**AI-PS Element Guide**

Element 7: HEMP

**Doc. Reference:** GU-XXX-07

**Version:** Issue 1.0

**Date:** 10 August 2011

**Doc. Owner:** Head of Technical Safety Engineering (MSE4)

**Element Owner:** Head of Technical Safety Engineering (MSE4)

**AI-PS Element Background**

***AI-PS in PDO***

Assuring the safety of our people, our assets, the environment and the company’s reputation is a core value of PDO and providing assurance that we are managing our major process safety risks is a critical aspect of our corporate governance. Asset Integrity Process Safety (AI-PS) describes the way we manage our assets so that the process risk is As Low As Reasonably Practicable (ALARP).

***What it is***

Asset Integrity Process Safety (AI-PS) is the means of ensuring that the people, systems, processes and resources, which deliver integrity, are in place, in use and fit for purpose throughout the whole lifecycle of the asset. The aim is to be able to confidently state that ‘our assets are safe and we know it’.

Asset Integrity Process Safety Management is a complex area of expertise covering a wide range of components, all of which are essential to ensuring systems, processes and equipment perform as required. There are a number of Elements which make up the Asset Integrity Process Safety management system.

***Structure of AI-PS Assurance in PDO***

PDO has a three-tiered approach to AI-PS assurance:

*Level 1*: Includes audits conducted on behalf of PDO's Internal Audit Committee (IAC) as part of the Integrated Audit Plan. This includes independent audits carried out by external bodies, such as Shell.

*Level 2*: Includes audits carried out on behalf of Asset Managers as part of their own Asset level assurance processes.

*Level 3*: Includes task verification and assurance activities that supplement the formal audit process.

There are 20 elements in total within the PDO AI-PS Management System as follows:

***Elements list:***

*Element 1: Process Safety Culture*

*Element 2: Compliance with Standards*

*Element 3: Corporate Process Safety Competency*

*Element 4: Workplace Involvement*

*Element 5: Stakeholder Outreach*

*Element 6: Process Knowledge Management*

***Element 7: HEMP***

*Element 8: Plant Operating Manuals*

*Element 9: PTW*

*Element 10: Technical Integrity*

*Element 11: Contractor Management*

*Element 12: Training and Performance Assurance*

*Element 13: Management of Change*

*Element 14: Readiness for Start Up*

*Element 15: Conduct of Operations*

*Element 16: Emergency Management*

*Element 17: Incident Management*

*Element 18: Measurements and Metrics*

*Element 19: Audit and Verification of Level 2 Process*

*Element 20: Management Review and Continuous Improvement*

**Element 7: HEMP**

***Background to Element***

Sustained commitment to risk management through the Hazard and Effects Management Process (HEMP) is one of the critical aspects to achieve process safety excellence. HEMP is conducted throughout the lifecycle of the facility - from its inception to decommissioning.

***Aims and Objectives of Element***

PDO activities have the potential to harm people and the environment, to cause damage or loss to assets, to defer oil production, to cause financial loss, and to adversely impact the Company’s reputation. The Hazards and Effects Management Process (HEMP) provides a structured approach to managing the hazards and potential effects of PDO’s activities. There are numerous techniques to carry out HEMP, and the technique chosen should be aligned to the scope of work, risk scenarios in that work, etc. For AI-PS hazards, HEMP techniques include:

* Hazard Identification;
* Bow-Tie Analysis;
* HAZOP;
* Fire, Explosion Risk Management (FERM);
* Quantitative Risk Assessment (QRA);
* Occupied Building Risk Assessment (OBRA);
* Instruments Protective Function (IPF) Studies;
* Job HSE Plans;
* Matrix of Permitted Operations (MOPO);
* Emergency Response Plans;
* Technical Integrity deviation management;
* Management of safeguarding system overrides.

Effective application of HEMP involves four steps: identify, assess, control, and recover, and all steps will generate records. These steps cover identification of the major hazards to people and the environment, assessment of the related risks, as well as implementing measures to control these risks, and to recover in case these measures fail.

