Process Safety Self-Assessment Methodology and Tool

2nd edition, 2022

TABLE OF CONTENTS

INTRODUCTION

According to the definition of the Center for Chemical Process Safety (CCPS), Process Safety is a disciplined framework applied to manage the integrity of the operating systems and processes and used to handle hazardous substances by implementing good design, engineering and operating practices. It deals with the prevention and control of incidents with the potential to release hazardous materials and/or energy. These incidents may result in toxic effects, fires or explosions and, finally, cause serious injuries, damage to property, loss of production and an impact on the environment.

In this context, and given the importance of safety and integrity in the oil and gas industry business and operations, ARPEL's Health, Safety and Environment Committee has defined Process Safety as a priority line of work. In this sense, in the last years, a series of experience-sharing activities has been organized, the CCPS cooperation agreement has been signed with the purpose of driving projects that support process safety management implementation and improvement in its associated companies.

This self-assessment methodology and tool will allow companies to measure their maturity level and their progress in terms of process safety implementation. It is aligned with and mainly based on CCPS's Risk-Based Process Safety System, but also includes other references and the experiences of oil and gas companies.

We should note that the process safety management system requires resources, training and a considerable time to be implemented, and therefore, a gradual Plan must be established.

PURPOSE

The purpose of the Self-Assessment Tool is to give oil and gas companies a useful and user-friendly tool that allows a fast identification of the gaps that a company or facility might have in terms of maturity in the implementation of a process safety management system.

Moreover, having a standardized methodology tool will allow the generation of reliable information at a regional level, as well as of a database to establish collaboration among different companies and follow up of improvements over time.

HOW TO USE IT

The tool has 21 questionnaires (one per element defined in the process safety management system) comprising a total of 252 questions (items).

Each item must be valued from 1 to 4 according to their development level:

1: Insufficient or not implemented item
2: Item under implementation
3: Item in the final implementation stage
4: Fully implemented item, continuous improvement

If the item does not apply or is not relevant to the company or facility, "NA (not applicable)" should be added, although this should occur only as an exception since these are transversal matters. The tool may be used to assess the company as a whole or at the facility level, allowing a comparison among the different Business Units.

The following factors are proposed for proper assessment of each item:

1 Insufficient or not implemented item

- Informal system lacking in context and with little documentation.

- The system written documentation is irregular and incomplete, and there is little coordination or correlation among goals, programs and plans.

- Staff members respond to the most immediate and pressing needs in a "put-out-fire" mode, which results in decisions based on "urgent" topics.

- The effectiveness of existing programs depends on one or two "key" persons. If these "key" persons leave, so does an important part of the program and institutional knowledge. (Dependent culture).

- "Barriers" or protection layers are not clearly defined.

- Compliance with existing documentation is weak – available records are scarce and/or not used.

- The organization does not show the ability to learn from its own experiences.

2 Item under implementation

- Informal system with some established programs.

- The system written documentation is regular and almost complete.

- There is some coordination or correlation among goals, programs and plans.

- There are some available records, but they are not used for analysis or accountability purposes.

- The organization shows evidence of understanding the major hazards and risks at its facilities. Risks are studied but not sufficiently analyzed, disclosed and/or considered in the decision-making process. The techniques applied are not enough to show the minimum legal compliance required.

- There is evidence of informal "operational discipline" practices. Some aspects of the "organizational culture" are informally recognized.

- There are some available records, but they are not used for analysis or accountability purposes.

- There are ad hoc efforts or areas where the element is under development, but works in an "isolated" fashion, and is not systemic (pocket of excellence).

3 Item in the final implementation stage

- Formal system with a high number of established programs.

- The system written documentation is regular and complete.

- There is medium to high coordination or correlation among goals, programs and plans. There are enough records and collecting and analyzing them is common practice.

- There are formally established programs.

- Protection actions are defined and maintained, although there is little effectiveness analysis. The required demand of implementation resources is understood, even if the practice has not been formalized.

- The organization has performance indicators that are sufficiently analyzed and/or used in management; however, the assessment of their enforceability is not sufficient or regular.

- There is a strong perception of the "risk-based approach", although it is not yet intrinsic to each decision nor fully part of the organization's "safety culture".

4 Fully implemented item, continuous improvement

- Formal system with all programs established.

- The system written documentation is regular and complete.

- The facility sets goals and objectives and formal Process Safety Management (PSM) programs and plans, and there is high coordination or correlation among them. The organization continuously performs progress follow-up and has formal "continuous improvement" systems as part of its common practice.

- Documentation and records are available and used for analysis and/or accountability purposes in a "generative" manner.

- Most organization decisions on safety matters are risk-based and are a standard behavior within its "safety culture".

- The facility has a regular self-assessment program involving third-party experts and internal personnel.

SELF-ASSESSMENT PROCESS

Once the maturity level for each item is established in the assessment scale, the value for each element, pillar, may be weighed, whether partially (according to the critical elements or key items selected for each assessment type) or totally, as applicable to the self-assessment process. Additionally, the organization may establish gap-closing or maturity-level-improvement actions and use the percentage scale considered convenient to value progress, carrying the average value obtained in percentage %, with 100% being an average value for 4: Fully implemented item, under continuous improvement.

The following flow chart describes the self-assessment process.
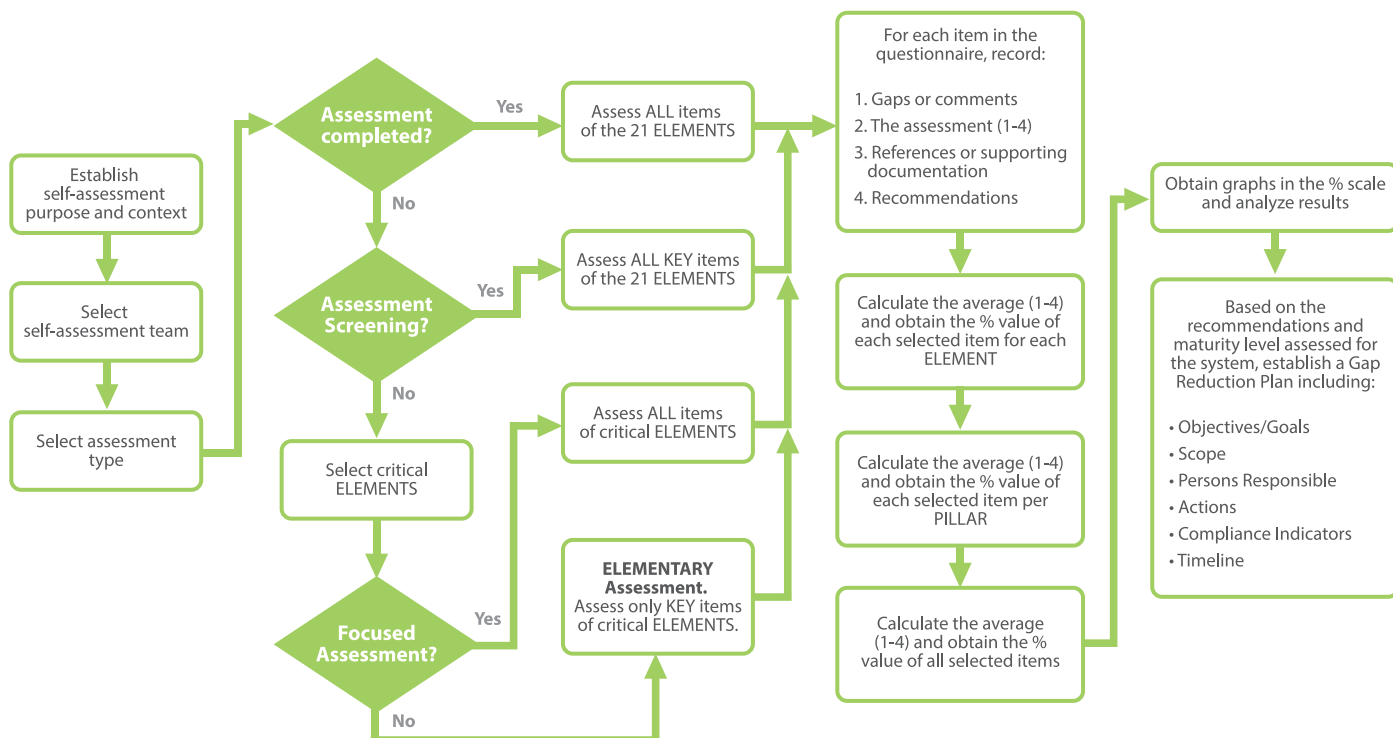
ASSESSMENT TEAM

The success of the self-assessment process fully depends on the system proposed for execution and mainly on the work team that will carry out the activities. All or some of the (critical) elements should be jointly reviewed with more than one player (for instance, with a maintenance group) to avoid discrepancies and the need of a subsequent validation.

In addition to having skills and knowledge on specific areas, the selected persons must usually be professionals with experience in the different disciplines required for the self-assessment of each

element and must form a team where all members supplement and complement each other's strengths and weaknesses.

Additionally, it is recommended that the assigned professionals should have proper technical knowledge of over 5 years or 2000 accumulated man-hours working in process-safety activities in the oil & gas industry, experience in academic and coaching activities, and the ability to communicate using simple vocabulary to facilitate understanding, master pace and keep a relationship of continuous and open dialog that encourages workers' involvement. The company shall form a team of formal and natural leaders that will integrate mainly 4 factors: Experience, Proper authority level with the ability to manage resources, Know-how and commitment and Clarity in the mission. The Leader or Coordinator of this multi-

disciplinary team shall be chosen from representatives from different areas (Engineering, Integrity, Safety, Operations and Maintenance, etc.). The team may have an internal or external advisor that will provide proper guidance throughout the process implementation. The assessment quality is directly proportional to the knowledge and experience of the assessment group members.

The team shall document and establish their action procedures, including:

• **Definition of roles and responsibilities**

• **Action Rules**

• **Communication mechanisms**

• **Document control; Reports and formats**

• **Accountability mechanisms**

The individuals selected must have at least the following skills

• **Broad knowledge of the matter with at least 5 years of experience or 2000 accumulated man-hours in process-safety activities in the Oil & Gas industry.**

• **Proper facilitation methods.**

• **High professional level.**

• **Ability to generate an involvement "climate".**

• **Interpersonal communication skills.**

• **Group management with modern and dynamic methods and processes.**

• **Assertive language.**

DATA COLLECTION

The assessment activities will include data collection activities such as:

• **Review of all process-safety procedures and policies.**

• **Review of support documents.**

• **Interviews with the facility personnel (to be defined, at least three individuals per facility).**

• **Vertical and horizontal assessments to determine critical and outstanding points.**

• **The vertical assessment involves assessing each individual Process Safety element, ensuring that the facility has implementation procedures and practices for each element to guarantee an effective implementation of all requirements in the involved standards.**

• **The horizontal assessment will allow the evaluation of how the different elements are integrated to determine the overall quality and efficiency of the implemented PSM system.**

STAFF INTERVIEWS

Interviews to key personnel are an important part of this process. They will be properly conducted according to the following protocol:

AT THE BEGINNING:

- At the beginning of the interview, the interviewer should devote a few minutes to explain the reason for such interview.
- The interviewer should explain the interviewee the importance of his/her cooperation during the self-assessment.
- To obtain the best results from the interview, the interviewer should start by making general questions whose answers allow a comprehensive view of the topic dealt with and the opportunity to identify the area or activity in which the interviewee is more involved.
- The interviewer must know the terms, idioms and acronyms used in the organization in advance.

DURING THE INTERVIEW:

- The interviewee should feel that he/she is being understood and is not being judged or criticized to stay motivated with the subject-matter of the interview.
- Interviews should focus on the expected topic/s and keep unrelated comments and conversations to the minimum.
- Answers should not be hurried. Sometimes, the interviewee should and needs to have the reasonable time to think about his/her answers.
- External and internal interruptions or distractions should be limited as much as possible.
- The interviewee's description of events should be differentiated from his/her personal opinion.
- The interviewee should never be contradicted. Instead, if the interviewer does not agree, he/she should use methods to turn a disagreement into an exchange of ideas.

ELEMENTS OF THE PROCESS SAFETY MANAGEMENT SYSTEM

The following 21 elements of the Process Safety Management System were defined and divided into 4 pillars, essentially following the CCPS Risk-Based Process Safety Management System (RBPS) model and adding the Q Element "Facility Engineering, Procurement, Construction and Delivery".

All elements that ARPEL considers critical to process safety management are highlighted in red; however, the Organization may select another critical Element that is more relevant to their operations.

PILLAR I
LEADERSHIP AND CULTURE

A. Process Safety Culture

B. Compliance with Standards

C. Process Safety Competency

D. Workforce Involvement

E. Stakeholders Involvement

PILLAR II
RISK IDENTIFICATION AND ANALYSIS

F. Process Information and Documentation Management

G. Hazard Identification and Risk Analysis

PILLAR III
RISK MANAGEMENT

H. Operating Procedures

I. Safe Work Practices

J. Asset Integrity and Reliability

K. Contractors Management

L. Training and Performance Assurance

M. Management of Change

N. Operational Readiness

O. Operational Discipline

P. Emergency Management

Q. Facility Engineering, Procurement, Construction and Handover

PILLAR IV
ASSESSMENT AND CONTINUOUS IMPROVEMENT

R. Incident Investigation

S. Measurement and Management Indicators

T. Audits

U. Management Review and Continuous Improvement

The organization will consider the following parameters and/or factors for the selection of a critical element:

- Risk in the process and identification of the main scenarios
- Event statistics in processes classified as TIER-1, TIER-2, TIER-3 and TIER-4
- Analysis of the organization opportunities, threats, vulnerability and strength
- Current legal requirements

ELEMENT AND ITEM CRITICALITY

Given their relevance to the implementation of a process safety management system and the risk management, the following elements were defined as critical:

B. Compliance with Standards (Pillar I)
G. Hazard Identification and Risk Analysis (Pillar II)
J. Asset Integrity and Reliability (Pillar III)
M. Management of Change (Pillar III)
N. Operation Readiness (Pillar III)
R. Incident Investigation (Pillar IV)

All the pillars have at least one critical element, and Pillar III, Risk Management, is the only one that has 3 critical elements given the high number of elements in it. The organization may choose critical elements that differ from those proposed, according to its own criteria. For this purpose, it will consider the following factors:

CRITICAL ELEMENT

Selection Factors

- Facility complexity level.
- Stakeholders' requirements (if more are to be selected, continue selecting element B in Pillar I).
- Internal requirements.
- Organization goals and objectives.
- Risk level and association to the elements (based on their strengthening for risk reduction purposes).
- Incident statistics and their relation with the elements.

ASSESSMENT TYPES

4 types of assessments have been defined, with different analysis depths.
They are structured around the elements defined as "critical" and the items defined as "key", which will be found in the corresponding questionnaires of each element and will be highlighted by shading.

