400 Series:
Process Safety

Process Safety Information

Standard Number: IVL EHS-402
Version: 1.0
Issue / Revision Date: 09 August 2024

Global Environmental, Health and Safety
Indorama Ventures

Table of Contents

1. Purpose

This standard establishes Indorama Ventures requirements to ensure that appropriate environmental, health, and safety (EHS) practices are in place to:

- Identify and document information related to process chemicals, process technology and process equipment to provide an understanding of the potential hazards in the process.
- Define the minimum requirements for the collection, maintenance, secure storage and access to Process Safety Information (PSI), including software.

2. Scope

This standard applies to all Indorama Ventures owned/operated sites. This standard does not apply to joint ventures (JVs) in which Indorama Ventures is a minority owner, nor to third-party warehouses and tollers, unless specifically requested by the related Segment EHS Leader.

This standard covers all relevant PSI and includes software, electronic and paper records.

This standard must be implemented by each site. Until implementation of this standard is complete, each site must at a minimum be in compliance with the local applicable regulations.

3. Responsibilities

Following is an overview of key responsibilities for this standard. Additional responsibilities, as applicable, are included in Section 4, Requirements.

3.1. Corporate EHS

3.1.1. Provide ongoing technical assistance related to this standard.

3.1.2. Periodically audit sites to determine compliance with this standard.

3.1.3. Review, update and communicate to all Indorama Ventures sites any updates or changes to this standard and associated documents and tools.

3.1.4. Periodically review this standard to ensure its continuing adequacy and suitability to Indorama Ventures' operations.

3.1.5. Ensure this standard is consistently implemented from site-to-site within Indorama Ventures.

3.1.6. Communicate, as applicable, any lessons learned as a result of best practices identified or any non-compliances associated with implementation of this standard.

3.2. Site Head or Designee

3.2.1. Ensure implementation of and compliance with this standard including that it is adhered to and a site-specific program is developed so all employees receive the proper training, resources, and communications.

3.2.2. Assist with the implementation of the site-specific program; in particular:

- Be thoroughly familiar with the requirements of this standard, the site-specific program, and any associated procedures and work practices.
- Provide support, resources and training needed to carry out the requirements of this standard and the site-specific program.
- Ensure required records are maintained on file.

- Ensure compliance with site-specific program by employees and contractors (as applicable).

3.3. Segment EHS

3.3.1. Ensure that any site or local standard or procedure related to the same topic follows the corporate requirements at minimum.

3.3.2. Support the sites on any technical point related to the standard, including implementation.

3.3.3. Periodically evaluate sites' level of compliance with this standard

3.4. Program Owner

3.4.1. Be thoroughly familiar with the requirements of this standard and local regulatory requirements.

3.4.2. Develop and implement a site-specific program that meets the requirements of this standard and any local/regional regulatory requirements.

3.4.3. Periodically review and monitor for compliance with the requirements of this standard, and per local regulatory requirements, at least every five (5) years.

3.4.4. Develop an action plan to correct any non-conformance with local regulatory or Indorama Ventures requirements.

3.5. Project Manager

3.5.1. For capital projects, ensure compliance with this standard through project completion.

3.6. Engineering, Maintenance, and Operations Personnel

3.6.1. Communicate changes that affect PSI so changes are managed in accordance with site-specific Management of Change (MOC) program (per IVL EHS-204, Management of Change Standard).

3.7. Employees and Contractors

3.7.1. All personnel must understand and follow the requirements of the site-specific program including:

- Being aware of and trained on, as applicable, the legal, regulatory and other associated requirements.
- Immediately reporting any situations that may cause or have a potential to cause a non-compliance.
- Completing any assigned regulatory tasks or actions.
- Being aware of and trained on the process safety information relevant to the process(es) they operate and/or maintain.
- Understand the hazards posed by the processes involving hazardous materials.

3.8. In addition to the roles and responsibilities detailed above, the site-specific program must define and document the roles and responsibilities for all personnel who play a role in implementing the site-specific program, at a minimum:

- Supervisors
- EHS Personnel

- Other applicable functions, as staffed at individual site level

4. Requirements

The site shall develop and implement a written site-specific program which meets local regulatory requirements, and, at a minimum, fulfills the following requirements:

4.1. All PSI shall be identified in accordance with the following definitions:

- Category 1 - PSI that is "Mandatory for EHS Critical Equipment."
  - PSI for EHS Critical equipment must be in place for existing, new, or modified EHS Critical equipment.
    - Includes EHS Critical equipment as defined in the IVL EHS-405 EHS Criticality Assessment standard, and
    - Any additional PSI required by local authorities.
- Category 2 - PSI that is "Mandatory for Non-EHS Critical Equipment."
  - PSI for Non-EHS Critical equipment must be in place when new, from date site comes into compliance with this standard forward (i.e., see Scope for compliance timing), and when existing Non-EHS Critical equipment is modified.
- Category 3 - PSI that is "Valued."
  - PSI for existing, new, or modified equipment that provides additional equipment information that is not required to be known for safe operation.

