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Development of an Effective Procedure Writer's Guide using a Human Factors and Regulatory Compliance Approach

S. Camille Peres[1*], Noor Quddus[2], Samina Rahmani[2], Pranav Kannan[2], Lubna Ahmed[2], Paul Ritchey[1], William Johnson[1], M. Sam Mannan[2]
[1]Texas A&M Ergonomics Center
[2]Mary Kay O'Connor Process Safety Center
Texas A&M University
*Corresponding author

ABSTRACT

Well-written procedures are an integral part of any industrial organization for safe operation, managing risks, and continuous improvement. Regulatory bodies around the world require industries to have current, accurate, and appropriate procedures for most processes. Although the importance of procedures is recognized by all industries in general, significant incidents have occurred in the past due to procedural breakdowns. Some of the procedural breakdowns come from obvious problems such as the procedure not being available or the procedure being wrong. However, some incidents have occurred when correct procedures were available and the operator used those procedures. In these instances, the reason why operators do not follow procedures correctly may be attributable to many factors, one of them being that the procedure is presented or designed in a manner that does not sufficiently communicate to the operators the information that is needed in a manner that is easily and quickly understood. The work presented here is focused on the latter circumstance and is part of a program of research that will ultimately lead to the development of a writer's guide for procedures that supports operators' comprehension and compliance with all types of industrial procedures. The writer's guide is based on empirical findings from human factors and human performance studies and provides writers with information on how to present procedures in a manner that is clear, thorough, and (if necessary) implementable with short notice. For the first phase of the project, a sample of the regulations and standards from several industries were used to identify procedure writing practices necessary for ensure regulatory compliance. Regulations and industrial standards from around the world were organized to reflect common ideas and the implications in terms of human factors needs were identified with regard to procedure design. Any human factors (HF) that had implications for the writer's guide that had empirical support, were included in the writer's guide (with the reference) with an explanation of the HF implication and empirical support. The writer's guide developed is structured to allow procedure writers access to guidance on various types of procedures they are writing, the type of information they are trying to communicate, and methods for maintaining accurate and current procedures. As mentioned, the current project is

the beginning of a program of research and then next phase will include feedback from operators regarding the challenges they face when using procedures.

1.0 INTRODUCTION

Following the correct procedure for performing tasks in high-risk work environments (*e.g.*, chemical plants, drilling rigs, nuclear power plants) is associated with safe, effective, and efficient operations (Jamieson & Miller, 2000). The methods used to provide procedures to workers can differ widely across industries and companies. For instance, in the nuclear industry, the steps for some procedures are integrated into the console where the operators perform the task (Niwa, Hollnagel, & Green, 1996). In other domains, it is more common for operators to use hand held, paper based procedures (Noroozi, Khan, MacKinnon, Amyotte, & Deacon, 2014). Regardless of the presentation, effective procedures not only mitigate risks but also are important for the transfer of knowledge from the engineers of the system to the operators of the system and for training purposes.

However, analyses of root causes for incidents and accidents in high-risk industries have found procedures use (or rather misuse) is one of the most frequently occurring root causes (Bullemer, & Laberge, 2010). Problems with procedure use vary from the procedures not being available or correct to the procedure being unclear or difficult to follow (Bullemer, & Laberge, 2010). While the availability and correctness of procedures is a management issue, the clarity of the presentation is essentially a design challenge. A bad procedure presentation design can cause confusion, result in missteps, or possibly result in an operator not using a procedure simply because it is difficult to follow (Embrey, 1999). Further, the "best" procedure presentation design has not clearly been established. Specifically, although there are many procedure writer's guides available, most of them are not based on results from peer reviewed studies regarding how presentation impacts human performance. The importance of procedures is further amplified by the fact that most regulations and standards have elements regarding procedure development, management, and availability. However, most writer's guides are not structured in a manner that will facilitate adherence to these regulations and standards associated with procedure development and use.

Research Objectives

The goal of the Advanced Procedures Writer's Guide project is to create a writer's guide that is based on peer reviewed scientific findings on human performance that facilitates procedures being written in a manner that adheres to relevant regulations and standards and increases the likelihood of procedure comprehension and compliance. To accomplish that, the following steps were taken:

- Review and summarize regulations and guidelines from different industries and countries
- Review and summarize procedures writer's guides from different industries and countries
- Identify aspects of the regulations and standards that have human performance implications
- Identify any existing human performance empirical studies that could be used to provide guidance to procedure writers and incorporate those findings into a new procedure writer's guide.

