condition			/	
				2	Medicine Expire			/	
				3	Fill Medicine			/	
				4	Tag			/	
2	**TH-PHU-112-69-RFA-101**	**Wellpad C Guard House**	**13/9/2023**	**1**	Box Condition			/	
				2	Medicine Expire			/	
				3	Fill Medicine			/	
				4	Tag			/	
3	**TH-PHU-113-69-RFA-101**	**Wellpad A Guard House**	**20/9/2023**	**1**	Box Condition			/	
				2	Medicine Expire			/	
				3	Fill Medicine			/	
				4	Tag			/	
4	**TH-PHU-116-69-RFA-101**	**Wellpad D Guard House**	**27/9/2023**	**1**	Box Condition			/	
				2	Medicine Expire			/	
				3	Fill Medicine			/	
				4	Tag			/	
5	**Pipeyard**	**Pipeyard Guard House**	**27/9/2023**	**1**	Box Condition			/	
				2	Medicine Expire			/	
				3	Fill Medicine			/	
				4	Tag			/	

Well site Fire Fighting Equipment Check Sheet

MONTH : พฤศจิกายน

Item	FIRST AID KID	Location	Date	List	Check Item	Equipment Check / Monthly			Remark
						Missing	*Damage*	*OK*	
1	**TH-PHU-111-69-RFA-101**	**Wellpad A Guard House**	**11/7/2023**	**1**	Box Condition			/	
				2	Medicine Expire			/	
				3	Fill Medicine			/	
				4	Tag			/	
2	**TH-PHU-112-69-RFA-101**	**Wellpad B Guard House**	**14/11/2023**	**1**	Box Condition			/	
				2	Medicine Expire			/	
				3	Fill Medicine			/	
				4	Tag			/	
3	**TH-PHU-113-69-RFA-101**	**Wellpad C Guard House**	**21/11/2023**	**1**	Box Condition			/	
				2	Medicine Expire			/	
				3	Fill Medicine			/	
				4	Tag			/	
4	**TH-PHU-116-69-RFA-101**	**Wellpad D Guard House**	**28/11/2023**	**1**	Box Condition			/	
				2	Medicine Expire			/	
				3	Fill Medicine			/	
				4	Tag			/	
5	**Pipeyard**	**Pipeyard Guard House**	**28/11/2023**	**1**	Box Condition			/	
				2	Medicine Expire			/	
				3	Fill Medicine			/	
				4	Tag			/	

Well site Fire Fighting Equipment Check Sheet

MONTH : ธันวาคม

Item	FIRST AID KID	Location	Date	List	Check Item	Equipment Check / Monthly			Remark
						Missing	*Damage*	*OK*	
1	**TH-PHU-111-69-RFA-101**	**Wellpad B Guard House**	**12/6/2023**	**1**	Box Condition			/	
				2	Medicine Expire			/	
				3	Fill Medicine			/	
				4	Tag			/	
2	**TH-PHU-112-69-RFA-101**	**Wellpad C Guard House**	**12/12/2023**	**1**	Box Condition			/	
				2	Medicine Expire			/	
				3	Fill Medicine			/	
				4	Tag			/	
3	**TH-PHU-113-69-RFA-101**	**Wellpad A Guard House**	**12/6/2023**	**1**	Box Condition			/	
				2	Medicine Expire			/	
				3	Fill Medicine			/	
				4	Tag			/	
4	**TH-PHU-116-69-RFA-101**	**Wellpad D Guard House**	**26/12/2023**	**1**	Box Condition			/	
				2	Medicine Expire			/	
				3	Fill Medicine			/	
				4	Tag			/	
5	**Pipeyard**	**Pipeyard Guard House**	**26/12/2023**	**1**	Box Condition			/	
				2	Medicine Expire			/	
				3	Fill Medicine			/	
				4	Tag			/	

เอกสารแนบ 2-34

เอกสาร Fire Fighting Equipment Check Sheet

PTTEP

SINPHUHORM FIRE FIGHTING EQUIPMENTCHECK SHEET

MONTHLY

ธันวาคม 2023

ลงชื่อผู้ตรวจสอบประจำเดือน

Summary Action for Fire Fighting Equipment

Item รายการ	Equipment name ชื่ออุปกรณ์	Location พื้นที่ติดตั้ง	Date วันที่	Detail รายละเอียด	Action การแก้ไข	Close date วันแก้ไขเสร็จสิ้น
1	Winscok	Blcok Valve 4	7/12/2023	ชำรุด/ขาด	เปลี่ยนตัวใหม่	เรียบร้อยแล้ว 7/12/2023
2	Winscok	Blcok Valve 1	20/12/2023	ชำรุด/ขาด	เปลี่ยนตัวใหม่	เรียบร้อยแล้ว20/12/2023
3						
4						
5						

PTTEP

SINPHUHORM FIRE FIGHTING EQUIPMENTCHECK SHEET

MONTHLY

พฤศจิกายน 2023

ลงชื่อผู้ตรวจสอบประจำเดือน

Summary Action for Fire Fighting Equipment

Item รายการ	Equipment name ชื่ออุปกรณ์	Location พื้นที่ติดตั้ง	Date วันที่	Detail รายละเอียด	Action การแก้ไข	Close date วันแก้ไขเสร็จสิ้น
1	FM 200	Supply to Substation line. Reserved.	27/10/2023	ส่งไปทำ Hydrotest	มีตัวสำรองใช่งานได้ ใช้ line main แทน on MOC. แจ้งแล้ว	กลับมาเรียบร้อย 5/11/2023
2	Winscok	GPP 5จุด	2/11/2023	ชำรุด/ขาด	เปลี่ยนตัวใหม่	เรียบร้อยแล้ว 2/11/2023
3	Winscok	Blcok Valve 4	5/11/2023	ชำรุด/ขาด	เปลี่ยนตัวใหม่	เรียบร้อยแล้ว 5/11/2023
4						
5						

PTTEP

SINPHUHORM FIRE FIGHTING EQUIPMENTCHECK SHEET

MONTHLY

ตุลาคม 2023

ลงชื่อผู้ตรวจสอบประจำเดือน

Summary Action for Fire Fighting Equipment

Item รายการ	Equipment name ชื่ออุปกรณ์	Location พื้นที่ติดตั้ง	Date วันที่	Detail รายละเอียด	Action การแก้ไข	Close date วันแก้ไขเสร็จสิ้น
1	Escape set	GPP Open drain pump	10/6/2023	ชำรุด/ขาด	เปลี่ยนตัวใหม่	กลับมาเรียบร้อยแล้ว 30/10/2023
2	FM-200 -01	Supply to Substation	11/10/2023	ส่ง Inpector	ใช้ชุดสำรอง	กลับมาเรียบร้อยแล้ว 26/10/2023
3	Winscok	Well pad C	17/10/2023	ชำรุด/ขาด	เปลี่ยนตัวใหม่	เรียบร้อยแล้ว 17/10/2023
4	FM-200 -02	Supply to Substation line Main.	25/10/2023	ส่ง Inpector	ใช้ชุดสำรอง ที่ line resolution	กลับมาเรียบร้อยแล้ว 27/11/2023
5					ออก mac ใช้งานปกติ	

PTTEP

SINPHUHORM FIRE FIGHTING EQUIPMENTCHECK SHEET

MONTHLY

กันยายน 2023

ลงชื่อผู้ตรวจสอบประจำเดือน

Summary Action for Fire Fighting Equipment

Item รายการ	Equipment name ชื่ออุปกรณ์	Location พื้นที่ติดตั้ง	Date วันที่	Detail รายละเอียด	Action การแก้ไข	Close date วันแก้ไขเสร็จสิ้น
1	Escape set	GPP 2 ตัว	10/8/2023	ส่งไป Inspector	มีชุดสำรองติดตั้งแทน	กลับมาเรียบร้อย 30/10/2023
2	Wind Sock	B.V 4 /	22/9/2023	ชำรุด ขาด	เปลี่ยนตัวใหม่	เรียบร้อยแล้ว 22/9/2023
3	Lifebuoy	Wall pad B,C /	26/9/2023	ชำรุด แตก	เปลี่ยนตัวใหม่	เรียบร้อยแล้ว 26/9/2023
4						
5						

PTTEP

SINPHUHORM FIRE FIGHTING EQUIPMENTCHECK SHEET

MONTHLY

สิงหาคม 2023

ลงชื่อผู้ตรวจสอบประจำเดือน

Summary Action for Fire Fighting Equipment

Item รายการ	Equipment name ชื่ออุปกรณ์	Location พื้นที่ติดตั้ง	Date วันที่	Detail รายละเอียด	Action การแก้ไข	Close date วันแก้ไขเสร็จสิ้น
1	Escape set	P - H 5 / 4	17/5/2023	ส่งไป Inspector	มีชุดสำรองติดตั้งแทน	กลับมาเรียบร้อยแล้ว 21/8/2023
2	Winscok	Wall Pad D	18/8/2023	ชำรุดขาด	เปลี่ยนตัวใหม่	เรียบร้อยแล้ว 18/8/2023
3	Winscok	GPP 4 จุด	21/8/2023	ชำรุดขาด	เปลี่ยนตัวใหม่	เรียบร้อยแล้ว 21/8/2023
4	SCBA	GPP	15/7/2023	ส่งไป Inspector	มีใช้งานอยู่ 4 ตัว	กลับมาเรียบร้อยแล้ว 29/8/2023
5						

PTTEP

SINPHUHORM FIRE FIGHTING EQUIPMENTCHECK SHEET

MONTHLY

กรกฎาคม 2023

ลงชื่อผู้ตรวจสอบประจำเดือน

([redacted] ssistant

[redacted]

ล

(อัญชุลี ผิวอ่อน) ตำแหน่ง Senior Technician, SSHE

Summary Action for Fire Fighting Equipment

Item รายการ	Equipment name ชื่ออุปกรณ์	Location พื้นที่ติดตั้ง	Date วันที่	Detail รายละเอียด	Action การแก้ไข	Close date วันแก้ไขเสร็จสิ้น
1	Escape set	GPP	23/2/2023	ส่งไป Inspector	มีชุดสำรองติดตั้งแทน	กลับมาเรียบร้อย 3/5/2023
2	Winscok	จุดรวมพล 3	2/5/2023	ชำรุด/ขาด	เปลี่ยนตัวใหม่	เรียบร้อยแล้ว 2/5/2023
3	Winscok	Blcok Valve	5/5/2023	ชำรุด/ขาด	เปลี่ยนตัวใหม่	เรียบร้อยแล้ว 5/5/2023
4	Escape set	wall pad A,B	17/5/2023	ส่งไป Inspector	มีชุดสำรองติดตั้งแทน	กลับมาเรียบร้อย 3/7/2023
5	Winscok	Well pad C	5/7/2023	ชำรุด/ขาด	เปลี่ยนตัวใหม่	เรียบร้อยแล้ว 5/7/2023

6	Winscok	Blcok Valve 1-4	14/7/2023	ชำรุด/ขาด	เปลี่ยนตัวใหม่	เรียบร้อยแล้ว 14/7/2023

เอกสารแนบ 2-35

ตัวอย่างการตรวจสอบการเดินทางของรถขนส่งของเสีย

รายงานประจำวัน :
ชื่อกลุ่มรถ : กลุ่มรถทั้งหมด
ชื่อรถ : 72-5554
เริ่ม : 2023-10-21 00:00
สิ้นสุด : 2023-10-22 02:30

