HUMAN PERFORMANCE
OIL & GAS

Best Practice in Procedure Formatting

REVISION 1 : August 2021

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Amendment/Review Summary

Issue No	Date	Description
Issue 1	October 2020	Author's Draft
Issue 2	February 2021	First Draft for HPOG Steering Committee and Member Review
Issue 3	03 March 2021	Second Draft for HPOG Steering Committee and HPOG Member Review
Issue 3a	05 April 2021	Minor Draft Amendments Section 4
Revision 1	02 August 2021	First formal issue

This document has been formally approved for issue by consensus of the HPOG Steering Committee and any subsequent amendments shall be similarly approved.

Amendments shall be issued via hpog.org and communications to all subscribers.

Additionally, the manual shall be periodically reviewed to ensure the validity of its content.

HPOG wishes to thank all contributors who have provided the resources used in developing this document, and thanks all those who have taken the time to review the content.

HPOG Steering Committee 2021

Table of Contents

1 Introduction

Procedures play an essential role in all management systems, helping to ensure safe and reliable operations by providing the right person with the right information at the right time.

However, even when procedures are developed following best practices and industry guidance, they cannot be considered an effective prevention for human performance risks that are the result of poor design or systems.

Human Performance in procedure management focuses on integrating the needs of the end user into the process and design of procedures and work instructions; at every stage of development, verification, roll-out and review.

In this context, a detailed analysis of task characteristics, complexity, criticality, and constraints will address Performance Shaping Factors that are not managed by design.

This document, in tandem with recognized industry best practice, offers additional guidance in the design of effective and usable procedures.

Background

Investigations into major incidents highlight ‘inadequate management of procedures’ as one of the main contributing factors – ***or a Performance Shaping Factor***. Irrelevant procedures may encourage deviation; procedure overload can overwhelm and discourage use; contradictory procedure statements can lead to adaptation.

Classifying these actions as ‘non-compliance’ or ‘procedural violation’ is counterproductive. There is value in understanding and monitoring the gap between written procedures (work as imagined) and actual work practice (work as done) with due consideration to task, organizational and environmental factors.

It is therefore necessary to determine what will or could happen in practice, or what problems may arise that cause the user to take a shortcut or make the procedure unworkable.

2 List of Abbreviations

HPOG Definitions		
Term	**Abbreviation**	**Definition**
Human Factors	HF	Human Factors is the range of physical, psychological, social or organisational influences which affect Human Performance and how people carry out their activities. It is also a discipline concerned with designing equipment, work environments and activities so that people find tasks easy to perform, safe and matched to their strengths and limitations. It is an approach which is integrated into risk management, engineering, procedure writing, job planning and training. These are also referred to as Performance Shaping Factors or Performance Influencing Factors, Error Traps or Error Producing Conditions
Human Performance	HP	It's what individuals do as part of their daily activities and how they carry out individual and group tasks. It's a synonym of behaviour. Identification and management of Human Performance is critical to ensuring robust operations
Performance Shaping Factors	PSFs	Performance Shaping Factors (PSFs) are a range of conditions that will influence Human Performance including aspects of human factors, worksite conditions, task design and organisational circumstance. These can be LATENT or long-term conditions that eventually contribute to an incident. For example, poorly written procedures is a PSF that can lead to misinterpretation, manual handling / no automated alternative is a PSF that can lead to fatigue, unclear roles and responsibilities is a PSF that can lead improvisation etc. Likewise there may be additional ACTIVE or short-term conditions that affect performance on the day of the incident. For example, poor shift planning / unreasonable deadlines is a PSF that can lead to taking short cuts or stress, restrictive PPE and a hot working environment are PSFs that can lead to dehydration and loss of concentration etc.
Work-As-Imagined versus Work-As-Done	WAI v WAD	In simple terms, WAI refers to how people think the work should be done whilst WAD is what people actually do to get the work done. However, if the difference between work-as-imagined and work-as-done is properly acknowledged and supported, then work can be adjusted safely and lead to reduced risk, increased reliability, and increased engagement.

HPOG Definitions *(continued)*		
Term	**Abbreviation**	**Definition**
Work-As-Imagined	WAI	Work-as-imagined is what engineers, planners, advisers, managers or anyone else involved in design believe the work should be done, under ideal circumstances. It's the work-as-imagined picture that determines how a process is set up, how people are trained and which controls need to be put in place. Work-as-imagined is an idealistic view of the formal task that doesn't consider how task performance is adjusted to match the constantly changing conditions of work and of the world. Work-as-imagined describes what should happen under normal working conditions.
Work-As-Done	WAD	Work-as-done is what people actually do to get the job done, taking into account the realities of the situation such as the equipment configuration, and ease of use of the procedure, and the time and resources they have. Those who have to do the work may find they want to adjust the plans set out in the work-as-imagined in order to get their work done. If this happens without appropriate support, shortcuts may be taken or other habits adopted that can lead to errors.
Human Reliability		A statement, usually in probabilistic terms, of likelihood with which a task may be performed successfully by a human being. Human Reliability Assessment is the modelling and estimation of the likelihood of human performance being successful, principally in relation to the operation of industrial systems.

3 Scope : Who Should Use This Document

This document, in tandem with recognized industry best practice, offers additional guidance in the design of effective and usable procedures. The content provides key stakeholders step by step guidance in the development of procedures. It also offers a resource that supports both general awareness of procedure content and a training aid for procedure writers.

Everyone across the organisation has a role to play. For more information on Stakeholder Engagement Guidance, please see Section 7.3.

Who Should Use This Document and Why	
Senior / Executive Leadership	Provides an overview of the process behind procedure development Helps drive the development, review and implementation of procedures
Operational / Site Level Leaders	A key stakeholder in procedure development providing user feedback Involvement in rolling out new and updated procedures through briefings
Front Line / Shop Floor Supervisors	Key stakeholder in procedure development providing user feedback Involvement in rolling out new and updated procedures
Engineers and Designers	Key stakeholder in development and providing technical feedback. Best practice guidance on procedure writing and design
HSE / Quality Specialists	Key stakeholder in development and providing technical feedback. Involvement in continuous and periodical review of procedures through management systems
Front Line Operators	Key stakeholder in development providing equipment user feedback
HF / HP Experts and Consultants	Key stakeholder in development providing specialist HF / HP feedback and guidance. Best practice guidance on procedure writing and design
HR, Learning, Training and Competency Management Professionals	Key stakeholder in development providing specialist feedback. Responsible for accompanying new procedures with relevant training and training updates.

4 Performance Shaping Factors

Before developing a procedure, it is important to understand why people can sometimes make mistakes, and why procedures are sometimes not followed. These points should be considered and addressed when developing procedures.

Performance Shaping Factors (PSFs) are a range of conditions that will influence Human Performance including aspects of human factors, worksite conditions, task design and organizational circumstance.

They are also referred to as Performance Influencing Factors, Error Traps or Error Producing Conditions.

