

GENERAL SPECIFICATION

Field Operations

GS EP EXP 407

Safety and Environment Critical Elements management in the CMIMS and OIAVS

05	12/2018	Merging, modification and clarification on Appendices 2 -3- 6 Complete review
04	01/2017	Update of overall document - methodology clarified and detailed
03	05/2015	Organisation change – January 2015
02	07/2014	Appendix 1 (Generic List of SECE Functions & Sub Functions), Appendix 5 (Generic Performance Standard Templates) added replacing example Performance Standard & Risk Matrix Updated with the E&P Universal 6x6 Risk Matrix
01	01/2012	Updating of generic list of SCEs, title. Section 4
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1. Scope

This document intends to provide entities in charge with the methodology and requirements for identifying and managing Safety and Environment Critical Elements (SECEs).

Present General Specification is intended to be used:

- By Company multidisciplinary team in charge to identify and implement the SECE (Project Safety engineer, Project Technical Integrity Coordinator, Maintenance and Inspection Leader (MIL), etc.).
- By Contractors mandated by Company Project Groups, in particular for any Project Safety studies which are sub-contracted.
- And by Maintenance & Inspection Engineering Contractors (MIEC) charged to prepare and implement the affiliate maintenance and inspection activities for SECE in the CMIMS.

Present General Specification is intended to be used starting from Basic Engineering through to the operational phase.

It does not question the principal design choices of the installations, but defines the methodology for identifying and implementing SECEs by the MIE teams, based on the deliverables provided by the Safety studies during Basic Engineering (SECE Register). It will however ensure that the performances standards related to the SECE are able to be measured and verified from the start of commissioning to the end of the operational phase.

Security issues (Cybersecurity) are not covered by this General Specification, but are covered by other EP references, in particular by [GS EP INS 135](#).

This document applies to all Company projects and operated installations.

2. Reference documents

The reference documents listed below form an integral part of this General Specification.

External Documents

Unless otherwise stipulated, the applicable version of these documents, including relevant appendices and addendums, is the latest revision published at the effective date of this document.

Reference	Title
2013/30/EU	Directive of the European Parliament and of the Council of 12 June 2013 on safety of offshore oil and gas operations and amending Directive 2004/35/EC
EI-SCE Guideline	Guidelines for the management of safety critical elements, 2 nd edition, April 2007, Energy Institute

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Total General Specifications

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Reference	Title
GS EP EXP 103	Pre-Commissioning and Commissioning engineering and preparation
GS EP EXP 207	Installation description structure
GS EP EXP 213	Minimum maintenance requirements
GS EP EXP 221	Data formats for CMIMS loading
GS EP EXP 311	Plant integrity - Minimum inspection requirements
GS EP INS 135	Cyber-security Requirements for Industrial Information Systems (SII)
GS EP SAF 041	Technological Risk Assessment Methodology
GS EP SAF 261	Emergency Shutdown and Emergency Depressurisation (ESD & EDP)

3. Introduction

3.1 Purpose

The purpose and focus of Technical Integrity Management is the avoidance of major accidents whilst meeting production objectives. A key part of Technical Integrity Management is the identification and management of Safety Critical Barriers (SCB) as defined in [GS EP SAF 041](#).

Safety and Environment Critical Elements' (SECE) are the Plant (Technical) barriers, and are a subset of SCBs.

This document defines how SECEs are identified and implemented in the Computerised Maintenance and Inspection Management System (CMIMS). The document covers the identification of SECEs and the creation of Measuring Points based on Performance Standards (Performance requirements, Means of Assurance and Verification schemes). It specifies in particular the required testing schemes and minimum periodicity to be implemented. It defines also the content of the "Operational Integrity Assurance & Verification Scheme" document (OIAVS).

3.2 Definitions

Objects	Definition
Barrier	Equipment, system, or set of procedures (either hardware, software, work processes or organizational) which lowers the probability of hazard occurrence (prevention) or the severity level of the consequence (mitigation) (GS EP SAF 041)