Summary of PSI Requirements:

Summary of PSI	PSI Requirements Category 1 and 2 PSI		
	Existing	**New and Modified**	**In support of a Process Hazard Analysis (PHA) or Technical Evaluation**
EHS Critical Equipment and Systems	√	√	√
Non-EHS Critical Equipment and Systems		√	√
Valued Information			√ **(as requested)**

4.2. PSI identified as Category 1 and 2 in Attachments A and B shall be readily available and accessible to those who need to use it.

4.3. All Category 1 and Category 2 PSI shall be developed and maintained for the life of the asset in accordance with any site or local agency requirements.

4.4. For Category 1 and Category 2 equipment:

4.4.1. PSI meeting Category 1 requirements in Attachment A or B, if not available or current, shall be obtained or updated.

4.4.2. PSI meeting Category 2 requirements in Attachment A or B shall be developed for new equipment and for the effected components of modified equipment as part of the engineering design and procurement process.

4.5. If PSI required to support a PHA or technical evaluation is not available or current, it shall be obtained or updated to the satisfaction of the PHA Facilitator.

4.6. Custodian(s) shall be assigned to manage the facility's PSI records.

4.7. All PSI must be maintained as controlled documentation to ensure it remains consistent, current, and secure, and available to those that to access it. In particular, the following must be controlled.

4.7.1. There shall be a register of PSI identifying where it is held. It shall be maintained by the custodian(s).

4.7.2. PSI shall be stored securely in a location where it cannot be mislaid or damaged.

4.7.3. Copies of relevant PSI shall be clearly identified as 'copies' so there is no confusion as to the latest version.

4.7.4. PSI shall remain accessible for Site Personnel and/or Emergency Services during any process related incident.

4.8. Any changes to PSI shall be managed through the site-specific MOC program (per IVL EHS-204, Management of Change Standard).

4.9. Timing

4.9.1. In the event of a change, all affected PSI shall be updated and timing assigned in accordance with the site-specific MOC program (per the IVL EHS-204 MOC Standard).

4.9.2. All PSI shall be maintained for the life of the asset and in accordance with any site or local agency requirements.

4.9.3. Any gaps in Category 1 or Category 2 PSI documentation shall be closed as soon as reasonably possible upon discovery.

4.10. Clarifications

4.10.1. Guidance on the type and level of information to be incorporated on a Piping and Instrumentation Diagram (P&ID) is provided in Attachment C.

4.10.2. PSI specified as Category 3 in Attachment A or B should be treated as "valued" but is not an essential requirement; if available, it should be retained and maintained in accordance with this standard. Category 3 PSI may only need to be developed or provided as requested.

4.10.3. PSI does not need to be maintained in one central file. It can be located in multiple areas of the facility provided its location is identified in forms such as those shown in Attachment A or B.

4.10.4. Electronic document storage is preferred for retention of the latest version of PSI. Red lining (see Attachment C, Section C.3.1 for an explanation on "Red lining") of drawings is permissible only when controlled, e.g., between revisions of as-built drawings.

4.10.5. Electronic file backup should be stored securely in a suitable location to prevent degradation or a chance of damage.

4.10.6. PHA revalidations require the review and validation of PSI, and update if necessary; however, PSI must be updated and maintained current utilizing the site's MOC process.

5. Training

Training requirements must be defined in the site-specific program. At a minimum, all training must be documented with the training date, the names of personnel trained, the names of the trainer(s), the content of the training (or reference to content) and other site-specific/business segment requirements, when applicable.

5.1. Initial

Training on the requirements of this standard and the site-specific program must be provided to Indorama Ventures personnel based on their relevant responsibilities and shall be provided in the local language. At a minimum, personnel and/or management with direct responsibilities for this standard and site-specific program must be trained prior to conducting activities associated with the site-specific program.

5.2. Refresher

Refresher training shall be provided periodically according to the requirements of this standard, the site-specific program, and any local legal requirements, at appropriate intervals (e.g., changes to regulatory requirements), or at least once every three (3) years.

6. Recordkeeping

Records associated with the site-specific program and PSI must be controlled and retained in accordance with regulatory or site business segment record retention requirements, whichever is more stringent. Examples of records to be maintained, include but may not be limited to, the forms included in Attachments A and B and any associated information/documentation referenced.