ลำดับ	วันที่	สถานะ	เริ่ม	ชื่อผู้ใช้รถ	สถานที่ เริ่ม	สถานี เริ่ม	สิ้นสุด	สถานที่ สิ้นสุด	สถานี สิ้นสุด	รวมเวลา	รวมเวลารถรับ(นาที)	เลขไมล์สะสม	ระยะทาง(กม.)	น้ำมัน(ลิตร)	แผนที่	ความเร็วสูงสุด	ความเร็วเฉลี่ย
1	21/10/2023	หยุด	0:00:27	NATAWUT MEELADKHAM	ต.ลอนชมพู อ.โนนสูง จ.นครราชสีมา		0:34:06	ต.เทพาลัย อ.คง จ.นครราชสีมา		0 วัน 0 ชม. 34 นาที	34	148720.8	28.48	-	/www.	60	53.4
2	21/10/2023	จอดไม่ดับเครื่อง	0:34:06	NATAWUT MEELADKHAM	ต.เทพาลัย อ.คง จ.นครราชสีมา		0:36:27	ต.เทพาลัย อ.คง จ.นครราชสีมา		0 วัน 0 ชม. 3 นาที	0	148749.3	0.01	-	/www.	0	0
3	21/10/2023	หยุด	0:36:27	NATAWUT MEELADKHAM	ต.เทพาลัย อ.คง จ.นครราชสีมา		0:39:58	ต.เทพาลัย อ.คง จ.นครราชสีมา		0 วัน 0 ชม. 4 นาที	4	148749.3	0.8	-	/www.	44	25
4	21/10/2023	จอดไม่ดับเครื่อง	0:39:58	NATAWUT MEELADKHAM	ต.เทพาลัย อ.คง จ.นครราชสีมา		0:40:19	ต.เทพาลัย อ.คง จ.นครราชสีมา		0 วัน 0 ชม. 1 นาที	0	148750.1	0	-	/www.	0	0
5	21/10/2023	หยุด	0:40:19	NATAWUT MEELADKHAM	ต.เทพาลัย อ.คง จ.นครราชสีมา		2:28:29	ต.เทพาลาดำเกลือบ่านไผ่ อ.บ้านไผ่ จ.ขอนแก่น		0 วัน 1 ชม. 49 นาที	109	148750.1	86.53	-	/www.	66	49.6
6	21/10/2023	จอดไม่ดับเครื่อง	2:28:29	NATAWUT MEELADKHAM	ต.เทพาลาดำเกลือบ่านไผ่ อ.บ้านไผ่ จ.ขอนแก่น		2:29:41	ต.เทพาลาดำเกลือบ่านไผ่ อ.บ้านไผ่ จ.ขอนแก่น		0 วัน 0 ชม. 2 นาที	0	148836.6	0	-	/www.	0	0
7	21/10/2023	หยุด	2:29:41	NATAWUT MEELADKHAM	ต.เทพาลาดำเกลือบ่านไผ่ อ.บ้านไผ่ จ.ขอนแก่น		3:38:02	ต.สำราญ อ.เมืองขอนแก่น จ.ขอนแก่น		0 วัน 1 ชม. 9 นาที	69	148836.6	52.46	-	/www.	62	50.8
8	21/10/2023	ไม่มีสัญญาณ GPS	3:21:46	NATAWUT MEELADKHAM	ต.ในเมือง อ.เมืองขอนแก่น จ.ขอนแก่น		3:21:47	ต.ในเมือง อ.เมืองขอนแก่น จ.ขอนแก่น		0 วัน 0 ชม. 1 นาที	0	148879.9	0	-	/www.	54	54
9	21/10/2023	จอดไม่ดับเครื่อง	3:38:02	NATAWUT MEELADKHAM	ต.สำราญ อ.เมืองขอนแก่น จ.ขอนแก่น		3:40:40	ต.สำราญ อ.เมืองขอนแก่น จ.ขอนแก่น		0 วัน 0 ชม. 3 นาที	0	148889.1	0	-	/www.	0	0
10	21/10/2023	รถจอด	3:40:40		ต.สำราญ อ.เมืองขอนแก่น จ.ขอนแก่น		4:19:19	ต.สำราญ อ.เมืองขอนแก่น จ.ขอนแก่น		0 วัน 0 ชม. 39 นาที	0	148889.1	0	-	/www.	0	0
11	21/10/2023	หยุด	4:19:19		ต.สำราญ อ.เมืองขอนแก่น จ.ขอนแก่น		4:25:16	ต.สำราญ อ.เมืองขอนแก่น จ.ขอนแก่น		0 วัน 0 ชม. 6 นาที	6	148889.1	1.51	-	/www.	41	18
12	21/10/2023	จอดไม่ดับเครื่อง	4:25:16		ต.สำราญ อ.เมืองขอนแก่น จ.ขอนแก่น		4:33:09	ต.สำราญ อ.เมืองขอนแก่น จ.ขอนแก่น		0 วัน 0 ชม. 8 นาที	0	148890.6	0.01	-	/www.	0	0
13	21/10/2023	ไม่แสดงตัวตนในการขับขี่	4:29:19		ต.สำราญ อ.เมืองขอนแก่น จ.ขอนแก่น		4:29:19	ต.สำราญ อ.เมืองขอนแก่น จ.ขอนแก่น		0 วัน 0 ชม. 0 นาที	0	148890.6	0	-	/www.	0	0
14	21/10/2023	หยุด	4:33:09		ต.สำราญ อ.เมืองขอนแก่น จ.ขอนแก่น		4:59:24	ต.ม่วงหวาน อ.บ้าฟอง จ.ขอนแก่น		0 วัน 0 ชม. 27 นาที	27	148890.6	19.52	-	/www.	71	47.6
15	21/10/2023	ไม่แสดงตัวตนในการขับขี่	4:39:19		ต.โนนท่อน อ.เมืองขอนแก่น จ.ขอนแก่น		4:39:19	ต.โนนท่อน อ.เมืองขอนแก่น จ.ขอนแก่น		0 วัน 0 ชม. 0 นาที	0	148895.2	0	-	/www.	60	60
16	21/10/2023	ไม่แสดงตัวตนในการขับขี่	4:49:19		ต.ม่วงหวาน อ.บ้าฟอง จ.ขอนแก่น		4:49:19	ต.ม่วงหวาน อ.บ้าฟอง จ.ขอนแก่น		0 วัน 0 ชม. 0 นาที	0	148904	0	-	/www.	53	53
17	21/10/2023	ความเร็วเกิน	4:50:54		ต.ม่วงหวาน อ.บ้าฟอง จ.ขอนแก่น		4:50:56	ต.ม่วงหวาน อ.บ้าฟอง จ.ขอนแก่น		0 วัน 0 ชม. 1 นาที	0	148905.7	0	-	/www.	71	70.5
18	21/10/2023	ไม่แสดงตัวตนในการขับขี่	4:59:19		ต.ม่วงหวาน อ.บ้าฟอง จ.ขอนแก่น		4:59:19	ต.ม่วงหวาน อ.บ้าฟอง จ.ขอนแก่น		0 วัน 0 ชม. 0 นาที	0	148910.1	0	-	/www.	0	0
19	21/10/2023	จอดไม่ดับเครื่อง	4:59:24		ต.ม่วงหวาน อ.บ้าฟอง จ.ขอนแก่น		5:03:54	ต.ม่วงหวาน อ.บ้าฟอง จ.ขอนแก่น		0 วัน 0 ชม. 5 นาที	0	148910.1	0	-	/www.	0	0
20	21/10/2023	รถจอด	5:03:54		ต.ม่วงหวาน อ.บ้าฟอง จ.ขอนแก่น		8:41:08	ต.ม่วงหวาน อ.บ้าฟอง จ.ขอนแก่น		0 วัน 3 ชม. 38 นาที	0	148910.1	0	-	/www.	0	0
21	21/10/2023	หยุด	8:41:08		ต.ม่วงหวาน อ.บ้าฟอง จ.ขอนแก่น		8:43:08	ต.ม่วงหวาน อ.บ้าฟอง จ.ขอนแก่น		0 วัน 0 ชม. 2 นาที	2	148910.1	0.03	-	/www.	0	0
22	21/10/2023	จอดไม่ดับเครื่อง	8:43:08		ต.ม่วงหวาน อ.บ้าฟอง จ.ขอนแก่น		9:41:25	ต.ม่วงหวาน อ.บ้าฟอง จ.ขอนแก่น		0 วัน 0 ชม. 59 นาที	0	148910.2	0.05	-	/www.	0	0
23	21/10/2023	ไม่แสดงตัวตนในการขับขี่	8:51:08		ต.ม่วงหวาน อ.บ้าฟอง จ.ขอนแก่น		8:51:08	ต.ม่วงหวาน อ.บ้าฟอง จ.ขอนแก่น		0 วัน 0 ชม. 0 นาที	0	148910.2	0	-	/www.	0	0
24	21/10/2023	ไม่แสดงตัวตนในการขับขี่	9:01:08		ต.ม่วงหวาน อ.บ้าฟอง จ.ขอนแก่น		9:01:08	ต.ม่วงหวาน อ.บ้าฟอง จ.ขอนแก่น		0 วัน 0 ชม. 0 นาที	0	148910.2	0	-	/www.	0	0
25	21/10/2023	ไม่แสดงตัวตนในการขับขี่	9:11:08		ต.ม่วงหวาน อ.บ้าฟอง จ.ขอนแก่น		9:11:08	ต.ม่วงหวาน อ.บ้าฟอง จ.ขอนแก่น		0 วัน 0 ชม. 0 นาที	0	148910.2	0	-	/www.	0	0
26	21/10/2023	ไม่แสดงตัวตนในการขับขี่	9:21:08		ต.ม่วงหวาน อ.บ้าฟอง จ.ขอนแก่น		9:21:08	ต.ม่วงหวาน อ.บ้าฟอง จ.ขอนแก่น		0 วัน 0 ชม. 0 นาที	0	148910.2	0	-	/www.	0	0
27	21/10/2023	ไม่แสดงตัวตนในการขับขี่	9:31:08		ต.ม่วงหวาน อ.บ้าฟอง จ.ขอนแก่น		9:31:08	ต.ม่วงหวาน อ.บ้าฟอง จ.ขอนแก่น		0 วัน 0 ชม. 0 นาที	0	148910.2	0	-	/www.	0	0
28	21/10/2023	ไม่แสดงตัวตนในการขับขี่	9:41:08		ต.ม่วงหวาน อ.บ้าฟอง จ.ขอนแก่น		9:41:08	ต.ม่วงหวาน อ.บ้าฟอง จ.ขอนแก่น		0 วัน 0 ชม. 0 นาที	0	148910.2	0	-	/www.	0	0
29	21/10/2023	หยุด	9:41:25		ต.ม่วงหวาน อ.บ้าฟอง จ.ขอนแก่น		9:42:32	ต.ม่วงหวาน อ.บ้าฟอง จ.ขอนแก่น		0 วัน 0 ชม. 2 นาที	2	148910.2	0.08	-	/www.	5	5
30	21/10/2023	รถจอด	9:42:32		ต.ม่วงหวาน อ.บ้าฟอง จ.ขอนแก่น		9:44:51	ต.ม่วงหวาน อ.บ้าฟอง จ.ขอนแก่น		0 วัน 0 ชม. 3 นาที	0	148910.3	0	-	/www.	0	0