Assessment Type	Description	Elements	Ítems	Total Elements	Total Items (questions)
Elementary	It allows a basic and quick system assessment of only the basic (critical) elements using key items. It may be used for a preliminary assessment.	Critical	Key	6	31
Focused	It allows a focused assessment of key elements using all their items. It may be used for an assessment with a higher level than the elementary one.	Critical	All	6	89
Screening	Essential assessment of all elements using their key items. It allows a general view of the system.	All	Key	21	90
Complete	It allows a thorough assessment of the system using all the items of the 21 elements. This is the assessment that demands the most time and human resources.	All	All	21	252
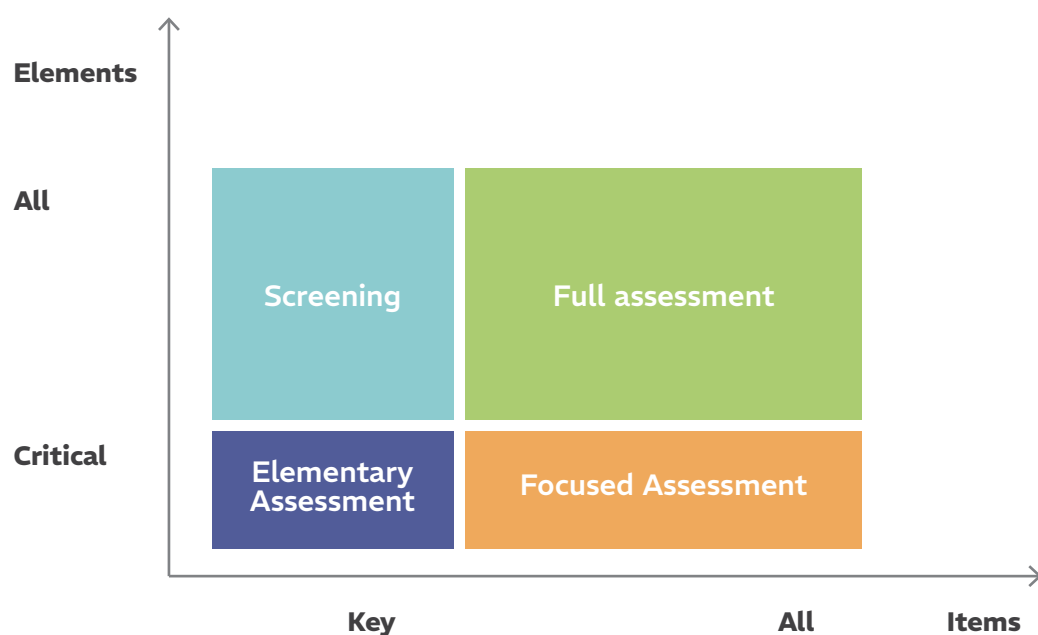
RESULTS

To facilitate the use of the tool and view of the results, an Excel book has been created to allow an easy response to questionnaires and the automatic generation of graphs and reports.

The results of an element's development level are calculated as the simple average of the levels assigned to each item.

The results of the total assessment are the simple average of the assessed elements.

Although the calculation is a simple average (i.e., no specific weight is assigned to the critical elements or key items), discriminated results are shown for the total and for critical elements or key items.

The Excel shows the results through radar charts and in a summary chart. The corresponding Annex shows examples of the outputs.

RECOMMENDED INDICATORS

A series of indicators is recommended for implementation and company performance follow up in each element.

These are suggested indicators and are listed only for illustrative purposes, as company guidelines.

However, a good self-assessment result must be consistent with a good outcome in these indicators.

This list is not exhaustive or restricted, and there may be other indicators relevant for a specific company that are not included in the proposed set of indicators.

In all cases, proactive indicators have been suggested to depict the reality of a company regarding one particular process safety element, thus anticipating future events.

The recommended indicators are listed in the corresponding annex.

LIMITATIONS

Since this is a qualitative self-assessment tool, the first limitation relates to the subjectivity in the answers and the expectations and demands of each assessor.

Therefore, a comparison among different companies and the evolution follow-up over time is also marked by this subjectivity, although it is not a fully invalidating fact.

In subsequent reviews of the tool, more unified and explicit criteria will be sought to achieve more objective and comparable assessments.

Moreover, the possibilities of an assessment in each facility type -from Upstream to Downstream- as well as question applicability need to be established.

The use of the self-assessment tool may be limited, among other factors, by:

- **Difficulty to gather the "ideal team" and schedule assessment times; the larger or more complex the facility –or the higher the risk–, the higher number of persons from different disciplines it may require.**

- **In times of deep "organizational" changes, it may be difficult to achieve optimal results.**

- **For new projects or in case of scarce information.**

- **During regulatory changes.**

- **Prior to facility start-up.**

APPLICABILITY OF RESULTS

The assessment results may be applied to a specific strategic Action Plan to reduce the "gaps" found. The strategic approach of the Risk-Based Process Safety – RBPS recommended by AIChE's CCPS is based on the principle that adequate detail levels and rigorous PROCESS SAFETY practices are built on three factors:

1. A broad and sufficient understanding of the risk associated to the processes on which the process safety practices are focused.

2. The demand level of process safety work activities compared to available resources.

3. The process safety policy and culture on which the process safety practices will be implemented.

Now, the implementation methodology would be based on establishing a typical functional life cycle using these factors, pursuant to the mechanisms of usual standards such as ISO-9001, including:

1. Design a PROCESS SAFETY MANAGEMENT system,

1. Manage and correct the PROCESS SAFETY SYSTEM,

1. Improve PROCESS SAFETY MANAGEMENT practices.

Therefore, the proposed action plan would be linked to these three (03) main factors, giving the process "continuity" with the three above-mentioned steps. And this includes performing an assessment or "gap analysis" between the current company system (existing processes and procedures) and the system to be implemented. This particular phase is the scheme approach or work framework in this Self-Assessment Guide.

The process must be consistent with the cycle:
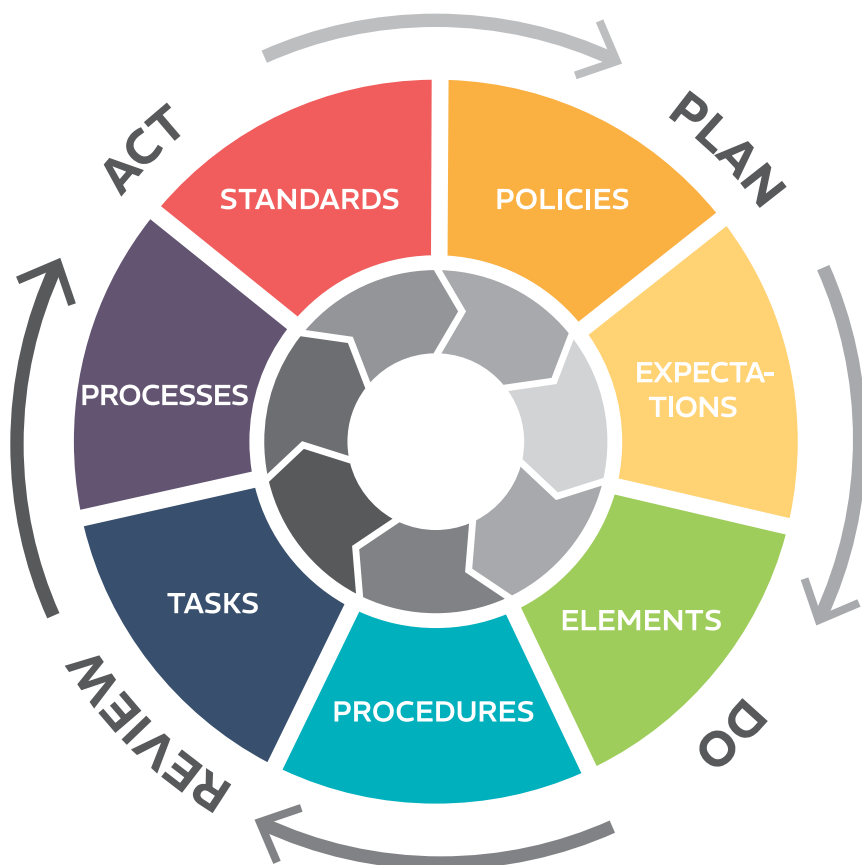
ANNEX I:
QUESTIONNAIRES

Following are the questionnaires corresponding to the 21 elements. The key items for each element are highlighted in pink

Pillar I:
Commitment to Process Safety

Element A: Process Safety Culture

Critical element according to ARPEL Methodology Assessment Types: NO

Description:

This element basically attempts to drive a consistent context (rooted values, effective communications, leadership focused on risks and practices and aligned processes) that influences collaborators' behaviors to consolidate PROCESS SAFETY within the organization. The leader role is key to the culture development; he/she leads with example, favors inter-disciplinary work and message alignment and provides a continuous improvement frame to the management.

This element is one of the cornerstones of PROCESS SAFETY MANAGEMENT, because it leverages the commitment required from the organization to manage risks and directly affects the implementation quality of the other elements, since it facilitates their development and adoption.

Minimum required information

- Organization policy
- Organization Management System Manual
- Specific "organizational safety culture" measures/studies performed
- Worker Participation programs
- Internal Communication procedure
- Personnel Skills procedure
- Senior Management Reports
- Personnel training and/or awareness procedure
- Organization KPIs
- Incident/Accident Reporting procedure
- Functions Manual

PILLAR	ELEM	#	CODE	ITEM
I	A	1	IA1	The organization has documented processes and practices to manage the safety culture led by the Senior Management. There is a well-known reference framework that supports the organization's safety culture management.
I	A	2	IA2	Management processes and practices (including participation programs, among others) ensure the involvement of all collaborators and the development of their leaders to continuously raise awareness of PROCESS SAFETY, ensuring a "two-way" communication that contributes to the promotion of a "mature" safety culture.
I	A	3	IA3	There are processes that drive the development of leadership skills focusing on: inspiring /generating sense, making risk-based decisions, spreading values in their communications, ensuring the required resources and leading with example.
I	A	4	IA4	The organization has established reflection spaces and practices to incorporate the behavioral patterns already identified in company and industry incident analyses as well as a regular review of indicators that seek to maintain the sense of vulnerability, challenge good results and spot system weaknesses that might reduce the likelihood of unwanted events.
I	A	5	IA5	Collaborators are involved, developed and empowered in relation with PROCESS SAFETY MANAGEMENT, its elements and programs based on a clear definition of roles and responsibilities in each area/ department, and key positions and a group, department or discipline responsible for each safety management process are identified within the organization to ensure, maintain and improve the technical and management skills required to enforce them.
I	A	6	IA6	The Senior Management is involved in the review (by attending call-ins), monitors PROCESS SAFETY MANAGEMENT status and progress and considers safety as a key and non-negotiable value to be consistently transmitted to all the levels.
I	A	7	IA7	There are formal and effective communication channels that ensure the continuous presence of PROCESS SAFETY MANAGEMENT in all organization levels.
I	A	8	IA8	Leaders normally "challenge" the standardization of deviations, thus promoting a continuous learning and mutual trust environment, facilitating continuous and timely reporting of deviations, non-conformities, incidents and/or unwanted events, without personal consequences, ensuring the quality of investigations and sharing own and industry lessons learned in and out of the organization, and must apply the task suspension philosophy as the last barrier, regardless of the hierarchical level. In addition, they promote operational discipline (do the right tasks in the right way) as a working methodology at all times.
I	A	9	IA9	Leaders promote dynamic interactions with a high degree of "visibility", prioritizing teamwork for proper decision-making, based on the understanding of PROCESS SAFETY management.
I	A	10	IA10	Actions have been made to promote a high level of continuity for site managers and other leadership levels, with key roles in the facility's PROCESS SAFETY MANAGEMENT system.

Pillar I:
Commitment to Process Safety

Element B: Compliance with Standards

Description:

Compliance with relevant standards, codes, regulations and laws is a system used to identify, develop, procure, assess, communicate and keep a file containing standards, codes, regulations, RAGAGEPs and laws affecting PROCESS SAFETY. The system includes national and international and internal and external standards, as well as local, regional and national laws.

An additional key factor is the easy availability and broad communication of compliance-related needs, with a clear identification of all associated responsibilities. It must have an administrative support allowing review, update and regular communication of new and/or reviewed regulations.

Minimum required information:

- Legal requirement identification and assessment procedure
- Legal Requirement Matrix
- Incident/Accident Reporting procedure
- Reporting of Suggestions and Improvement Opportunities procedure
- Change Management procedure
- Internal Communication procedure

PILLAR	ELEM	#	CODE	ITEM
I	B	1	IB1	The organization is committed to ensuring compliance with all established standards and legal requirements, and there is formal evidence thereof, such as: audit/assessment results, identification and/or update of standards and legal requirements, communication of applicable regulations/standards, etc.
I	B	2	IB2	There is a methodology, procedure or system that helps to properly identify, interpret, communicate, apply, monitor/assess, update and keep all legal requirements, codes, industry standards, local practices and any other document required and applicable to asset management and projects, and to the design, operation and maintenance of the processes and equipment included in the PROCESS SAFETY management system.
I	B	3	IB3	The organization has reliably communicated and documented the standards and legal requirements that must be complied with by stakeholders and are fully available to everybody.
I	B	4	IB4	The standards and legal requirements established by the organization are known, applied and understood by all its members.
I	B	5	IB5	The organization has formally established internal accountabilities regarding compliance with legal and other applicable requirements in the Safety Policy, position profiles, management procedures for applicable standards or legal requirements and/or any other document.
I	B	6	IB6	The organization has a change control and deviation management system, analyzes the results obtained from the assessed compliance with established standards and practices, and plans and applies any corresponding improvement actions.
I	B	7	IB7	The organization communicates all updates and/or changes applied on the established standards, and on legal and other applicable requirements to its members and stakeholders.
I	B	8	IB8	The impacts of changes on the established standards and on legal and other applicable requirements are analyzed.
I	B	9	IB9	The period to perform the review and/or update of internal standards has been defined.
I	B	10	IB10	There is a methodology to ensure there will be no superseding or redundant standards to be complied with, and that they will be aligned with the existing management programs in the organization.

Pillar I:
Commitment to Process Safety

Element C: Process Safety Skills
Critical element according to ARPEL Methodology Assessment Types: NO

Description:
This element combines three essential actions:
(1) Continuous improvement of knowledge and skills
(2) Ensuring that proper information is available to all people requiring it
(3) Consistently applying the topics learned.

The main PROCESS SAFETY product is a proper understanding and interpretation of knowledge so that the organization can apply such knowledge to make more informed decisions and increase the likelihood of taking proper actions when the personnel face abnormal situations.
This element seeks to ensure proper personnel skills in connection with PROCESS SAFETY to strengthen and consolidate a preventive and risk-control culture through the diagnosis and definition of gaps in workers' skills, as well as by planning, running and measuring the effectiveness of PROJECT SAFETY training plans.

Minimum required information:

- Staff position profiles

- Personnel Skills Matrix

- Training plans and programs for company and contractor's personnel

- Staff assessment, selection, location and development procedure

- Preliminary studies or diagnoses focused on identifying and detecting training needs in PSM and the RACI Matrix

- Critical Knowledge Maintenance Program

PILLAR	ELEM	#	CODE	ITEM
I	C	1	IC1	Profiles of technical, management and social skills in PROCESS SAFETY are defined for each position.
I	C	2	IC2	Within the organization, a group, department or discipline has been identified, which is mainly responsible for maintaining and improving PROCESS SAFETY skills.
I	C	3	IC3	There is a documented personnel assessment, selection, location and development process that ensures the PROCESS SAFETY skills required to fill the different positions.
I	C	4	IC4	The organization uses structured methods to assess the PROCESS SAFETY skills, and these methods help the organization to identify gaps and focus on training plans.
I	C	5	IC5	An annual company personnel training plan is created, carried out and recorded to close all identified gaps.
I	C	6	IC6	Contractors are requested to carry out and record a training plan that provides the required PROCESS SAFETY skills to their personnel.
I	C	7	IC7	The organization has developed a strengthening and consolidation program for the required PROCESS SAFETY skills. Promoting activities that help the organization to create, procure, interpret, transfer and retain knowledge.
I	C	8	IC8	A technology administrator has been assigned to each process type in order to monitor changes to the investigations and codes that are relevant to the processes and the PROCESS SAFETY that requires new knowledge and/or the increase of related skills.
I	C	9	IC9	There is a documented process to plan personnel succession throughout the organization by means of a program aiming at maintaining the organization critical knowledge and PROCESS SAFETY skills during transitions and improving them over time.
I	C	10	IC10	In addition to Technical Skills, the skill assessment methods applied by the organization cover Behavioral/Social Skills and Individual Skills.