7. References

7.1. IVL EHS-204 MOC

7.2. IVL EHS-405 EHS Criticality Assessment

8. Terms and Definitions

See IVL EHS Glossary

9. Revision History

Version	Date	Summary of Update	Owner	Approver	Next Review Date
Original	18 April 2022	Initial Release	Chad Wyble, Global Process Safety Program Director	Todd Hogue, VP, Global Head of EH&S	18 April 2025
1.0	09 August 2024	Updated implementation timeframe (Section 2) and Responsibilities (Section 3); made minor editorial updates.	Chad Wyble, Global Process Safety Program Director	Todd Hogue, VP, Global Head of EH&S	09 August 2029

Attachment A: Process Chemicals and Technology PSI Requirements

INDORAMA VENTURES	**PSI DOCUMENTATION INVENTORY** **Process Chemicals and Technology**	Form IVL EHSF-402-01

Facility:	Process:
Equipment Description:	Equipment ID No:
PSI Custodian:	Category [a]

EHS Criticality Designation:	Responsible Department	Location [b]
1 EHS Protection and Mitigation		
1.1 EHS Critical Equipment List		
1.2 Operating, Start-up and Shutdown procedures		
1.3 Plant Upset and Emergency Shutdown procedures		
1.4 Safe upper and lower operating limits and consequences of deviation, Trip and Alarm Register		
1.5 Operator Training and Competence Requirements (where necessary)		
1.6 Design Basis of Consequence Mitigation Systems		
1.7 Design Basis for Fixed and Mobile Fire Protection Systems		
1.8 Emergency Action Plan or Emergency Response Procedures		
1.9 Safety Instrumented Functions (SIFs)		
• Safety Requirements Specifications (SRS)		
• PFD Average Calculation and Proof Test Period		
2 Electricity		
2.1 Hazardous Area Classification		
2.2 Generation / Distribution / Standby / UPS / Emergency Drawings		
2.3 Electrical one-line diagrams		
2.4 Static Earthing / Grounding and Lightning Protection Plan		
3 General Information		
3.1 Process Chemistry and Technology		
• Reaction chemistry - equations		
• Thermal and chemical stability; flammability data		
• Toxicity of raw materials; intermediates; products etc.		
• Corrosivity data		
• Permissible exposure limits		
• Dangerous chemical interactions		
• Runaway reactions		
• Block flow diagram		
• Inventory of hazardous materials		
3.2 Process Related Incident Log or Database		
3.3 Material Safety Data Sheets		
3.4 Process Flow Diagram and Material and Energy Balance (built after 5/26/92 – US only)		
4 Regulatory		
4.1 List of applicable legislation		
4.2 Permits / consents / licenses / authorizations		
4.3 Breaches of Discharge Consents – air, water and land		
4.4 Prosecutions / prohibition and improvement/enforcement notices		
4.5 Correspondence with regulatory authorities		

INDORAMA VENTURES	**PSI DOCUMENTATION INVENTORY** **Process Chemicals and Technology**	Form IVL EHSF-402-01

Facility:	Process:
Equipment Description:	Equipment ID No:
PSI Custodian:	Category [a]

EHS Criticality Designation:	**Responsible Department**	**Location [b]**
5 Site Data		
5.1 Site Layout Drawing		
5.2 Building Occupancy Data (if applicable)		
5.3 Historical site development maps		
5.4 Locality Weather Data		
5.5 Historical inventories of discharges to air / water / ground (permitted and accidental)		
6 EHS Management		
6.1 Process Hazard Analysis Study Records		
6.2 Hygiene Risk Assessments (if applicable)		
6.3 Environmental Impact Assessments		
6.4 OSHA / EPA / Seveso II / COMAH Safety Reports (if applicable)		
6.5 Facility Siting Reports (if applicable)		
7 Civil		
7.1 Buildings Structural Drawings		
7.2 Building Ventilation Design Details - including Local Exhaust Ventilation		
7.3 Site geology and groundwater data (if applicable)		
• Including sampling data		
• Boreholes and test sampling wells		
• Water abstraction		
7.4 Drainage drawings including outfalls to watercourses (if applicable)		
7.5 Bunds, catch-pits and separators (if applicable)		
7.6 Structures and Pipe racks / bridges carrying hazardous materials (if applicable)		
7.7 Design details for severe weather, landslide, earthquake etc. (if applicable)		
8 Asset Integrity		
8.1 Manufacturer's Maintenance, Inspection, Testing Procedures and Reference to Good Engineering Practices		
8.2 Documented Basis of the Inspection Program, Frequency and Records of Inspection		
9 Other		

Notes:

a. Category 1 – PSI that is “Mandatory for EHS Critical equipment.”
Category 2 – PSI that is “Mandatory for Non-EHS Critical equipment.”
Category 3 – PSI that is “Valued.”

b. For all items of PSI the Location shall be recorded.

c. If originally designed and constructed in accordance with codes, standards, or practices no longer in general use, PSI must show that equipment is designed, maintained, inspected, tested, and operating in a safe manner.