31	21/10/2023	หยุด	9:44:51		ต.ม่วงหวาน อ.บ้าฟอง จ.ขอนแก่น		9:49:47	ต.กุดน้ำใส อ.บ้าฟอง จ.ขอนแก่น		0 วัน 0 ชม. 5 นาที	5	148910.3	0.21	-	/www.	8	3.3
32	21/10/2023	จอดไม่ดับเครื่อง	9:49:47		ต.กุดน้ำใส อ.บ้าฟอง จ.ขอนแก่น		9:50:12	ต.กุดน้ำใส อ.บ้าฟอง จ.ขอนแก่น		0 วัน 0 ชม. 1 นาที	0	148910.5	0.01	-	/www.	0	0
33	21/10/2023	หยุด	9:50:12		ต.กุดน้ำใส อ.บ้าฟอง จ.ขอนแก่น		9:56:15	ต.กุดน้ำใส อ.บ้าฟอง จ.ขอนแก่น		0 วัน 0 ชม. 7 นาที	7	148910.5	0.47	-	/www.	7	5.6
34	21/10/2023	ไม่แสดงตัวตนในการขับขี่	9:54:51		ต.กุดน้ำใส อ.บ้าฟอง จ.ขอนแก่น		9:54:51	ต.กุดน้ำใส อ.บ้าฟอง จ.ขอนแก่น		0 วัน 0 ชม. 0 นาที	0	148911	0	-	/www.	2	2
35	21/10/2023	จอดไม่ดับเครื่อง	9:56:15		ต.กุดน้ำใส อ.บ้าฟอง จ.ขอนแก่น		9:56:44	ต.กุดน้ำใส อ.บ้าฟอง จ.ขอนแก่น		0 วัน 0 ชม. 1 นาที	0	148911	0	-	/www.	0	0
36	21/10/2023	รถจอด	9:56:44		ต.กุดน้ำใส อ.บ้าฟอง จ.ขอนแก่น		11:18:23	ต.กุดน้ำใส อ.บ้าฟอง จ.ขอนแก่น		0 วัน 1 ชม. 22 นาที	0	148911	0	-	/www.	0	0
37	21/10/2023	หยุด	11:18:23		ต.กุดน้ำใส อ.บ้าฟอง จ.ขอนแก่น		11:18:32	ต.กุดน้ำใส อ.บ้าฟอง จ.ขอนแก่น		0 วัน 0 ชม. 1 นาที	1	148911	0	-	/www.	0	0
38	21/10/2023	รถจอด	11:18:32		ต.กุดน้ำใส อ.บ้าฟอง จ.ขอนแก่น		11:46:55	ต.กุดน้ำใส อ.บ้าฟอง จ.ขอนแก่น		0 วัน 0 ชม. 29 นาที	0	148911	0	-	/www.	0	0
39	21/10/2023	หยุด	11:46:55		ต.กุดน้ำใส อ.บ้าฟอง จ.ขอนแก่น		11:47:02	ต.กุดน้ำใส อ.บ้าฟอง จ.ขอนแก่น		0 วัน 0 ชม. 1 นาที	1	148911	0	-	/www.	0	0
40	21/10/2023	รถจอด	11:47:02		ต.กุดน้ำใส อ.บ้าฟอง จ.ขอนแก่น		12:06:57	ต.กุดน้ำใส อ.บ้าฟอง จ.ขอนแก่น		0 วัน 0 ชม. 20 นาที	0	148911	0	-	/www.	0	0
41	21/10/2023	หยุด	12:06:57		ต.กุดน้ำใส อ.บ้าฟอง จ.ขอนแก่น		12:08:57	ต.กุดน้ำใส อ.บ้าฟอง จ.ขอนแก่น		0 วัน 0 ชม. 2 นาที	2	148911	0	-	/www.	0	0
42	21/10/2023	จอดไม่ดับเครื่อง	12:08:57		ต.กุดน้ำใส อ.บ้าฟอง จ.ขอนแก่น		12:22:52	ต.กุดน้ำใส อ.บ้าฟอง จ.ขอนแก่น		0 วัน 0 ชม. 14 นาที	0	148911	0.02	-	/www.	0	0
43	21/10/2023	ไม่แสดงตัวตนในการขับขี่	12:16:57		ต.กุดน้ำใส อ.บ้าฟอง จ.ขอนแก่น		12:16:57	ต.กุดน้ำใส อ.บ้าฟอง จ.ขอนแก่น		0 วัน 0 ชม. 0 นาที	0	148911	0	-	/www.	0	0
44	21/10/2023	หยุด	12:22:52		ต.กุดน้ำใส อ.บ้าฟอง จ.ขอนแก่น		12:25:04	ต.กุดน้ำใส อ.บ้าฟอง จ.ขอนแก่น		0 วัน 0 ชม. 3 นาที	3	148911	0.11	-	/www.	5	4
45	21/10/2023	รถจอด	12:25:04		ต.กุดน้ำใส อ.บ้าฟอง จ.ขอนแก่น		12:29:14	ต.กุดน้ำใส อ.บ้าฟอง จ.ขอนแก่น		0 วัน 0 ชม. 5 นาที	0	148911.1	0	-	/www.	0	0
46	21/10/2023	หยุด	12:29:14		ต.กุดน้ำใส อ.บ้าฟอง จ.ขอนแก่น		12:31:14	ต.กุดน้ำใส อ.บ้าฟอง จ.ขอนแก่น		0 วัน 0 ชม. 2 นาที	2	148911.1	0	-	/www.	0	0
47	21/10/2023	จอดไม่ดับเครื่อง	12:31:14		ต.กุดน้ำใส อ.บ้าฟอง จ.ขอนแก่น		13:18:03	ต.กุดน้ำใส อ.บ้าฟอง จ.ขอนแก่น		0 วัน 0 ชม. 47 นาที	0	148911.1	0.01	-	/www.	0	0
48	21/10/2023	ไม่แสดงตัวตนในการขับขี่	12:39:14		ต.กุดน้ำใส อ.บ้าฟอง จ.ขอนแก่น		12:39:14	ต.กุดน้ำใส อ.บ้าฟอง จ.ขอนแก่น		0 วัน 0 ชม. 0 นาที	0	148911.1	0	-	/www.	0	0
49	21/10/2023	ไม่แสดงตัวตนในการขับขี่	12:49:58		ต.กุดน้ำใส อ.บ้าฟอง จ.ขอนแก่น		12:49:58	ต.กุดน้ำใส อ.บ้าฟอง จ.ขอนแก่น		0 วัน 0 ชม. 0 นาที	0	148911.1	0	-	/www.	0	0
50	21/10/2023	ไม่แสดงตัวตนในการขับขี่	13:00:04		ต.กุดน้ำใส อ.บ้าฟอง จ.ขอนแก่น		13:00:04	ต.กุดน้ำใส อ.บ้าฟอง จ.ขอนแก่น		0 วัน 0 ชม. 0 นาที	0	148911.1	0	-	/www.	0	0
51	21/10/2023	ไม่แสดงตัวตนในการขับขี่	13:10:04		ต.กุดน้ำใส อ.บ้าฟอง จ.ขอนแก่น		13:10:04	ต.กุดน้ำใส อ.บ้าฟอง จ.ขอนแก่น		0 วัน 0 ชม. 0 นาที	0	148911.1	0	-	/www.	0	0
52	21/10/2023	หยุด	13:18:03		ต.กุดน้ำใส อ.บ้าฟอง จ.ขอนแก่น		13:24:46	ต.กุดน้ำใส อ.บ้าฟอง จ.ขอนแก่น		0 วัน 0 ชม. 7 นาที	7	148911.1	0.6	-	/www.	11	5.8
53	21/10/2023	ไม่แสดงตัวตนในการขับขี่	13:20:04		ต.กุดน้ำใส อ.บ้าฟอง จ.ขอนแก่น		13:20:04	ต.กุดน้ำใส อ.บ้าฟอง จ.ขอนแก่น		0 วัน 0 ชม. 0 นาที	0	148911.3	0	-	/www.	11	11
54	21/10/2023	จอดไม่ดับเครื่อง	13:24:46		ต.กุดน้ำใส อ.บ้าฟอง จ.ขอนแก่น		13:25:17	ต.กุดน้ำใส อ.บ้าฟอง จ.ขอนแก่น		0 วัน 0 ชม. 1 นาที	0	148911.7	0.01	-	/www.	0	0
55	21/10/2023	หยุด	13:25:17		ต.กุดน้ำใส อ.บ้าฟอง จ.ขอนแก่น		13:28:09	ต.ม่วงหวาน อ.บ้าฟอง จ.ขอนแก่น		0 วัน 0 ชม. 3 นาที	3	148911.7	0.07	-	/www.	6	5.5
56	21/10/2023	รถจอด	13:28:09		ต.ม่วงหวาน อ.บ้าฟอง จ.ขอนแก่น		13:34:52	ต.ม่วงหวาน อ.บ้าฟอง จ.ขอนแก่น		0 วัน 0 ชม. 7 นาที	0	148911.8	0	-	/www.	0	0
57	21/10/2023	หยุด	13:34:52		ต.ม่วงหวาน อ.บ้าฟอง จ.ขอนแก่น		13:43:33	ต.ม่วงหวาน อ.บ้าฟอง จ.ขอนแก่น		0 วัน 0 ชม. 9 นาที	9	148911.8	3.57	-	/www.	55	33
58	21/10/2023	จอดไม่ดับเครื่อง	13:43:33		ต.ม่วงหวาน อ.บ้าฟอง จ.ขอนแก่น		13:45:36	ต.ม่วงหวาน อ.บ้าฟอง จ.ขอนแก่น		0 วัน 0 ชม. 3 นาที	0	148915.4	0	-	/www.	0	0
59	21/10/2023	ไม่แสดงตัวตนในการขับขี่	13:44:52		ต.ม่วงหวาน อ.บ้าฟอง จ.ขอนแก่น		13:44:52	ต.ม่วงหวาน อ.บ้าฟอง จ.ขอนแก่น		0 วัน 0 ชม. 0 นาที	0	148915.4	0	-	/www.	0	0
60	21/10/2023	หยุด	13:45:36		ต.ม่วงหวาน อ.บ้าฟอง จ.ขอนแก่น		15:24:09	ต.เทพาลาดำเกลือบ่านไผ่ อ.บ้านไผ่ จ.ขอนแก่น		0 วัน 1 ชม. 39 นาที	99	148915.4	84.12	-	/www.	71	52.4
61	21/10/2023	ความเร็วเกิน	13:52:14		ต.ม่วงหวาน อ.บ้าฟอง จ.ขอนแก่น		13:52:32	ต.โนนท่อน อ.เมืองขอนแก่น จ.ขอนแก่น		0 วัน 0 ชม. 1 นาที	0	148920.4	0	-	/www.	71	70
62	21/10/2023	ไม่แสดงตัวตนในการขับขี่	13:54:52		ต.โนนท่อน อ.เมืองขอนแก่น จ.ขอนแก่น		13:54:52	ต.โนนท่อน อ.เมืองขอนแก่น จ.ขอนแก่น		0 วัน 0 ชม. 0 นาที	0	148922.5	0	-	/www.	46	46