Pillar I:
Commitment to Process Safety

Element D: Workers' Involvement
Critical element according to ARPEL Methodology Assessment Types: NO

Description:

This element seeks to establish mechanisms to allow active worker and contractor participation in the design, development, implementation and continuous improvement of the PROCESS SAFETY management system.

Involving workforce in a two-way communication allows workers to access the information they need to perform their tasks, including a detail of their roles in the implementation of the PROCESS SAFETY Management System and, similarly, their involvement helps to strengthen a PROCESS SAFETY culture by contributing with the knowledge gained from experience.

Minimum required information:

- Organization policy
- Worker Participation programs
- Internal Communication procedure
- Hazard Identification and Process Risk Analysis procedure
- Reporting of Suggestions and Improvement Opportunities procedure

PILLAR	ELEM	#	CODE	ITEM
I	**D**	**1**	ID1	The organization has a high-level document (e.g., policy) that promotes workers' involvement in PROCESS SAFETY related topics.
I	D	2	ID2	Management processes and practices (including participation programs, among others) ensure the involvement of all collaborators and the development of their leaders to continuously raise awareness of PROCESS SAFETY, ensuring a "two-way" communication that contributes to the promotion of a "mature" safety culture.
I	D	3	ID3	The organization promotes an active participation of workers, particularly "key" personnel with experience in/knowledge of the facilities and processes, the performance of hazard identification and process risk analysis studies, and the development, implementation and continuous improvement of operating procedures and critical documentation, as well as other PROCESS SAFETY MANAGEMENT system elements.
I	D	4	ID4	A system to suggest improvements to quality, safety and operational conditions has been implemented to encourage workers to report suggestions and improvement opportunities.

Pillar I:
Commitment to Process Safety

Element E: Stakeholders' Involvement
Critical element according to ARPEL Methodology Assessment Types: NO

Description:

The purpose of the element is to enable a process to identify, involve and maintain good relations with internal and external groups involved in the success of PROCESS SAFETY programs. This takes place through the establishment and execution of policies, programs and activities to provide information to the stakeholders linked to the activities in the PROCESS SAFETY Management (PSM) and Emergency Response programs in the facilities, and through the request of feedback to determine if the efforts made to share these policies, programs and activities with Stakeholders are effective to keep a positive insight and a sense of trust regarding risks, the PROCESS SAFETY Management program, the emergency response plan and performance in the facilities.

The first objective of this element is to establish a dialog with the key players that might be affected by facility operations, particularly during an incident. This includes members of the community, other neighboring industries, emergency response groups (firefighters, police, civil defense, etc.), Government officials, non-governmental agencies or community service groups.

Minimum required information:

- Stakeholder identification matrix

- Training plans and programs addressed to stakeholders

- External Communication procedure

- Commitment to Stakeholders Matrix

- Community Relations Policy

- Simulations Program

- Round table procedure or other mechanisms

PILLAR	ELEM	#	CODE	ITEM
I	E	1	IE1	The stakeholders that must receive PROCESS SAFETY communications and information and training on emergency responses have been identified.
I	E	2	IE2	The scope of the PROCESS SAFETY communication and emergency preparedness and response activities has been defined to communicate the actions made by the organization to protect the environment, and the community health and safety.
I	E	3	IE3	Proper PROCESS SAFETY communication/sharing, and emergency preparedness and response activities are carried out, in connection to which proper communication mechanisms have been identified, the right communication tools have been developed and a relevant communication mechanism is kept with stakeholders.
I	E	4	IE4	There is a follow-up system for agreed commitments and actions. Commitments to stakeholders are met and feedback is received. Stakeholders' concerns are shared with the organization's Senior Management and all communication meetings are documented.
I	E	5	IE5	The involved managements have developed, documented and implemented an organization policy that recognizes Responsible Care and has been communicated to employees and stakeholders, including the public, thus promoting openness and transparency.
I	E	6	IE6	The organization has/participates in or supports a risk-prevention training program. External and internal emergency response groups and the public (firefighters, police, civil protection or risk management body, medical emergencies, community, etc.) receive the proper information on the hazards in the facilities and the products handled, how to behave in the event of an accident and how to control and mitigate risks, protecting the community and their own lives.
I	E	7	IE7	The organization provides specific equipment, human and/or economic resources to collaborate with community emergency awareness and preparedness projects, including training, exercises and simulations involving the stakeholders (emergency response groups, other organizations, the public).
I	E	8	IE8	The organization has established and maintains a system to assess stakeholders' concerns in connection with the risks, safety, reliability and environment of the facilities.
I	E	9	IE9	The organization regularly assesses the effectiveness of their stakeholder communication programs by means of surveys, door-to-door visits, regular meetings with the different groups and the general public or other methodologies. The feedback provided by stakeholders is used to change and improve the communication programs at the facilities.
I	E	10	IE10	The organization is an industrial leader in PROCESS SAFETY MANAGEMENT, takes leadership roles in organizations devoted to or focused on safety (CCPS-NFPA-ARPEL-IOGP, etc.), and promotes and develops programs to share learning experiences and results with stakeholders.

Pillar II:
Risk Identification and Analysis

Element F: Process Information and Documentation Management

Critical element according to ARPEL Methodology Assessment Types: NO

Description:
Process Information and Documentation Management is understood as the management system for technical information that is critical to the operation, its understanding, access, update and protection. Critical information means the information that may easily be recorded in documents, such as written technical documents and specifications, process design bases, process equipment design, manufacturing and installation specifications and other written documents such as Safety Data Sheet (SDS), technical specifications for the tools and equipment to be used, etc.

The main purpose of this element is to keep accurate, current, complete, understandable and authorized information to be used or accessed on demand and includes work activities to guarantee that the information remains updated, current and accurate, is stored in a way that enables recovery and may be accessed by the employees that require so to perform their process safety related tasks.

Minimum required information

- Process Information and Documentation Management procedure
- Process critical documentation (P&ID's, MSDS, plans, codes, standards) maintenance procedures
- Functions Manual
- PSSR procedure
- Equipment operation manuals
- Information Back-Up procedure

PILLAR	ELEM	#	CODE	ITEM
II	F	1	IIF1	There is a corporate policy or guideline for the process information and documentation management procedure.
II	F	2	IIF2	The organization has a relevant technical information system for PROCESS SAFETY and other management system elements where critical documents associated to process knowledge management are stored and/or recorded (including lessons learned and access to incident investigation reports). This system is available to and easily accessed by all workers, who fully understand how to use it (for the purpose of communicating the associated hazards and risks). The process technology information will include, at least: • A simplified block diagram or flow chart • Process chemistry • Maximum Inventories • Maximum and minimum safe operating limits • Construction materials • Piping and Instrument Diagrams - P&ID • Electrical Classification • Pressure-Relieving systems • Cause-effect diagrams • Descriptive memories, operation/maintenance manuals operation, control and/or safety philosophies or narratives. • SCE information • The design codes and standards used
II	F	3	IIF3	There is a structure of persons in charge of managing and updating the document management system, who have the resources required.
II	F	4	IIF4	The organization has a formal documentation process, and facility delivery requirements are defined to guarantee the minimum information to be effectively delivered to the operations, maintenance and other critical workers, as part of the start-up - PSSR (and commissioning) of new facilities or during changes to existing facilities, including design bases and criteria, inspection plans and maintenance, training, procedures, etc.
II	F	5	IIF5	A manual has been created and is regularly updated to include the facilities' minimum technology information and critical documentation required for operation and maintenance of the assets documented in the process history, as well as the critical knowledge to maintain PROCESS SAFETY skills.
II	F	6	IIF6	There is a document control system for information classification and categorization purposes and the purpose of establishing the criticality and frequency of technical document updates.
II	F	7	IIF7	The regular review and update process for critical information (operational procedures, safe work practices, etc.) promotes the active involvement of key process personnel to preserve the experience in the practical application of process knowledge.
II	F	8	IIF8	There are mechanisms to prevent unauthorized file changes and maintain traceability of accesses and changes.
II	F	9	IIF9	There are mechanisms against loss of information (back-up).
II	F	10	IIF10	Critical information is regularly reviewed and updated at the frequency defined by the organization in an information system, to validate its execution, preserve its history and traceability, and ensure that all the persons work with updated document versions.

Pillar II:
Risk Identification and Analysis

Element G: Hazard Identification and Risk Analysis

Critical element according to ARPEL Methodology Assessment Types: YES

Description:
The "Hazard Identification and Risk Analysis" (HIRA) element focuses on the analytical process to identify hazards and assess process risks throughout their life cycle to ensure that risks to employees, the public or the environment are systematically controlled within the organization risk tolerance. It attempts to answer the following questions: What can go wrong? What will be the impacts? How likely is it to happen? This element is one of the cornerstones of the PROCESS SAFETY MANAGEMENT, since it provides critical information to all the elements in the management scope.

Minimum required information:

- Process Information and Documentation

- Hazard Identification and Risk Analysis procedure

- Risk tolerance and/or acceptability criteria matrix allowing the setting of risk types and their hierarchies according to their importance.

- Hazard Identification and Risk Analysis Matrix

- Safe Work Practices procedure

- Reporting of Incidents/Accidents and Improvement Opportunities procedure

- Incident/accident statistics

- Inspection, Testing and Maintenance (ITM) Management procedure

- Risk report for external audiences and stakeholders.

- Hazard and Risk and/or similar Studies

PILLAR	ELEM	#	CODE	ITEM
II	G	1	IIG1	The organization has systematized risk management guidelines/ procedures. It maintains uniform practices, well-established technical guides, risk assessment and acceptability criteria.
II	G	2	IIG2	The risk assessment, valuation and acceptability criteria are standardized, accepted by the entire organization and duly documented, updated and communicated. It considers impacts to the personnel, population, environment, financial assets and liabilities or other categories of interest to the company.
II	G	3	IIG3	The analysis tools and techniques are defined, are fit for the facility complexity, impact and type, and are added to the best risk management practices. Hazards, risk scenarios and their potential causes and consequences are clearly identified (considering their potential impacts on stakeholders), and so are the critical prevention and mitigation barriers and their efficiency. Moreover, the analysis includes the human, organizational and technology factors. A broad spectrum of external threats is considered, such as natural phenomena, third-party actions (whether industrial or not), cybersecurity, etc.
II	G	4	IIG4	Facility conditions and organizational aspects are considered in the risk analysis during the assessment of the effectiveness of safety critical barriers/elements - SCEs (facility integrity, years of operation, maintenance performance, organizational structure for integrity and maintenance management, etc.).
II	G	5	IIG5	Incident statistics for the unit/facility and other related indicators are one process risk analysis variable.
II	G	6	IIG6	The organization Management regularly receives operation risk reports and supports the resolution of recommendations to manage them. There is a report to the Senior Management for intolerable risk levels. Reports are standardized and formats are controlled.
II	G	7	IIG7	The processes' risk identification and assessment process includes competent, interdisciplinary personnel with proven experience in the operation and process. The organization consisting of more than one facility has a Process Risk Analysis Expert Network, responsible for the development of internal regulations on this matter and for the technical support to the creation or update of process risk analyses or third-party supervisions during these tasks.
II	G	8	IIG8	The required times and resources are assigned to the review processes, including risk analysis studies (e.g., HAZOP, HAZID, QRA, etc.) involving different specialties.
II	G	9	IIG9	Internal or third-party leaders of risk analyses and studies are previously evaluated to guarantee their technical skills for risk analysis creation or update by means of any kind of homologation/approval system. The independence in the risk analysis creation or provision must be ensured, regardless of the facility or project complexity.
II	G	10	IIG10	The risk management cycle (identification, assessment, management) is fully implemented at the unit/facility with reviews/revalidations with a frequency to be defined and regular controls, in order to identify changes to the risk levels.
II	G	11	IIG11	A system has been established to quickly deal with the team's findings and recommendations. There are well defined heads for improvement actions, and follow up to their implementation is performed, with the required resources assigned according to their impact on risk reduction.

PILLAR	ELEM	#	CODE	ITEM
II	G	12	IIG12	All phases of the asset/facility life cycle and engineering stages (Conceptualization, Project, Construction, Start-up, Operation, Stops, Abandonment and/or Decommissioning) are systematically analyzed (risks are properly identified and prioritized) and considered in the risk management with adequate tools and processes, establishing the studies, techniques, methodologies (including inherently safe design criteria) and detail level required to identify hazards and risk assessment, such as MAHID, HAZID, HAZOP, LOPA, QRA, WHAT IF, FMEA, etc.
II	G	13	IIG13	The areas or organizations (operation, technical, maintenance, integrity, etc.) use risk studies for decision-making purposes (including operation, testing, inspection, maintenance, construction, design, new projects and/or investment activities). The organization uses risk studies to determine ITM (Inspection, Testing and Maintenance) activities, considering risk reduction, performance, compliance and sustainability aspects (e.g., RBI, FMEA, RCM, etc.) and the incorporation of other applicable tools, methodologies and/or systems. These risk studies are a dynamic and updated document with concise, practical and available consultation information to develop controls on other elements in the PROCESS SAFETY management system.
II	G	14	IIG14	The barriers or protection layers (SCEs) are known and properly managed to ensure their availability and reliability, are integrated to the site asset integrity program and consider Inspection, Testing and Maintenance (ITM) management, risk reduction, performance, compliance and sustainability.
II	G	15	IIG15	Critical operations or tasks are analyzed for hazards during their development, and there is a task prioritization process based on the criteria duly established in risk analyses.
II	G	16	IIG16	Reviews by third parties, such as partners, regulatory entities, insurance companies, Non-Profit Organizations, etc., are systematically considered for the purpose of adding improvements in connection with the control of major events,
II	G	17	IIG17	There are adequate risk reports for external audiences and stakeholders.

Pillar III:
Risk Management

Element H: Operation Procedures

Critical element according to ARPEL Methodology Assessment Types: NO

Description:

The operation procedures are written instructions (printed and electronically stored documents) containing approved methods to operate the processes included in the PROCESS SAFETY program. These methods include the steps needed to perform the required operations, as well as the necessary supplementary information to perform the operations safely. Well-written operating procedures describe the process, risks, tools, personal protection equipment and controls in sufficient detail to allow operators to understand the hazards, verify that controls are enforced and confirm that the process works as expected. Additionally, procedures may describe abnormal conditions and the operations that occur under these conditions, including the emergency shutdown and when/how to use it.
Procedures guarantee risk control and the execution (in an efficient and safe manner for workers, facilities and the environment) of all the activities required in each process phase, including both standard and startup, stop and emergency operations.

Minimum required information

- List of operational procedures
- List of Safe Work Practices procedures
- Personnel training and/or awareness procedure
- Incident/accident investigation procedure
- SCE (safety critical equipment/elements) management and use procedure
- Structure of operational procedures

PILLAR	ELEM	#	CODE	ITEM
III	H	1	IIIH1	The organization has duly documented operational procedures or management standards for all routine and temporary operations in the following situations: • Pre-startup • Temporary shutdowns • Emergency shutdowns • Total blackout • Total loss of critical instrumentation system • Plant shutdown • Plant turnarounds (with or without changes) • Long shutdowns (with or without changes), for example, due to commercial reasons. • Startups • Process and operating emergency situations (including those caused by loss of auxiliary services –utilities.
III	H	2	IIIH2	There is a standard methodology for the creation of operational procedures.
III	H	3	IIIH3	Operating procedures consider the necessary steps to correct or prevent operating deviations.
III	H	4	IIIH4	Operating procedures cover the safety actions required to perform tasks safely: Blocking and Labeling, Access to Confined Spaces, Work at Height, etc.
III	H	5	IIIH5	Operational procedures are available and may be easily accessed by the personnel involved according to their roles and responsibilities.
III	H	6	IIIH6	A supervised personnel assessment program is enforced and followed to check full understanding of the procedures, including field assessments of their compliance.
III	H	7	IIIH7	Any deviation from an operational procedure is investigated as an incident with potential impact on safety.
III	H	8	IIIH8	Any deviation from an operational procedure will result in applied corrective actions and disclosed lessons learned.
III	H	9	IIIH9	The organization has implemented special procedures for activities that might affect the facility's PROCESS SAFETY, including the proper way to carry out SCE (safety critical equipment/elements) management.
III	H	10	IIIH10	Operating procedures include a cover or approval page showing the procedure date, author and approver for use.
III	H	11	IIIH11	Operating procedures are accurate and depict the current status of the processes.