This paper presents a detailed description of the analyses of the regulations and standards related to procedures. These analyses involved not only identifying which of them had information about procedures but also identifying common themes (or elements) across the different agencies. These elements were further grouped into categories to reflect the current state of regulations and standards with regard to procedures. This analysis of the content of these regulations and standards facilitated the development of a writer's guide that supports regulatory compliance. Additionally (and possibly more importantly) when these analyses are combined with information about attributes of procedures that impact human performance and risk mitigation, this information can be used to identify potential gaps in the guidance being provided to industry regarding procedure development, presentation, and use.

2.0 METHODOLOGY

Figure 1 illustrates the overall methodology for the integration of the regulations and standards analysis into the Advanced Procedures Writer's Guide and includes: identifying and reviewing regulations and standards; identifying common elements across them; grouping the elements into categories based their functional relationships; and finally, using this information to identify the guidelines needed in the Advanced Procedures Writer's Guide.

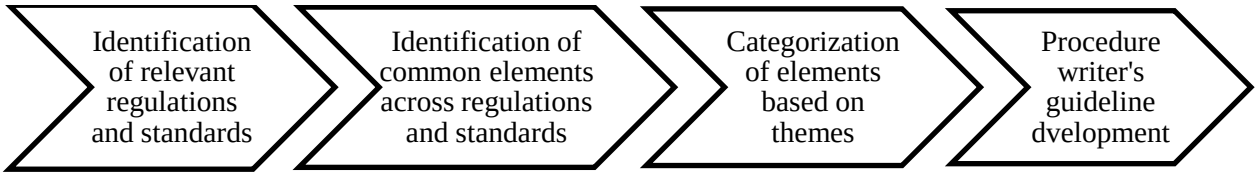


Figure 1: Schematic illustration of the methodology for integrating regulations and standards into a procedure writer's guide.

Review of Regulations and Standards

In order to have a holistic view of the current regulatory requirement for procedure development and usage, a global cross section of policies was used for the regulatory analyses. Three United States of America (US) agencies were reviewed: US-Occupational Safety and Health Administration (OSHA), the US-Environmental Protection Agency (EPA), and Safety and Environmental Management Systems (SEMS: administered by Bureau of Safety and Environmental Enforcement for offshore facilities in the US). One agency from the United Kingdom was reviewed (The Off Shore Installations (Safety Case) Regulations 2005), as well as one from Qatar (Health and Safety Regulations and Enforcement Directorate) and one from Australia (National Offshore Petroleum Safety and Environmental Management Authority - Commonwealth Australia). Three international agency's materials were also reviewed: International Organization for Standardization (ISO) 9002 Model for Quality Assurance in Production, Installation, and Servicing; ISO 14001:2004 Environmental Management Systems; and Occupational Health and Safety Assessment Series for Health and Safety Management Systems (OHSAS) 18001:2007. The listing of these and their abbreviations are provided in Table 1.

Table 1: Names of the Regulatory and Standards Agencies used in the study	
Agency	Abbreviation
Occupational Safety and Health Administration	US-OSHA
Environmental Protection Agency	US-EPA
Bureau of Safety and Environmental Enforcement	US-BSEE
Safety and Environmental Management Systems SEMS adapted from API Recommended Practice 75	
The Off Shore Installations (Safety Case) Regulations 2005	UK Safety Case
Health and Safety Regulations and Enforcement Directorate (Qatar HSE Regulations)	Qatar HSE
National Offshore Petroleum Safety and Environmental Management Authority (NOPSEMA) - Commonwealth Australia	Australia NOPSEMA
General Environmental Law and Rules for Implementation [28 Rajab 1422 H] (Saudi Arabia Environmental Law)	Saudi Arabia EL
International Organization for Standardization ISO 9002 Model for Quality Assurance in Production, Installation and Servicing	ISO 9002
International Organization for Standardization ISO 14001:2004 Environmental Management Systems	ISO 14001
Occupational Health and Safety Assessment Series for Health and Safety Management Systems OHSAS 18001:2007	OHSAS

Note: For the safety case regulations, there was no direct reference or section available for procedures, thus relevant sections were taken which had implications for the development of the procedures.