63	21/10/2023	ความเร็วเกิน	13:55:37		ต.โนนท่อน อ.เมืองขอนแก่น จ.ขอนแก่น		13:55:51	ต.โนนท่อน อ.เมืองขอนแก่น จ.ขอนแก่น		0 วัน 0 ชม. 1 นาที	0	148923.5	0	-	/www.	71	70.5
64	21/10/2023	ไม่แสดงตัวตนในการขับขี่	14:04:52		ต.สำราญ อ.เมืองขอนแก่น จ.ขอนแก่น		14:04:52	ต.สำราญ อ.เมืองขอนแก่น จ.ขอนแก่น		0 วัน 0 ชม. 0 นาที	0	148932.3	0	-	/www.	46	46
65	21/10/2023	ไม่แสดงตัวตนในการขับขี่	14:14:55		ต.คึลา อ.เมืองขอนแก่น จ.ขอนแก่น		14:14:55	ต.คึลา อ.เมืองขอนแก่น จ.ขอนแก่น		0 วัน 0 ชม. 0 นาที	0	148941.3	0	-	/www.	24	24
66	21/10/2023	ไม่แสดงตัวตนในการขับขี่	14:24:55		ต.บึงเนียม อ.เมืองขอนแก่น จ.ขอนแก่น		14:24:55	ต.บึงเนียม อ.เมืองขอนแก่น จ.ขอนแก่น		0 วัน 0 ชม. 0 นาที	0	148950.8	0	-	/www.	50	50
67	21/10/2023	ไม่แสดงตัวตนในการขับขี่	14:34:55		ต.เมืองเก่า อ.เมืองขอนแก่น จ.ขอนแก่น		14:34:55	ต.เมืองเก่า อ.เมืองขอนแก่น จ.ขอนแก่น		0 วัน 0 ชม. 0 นาที	0	148959.9	0	-	/www.	63	63
68	21/10/2023	ไม่แสดงตัวตนในการขับขี่	14:44:55		ต.ท่าพระ อ.เมืองขอนแก่น จ.ขอนแก่น		14:44:55	ต.ท่าพระ อ.เมืองขอนแก่น จ.ขอนแก่น		0 วัน 0 ชม. 0 นาที	0	148967.7	0	-	/www.	34	34
69	21/10/2023	ไม่แสดงตัวตนในการขับขี่	14:55:00		ต.โนนสมบูรณ์ อ.บ้านแฮด จ.ขอนแก่น		14:55:00	ต.โนนสมบูรณ์ อ.บ้านแฮด จ.ขอนแก่น		0 วัน 0 ชม. 0 นาที	0	148976.2	0	-	/www.	48	48
70	21/10/2023	ไม่แสดงตัวตนในการขับขี่	15:05:00		ต.บ้านแฮด อ.บ้านแฮด จ.ขอนแก่น		15:05:00	ต.บ้านแฮด อ.บ้านแฮด จ.ขอนแก่น		0 วัน 0 ชม. 0 นาที	0	148984.9	0	-	/www.	43	43
71	21/10/2023	ไม่แสดงตัวตนในการขับขี่	15:15:00		ต.บ้านไผ่ อ.บ้านไผ่ จ.ขอนแก่น		15:15:00	ต.บ้านไผ่ อ.บ้านไผ่ จ.ขอนแก่น		0 วัน 0 ชม. 0 นาที	0	148994.4	0	-	/www.	62	62
72	21/10/2023	ความเร็วเกิน	15:16:55		ต.บ้านไผ่ อ.บ้านไผ่ จ.ขอนแก่น		15:17:07	ต.เทพาลาดำเกลือบ่านไผ่ อ.บ้านไผ่ จ.ขอนแก่น		0 วัน 0 ชม. 1 นาที	0	148996.4	0	-	/www.	71	70.5
73	21/10/2023	จอดไม่ดับเครื่อง	15:24:09		ต.เทพาลาดำเกลือบ่านไผ่ อ.บ้านไผ่ จ.ขอนแก่น		15:24:39	ต.เทพาลาดำเกลือบ่านไผ่ อ.บ้านไผ่ จ.ขอนแก่น		0 วัน 0 ชม. 1 นาที	0	148999.5	0.01	-	/www.	0	0
74	21/10/2023	หยุด	15:24:39		ต.เทพาลาดำเกลือบ่านไผ่ อ.บ้านไผ่ จ.ขอนแก่น		15:32:13	ต.เทพาลาดำเกลือบ่านไผ่ อ.บ้านไผ่ จ.ขอนแก่น		0 วัน 0 ชม. 8 นาที	8	148999.5	2.42	-	/www.	49	25.2
75	21/10/2023	ไม่แสดงตัวตนในการขับขี่	15:25:00		ต.เทพาลาดำเกลือบ่านไผ่ อ.บ้านไผ่ จ.ขอนแก่น		15:25:00	ต.เทพาลาดำเกลือบ่านไผ่ อ.บ้านไผ่ จ.ขอนแก่น		0 วัน 0 ชม. 0 นาที	0	148999.5	0	-	/www.	21	21
76	21/10/2023	รถจอด	15:32:13		ต.เทพาลาดำเกลือบ่านไผ่ อ.บ้านไผ่ จ.ขอนแก่น		16:25:02	ต.เทพาลาดำเกลือบ่านไผ่ อ.บ้านไผ่ จ.ขอนแก่น		0 วัน 0 ชม. 53 นาที	0	149001.9	0	-	/www.	0	0
77	21/10/2023	หยุด	16:25:02		ต.เทพาลาดำเกลือบ่านไผ่ อ.บ้านไผ่ จ.ขอนแก่น		17:13:57	ต.หนองแวงโสกพระ อ.พล จ.ขอนแก่น		0 วัน 0 ชม. 49 นาที	49	149001.9	37.32	-	/www.	71	53.9
78	21/10/2023	ไม่แสดงตัวตนในการขับขี่	16:35:02		ต.โนนแดง อ.โนนคีลา จ.ขอนแก่น		16:35:02	ต.โนนแดง อ.โนนคีลา จ.ขอนแก่น		0 วัน 0 ชม. 0 นาที	0	149008.6	0	-	/www.	60	60
79	21/10/2023	ความเร็วเกิน	16:44:53		ต.โนนคีลา อ.โนนคีลา จ.ขอนแก่น		16:45:06	ต.โนนคีลา อ.โนนคีลา จ.ขอนแก่น		0 วัน 0 ชม. 1 นาที	0	149015.4	0	-	/www.	71	70.5
80	21/10/2023	ไม่แสดงตัวตนในการขับขี่	16:45:02		ต.โนนคีลา อ.โนนคีลา จ.ขอนแก่น		16:45:02	ต.โนนคีลา อ.โนนคีลา จ.ขอนแก่น		0 วัน 0 ชม. 0 นาที	0	149015.4	0	-	/www.	73	73
81	21/10/2023	ความเร็วเกิน	16:47:12		ต.หนองแวงนางเบ้า อ.พล จ.ขอนแก่น		16:47:20	ต.หนองแวงนางเบ้า อ.พล จ.ขอนแก่น		0 วัน 0 ชม. 1 นาที	0	149017.8	0	-	/www.	71	70.5
82	21/10/2023	ความเร็วเกิน	16:48:07		ต.หนองแวงนางเบ้า อ.พล จ.ขอนแก่น		16:48:14	ต.หนองแวงนางเบ้า อ.พล จ.ขอนแก่น		0 วัน 0 ชม. 1 นาที	0	149018.9	0	-	/www.	71	70.5
83	21/10/2023	ไม่แสดงตัวตนในการขับขี่	16:55:02		ต.เก่าวัง อ.พล จ.ขอนแก่น		16:55:02	ต.เก่าวัง อ.พล จ.ขอนแก่น		0 วัน 0 ชม. 0 นาที	0	149025.4	0	-	/www.	66	66
84	21/10/2023	ไม่แสดงตัวตนในการขับขี่	17:05:02		ต.เมืองพล อ.พล จ.ขอนแก่น		17:05:02	ต.เมืองพล อ.พล จ.ขอนแก่น		0 วัน 0 ชม. 0 นาที	0	149031	0	-	/www.	62	62
85	21/10/2023	ความเร็วเกิน	17:07:33		ต.โนนข่า อ.พล จ.ขอนแก่น		17:07:34	ต.โนนข่า อ.พล จ.ขอนแก่น		0 วัน 0 ชม. 1 นาที	0	149034.6	0	-	/www.	71	70.5
86	21/10/2023	ความเร็วเกิน	17:08:18		ต.โนนข่า อ.พล จ.ขอนแก่น		17:08:45	ต.หนองแวงโสกพระ อ.พล จ.ขอนแก่น		0 วัน 0 ชม. 1 นาที	0	149035.5	0	-	/www.	71	70.5
87	21/10/2023	จอดไม่ดับเครื่อง	17:13:57		ต.หนองแวงโสกพระ อ.พล จ.ขอนแก่น		17:14:51	ต.หนองแวงโสกพระ อ.พล จ.ขอนแก่น		0 วัน 0 ชม. 1 นาที	0	149039.2	0.02	-	/www.	0	0
88	21/10/2023	รถจอด	17:14:51		ต.หนองแวงโสกพระ อ.พล จ.ขอนแก่น		17:43:52	ต.หนองแวงโสกพระ อ.พล จ.ขอนแก่น		0 วัน 0 ชม. 30 นาที	0	149039.3	0	-	/www.	0	0
89	21/10/2023	หยุด	17:43:52		ต.หนองแวงโสกพระ อ.พล จ.ขอนแก่น		19:54:00	ต.กุดจิก อ.สูงเนิน จ.นครราชสีมา		0 วัน 2 ชม. 11 นาที	131	149039.3	127.38	-	/www.	71	59.5
90	21/10/2023	ไม่แสดงตัวตนในการขับขี่	17:53:52		ต.หนองหว้า อ.บัวลาย จ.นครราชสีมา		17:53:52	ต.หนองหว้า อ.บัวลาย จ.นครราชสีมา		0 วัน 0 ชม. 0 นาที	0	149047.3	0	-	/www.	63	63
91	21/10/2023	ไม่แสดงตัวตนในการขับขี่	18:03:52		ต.สามเมือง อ.สีดา จ.นครราชสีมา		18:03:52	ต.สามเมือง อ.สีดา จ.นครราชสีมา		0 วัน 0 ชม. 0 นาที	0	149055.8	0	-	/www.	65	65
92	21/10/2023	ความเร็วเกิน	18:13:14		ต.โพนทอง อ.สีดา จ.นครราชสีมา		18:13:15	ต.โพนทอง อ.สีดา จ.นครราชสีมา		0 วัน 0 ชม. 1 นาที	0	149065.3	0	-	/www.	71	70.5
93	21/10/2023	ความเร็วเกิน	18:13:17		ต.โพนทอง อ.สีดา จ.นครราชสีมา		18:13:19	ต.โพนทอง อ.สีดา จ.นครราชสีมา