Pillar III:
Risk Management

Element I: Safe Work Practices
Critical element according to ARPEL Methodology Assessment Types: NO

Description:

This element covers the need to have a process to minimize the risks associated to all the tasks performed during the exploration, construction, operation, maintenance and abandonment activities, and the handling of materials or substances that might affect safety, the environment and asset integrity.

Safe work practices are written procedures for non-routine activities in process areas, covering a work control system carried out by means of work permits, isolation tasks, equipment de-energization, access to confined spaces, opening of process lines and equipment, load lifting activities, drilling, hot works, etc.

Due to its nature, non-routine work involves the possibility of unknown risks that have sometimes led to a catastrophic incident. Non-routine operations are operations not covered by an approved procedure, such as operation, maintenance and emergency. The enforcement of safe work practices helps minimize the potential of unknown hazards and provides adequate actions to ensure their control.

Minimum required information

- Safe Work Practices procedure
- Work Permit Procedures
- List of Safe Work Practices procedures
- Training plans and programs for company and contractor's personnel

PILLAR	ELEM	#	CODE	ITEM
III	I	1	IIII1	There is a work control system based on work permits that allows safe execution of all "non-routine" activities carried out in process areas, which consists of: identifying hazards, establishing the required preventive and control actions and checking the training of the workers that will perform the task.
III	I	2	IIII2	The work control system uses proper forms to authorize the work permit. Their processing and distribution for the purpose of informing all potentially involved parties is adequate, including a work-in-progress permit record system.
III	I	3	IIII3	All work permits include the authorization date, time and term, as well as the individuals responsible for such authorization and in charge of performing the task, plus a closure record, the authorized activity and the preventive safety and control, hygiene and environmental protection actions taken before the task was started. That is to say, all the information that is relevant for proper tracing of the work execution.
III	I	4	IIII4	The work control system has a recording and filing system for closed work permits for a period of at least 5 years.
III	I	5	IIII5	The work control system has an updated safe work practices procedure to measure the risk of exposure to hazardous atmospheres.
III	I	6	IIII6	The work control system has an updated safe work practices procedure for the following activities: • Isolation, blocking and de-energization • Annulment or disablement of critical safety devices • Access to confined spaces • Opening of process equipment or pipes • Hot works • Drilling or ditch works • Works at height • Load lifting and prohibition of activities under suspended loads
III	I	7	IIII7	Subcontractor companies' workers are tested to ensure proper training on safe work practices, including contractors in the training plan.
III	I	8	IIII8	Subcontractor companies are checked to ensure they have proper procedures on safe work practices for the activities to be performed. Otherwise, the critical procedures of the company receiving the provision shall apply.
III	I	9	IIII9	The individuals responsible for authorizing work permits and/or the execution of safe work practices have been duly trained and enabled for such roles.
III	I	10	IIII10	The organization has personnel whose responsibilities include inspection or audit of the activities performed in the process area to detect deviations from work permits or safe work practices, with sufficient resources and the authority to halt the activity when deemed necessary.
III	I	11	IIII11	Access to work locations is restricted and controlled so that nobody may access them without the corresponding authorization.
III	I	12	IIII12	Safe work practices procedures are regularly reviewed. Additionally, the procedures are timely reviewed after a PROCESS SAFETY incident.
III	I	13	IIII13	Shift rotation is a formal process where relevant information on the plant, unit and equipment status and work permits is exchanged between the operators that finish their shifts and those who start theirs.

Pillar III:
Risk Management

Element J: Asset Integrity and Reliability

Critical element according to ARPEL Methodology Assessment Types: YES

Description:

The Asset Integrity and Reliability element involves the systematic implementation of the activities required to guarantee that the equipment is fit for its intended use throughout its useful life. In particular, work activities related to this element focus on:
(1) preventing loss of integrity and the consequent catastrophic release of a hazardous material or a sudden release of energy
(2) ensuring high availability (and reliability) of critical safety or utility systems that prevent or mitigate the effects of this type of events (CCPS, 2007c).

This element of a process safety program covers the entire life cycle of the facility equipment, from preliminary design to decommissioning, and involves a wide variety of activities and responsibilities in the facilities.

Minimum required information

- Facility and asset integrity management program

- Tender and/or Procurement procedure

- Facility Maintenance Plans

- Compliance with plans/records or indicator monitoring program

- Operating Personnel Function Manual

- Barrier, SCE and/or Safety Instrumented Function (SIF) Testing result record

- Equipment Storage Management and preservation procedure

- Permanent and/or temporary repairs or changes to facility assets procedure

- Failure and loss of integrity record

- Inspection and testing record

PILLAR	ELEM	#	CODE	ITEM
				GENERAL
III	J	1	IIIJ1	The organization has an asset integrity management program that is formally established and aligned with the business vision and goals, strategic plan and applicable procedures and standards.
III	J	2	IIIJ2	The organization's asset integrity program establishes safe operation limits consistently and according to the limits defined by the process technology, as well as inspection plans and how to manage risks in process-associated equipment.
III	J	3	IIIJ3	The organization's asset integrity program documents and establishes the proper integration and relationship with other management systems in the organization.
				LEADERSHIP AND RESPONSIBILITY
III	J	4	IIIJ4	The organization's asset integrity program has been deployed, accepted and communicated by the Senior Management, and their goals have been understood by operational levels.
III	J	5	IIIJ5	The site operation personnel has a defined role in the equipment inspection/control.
				RECURSOS
III	J	6	IIIJ6	There is an information system available onsite to ensure the work management cycle in maintenance activities (inspection, maintenance and change management procedures and activities) and record the information resulting from inspections, testing and monitoring of asset conditions and change management. It is used to optimize asset management (ERP/EAM/CMMS); the information contained adds to the quality of the processing and effective data analysis and is disclosed to all interested areas.
III	J	7	IIIJ7	There is a digital comprehensive information consultation system that consolidates online information and supports decision-making processes for asset health (CMMS, IDMS, SCADA, PLCs, etc.).
III	J	8	IIIJ8	The organization has certified inspectors, specialists or technical referents (Persons with high technical skills - internal or third-party SMEs) to investigate faults/defects, innovation initiatives and technologies to improve processes in the asset integrity management program.
III	J	9	IIIJ9	There is a space/area and resources devoted to technology research and development to assist in meeting the integrity plan goals.
				SAFETY CRITICAL ELEMENTS - SCE
III	J	10	IIIJ10	There is an onsite systemic process to identify delays in the performance of ITM activities for SCEs. There is a record and an approval chain involving managerial levels.
III	J	11	IIIJ11	The organization has a system to manage SCE testing results by comparing response times, functionality, reliability and other parameters, ensuring that safety is not affected by reviews, repairs and tests.

PILLAR	ELEM	#	CODE	ITEM
ASSET INTEGRITY				
III	J	12	IIIJ12	There are safeguarding procedures for the supply chain phases, particularly during storage.
III	J	13	IIIJ13	The site has procedures to identify critical activities (which normally require a work permit). This process includes the definition of the outsourcing of these activities.
III	J	14	IIIJ14	The procedures applied to permanent and/or temporary inspections, testing, preventive maintenance, repairs and/or changes and to inspection, testing and preventive maintenance on the facility assets are written and compliant with the guidelines established in the RAGAGEPs.
III	J	15	IIIJ15	There is an inspection tour process in the facility that identifies deviations from base conditions in connection with facility integrity. There is a process / system to ensure documentation of findings and activities performed.
III	J	16	IIIJ16	The facility applies predictive practices using certified precision technology for the diagnosis of assets' conditions (vibrations, thermography, oil analysis, X-rays, NDTs, simulations, etc.).
CONTINUOUS IMPROVEMENT				
III	J	17	IIIJ17	There is a systematic Reliability Engineering process to identify and analyze the trends and behaviors of the condition, failures or potential issues associated with the operational process, including a formal process to collect fault and/or deviation information, and to mitigate or eliminate associated defects and/or asset performance with evidence of their results.
III	J	18	IIIJ18	There is a formal process or system in the organization to document the information related to faults or loss of integrity. The process is aligned with the RAGAGEPs and allows the capture of failure times, modes and effects.
III	J	19	IIIJ19	The organization has a formal process to analyze and investigate failures using a structured methodology. The organization performs the follow up of resulting actions and validates the effectiveness of the proposed measures.
III	J	20	IIIJ20	Mean time elapsed between failures and reliability modeling, among other factors and/or parameters, are used to identify improvement and optimization opportunities for the preventive maintenance activities conducted on assets.

Pillar III:
Risk Management

Element K: Contractors Management
Critical element according to ARPEL Methodology Assessment Types: NO

Description:
Este elemento trata sobre los controles implementados en la organización con el fin de asegurar que
This element refers to the controls implemented in the organization to ensure that the contracted services and workers perform their tasks safely and without increasing the risk level in the facilities, in compliance with process and personal safety goals.
Poorly managed contractors may significantly increase the risk associated with process maintenance and operations, so special attention must be paid to contractors working in a specific facility.
From the process safety perspective, an effective contractor management involves responsibilities of both the company owning the facilities and the contractor.

Minimum required information:

- Contractor QHSSE management manual/procedure

- Tender and/or Procurement procedure

- Contractor personnel inspection program

- List of critical contractors and record of activities and/or indicators

- Contractor Performance Assessment procedure

- Contractor Personnel Induction and Training procedure

PILLAR	ELEM	#	CODE	ITEM
III	K	1	IIIK1	The contractor management program covers PROCESS SAFETY aspects for all the tasks to be performed (maintenance, projects, plant shutdowns, etc.) in the areas covered by the PROCESS SAFETY management system.
III	K	2	IIIK2	The organization conducts a project/service risk analysis to ensure a correct description of the minimum PROCESS SAFETY requirements to be included in the tender technical specifications.
III	K	3	IIIK3	There is an established process to select the companies invited to participate in the tender process (suppliers/contractors) and a previous assessment of the offers and their HSE and PROCESS SAFETY capabilities is considered.
III	K	4	IIIK4	The specifications include an annex with the minimum PROCESS SAFETY requirements specific to each project/service. The rating of offers includes the assessment of the HSE / PROCESS SAFETY plans submitted by offerors, and contractor plans adjust to the organization and are specific to the location/project/service.
III	K	5	IIIK5	Documents are created to ensure alignment between the organization and contractor's PROCESS SAFETY standards and to assess the quality of the contracted services.
III	K	6	IIIK6	Inspections are conducted to ensure compliance with all agreed PROCESS SAFETY aspects before and during project/service execution.
III	K	7	IIIK7	Final performance assessments of PROCESS SAFETY aspects are conducted for all contractors.
III	K	8	IIIK8	There is evidence of a systemic result assessment process and management of findings in connection with the contracted activities in all elements of the PROCESS SAFETY SYSTEM. The results of performance assessments provide feedback to the organization's supplier/contractor database.
III	K	9	IIIK9	The organization has defined how to act in the event of a PROCESS SAFETY deviation by the contractor and clearly and efficiently communicates to its contractor the aspects of its PROCESS SAFETY MANAGEMENT to be improved.
III	K	10	IIIK10	The organization conducts safety inductions addressed to all contractors prior to their access to the facilities or the start of works, including potential risks known as fire, explosions or toxic releases related to the contractor's work and process, the emergency preparedness and response plan and self-protection actions.

Pillar III:
Risk Management

Element L: Training and Performance Assurance
Critical element according to ARPEL Methodology Assessment Types: NO

Description:

This element attempts to verify that the organization has implemented a training and performance assurance plan that covers all the aspects of PROCESS SAFETY. Moreover, it attempts to verify that the organization ensures compliance with, follow up and measuring of the training and performance assurance plan.

A high level of human performance is a critical aspect of any PROCESS SAFETY program. Without a proper training and performance assurance program, a facility cannot be sure that tasks will be consistently performed pursuant to approved procedures and practices.

Minimum required information:

- Training and/or Coaching procedure
- Initial and regular training plans and programs for company and contractor's personnel
- Personnel performance assessment procedure
- Functions Manual
- Preliminary studies or diagnoses focused on identifying and detecting training needs in PSM
- Training records

PILLAR	ELEM	#	CODE	ITEM
III	L	1	IIIL1	The Organization's PROCESS SAFETY management program requires an initial and regular documented training plan to ensure that all the affected personnel is trained in the operational procedures to ensure safe work (safe work practices) and considers PROCESS SAFETY and environmental provisions according to their work responsibilities.
III	L	2	IIIL2	The resources required to carry out the training plan have been defined.
III	L	3	IIIL3	Follow up of the training plan progress and execution is regularly conducted.
III	L	4	IIIL4	Training programs are regularly assessed to check that trained employees understand and implement the necessary capabilities, knowledge and routines.
III	L	5	IIIL5	Key positions that, due to their function and responsibility, require specific PROCESS SAFETY trainings (process risk analysis, emergency brigades, operating procedures, etc.) are covered.
III	L	6	IIIL6	The PROCESS SAFETY training plan is based on the position profile and skills.
III	L	7	IIIL7	The topics included in the PROCESS SAFETY training plan cover the main operation risks and particularly focus on major risks.
III	L	8	IIIL8	The personnel assigned to giving the trainings have the necessary skills and quality assessments of the training activity are carried out after their execution.
III	L	9	IIIL9	Training records document every training activity. They contain, at least, the following information: date, attendants, instructors, topics, exam results and certificate.
III	L	10	IIIL10	There is a methodology that allows the assessment of how the concepts explained have been understood at the end of the training, such as learning exercises.

Pillar III:
Risk Management

Element M: Management of Change

Description:

This element seeks to prevent or mitigate potential risks resulting from changes in operations. Companies shall implement procedures to manage changes in operations, both physical and technological, as well as organizational, in order to keep risk levels under control. Organizational changes have an impact on the PROCESS SAFETY cultural and competence aspects.

Changes must be controlled to ensure that safety or health risks are not inadvertently introduced, and to ensure that the documentation and systems required by other PROCESS SAFETY MANAGEMENT program elements are appropriately updated.

This is achieved through clear and precise procedures that allow appropriate identification of changes, their assessment in terms of impact, their analysis, and proper approval and implementation according to their nature.

The latter includes training, validations, verifications and updating of all processes and documentation affected by the change.