For AI-PS, HEMP is used to identify the hazards and assess the risks associated with process piping and equipment, determine the performance required of safeguards and make recommendations to ensure risks are tolerable levels and reduced to As Low As Reasonably Practicable (ALARP).

***Scope of Element***

The scope of this element applies to all PDO assets during all phases of the facility lifecycle (design, commissioning, start up, shutdown, operations and decommissioning) and through day-to-day operations to ensure that hazards are identified and risks are managed to a level that is demonstrably tolerable and ALARP.

**AI-PS Element Guide Implementation**

***Aims and Objectives of AI-PS Element Guide***

The aim of this AI-PS Element Guide is to provide background to AI-PS and a structured and consistent approach to carrying out Level 2 Self Assessments and Level 3 Verification for all AI-PS Elements within PDO.

The intended audience for the guide are the members of the AIPSALT although this can be used as a basis for training and awareness for all staff at the asset.

***Responsibilities and Accountabilities for AI-PS Element Guide Implementation***

The Operations Manager is accountable for the Level 2 Assurance process at the asset.

Completion of the Level 2 Self Assessment and Level 3 Verification Checklists, as provided in this element guide, is the responsibility of the Element Champions and AIPSALT. The Delivery Team Leader (DTL) is accountable for the AIPSALT.

**AI-PS Assurance Leadership Team (AIPSALT)**

The AIPSALT is comprised of the asset DTL and Process Safety Element Champions (PSEC).

The DTL and PSEC roles include: reporting the status of the Level 3 Verification activities for the relevant Element at the AIPSALT meeting; maintaining Key Performance Indicators (KPIs) for the Element; monitoring the effectiveness of the Level 3 Verification activities in assuring AI-PS, and recommending changes to improve effectiveness and efficiency as appropriate; monitoring the progress of corrective actions and improvement plans associated with that Element; and leading Level 2 Self-Assessment of compliance with the requirements of that Element.

**Level 2 Assurance**

***Level 2 Self Assessment and Audit***

Level 2 assurance is provided by a series of AI-PS audits carried out on behalf of Asset Directors and Operations Managers as part of their own Directorate-Level assurance processes.

Level 2 Audits (and Level 2 Self Assessments) are conducted at each Directorate using standard protocols and templates described in this series of AI-PS Element Guides.

The Level 2 Self Assessment Checklist (provided in this AI-PS Element Guide) can be viewed as a ‘health check’ of asset performance again the element. Completing the Level 2 Self Assessment will help the asset to identify areas for improvement ahead of the Level 2 Audit.

***Frequency of Level 2 Assurance***

Level 2 Audits are conducted annually at each Directorate but the frequency and duration may be adjusted to reflect either positive or negative trends, recent audit findings, emerging risks and alignment with other audit activities. The schedule of Level 2 Audits is set in the Directorate HSE Plan.

The frequency of Level 2 Self Assessment should also reflect how well the asset is performing against all AI-PS Elements and be performed no less than on an annual basis (ahead of the Level 2 Audit).

**Level 3 Verification Checklist**

***Level 3 Verification Description***

Level 3 Verification demonstrates compliance with the asset HSE Case ‘barriers’, HSE Critical Tasks, operational procedures and other requirements defined in the HSE Management System. These activities provide an ongoing check that the procedures, tests and inspections necessary to maintaining the functionality of Safety Critical Elements and systems are completed as required so that process risk is managed to a level that is As Low As Reasonably Practicable (ALARP).

In summary, the Level 3 Checklists are an operational level sample check or ‘mini audit’ completed by the asset against PDO and asset based procedures. The effectiveness of the Level 3 Verification process is assessed during the Level 2 Self Assessment process and ultimately via the Level 2 Audit programme.

***Verification Checklists***

Level 3 Verification checklists have been developed for each AI-PS Element within PDO in order to provide a structured and consistent approach to Level 3 Verification across all assets. The Level 3 Verification checklists are structured as a sample check or specific and local audit of the Element in question.