Identification of Common Elements

Many of the agencies had similar regulations and standards (or ones that had similar intent). To identify similarities and differences across the agencies' materials, the regulations and standards were grouped into elements given these similarities. For instance, as shown in figure 2, regulations across all agencies that address the reviewing of procedures were identified and the clauses from these regulations were grouped under the element '"Review of procedure".

Element # 21: Review of procedures	
US-OSHA	1910.119(f)(3) - The operating procedures shall be reviewed as often as necessary to assure that they reflect current operating practice, including changes that result from changes in process chemicals, technology, and equipment, and changes to facilities. The employer shall certify annually that these operating procedures are current and accurate.
US-EPA	(c) The owner or operator shall ensure that the operating procedures are updated, if necessary, whenever a major change occurs and prior to startup of the changed process.
USA-BSEE	(c) Operating procedures must be reviewed at the conclusion of specified periods and as often as necessary to assure they reflect current and actual operating

Figure 2: Example of the element "Review of procedure" which

contains several regulations or standards from different agencies

Grouping Elements into Categories

To clarify the functional relationships of the elements identified to the development of procedures, the elements were grouped into categories based on the stage and aspect of procedures each element described. For instance, as shown in figure 3, the elements “Review of procedures”, “Safe work practices”, “Document changes”, “Evaluation of compliance”, and “Internal audit” were all deemed to have similar functional objectives related to ensuring that procedures are updated and managed effectively and regularly. Thus they were grouped into a category named “Management of procedures”.

Category 5: Management of Procedures	
21	Review of procedures
22	Safe work practices
23	Document changes
26	Evaluation of compliance
29	Internal audit

Figure 3: Example of the category “Management of Procedure” that has five elements in it.

3.0 RESULTS

Common Elements

Appendix A summarizes twenty-nine common elements that in total contain eighty different pieces of regulations and standards with specific wording for each. A general theme found in the element was that procedures need to be clear and concise, accurately reflect process safety information, and be subject to document and operational control.

Element Categories

The twenty-nine elements were identified based on common themes and then were grouped further into five different categories of elements. Table 2 represents the five categories of elements along with the element listing. The last column of Table 2 illustrates the number of constituent regulations and standards that were obtained to identify each element. The categories are:

1. General procedure requirements: Overall requirements in terms of procedures at a facility
2. Types of procedures necessary: Procedures addressing different operational functions and environments
3. Normal operating limits and ranges: Information regarding important operation parameters
4. Hazard information: Information regarding hazards, consequences, and risk
5. Management of procedures: Documents control, management of change, revision schedules

1. General procedure requirements

This category encompasses regulations and standards that outline the need for the employers/organizations to have procedures and for those procedures to be 'written'. This category also covers the aspect of having procedures provide instructions for "safe operation" consistent with the process or operation in discussion. All of the agencies reviewed had items associated with this category.

2. Types of procedures necessary

The elements in this category all articulate specific types of procedures that must be available to operators such as procedures for normal operations and procedures for normal shutdowns. These elements also include regulations and standards associated with the nature of operations (i.e., one-off procedures, frequently completed procedures, and procedures for emergencies). Many agencies had at least one item in this category and those agencies included US-OSHA, US-EPA, US-BSEE, ISO, OHSAS, and NOPSEMA.

3. Normal operating limits and ranges

This category includes elements associated with providing operators information about the functional limits of certain process variables in a facility. Not only do the limits themselves need to be communicated but also the consequences and corrective actions needed if the limits are exceeded. All of the agencies had elements in this category.

4. Hazard exposure

The focus of the elements in this category was the identification of hazards and the appropriate response to these hazards. These hazards could be associated with process, personal, or environmental safety and the agencies that had elements associated with this category were US-OSHA, ISO, OHSAS, US-BSEE, UK-Safety Case, Qatar HSE Regulations, and NOPSEMA.

5. Management of procedures

This category consisted of elements that include the audit of existing procedures to ensure they reflects the needs of both the process and operator and also to update procedures when changes to the process or equipment affect how an operation should be completed. The agencies with specific items regarding management of procedures were US-OSHA, US-EPA, US-BSEE, OHSAS, ISO 9002 & 14001, and OHSAS.

Table 2: Description of categories and the number of regulations and standards in each category and element.