<table>
<tr><th colspan="2">Examples of Performance Shaping Factors (PSFs)</th></tr>
<tr><th>Task Related Factors</th><th>People Related Factors</th></tr>
<tr><td rowspan="2">Complex or badly presented procedures.
Confusing tool / equipment design.
Difficult system / equipment interface, labelling, controls, alarms.
Unusual, infrequent, unfamiliar, or novel situations.
Boring, trivial, or repetitive actions.
Simultaneous operations, multi-Tasking, divided attention.
Infrequent or First-Time tasks, Insufficient time available.
Unclear signs, signals, instructions, or other information.
Difficult working environment (e.g. noise, heat, cramped conditions, lighting, ventilation, ease of access).
Potential for interruptions or distractions.</td><td>Fatigue, stress, workload.
Morale, motivation.
Inadequate training / competence.
Physical capability and condition.</td></tr>
<tr><th>Organization Related Factors</th></tr>
<tr><td>Changes of responsibility without adequate arrangements to ensure capability or competence.
Reduction in supervision.
Team-work deficiencies.
Conflicting priorities.
Overwork leading to inefficiency and lack of appropriate control.
Reduction in available resources.
Change of priority away from related tasks.
Inadequate staffing.
Poor communication and job planning.</td></tr>
</table>

4.1 Why Procedures are not Followed

Although procedures are a key element of a safety management system and an important training tool, organizations may rely too heavily on procedures as their primary means of controlling risk and fail to apply an appropriate hierarchy of control.

Procedures are Not Followed Because:	
Accuracy	They are inaccurate
	They are out of date
Practicality	They are unworkable in practice
	They make it more difficult to do the work
	They are too restrictive
	They are too time consuming
	If they were followed to the letter, they could not get done in time
Optimization	People usually find a better way to do the job
	They do not describe the best way to carry out the job
Presentation	It is difficult to know which is the right procedure
	They are too complex and difficult to use
	It is difficult to find the information you need in the procedure
Accessibility	It is difficult to locate the right procedure
	People are not aware that a procedure exists for the job they are doing
Policy	People do not understand why they are necessary
	No clear policy on when they should be used
Usage	People resent being told on how to do their job
	People prefer to rely on their own skills and experience
	People assume they know what is in the procedure

4.2 Encouraging Conformance

Tips for Encouraging Procedural Conformance	
Design	Design procedures to minimize the time and effort it takes for users to conform.
Match the Task	Base the procedure on how the task is *actually* performed in practice. The operators may have devised an informal procedure that is quicker or easier, and these methods could potentially be incorporated into the formal procedure as long as safety/quality issues are not compromised.
Address Short Cuts	Identify where short cuts may be taken and address these directly *(e.g. introduce verification checks if task is prone to skipping steps)*.
Involve Experienced Hands	Recognize 'experienced hands' by asking them to document examples of proven procedural practice as legacy for a less experienced workforce.
Keep it Short and Precise	Use short, easily understood sentences, providing precise and specific information. Avoid writing too much self-evident information as this will reduce the impact of key messages. Be precise in your description and controls, *(e.g. 'Open valve for 10 seconds' instead of 'Open valve for a short time')*.
Keep it Simple	Aim for documentation to be as simple and uncluttered as possible.
Use Pictures and Diagrams	Use pictures and diagrams where possible, ensuring that the pictures of equipment layout used align directly with the steps in the procedure.
Keep Up to Date	Adopt a control and review process to keep procedures relevant and up to date.
Avoid Unfamiliar Terms	Use clear and simple language avoiding unfamiliar terminology and abbreviations.
Use Active Language	Use active language using the WHO / WHAT / WHEN template *(e.g. 'PA places barrier around the worksite before any work starts' instead of 'a barrier should be placed around the worksite')*.
Avoid Negatives	Avoid negatives *(e.g. 'do not use tools in poor condition')*.
Clear Direction	Provide clear direction for any next steps. For example, if the step states "if pressure exceeds 120 psig (8.27 BAR), Call the Driller".
Step-by-Step Flow	Organize procedures in a chronological step-by-step flow of information.
Hazards and Warnings	Provide hazards and warnings at each step.

4.3 Work as Imagined vs Work as Done (WAI v WAD)

Important Note: WAI v WAD is an important consideration in procedure development. If work as done is reflected in the procedure, shortcuts are less likely to be taken.

In simple terms, WAI refers to how people think the work should be done whilst WAD is what people actually do to get the work done.

Those who have to do the work may find they want to adjust the plans set out in the work-as-imagined in order to get their work done. If this happens without appropriate support, shortcuts may be taken, or other habits adopted that can lead to errors.

However, if the difference between work-as-imagined and work-as-done is properly acknowledged and supported, then work can be adjusted safely and lead to reduced risk, increased reliability, and increased engagement.

WAI vs WAD	
WAI (Work-as-Imagined)	**What engineers, planners, advisers, managers, or anyone else involved in design believe the work should be done**, under ideal circumstances. It's the work-as-imagined picture that determines how a process is set up, how people are trained, and which controls need to be put in place.
Work-as-imagined describes what should happen under normal working conditions *and is an idealistic view of the formal task that doesn't consider how task performance is adjusted to match the constantly changing conditions of task or working environment.*	
WAD (Work-as-Done)	**What people actually do to get the job done**, taking into account the realities of the situation such as the equipment configuration, and ease of use of the procedure, and the time and resources they have.

5 Procedure or Job Aid?

Depending on the type of task being carried out, sometimes a simplified job aid is suitable for use.

It is important that procedures, job aids, policies and guidelines are all separate documents, but that they do not conflict with each other.

5.1 Decision Tree

To determine whether a procedure or other job aid is needed for each activity, the process is a simple one. To confirm that the most appropriate decision is made, it is advisable to involve end-users in the decision. This table should help with the decision-making process.

Task Criticality		Low			Medium			High		
Task Familiarity		Freq.	Infreq.	Rare	Freq.	Infreq.	Rare	Freq.	Infreq.	Rare
Task Complexity	Low									
	Med									
	High									

No Written Instruction Required | Job Aid Required | Step-by-Step Procedure Required

Important: The decision tree table shown above is presented as a guide only. It is recommended that a detailed analysis of task criticality is carried out before any decisions are made, in line with existing company policy.

5.2 Common Job Aids

Step-by-step procedures are the main type of procedure discussed in this manual. In some circumstances, job aids may be sufficient and are an important tool to guide and assure performance. Common types of job aid include:

Checklists: To systematically check all important elements have been considered.

Diagrams: To illustrate the layout of a unit.

Flowcharts: To show how a control of work system operates.

5.3 Other Documents

It is important that organizations distinguish between procedures and other types of document but show how they interlink with each other. **It is often found that procedures are combined with guidance and standards, making it difficult to focus on, and follow the steps.**

Common Types of Documents in Management Systems	
Policies	**Policies are statements about strategies for realizing business objectives.** These documents are usually corporately owned, limited to the number of business processes within the organization, and are typically one page in length.
Standards	**Standards are the minimum mandatory legal and/or business requirements to support the policies.** Organizations typically aim to limit the number of standards by defining them at a corporate level. Sometimes local standards are required when the context of the operations differs substantially, such as operating in another country where legislation may differ.
Guidelines	**Guidelines support documents to procedures and standards, providing more detail and references, including educational information on a topic.**

6 Content, Level of Detail and Adaptation

Procedures should be written specific to the work assigned and should describe the full scope of the work involved. A procedure should represent the best, most efficient way of performing the work.