Objects	Definition
CMIMS	Computerised Maintenance & Inspection Management System. A computerised system that allows detailed management of activities and data related to the maintenance and inspection of assets. In this document CMIMS designates UNISUP or lighter version SALSA PM, developed within the SAP environment.
Functional Location	A Functional Location represents the place where an equipment can be installed or a maintenance task can be performed. The "Functional Location category" is M for standard Functional Locations and P for Scheduling Tags.
Maintenance Activity Performance Standard (MACTPF) Measuring Point	Specific Measuring Point of Scheduling tag used to give a general integrity status of the related SECE Primary function resulting from maintenance and inspection operations.
Maintenance Item	A Maintenance Item associates Maintenance Plans to Functional Locations.
Maintenance Plan	A Maintenance Plan schedules maintenance operations against a Functional Location.
Means of Assurance	Calculations, inspection and testing performed by project to ensure initial fitness for purpose (initial means of assurance) AND the maintenance, inspection, testing, surveillance and monitoring performed by operations to ensure continuous operational fitness for purpose (operational means of assurance).
MIL	Maintenance and Inspection Leader
MRR	Major Risk Register
Object Link	Within the CMIMS, an Object Link is a relation between two Functional Locations (within the same hierarchical structure or not).
OIAVS	Operational Integrity Assurance Verification Scheme: compilation of all the performance standards, means of assurance and verification schemes for a field/asset.
Performance Standard	Minimum requirements of an SECE. The Performance Standards define the functionalities to be fulfilled and checked during the maintenance and inspection operations to ensure SECE equipment functionality, reliability, availability and survivability.
Performance Standard Measuring Point	Performance Standards Measuring Points are used to record qualitative or quantitative measurements and/or statuses collected during maintenance and inspection operations.
Route	List of Measuring Points attached in the maintenance item.
Safety Critical Barriers (SCB)	Plant (SECE), processes, or people whose purpose is to prevent a major accident event or, to limit or mitigate the escalation of such an event (GS EP SAF 041).

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Objects	Definition
Safety & Environment Critical Element (SECE)	Parts of an installation, including computer programmes, the purpose of which is to prevent or limit the consequences of a Major Accident, or the failure of which could cause or contribute substantially to a major accident. SECEs are a subset of SCB (2013/30/EU).
Scheduling Tag	Functional Location (FL) with an associated maintenance plan scheduling preventive Work Orders for a single or multiple equipment. Could be a location where a physical equipment is installed (i.e. fire water pump) or a “virtual” FL gathering other elements (i.e. Gas detection Zone 1). A virtual Scheduling Tag is called “Dummy scheduling Tag”
Primary SECE Id	Unique SECE Identification of an SECE scheduling Tag. In case the Scheduling Tag supports several SECE functions, the Primary SECE Id is the main function.
Secondary SECE Id	Identification of all SECE (in addition Primary SECE Id). Can be attached to the Scheduling Tag or to a SECE Functional Location.
Topo-Functional structure	Hierarchical organisation of Functional Locations (GS EP EXP 207).

3.3 General process for managing SECE

The overall process, coordinated by the Project Technical Integrity Coordinator, can be illustrated by the **Table 1**:

Table 1: SECE management general process

Workpack	Description	Lead by Company	Phase
1	Identification of Safety Critical Barriers and elaboration of the SECE register		
	Collect Risk assessment outcomes	Project Safety engineer	Basic engineering
	Identify Safety Critical Barriers, including SECE system / sub-systems		
	Elaborate the SECE register (system/sub-system)		
2	Customization of performance standards templates		
	Customize generic performance requirements (functionality, availability / reliability, survivability)	Project Safety engineer	Basic engineering -
	Customize generic design means of assurance		
	Customize generic design verifications schemes	Project Technical Integrity Coordinator	Detailed Engineering
	Customize generic operational means of assurance	MIL	
	Customize generic operational verifications schemes	Project Technical Integrity Coordinator	
3	Identification of SECE at equipment level		
	Identify SECE at equipment level	Project Safety engineer	Detailed engineering
	Topo-functional mark-up with SECE equipment	MIL	
4	Implementation of operational integrity scheme into CMIMS		
	Identify SECE at functional location / tag level and implementation in the CMIMS	MIL	Detailed engineering (prior to Commissioning)
	Update operational means of assurance and define measuring points		
5	Elaboration of an OIAVS document		
	Finalize Performance Standards	Project Technical Integrity Coordinator	Detailed engineering (prior to Commissioning)
	Compile SECE OIAVS into a document		
	Update OIAVS in line with TRA revision	Project Safety engineer	Operations

The process is based on a step by step approach. The following chapters segregate the process in successive workpacks, each workpack being split into several steps. Workpacks may be given to different contractors as the nature of the work varies significantly from one to the other. The given split and scope of workpacks is indicative only, and can be adjusted to project needs or to the organization of the affiliate, especially when the work is partially done using internal resources.

4. Workpack 1: Identification of Safety Critical Barriers and elaboration of the SECE register

4.1 Step 1 - Collect Risk Assessments outcomes

GS EP SAF 041 defines Risk assessment's methodologies and responsibilities for conducting Preliminary and Detailed Risk Assessments (PRA/DRA), during the project phase and during the operation phase.