97	21/10/2023	ความเร็วเกิน	18:14:57		ต.โพนทอง อ.สีดา จ.นครราชสีมา		18:15:01	ต.โพนทอง อ.สีดา จ.นครราชสีมา		0 วัน 0 ชม. 1 นาที	0	149067.4	0	-	/www.	71	70.5
98	21/10/2023	ไม่แสดงตัวตนในการชับขี่	18:23:52		ต.ลอยบาวใหญ่ อ.โนนแดง จ.นครราชสีมา		18:23:52	ต.ลอยบาวใหญ่ อ.โนนแดง จ.นครราชสีมา		0 วัน 0 ชม. 0 นาที	0	149075.7	0	-	/www.	59	59
99	21/10/2023	ไม่แสดงตัวตนในการชับขี่	18:33:52		ต.เทพาลัย อ.ลำ จ.นครราชสีมา		18:33:52	ต.เทพาลัย อ.ลำ จ.นครราชสีมา		0 วัน 0 ชม. 0 นาที	0	149086	0	-	/www.	65	65
100	21/10/2023	ไม่แสดงตัวตนในการชับขี่	18:43:52		ต.ธารปราสาท อ.โนนสูง จ.นครราชสีมา		18:43:52	ต.ธารปราสาท อ.โนนสูง จ.นครราชสีมา		0 วัน 0 ชม. 0 นาที	0	149097	0	-	/www.	64	64
101	21/10/2023	ความเร็วเกิน	18:47:07		ต.ธารปราสาท อ.โนนสูง จ.นครราชสีมา		18:47:11	ต.ธารปราสาท อ.โนนสูง จ.นครราชสีมา		0 วัน 0 ชม. 1 นาที	0	149101.6	0	-	/www.	71	70.5
102	21/10/2023	ไม่แสดงตัวตนในการชับขี่	18:53:52		ต.ลอนชมพู อ.โนนสูง จ.นครราชสีมา		18:53:52	ต.ลอนชมพู อ.โนนสูง จ.นครราชสีมา		0 วัน 0 ชม. 0 นาที	0	149107.9	0	-	/www.	62	62
103	21/10/2023	ไม่แสดงตัวตนในการชับขี่	19:03:52		ต.ลอนหวาย อ.โนนสูง จ.นครราชสีมา		19:03:52	ต.ลอนหวาย อ.โนนสูง จ.นครราชสีมา		0 วัน 0 ชม. 0 นาที	0	149118	0	-	/www.	56	56
104	21/10/2023	ไม่แสดงตัวตนในการชับขี่	19:13:52		ต.บ้านโพธิ์ อ.เมืองนครราชสีมา จ.นครราชสีมา		19:13:52	ต.บ้านโพธิ์ อ.เมืองนครราชสีมา จ.นครราชสีมา		0 วัน 0 ชม. 0 นาที	0	149128.6	0	-	/www.	62	62
105	21/10/2023	ไม่แสดงตัวตนในการชับขี่	19:23:52		ต.จอหอ อ.เมืองนครราชสีมา จ.นครราชสีมา		19:23:52	ต.จอหอ อ.เมืองนครราชสีมา จ.นครราชสีมา		0 วัน 0 ชม. 0 นาที	0	149138	0	-	/www.	55	55
106	21/10/2023	ไม่แสดงตัวตนในการชับขี่	19:33:52		ต.ปรุใหญ่ อ.เมืองนครราชสีมา จ.นครราชสีมา		19:33:52	ต.ปรุใหญ่ อ.เมืองนครราชสีมา จ.นครราชสีมา		0 วัน 0 ชม. 0 นาที	0	149148.5	0	-	/www.	52	52
107	21/10/2023	ไม่แสดงตัวตนในการชับขี่	19:43:52		ต.โคกกรวด อ.เมืองนครราชสีมา จ.นครราชสีมา		19:43:52	ต.โคกกรวด อ.เมืองนครราชสีมา จ.นครราชสีมา		0 วัน 0 ชม. 0 นาที	0	149157.2	0	-	/www.	59	59
108	21/10/2023	ไม่แสดงตัวตนในการชับขี่	19:53:52		ต.กุดจิก อ.สูงเนิน จ.นครราชสีมา		19:53:52	ต.กุดจิก อ.สูงเนิน จ.นครราชสีมา		0 วัน 0 ชม. 0 นาที	0	149166.6	0	-	/www.	0	0
109	21/10/2023	รถจอด	19:54:00		ต.กุดจิก อ.สูงเนิน จ.นครราชสีมา		20:15:28	ต.กุดจิก อ.สูงเนิน จ.นครราชสีมา		0 วัน 0 ชม. 22 นาที	0	149166.6	0	-	/www.	0	0
110	21/10/2023	รถวิ่ง	20:15:28		ต.กุดจิก อ.สูงเนิน จ.นครราชสีมา		22:24:00	ต.ทับกวาง อ.แก่งคอย จ.สระบุรี		0 วัน 2 ชม. 9 นาที	129	149166.6	111.98	-	/www.	72	55.6
111	21/10/2023	ไม่แสดงตัวตนในการชับขี่	20:25:28		ต.สูงเนิน อ.สูงเนิน จ.นครราชสีมา		20:25:28	ต.สูงเนิน อ.สูงเนิน จ.นครราชสีมา		0 วัน 0 ชม. 0 นาที	0	149174.3	0	-	/www.	60	60
112	21/10/2023	ไม่แสดงตัวตนในการชับขี่	20:35:28		ต.มะเกลือใหม่ อ.สูงเนิน จ.นครราชสีมา		20:35:28	ต.มะเกลือใหม่ อ.สูงเนิน จ.นครราชสีมา		0 วัน 0 ชม. 0 นาที	0	149184.4	0	-	/www.	52	52
113	21/10/2023	ไม่แสดงตัวตนในการชับขี่	20:45:28		ต.มิตรภาพ อ.สีดา จ.นครราชสีมา		20:45:28	ต.มิตรภาพ อ.สีดา จ.นครราชสีมา		0 วัน 0 ชม. 0 นาที	0	149194.1	0	-	/www.	51	51
114	21/10/2023	ความเร็วเกิน	20:45:48		ต.มิตรภาพ อ.สีดา จ.นครราชสีมา		20:46:06	ต.มิตรภาพ อ.สีดา จ.นครราชสีมา		0 วัน 0 ชม. 1 นาที	0	149194.4	0	-	/www.	71	70.5
115	21/10/2023	ไม่แสดงตัวตนในการชับขี่	20:55:28		ต.ลาดบัวขาว อ.สีดา จ.นครราชสีมา		20:55:28	ต.ลาดบัวขาว อ.สีดา จ.นครราชสีมา		0 วัน 0 ชม. 0 นาที	0	149203.9	0	-	/www.	55	55
116	21/10/2023	ความเร็วเกิน	20:56:31		ต.คลองไผ่ อ.สีดา จ.นครราชสีมา		20:56:52	ต.คลองไผ่ อ.สีดา จ.นครราชสีมา		0 วัน 0 ชม. 1 นาที	0	149205.3	0	-	/www.	71	70.5
117	21/10/2023	ความเร็วเกิน	21:00:18		ต.คลองไผ่ อ.สีดา จ.นครราชสีมา		21:00:56	ต.หนองสาหร่าย อ.ปากช่อง จ.นครราชสีมา		0 วัน 0 ชม. 1 นาที	0	149207.7	0	-	/www.	72	71
118	21/10/2023	ความเร็วเกิน	21:02:05		ต.หนองสาหร่าย อ.ปากช่อง จ.นครราชสีมา		21:02:37	ต.หนองสาหร่าย อ.ปากช่อง จ.นครราชสีมา		0 วัน 0 ชม. 1 นาที	0	149209.7	0	-	/www.	71	70.5
119	21/10/2023	ความเร็วเกิน	21:03:37		ต.หนองสาหร่าย อ.ปากช่อง จ.นครราชสีมา		21:03:46	ต.หนองสาหร่าย อ.ปากช่อง จ.นครราชสีมา		0 วัน 0 ชม. 1 นาที	0	149211.4	0	-	/www.	71	70.5
120	21/10/2023	ไม่แสดงตัวตนในการชับขี่	21:05:28		ต.หนองสาหร่าย อ.ปากช่อง จ.นครราชสีมา		21:05:28	ต.หนองสาหร่าย อ.ปากช่อง จ.นครราชสีมา		0 วัน 0 ชม. 0 นาที	0	149212.6	0	-	/www.	56	56
121	21/10/2023	ความเร็วเกิน	21:05:41		ต.หนองสาหร่าย อ.ปากช่อง จ.นครราชสีมา		21:06:03	ต.หนองสาหร่าย อ.ปากช่อง จ.นครราชสีมา		0 วัน 0 ชม. 1 นาที	0	149213.4	0	-	/www.	71	70.5
122	21/10/2023	ความเร็วเกิน	21:07:21		ต.หนองสาหร่าย อ.ปากช่อง จ.นครราชสีมา		21:07:40	ต.หนองสาหร่าย อ.ปากช่อง จ.นครราชสีมา		0 วัน 0 ชม. 1 นาที	0	149215.2	0	-	/www.	71	70.5
123	21/10/2023	ความเร็วเกิน	21:10:05		ต.หนองสาหร่าย อ.ปากช่อง จ.นครราชสีมา		21:10:25	ต.หนองสาหร่าย อ.ปากช่อง จ.นครราชสีมา		0 วัน 0 ชม. 1 นาที	0	149218.3	0	-	/www.	71	70.5
124	21/10/2023	ไม่แสดงตัวตนในการชับขี่	21:15:28		ต.หนองสาหร่าย อ.ปากช่อง จ.นครราชสีมา		21:15:28	ต.หนองสาหร่าย อ.ปากช่อง จ.นครราชสีมา		0 วัน 0 ชม. 0 นาที	0	149223.1	0	-	/www.	50	50
125	21/10/2023	ความเร็วเกิน	21:17:20		ต.หนองสาหร่าย อ.ปากช่อง จ.นครราชสีมา		21:17:22	ต.หนองสาหร่าย อ.ปากช่อง จ.นครราชสีมา		0 วัน 0 ชม. 1 นาที	0	149225.9	0	-	/www.	71	70.5
126	21/10/2023	ความเร็วเกิน	21:21:32		ต.หนองสาหร่าย อ.ปากช่อง จ.นครราชสีมา		21:21:47	ต.หนองสาหร่าย อ.ปากช่อง จ.นครราชสีมา		0 วัน 0 ชม. 1 นาที	0	149230	0	-	/www.	71	70.5
127	21/10/2023	ไม่แสดงตัวตนในการชับขี่	21:25:28		ต.ขนงพระ อ.ปากช่อง จ.นครราชสีมา		21:25:28	ต.ขนงพระ อ.ปากช่อง จ.นครราชสีมา		0 วัน 0 ชม. 0 นาที	0	149233	0	-	/www.	21	21
128	21/10/2023	ไม่แสดงตัวตนในการชับขี่	21:35:28		ต.หนองน้ำแดง อ.ปากช่อง จ.นครราชสีมา		21:35:28	ต.หนองน้ำแดง อ.ปากช่อง จ.นครราชสีมา		0 วัน 0 ชม. 0 นาที	0	149240.1	0	-	/www.	20	20
129	21/10/2023	ความเร็วเกิน	21:42:19		ต.หนองน้ำแดง อ.ปากช่อง จ.นครราชสีมา		21:42:29	ต.หนองน้ำแดง อ.ปากช่อง จ.นครราชสีมา		0 วัน 0 ชม. 1 นาที	0	149242.6	0	-	/www.	71	70.5
130	21/10/2023	ความเร็วเกิน	21:43:34		ต.หนองน้ำแดง อ.ปากช่อง จ.นครราชสีมา		21:43:45	ต.หนองน้ำแดง อ.ปากช่อง จ.นครราชสีมา		0 วัน 0 ชม. 1 นาที	0	149243.8	0	-	/www.	71	70
131	21/10/2023	ไม่แสดงตัวตนในการชับขี่	21:45:28		ต.กลางดง อ.ปากช่อง จ.นครราชสีมา		21:45:28	ต.กลางดง อ.ปากช่อง จ.นครราชสีมา		0 วัน 0 ชม. 0 นาที	0	149245.1	0	-	/www.	56	56
132	21/10/2023	ความเร็วเกิน	21:50:37		ต.กลางดง อ.ปากช่อง จ.นครราชสีมา		21:50:39	ต.กลางดง อ.ปากช่อง จ.นครราชสีมา		0 วัน 0 ชม. 1 นาที	0	149251.2	0	-	/www.	71	70.5
133	21/10/2023	ความเร็วเกิน	21:50:40		ต.กลางดง อ.ปากช่อง จ.นครราชสีมา		21:51:00	ต.กลางดง อ.ปากช่อง จ.นครราชสีมา		0 วัน 0 ชม. 1 นาที	0	149251.2	0	-	/www.	71	70.5
134	21/10/2023	ไม่แสดงตัวตนในการชับขี่	21:55:28		ต.พญาเย็น อ.ปากช่อง จ.นครราชสีมา		21:55:28	ต.พญาเย็น อ.ปากช่อง จ.นครราชสีมา		0 วัน 0 ชม. 0 นาที	0	149255.6	0	-	/www.	60	60
135	21/10/2023	ความเร็วเกิน	21:57:57		ต.พญาเย็น อ.ปากช่อง จ.นครราชสีมา		21:58:03	ต.พญาเย็น อ.ปากช่อง จ.นครราชสีมา		0 วัน 0 ชม. 1 นาที	0	149258.5	0	-	/www.	71	70.5
136	21/10/2023	ความเร็วเกิน	21:58:07		ต.พญาเย็น อ.ปากช่อง จ.นครราชสีมา		21:58:08	ต.พญาเย็น อ.ปากช่อง จ.นครราชสีมา		0 วัน 0 ชม. 1 นาที	0	149258.7	0	-	/www.	71	70
137	21/10/2023	ความเร็วเกิน	21:58:10		ต.พญาเย็น อ.ปากช่อง จ.นครราชสีมา		21:58:29	ต.มิตรภาพ อ.มวกเหล็ก จ.สระบุรี		0 วัน 0 ชม. 1 นาที	0	149258.8	0	-	/www.	71	70.5
138	21/10/2023	ไม่แสดงตัวตนในการชับขี่	22:05:28		ต.มิตรภาพ อ.มวกเหล็ก จ.สระบุรี		22:05:28	ต.มิตรภาพ อ.มวกเหล็ก จ.สระบุรี		0 วัน 0 ชม. 0 นาที	0	149264.8	0	-	/www.	60	60
139	21/10/2023	ความเร็วเกิน	22:06:47		ต.มิตรภาพ อ.มวกเหล็ก จ.สระบุรี		22:06:54	ต.มิตรภาพ อ.มวกเหล็ก จ.สระบุรี		0 วัน 0 ชม. 1 นาที	0	149267.1	0	-	/www.	71	70.5