6.1 Content

Procedural content should accurately reflect how a job is expected to be performed and should include only the information that is useful to the individuals who are involved in or who have responsibility for completing the work. All content should be consistent with other operating documents related to the work, such as the process description, operations manual, manufacturer information, training, applicable technical notes and standards, and regulatory requirements.

Recommended Procedure Components **Best Practice: *Procedures should state precautions before procedural steps.***	
Title and Revision	Document title, date created and each revision, with approval information.
Table of Contents	May aid navigation in long procedures, such as in shutdown or start-up.
Purpose and Scope	Outlining the goal of the procedure and to whom or what it applies.
Discussion	Briefly describing components, systems, and tasks.
Definitions	Describing all abbreviations and terms used.
Roles and Responsibilities	Including the number of personnel, the training, and the qualifications required for performing the tasks.
PPE	Describing all personal protective equipment required and any associated safety-critical information *(e.g. refills, replacements etc)*.
Materials and Equipment	Describing all materials and equipment required to perform the task steps and any associated safety-critical information *(e.g. securement, inspection etc)*.
Precautions	Related to safety of personnel, equipment, and environment.
Prerequisites	Including pre-completion or operational readiness review checklists.
Limitations	Such as restrictions on plant status, system or equipment operation, and important operational parameters.
Procedure Steps	May include illustrations or photographs to aid in clarification.
Acceptance Criteria	The set of predefined requirements that must be met in order to mark the task step(s) complete.
Final Conditions	How the plant, equipment etc should be left on completion.
References	List of all the sources used in the procedure so readers can easily find what has been cited or referred to.
Appendices	Including consequences of deviation tables, flowcharts, and graphs.
Related Documents	Job Aids such as checklists, data sheets, forms, matrices, and all other procedures. When referring to other documents, writers should note the version (with date) of each document in the procedure text.

6.2 Level of Detail

Procedure writers must provide enough information and detail so that workers can perform tasks correctly and safely. Procedures that are too detailed and hard to follow may lead to workers using them less frequently than they should. Procedures that have too little information may prevent an inexperienced worker from carrying out the written instruction.

Factors to Consider in Determining Level of Detail	
HSE and Asset Risks *Consequences of error associated the task.*	The severity of potential consequences that may occur if worker actions deviate from written instructions should influence the level of detail that writers include in procedures. **The level of detail should increase as the risk of injury, asset damage, reduction in effectiveness of safety-related systems, or complexity of the task increases.**
Worker Characteristics *Knowledge, skills, and physical abilities of the person assigned to perform the task.*	Procedures should provide sufficient detail so newly qualified and transferred workers can independently: • Understand the potential hazards associated with the process or equipment involved with the procedures. • Verify defined controls are in place. • Confirm the process or equipment is responding as expected. • Carry out infrequent or unusual tasks.
Task Characteristics *Task complexity or difficulty, including variability.*	The level of detail in a procedure depends in part on the complexity of the work, difficulty in performing it, and task variability, which influence the cognitive and physical skill required to perform a task. **Consider the Task 'Types' listed below:**
Complex or Difficult Tasks: These task types may need greater detail to help operators avoid omitting steps while simple or easy tasks may not require as much detail. **Less detail may be appropriate for tasks with a high level of variability.** Variable field conditions may expose workers to situations that require immediate decisions based on experience, knowledge, and common sense. In such situations, providing a worker with necessary detail for making good decisions would be more useful than prescriptive action steps.	
Routine Tasks: Routine tasks have a low likelihood of error when performed by qualified and experienced operators and may require less detail than tasks performed occasionally *(i.e. with a higher likelihood of error)*. **Tasks with reliable feedback mechanisms that allow the operator to recover quickly in the event of an error may also require less detailed procedures.**	
Unusual Tasks: Many procedures include steps such as "open *(a particular)* valve." If the proper method to open and close valves is covered under basic operator training, then procedures generally would not specify how to open the valve. **However, if a particular valve has unusual features, such as a mechanical key interlock, then operators may need the associated procedure to specify the unique actions necessary to open the valve.**	
Infrequent Tasks: Procedures that are used less often *(e.g. commissioning, start-up, shutdown, and maintenance work)* may require more detail than a frequently used procedure for routine operations. **Because emergency or upset conditions require immediate action, associated procedures may require a unique format that presents details in a way that facilitates quick response.**	

6.3 Procedural Adaptations

Important Note: Adaptation is an important consideration in procedure development. In the event of a variation to normal work arising, the procedure should have enough flexibility to accommodate an operator adapting to the situation.

Applying procedures is not simple rule-following. It is often found that in complex, dynamic situations, procedures are not sufficient when addressing the many small variations that arise when put into context. **Situations may occur where multiple procedures need to be applied at once due to multiple things happening at the same time.**

In these situations, procedures may contradict each other. For example, an Operator finds smoke *and* excessive vibrations at a critical plant control panel. There may not be a procedure to address the combined issues, only separately. **Adaptation would likely be necessary to deal with the situation.**

Applying procedures can be a delicate balance between adapting them in unanticipated situations where there is a risk of failure and blame for the Operator not following them and, sticking to the procedures to discover adaptation would have been the better option, followed by blame for the Operator not being flexible when needed.

It is important to view 'procedure following' as a substantive, skilful cognitive activity, rather than a simple checkbox exercise.

Three Main Assumptions to Address in Writing Procedures
Linear: The assumption is that workers can and should follow procedures step by step. This is rarely possible. There are multiple checks, things going on around you, dependencies with other activities. **You may need to stop, revert back, check previous step, jump ahead – all depending on the situation.**
Predictable: Assumption is there will be no surprises, and everything will go exactly to the plan. For example, Work as imagined (e.g. it will take you 5 mins per step. No more no less. There are tools in place. **This is never the case. There will always be variation, some things take longer, some are no longer needed etc. this should be openly discussed.**
Controllable: Assumption is that the worker is in control of what is happening around them, including the time it takes to complete the task, the tools they use, and that there are no dependencies and pressures and constraints. **This is rarely or never the case. There are always constraints in place that result in variability and adaptations.**
These assumptions should be challenged and then incorporated into how we design procedures. They should allow for flexibility and guide the user on how to respond to unexpected events and support adaptations.

7 Development Process

Understanding the task is a key stage in the development of a new or updated procedure. Most methods for achieving an understanding are based on observations of the task and physically demonstrating the task on the plant or equipment where the task is carried out using the Walk-Through Talk-Through method.

7.1 Walk-Through Talk-Through (WTTT)

The WTTT process is a method used to collect, record and analyse information about a Task at a basic level to help understand how people actually get the work done. It is a tool to help identify where errors or mistakes can be made, the Performance Shaping Factors (PSFs) that increase the likelihood or error and how the operator might typically react to recover the situation.

This affords real opportunity to make changes that improve Human Performance.

Download WTTT guidance and resource at https://www.hpog.org/resource-centre/wttt/

7.2 Task Analysis

On completion of a Walk-Through Talk-Through, the operator will have a step-by-step list of the actions carried out and decisions made in a particular task, know which of those are safety critical, and have an understanding of the factors which might affect Human Performance in carrying them out.

Task analysis is the stage where trained personnel develop further understanding of the task through various methods. The most effective method of task analysis for developing procedures is hierarchical task analysis; where the task is re-described at a high level, then in increasing detail step by step.