Element #	Description	Number of Regulations and Standards
Category 1: General Procedure requirements		**19**
1	Overall procedure requirements	8
2	Steps of a procedure	1
20	Procedures availability and clarity	5
24	Overall requirement for procedure content	1
27	Competence, training and awareness	2
28	Legal and other requirements	2
Category 2: Types of Procedures Necessary		**24**
3	Initial startup	3
4	Normal operations	3
5	Temporary operations	2
6	Safe emergency shutdown	3
7	Emergency operations	4
8	Normal shutdown	3
9	Startup after maintenance and emergency	4
25	Quality control	2
Category 3: Normal Operating Limits and Ranges		**9**
10	Operating limits	2
11	Consequences of exceeding limits	5
12	Preventative and corrective actions for deviated from limits	2
Category 4: Hazards Information		**17**
13	Safety, health and environmental consideration	2
14	Identification of typical hazards	2
15	Precautions necessary to avoid hazards	3
16	Control of and response to hazards	2
17	Raw material control	2
18	Identification of unique hazards	2
19	Knowledge of system safety	4
Category 5: Management of Procedures		**11**
21	Review of procedures	4
22	Safe work practices	2
23	Document changes	1
26	Evaluation of compliance	2
29	Internal audit	2

4.0 DISCUSSION

The analysis of regulations and standards done here clearly show that procedures are considered important and necessary by many agencies around the world and that there are some similarities in those agencies' judgments regarding what high risk industries need with regard to procedures. However, while these analyses are a good beginning, they are unlikely to provide a *complete* understanding of the necessary information to facilitate effective development and use of procedures in high-risk industrial settings.

These analyses do give an interesting and surprising insight into the scale of differences when it comes to compliance requirements. One observation is the lack of homogeneity in the requirements across the different regulatory bodies—while this can be attributed to a combination of geographical, social, political, environmental, and other factors—it is not an overstatement to say that regulations regarding procedure use and implementation have been instituted in order to enforce a "minimum" requirement of personal and process safety. However, true best practices need to *build* on these minimum requirements. Nevertheless, the categorization of elements presented here provides a good basis or structure for developing guidelines for procedures since these categories can facilitate companies' complying with regulations. Further, given that many organizations need to meet these regulations and that the categorizations of the regulations are functional in nature, they provide a logical structure for an effective writer's guide.

Writer's Guide Development

Although the regulations summary does not provide the necessary content of an effective writer's guide, it provides an excellent outline. Indeed, Figure 4 shows the outline of the Advanced Procedures Writer's Guide (Peres, Mannan, Rahmani, Ahmed, Johnson, Kannan, & Ritchey, unpublished) and it should be noted that each section of the writer's guide is essentially a category of the elements of regulations and standards as identified in the results section. To develop the content of this guide, subject matter experts in Human Factors and in procedure use in high-risk industrial settings did a review of the content of the five categories. With these reviews, clear descriptions of each element were created along with the reasons for the element and the consequence of not having the element (see Figure 5).