Minimum required information:

- Management of Change (MOC) Procedure
- MOC Procedure Matrix or Flowchart
- MOC Executed Records

PILLAR	ELEM	#	CODE	ITEM
III	M	1	IIIM1	The organization has a written Management of Change (MOC) procedure that considers reviews, approvals, communication and prevention and control measures according to the change.
III	M	2	IIIM2	Approvals are clearly established at an appropriate level and include technical reviews by specialists according to the nature of the change.
III	M	3	IIIM3	There is a specific definition of what is NOT covered by the MOC procedure (RIK - Replacement in Kind, major projects, alternative processes, etc.).
III	M	4	IIIM4	The MOC procedure addresses at least the following changes: • Permanent changes • Temporary changes, including the duration of the change • Emergency changes • Personnel changes that may affect PROCESS SAFETY • Physical changes in the facility, in process chemical products, in process conditions that exceed design conditions or are outside safe operating limits, in operating or maintenance procedures, in process control sets and safety system sets, in safety system testing frequencies or procedures, in emergency plans or in brigade formation. • Changes in technological and computer systems or technology of any kind, in logistical operations. • Organizational changes, such as number of personnel required to operate, changes in critical positions, temporary replacements, shift extensions, changes in roles and responsibilities, in the location or habitation of buildings, particularly in the environment of hazardous facilities, in the planning: deferrals or changes in the scope of plant shutdowns or maintenance activities, in the environment, in critical stocks and in projects.
III	M	5	IIIM5	The MOC has an explicit definition of "temporary change" and "emergency change". There is a specific treatment for temporary and emergency changes that considers approvals, communication and prevention and control measures according to the change (e.g., inhibition control procedure).
III	M	6	IIIM6	The terms of validity of temporary changes are defined, after which their reclassification and management as a permanent change or return to the initial situation is decided.
III	M	7	IIIM7	The MOC specifically requires defining the technical bases for the change (reason, resources required, technical details, etc.), setting a defined period for the implementation of the change and determining the need to carry out a safety review prior to the implementation, in order to allow a proper assessment of the change request.
III	M	8	IIIM8	The MOC specifically requires an analysis of the impact of change on the safety of people, the environment and assets (including analysis of the interaction of such change with other concomitant changes and with all other associated operations), through a risk analysis, fully articulated with the organization's change management process, during its implementation and once implemented, that allows foreseeing changes in the risk level or identifying new hazards, in order to take appropriate prevention, control and mitigation measures.

PILLAR	ELEM	#	CODE	ITEM
III	M	9	IIIM9	The organization's change management process includes updating documentation, completing monitoring elements and disseminating them to all those involved in the process. The MOC specifically requires updating: • All affected operating procedures • All maintenance schedules and inspection dates • All technical documentation affected by the change (drawings, P&IDs, ESD Logic Diagrams, SDSs, procedures, etc.) • Emergency plans • Risk analysis of existing processes
III	M	10	IIIM10	The MOC specifically requires that all affected employees and contractors be communicated and trained on the change prior to the implementation of such change.
III	M	11	IIIM11	A process is in place to ensure that follow-up items are completed (e.g., updates to drawings and technical documentation, changes to procedures, updates to emergency plans, etc.).
III	M	12	IIIM12	The MOC specifically requires checking, once implemented, that the change meets expectations and is within planned limits in preparation for the Pre-Startup Safety Review - PSSR.

Element N: Operation Readiness

Critical element according to ARPEL Methodology Assessment Types: YES

Description:

The Operation Readiness element focuses primarily on ensuring the safe start-up of processes throughout the life of a facility. This is accomplished by performing pre-startup readiness reviews for the following:
• New processes
• Existing processes that have been shut down for modifications
• Existing processes that have been administratively shut down for other reasons, ranging from minor, short-term shutdowns for maintenance to extended shutdowns for maintenance changes or due to lack of product demand or availability of raw materials.

The Operation Readiness process of a unit is related to the commissioning process, which ensures that the required checks and tests are carried out to demonstrate that the technical integrity of the design has been preserved after completion of a project (either a new facility or modification of an existing facility) or when major maintenance work is performed, prior to commissioning or start-up, in order to ensure a safe start-up.

Additionally, during the commissioning process, specific Pre-Start-Up Safety Review (PSSR) meetings shall be conducted to verify critical aspects of the facilities, procedures and personnel training prior to commissioning the unit.

Operational readiness reviews for larger projects are generally initiated months prior to the planned commissioning, while the operational readiness review for a smaller project may take only several hours to perform.

Minimum required information:

- Operational readiness procedure.
- Facility start-up procedure (after shutdowns and operational emergencies)
- Facility start-up audits
- PHA Recommendation Management
- Commissioning Plans

PILLAR	ELEM	#	CODE	ITEM
III	N	1	IIIN1	There is a Pre-Start-Up Safety Review (PSSR) procedure or management system standard that applies to all the organization's operations and during commissioning in the following situations: • New processes • Existing processes that have been shut down for modifications • Temporary shutdowns • Maintenance shutdowns (with or without modifications). • Extended shutdowns (with or without modifications), e.g., for commercial reasons. • Existing processes that have been administratively shut down for other reasons (due to lack of product demand or availability of raw materials).
III	N	2	IIIN2	The organization's documentation (standard, procedures or commissioning plan) requires or includes the execution of commissioning processes and pre-start-up safety review (PSSR) activity of a project or after maintenance.
III	N	3	IIIN3	The standard, procedures or commissioning plan considers planning strategies for all activities to be executed, including: • A specific plan and a commissioning matrix with minimum testing requirements by specialty. • Procedures, checklists, test sheets and/or formats defined by specialty for commissioning. • The description of the events sequence that must occur in the activities of: commissioning, PSSR and delivery to the operations area for delivery and safe start-up of the units or facilities.
III	N	4	IIIN4	Requirements demand that these processes are auditable by third parties.
III	N	5	IIIN5	The commissioning authority is independent of the engineering, construction and operations on new projects or major maintenance.
III	N	6	IIIN6	The commissioning plan includes checkpoints during the execution of all phases, and commissioning only starts with the pre-commissioning certification.
III	N	7	IIIN7	The organization has the necessary resources to lead and supervise the commissioning.
III	N	8	IIIN8	The organization maintains a management system to identify, monitor and generate learning actions on pre-commissioning and commissioning gaps.
III	N	9	IIIN9	The person responsible for executing the PSSR belongs to the operations area.
III	N	10	IIIN10	The PSSR includes the implementation review of all risk analysis recommendations (HazOp or other methodologies).
III	N	11	IIIN11	The procedure considers the conformation of a work team (including contractors), where roles and responsibilities are defined (including who delivers and who ensures the commissioning), the required competencies and the preparation of the commissioning plan from an early stage (during the development of project engineering or maintenance planning).
III	N	12	IIIN12	The commissioning leader identifies and verifies the limits of the systems to be built, modified or maintained and delivered for operation.

PILLAR	ELEM	#	CODE	ITEM
III	N	13	IIIN13	The PSSRs enable to verify that the construction and facilities are in accordance with the design specifications and that the minimum requirements of verifications and tests, consistent with the corresponding quality assurance/quality control (QA/QC) plan, are met.
III	N	14	IIIN14	The PSSR team verifies the pre-commissioning procedures are integrated into the work team from an early stage (during the last stage of construction) and intervenes during the execution of the pre-commissioning activities in the field, reviewing (among other factors) the status of the PSSR check items and defining the action plan to advance on the incomplete items.
III	N	15	IIIN15	The procedure defines the requirements for facility transfers from the pre-commissioning team to the commissioning team and from the commissioning team to the operations team.

Pillar III:
Risk Management

Element O: Operational Discipline
Critical element according to ARPEL Methodology Assessment Types: NO

Description:

This element focuses primarily on ensuring proper operational discipline in all areas and at all levels of the organization (organizational, operational and individual discipline) to ensure safe and reliable operations (operational excellence). This is achieved by establishing and executing operational and management systems to ensure consistent performance of critical tasks. It includes the following basic elements:
  • Control of operations activities
  • Controlling the status of systems and equipment
  • Developing required skills/behaviors
  • Organizational performance monitoring

Requires an organizational commitment to safe, reliable and consistent operations, as well as a culture that advocates these values. Operations behavior applies to all working activities, not just those in the operations department (CCPS, 2007c).

Minimum required information:

• Operational Discipline Procedure

• Safe work practices procedure

• Operational Discipline Goals

PILLAR	ELEM	#	CODE	ITEM
III	O	1	IIIO1	Discipline and Operational Excellence are an explicit part of the organization's vision/policy/strategy and this is recorded in written documents.
III	O	2	IIIO2	There is an area at the corporate level that defines the guidelines for implementing or managing the Operational Discipline.
III	O	3	IIIO3	Locally, there are subsidiaries or sites which are responsible for the application, monitoring, control, assessment, and improvement of Operational Discipline.
III	O	4	IIIO4	A management system is in place and implemented to control operational activities. This system includes at least: • Written operating procedures in place that reflect current operational practice. • Monitoring and enforcement of safe operating limits and boundary conditions for operations. • Safe work practices • Qualification of workers • Allocation of sufficient resources • Formal communications among workers, process units, shifts and working groups • Access to and occupancy of facilities
III	O	5	IIIO5	A management system is in place to monitor the status of systems and equipment: • Equipment access and ownership/access protocols are formalized. • Equipment status is monitored. • Proper cleaning is maintained. • Labeling is maintained. • Lighting is maintained.
III	O	6	IIIO6	A management system is in place to monitor the organization's performance: • Accountability is maintained. • Continuous improvement is emphasized. • Fitness for duty is maintained. • Field inspections are conducted. • Deviations are immediately corrected.
III	O	7	IIIO7	The organization's policy includes in its training and communication plans the systematic and strict dissemination and application of the Operational Discipline to its own workers and contractors.
III	O	8	IIIO8	The organization incorporates industry-recognized benchmark practices in relation to Operational Discipline.
III	O	9	IIIO9	The organization identifies, monitors and takes action on gaps in compliance with Operational Discipline.
III	O	10	IIIO10	Goals are defined for the worker in relation to Operational Discipline and compliance is periodically reviewed against these goals.

Pillar III:
Risk Management

Element P: Emergency Management
Critical element according to ARPEL Methodology Assessment Types: NO

Description:

The emergency management element encompasses a broad range of planning and response activities aimed at mitigation or control measures for process disturbances, fires, explosions, spills, chemical releases, and other unforeseen and sudden events that may result in damage or loss. Each facility shall have a plan for the management of foreseeable emergencies, based on knowledge of the hazards of the process facilities, risk analysis studies and other sources, the risk type and scenario of internal and external events that may occur at the facility, in order to plan the appropriate and effective response to an emergency situation.

Depending on the size and nature of the facility, emergency management may range from primary emergency response planning by external personnel, with minimal response by facility personnel (except to maintain their own safety and security) to full internal emergency management with comprehensive response capabilities for fire, medical, rescue, hazardous materials, and all other types of incidents.

In any case, each facility shall have a written emergency management plan detailing the activities to be performed in the event of an emergency, based on the applicable Incident Command System (ICS) scenarios. The plan shall include means to identify, report and communicate emergency conditions to the entire community and potentially affected personnel so that they can evacuate, shelter in place, or take other appropriate actions to ensure their own safety. Accordingly, the necessary organization, human, material and financial resources, and the actions to be taken before, during and after an emergency shall be defined, in order to have control of the emergency in the shortest possible time and minimize the damage it may cause.

Minimum required information:

- Emergency management manual/procedure.

- Facility emergency/contingency response plan.

- Reports or records of emergencies attended, reports of drills and/or exercises carried out.

- Communication and coordination protocol in case of emergencies.

- Brigade procedure and personnel functions in case of emergencies.

PILLAR	ELEM	#	CODE	ITEM
III	P	1	IIIP1	The facilities have an Emergency Response Plan (ERP) based on an updated risk analysis, which covers all reasonably credible accident scenarios, specific to the processes and external events identified, including meteorological and geological phenomena and actions of third parties, which could affect workers, the population, the environment, the stoppage or deferral of production or the facilities themselves, and the procedures necessary to control all foreseeable emergencies.
III	P	2	IIIP2	The facility's ERP is coordinated with pre-existing plans (other neighboring industries, government, etc.).
III	P	3	IIIP3	There is an emergency control center (and an alternate one) that have the necessary resources for communications, documentation, information, plans, and emergency lighting.
III	P	4	IIIP4	The ERP includes the allocation of responsibilities for organizing the emergency response under the Incident Command System (ICS) or equivalent.
III	P	5	IIIP5	The ERP has a protocol for establishing the line of authority and communication.
III	P	6	IIIP6	The ERP includes the emergency procedures to be applied by personnel to perform critical control operations and defensive and offensive emergency response actions, including their roles and responsibilities.
III	P	7	IIIP7	The ERP details the Personal Protective Equipment (PPE) to be used for emergency control and response.
III	P	8	IIIP8	There is an alarm system to alert the company's own personnel and contractors that an emergency has occurred and that they must take self-protection action (evacuation to designated meeting points or on-site protection) and an alarm system to alert the community in the event of an accident that could have an external impact and require protective actions (evacuation and/or on-site protection) by the community.
III	P	9	IIIP9	The ERP includes a procedure for evacuation and determination of safe locations, escape or evacuation routes (including alternative routes) and assembly or confinement points that shall be adequately equipped for such protective action. A procedure for personnel headcount after evacuation or protection in place is included.
III	P	10	IIIP10	The ERP includes decontamination procedures where applicable.
III	P	11	IIIP11	There is adequate signage of fire-fighting equipment, safety elements, assembly points and escape/evacuation routes in the facility.
III	P	12	IIIP12	The ERP includes procedures for informing the public and local emergency response agencies about accidental releases and establishes who is responsible in the organization for attending to the authorities and the media during an emergency.
III	P	13	IIIP13	Mechanisms are in place for pre-hospital response, management of the injured or deceased as a result of the accident or emergency control and mitigation tasks.

PILLAR	ELEM	#	CODE	ITEM
III	P	14	IIIP14	Personnel are assessed for physical fitness (if applicable), formally designated, and adequately trained to perform all tasks necessary for emergency response, including evacuation of personnel.
III	P	15	IIIP15	The facility's ERP is reviewed according to pre-established triggers such as audits, changes in the facility's hazards or risks, assessment of drills or lessons learned after an emergency, to improve emergency response.
III	P	16	IIIP16	The ERP includes annual training programs, drills and exercises in which workers and members of the emergency response teams or brigades receive training and instruction to effectively fulfill their functions and responsibilities in the event of an emergency.
III	P	17	IIIP17	All visitors are informed, prior to accessing the facility, of the self-protection actions to take in the event of the ERP being activated.
III	P	18	IIIP18	All contractor companies and their workers are informed and have at their disposal the information regarding the actions to be taken in the event of the facility's ERP being activated.

Pillar III:
Risk Management

Element Q: Facility Engineering, Procurement, Construction and Handover

Critical element according to ARPEL Methodology Assessment Types: NO

Description:

This element seeks to systematically manage the activities involved in the development of a project from the engineering stage to the handover of the facility, ensuring consistency with the organization and industry standards and in order to guarantee a safe delivery, minimizing the risks associated with the start-up and subsequent operation of the facility.

Engineering intent must be preserved during the processes of purchasing materials and equipment, contracting services, fabrication, construction, commissioning and handover of facilities through a quality control and quality assurance system.