Download the HPO Task Analysis Fact Sheet at
https://www.hpog.org/assets/documents/HPOG-FS10-What-is-Task-Analysis.pdf

7.3 Stakeholder Engagement

Leadership should engage people with the appropriate knowledge and experience in the development and review of procedures, including writers, reviewers, approvers, trainers, operators, maintenance personnel, engineers, Process Safety staff, HSE staff, and subject matter experts (SMEs).

Engaging writers as well as operators, maintenance personnel, supervisors, and others during development (and review) can provide a realistic and accurate view of how a job is actually performed and can encourage ownership and acceptance. Informal working practices and alternative methods can also be accurately documented in this way. Workers can advise on the amount of detail, wording, and style as well as provide warnings against common or easily made errors.

It is important to view 'procedure following' as a substantive, skilful cognitive activity, rather than a simple checkbox exercise.

The following tables provide guidance for each Stakeholder in developing and reviewing procedures.

7.3 Stakeholder Engagement *(continued)*

Stakeholder Engagement Guidance
Procedure Writers Should:
• **Identify steps to include in a procedure**. This can be achieved by observing steps as they are performed through a Walk-Through Talk-Through, or by conducting operator interviews. Workers of various experience levels should be involved to ensure the information collected **best represents the way the steps are carried out in the field**. • **Identify which steps are safety-critical** and the potential consequences of errors associated with performing these steps. • **Identify decisions and subsequent actions** that a worker will need to make while performing a task. • **Identify the Performance Shaping Factors** (e.g., environmental, physical, or mental) that tasks will be performed under. • Design a procedure to achieve **specific results**. • Include all steps that are essential and that should be performed the same way by all workers. **Steps should include enough detail to eliminate significant performance variation** among workers without being overly prescriptive. This can be achieved by including workers most proficient with the task during procedure design. • Design a procedure to instruct workers to safely and successfully complete tasks in the most efficient way. A procedure should describe the **easiest, safest method for completing steps**. • Design a procedure so that the mode of operation with which it is associated is clearly identified. There should be **no ambiguity** between which procedures apply to which situations. • Provide task stakeholders (e.g., workers, supervisors, and SMEs) an **opportunity to review and suggest changes** that can make a procedure easier to understand or more accurate or that will improve performance. • Verify and validate a procedure by **engaging a worker in the field** to perform each step as it is written. Steps should be revised if they confusion or are not the safest, most efficient method for achieving desired results**.**
Operators and Maintenance Workers Should (in conjunction with Procedure Writers)**:**
• **Verify safety-critical steps**. • Identify the steps that have **potential to cause injury or damage**. • **Participate in walk-throughs** of draft procedures. • **Participate in procedure review**, verification, and validation. • Notify authority regarding **any deviation** from a procedure. • Notify authority of the need for **documentation for new situations**.
Important Note: If translation is required, it is important to include natural speakers of the language to account for potential issues arising from "literal" translations and local dialects.

(Table continues overleaf)

Stakeholder Engagement Guidance *(continued)*

SMEs, HSE Staff and Engineers Should (in conjunction with Procedure Writers)**:**

- Ensure that **safety-critical steps** are identified.
- Ensure all associated **hazards and hazardous scenarios are identified.**
- **Participate in procedure review**, verification, and validation.

Leadership Should (in conjunction with Procedure Writers)**:**

- Recognize that detailed written **procedures are not a substitute for training**.
- Ensure the procedure writing process is **completed by the people most qualified** to produce current, accurate, and useful procedures that meet expectations for safety and efficiency.
- **Provide resources** to write, review, verify, validate, and update procedures.
- **Communicate the need to follow procedures** and define what workers should do when they cannot access or follow a procedure.
- Establish a suitable **quality assurance system** to ensure that procedures are up-to-date, and that worker deviation and errors can be quickly detected and corrected.
- Establish the **frequency for procedure reviews and updates**, and define the circumstances that trigger an update, e.g., an equipment change.
- **Define the audit process** and ensure compliance with it.

Important Note: If translation is required, it is important to include natural speakers of the language to account for potential issues arising from "literal" translations and local dialects.

8 Procedure Presentation and Design

Procedure writers can purposely develop and revise procedure text and documentation to help workers improve task performance. This section provides guidance on word choice and document formatting across all areas of procedure writing.

The following provides best practice guidance that should complement existing corporate procedure templates and house styles.

8.1 Structure of Procedure Steps

Guideline: Write procedure steps in a format that is easily understood. Level of detail, structure of steps, and verbs are to be adequate, correct, and clear in the procedure.

Explanation: Procedure step format influences usability and efficiency in performing a procedure. The likelihood of human error can be reduced when information is structured consistently.

The tables that follow present guidance that can enhance Human Performance through improved grammatical structure and format of procedure text.

Recommended Structure and Format of Procedure Text	
Guideline	**Explanation**
Begin a step with an action verb. Action steps tell a worker what and how to correctly perform a specific task, not why.	Begin a step with an action verb (*e.g., open, rotate, fill, or verify*) followed by the object of the action. Beginning a step with an action verb ensures that active voice is used. See (appendix) for recommended action verbs and definitions. **Examples:** ***Start*** produced water pump P-1101. ***Adjust*** produced water pump P-1101 flow rate to 100 gallons per minute.
Use present tense.	Past and future tenses can confuse readers, especially those whose primary language is not English. **Use:** / **Avoid:** ***Open*** reboiler stack SD-3. / The reboiler stack will be opened. ***Open*** valve V-12 in 5-degree increments. / The valve will be opened in 5-degree increments

(Table continues overleaf)

Recommended Structure and Format of Procedure Text *(continued)*	
Guideline	**Explanation**
Provide specific object and location information. Details should clarify, not confuse.	Refer to specific, concrete objects rather than generic or abstract concepts. Provide a detailed and specific description of the object (*e.g., water pump or oil pump*) followed by the object nomenclature (*e.g., P-1101*). If a specific type of object is involved, then refer to it in specific terms (*e.g., water pump instead of pump*). **Use:** Transfer bottoms of column C-1 to storage tank 21-T-113. Use temperature controller TV-3010 to raise column C-1 side draw temperature in 5-degree increments every 30 minutes. **Avoid:** Transfer the bottoms of the column to the storage facility. Use the applicable control room equipment to slowly raise the temperature.
Use positive commands.	Use simple, positive command statements that assign action to the worker. **Use:** Open valves in the following order: 1. Valve A 2. Valve B Verify valve V-101 is open. **Avoid:** Do not open valve B until valve A has been opened. Verify that the valve is not closed.
Address the primary worker using the procedure.	If more than one person is performing a procedure, write instructions from the primary worker's point of view and identify other workers (roles), teams, or units who will perform the task. **Use:** Notify Blending and Shipping systems to start transfer. **Avoid:** Start the transfer / B&S shall start the transfer.
Include one action per step. Break a long action step into short substeps.	Break work steps into distinct activities by using short sentences with one action per step. **Use:** 1. Align flange to flat surface. 2. Connect flange to flat surface using 3/8inch bolts. **Avoid:** 1. Align flange to flat surface, and bolt up using 3/8-inch bolts.
Use appropriate punctuation. Punctuation affects meaning, emphasis, and effectiveness of sentences.	Use periods mark the end of a complete sentence. Use commas (,) to separate clauses or items in a list. Semicolons (;), hyphens (-), or slashes (/) are used in complex sentences and **should be avoided in procedures** unless they are part of a specific document title, equipment name, or measurement. Quotation marks (" ") should be avoided as they can represent either a direct quote or an implied alternative meaning, leaving them open to easy misinterpretation. Rewrite sentences to avoid excessive punctuation.