The outcome of these studies is the creation of a Major Risk Register (MRR), including three deliverables:

- Critical events Register of Major scenarios
- Action plan
- Scenarios with top 10 consequences.

Major scenarios are defined as the scenarios with major consequences, that is to mean "potential damage severity of "catastrophic" or above to people, environment or asset" according to **GS EP SAF 041**. They correspond to the squared zone of the risk matrix shown in **Figure 1**.

		Severity of Consequence					
		Minor	Moderate	Serious	Very Serious	Catastrophic	Disastrous
		1	2	3	4	5	6
Likelihood of Occurrence	6	6	12	18	24	30	36
	5	5	10	15	20	25	30
	4	4	8	12	16	20	24
	3	3	6	9	12	15	18
	2	2	4	6	8	10	12
	1	1	2	3	4	5	6

Major Consequence

Figure 1 : Representation of Major Scenarios (squared zone) in the risk matrix

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The **Major Risk Register - Critical Events Table** compiles by Functional Blocks (Wellhead, Production Manifold, Separator, etc.) the major scenarios or critical events describing the major risks and providing clear links between the identified risks and control measures, systems, processes and procedures implemented to manage/mitigate the risk. A typical example is given in **Appendix 1**, showing the main elements of the register i.e.

- The functional blocks
- The operating mode or environment parameter
- The critical events
- The main causes of the event.
- The existing preventive measures
- The consequences incident outcomes
- The existing mitigation measures
- The duration of incident outcome
- The damages category

This register and final DRA report are the main inputs of SECE system / sub-system identification, as described in the **Figure 2**, extracted from **GS EP SAF 041**.