Minimum required information:

- Procedure for pre-commissioning and commissioning of facilities.
- Procedure for quality control, quality assurance and traceability of all materials used for project construction.
- Quality plan, inspection and functional test plans for critical equipment and safety critical barriers/elements - SCEs.
- Control plan that ensures the specification, fabrication, construction and/or installation of an asset, materials and/or equipment.
- Bidding and/or Purchasing Procedure
- Technical Risk Matrix

PILLAR	ELEM	#	CODE	ITEM
III	Q	1	IIIQ1	The organization has a methodology or written procedure for project execution that ensures through review and assurance exercises, the design intent, and the quality, reliability and safety of the projects.
III	Q	2	IIIQ2	The organization maintains within the management system a process to identify, monitor and generate improvement actions and lessons learned (in addition to industry experiences) that applies to new projects.
III	Q	3	IIIQ3	There is a project maturity process (Front-end Loading - FEL or others) where the requirements and deliverables of conceptual, basic and detailed engineering are specified at each stage.
III	Q	4	IIIQ4	The project has an Operations, Maintenance and eventually PROCESS SAFETY representative available as an integral part of the team.
III	Q	5	IIIQ5	Maintenance strategies are defined for the planned facilities in order to ensure the integrity, reliability and availability of all equipment and associated systems, including safety systems, during their service life.
III	Q	6	IIIQ6	Strict compliance with the specified standards for the provision of equipment and materials is verified.
III	Q	7	IIIQ7	There are procedures for quality and traceability control and assurance of all materials used for project construction.
III	Q	8	IIIQ8	There is a process for the reception, storage and preservation of materials and equipment received.
III	Q	9	IIIQ9	Critical equipment and safety critical barriers/elements - SCEs or process protection layers have a quality plan, inspection plans and functional tests prior to installation.
III	Q	10	IIIQ10	There is a defined process for documentary management of material certificates, design dossiers and equipment testing. All documents developed by the project are subject to a documentary control program.
III	Q	11	IIIQ11	The organization has a quality assurance process and control plan that guarantees the specification, manufacture, construction and/or installation of an asset, materials and/or equipment in accordance with international standards (such as ASME, ASTM, API, among others), design specifications, supplier/manufacturer recommendations and the execution of tests and trials of equipment and materials.
III	Q	12	IIIQ12	The owner carries out audits to verify the contractor's implementation of the construction quality assurance plan.
III	Q	13	IIIQ13	Once construction is completed, a certification plan is implemented (pre-commissioning & commissioning) to include verifications, technical documentation generated by the project and functional testing of the facility.
III	Q	14	IIIQ14	A technical risk matrix is in place from the beginning of the project, which is transferred to the operations area during handover.

Pillar IV:
Assessment and Continuous Improvement

Element R: Incident Investigation

Critical element according to ARPEL Methodology Assessment Types: YES

Description:

The Incident Investigation element identifies the following four objectives for an effective system:

• Encouraging employees to report all incidents, including near misses.

• Ensuring that investigations identify the root causes of the incident

• Ensuring that investigations identify recommended preventive actions that reduce the likelihood of recurrence or mitigate potential consequences.

• Ensuring follow-up actions to effectively resolve incident investigation recommendations.

• Companies shall investigate every incident that results, or could have resulted, in an energy release, leak or spill of hazardous materials at the workplace.

• To this end, an incident investigation team shall be established. This team will consist of at least one person with knowledge of the process involved (including a contractor's employee if the incident involves contractor work), and others with appropriate knowledge and experience to thoroughly investigate and analyze the incident. Companies shall establish a system for documenting, addressing and resolving the findings and recommendations of the incident investigation report in a timely manner. Such a report shall be brought to the attention of all affected personnel whose duties are relevant to the findings of the investigation, including contractor employees where applicable.

• The use of incident investigation findings for "blame game" searches shall be avoided.

Minimum required information:

• Incident Investigation Procedure

• Incident/Accident Report Procedure

• Procedure for the Reporting of Suggestions, Opportunities for Improvement or recommendations.

• Reporting the results of incident investigations to the Top Management

PILAR	ELEM	#	COD	ITEM
IV	R	1	IVR1	There is a written incident investigation procedure that describes the management systems aimed to address how incident investigations are to be organized, attended, managed, documented, reported and how they will be followed up.
IV	R	2	IVR2	An early warning or alert system is in place for serious incidents.
IV	R	3	IVR3	All incidents are reported, recorded and classified.
IV	R	4	IVR4	All high potential incidents are investigated, analyzing causes to an appropriate depth to uncover root causes, with technical rigor throughout the process and using effective data collection methods and appropriate techniques for analysis.
IV	R	5	IVR5	The composition of the investigative team is defined according to the incident classification. Investigation team leaders are impartial to the investigations they lead.
IV	R	6	IVR6	The procedure requires that the investigation team has adequate experience and tools that include a member trained in incident investigation techniques and the line supervisor or someone equally familiar with the process.
IV	R	7	IVR7	If the incident involved a failure of a piece of equipment or part of it, support from engineering or inspection personnel is required for a failure analysis to identify the conditions or practices that caused it.
IV	R	8	IVR8	Actively involves line personnel in the investigation process.
IV	R	9	IVR9	Site management participates in the investigation and review of incidents.
IV	R	10	IVR10	There is a standard form for investigation of major PROCESS SAFETY events incidents (TIER 1 and TIER 2, at a minimum as per API 754 practical recommendation), that includes: date of incident, date investigation started, persons involved in the incident, type of event, description, immediate causes, assessment of potential severity and probability of occurrence, and recommendations to prevent recurrence.
IV	R	11	IVR11	The procedure establishes the timeframes within which the recommendations of the investigations are to be implemented.
IV	R	12	IVR12	The outcome of investigations of serious or high potential incidents is communicated to the top management.
IV	R	13	IVR13	Responsible persons are assigned and improvement actions resulting from incidents are recorded.
IV	R	14	IVR14	Improvement actions arising from incidents are systematically followed up, their effectiveness is verified and they are implemented within the established deadlines.
IV	R	15	IVR15	The quality of incident investigations is assessed to ensure the required technical rigor and a clear link to their causes and recommendations.

Pillar IV:
Assessment and Continuous Improvement

Element S: Measurement and Management Indicators
Critical element according to ARPEL Methodology Assessment Types: NO

Description:

The Management Indicators element establishes efficiency and performance indicators to monitor the effectiveness of PROCESS SAFETY MANAGEMENT (PSM) programs and their elements to monitor the near real-time effectiveness of the risk-based PROCESS SAFETY MANAGEMENT SYSTEM and its constituent elements and work activities. This element addresses what indicators shall be considered, how often data shall be collected, and what to do with the information to help ensure the performance of a company's PROCESS SAFETY MANAGEMENT SYSTEM.

PROCESS SAFETY indicators or metrics are a critical management tool for assessing the performance of a PROCESS SAFETY SYSTEM. Tracking the number of PROCESS SAFETY incidents is a measure of performance, but just tracking incidents retrospectively will not be enough to really understand how to improve performance. Tracking retrospective (reactive - lagging) and prospective (proactive - leading) indicators of PROCESS SAFETY systems and subsystems is key to understanding the day-to-day quality of management programs execution.

Minimum required information:

- KPIs of the organization
- Review of KPIs
- Procedure for the treatment of deviations generated from the KPI measurement.

PILLAR	ELEM	#	CODE	ITEM
IV	S	1	IVS1	There is a management system procedure that specifies how the PROCESS SAFETY indicators are obtained, updated, reviewed, analyzed and disseminated. Established indicators are systematically updated and monitored. Individuals responsible for the process are defined and it includes a periodic assessment of the indicators being used to confirm that they are correct.
IV	S	2	IVS2	The organization has defined and manages the PROCESS SAFETY indicators separately from those for occupational safety, environmental quality, product quality and reliability.
IV	S	3	IVS3	Predictive KPIs have been defined for all PROCESS SAFETY management elements (including incident investigation) and are properly recorded, analyzed and disseminated, including; the status and quality of activities required by external or internal company or facility standards/directives/regulations regarding PROCESS SAFETY, the involvement of workers in PROCESS SAFETY management and the safety culture assessment practices that allow monitoring their level of maturity and evolution over time to identify gaps to be closed.
IV	S	4	IVS4	Retrospective KPIs for PROCESS SAFETY management have been defined and are adequately recorded, analyzed and disseminated (e.g., frequency and severity TIER 1 and 2 according to API 754 Recommended Practice).
IV	S	5	IVS5	Performance targets have been established for each organization and job position in each applicable aspect of PROCESS SAFETY management, including integrity of operations, against which the indicators can be compared.
IV	S	6	IVS6	The company's middle management, senior management and top management periodically review the indicators.
IV	S	7	IVS7	PROCESS SAFETY management indicators are used to compare performance between company units and with the industry.
IV	S	8	IVS8	All recommendations arising from reviews of PROCESS SAFETY metrics have been resolved in a timely manner.
IV	S	9	IVS9	All resolutions of recommendations arising from reviews of PROCESS SAFETY management indicators are documented.
IV	S	10	IVS10	A system is in place to promptly address all findings and recommendations arising from PROCESS SAFETY indicators, including the development of a written schedule of when actions shall be taken to resolve and complete the recommendations arising from reviews of these indicators.
IV	S	11	IVS11	All resolutions of PROCESS SAFETY management indicator recommendations (e.g., actions to be taken) have been communicated to all employees who work on the process or who may be affected by the actions or recommendations.

Pillar IV:
Assessment and Continuous Improvement

Element T: Audits
Critical element according to ARPEL Methodology Assessment Types: NO

Description:

The Audit element is one of the major quality control activities in a PROCESS SAFETY MANAGEMENT program and one of the major elements that provide opportunities to rely on experience.
The Audit element provides a system for scheduling, staffing, effectively conducting, and documenting periodic assessments of all elements of the PROCESS SAFETY MANAGEMENT program and managing the resolution of findings and corrective actions generated by audits.
Audits are defined as systematic, independent reviews to verify compliance to prescribed requirements using a carefully defined review process, both to ensure consistency and to enable the auditor to reach defensible conclusions.

Minimum required information:

- Internal and External Audit Procedure.
- Audit Plan
- Profiles of assigned Auditors
- Audit reports
- Procedure for the treatment of deviations generated from the Audit.

PILLAR	ELEM	#	CODE	ITEM
IV	T	1	IVT1	There is a written management system methodology or procedure for organizing, conducting and documenting audits and assessment of the process safety management status, including updating of relevant documentation. External audits (specialists or companies in the field) are considered in order to incorporate industry best practices and the procedure to assess the efficiency of the improvement actions implemented and to select auditors and make up the audit team to ensure the necessary competencies.
IV	T	2	IVT2	The organization has defined an audit plan and top management is involved in the review and approval of such audit plan.
IV	T	3	IVT3	The organization has communicated the approved audit plan or program to its members and stakeholders.
IV	T	4	IVT4	The result of audits is documented.
IV	T	5	IVT5	The result of audits is communicated / reported to the top management and the rest of the organization.
IV	T	6	IVT6	There is a program for addressing non-conformities and implementing improvement actions. These programs are communicated within the organization and are documented.
IV	T	7	IVT7	There is a procedure/methodology for selecting auditors and making up the audit team to ensure the necessary competencies. Roles and responsibilities within the audit team are defined.
IV	T	8	IVT8	Relevant records and documents are reviewed during the audit.
IV	T	9	IVT9	Interviews including management and non-management personnel are conducted during the audit.
IV	T	10	IVT10	A field inspection is conducted during the audit.

Pillar IV:
Assessment and Continuous Improvement

Element U: Management Review and Continuous Improvement
Critical element according to ARPEL Methodology Assessment Types: NO

Description:

This element consists of the periodic assessment by the top management of whether the PROCESS SAFETY MANAGEMENT SYSTEM is performing as planned and is producing the desired results.

An essential factor in any Management System to contribute to its deployment, strengthening and continuous improvement, is the involvement of senior and management levels in the review and assessment of the Management System in a periodic and structured manner.

The communication to the organization of what has been discussed and arranged in these activities shall be carried out in a broad and consistent manner. Not only shall the key indicators be reviewed, but the main achievements and threats shall be assessed in order to continue with the continuous improvement of the system.

Minimum required information:

- Management Review Procedure
- Management Review Report

PILLAR	ELEM	#	CODE	ITEM
IV	U	1	IVU1	The organization has a procedure governing the conduct and follow-up of management reviews and continuous improvement of the PROCESS SAFETY MANAGEMENT program.
IV	U	2	IVU2	There is a planning process and the generation of a documented program for the review of the management system, disclosed to the members of the organization.
IV	U	3	IVU3	The review process is conducted in such a way that each element of the process safety management system is reviewed at least annually.
IV	U	4	IVU4	Responsible persons are designated to participate in each phase of the Management System review process, including in the preparation of the material and the call. They are trained for this purpose.
IV	U	5	IVU5	The information required to conduct the review (inputs) is obtained and presented in a summarized and understandable manner to those responsible for the review.
IV	U	6	IVU6	Those responsible for the review, in addition to the desk work, perform periodic inspections in the field / operation, to verify compliance with the Management System elements. Compliance is documented and followed up by senior and management levels.
IV	U	7	IVU7	The results obtained from safety management review processes are analyzed and reported.
IV	U	8	IVU8	Actions against deviations detected during management reviews are identified, planned and implemented.
IV	U	9	IVU9	Actions against deviations detected are identified, planned and implemented, and the necessary resources to rectify them are available.
IV	U	10	IVU10	Top management reviews examine whether changes of various types in the company or its facilities impact the effectiveness of the PROCESS SAFETY MANAGEMENT program; the robustness of the program to accommodate such changes without compromising the functionality of the program is verified.
IV	U	11	IVU11	Monitoring and assessment of the effectiveness of improvement actions implemented as part of the management review is performed.
IV	U	12	IVU12	The organization communicates the results of the management review of the management system to its members and stakeholders.

ANNEX II:
RECOMMENDED INDICATORS

Pillar I:
Commitment to Process Safety

ELEMENT	RECOMMENDED INDICATORS
A. **Process Safety Culture**	The measurement of safety culture in general is done with a qualitative-quantitative survey that measures perceptions. Additionally, the result of the management of each of the PROCESS SAFETY MANAGEMENT elements also allows monitoring the status of the organization's safety culture. Culture is an element that is ultimately reflected through the other elements.
B. **Compliance with Standards**	• Frequency of internal standards review. • Number of obsolete standards. • Completion of the audit plan. • % of contractors who know and use the standards that apply to their work. • % of training conducted on codes and standards for facility personnel and stakeholders (contractors - visitors). • % of relevant codes and standards that have a responsible person assigned to them.
C. **Process Safety Competencies**	• % of competency profiles defined / job positions. • % of skills diagnostics performed / number of workers. • % of closure of gaps / gaps identified.
D. **Workers' Involvement**	• Progress in implementing and complying with the employee participation and involvement program. • % of operational level personnel participating in PHAs and risk analysis. • % of PHA studies or risk analyses with participation of cross-functional groups, including operational level personnel • Number of PROCESS SAFETY deviations reported or suggestions received to the PROCESS SAFETY MANAGEMENT system from employees. • % of elements of PROCESS SAFETY MANAGEMENT with multidisciplinary participation, including operational level personnel, in the development and implementation.
E. **Stakeholders' Involvement**	• Annual number of public meetings held with stakeholders to report on facility hazards and risks, prevention and mitigation plans, and self-protection measures. • Number of public meetings held with stakeholders to report process incidents and accidents and learning experiences. • % of plant visits with community organizations and members. • % of drills and exercises with stakeholder participation (especially external response groups and community). • Time to implement actions agreed with stakeholders.