140	21/10/2023	ความเร็วเกิน	22:08:31		ต.ทับกวาง อ.แก่งคอย จ.สระบุรี		22:08:51	ต.ทับกวาง อ.แก่งคอย จ.สระบุรี		0 วัน 0 ชม. 1 นาที	0	149268.9	0	-	/www.	71	70.5
141	21/10/2023	ความเร็วเกิน	22:09:20		ต.ทับกวาง อ.แก่งคอย จ.สระบุรี		22:09:21	ต.ทับกวาง อ.แก่งคอย จ.สระบุรี		0 วัน 0 ชม. 1 นาที	0	149269.9	0	-	/www.	71	70.5
142	21/10/2023	ไม่แสดงตัวตนในการชับขี่	22:15:28		ต.ทับกวาง อ.แก่งคอย จ.สระบุรี		22:15:28	ต.ทับกวาง อ.แก่งคอย จ.สระบุรี		0 วัน 0 ชม. 0 นาที	0	149274.7	0	-	/www.	34	34
143	21/10/2023	จอดไม่ดับเครื่อง	22:24:00		ต.ทับกวาง อ.แก่งคอย จ.สระบุรี		22:59:24	ต.ทับกวาง อ.แก่งคอย จ.สระบุรี		0 วัน 0 ชม. 36 นาที	0	149278.6	0.02	-	/www.	0	0
144	21/10/2023	ไม่แสดงตัวตนในการชับขี่	22:25:28		ต.ทับกวาง อ.แก่งคอย จ.สระบุรี		22:25:28	ต.ทับกวาง อ.แก่งคอย จ.สระบุรี		0 วัน 0 ชม. 0 นาที	0	149278.6	0	-	/www.	0	0
145	21/10/2023	ไม่แสดงตัวตนในการชับขี่	22:35:28		ต.ทับกวาง อ.แก่งคอย จ.สระบุรี		22:35:28	ต.ทับกวาง อ.แก่งคอย จ.สระบุรี		0 วัน 0 ชม. 0 นาที	0	149278.6	0	-	/www.	0	0
146	21/10/2023	ไม่แสดงตัวตนในการชับขี่	22:45:28		ต.ทับกวาง อ.แก่งคอย จ.สระบุรี		22:45:28	ต.ทับกวาง อ.แก่งคอย จ.สระบุรี		0 วัน 0 ชม. 0 นาที	0	149278.6	0	-	/www.	0	0
147	21/10/2023	ไม่แสดงตัวตนในการชับขี่	22:55:28		ต.ทับกวาง อ.แก่งคอย จ.สระบุรี		22:55:28	ต.ทับกวาง อ.แก่งคอย จ.สระบุรี		0 วัน 0 ชม. 0 นาที	0	149278.6	0	-	/www.	0	0
148	21/10/2023	รถวิ่ง	22:59:24		ต.ทับกวาง อ.แก่งคอย จ.สระบุรี		23:04:47	ต.ทับกวาง อ.แก่งคอย จ.สระบุรี		0 วัน 0 ชม. 6 นาที	6	149278.6	0.06	-	/www.	4	4
149	21/10/2023	จอดไม่ดับเครื่อง	23:04:47		ต.ทับกวาง อ.แก่งคอย จ.สระบุรี		23:05:22	ต.ทับกวาง อ.แก่งคอย จ.สระบุรี		0 วัน 0 ชม. 1 นาที	0	149278.7	0.01	-	/www.	0	0
150	21/10/2023	รถวิ่ง	23:05:22		ต.ทับกวาง อ.แก่งคอย จ.สระบุรี		23:07:53	ต.ทับกวาง อ.แก่งคอย จ.สระบุรี		0 วัน 0 ชม. 3 นาที	3	149278.7	0.05	-	/www.	5	5
151	21/10/2023	ไม่แสดงตัวตนในการชับขี่	23:05:28		ต.ทับกวาง อ.แก่งคอย จ.สระบุรี		23:05:28	ต.ทับกวาง อ.แก่งคอย จ.สระบุรี		0 วัน 0 ชม. 0 นาที	0	149278.7	0	-	/www.	5	5
152	21/10/2023	จอดไม่ดับเครื่อง	23:07:53		ต.ทับกวาง อ.แก่งคอย จ.สระบุรี		23:08:55	ต.ทับกวาง อ.แก่งคอย จ.สระบุรี		0 วัน 0 ชม. 2 นาที	0	149278.8	0.01	-	/www.	0	0
153	21/10/2023	รถวิ่ง	23:08:55		ต.ทับกวาง อ.แก่งคอย จ.สระบุรี		23:26:49	ต.ทับกวาง อ.แก่งคอย จ.สระบุรี		0 วัน 0 ชม. 18 นาที	18	149278.8	3.25	-	/www.	16	10
154	21/10/2023	ไม่แสดงตัวตนในการชับขี่	23:15:28		ต.ทับกวาง อ.แก่งคอย จ.สระบุรี		23:15:28	ต.ทับกวาง อ.แก่งคอย จ.สระบุรี		0 วัน 0 ชม. 0 นาที	0	149280	0	-	/www.	12	12
155	21/10/2023	ไม่แสดงตัวตนในการชับขี่	23:25:28		ต.ทับกวาง อ.แก่งคอย จ.สระบุรี		23:25:28	ต.ทับกวาง อ.แก่งคอย จ.สระบุรี		0 วัน 0 ชม. 0 นาที	0	149282	0	-	/www.	0	0
156	21/10/2023	จอดไม่ดับเครื่อง	23:26:49		ต.ทับกวาง อ.แก่งคอย จ.สระบุรี		0:43:24	ต.ทับกวาง อ.แก่งคอย จ.สระบุรี		0 วัน 1 ชม. 17 นาที	0	149282	0.02	-	/www.	0	0
157	21/10/2023	ไม่แสดงตัวตนในการชับขี่	23:35:28		ต.ทับกวาง อ.แก่งคอย จ.สระบุรี		23:35:28	ต.ทับกวาง อ.แก่งคอย จ.สระบุรี		0 วัน 0 ชม. 0 นาที	0	149282	0	-	/www.	0	0
158	21/10/2023	ไม่แสดงตัวตนในการชับขี่	23:45:28		ต.ทับกวาง อ.แก่งคอย จ.สระบุรี		23:45:28	ต.ทับกวาง อ.แก่งคอย จ.สระบุรี		0 วัน 0 ชม. 0 นาที	0	149282	0	-	/www.	0	0
159	21/10/2023	ไม่แสดงตัวตนในการชับขี่	23:55:28		ต.ทับกวาง อ.แก่งคอย จ.สระบุรี		23:55:28	ต.ทับกวาง อ.แก่งคอย จ.สระบุรี		0 วัน 0 ชม. 0 นาที	0	149282	0	-	/www.	0	0
	รวม										724		561.22				
1	22/10/2023	ไม่แสดงตัวตนในการชับขี่	0:05:28		ต.ทับกวาง อ.แก่งคอย จ.สระบุรี		0:05:28	ต.ทับกวาง อ.แก่งคอย จ.สระบุรี		0 วัน 0 ชม. 0 นาที	0	149282	0	-	/www.	0	0
2	22/10/2023	ไม่แสดงตัวตนในการชับขี่	0:15:28		ต.ทับกวาง อ.แก่งคอย จ.สระบุรี		0:15:28	ต.ทับกวาง อ.แก่งคอย จ.สระบุรี		0 วัน 0 ชม. 0 นาที	0	149282	0	-	/www.	0	0
3	22/10/2023	ไม่แสดงตัวตนในการชับขี่	0:25:28		ต.ทับกวาง อ.แก่งคอย จ.สระบุรี		0:25:28	ต.ทับกวาง อ.แก่งคอย จ.สระบุรี		0 วัน 0 ชม. 0 นาที	0	149282	0	-	/www.	0	0
4	22/10/2023	ไม่แสดงตัวตนในการชับขี่	0:35:28		ต.ทับกวาง อ.แก่งคอย จ.สระบุรี		0:35:28	ต.ทับกวาง อ.แก่งคอย จ.สระบุรี		0 วัน 0 ชม. 0 นาที	0	149282	0	-	/www.	0	0
5	22/10/2023	รถวิ่ง	0:43:24		ต.ทับกวาง อ.แก่งคอย จ.สระบุรี		0:46:43	ต.ทับกวาง อ.แก่งคอย จ.สระบุรี		0 วัน 0 ชม. 4 นาที	4	149282	0.17	-	/www.	7	6.5
6	22/10/2023	ไม่แสดงตัวตนในการชับขี่	0:45:28		ต.ทับกวาง อ.แก่งคอย จ.สระบุรี		0:45:28	ต.ทับกวาง อ.แก่งคอย จ.สระบุรี		0 วัน 0 ชม. 0 นาที	0	149282.2	0	-	/www.	0	0
7	22/10/2023	จอดไม่ดับเครื่อง	0:46:43		ต.ทับกวาง อ.แก่งคอย จ.สระบุรี		0:50:23	ต.ทับกวาง อ.แก่งคอย จ.สระบุรี		0 วัน 0 ชม. 4 นาที	0	149282.2	0	-	/www.	0	0
8	22/10/2023	รถจอด	0:50:23		ต.ทับกวาง อ.แก่งคอย จ.สระบุรี		1:23:55	ต.ทับกวาง อ.แก่งคอย จ.สระบุรี		0 วัน 0 ชม. 34 นาที	0	149282.2	0	-	/www.	0	0
9	22/10/2023	รถวิ่ง	1:23:55		ต.ทับกวาง อ.แก่งคอย จ.สระบุรี		1:25:55	ต.ทับกวาง อ.แก่งคอย จ.สระบุรี		0 วัน 0 ชม. 2 นาที	2	149282.2	0.01	-	/www.	0	0
10	22/10/2023	จอดไม่ดับเครื่อง	1:25:55		ต.ทับกวาง อ.แก่งคอย จ.สระบุรี		1:29:11	ต.ทับกวาง อ.แก่งคอย จ.สระบุรี		0 วัน 0 ชม. 4 นาที	0	149282.2	0	-	/www.	0	0
11	22/10/2023	รถวิ่ง	1:29:11		ต.ทับกวาง อ.แก่งคอย จ.สระบุรี		1:42:07	ต.ทับกวาง อ.แก่งคอย จ.สระบุรี		0 วัน 0 ชม. 13 นาที	13	149282.2	2.42	-	/www.	20	11.5
12	22/10/2023	ไม่แสดงตัวตนในการชับขี่	1:33:55		ต.ทับกวาง อ.แก่งคอย จ.สระบุรี		1:33:55	ต.ทับกวาง อ.แก่งคอย จ.สระบุรี		0 วัน 0 ชม. 0 นาที	0	149282.8	0	-	/www.	8	8
13	22/10/2023	จอดไม่ดับเครื่อง	1:42:07		ต.ทับกวาง อ.แก่งคอย จ.สระบุรี		1:47:32	ต.ทับกวาง อ.แก่งคอย จ.สระบุรี		0 วัน 0 ชม. 6 นาที	0	149284.6	0	-	/www.	0	0
14	22/10/2023	ไม่แสดงตัวตนในการชับขี่	1:43:55		ต.ทับกวาง อ.แก่งคอย จ.สระบุรี		1:43:55	ต.ทับกวาง อ.แก่งคอย จ.สระบุรี		0 วัน 0 ชม. 0 นาที	0	149284.6	0	-	/www.	0	0
15	22/10/2023	รถวิ่ง	1:47:32		ต.ทับกวาง อ.แก่งคอย จ.สระบุรี		1:50:57	ต.ทับกวาง อ.แก่งคอย จ.สระบุรี		0 วัน 0 ชม. 4 นาที	4	149284.6	0.07	-	/www.	5	4.5
16	22/10/2023	จอดไม่ดับเครื่อง	1:50:57		ต.ทับกวาง อ.แก่งคอย จ.สระบุรี		1:55:27	ต.ทับกวาง อ.แก่งคอย จ.สระบุรี		0 วัน 0 ชม. 5 นาที	0	149284.7	0.02	-	/www.	0	0
17	22/10/2023	ไม่แสดงตัวตนในการชับขี่	1:53:55		ต.ทับกวาง อ.แก่งคอย จ.สระบุรี		1:53:55	ต.ทับกวาง อ.แก่งคอย จ.สระบุรี		0 วัน 0 ชม. 0 นาที	0	149284.7	0	-	/www.	0	0
18	22/10/2023	รถวิ่ง	1:55:27		ต.ทับกวาง อ.แก่งคอย จ.สระบุรี		2:34:00	ต.เข้าพักแพง อ.แก่งคอย จ.สระบุรี		0 วัน 0 ชม. 39 นาที	39	149284.7	30.05	-	/www.	71	50.4
19	22/10/2023	ไม่แสดงตัวตนในการชับขี่	2:03:55		ต.มิตรภาพ อ.มวกเหล็ก จ.สระบุรี		2:03:55	ต.มิตรภาพ อ.มวกเหล็ก จ.สระบุรี		0 วัน 0 ชม. 0 นาที	0	149287.2	0	-	/www.	12	12
20	22/10/2023	ความเร็วเกิน	2:05:50		ต.ทับกวาง อ.แก่งคอย จ.สระบุรี		2:05:54	ต.ทับกวาง อ.แก่งคอย จ.สระบุรี		0 วัน 0 ชม. 1 นาที	0	149288.8	0	-	/www.	71	70.5
21	22/10/2023	ความเร็วเกิน	2:05:56		ต.ทับกวาง อ.แก่งคอย จ.สระบุรี		2:06:12	ต.ทับกวาง อ.แก่งคอย จ.สระบุรี		0 วัน 0 ชม. 1 นาที	0	149288.9	0	-	/www.	71	70.5
22	22/10/2023	ความเร็วเกิน	2:11:35		ต.ทับกวาง อ.แก่งคอย จ.สระบุรี		2:12:26	ต.ทับกวาง อ.แก่งคอย จ.สระบุรี		0 วัน 0 ชม. 1 นาที	0	149294.9	0	-	/www.	71	70.5
23	22/10/2023	ความเร็วเกิน	2:12:38		ต.ทับกวาง อ.แก่งคอย จ.สระบุรี		2:12:39	ต.ทับกวาง อ.แก่งคอย จ.สระบุรี		0 วัน 0 ชม. 1 นาที	0	149296.2	0	-	/www.	71	70
24	22/10/2023	ไม่แสดงตัวตนในการชับขี่	2:13:55		ต.ทับกวาง อ.แก่งคอย จ.สระบุรี		2:13:55	ต.ทับกวาง อ.แก่งคอย จ.สระบุรี		0 วัน 0 ชม. 0 นาที	0	149297.3	0	-	/www.	65	65
25	22/10/2023	ไม่แสดงตัวตนในการชับขี่	2:23:55		ต.ลาดเตียว อ.แก่งคอย จ.สระบุรี		2:23:55	ต.ลาดเตียว อ.แก่งคอย จ.สระบุรี		0 วัน 0 ชม. 0 นาที	0	149307.2	0	-	/www.	60	60
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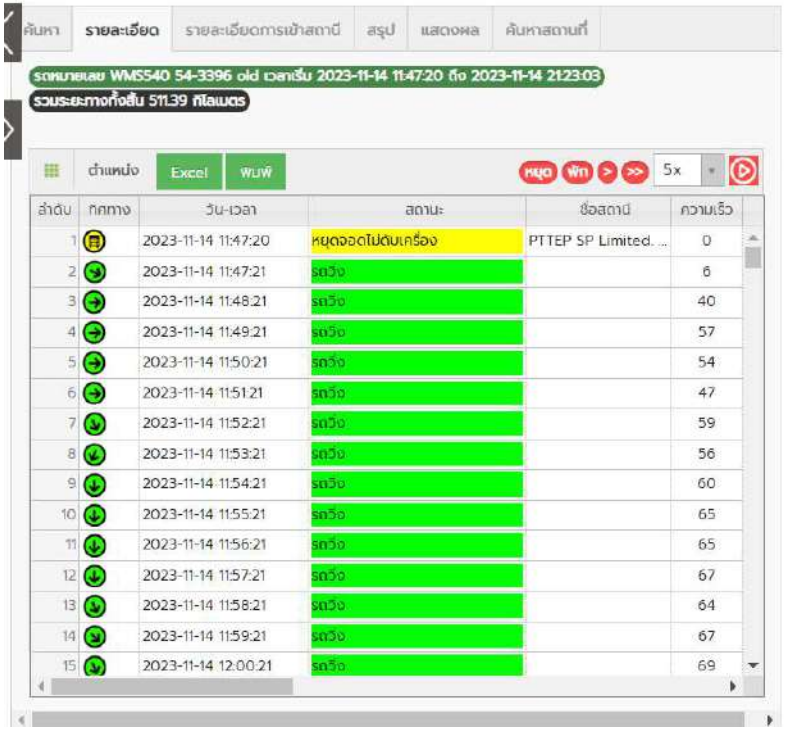
	Total									1 วัน 3 ชม. 5 นาที	784		593.96	0			