By successfully verifying that the Level 3 Verification activities are being completed correctly it provides a strong indication that the element is being implemented at the ’system level’ (assessed via the Level 2 Self Assessment and Level 2 Audits).

The Level 2 Self Assessment and Level 3 Verification checklists for this element are provided below.

**Level 2 Self Assessment**

| **SN** | **Protocol** | **Y / N / NA & evidence** | **Possible approaches** |
| --- | --- | --- | --- |
|  | Is a Design Integrity Review (PR-1232) programme established for the asset?The programme schedule should comply with the 5 year (maximum) review cycle. The scope of the Design Integrity Review should cover all process facilities and the asset specific HEMP studies, e.g. HAZOP, IPF Classification, FERM, etc. |  | Review the schedule and the most recent Design Integrity Review reports. |
|  | Has a gap analysis against Process Safety Basic Requirements been completed for the asset and is a gap closure plan in place and on target? |  | Confirmation may be documented in the asset HSE Case, particularly the Statement of Fitness.Gap closure plan may be contained in the AI-PS Action Tracking System. |
|  | For new projects and for asset related modifications, are HEMP studies carried out as per DCAF and company procedures? E.g.:* PR-1696 HAZOP Procedure;
* SP-1258 QRA;
* SP-2062 Specification for HSE Cases;
* GU-437 SIL Assessment Guide?
 |  | Select a recent project or modification at the asset. Review the report (e.g. trained study leader, process engineer with in depth knowledge of the process technology, experienced technician with in depth knowledge of actual plant operations and practices, plus other functional competencies as required - machines engineer in the compressor review, E&I engineer in the IPF review) |
|  | Are the findings of the HEMP studies / HSE Case communicated by the asset leadership team to the asset organisation, e.g. to the technicians, contractors and other personnel working in the area studied? |  | Ask. Review meeting minutes or other logs to verify. |
|  | Were the recommendations / actions from the HEMP studies and Design Integrity Reviews entered into FIM and / or AI-PS Action Tracking System? |  | Look for the recommendations in FIM and / or the AI-PS Tracking System.  |
|  | Are there any overdue completions on actions arising from the HSE Case or HEMP Study? |  | Look for the recommendations in FIM and / or the AI-PS Tracking System. Select a sample of closed actions and form an opinion on the quality of the action close-out statement.Have close-out been reviewed or endorsed by relevant discipline or appropriate management level?  |
|  | Are risk assessments supporting Operations Procedure Temporary Variances (PR-1001e) adequate? |  | Review HEMP or Conduct of Operations Level 3 Verification checklists completed in the last year. Or, review the asset Variance and Change Control Register. Form an opinion if the risk assessment, HAZOP (if required), and TA review provided an adequate implementation of HEMP. |
|  | Are risk assessments supporting Temporary Overrides of Safeguarding Systems (PR-1001c) adequate? |  | Review HEMP or Conduct of Operations Level 3 Verification checklists completed in the last year.Or, review the Safeguarding System Temporary Overriding Request Forms in the Operational Override Log. Form an opinion if the risk assessment supporting the approved overrides provided an adequate implementation of HEMP. |
|  | Are risk assessments supporting SCE Maintenance and Deviation Control (PR-1005) adequate?  |  | Review HEMP or Technical Integrity Level 3 Verification checklists completed in the last year. Or, review FSR and confirm that deviations are in place and supported by adequate risk assessments. |
|  | Are approved Job Specific HSE Plans adequate to support activities in process facilities and hydrocarbon areas? |  | Review HEMP or PTW Level 3 Verification checklists completed in the last year. Or, identify a recent or ongoing modification /construction activity at the facility – request the supporting Job HSE Plan and risk assessment. Determine if the Job HSE Plan is adequate for the task and proportional in its assessment of the hazard and risk. |