Pillar II:
Risk Identification and Analysis

ELEMENT	RECOMMENDED INDICATORS
F. **Process Information and Documentation Management.**	• Deviations detected in technical documentation review audits. • % of documents rejected due to expiration or non-compliance with system requirements. • # of incidents or accidents related to inappropriate documents • % of controlled documents reviewed on time
G. **Hazards Identification and Risk Analysis**	• (Completion - Revalidation of risk analysis older than 5 years)/(Total number of facilities with risk analysis)*100 • Number of risk analyses in force/Number of risk analyses that shall be in force. • (Expired risk analysis recommendations)/(Total number of recommendations) • (Expired risk analysis recommendations (external entity))/(Total number of recommendations) • (Number of rejected recommendations)/(Total number of recommendations) • (Number of high-risk expired recommendations)/(Number of high-risk recommendations) • (Number of high-risk scenarios (in operation))/(Number of scenarios analyzed)

Pillar III:
Risk Management

ELEMENT	RECOMMENDED INDICATORS
H. **Operating Procedures**	• % of compliance with the procedures disclosure program. • Average score of Operational Procedures field assessments greater than or equal to the requirement. • % of compliance with corrective actions derived from investigations of deviations from operational procedures. • % of Procedures developed with active participation of first-line operators.
I. **Safe Work Practices**	• % of execution of recommendations resulting from audits. • % of issuers or executors with proven competencies. • % of work permits duly closed • % of work permits supported by safe work instructions. • % of work permits issued correctly
J. **Asset Integrity and Reliability**	• % of Compliance with the inspection and maintenance program • Deviations detected in integrity management audits. • Back log of SCEs • Asset availability and reliability • Mean Time Between Failure (MTBF), Mean Time To Repair (MTTR)
K. **Contractor Management**	• % of contractors assessed / total contractors • % of contractors performing below requirements • % of compliance with actions resulting from contractor auditing

ELEMENT	RECOMMENDED INDICATORS
L. **Training and Performance Assurance**	• Percentage of planned/accomplished progress of the plan • Ratio of training hours to man-hours worked • Results of post-training assessments • Percentage of training needs that are actually implemented • Percentage of attendance at training activities • Results of training quality assessments
M. **Management of Change**	• Unmanaged temporary changes (after their effective date) • Ratio of normal to emergency changes; % of changes considered "normal" vs. % of emergency changes • No. of changes implemented / No. of total changes as % of total changes • Changes duly managed (audited) / changes closed in the period
N. **Operational Readiness**	• Time lost in the start-up of a plant or system due to equipment malfunctions • System attributable to failures in the commissioning process. • Production losses attributable to maintenance or integrity issues, expressed in equivalent barrels due to commissioning failures. • % of safety-critical equipment that performed as expected on demand. • Number of anomalies identified in inspections associated with equipment commissioning and start-up. • Compliance with project delivery times (compliance with commissioning schedule). • Non-conformities raised during pre-start-up review related to project commissioning.
O. **Operational Discipline**	• % of operating procedures updated • % of compliance during operation of operating procedures % of procedures drawn up or reviewed by sector operators
P. **Emergency Management**	• No. of drills performed/No. of planned drills • % of own employees and contractors trained and qualified in the Emergency Plan • No. of improvements implemented/no. of total improvements recommended in assessments (post drills-incidents) • % of compliance with the program of Inspections and Maintenance of emergency equipment (fire-response network, vehicles, rescue equipment, etc.)
Q. **Facility Engineering, Procurement, Construction and Handover**	• % of engineering and projects with complete, revised and approved Engineering. • % of engineering and projects with risk studies completed • % of engineering and projects in accordance with international standards and internal company rules.

Pillar IV:
Assessment and Continuous Improvement

ELEMENT	RECOMMENDED INDICATORS
R. **Incident Investigation**	• No. of investigations carried out / total no. of incidents • % of compliance with recommendations arising from accident investigations • % of accident Reports completed and closed • % of accident investigations reported as learning lessons to all personnel • % of near misses investigated
S. **Measurement and Management Indicators**	• (Completion - Revalidation of risk analysis over 5 years old) /(Total number of facilities with risk analysis)*100 • (Expired risk analysis recommendations)/(Total number of recommendations) • (Expired risk analysis recommendations (external entity))/(Total number of recommendations) • (Number of rejected recommendations)/(Total number of recommendations) • (Number of high-risk expired recommendations) / (Number of high-risk recommendations) • (Number of high-risk scenarios (in operation))/(Number of scenarios analyzed)
T. **Audits**	• % of audits carried out / audits planned • No. of improvement actions implemented / Total No. of improvement actions recommended in audits. • No. of audits with expired date • No. of non-conformities or expired improvement actions.
U. **Management Review and Continuous Improvement**	• No. of elements of the PROCESS SAFETY MANAGEMENT system reviewed by the top management. • No. of plant visits to verify the management system, carried out by the top management. • No. of meetings with top management participation to assess and monitor the PROCESS SAFETY MANAGEMENT system.

ANNEX III:
ACRONYMS AND GLOSSARY

API: American Petroleum Institute

ARPEL: Asociación Regional de Empresas del Sector Petróleo, Gas y Energía Renovable en Latinoamérica y el Caribe (Regional Association of Oil, Gas and Renewable Energy Companies in Latin America and the Caribbean)

ASME: American Society of Mechanical Engineers

ASTM: American Society for Testing and Materials

CCPS: Center for Chemical Process Safety

CMMS: Computerized Maintenance Management System

EAM: Enterprise Asset Management

ERP: Emergency Response Plan

ERP: Enterprise Resources Planning

ESD: Emergency Shutdown System

FEL: Front-End Loading

FMEA: Failure Mode Effects Analysis

HAZID: Hazard Identification Study

HAZOP: Hazard and Operability Study

HIRA: Hazard Identification and Risk Analysis

HSE: Health, Safety and Environment

ICS: Incident Command System

IDMS: Integrated Database Management System

IOGP: International Oil and Gas Producers Association

ITM: Inspection, Testing and Maintenance

KPI: Key Performance Indicators

LOPA: Layer of Protection Analysis

LOPC: Loss of Primary Containment

MAHID: Major Accident Hazard Identification

MOC: Management of Change

MTBF: Mean Time Between Failure

MTTR: Mean Time To Repair

NDT: Non-Destructive Test

NFPA: National Fire Protection Association

NGO: Non-Governmental Organization

OD: Operational Discipline

P&ID: Piping and Instrumentation Diagram

PHA: Preliminary Hazard Analysis

PLC: Programmable Logic Controller

PPE: Personal Protective Equipment

PSM: Process Safety Management

PSSR: Pre-Start-Up Safety Review

QA: Quality Assurance

QC: Quality Control

QRA: Quantitative Risk Analysis

RAGAGEPs: Recognized And Generally Accepted Good Engineering Practices

RBI: Risk-Based Inspection

RCM: Reliability-Centered Maintenance

RIK: Replacement-in-Kind

SCADA: Supervisory Control and Data Acquisition

SCE: Safety Critical Element

SDS: Safety Data Sheets

SIF: Safety Instrumented Functions

SME: Subject-Matter Expert

TIER 1: LEVEL 1 According to API 754, indicators used for high-severity Loss of Primary Containment (LOPC) events.

TIER 2: LEVEL 2 According to API 754, indicators used for medium-severity Loss of Primary Containment (LOPC) events.

WHAT IF: Risk analysis methodology that is based on posing possible deviations in a process under the question "What if…?"

GLOSSARY

Below is a glossary containing some terms that require precision in their meaning. If you do not find the term you are looking for, we recommend that you refer to the CCPS Glossary (https:// www.aiche.org/ccps/resources/glossary)

Accident: An event or series of events that resulted in one or more unintended consequences, such as harm to persons, damage to the environment or loss of assets or discontinuity in business. Such events include: fires, explosions, release of toxic or other harmful substances, etc. In many contexts "incident" is used. Incidents, then, are the sum of near misses and accidents. In this document the words "incident" or "accident" are used interchangeably.

Auxiliary Services / Utilities: Services that, without being a direct part of the production process, are essential to maintain the plant operation. Typically, they refer to energy, water, steam, gas, etc. services.

Critical Knowledge: This is the body of knowledge or know-how that makes an essential contribution to operation and PROCESS SAFETY. The loss or mismanagement of this knowledge can have important consequences and lead to major incidents.

Deviation: A process condition outside established design limits, safe operating limits or standard operating procedures.

Emergency Operation: Process changes initiated by operations personnel to bring the process to a safe condition (i.e., return to normal operations or stop the process) in response to any abnormal situation that may cause a release, explosion or other significant event.

Emergency: According to NFPA 1 (2021) code; a fire, explosion, or hazardous condition that presents an immediate threat to life safety or property damage.

Finding Affecting Mechanical Integrity: Any deviation to a standard, code, procedure or specification that affects the mechanical integrity of components, equipment, systems and facilities during their service life, from the design, manufacturing, installation, construction, operation, maintenance and decommissioning phase.

High Potential Incident: An incident that, under different circumstances, could easily have resulted in a catastrophic loss.

Incident Management System (IMS): A standardized approach to the command, control and coordination of the response to an emergency that provides a common hierarchy among the multiple agencies responding to an emergency in order to improve effectiveness.

Individual Discipline: It is the recognition that the actions of individuals are the fundamental element within the Organizational Operational Discipline program. "Individual" means: I am committed to doing my job safely, performing all the tasks required to do my job correctly every time.

Inherently Safe Design: This is a conception about the design of chemical plants and processes that places its focus on elimination/reduction of hazards, over management and control.

Life Cycle: These are the stages through which a physical process or management system goes from inception to completion. These stages include conception, design, deployment, acquisition, operation, maintenance, decommissioning and disposal.

Loss of Primary Containment (LOPC): An unplanned or uncontrolled release of a material or substance from its primary containment vessel. This includes non-toxic and non-flammable substances (e.g., water vapor, hot condensate, nitrogen, CO_2 or compressed air).

Near Miss: An event in which the occurrence of an accident (involving asset damage, environmental impact or human loss) or operational disruption would have been plausible had the circumstances in which it occurred been slightly different.

Non-conformities: A non-compliance with a management system requirement, whether specified or unspecified. A requirement is known as an established need or expectation, usually explicit or mandatory. Non-conformities arise as a result of audits.

Non-routine Operations: Those that are not covered by an approved procedure, e.g., operation, maintenance and emergency.

Normal Operation: The phase of process operation between the start-up and shutdown phase. A normal operation is any process operation that can be performed during this period, allowing for continuous operation within safe upper and lower operating limits.

Normalization of Deviations: It is the gradual erosion of performance standards as a result of increased tolerance for non-conformities.

Operational Discipline: It is the rigorous and continuous compliance in all areas, of all procedures and work instructions, both operational and administrative, together with the application of best practices and the early detection of risks in the processes, setting the basis to control them in a consistent and safe manner, and analyzing the consequences that arise from these risks.

Operational Windows: These are the set of operating ranges and limits of key process variables that focus on maintaining equipment integrity or reliability. Operating within these defined limits shall result in predictable and reasonably low degradation rates, while operating outside these limits may result in unforeseen or accelerated damage to equipment and piping.

Operations Area: Refers to operational personnel, i.e., those directly responsible for production.

Organization Leadership: Refers to the highest body of a company, the one that makes strategic decisions about the business as a whole.

Organizational Discipline: It is the policy statement on dedication and formal commitment of all members of an organization, to perform each task the right way, every time, from the first time.

Plant Shutdown: The process by which a plant or operating system is brought into a safe, non-operational mode.

Pre-Start-up: All tasks that are systematically performed to prepare the process or plant to ensure that it is in a safe condition prior to the entry of highly hazardous chemicals.

Lagging Indicators: They are based on incidents that have reached the reporting threshold as part of the industry's PROCESS SAFETY indicator system.

Leading Indicators: They look ahead indicating the performance of key work processes, operational discipline or layers of protection that prevent incidents.

Process Safety Incident (API 754 Tier 1, Tier 2 and Severity): According to API 754 recommended practice, an incident is considered a process incident if: the production process is involved, if it exceeds certain reporting thresholds, if it happens in a process area, and if there is an instantaneous release of a hazardous substance. The classification between tier 1 or 2 depends on the consequences of the incident[1]. In the case of severity, the recommended practice itself establishes criteria for scoring incidents.

Quality Assurance: The set of activities performed to ensure that a piece of equipment is properly designed and to ensure that the design is not compromised, providing confidence that a product or service will satisfactorily and continuously provide the defined need throughout the life cycle of the equipment.

Responsible Care: Responsible Care® is a voluntary initiative within the global chemical industry aimed at promoting the safe handling of chemicals from their origin in research laboratories through production, distribution, use and disposal. It also involves the public in decision-making processes. It began in Canada in 1987, expanding to 45 countries and exceeding what is required by law in most of these.

Root Cause: Failures in the management system, such as incorrect design or inadequate training, which led to an unsafe act and resulted in an incident; it is the root cause underlying the incident. If the root causes had not been present, the incident would not have occurred.

Routine Operations: These are all those operations that are covered by an approved operating procedure.

Safe Operating Limits: The set of specifications for critical systems that must be operational and for critical resources that must be available to start a process or continue normal operation. Critical systems typically include fire protection, flares, emergency cooling, thermal oxidizers; critical resources commonly include staffing levels required for operations and other critical functions.

Supply Chain: The set of all processes and suppliers involved in the provision of a good or service.

Tolerable or Acceptable Risk: The average rate of loss that is considered tolerable for a given activity.

Tolerable Risk Level: The maximum level of risk of a particular process or technical condition that is considered tolerable in the context of the circumstances involved.

Top Management: Refers to the first level of management of the company, reporting directly to the CEO and having responsibility for the operation and the business.

---

1. Further details can be found in the API Process Safety Incident Reporting Guide: http://www.api.org/~/media/Files/Oil-and-Natural-Gas/Refining/Process%20Safety/API_Guide_to_Report_PSE_Version_3.pdf.

ANNEX IV:
EXCEL OUTPUTS

The Excel file consists of an introductory screen that allows us to enter the basic data of the assessment (date, assessor and site to be assessed), as well as to choose the type of assessment to be performed.

Depending on the type of assessment chosen, the boxes to be filled in all the other tabs of the file will be enabled (e.g., if I choose an "essential" assessment, all the non-critical elements, as well as the non-key items of the critical elements, will be shaded to indicate that they shall not be filled in).

The sample of results (the table containing all the answers) is also linked to the type of assessment to be performed, taking a shading hue when the element or item does not correspond to the type of assessment chosen.

The graphs are generated automatically, but their correct use depends on the type of assessment performed. The graphs offered automatically by the tool are:

- **Essential Graph (vertical bars):** Shows the average results of the key items of the critical elements.
- **Focused Chart (vertical bars)**: Shows the average results of the critical elements, both the key items and the overall average of the element.
  If an essential assessment was chosen, the key items and the element average will match. If a screening was chosen, the same will happen but not all elements will be represented.
- **Pillar Chart (vertical bars):** Shows the average results of the pillars and the overall average of the assessment.
  This chart is recommended for screening and comprehensive assessments (because they assess all elements of all pillars).
- **Elements Chart (horizontal bars):** Shows the average results for all elements. In the essential and focused assessment, many will appear as 0 since they are not assessed.
- **Pillar Chart (radar):** These graphs show all elements of each pillar, both the key and overall item series. They are radar charts, except for Pillar II, which has only two elements.

Notwithstanding the above, assessors are encouraged to use the data to generate other types of graphs and reports according to their specific information visualization needs.

INTRODUCTION TO THE TOOL

Navigation through hyperlinks within the tool is recommended.