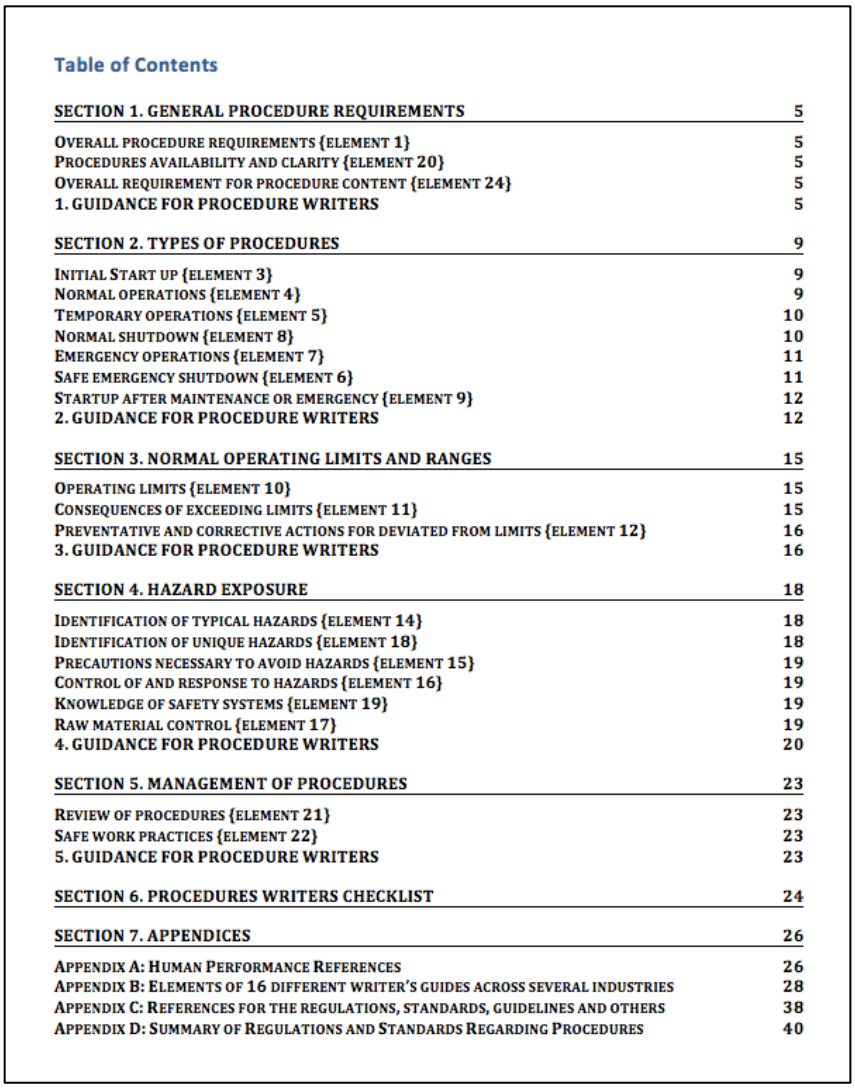
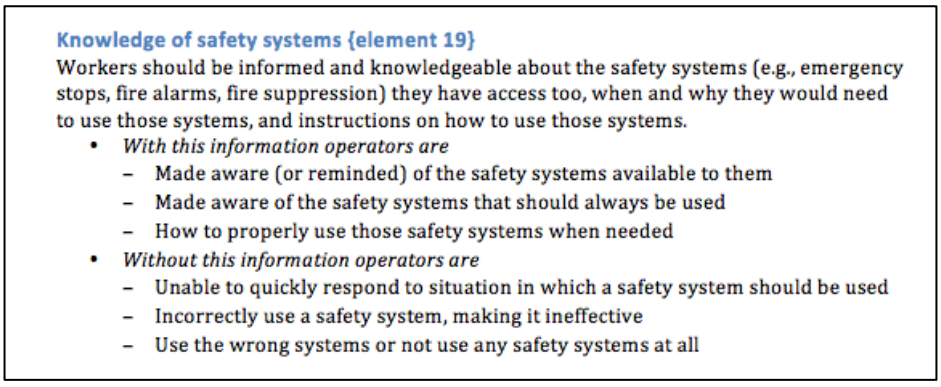


Table of Contents

Figure 4: Table of content of the Advanced Procedures writer's guide



Knowledge of safety systems {element 19}

Workers should be informed and knowledgeable about the safety systems (e.g., emergency stops, fire alarms, fire suppression) they have access too, when and why they would need to use those systems, and instructions on how to use those systems.

- *With this information operators are*
  - Made aware (or reminded) of the safety systems available to them
  - Made aware of the safety systems that should always be used
  - How to properly use those safety systems when needed
- *Without this information operators are*
  - Unable to quickly respond to situation in which a safety system should be used
  - Incorrectly use a safety system, making it ineffective
  - Use the wrong systems or not use any safety systems at all

Figure 5. Example of an explanation of an element, the need for the element, and the potential consequences if the element is not available.

With this information, studies on human performance related to procedure use as well as existing writer's guides were applied to the content identified in the analysis of the regulations and standards. This information was provided in the "Guidance for Procedures Writer's" sections of the writer's guide.

Challenges with current approach

It is important to note that many facilities may use similar technology but may be under different jurisdictions of regulatory and standards authorities. Hence, a common method for developing and deploying procedures may yield an over-simplification of the process that is not effective. For instance, a common method of building procedures can be very effective for a very common set of procedures, particularly if there is a need to transcribe the procedures in multiple languages. However, this could also lead to misinterpretations of the procedure if there is a loss of context or cultural differences. Thus, ultimately (or ideally) there will need to be elements and categories in the writer's that address these types of cultural and contextual issues, particularly given the number of international companies who do high-risk industrial work.