Attachment B: Process Equipment PSI Requirements

INDORAMA VENTURES	PSI DOCUMENTATION INVENTORY **PRESSURE VESSELS:** **HEATED / UNHEATED / FIRED / VACUUM**	Form IVL EHSF-402-02

Facility:	Process:
Equipment Description:	Equipment ID No:
PSI Custodian:	Category [a]

EHS Criticality Designation:	Responsible Department	Location [b]
1 Drawings		
1.1 PIDs		
1.2 Fabricator Shop Drawings or Vessel Sketch		
2 Design Specifications		
2.1 Design Code, including applicable recognized and generally accepted good engineering practices[c]		
2.2 Vessel Specification Sheet		
2.3 Vessel Contents (including coils and jackets)		
2.4 Maximum Volume		
2.5 Design Pressure and Minimum / Maximum Temperatures		
2.6 Materials of Construction (shell, heads, jackets, internals)		
2.7 Actual Shell and Head Thicknesses		
2.8 Corrosion Allowance		
2.9 Fabrication and Repair Inspection Reports		
2.10 Mill Test Reports (MTRs) / Material Certifications		
2.11 Heat Treatment Records		
2.12 Welding Procedures / Qualifications		
2.13 Most Recent Non-Destructive Testing Interpretation Report		
2.14 Nameplate data, etching, or drawing		
2.15 Appropriate Pressure Vessel Registration Documents		
2.16 Inspection Frequency and Method		
2.17 Design Verification Certificates (if applicable)		
3 Calculations		
3.1 Wall Thicknesses, Tmin (minimum allowable thickness)		
3.2 Design Code-specific calculations		

Notes:

a. Category 1 – PSI that is "Mandatory for EHS Critical equipment."
Category 2 – PSI that is "Mandatory for Non-EHS Critical equipment."
Category 3 – PSI that is "Valued."

b. For all items of PSI the Location shall be recorded.

c. If originally designed and constructed in accordance with codes, standards, or practices no longer in general use, PSI must show that equipment is designed, maintained, inspected, tested, and operating in a safe manner.

INDORAMA VENTURES	PSI DOCUMENTATION INVENTORY **HEAT EXCHANGERS:** **SHELL and TUBE / PLATE**	Form IVL EHSF-402-03

Facility:	Process:
Equipment Description:	Equipment ID No:
PSI Custodian:	Category [a]

EHS Criticality Designation:	Responsible Department	Location [b]
1 Drawings		
1.1 P&IDs		
1.2 Fabricator Shop Drawing or Exchanger Sketch		
2 Design Specifications		
2.1 Design Code, including applicable recognized and generally accepted good engineering practices[c]		
2.2 Heat Exchanger Specification Sheet		
2.3 Shell Side and Tube Side Fluid		
2.4 Shell and Tube Diameters, Number of Tubes/Plates		
2.5 Design Pressure and Temperature (shell, tubes/plates)		
2.6 Materials of Construction (shell, tubes, plates, channels, tube-sheets, gaskets)		
2.7 Shell and Tube Wall and Plate Thickness (actual or nominal)		
2.8 Corrosion Allowance		
2.9 Fabrication and Repair Inspection Reports		
2.10 Mill Test Reports (MTRs) / Material Certifications		
2.11 Heat Treatment Records		
2.12 Welding Procedures / Qualifications		
2.13 Most Recent Non-Destructive Testing Interpretation Report		
2.14 Nameplate data, etching, or drawing		
2.15 Appropriate pressure vessel registration documents		
2.16 Design Verification Certificates (if applicable)		
3 Calculations		
3.1 Wall/Plate Thicknesses, Tmin (minimum allowable thickness)		
3.2 Heat Transfer calculations		
3.3 Velocity and Pressure Drop (shell / tube)		

Notes:

a. Category 1 – PSI that is “Mandatory for EHS Critical equipment.”
Category 2 – PSI that is “Mandatory for Non-EHS Critical equipment.”
Category 3 – PSI that is “Valued.”

b. For all items of PSI the Location shall be recorded.

c. If originally designed and constructed in accordance with codes, standards, or practices no longer in general use, PSI must show that equipment is designed, maintained, inspected, tested, and operating in a safe manner.