ค้นหา
รายละเอียด
รายละเอียดการเข้าสถานี
สรุป
แสดงผล
ค้นหาสถานที่
รถหมายเลข WMS540 54-3396 old เวลาเริ่ม 2023-11-14 11:47:20 ถึง 2023-11-14 21:23:03
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ตำแหน่ง
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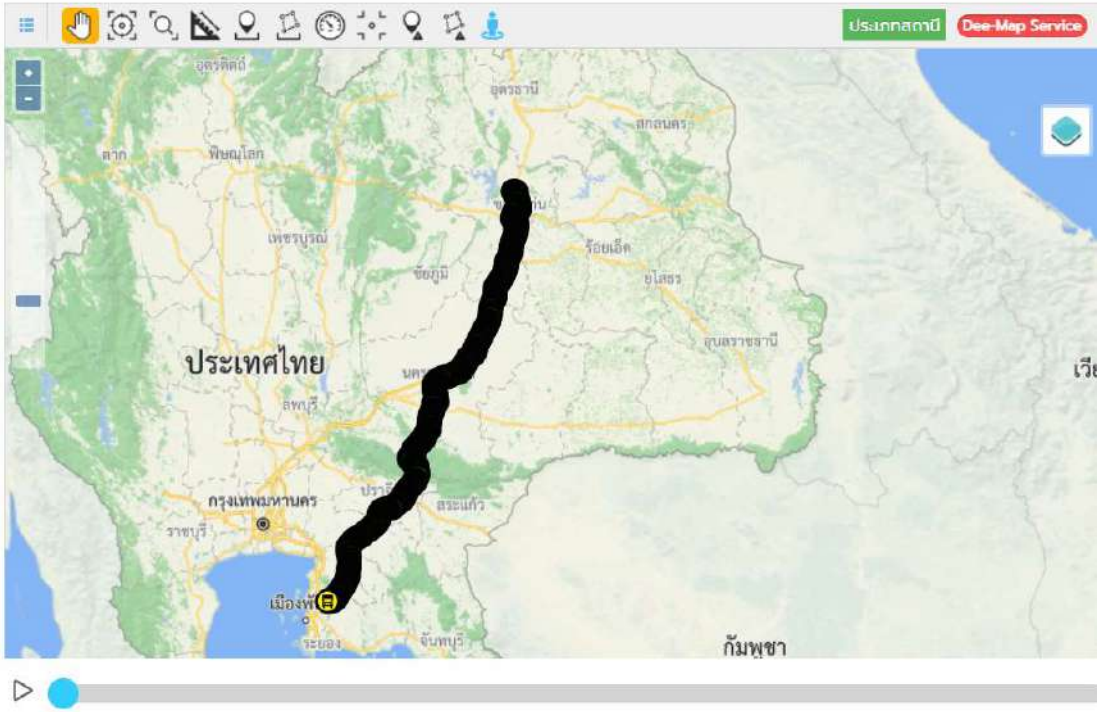
ลำดับ
ทิศทาง
วัน-เวลา
สถานะ
ชื่อสถานี
ความเร็ว
1 2023-11-14 11:47:20 หยุดจอดไม่ดับเครื่อง PTTEP SP Limited. ... 0
2 2023-11-14 11:47:21 รถวิ่ง 6
3 2023-11-14 11:48:21 รถวิ่ง 40
4 2023-11-14 11:49:21 รถวิ่ง 57
5 2023-11-14 11:50:21 รถวิ่ง 54
6 2023-11-14 11:51:21 รถวิ่ง 47
7 2023-11-14 11:52:21 รถวิ่ง 59
8 2023-11-14 11:53:21 รถวิ่ง 56
9 2023-11-14 11:54:21 รถวิ่ง 60
10 2023-11-14 11:55:21 รถวิ่ง 65
11 2023-11-14 11:56:21 รถวิ่ง 65
12 2023-11-14 11:57:21 รถวิ่ง 67
13 2023-11-14 11:58:21 รถวิ่ง 64
14 2023-11-14 11:59:21 รถวิ่ง 67
15 2023-11-14 12:00:21 รถวิ่ง 69