(Table continues overleaf)

<table>
<tr><th colspan="2">Recommended Structure and Format of Procedure Text (continued)</th></tr>
<tr><th>Guideline</th><th>Explanation</th></tr>
<tr><td>Use appropriate text formatting.

Important Notes:
Please refer to your Corporate branding guidance for specific restrictions on font use.
Incompatible or unavailable fonts can create text display problems when files are transferred between desktops and other devices.</td><td>Simple, easy to read fonts should be used in procedures. Stylized fonts should be avoided and be mindful if the font you are using is installed and available on all computers and devices.
Consider type size, it’s recommended 11 or 12 point is used and 8 point or smaller is avoided.
When used consistently, type that is bold, italic, or <u>underlined</u> can serve as a visual cue that helps readers find information and understand its importance. However, overuse is often distracting and sometimes confusing. Use such styles modestly.
Avoid presenting titles and headings in letters that are all uppercase or all italic because they are harder to read; instead, use initial capital letters (e.g., Procedural Requirements and Responsibilities) or sentence case (e.g., Procedural requirements and responsibilities).
Use:
Procedure Sequence
1. Monitoring levels
1.1 Use lower explosive limit (LEL) monitor once each hour to verify LEL of area is below 10%.
Avoid:
PROCEDURE SEQUENCE
1. Monitoring levels
1.1 Test area with LEL monitor to verify LEL is <u>10%</u> once each hour.</td></tr>
<tr><td>Use parallel structure to express parallel ideas.</td><td>Workers can comprehend sentences, lists, and series faster when similar ideas are worded in the same way (a grammar rule know as parallelism).
Procedure writers use parallel structure when they begin all steps in a procedure with action verbs. In addition, writing heading in parallel grammatical structure throughout a procedure is a best practice.
Use (in sentences):
Possible data sources on existing systems include metallurgy reviews and subject matter experts.
Use (in lists):
Any of the following test methods may be used:
• Portable X-ray fluorescence
• Portable optical emission spectroscopy
• Laboratory chemical analysis
Use (in headings):
3.1 Gather Data
3.2 Identify Damage Mechanisms
3.3 Assess Risk
Avoid (in sentences):
Possible data sources on existing systems include metallurgy reviews and consulting subject matter experts.
Avoid (in lists):
Any of the following test methods may be used:
• Portable X-ray fluorescence
• Portable optical emission spectroscopy
• Conducting laboratory chemical analysis
Avoid (in headings):
3.1 Gathering Data
3.2 Damage Mechanisms Identified
3.3 Risk Assessment</td></tr>
</table>

8.2 Step Numbering and Indentation

Guideline: Format procedure steps so they can be easily distinguished from other information.

Explanation: Using a consistent system for step numbering and indentation enables a worker to readily locate and follow steps.

The table that follows presents guidance that can enhance Human Performance through consistent, systematic step numbering and indentation in procedure content.

<table>
<tr><th colspan="2">Recommended Step Numbering and Indentation</th></tr>
<tr><th>Guideline</th><th>Explanation</th></tr>
<tr><td>Use appropriate step numbering formats.

Avoid numbering safety and informational statements.

They should be set apart from the action steps.</td><td>To assist in readily locating each individual step of the task, apply systematic step numbering.

Use:
1. Energize SWG-001 (4.16KV):
1.1. Verify zero voltage on switchboard.
1.2. Close VCB DG:VCB for Essential D/G.
1.3. Verify SWBD readings for the following:
• SWG-001 Bus voltage 4160v
• SWG-001 frequency 60Hz.

Avoid:
Energize SWG-001 (4.16KV):
Verify zero voltage on switchboard.
Close VCB DG:VCB for Essential D/G.
Verify SWBD readings for the following:
• SWG-001 Bus voltage 4160v
• SWG-001 frequency 60Hz.</td></tr>
<tr><td>Use bullets and numbering appropriately.

Use a bulleted list when the sequence of a group of items is not important.

Use a numbered list when a specific order must be followed.</td><td>When an action verb is followed by a series of two or more items, use a bulleted or numbered list instead of a list embedded in a command.
Include a colon (:) at the end of an introductory clause to signal that a list or clarification follows.
If a list includes more than eight items, consider placing the items in a table, checklist, or columns to simplify presentation of the information.

Use:
Shut down the following pumps:
• P-1149
• P-1159
• P-1169
Close valves in the following order:
1. V-1275
2. V-1375
3. V-1475.

Avoid:
Shut down pumps P-1149, P-1159 and P-1169.
Close valves V-1275, V-1375 and V-1475.</td></tr>
</table>

8.3 Vocabulary

Guideline: Use simple vocabulary and write steps clearly. Use technical terms that are familiar to workers.

Explanation: Simple sentences can be understood very easily and quickly and minimize the potential for worker misrepresentation, assumption, and performance errors.

The tables that follow present guidance that can enhance Human Performance through word choices in procedure text.

<table>
<tr><th colspan="2">Recommended Vocabulary</th></tr>
<tr><th>Guideline</th><th>Explanation</th></tr>
<tr><td rowspan="2">Use simple, concise, and unambiguous vocabulary.

Keep in mind that the primary language of workers may not be the language used in the procedure and that workers may not be familiar with local terminology.</td><td>Avoid contractions (e.g., can’t, isn’t, won’t, would’ve) and truncated words (e.g., thru instead of through, hi instead of high).
State facts and specifically verify their correctness and accuracy.
Avoid wordiness. Include only the necessary information to complete the task.
Avoid jargon. Use technical terms when they are commonly used and familiar among workers.
Use clear and accurate words and phrases to define terminology.

Use: — Avoid:
Give — Provide
Start — Initiate
Perform — Execute</td></tr>
<tr><td>Avoid using words such as quickly because of their ambiguity. If a long or abstract word expresses the meaning better, then use it, but consider that abstract words can be misinterpreted.
Avoid ambiguous phrases that refer to position or direction (e.g., right valve, which should be revised to right-hand valve and augmented by a specific valve name or number).

Use:
Notify control room that boiler feedwater line has been blinded.
Rotate handle clockwise.

Avoid:
Convey the information to the control room that the boiler feedwater line has been blinded.
Turn the handle in a clockwise direction.</td></tr>
</table>

(Table continues overleaf)

<table>
<tr><th colspan="2">Recommended Vocabulary (continued)</th></tr>
<tr><th>Guideline</th><th>Explanation</th></tr>
<tr><td>Use consistent terminology.

Language variation in procedures can confuse and mislead workers.</td><td>Use a word or phrase consistently so that it clearly has a singular meaning throughout a procedure, even if that means you must use the same word or phrase repeatedly (e.g., use blind or blank in every instance, not synonyms such as isolation device, plate, pancake, etc).