INDORAMA VENTURES	**PSI DOCUMENTATION INVENTORY** **PIPING SYSTEMS:** **METALLIC / NON-METALLIC**	Form IVL EHSF-402-04

Facility:	Process:
System Description:	System ID No:
PSI Custodian:	Category [a]

EHS Criticality Designation:	**Responsible Department**	**Location [b]**
1 Drawings		
1.1 P&IDs		
1.2 EHS Critical Piping Drawings, Sketches, Isometrics		
1.3 Component Drawings, Catalogue Sheets		
2 Design Specifications		
2.1 Design Standard, including applicable recognized and generally accepted good engineering practices[c]		
2.2 Piping / Valve / Component Specifications		
2.3 Process Fluid (worst case for common or multi-product lines)		
2.4 Pipe Size and Nominal Wall Thickness (pipe schedule)		
2.5 Minimum Allowable Wall Thickness / Corrosion Allowance		
2.6 Mill Test Reports (MTRs) / Material Certifications		
2.7 Heat Treatment Records		
2.8 Welding Procedures / Qualifications		
2.9 Most Recent Non-Destructive Testing Interpretation Report		
2.10 Type of Insulation / Heat Tracing		
2.11 Design Verification Certificates (if applicable)		
3 Calculations		
3.1 System Stress Analysis (if applicable)		
3.2 Sizing and Pressure Drop Calculations (piping associated with relief streams)		

Notes:

a. Category 1 – PSI that is “Mandatory for EHS Critical equipment.”
Category 2 – PSI that is “Mandatory for Non-EHS Critical equipment.”
Category 3 – PSI that is “Valued.”

b. For all items of PSI the Location shall be recorded.

c. If originally designed and constructed in accordance with codes, standards, or practices no longer in general use, PSI must show that equipment is designed, maintained, inspected, tested, and operating in a safe manner.

INDORAMA VENTURES	**PSI DOCUMENTATION INVENTORY** **ROTATING EQUIPMENT:** **PUMP / COMPRESSOR / FAN / TURBINES / HV MOTOR / CENTRIFUGE**	Form IVL EHSF-402-05

Facility:	Process:
Equipment Description:	Equipment ID No:
PSI Custodian:	Category [a]

EHS Criticality Designation:	**Responsible Department**	**Location [b]**
1 Drawings / Manuals		
1.1 P&IDs		
1.2 Manufacturer's Drawings (general arrangement, cross section)		
1.3 Instruction Manual and Spare Parts List		
1.4 Pump / Compressor / Fan Curve		
2 Design Specifications		
2.1 Design Code, including applicable recognized and generally accepted good engineering practices[c]		
2.2 Area Classification		
2.3 Manufacturer and Model Number		
2.4 Process Data Sheet		
2.5 Mechanical Data Sheet		
2.6 Fluid Handled		
2.7 Maximum/Minimum/Normal Operating Temperature and Pressure		
2.8 TDH (Total Dynamic Head) and Pressure Relief Case		
2.9 Materials of Construction (casing, impeller, seals etc.)		
2.10 Equipment Drive (turbine, motor)		
2.11 Equipment Speed, Power, Motor Enclosure		
2.12 Seal Configurations		
2.13 Monitors and Limits (temperature, vibration, amps, power)		
2.14 Design Verification Certificates (if applicable)		
2.15 Noise Data (if applicable)		
3 Calculations		
3.1 Capacity, Head, and NPSH calculations		

Notes:

a. Category 1 – PSI that is "Mandatory for EHS Critical equipment."
Category 2 – PSI that is "Mandatory for Non-EHS Critical equipment."
Category 3 – PSI that is "Valued."

b. For all items of PSI the Location shall be recorded.

c. If originally designed and constructed in accordance with codes, standards, or practices no longer in general use, PSI must show that equipment is designed, maintained, inspected, tested, and operating in a safe manner.

INDORAMA VENTURES	**PSI DOCUMENTATION INVENTORY** **TANKS :** **METALLIC**	Form IVL EHSF-402-06

Facility:	Process:
Equipment Description:	Equipment ID No:
PSI Custodian:	Category [a]

EHS Criticality Designation:	**Responsible Department**	**Location [b]**
1 Drawings		
1.1 P&IDs		
1.2 Fabricator Shop Drawings or Tank Sketch		
2 Design Specifications		
2.1 Design Code, including applicable recognized and generally accepted good engineering practices[c]		
2.2 Tank Specification Sheet		
2.3 Tank Contents (including coils, jackets, and internal linings) and Fluid Specific Gravity		
2.4 Maximum Volume		
2.5 Design Pressure and Temperature		
2.6 Materials of Construction (shell, heads, roof, bottom)		
2.7 Actual Shell and Head / Roof / Bottom Thicknesses		
2.8 Roof Type (Fixed, weak seam, floating)		
2.9 Mill Test Reports (MTRs) / Material Certifications		
2.10 Heat Treatment Records		
2.11 Welding Procedures / Qualifications		
2.12 Most Recent Non-Destructive Testing Interpretation Report		
2.13 Identification Number on Tank		
2.14 Inspection Frequency and Type		
2.15 Design Verification Certificates (if applicable)		
3 Calculations		
3.1 Wall Thicknesses, Tmin (minimum allowable thickness)		
3.2 Design Calculations		

Notes:

a. Category 1 – PSI that is "for EHS Critical equipment."
Category 2 – PSI that is "Mandatory for Non-EHS Critical equipment."
Category 3 – PSI that is "Valued."

b. For all items of PSI the Location shall be recorded.

c. If originally designed and constructed in accordance with codes, standards, or practices no longer in general use, PSI must show that equipment is designed, maintained, inspected, tested, and operating in a safe manner.