ARPEL Process Safety Self-Assessment Tool

Version: July 2022

Assessor Name:	
Company / Line of Business / Site to assess:	
Date of Assessment:	
Type of Assessment:	Essential (Critical elements / key items) ▼

Links to Elements

Pillar I - Leadership and Culture
A. Process Safety Culture
B. Compliance with Standards
C. Process Safety Competencies
D. Workers Involvement
E. Stakeholders Involvement

Pillar II - Risk Identification and Analysis
F. Information Management and Process Documentation
G. Hazard Identification and Risk Analysis

Pillar III - Risk Management
H. Operating Procedures
I. Safe Work Practices
J. Asset Integrity and Reliability
K. Contractors Management
L. Training and Performance Assurance
M. Management of Change
N. Operational Readiness
O. Operational Discipline
P. Emergency Management
Q. Facility Engineering, Procurement, Construction and Delivery

Pillar IV - Assessment and Continuous Improvement
R. Incident Investigation
S. Measurement and Management Indicators
T. Audits
U. Management Review and Continuous Improvement

SCORECARDS

Example of essential assessment

WITH SCORES:

Average Scores - Pillars

Pillar	I	II	III	IV	Global
Total Average	3,25	3,50	2,60	2,40	2,94
Key Items Average	3,25	3,50	2,60	2,40	2,94

Average scores - Elements

Pillar	I	I	I	I	I	II	II	III	III	III	III	III	III	III	III	III	III	IV	IV	IV	IV
Element	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U
Element Average	NA	3,25	NA	NA	NA	NA	3,50	NA	NA	3,14	NA	NA	2,25	2,40	NA	NA	NA	2,40	NA	NA	NA
Key Items Average	NA	3,25	NA	NA	NA	NA	3,50	NA	NA	3,14	NA	NA	2,25	2,40	NA	NA	NA	2,40	NA	NA	NA

Elements / Items	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U
1	NA	4	NA	NA	NA	NA	4	NA	NA	2	NA	NA	2	2	NA	NA	NA	2	NA	NA	NA
2	NA	3	NA	NA	NA	NA	4	NA	NA	3	NA	NA	2	3	NA	NA	NA	NA	NA	NA	NA
3	NA	4	NA	NA	NA	NA	4	NA	NA	1	NA	NA	NA	4	NA	NA	NA	NA	NA	NA	NA
4	NA	2	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1	NA	NA	NA
5	NA	NA	NA		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
6	NA	NA	NA		NA	NA	4	NA	NA	4	NA	NA	NA	NA	NA	NA	NA	4	NA	NA	NA
7	NA	NA	NA		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
8	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	3	NA	NA	NA	NA	NA	NA	NA	NA
9	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	2	NA	NA	NA	NA	NA	NA	NA	NA
10	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
11							NA	NA	NA	4			NA	1		NA	NA	2	NA		NA
12							3		NA	NA			NA	NA		NA	NA	NA			NA
13							2		NA	NA				2		NA	NA	NA			
14							NA			4				NA		NA	NA	3			
15							NA			NA				NA		NA	NA				
16							NA			NA						NA					
17							NA			4						NA					
18							NA			NA						NA					
19							NA			NA											
20							NA			NA											

WITH PERCENTAGES:

% Average - Pillars

Pillar	I	II	III	IV	Global
Total Average	81%	88%	65%	60%	73%
Key Items Average	81%	88%	65%	60%	73%

Average % - Elements

Pillar	I	I	I	I	I	II	II	III	III	III	III	III	III	III	III	III	III	IV	IV	IV	IV
Element	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U
Element Average	NA	81%	NA	NA	NA	NA	88%	NA	NA	79%	NA	NA	56%	60%	NA	NA	NA	60%	NA	NA	NA
Key Items Average	NA	81%	NA	NA	NA	NA	88%	NA	NA	79%	NA	NA	56%	60%	NA	NA	NA	60%	NA	NA	NA

Elements / Items	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U
1	NA	4	NA	NA	NA	NA	4	NA	NA	2	NA	NA	2	2	NA	NA	NA	2	NA	NA	NA
2	NA	3	NA	NA	NA	NA	4	NA	NA	3	NA	NA	2	3	NA	NA	NA	NA	NA	NA	NA
3	NA	4	NA	NA	NA	NA	4	NA	NA	1	NA	NA	NA	4	NA	NA	NA	NA	NA	NA	NA
4	NA	2	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1	NA	NA	NA
5	NA	NA	NA		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
6	NA	NA	NA		NA	NA	4	NA	NA	4	NA	NA	NA	NA	NA	NA	NA	4	NA	NA	NA
7	NA	NA	NA		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
8	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	3	NA	NA	NA	NA	NA	NA	NA	NA
9	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	2	NA	NA	NA	NA	NA	NA	NA	NA
10	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
11							NA	NA	NA	4			NA	1		NA	NA	2	NA		NA
12							3		NA	NA			NA	NA		NA	NA	NA			NA
13							2		NA	NA				2		NA	NA	NA			
14							NA			4				NA		NA	NA	3			
15							NA			NA				NA		NA	NA				
16							NA			NA						NA					
17							NA			4						NA					
18							NA			NA						NA					
19							NA			NA											
20							NA			NA											

SCORECARDS
Example of complete assessment

WITH SCORES:

Average Scores - Pillars					
Pillar	I	II	III	IV	Global
Total Average	2,70	2,90	2,80	2,85	2,81
Key Items Average	2,88	3,38	2,84	2,79	2,97

Average scores - Elements																					
Pillar	I	I	I	I	I	II	II	III	III	III	III	III	III	III	III	III	III	IV	IV	IV	IV
Element	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U
Element Average	2,50	3,10	2,60	2,50	2,80	2,80	3,00	3,09	2,62	2,85	2,80	2,70	2,58	2,60	2,80	2,50	3,50	2,67	2,55	3,20	3,00
Key Items Average	2,75	3,25	2,75	3,00	2,67	3,25	3,50	3,25	2,40	3,14	3,00	2,50	2,25	2,40	3,25	2,17	4,00	2,40	2,75	3,00	3,00

Elements / Items	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U
1	4	4	1	3	2	3	4	3	2	2	3	4	2	2	4	1	4	2	3	2	2
2	3	3	2	2	4	2	4	4	3	3	3	2	2	3	4	1	3	3	2	3	3
3	2	4	3	4	3	3	4	3	2	1	2	3	3	4	4	1	4	3	3	3	3
4	2	2	4	1	2	4	3	2	3	3	2	1	3	3	3	2	3	1	2	3	3
5	1	3	3		3	2	3	3	2	2	3	4	2	2	3	2	4	2	3	4	4
6	3	2	3		3	1	4	4	3	4	2	3	2	2	3	2	3	4	2	4	4
7	4	4	2		4	4	3	4	3	3	3	2	3	3	2	3	4	3	1	3	3
8	2	3	2		4	3	2	2	2	3	4	2	3	4	2	3	3	3	2	4	3
9	3	3	4		1	2	4	2	4	4	3	3	2	2	2	3	4	3	3	2	3
10	1	3	2		2	4	4	3	3	3	3	3	4	3	1	2	3	4	4	4	2
11							3	4	2	4			3	1		2	4	2	3		2
12							3		3	2			2	2		2	3	2			4
13							2		2	2				2		4	4	3			
14							2			4				3		4	3	3			
15							1			3				3		4		2			
16							3			3						3					
17							2			4						3					
18										3						3					
19										2											
20										2											

WITH PERCENTAGES:

% Average - Pillars					
Pillar	I	II	III	IV	Global
Total Average	68%	73%	70%	71%	70%
Key Items Average	72%	84%	71%	70%	74%

Average % - Elements																					
Pillar	I	I	I	I	I	II	II	III	III	III	III	III	III	III	III	III	III	IV	IV	IV	IV
Element	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U
Element Average	63%	78%	65%	63%	70%	70%	75%	77%	65%	71%	70%	68%	65%	65%	70%	63%	88%	67%	64%	80%	75%
Key Items Average	69%	81%	69%	75%	67%	81%	88%	81%	60%	79%	75%	63%	56%	60%	81%	54%	100%	60%	69%	75%	75%

Elements / Items	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U
1	4	4	1	3	2	3	4	3	2	2	3	4	2	2	4	1	4	2	3	2	2
2	3	3	2	2	4	2	4	4	3	3	3	2	2	3	4	1	3	3	2	3	3
3	2	4	3	4	3	3	4	3	2	1	2	3	3	4	4	1	4	3	3	3	3
4	2	2	4	1	2	4	3	2	3	3	2	1	3	3	3	2	3	1	2	3	3
5	1	3	3		3	2	3	3	2	2	3	4	2	2	3	2	4	2	3	4	4
6	3	2	3		3	1	4	4	3	4	2	3	2	2	3	2	3	4	2	4	4
7	4	4	2		4	4	3	4	3	3	3	2	3	3	2	3	4	3	1	3	3
8	2	3	2		4	3	2	2	2	3	4	2	3	4	2	3	3	3	2	4	3
9	3	3	4		1	2	4	2	4	4	3	3	2	2	2	3	4	3	3	2	3
10	1	3	2		2	4	4	3	3	3	3	3	4	3	1	2	3	4	4	4	2
11							3	4	2	4			3	1		2	4	2	3		2
12							3		3	2			2	2		2	3	2			4
13							2		2	2				2		4	4	3			
14							2			4				3		4	3	3			
15							1			3				3		4		2			
16							3			3						3					
17							2			4						3					
18										3						3					
19										2											
20										2											

ESSENTIAL CHART

Essential Assessment (Critical Elements/Key Items)

FOCUSED CHART

Focused Assessment (Critical Elements/All items)

■ Element Average   ■ Key Items Average

PILLAR CHART

Pilar Average of the Management System

■ Total Average   ■ Key Items Average

ELEMENTS CHART

Legend: ■ Element Average   ■ Key Items Average

Element	Element Average	Key Items Average
I-A. Process Safety Culture	63%	69%
I-B. Compliance with Standards	78%	81%
I-C. Process Safety Skills	65%	69%
I-D. Workers' Involvement	63%	75%
I-E. Stakeholders' Involvement	70%	67%
II-F. Process Information and Documentation Management	70%	81%
II-G. Hazard Identification and Risk Analysis	75%	88%
III-H. Operation Procedures	77%	81%
III-I. Safe Work Practices	65%	60%
III-J. Asset Integrity and Reliability	71%	79%
III-K. Contractors Management	70%	75%
III-L. Training and Performance Assurance	68%	63%
III-M. Management of Change	65%	56%
III-N. Operation Readiness	65%	60%
III-O. Operational Discipline	70%	81%
III-P. Emergency Management	63%	54%
III-Q. Facility Engineering, Procurement, Construction and Handover	88%	100%
IV-R. Incident Investigation	67%	60%
IV-S. Measurement and Management Indicators	64%	69%
IV-T. Audits	80%	75%
IV-U. Management Review and Continuous Improvement	75%	75%

PILLAR CHART (EXAMPLE PILLAR I CHART)

Average scores - Pillar I Elements - Commitment to Process Safety

Legend: ── Element Average   ── Key Items Average

Radar chart axes: I-A. Process Safety Culture, I-B. Compliance with Standards, I-C. Process Safety Skills, I-D. Workers' Involvement, I-E. Stakeholders' Involvement (scale 0% to 90%)
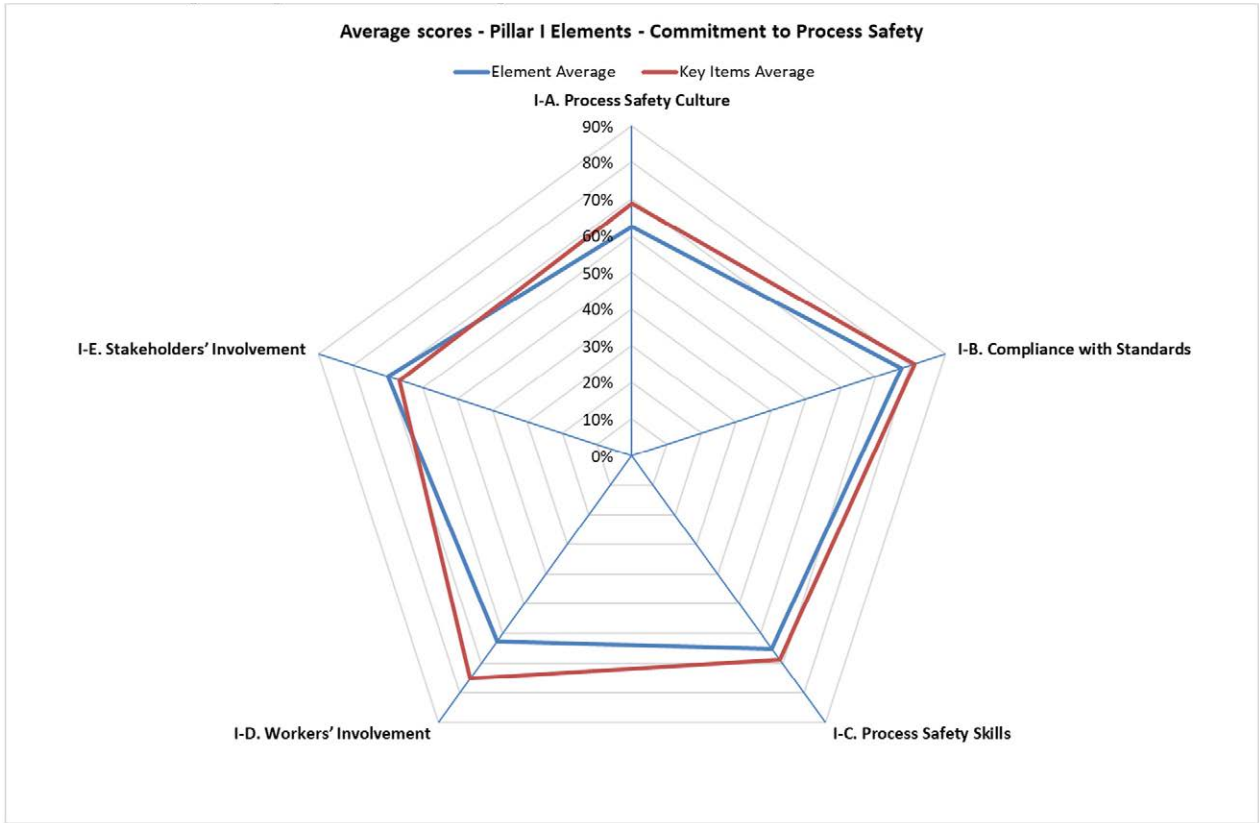
AUTHORS, COPYRIGHTS AND DISCLAIMERS

Coordinators:

• Process Safety Project Team – ARPEL

• Industrial and Process Safety Department – TEMA LITOCLEAN.

Authors:

Version 2 of the Process Safety Self-Assessment Tool was created from the joint effort of the members of the ARPEL Process Safety Project Team, the group of specialists of TEMA LITOCLEAN's Industrial and Process Safety Department and members of ARPEL's partner companies.

ARPEL would like to give special thanks to all the people who dedicated their time, knowledge and experience to the preparation of this document.

arpel ASSOCIATION OF OIL, GAS AND RENEWABLE ENERGY COMPANIES OF LATIN AMERICA AND THE CARIBBEAN

tema litoclean

Copyright

Disclaimer of Liability

BIBLIOGRAPHY

- *Center for Chemical Process Safety "Guidelines for Risk Based Process Safety"* American Institute or Chemical Engineers, New York NY (2007)

- *Center for Chemical Process Safety "Guidelines for Auditing Process Safety Management System"* Second Edition American Institute or Chemical Engineers, New York NY (2011)

- *Center for Chemical Process Safety "Guidelines for Management of Change for Process Safety"* American Institute of Chemical Engineers, New York NY (2008)

- *Center for Chemical Process Safety "Conduct Operations and Operational Discipline"* American Institute or Chemical Engineers, New York NY (2011)

- *Center for Chemical Process Safety "Guidelines for Process Safety Metrics"* American Institute or Chemical Engineers, New York NY (2009)

- *Center for Chemical Process Safety "Guidelines for Implementing Process Safety Management"*, 2nd Edition, New York NY (2016)

Process Safety Self-Assessment Methodology and Tool

2nd edition, 2022

BEST PRACTICES

September **2024**

Arpel Publication
MP01-2022

arpel

ASSOCIATION OF OIL, GAS AND
RENEWABLE ENERGY COMPANIES
OF LATIN AMERICA AND THE CARIBBEAN

ARPEL is a non-profit association gathering oil, gas and renewable energy sector companies and institutions in Latin America and the Caribbean. Founded in 1965 as a vehicle of cooperation and reciprocal assistance among sector companies, its main purpose is to actively contribute to industry integration and competitive growth, and to sustainable energy development in the region.

Its members currently operate in more than 30 countries in Latin America and the Caribbean, including national and international operating companies; technology, goods and services providers for the value chain, and national and international institutions in the sector.