



Exploration & Production

GENERAL SPECIFICATION

SAFETY

GS EP SAF 260

Design of High Integrity Protection Systems (HIPS)

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1. Scope

The purpose of this specification is to define the requirements for the design of High Integrity Protection Systems.

2. Applicability

This specification applies to all projects managed by Total E&P and its Affiliates and to Companies of which Total is a shareholder and which have decided to apply the Total E&P General Specifications.

This specification is not retroactive; it applies to new installations (fields or plants) and to major modifications or extensions of existing installations, both onshore and offshore.

3. Reference documents

3.1 Standards Professional Documents and Codes

Where national regulations exist, their provisions and those of the standards and codes to which they refer shall apply, supplementing or amending the provisions of this document. If there are no national regulations covering all or part of the subject of this document, the reference documents shall be strictly applied, as supplemented by the provisions of this document.

Only the main reference documents are mentioned; the CONTRACTOR shall be responsible for complying with all secondary reference documents dealing with the subject of this document.

Unless otherwise specified, the CONTRACTOR shall apply [IEC 61508](#), [IEC 61511](#) standards.

Unless otherwise indicated in the detailed contractual conditions, all the reference documents to be used, as well as their supplements shall be the latest issues.

The list of industry standards applicable to the design of a HIPS given hereafter is not restrictive. It should be completed on a case by case basis.

Standards

Reference	Title
IEC 61508	Functional safety of electrical/electronic/programmable electronic-safety related systems
IEC 61511	Functional safety : safety instrumented systems for the process industry sector
ISO 10418	Analysis, Design, Installation and testing of Basic Surface Safety Systems

Professional Documents

Reference	Title
ANSI/ASME B 31-3	Process piping
ANSI/ASME B 31-4	Liquid transportation systems for hydrocarbons, liquid petroleum
ANSI/ASME B 31-8	Gas transmission and distribution piping systems

API RP 14C	Recommended practice on analysis, design, and testing of basic surface safety systems for offshore production platforms
API RP 520	Sizing, Selection and Installation of Pressure Relieving Devices in Refineries
API RP 521	Guide for pressure Relief and Depressuring Systems
ASME Section VIII	Rules for Construction of Pressure vessels
BS (PD) 5500	Specification for Unfired Fusion Welded Pressure Vessels
UKOOA	Guidelines for instrument-based protective systems

Codes

Reference	Title
DNV 81	Rules for submarine pipeline systems

Other documents

Reference	Title
	Operating Philosophy Safety Concept Statement Of Requirements (SOR)

Total General Specifications

Reference	Title
GS EP ECI 002	Drawing and Symbol - Principles of Presentation
GS EP INS 102	Instrumentation Symbols and Identification
GS EP PVV 142	Valves
GS EP SAF 261	Emergency Shut-Down and Emergency De-Pressurisation (ESD & EDP)
GS EP SAF 262	Pressure protection relief and hydrocarbon disposal systems

The provisions of this document shall be applied in the light of the supplementary documents relevant to the new facilities. This information shall be supplied by COMPANY and may include (when they exist):

- * Country specificity appendices
- * STATEMENT OF REQUIREMENTS
- * SAFETY CONCEPT
- * Preliminary HIPS dossier
- * Job specification
- * Data sheets
- * Articles and conditions, list of tasks
- * Quality assurance provisions.

4. Terminology and definitions

Common Mode of Failure (CMF)	Failure of two or more channels in the same way causing the same erroneous result. (IEC 61511-1)
Common Cause of Failure (CCF)	Failure, which is the result of one or more events, causing failures of two or more separate channels in a multiple channel system, leading to system failure. (IEC 61511-1)
Demand rate	Number of times per year where the activation of a protection system is required.
Design conditions	The internal equipment conditions used in the design calculations of the equipment according to an industry standard. The design conditions usually refer to pressure/temperature, occasionally to flow-rate, hazardous component content.
Diversity (Diversification)	Different means of performing a required function. Diversity may be achieved by different physical methods or different design approaches (with the aim of minimising the common mode of failure). (IEC + COMPANY).
Emergency Shut Down (ESD)	Control actions undertaken to shut-down equipment or process in response to a hazardous situation (COMPANY)
Emergency Shut Down System (ESD System)	System, activated by automatic or manual signals, which undertakes the control actions to shutdown equipment or processes in response to a hazardous situation (ISO 10418) Alternative abbreviations: ESDS and SSS.
Emergency Shut Down Valve (ESDV)	High integrity shut-down valve, handling a hazardous fluid or a fluid having an essential function, and located at the limit of a fire zone or within a fire zone to limit hydrocarbon inventory (COMPANY)
Failure	Termination of the ability of a device or equipment item to perform a required function (IEC + API).
Failure rate (λ)	Conditional probability of failure per unit of time; generally expressed in 10^{-6} per hour.
Hazard	A chemical or physical condition with the potential of causing damage (COMPANY)
High Integrity Protection System (HIPS)	Instrument-based systems of sufficient integrity (involving high reliability redundant and/or diversified instruments) so as to make the probability of exceeding the design parameters lower than a target value.
High Integrity Pressure Protection System (HIPPS)	A HIPS exclusively devoted to protection against over-pressurisation Alternative terminology: Over-Pressure Protection System (OPPS)
Integrity	Probability of a system satisfactorily performing the required function under all the stated conditions within a stated period of time (ISO 10418)

Incident	Any event or a chain of events which has caused any or all of the following consequences: • occupational injury or fatality • damage to the environment • material / production loss • loss of image
Major accident event	• A fire, explosion or other release of a dangerous substance involving death or serious personal injury to persons on the installation or engaged in an activity on or in connection with it; • Any event involving major damage to the structure of the installation or plant affixed thereto or any loss in the stability of the installation; • The collision of a helicopter with the installation; • Any event arising from a work activity involving death or serious personal injury to five or more persons on the installation or engaged in an activity in connection with it (HSE (UK))
Major failure	A conceivable incident that can possibly occur on the concerned facility, selected out of a list of reference incidents based on experience and considering or not that mitigation measures have been implemented and protection systems have operated as required (COMPANY)
Major releases	a Gas Releases EITHER Quantity released > 300 kg OR Mass release rate > 1 kg/s AND Duration > 5 minutes b Liquid Releases (Oil / Condensate / Non-process) EITHER Quantity released > 9000 kg OR Mass release rate > 10 kg/s AND Duration > 15 min's c 2-Phase Releases EITHER Quantity released > 300 kg OR Mass release rate > 1 kg/s AND Duration > 5 minutes (COMPANY)
Maximum allowable incidental condition	The maximum condition that is allowed for short duration in case of process upset leading to excursion out of the design conditions.
Maximum allowable working pressure(MAWP)/ temperature	The maximum pressure/temperature that is allowed in given exceptional conditions in accordance with an industry standard. The maximum allowable pressure/temperature is the basis for defining the set pressure/temperature of the protection system in order to not exceed this pressure/temperature.
Maximum operating conditions	The maximum pressure, temperature, flow rate, etc., in the equipment when the plant operates at unstable conditions corresponding to the high alarm set point.
Mitigation	Reduction of the effects of a hazardous event (ISO + COMPANY)