|  | Has the HSE Case been updated within the last 5 years to reflect the asset in terms of design, scope of operations and organisation?  |  | Review the HSE Case and form an opinion if it complies with SP-2062 ‘Specification for HSE Cases’? E.g. Does the HSE case adequately describe the facilities and activities associated with the location; have bridging documents been developed (large construction sites, SIMOPS); etc? |
|  | Has a structured Hazard Identification process been completed for the facility?  |  | Review the Hazards and Effects (H&E) Register for the facility? Does the H&E Register rank all hazards and identify which are Major Accident Hazards? |
|  | Have Health and Security hazards been identified for the Asset/Facility? |  | Review the Health Risk Assessment and Security Risk Assessment for the Asset/Facility.Are health and security risks included in the Hazards and Effects Register? |
|  | Have Bow-Ties been developed for all Major Accident Hazards |  | Do all High Risk and Severity 5 hazards in the Hazards and Effects register have an associated Bow-Tie in the asset HSE Case?Does the HSE case include references to how the quality or effectiveness of bow-tie barriers has been assessed? |
|  | Have Safety Critical Elements been identified for the asset or facility? |  | Review the asset HSE Case. Does the HSE Case describe the process of how HEMP and Bow-Tie analysis supports the identification of SCEs? Does the HSE Case list all Safety Critical Element groups for the asset? Does the HSE Case describe how integrity of SCEs is maintained through MIE (CMMS/SAP)? |
|  | Are HSE Critical Tasks defined and Positions defined for the Asset?  |  | Review the asset HSE Case. Are HSE Critical roles and positions defined in the HSE Case? |
|  | Are competency requirements for HSE Critical positions defined? |  | Review the HSE Case. For HSE Critical positions, does the HSE Case explain the competency requirements and how competency assurance is managed? |
|  | Are HSE Critical Tasks communicated to personnel in HSE Critical positions and accepted?  |  | Ask personnel in HSE Critical Positions identified in the asset HSE Case. Are HSE Critical Tasks included in Performance Contracts or job descriptions for personnel in HSE Critical positions? Have personnel in HSE Critical Positions signed an HSE Case ‘oath’ (or similar acceptance and commitment to the HSE Critical Tasks). Can personnel in HSE Critical Positions describe their role in managing Major Accident Hazards? |
|  | Does the HSE Case describe how tasks associated with the maintenance of Safety Critical Elements are managed for the Asset? |  | Review the asset HSE Case. Also, refer to Technical Integrity Element Level 2 protocols.  |
|  | Does the HSE Case include ALARP documentation from the design phase or for large modifications? |  | Review the asset HSE Case. Are risk reduction measures from Design phase included or referenced in the HSE Case? Is there an ALARP demonstration report for smaller projects or modifications?  |
|  | Does the HSE Case describe the HSE Management system for the Asset? |  | Review the asset HSE Case. Is there a clear reference to the PDO HSE Management System (CP-122)? |
|  | Has roll out and implementation been provided for the asset organisation to ensure understanding of the HSE Case in relation to the operating asset? |  | Ask personnel in HSE Critical Positions identified in the asset HSE Case. Have the latest HSE Case been formally presented or otherwise communicated to Operations staff? |
|  | Do operations personnel know when and how to apply the MOPO? |  | Ask. Are MOPOs displayed at the asset e.g. in the CR, Area Authority / PTW offices, Engineering Department? Through discussion with asset staff, is there adequate understanding of the purpose and application of the MOPO. |
|  | Is there a Statement of Fitness for the Asset? |  | Review the asset HSE Case. Does the HSE Case contain a Statement of Fitness? Has the SoF been signed by Asset Management within the last year? |
|  | Has ALARP been demonstrated for the facility?  |  | Review the asset HSE Case. Does the HSE Case include an ALARP demonstration? Is the ALARP demonstration supported by Formal Safety Assessments (HAZID, HAZOP, QRA, SIL assessment, bow-ties)? Does the HSE Case describe how the asset has sought to identify and assess additional measures to reduce risk? |