Use terminology that operators can understand and is consistent with equipment labeling. Avoid inconsistent terminology (e.g., Safety Switch S-16 and Breaker Switch S-16).

Use:
1. Install blind on boiler feedwater line between valves 1102 and 1103.
2. Install blind on boiler feedwater line between valves 1201 and 1203.

In the example above, blind is used consistently in both steps.

Avoid:
1. Install stop on boiler feedwater line between valves 1102 and 1103.
2. Install blind on boiler feedwater line between valves 1201 and 1203.

In the example above, Step 1 uses stop and Step 2 uses blind to mean the same object.</td></tr>
<tr><td rowspan="2">Avoid vague adjectives and adverbs.</td><td>Avoid vague adjectives (words that modify nouns) and adverbs (words that modify verbs) that are subject to interpretation.

Avoid ambiguous, relative, abstract, and vague words that could cause an in-field decision to be made for safety-critical tasks (e.g., about, near, frequently, slowly, approximately, and as a rule of thumb).

Specify quantities whenever possible. Specify direction if rotation or turning is involved.

Use:
Drain the tank at 10 gallons per minute.

Rotate knob clockwise 25 degrees.

Roll up hose and store next to valve V-11.

Avoid:
Drain the tank slowly.

Rotate knob.

Roll up hose and store in appropriate location.</td></tr>
<tr><td>When using important information related to quantities, provide a definition (e.g., when using terms like too high, reaches critical level, normal range, above maximum, always provide a specific number).

Use:
If tank level rises above 26.5 feet, the verify water pump P-12 is operating through HMI.

If tank pressure gauge is above 4 feet of water column, then verify TRVU compressor is running and TRVU valve V-1101 is fully open.

If substrate is thicker than 1.5cm, then remove excess.

Avoid:
If tank level gets too high, verify water pump P-12 is operating through HMI.

If tank pressure gauge is above critical level, verify TRVU compressor is running and TRVU valve V-1101 is fully open.

If substrate is too thick, remove excess.</td></tr>
</table>

(Table continues overleaf)

Recommended Vocabulary *(continued)*	
Guideline	**Explanation**
Minimize verbiage. Avoid including information that is not essential to completing the task. Provide such information in references or appendices as additional guidance.	Minimize verbiage so that each task is clearly defined and includes sufficient detail. Use plain language and words that are understandable to the people who perform the work. **Use:** Clear obstruction in steam line. Inspect tube, confirm line is clear. **Avoid:** Clear the obstruction in the steam line. Inspect the tube to ensure that the line is clear.

8.4 Step Sequence

Guideline: Write steps in the order in which a worker needs to perform them. If exceptions apply, then explicitly state the exception prior to the step sequence.

Explanation: Following a logical, consistent, and familiar sequence enables a worker to complete steps in the listed order and minimize errors.

The table below presents guidance that can enhance Human Performance through the types of steps used in procedure content.

<table>
<tr><th colspan="3">Recommended Step Sequence</th></tr>
<tr><th>Guideline</th><th colspan="2">Explanation</th></tr>
<tr><td rowspan="3">Step Type: Conditional

Conditional steps usually fall into two categories:
• If-then steps
• When-then steps.</td><td colspan="2">Present decision criteria clearly and with the appropriate logic words. Always place the qualifying condition before the action instruction. Use a comma after the condition.
Use If for an unexpected but possible condition (e.g., if green light is on…). In this case, the worker is not required to wait for an event to occur prior to going to the next step.
Use:
If pump P-1175 is down, then pump vessel V-1175 with pump P-1198.
Avoid:
Pump vessel V-1175 with pumps P-1198 if pump P-1175 is down.</td></tr>
<tr><td colspan="2">When more than two If conditions exist, use a list format.
Use:
If pump P-1175 is down, then pump vessel V-1175 with:
• P-1198, or
• P-1192, or
• P-1130.
Avoid:
Pump vessel V-1175 with pumps P-1198, or P-1192, or P-1130.</td></tr>
<tr><td colspan="2">Use When for an expected condition (e.g., When level reaches 50%...).
This highlights that the worker must wait for an event or condition to occur prior to going to the next step.
Use:
When compressor is repaired, then conduct leak test.
Avoid:
Conduct leak test when compressor is repaired.</td></tr>
</table>

(Table continues overleaf)

Recommended Step Sequence *(continued)*	
Guideline	**Explanation**
Step Type: Concurrent. Concurrent steps are actions that must be performed at the same time. In some instances concurrent steps may have to be performed by more than one operator.	To write concurrent steps for actions that must be performed at the same time, state specifically the steps that are concurrent and use terms such as *while, simultaneously*, and *at the same time*. Concurrent steps may have to be performed by more than one operator in some instances. Write concurrent steps from the point of view of the operator who is coordinating the activity. **If the step is to be performed by an operator who is not coordinating the activity, then identify that operator.** Indicate the role of each operator clearly in a NOTE message and place the message before the concurrent step sequence. **Use:** Start pumps P-1101 and P-1111 simultaneously. While pressing Ctrl and Alt keys, press Delete. **Avoid:** Start pumps P-1101 and P-1111. Press Ctrl, Alt, and Delete keys.
Step Type: Recurrent. Concurrent steps are actions that performed repeatedly.	Recurrent steps or repeat loops instruct workers to perform steps repeatedly until a condition is met or according to a specified frequency. **Recurrent steps are confusing and error-prone and should be avoided if possible.** When describing recurrent steps, specify the number of repetitions or the condition to be met and then direct the worker to the next step. **Example:** Repeat Steps 4 to 6 until the pressure is reduced to zero, then continue to Step 7.

8.5 Referencing and Branching

Guideline: Use appropriate referencing and branching to direct workers elsewhere, only if necessary.

Explanation: Referencing and branching are prone to errors because they interrupt flow. Such practices should be kept to a minimum to avoid confusion.

Referencing	Directs the worker to other steps, pages, or sections within a procedure or to other procedures (either in whole or in part) to accomplish a given procedure, **with the expectation that the worker will return** to where he or she left the initial procedure.
Branching	Routes the worker to other procedures or to another step or section in the same procedure, but **the worker is not expected to return** to where he or she left the initial procedure.
Avoid referencing and branching when possible. In some circumstances (such as when describing high-risk tasks), **banning these practices may be warranted.**	

Referencing and branching are challenging for the very best procedure writers. Make sure procedure numbering is updated when changes are made to a procedure document. Also verify that current versions of external documents are referred to correctly.

When Referencing:

Use specific verbs and phrases to indicate referencing instructions, such as:

- Refer to…
- Record on…
- …in accordance with…
- …as/or per…

Then state the expectation for the worker to return to where he or she left the initial procedure.

For example:

- Record pressure readings in Table A.

When Branching:

When using branching instructions, use specific verbs and phrases to indicate branching instructions, such as:

- Go to… (forward or backward in the same procedure)
- …per… (another procedure)

For example:

- When system pressure has stabilized to 2000 psig for 12 hours, then go to Step 6.
- Release the compressor for repair per operating procedure MS-COP-SU0153.

8.6 Place Keeping

Guideline: Provide a means of documenting completion or verification (or both) of steps within a procedure.