INDORAMA VENTURES	**PSI DOCUMENTATION INVENTORY** **TANKS:** **POLYMER (PLASTIC) TANKS**	Form IVL EHSF-402-07

Facility:	Process:
Equipment Description:	Equipment ID No:
PSI Custodian:	Category [a]

EHS Criticality Designation:	**Responsible Department**	**Location [b]**
1 Drawings		
1.1 P&IDs		
1.2 Fabricator Shop Drawings or Tank Sketch		
2 Design Specifications		
2.1 Design Code, including applicable recognized and generally accepted good engineering practices[c]		
2.2 Tank Specification Sheet		
2.3 Tank Contents (including coils, jackets, and internal linings) and Fluid Specific Gravity		
2.4 Maximum Volume		
2.5 Design Pressure and Temperature		
2.6 Plastic Softening Temperature		
2.7 Maximum Working Temperature		
2.8 Materials of Construction (shell, heads, roof, bottom) Exact definition of plastic		
• Anti-Static added during plastic compounding		
• U.V. Light Stabilizer added during plastic compounding		
• Transition Metal Stabilizer added during compounding		
2.9 Actual Shell and Head / Roof / Bottom Thicknesses		
2.10 Maximum specific gravity for a liquid		
2.11 Maximum grams / liter for a slurry		
2.12 Details of agitator(s)		
2.13 Most Recent Non-Destructive Testing Report on Static head or hydraulic pressure test		
2.14 Identification Number on Tank		
2.15 Inspection Frequency and Type		
2.16 Design Verification Certificates (if applicable)		
3 Calculations		
3.1 Wall Thicknesses, Tmin (minimum allowable thickness)		
3.2 Design Calculations		

Notes:

a. Category 1 – PSI that is “Mandatory for EHS Critical equipment.”
Category 2 – PSI that is “Mandatory for Non-EHS Critical equipment.”
Category 3 – PSI that is “Valued.”

b. For all items of PSI the Location shall be recorded.

c. If originally designed and constructed in accordance with codes, standards, or practices no longer in general use, PSI must show that equipment is designed, maintained, inspected, tested, and operating in a safe manner.

INDORAMA VENTURES	**PSI DOCUMENTATION INVENTORY** **TANKS :** **GLASS AND FIBRE REINFORCED VESSELS**	Form IVL EHSF-402-08

Facility:	Process:
Equipment Description:	Equipment ID No:
PSI Custodian:	Category [a]

EHS Criticality Designation:	**Responsible Department**	**Location [b]**
1 Drawings		
1.1 P&IDs		
1.2 Fabricator Shop Drawings or Tank Sketch		
2 Design Specifications		
2.1 Design Code, including applicable recognized and generally accepted good engineering practices[c]		
2.2 Tank Specification Sheet		
2.3 Number of design life stress cycles if susceptible to fatigue		
2.4 Tank Contents (including coils, jackets, and internal linings) and Fluid Specific Gravity		
2.5 Maximum Volume		
2.6 Design Pressure and Temperature		
2.7 Heat Distortion Temperature (HDT) of resin		
2.8 Resin manufacturer and grade (shell, heads, roof, bottom)		
2.9 Shell and Head / Roof / Bottom Thicknesses and glass content measured in grams/m2		
2.10 Thickness of corrosion barriers on Head / Roof / Bottom and glass content measured in grams/m2		
2.11 Thickness in inches or millimeters of thermal barrier to maintain structural laminate below design temperature.		
2.12 Resin manufacturer and grade of thermal barrier		
2.13 Post Curing Temperature Records		
2.14 Barcol hardness of resin when new		
2.15 Identification Number on Tank		
2.16 Inspection Frequency and Type		
2.17 Design Verification Certificates		
3 Calculations		
3.1 Wall Thicknesses, Tmin (minimum allowable thickness)		
3.2 Design Calculations		
3.3 Design safety factor 'K'		

Notes:

a. Category 1 – PSI that is "for EHS Critical equipment."
Category 2 – PSI that is "Mandatory for Non-EHS Critical equipment."
Category 3 – PSI that is "Valued."

b. For all items of PSI the Location shall be recorded.

c. If originally designed and constructed in accordance with codes, standards, or practices no longer in general use, PSI must show that equipment is designed, maintained, inspected, tested, and operating in a safe manner.