ประเภทสถานี
Dee-Map Service
ประเทศไทย
กรุงเทพมหานคร
เมืองพัทยา
กัมพูชา

เอกสารแนบ 2-36
ข้อปฏิบัติของพนักงานขับรถ

ข้อปฏิบัติของพนักงานขับรถ

1. การแต่งกายต้องสุภาพเรียบร้อย และทรงผมจะต้องตัดตามระเบียบของบริษัท เท่านั้น ห้ามใส่กางเกงยีน
2. จะต้องพูดจาสุภาพ ห้ามบ่นในขณะที่ปฏิบัติหน้าที่ คำที่จะพูดได้บ่อย ๆ "ครับนาย"
3. ห้ามพูดคุยโทรศัพท์ในขณะที่ขับรถ โดยเด็ดขาด
4. ห้ามมาสาย หรือ ต้องมาก่อนเวลาอย่างน้อย 25 นาที เพื่อตรวจดูความเรียบร้อยของรถ
5. ห้ามดื่มสุรา ห้ามสูบบุรี่ โดยเด็ดขาด
6. ต้องใช้สมาธิในการขับรถ ห้ามเปิดเพลง และวิทยุ ถ้านายไม่สั่ง ในขณะขับรถ
7. ต้องปฏิบัติตามกฎจราจรอย่างเคร่งคัด เช่น ห้ามขับเกินกว่า 90 กิโลเมตร ต่อ ชั่วโมง
8. ห้ามรูดการ์ดก่อนเติมน้ำมันโดยเด็ดขาด และไม่นำรถที่ไม่เกี่ยวข้องกับการใช้งานของบริษัท มาเติมน้ำมัน จากการรูดการ์ดของบริษัท ฯ โดยเด็ดขาด เพื่อรักษาประโยชน์อันสูงสุดของบริษัท ฯ
9. ห้ามนำรถของบริษัท ฯ ออกไปใช้งานส่วนตัว โดยเด็ดขาด ไม่ว่าในกรณีใด ๆ ทั้งสิ้น
10. หมั่นดูแลทำความสะอาดรถทุกครั้งที่มีเวลา ทั้งภายนอก และภายในตัวรถ อย่างสม่ำเสมอ
11. ต้องจดบันทึกระยะทางที่ใช้งานของรถทุกวัน เช่น วันนี้ไปรับใคร ใช้ระยะทางกี่กิโลเมตร และลงบันทึกเวลารับถึงเวลาส่ง เพื่อเป็นข้อมูลให้บริษัท ฯ ประเมินผล

- เมื่อพนักงานทุกท่านได้อ่านข้อปฏิบัติ และหน้าที่ของพนักงานขับรถแล้ว จะปฏิบัติตามกฎระเบียบ ของบริษัท ฯ อย่างเคร่งคัด
- หากพนักท่านใดกระทำผิดกฎของบริษัท ฯ ข้อใดข้อหนึ่ง ทางบริษัทสามารถบอกเลิกสัญญาว่าจ้างได้โดยทันที

เรียน พขร.ทุกท่าน

เริ่มตั้งแต่วันนี้เป็นต้นไปให้ปฏิบัติดังนี้

ให้ตรวจสอบสภาพรถก่อนใช้งานทุกครั้งที่มาเข้ากะ *(มีฟอร์มให้)* ตรวจเสร็จส่งที่ป้อม 1 ทุกครั้ง ถ้าหากตรวจเจอปัญหาให้แจ้งต่ายได้ทันที (แล้วลงบันทึกไว้ที่หมายเหตุ) **อยู่ในกฎระเบียบของบริษัท ฯ**

จึงเรียนมาเพื่อทราบ

(.....) ฝ่ายธุรการ

เอกสารแนบ 2-37
ข้อปฏิบัติในการขับรถ

ข้อปฏิบัติในการขับรถ

1. ยานพาหนะต้องเหมาะสมกับวัตถุประสงค์ของการใช้และมีการดูแลรักษาอยู่ประจำ เพื่อให้อยู่ในสภาพพร้อมใช้งาน

- ***เข็มขัดนิรภัย 3 จุด สภาพใช้งานได้ทุกที่นั่****
- **จัดเตรียมกระเป๋ายา ประจำรถ**
- **จัดเตรียม ที่ทุบกระจก ประจำรถ**
- **จัดเตรียมถังดับเพลิง ประจำรถ**
- **เบาะนั่งอยู่ในสภาพใช้งานได้ดี**
- **มีหมอนรองศีรษะทุกที่นั่ง**

2. ผู้ขับรถจะต้องแจ้งให้ผู้โดยสารคาดเข็มขัดนิรภัยทราบก่อนออกรถทุกครั้ง

ในกรณีเกิดเหตุฉุกเฉิน หรือมีข้อเสนอแนะ

กรุณาติดต่อ หมายเลขโทรศัพท์

043-232933

3. ผู้ขับขี่และผู้โดยสารต้องคาดเข็มขัดนิรภัยทุกครั้ง

4. ผู้โดยสารต้องไม่เกินจำนวนที่นั่ง

5. ห้ามบรรทุกของเกินน้ำหนักที่กฎหมายกำหนดและมาตรฐานของรถ

6. ผู้ขับขี่ต้องอยู่ในสภาพที่พร้อมทำงาน มีใบอนุญาตขับขี่ตามประเภทของรถ

7. ผู้ขับขี่ห้ามใช้โทรศัพท์มือถือเด็ดขาดในขณะขับรถ ถ้าจำเป็นควรจอดข้างทาง ในเส้นทางที่สามารถมองเห็นได้ชัดเจน

8. ห้ามดื่มสุรา สารเสพติด หรือยาที่มีผลกระทบต่อการขับขี่ จะมีการตรวจวัดระดับแอลกอฮอล์ทุกครั้ง

9. ควรดับเครื่องยนต์เมื่อไม่ได้ใช้งาน

10. ห้ามขับรถเกิน 40 กิโลเมตรต่อชั่วโมงบนถนนในเขตป่าสงวน และ 90 กิโลเมตรต่อชั่วโมงบนถนนหลวง หรือตามป้ายกำหนดความเร็ว

11. ให้ระวังถนนเปียก สภาพอากาศไม่ดี และขับขี่บนถนนในหมู่บ้าน หรือ ชุมชน

12. ขับรถให้ทิ้งระยะห่างรถข้างหน้าพอสมควร

13. รถควรมีสภาพพร้อมใช้งานและมีการตรวจสภาพรถก่อนใช้งาน (ตามเอกสารการตรวจสภาพรถของบริษัท)

14. ห้ามบรรทุกสิ่งของที่เป็นอันตราย หรือ อาจทำให้เกิดกลิ่นรำคาญต่อผู้โดยสาร

15. ห้ามมิให้ใช้รถในการอื่น นอกเหนือจากได้รับมอบหมายจากบริษัท

16. ปฏิบัติตามป้าย และ กฎจราจรอย่างเคร่งครัด

17. ยาง ควรมีการเปลี่ยนทุก 50,000 กม.

****

เอกสารแนบ 2-38
แบบฟอร์มตรวจสอบรถประจำวัน

ฟอร์มตรวจสอบสภาพรถประจำวัน

ชื่อพนักงานขับรถ.....

ทะเบียน..... ☐ รถตู้ ☐รถกระบะ

วันที่.....เวลา.....

…… ……

ผู้ตรวจรถ(พขร.) เจ้าหน้าที่ธุรการ

……..

เจ้าหน้าที่เซฟตี้ (เซนต์รับทราบ)

เลขไมล์.....

ทะเบียน.....

หมายเหตุ

.....

.....

การตรวจเช็คสภาพรถเบื้องต้นก่อนเดินทาง ☑ **อยู่ในสภาพดี** ☒ **อยู่ในสภาพ ไม่ดี**

1. ตรวจภายนอกรถ

☐ 1.1 ยาง ตรวจความดันลมยาง ดอกยาง 4 ล้อ

☐ 1.2 รอยรั่วซึม ร่องรอยน้ำมันเครื่อง น้ำมันเกียร์ น้ำมันเบรค หรือ น้ำรั่วซึมจากใต้ท้องรถ

☐ 1.3 ยางปัดน้ำฝน (ทดลองปัดดู)

☐ 1.4 ไฟส่องสว่าง ตรวจดูไฟหน้า ไฟท้าย ไฟเบรค ไฟเลี้ยวหรืออื่นๆรวมทั้งไฟหน้าปัด เป็นปกติทั้งหมด

☐ 1.5 กระจก ☐ 1.6 ฝาครอบล้อ

2. ตรวจภายในรถ

☐ 2.1 ยางอะไหล่และแม่แรง ตรวจเช็คลมยาง และให้แน่ใจว่าแม่แรงและด้ามขันใช้งานได้ตามปกติ

☐ 2.2 เข็มขัดนิรภัย ตรวจเช็คว่าหัวเข็มขัดสามารถล็อคได้เรียบร้อย

☐ 2.3 แตร พวงมาลัย ให้แน่ใจว่าดังดี ใช้งานได้ตามปกติ

☐ 2.4 แผงควบคุมและอุปกรณ์ ตรวจดูให้แน่ใจว่าทำงานเป็นปกติ

☐ 2.5 เบรก เช็คระยะฟรีขาเบรก และเบรกมืออยู่ในค่ากำหนดหรือไม่

☐ 2.6 ระดับน้ำหล่อเย็น ควรจะมีอยู่ถึงระดับสูงสุดในถังพักสำรอง

☐ 2.7 หม้อน้ำและท่อยาง ควรดูว่าด้านหน้าหม้อน้ำสะอาดไม่มีเศษวัสดุ หรือใบไม้ติดอยู่ ดูท่อยางว่ามีรอยแยกเปื่อย มีรอยฉีกขาดหรือหลวม

☐ 2.8 สายพานขับต่างๆ ต้องไม่มีรอยแตก เลอะน้ำมันหล่อลื่น และความตึงสายพานอยู่ในค่ากำหนด

☐ 2.9 แบตเตอรี่และสายไฟ ตรวจดูและเติมน้ำกลั่นให้ได้ระดับที่กำหนดดูเปลือกแบตเตอรี่ว่ามีร่องรอยเสียหายหรือไม่ ดูขั้วต่อและสายไฟว่าอยู่ในสภาพดีหรือไม่

☐ 2.10 ระดับน้ำมันเบรคและคลัชท์ ตรวจดูว่าระดับน้ำมันเบรคและคลัทช์อยู่ในระดับที่ถูกต้อง

2.11 ระดับน้ำมันเชื้อเพลิง

☐ เต็ม ☐ ¾ ☐ ½ ☐ ¼ ☐ <1/4

3. อื่นๆ

☐ 3.1 กล่องกระดาษทิชชู่ ☐ 3.2 ร่ม ☐ 3.3 น้ำดื่ม

☐ 3.4 ผ้าปิดจมูก ☐ 3.5 อุปกรณ์ปฐมพยาบาลมีครบ

☐ 3.6 ถังดับเพลิงแรงดันปกติ

☐ 3.7 **กระเป๋าเครื่องมือ (PTTEP SP)____กรวยจราจรฉุกเฉินแบบพับได้____สายพ่วงแบตเตอรี่รถยนต์ ____ ค้อนทุบกระจกรถ ___ สายลากจูงรถ ____ ประแจปากตายกากบาทตัวX ___ชุดแม่แรงของรถ**

☐ 3.8 เสื้อสะท้อนแสง ☐ **3.9 ความสะอาดภายในรถ** ☐ **3.10 ความสะอาดภายนอกรถ อื่นๆ**.....

☐ 3.11 กล้องติดรถเช็คไฟสัญญาณ (ถ้าขึ้นไฟสีฟ้ากะพริบ :ปกติ)

☐ 3.12 เสาร์วิทยุสื่อสารติดประจำรถยนต์บริษัทฯ

☐ **3.13 เช็คการทำงานของกล้องติดรถและเช็คเมมโมรี่(ว่าข้อมูลเต็มหรือเปล่า)ทุกวันอาทิตย์**

เพื่อให้การเดินทางเป็นไปอย่างราบรื่นและปลอดภัย ไม่ควรละเลยสิ่งเล็กๆ น้อยๆ...OK!