Explanation: Place keepers enable workers to track the steps that have been completed, which can be especially useful in the event a procedure must be temporarily discontinued (due to work breaks, distractions, and so on).

Integrate place keepers in documented procedures so workers can track their progress and avoid omitting steps accidentally.	
Referencing	Directs the worker to other steps, pages, or sections within a procedure or to other procedures (either in whole or in part) to accomplish a given procedure, **with the expectation that the worker will return** to where he or she left the initial procedure.
Branching	Routes the worker to other procedures or to another step or section in the same procedure, but **the worker is not expected to return** to where he or she left the initial procedure.
Avoid referencing and branching when possible. In some circumstances (such as when describing high-risk tasks), **banning these practices may be warranted.**	

Integrate place keepers in documented procedures so workers can track their progress and avoid omitting steps accidentally. Use place keepers where workers can write or type their initials, check marks, or other indicators, when:

- Several steps are required to be performed.
- Sequence of steps is critical to quality or safety.
- Task is performed by different operators back to back (shift work).
- Equipment manipulation is involved.
- Frequent stops or interruptions are expected.

Use recommended place keepers such as check boxes (☐) or blanks (___). **For example:**	
Shut down the following pumps: ☐ P-1149 ☐ P-1159 ☐ P-1169	Shut down the following pumps: P-1149 _____ P-1159 _____ P-1169 _____
Do not use place keepers for steps in which verification sign-offs are necessary.	

8.6 Place Keeping *(continued)*

Do not use place keepers for steps in which verification sign-offs are necessary			
A **verification sign-off** is a more formal way to document step completion. **For example:**			
10. Allow pressure to build in vessel V-215 to a minimum of 600 psi.	_____ Initial	___ / _____ / _____ Date DD/Month/YYYY	____:____ Time 24hr

A range of options specific to a task may be needed for checklists.

For example:

Condition	**Yes**	**No**	**Not Applicable**	**Comment or Reference**
1. Have the following blinds been removed?				
• Inlet feed to tank 103				
• Inlet feed to column 104				
• Outlet from tank 103 to pump 106				
• Column 104 recirculation line				

8.7 Safety Information Symbols and Statements for HS&E Hazards

Guideline: **Use recognised safety symbols and statements** (danger, warning, or caution messages) to alert workers to a hazard or potential for damage to personnel or property.

Use environmental warning messages to alert workers to a hazard or potential for damage to the environment.

Use information statements (notes) to provide a description or explanation to support the performance of a procedure.

Place safety and information symbols and statements prior to relevant steps, and make sure the statements appear distinct and separate from the steps.

Explanation: Warnings about conditions or actions that could be hazardous, cause damage to equipment, or affect operations should stand out from other information in a procedure and attract a worker's attention.

Such a statement should be presented before procedure steps to prevent the worker from accidentally taking action before reading the warning.

Explanatory or descriptive information (notes) intended to aid the worker in performing procedure steps should also be provided separately to attract the worker's attention.

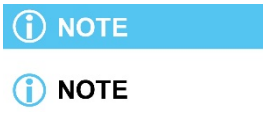
Format and Place Messages According to Worker Needs	
Safety and Information Statements	• Ensure that safety and information statements are clear and concise and contain only relevant information. • Place safety and information messages separately in boxes. • Place a symbol to the left of the message. • Make sure that HS&E, and reliability information in the message is accurate.
Procedure steps that may initiate unrecoverable events	• Procedures which contain steps that may initiate unrecoverable events should include alerts in the form of danger, warning, caution, or environment statements that identify the potential consequences. • Always place safety statements prior to the applicable steps and on the same page as the steps.
Important Note: If a safety message is at the bottom of a page, place a page break above the safety message such that it appears before its associated step on top on the next page	
Recommendation	
Previous incidents associated with procedure steps	It is encouraged to briefly highlight previous incidents associated with specific stages in the procedure. **This is an opportunity to embed events in corporate history and reinforce collective learning.**

Important: All safety and information statements and symbols used in the document should:

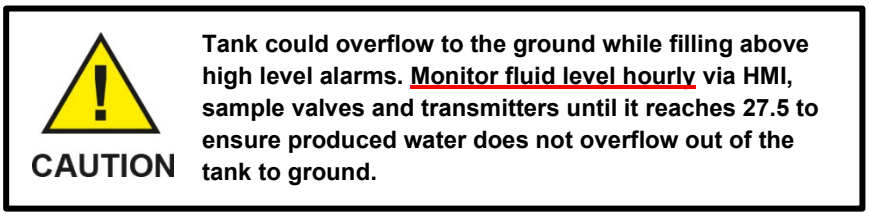
- Align with any local requirements and standard
- Match all symbols and colours shown on the plant or equipment that the procedure refers to
- Remain consistent throughout all procedures.

The tables that follow present recommended formats for safety and information symbols and statements.

8.7 Safety Information Symbols and Statements for HS&E Hazards *(continued)*

Safety Information Statements for HS&E Hazards	
All Safety Symbols that alert the Operator of hazardous situations must match those displayed on plant and equipment signage, control panels and other associated instructional materials.	
	**DANGER** indicated an **imminently** hazardous situation which, if not avoided, will result in death or serious injury. **This signal word should be limited to the most extreme situations.** It should not be used to indicate property damage hazards unless personal injury risk appropriate to this level is involved. **Note:** The colour **Red** will show as black or dark grey if printed in black and white.
	**WARNING** indicates a **potentially** hazardous situation which, if not avoided, could result in death or serious injury. This signal word should not be used to indicate property damage hazards unless personal injury risk appropriate to this level is involved. **Note:** The colour **Orange** will show as black or dark grey if printed in black and white.
	**CAUTION** indicates a **potentially** hazardous situation which, if not avoided, may result in minor or moderate injury. Also used to alert against unsafe practices that may cause property damage. **Note:** The colour **Yellow** will show as light grey and may be illegible if printed in black and white.
Environmental messages describe conditions or actions that pose a concern to the environment.	
	**ENVIRONMENT** identifies activities that may require contingency measures to ensure compliance with environmental / regulatory commitments. This prompt should also be used to minimize potential environment impact where practicable or foreseeable. **Note:** The colour **Green** is typically related to Safe Conditions or the command GO. Consider using a softer green and incorporate recognizable icons where possible.
Notes may come before or after a step, depending upon the information needs of the worker. If in doubt, ask yourself, "Does the worker need to know this information before or after performing this step. It is not recommended to place action steps in Notes.	
	**NOTE** indicates when an operation, condition or information is of sufficient importance to warrant highlighting. **Note:** The colour **Blue** is typically related to Mandatory Safety Requirements. Consider using a softer blue and incorporate recognizable icons where possible

(Table continues overleaf)

<table>
<tr><th colspan="2">Safety Information Statements for HS&E Hazards</th></tr>
<tr><th>Guideline</th><th>Explanation</th></tr>
<tr><td>Use Direct Language</td><td>Place headings above informational statements. Headings that are phrases or clauses (not complete sentences) are acceptable.
Most importantly, use direct, unambiguous language. Follow the heading with further information or instructions.
For example:
Use:
Risk of Electric Shock
Main disconnect must be “Off” and locked before servicing machine.
Avoid:
Turn main disconnect switch “Off” and padlock before servicing machine, as there may be a possibility of electric shock.</td></tr>
<tr><td rowspan="2">Avoid Embedded Action Steps within Safety and Information Statements</td><td>Do not place action steps in safety (danger, warning, caution, or environment) statements. Embedded action steps in safety messages may be misinterpreted.
The following errors could occur due to action steps in safety or information statements:
An unintended action with undesirable consequences may be performed
A necessary action required to prevent an undesirable consequence may be skipped.
Experienced workers familiar with a task may skip action steps embedded in safety statements because they expect the steps to be in the numbered sequence and the information statements to contain advisory information.</td></tr>
<tr><td>Avoid:
The following statement presents a warning of an undesirable consequence in which an action step is embedded (see red underlining). This should be avoided.
 