**AI-PSM Level 3 HEMP Verification Checklist**

|  |  |
| --- | --- |
| **Asset**  | **Date**  |
| **Name (Interviewees)**  | **Contractor / Ref. ID(s)**  |

|  | **Yes** | **No** | **Remarks (Provide reference to sampled permit, variance form, risk assessment, etc.)** |
| --- | --- | --- | --- |
| **1** | **HEMP review with Production Supervisor**  |  |  |  |
|  | 1. Is a copy of the latest version of the asset HSE Case available?
 |  |  |  |
|  | 1. Is a copy of the latest MOPO readily available (preferably visible as a poster)?
 |  |  |  |
|  | 1. Has the Supervisor formally accepted the HSE Critical Tasks relevant to his position (from asset HSE Case)?
 |  |  |  |
|  | 1. Has the Supervisor completed a competence assessment on the asset HSE Case?
 |  |  |  |
|  | 1. Review a sample of Operations Procedure Temporary Variances. Has a Risk Assessment Form been completed and attached for all requests for Operations Procedure Temporary Variance in line with PR-1001e?
 |  |  |  |
|  | 1. Review a sample of Safeguarding Temporary Override Requests. Are Risk Assessments available for all overrides requested and are they approved? Confirm that there is no conflict with the operational MOPO.
 |  |  |  |
| 1. Review a sample of Permits. Is a Job HSE Plan attached to the sampled Permits, and has a quality TRIC discussion taken place (check TRIC card). Have all the local specific hazards been identified and are any special precautions and controls in place and being observed?
 |  |  |  |
| **2** | **HEMP review with Maintenance Supervisor**  |  |  |  |
|  | 1. Has the Supervisor formally accepted the HSE Critical Tasks relevant to his position (from asset HSE Case)?
 |  |  |  |
|  | 1. Has the Supervisor completed a competence assessment on the asset HSE Case?
 |  |  |  |
|  | Take a sample of FSR Deviation Control Forms, review the following: |  |  |  |
|  | 1. Does the Performance Standard clearly define acceptance criteria (pass/fail) for the SCE?
 |  |  |  |
|  | 1. Does the FSR deviation describe which Performance Standard criteria is not achieved?
 |  |  |  |
|  | 1. Are the Deviation Control Forms completed fully and does the Risk Assessment represent a realistic assessment of the risk posed by the deviation?
 |  |  |  |
|  | 1. Does the description of the deviation provide sufficient information to verify the risk assessment performed in support of the Deviation Control Form?
 |  |  |  |
|  | 1. Are the comments and mitigation measures appropriately developed and proportional to the risk assessment completed?
 |  |  |  |
|  | 1. Is the MOPO referred to in the Risk Assessment or the mitigation measures?
 |  |  |  |
|  | 1. Has the deviation been prioritised using the CMPT?
 |  |  |  |
|  | 1. Does the Bow-Tie relevant for this SCE and Major Hazard include any additional barriers or mitigation that should be considered in the risk assessment?
 |  |  |  |
|  | 1. Is the validity of the Deviation Control Form accurate and justified for the risk associated with the deviation?
 |  |  |  |
| **3** | **Walk through the facility with the Station Operator** |  |  |  |
|  | 1. Has the Operator formally accepted the HSE Critical Tasks relevant to his position (from asset HSE Case)?
 |  |  |  |
|  | 1. Can the Operator describe the process hazards at the facility?
 |  |  |  |
|  | 1. Are temporary buildings (portacabins, occupied containers, etc) more than 150 m from process equipment, or covered by an Occupied Building Risk Assessment?
 |  |  |  |
|  | 1. If temporary process piping and equipment has been installed at the facility, has the equipment has been adequately risk assessed, e.g. HAZOP-ed.
 |  |  |  |
|  | 1. If there are more people on-site than normally permitted (Operations Philosophy, PR-1078 for High Risk Sour facilities), has this been addressed by a risk assessment?
 |  |  |  |

**Auditor overall comments**

|  |  |
| --- | --- |
| **Auditor Name\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Signature \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Indicator \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** | **Date**  |