INDORAMA VENTURES	PSI DOCUMENTATION INVENTORY **FIELD INSTRUMENTS AND SENSORS: PRESSURE / TEMPERATURE / FLOW / LEVEL / ANALYTICAL**	Form IVL EHSF-402-09

Facility:	Process:
Equipment Description:	Equipment ID No:
PSI Custodian:	Category [a]

EHS Criticality Designation:	**Responsible Department**	**Location [b]**
1 Drawings / Manuals		
1.1 P&IDs (Drawing number and location)		
1.2 Loop Diagrams Electrical and Pneumatics		
1.3 Area Classification		
1.4 Flow Sheet / Flow Data		
1.5 List of all Trips and Alarms with record of those which are Hard-Wired (if applicable)		
1.6 Cause and Effect Diagram for all Trips (if applicable)		
2 Design Specifications		
2.1 Installation and Operation Manuals		
2.2 Instrument Specification Sheet and/or Manufacturer's Data Sheet		
2.3 Materials of Construction (housing, seal, wetted parts)		
2.4 Protection Rating (explosion, weather, dust etc.)		
2.5 Calibration Procedure		
2.6 Safety Integrity Level (SIL) Related Information		
2.7 Manufacturer Maintenance, Inspection, Testing Procedures		
2.8 Established Frequency of Inspections and Testing		
2.9 Documentation of Inspections and Testing		
2.10 Design Codes, Standards or Practices, including applicable recognized and generally accepted good engineering practices[c]		
2.11 Design Verification Certificates (if applicable)		
3 Calculations		
3.1 Sizing for equipment		
3.2 SIF Calculations		
3.3 Curves and Tables		

Notes:

a. Category 1 – PSI that is "for EHS Critical equipment."
Category 2 – PSI that is "Mandatory for Non-EHS Critical equipment."
Category 3 – PSI that is "Valued."

b. For all items of PSI the Location shall be recorded.

c. If originally designed and constructed in accordance with codes, standards, or practices no longer in general use, PSI must show that equipment is designed, maintained, inspected, tested, and operating in a safe manner.

INDORAMA VENTURES	**PSI DOCUMENTATION INVENTORY** **CONTROL SYSTEM:** **PLC / DCS / SCADA / SLC / PM / RandT [(a)]**	Form IVL EHSF-402-10

Facility:	Process:
Equipment Description:	Equipment ID No:
PSI Custodian:	Category [a]

EHS Criticality Designation:	**Responsible Department**	**Location [b]**
1 Drawings / Manuals		
1.1 P&IDs (Drawing set reference number)		
1.2 Wiring Schematics		
1.3 Cabinet Door / Panel Layout		
1.4 Area Classification		
1.5 Bill of Material		
2 Design Specifications		
2.1 Installation and Operation Manuals		
2.2 Spare Parts Listing with vendor information		
2.3 Input / Output (I/O) Listing and Description		
2.4 Internal Address Listing and Description		
2.5 Logic Print-out		
2.6 Description of Operation/Functional Spec (i.e. process interlock)		
2.7 Description of Safety Interlock		
2.8 Communication Cabling Diagram (Pin Assignment) for Custom-made Cables		
2.9 Description of Alarming Function		
2.10 System Specification		
2.11 Cabinet / Enclosure Specification		
2.12 DCS and EHS critical equipment software back-up copies		
2.13 Design Verification Certificates (if applicable)		
3 Calculations		
3.1 Power Consumption		
3.2 Components Sizing		

Notes:

a. PLC – Programmable Logic Control
DCS – Distributed Control System
SLC – Single Loop Control
SCADA – Supervisory Control and Data Acquisition
PM – Panel Mounted
RandT – Relays and Timers

b. Category 1 – PSI that is “Mandatory for EHS Critical equipment.”
Category 2 – PSI that is “Mandatory for Non-EHS Critical equipment.”
Category 3 – PSI that is “Valued.”

c. For all items of PSI the Location shall be recorded.

INDORAMA VENTURES	**PSI DOCUMENTATION INVENTORY** **RELIEF AND VENT SYSTEMS**	Form IVL EHSF-402-11

Facility:	Process:
Equipment Description:	Equipment ID No:
PSI Custodian:	Category [a]