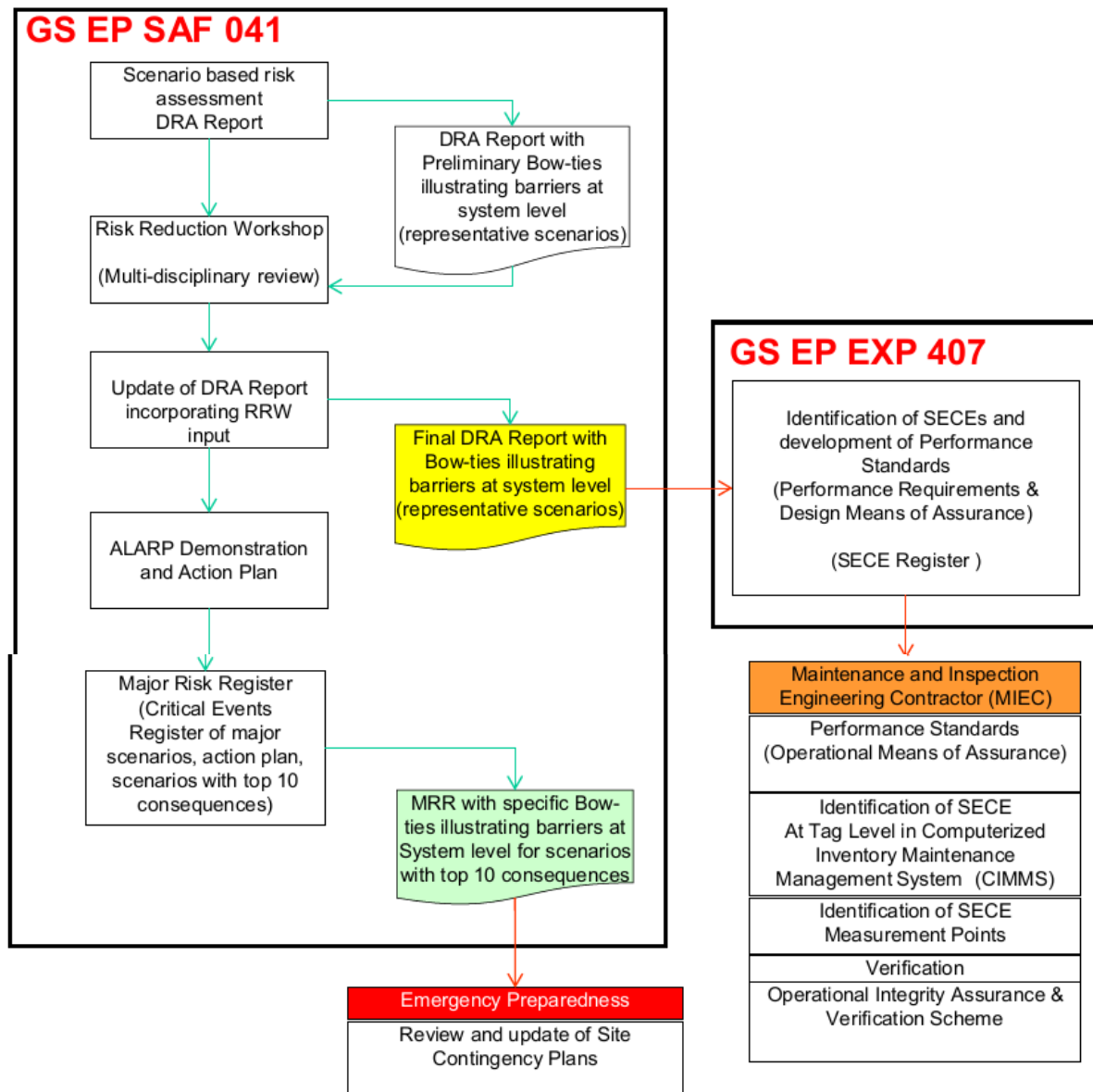


Figure 2: Interface between GS EP SAF 041 and GS EP EXP 407 (extract from GS EP SAF 041)

4.2 Step 2 - Identify SECE systems / sub-systems

SECE systems / sub-systems are identified as a subset of SCBs. It has to be noted that:

- People and processes SCBs are not defined as SECEs and treated in other Company documents. Present General Specification focuses on equipment.
- At this stage, SECEs are identified at the system / sub-system level, not at equipment tag level.

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- Systems / sub-systems not related to major accident hazards are not to be considered as SECE.

SECE systems / sub-systems are identified from the generic list provided in **Appendix 2**. The generic list is screened in detail and tailored to align with actual facilities, by removing SECE Systems / sub-systems that do not exist in the concerned installations e.g. offshore related assets if concerned development is onshore.

{Rule 1:

SECEs systems / sub-systems shall be identified from the Major Risk Register's scenarios whose consequences are categorized "catastrophic" or "disastrous".}

SECE classification given in attached generic list is to be respected so as to ensure system coherence throughout affiliates.

- Level 1: Barriers (4)
 - **P** Hazard Prevention
 - **C** Hazard Control
 - **M** Hazard Mitigation
 - **E** Evacuation, Escape & Rescue
- Level 2 : SECE systems (53)
 - **P1 to P18**
 - **C1 to C14**
 - **M1 to M11**
 - **E1 to E12**
- Level 3: SECE sub-systems (160)
 - **P1.1 to P1.n**
 - **C1.1 to C1.n**
 - Etc.

The classification is used in all aspects of SECE management, especially for identifying SECE in the CMIMS and reporting on Asset Integrity.

4.3 Step 3 – Elaborate the SECE register (system/sub-system)

Main workpack 1 outcome is the SECE register.

{Rule 2:

A SECE register listing SECE systems / sub-systems shall be elaborated and delivered in basic engineering phase.}

The minimum information to be provided in the SECE register is:

1. The SECE system Reference number and description
2. The SECE sub-system Reference number and description

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3. The guardian of the SECE.
4. The Major Scenario(s) the SECE is attached to. All scenarios whose consequences are categorized “catastrophic” or “disastrous” identified during the TRA are referenced in the SECE Register.
5. The type of contribution of the SECE (Prevention, Control, Mitigation, Evacuation, Escape and Rescue).

The tabulated format given in **Appendix 2** is provided for guidance. The proposed format allows the easy identification of SECEs being involved in several major scenarios.

5. Workpack 2: Customization of performance standards templates

Performance Standards are established on the basis of the Generic Performance Standards Templates given in **Appendix 3**.

The Contractor uses this as a guidance to develop Project **specific** Performance Standards. This is used for equipment acceptance in the Commissioning period and generally maintained during the Asset’s operating phase.

For each specific Performance Standard, the following are elaborated:

- The actual performance requirements
- The actual design and operational means of assurance
- The actual design and operational verification schemes

{Rule 3:

Performance Standards shall be elaborated and delivered in basic or detailed engineering phase.}

5.1 Step 1 - Customize generic Performance requirements (functionality, availability / reliability, survivability)

Performance requirements are to be met by SECEs in order to ensure they effectively prevent or mitigate a major accident.

Performance Standards are organized in three main areas:

1. **Functionality** – What its functions are?

Example: for an ESD Valve - pressure containment, mechanical activation, system activation (control loop), closure time.

2. **Availability, reliability** – What its target availability / reliability is.

Example for an ESD Valve: meet or exceed 99.5% reliability on demand based on SIL assessments.

3. **Survivability** – Whether the equipment needs to keep its functions during an incident or not and how to maintain this capacity.

Example for an ESD Valve: fail safe philosophy, fire proofing, blast resistance.