Next steps

As stated previously, the review and analysis of the regulations and standards provided an important outline of the minimum standards for procedures. However, not only are these only the minimum standards, there are challenges operators experience with using procedures that are not articulated by these agencies at all. For instance, a survey of 400 operators found that 62% of them reported: "if they followed the procedure to the letter, they would not be able to get their work done in time" (Embrey, 1999). This clearly indicates that observational studies with employees in these industries need to be done to determine the kinds of issues they are having with procedure use to include guidance to procedure writers that will mitigate these issues and this research is currently ongoing. Finally, empirical studies need to be conducted to determine if the Advanced Procedures Writer's Guide does in fact support the development of more clear procedures that meet regulatory and standards criteria (at a minimum).

5.0 CONCLUSION

Many companies have facilities from around the world as part of their portfolio, thus having an effective, unified system of preparing operating procedures would be extremely advantageous to save costs and to save lives. To do this, it is necessary to identify and incorporate all the elements of regulations and standards associated with procedures. Further, the procedures need to be built in such a way that any upgrade or change can be performed in a comprehensive manner following adequate management of change procedures and ensuring overall safety. However, the methods for doing this are neither easy nor obvious. The analyses of the regulations and standards here as well as the preview of the writer's guide, written with a Human Factors perspective, can facilitate companies being able to do this more effectively and efficiently.

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APPENDIX-A

Source	Regulation/Standard Wording
Element # 1: Overall procedure requirements	
US-OSHA	1910.119(f)(1) - The employer shall develop and implement written operating procedures that provide clear instructions for safely conducting activities involved in each covered process consistent with the process safety information and shall address at least the following elements.
US-EPA	§68.52 Operating procedures: The owner or operator shall prepare written operating procedures that provide clear instructions or steps for safely conducting activities associated with each covered process consistent with the safety information for that process. Operating procedures or instructions provided by equipment manufacturers or developed by persons or organizations knowledgeable about the process and equipment may be used as a basis for a stationary source's operating procedures.
US-BSEE	(a) You must develop and implement written operating procedures that provide instructions for conducting safe and environmentally sound activities involved in each operation addressed in your SEMS program. These procedures must include the job title and reporting relationship of the person or persons responsible for each of the facility's operating areas and address the following:
UK-Safety Case Regulations	SER 2005 - UK - Regulation 11 (Schedule 5) : A description of how the proposed arrangements, methods and procedures for dismantling the installation and connected pipelines take adequate account of the design and method of construction of the installation and its plant.
ISO 9002	4.4: Document control - Establish and maintain procedures to control all documents and data that relate to requirements of standard. Documents shall be reviewed and approved for adequacy by authorised personnel prior to issue. (b) Obsolete documents promptly removed from all points of issue.
ISO14001: 2004	4.4.6: Operational Control- The organization shall establish, implement and maintain a procedure.
OHSAS 18001: 2007	4.4.6 Operational Control-The organization shall establish, implement and maintain a procedure.

Qatar HSE regulation	Article 59: Local Supervision Rules: Set the rules and procedures in a language well understandable to the workers. DECREE-LAW NO. (30) OF 2002: 8- Development of the environment: The politics and procedures that satisfy the needs of the permanent development in the state, socially, culturally and economically. The politics and procedures achieve the goals and principles for which this law has been issued, including improving the elements of the natural environment, preserving the biological variety and the historical, archeological, natural, present and future heritage.
Element #2: Steps of a procedure	
US-OSHA	1910.119(f)(1)(i) -Steps for each operating phase
Element #3: Initial start up	
US-OSHA	1910.119(f)(1)(i)(A) - Initial startup;
US-EPA	(1) Initial startup
US-BSEE	(1) Initial startup;
Element #4: Normal operations	
US-OSHA	1910.119(f)(1)(i)(B) - Normal operations;
US-EPA	(2) Normal operations;
US-BSEE	(2) Normal operations;
Element #5: Temporary operations	
US-OSHA	1910.119(f)(1)(i)C -Temporary operations;
US-EPA	(3) Temporary operations;
Element #6: Safe emergency shutdown	
US-OSHA	1910.119(f)(1)(i)(D) : Emergency shutdown including the conditions under which emergency shutdown is required, and the assignment of shutdown responsibility to qualified operators to ensure that emergency shutdown is executed in a safe and timely manner
US-EPA	(4) Emergency shutdown and operations;
US-BSEE	(3) All emergency operations (including but not limited to medical evacuations, weather-related evacuations and emergency shutdown operations);
Element # 7: Emergency operations	
US-OSHA	1910.119(f)(1)(i)E - Emergency Operations;
US-EPA	(4) Emergency shutdown and operations;
ISO 14001: 2004	4.4.7 : Emergency Preparedness and Response
OHSAS 18001: 2007	4.4.7 :Emergency Preparedness and Response
Element # 8: Normal shutdown	
US-OSHA	1910.119(f)(1)(i)(F) - Normal shutdown;
US-EPA	(5) Normal shutdown;
US-BSEE	(4) Normal shutdown;
Element # 9: Start up after maintenance or emergency	
US-OSHA	1910.119(f)(1)(i)(G) - Startup following a turnaround, or after an emergency shutdown.