EHS Criticality Designation:	**Responsible Department**	**Location [b]**
1 Drawings		
1.1 P&IDs		
1.2 Manufacturer's Drawing or Data Sheet (Relief and Associated Protective Devices)		
1.3 Installation Piping Drawing or Sketches or Isometrics		
1.4 Details of Disposal, Vent Location or Containment System		
2 Design Specifications		
2.1 Design Code or Practice, including applicable recognized and generally accepted good engineering practices[c]		
2.2 Design Basis and Relief Conditions (fire, runaway reaction, equipment failure, etc.) (List of potential causes of over and under pressurization. Worst-case coincident relief condition.)		
2.3 Design Specification Sheet or Data Sheet (Relief and Associated Protective Devices)		
2.4 Process Fluid and State		
2.5 Required and Rated Flow Rates and Set Pressure		
2.6 Maximum Venting Temperature		
2.7 Materials of Construction		
2.8 Testing Data		
2.9 Discharge Location (atmosphere, catch tank, scrubber, etc.)		
2.10 Document that design of the relief or vent system discharges to a safe location		
2.11 Manufacturer's Test Certification Form or Copy of Nameplate Stamp (Certificates of Conformity)		
2.12 Design Verification Certificates (if applicable)		
3 Calculations		
3.1 Venting Capacity Requirement (flow rate)		
3.2 Device Sizing		

Notes:

a. Category 1 – PSI that is "for EHS Critical equipment."
Category 2 – PSI that is "Mandatory for Non-EHS Critical equipment."
Category 3 – PSI that is "Valued."

b. For all items of PSI the Location shall be recorded.

c. If originally designed and constructed in accordance with codes, standards, or practices no longer in general use, PSI must show that equipment is designed, maintained, inspected, tested, and operating in a safe manner.

Attachment C: Piping and Instrumentation Diagram (P&ID) Guidance

C.1 General

C.1.1 The Process Safety Information (PSI) requirement ensures that the management of highly hazardous materials is based on accurate, up-to-date information. PSI is the backbone of a process safety management program. PSI is used as a basis for other activities including: Process Hazard Analysis (PHA), Operating Procedures, Operator Training, Mechanical Integrity and Management of Change (MOC) and Emergency Response.

C.1.2 PSI is important for a number of reasons:

a. Records of design criteria ensure that on-going operations and maintenance are consistent with the original intent.

b. It serves as a basis for future additions or expansions, thereby managing change.

c. Demonstrates use of good engineering practice in designing, operating and maintaining the facility.

C.1.3 One of the most important sets of information for facilities with process chemical and utility systems present, is the Piping and Instrumentation Diagram (P&ID).

C.2 What should be included on a P&ID?

C.2.1 The following is a list of what should be included on a P&ID

a. All process-associated equipment, including pressure vessels, tanks, heat transfer equipment, pumps, transfer / unloading stations, etc.

b. All valves, such as isolation valves and control stations, as well as all safety relief elements (valves, disks, etc.).

c. Controls (regulators, float switches, etc.) and solenoid valves.

d. Control schemes including interlocks, permissives, etc.

e. Permanent instruments and sensors

(pressure / temperature / flow transducers, meters, etc.).

f. Trips and Alarms and whether High and/or Low

g. Simple Trip Logic.

h. Flow direction and line slope: as a minimum, always show the permitted-flow direction on a check valve and slope of line toward low point drain or high point vent.

i. Line sizes / reducers; expansion tie-ins and block valves, etc.

j. Design working pressure and other pressure vessel / equipment label information.

k. Support equipment and non-chemical lines such as condenser water pumps, secondary heat transfer fluid (glycol / brine) loops.

l. Equipment / valve numbering: proper labelling, both on the P&ID and in the field, will reduce the risk of operator error and simplify the writing of operating procedures.

m. Purge / gauge valves.

n. Line designations / purposes: some processes, such as refrigeration, have recognized systems for line designation. For others, use a system that explains the line's function and optionally includes other information such as temperature and pressure levels, etc.

o. Safety relief valve specifications: information on the relief valve design and design basis is required before starting the PHA study.

C.2.2 Any item on the list above unable to be included on the P&ID should be available in another form (e.g., list of safety relief valve specifications; control scheme; schedule of interlocks and permissives, etc.).

C.2.3 All facilities with process chemicals and utility systems present should have a standard system defining the symbols and abbreviations on P&IDs. This is usually on a separate drawing or document.

C.2.4 After P&IDs are prepared, they should be verified against field conditions. It is recommended that each and every line, valve, sensor, or other P&ID item be checked visually against the as-built drawings.

C.3 Current PSI

C.3.1 One of the most important aspects of PSI is keeping the information current and up to date. Usually the element most difficult to maintain is P&IDs. Once drawings have been brought up to date, a technique that is useful for changes is known as "red lining" where master sets of drawings are marked up using a red pencil or pen. This denotes a change that has not yet been incorporated into the electronic originals. These "red-lined" drawings can be used by operating and maintenance personnel with a degree of confidence that the information is up to date. Master drawings should be updated with the "red line" changes at least once per year, or more frequently as appropriate.

C.3.2 The site-specific MOC program (per IVL EHS-204 Management of Change Standard) must be followed for keeping documentation current and effectively managing changes to PSI, including P&IDs, due to equipment or process modifications.