US-EPA	(6) Startup following a normal or emergency shutdown or a major change that requires a hazard review
US-BSEE	(5) Startup following a turnaround, or after an emergency shutdown;
Australia-Work - Health and safety and NOPSEMA: Offshore and common wealth waters	Party 2 - Division 1 : 9 - Duties of the operator - Specific duties 2 (e) to take all reasonably practicable steps to implement and maintain appropriate procedures and equipment for the control of, and response to, emergencies at the facility;
Element # 10: Operating limits	
US-OSHA	1910.119(f)(1)(ii)-Operating limits:
UK-Safety Case Regulations	Regulation 17 (Schedule 6) - (d) a description of the design of the well, including the limits on its safe operation and use.
Element # 11: Consequences of exceeding limits	
US-OSHA	1910.119(f)(1)(ii)(A) -Consequences of deviation;
US-EPA	(7) Consequences of deviations and steps required to correct or avoid deviations (8) Equipment inspections.
US-BSEE	(7) Safety and environmental consequences of deviating from your equipment operating limits and steps required to correct or avoid this deviation;
Qatar HSE Regulation	Anyone who intends to do an action or abstains from an action which could lead to negative impacts on the environment, shall identify its potential impacts, […] procedures to prevent those impacts or to reduce the possibility of their occurrence
Saudi Arabia Environmental Law	Environmental Assessment: The study carried out to identify the potential of the project or consequential environmental impacts, the procedures and appropriate methods to prevent or reduce the negative impact and increase or achieve positive outputs of the project on the environment in accordance with the environmental standards in force.
Element # 12: Preventative and corrective actions for deviated from limits	
US-OSHA	1910.119(f)(1)(ii)(B) - Steps required to correct or avoid deviation.
US-BSEE	(6) Bypassing and flagging out-of-service equipment;
Element # 13: Safety, health and environmental consideration	
US-OSHA	1910.119(f)(1)(iii) - Safety and health considerations:
ISO 14001: 2004	- 4.3.1 - Environmental Aspects
Element # 14: Identification of typical hazards	
US-OSHA	1910.119(f)(1)(iii)(A) - Properties of, and hazards presented by, the chemicals used in the process;
OHSAS 18001: 2007	4.3.1: Hazard Identification, Risk Assessment and Determining Controls
Element # 15: Precautions necessary to avoid hazards	
US-OSHA	1910.119(f)(1)(iii)(B) - Precautions necessary to prevent exposure, including engineering controls, administrative controls, and personal protective equipment;

US-BSEE	(9) Precautions you will take to prevent the exposure of chemicals used in your operations to personnel and the environment. The precautions must include control technology, personal protective equipment, and measures to be taken if physical contact or airborne exposure occurs;
UK-Safety Case Regulations	Regulation 17 (Schedule 6) - (c) the procedures for effectively monitoring the direction of the well-bore, and for minimizing the likelihood and effects of intersecting nearby wells;
Element # 16: Control of and response to hazards	
US-OSHA	1910.119(f)(1)(iii)(c) -Control measures to be taken if physical contact or airborne exposure occurs;
Qatar HSE regulation	Article 64 Evaluation of Exposure: The licensee shall undertake to adopt all necessary measures for the evaluation of the occupational exposure of workers to radiation as well as to carry out appropriate procedures […] under an adequate program for the control of quality.
Element # 17: Raw material control	
US-OSHA	1910.119(f)(1)(iii)(D) - Quality control for raw materials and control of hazardous chemical inventory levels;
US-BSEE	(8) Properties of, and hazards presented by, the chemicals used in the operations;(10) Raw materials used in your operations and the quality control procedures you used in purchasing these raw materials; (11) Control of hazardous chemical inventory;
Element # 18: Identification of unique hazards	
US-OSHA	1910.119(f)(1)(iii)(E) - Any special or unique hazards. Special or unique hazards include: a) Exposed high voltage equipment b) Unusual reactions c) Liquid full piping, also other factors such as inadvertent mixing amongst others.
US-BSEE	(12) Impacts to the human and marine environment identified through your hazards analysis.
Element # 19: Knowledge of safety systems	
US-OSHA	1910.119(f)(1)(iv) -Safety systems and their functions.
ISO 14001:2004	4.5.1 - Monitoring and Measurement
OHSAS 18001:2007	4.5.3 - Incident Investigation, Nonconformity, CAPA
Australia-Work - Health and safety and NOPSEMA: Offshore and common wealth waters	Party 2 - Division 1 : 9 - Duties of the operator - to take all reasonably practicable steps to ensure that any plant, equipment, materials and substances at the facility are safe and without risk to health;
Element # 20: Procedures availability and clarity	
US-OSHA	1910.119(f)(2) - Operating procedures shall be readily accessible to employees who work in or maintain a process.
US-BSEE	(b) Operating procedures must be accessible to all employees involved in the operations.

ISO 9002	Section 4.4 - (a) Appropriate documents available at all locations where operations essential to the effective functioning of a quality system are performed.
Qatar HSE regulation	Article 74: Quality Assurance: Written records of all related procedures and results
Australia-Work - Health and safety and NOPSEMA: Offshore and common wealth waters	Model work and safety wall: Part 5 - Division 2 - If the person conducting the business or undertaking and the workers have agreed to procedures for consultation, the consultation must be in accordance with those procedures.
Element # 21: Review of procedures	
US-OSHA	1910.119(f)(3) - The operating procedures shall be reviewed as often as necessary to assure that they reflect current operating practice, including changes that result from changes in process chemicals, technology, and equipment, and changes to facilities. The employer shall certify annually that these operating procedures are current and accurate.
US-EPA	(c) The owner or operator shall ensure that the operating procedures are updated, if necessary, whenever a major change occurs and prior to startup of the changed process.
US-BSEE	(c) Operating procedures must be reviewed at the conclusion of specified periods and as often as necessary to assure they reflect current and actual operating practices, including any changes made to your operations.
OHSAS 18001:2007	4.5.4 - Control of Records
Element # 22: Safe work practices	
US-OSHA	1910.119(f)(4) - The employer shall develop and implement safe work practices to provide for the control of hazards during operations such as lockout/tagout; confined space entry; opening process equipment or piping; and control over entrance into a facility by maintenance, contractor, laboratory, or other support personnel. These safe work practices shall apply to employees and contractor employees.
US-BSEE	(d) You must develop and implement safe and environmentally sound work practices for identified hazards during operations and the degree of hazard presented. (e) Review of and changes to the procedures must be documented and communicated to responsible personnel.
Element # 23: Document changes	
ISO 9002	Section 4.4.2 Document Changes/Modifications - Changes shall be reviewed and approved - Nature of change identified in documents /attachments - Procedure in place to preclude use of non applicable procedures - Documents reissued (revised) after practical number of changes made.
Element # 24: Overall requirements	

ISO 9002	Section 4.8.1 (a) Process Control - Establish instructions defining manner of production and installation where absence of instructions would adversely affect quality
Element # 25 Quality control	
ISO 9002	Section 4.12 - Control of non-conforming product - Establish and maintain procedures to ensure non-conforming product not used or established.
ISO 9002	Section 4.18 - Statistical techniques - Where appropriate establish procedures identifying statistical techniques for verifying acceptability of process and products.
Element # 26 Evaluation of compliance	
ISO 14001:2004	4.5.2 - Evaluation of Compliance
OHSAS 18001:2007	4.5.1 – Checking and 4.5.2 - Evaluation of Compliance
Element # 27: Competence, training and awareness	
ISO 14001:2004	4.4.2 - Competence, Training and Awareness
OHSAS 18001:2007	4.4.2 - Competence, Training and Awareness
Element # 28: Legal and other requirements	
ISO 14001:2004	4.3.2 - Legal and other Requirements
OHSAS 18001:2007	4.3.2 - Legal and other Requirements
Element # 29: Internal audit	
ISO 14001:2004	4.5.5 Internal Audit
OHSAS 18001:2007	4.5.5 Internal Audit