</td></tr>
<tr><td>Include Warning Information in Precautions Section
(at the start of a procedure)</td><td>Safety statements placed before applicable procedure steps should also be provided in a Precautions section at the start of a procedure (see Section 6.1 Recommended Procedure Components).
The Precautions section gives the worker information about what can happen, why, and the consequences of ignoring the precaution. Restrict the Precautions section to important health and safety issues.
Too much information about self-evident issues reduces the impact of key messages. Cautionary statements in the steps section reiterate the precautions.</td></tr>
</table>

(Table continues overleaf)

Safety Information Statements for HS&E Hazards *(continued)*	
Guideline	**Explanation**
Avoid Place Keepers or Sign-Offs Within Safety and Information Statements	Avoid using placekeepers or sign-offs next to safety and information statements so that workers do not mistake the information as a task to complete. The example image below shows a scenario in which a Task Completed box is provided next to a caution message as well as the action steps that follow. An appropriate alternative is provided.
Avoid Colors Used for Safety Symbols	When applying color to titles or headings, use colors other than those used for safety symbols (red, orange, yellow, and green). Text that is stylized with safety symbol colors can distract the worker and diminish the visual impact of nearby safety symbols. If color-formatting is needed to highlight procedure type, use color sparingly so as not to distract the worker from other safety related information. Refer to your own company branding for appropriate color choices for text that is unrelated to safety.

Use:

Critical Operating Procedure	Startup Operations	MS-COP-LL-0327
Procedure Sequence		Task Completed
⚠ CAUTION	Activity should not resume until LEL is below 10%	

Avoid:

Critical Operating Procedure	Startup Operations	MS-COP-LL-0327
PROCEDURE SEQUENCE		Task Completed
⚠ CAUTION	If LEL is above 10%, evacuate and secure area. Do not resume until conditions drop below 10%	

8.8 Numbers, Units of Measurement, Symbols, Acceptance Criteria and Tolerance Ranges

Guideline: Use appropriate representations of numbers to aid worker comprehension. Use a consistent format for units of measurement. Use familiar and easily understood symbols. Provide clear instruction on acceptance criteria and tolerance ranges where appropriate.

Explanation: Making mistakes is easy when reading and using numbers. Inconsistent units and symbols can cause confusion and lead to errors. Operators often must make decisions based on acceptance criteria and tolerances.

The goal of the procedure writer is to reduce the amount of interpretation a worker must make while performing a job.

The table below presents guidance that can enhance Human Performance through the numbers and symbols used in procedure content.

<table>
<tr><th colspan="3">Recommended Use of Numbers, Units of Measurement, Symbols, Acceptance Criteria and Tolerance Ranges</th></tr>
<tr><th>Guideline</th><th colspan="2">Explanation</th></tr>
<tr><td>Number Formats</td><td colspan="2">Number sources include readings, instrument displays, calculated values, control setting, physical quantities, and equipment numbers.
Use digits for:
Numbers 10 and higher
Physical measurements (e.g., 120 C, 10 kg/cm2)
Sections, paragraphs, figures, and tables
Tabulated numbers
Dates (days and years only; spell out months e.g., January 24, 2012.</td></tr>
<tr><td></td><td>Use:</td><td>Avoid:</td></tr>
<tr><td></td><td>Set the pressure to 150 psig.</td><td>Set the pressure to one hundred and fifty psig.</td></tr>
<tr><td></td><td>Set the temperature to 120 F.</td><td>Set the temperature to one hundred and twenty degrees Fahrenheit.</td></tr>
<tr><td></td><td>Refer to Section 2.</td><td>Refer to section two.</td></tr>
<tr><td></td><td>May 3, 2014 (or) 3 May 2014.</td><td>05/03/2014.</td></tr>
</table>

(Table continues overleaf)

<table>
<tr><th colspan="2">Recommended Use of Numbers, Units of Measurement, Symbols, Acceptance Criteria and Tolerance Ranges (continued)</th></tr>
<tr><th>Guideline</th><th>Explanation</th></tr>
<tr><td>Number Formats
(continued)</td><td>
Spell out:

Numbers that start a sentence.
Numbers less than 10.
Numbers more than 10 that describe quantities that do not have an established unit of measurement.
Numbers less than 101 when they are in front of a compound modifier and that modifier contains a figure, e.g., three 12-foot boards.
Fractions less than one or without dimensions that end a sentence; also spell out related groups of dimensionless whole numbers or fractions that end a sentence, e.g., …the ranges are half to three quarters, five to ten and eleven to twenty.

<table>
<tr><th>Use:</th><th>Avoid:</th></tr>
<tr><td>Carry 15 bags to station.</td><td>Carry fifteen bags to station.</td></tr>
<tr><td>Carry two 75-pound bags.</td><td>Carry 2 75-pound bags.</td></tr>
<tr><td>Reduce the pressure to half.</td><td>Reduce the pressure to ½.</td></tr>
</table>
</td></tr>
<tr><td rowspan="2">Symbols
Note: Symbols that are not available on a QWERTY keyboard may not appear clearly in print.</td><td>
A symbol is an internationally recognized representation of a unit of measurement or of a concept – not an abbreviation. Use only symbols that are standard, familiar, and understood.
<table>
<tr><th>Acceptable Symbols:</th><th>Examples:</th></tr>
<tr><td>+ Plus</td><td>3 + 5</td></tr>
<tr><td>- Minus</td><td>20 - 6 (or) -10 C</td></tr>
<tr><td>× Multiply by or dimensions (length × width × depth)</td><td>3 × 5 (or) 2 × 4 × 8 mm</td></tr>
<tr><td>÷ Divide by</td><td>5 ÷ 3</td></tr>
<tr><td>= Equals</td><td>3 + 5 = 8</td></tr>
<tr><td>% Percent (mathematical use only).</td><td>75%.</td></tr>
</table>
</td></tr>
<tr><td>
Avoid using symbols that have multiple meaning or that could be confusing or unclear in print.
Use specific ranges (e.g. 10 to 40 m) rather than plus/minus symbols.
Use specific measurements (e.g. feet, inches) rather than apostrophe symbols.
Spell out symbols for clarity.
<table>
<tr><th>Use:</th><th>Avoid:</th></tr>
<tr><td>Difference of 8</td><td>Δ 8</td></tr>
<tr><td>100 ohms</td><td>100 Ω</td></tr>
<tr><td>500 times</td><td>500X</td></tr>
<tr><td>30C, 10F</td><td>30ºC, 10ºF</td></tr>
</table>
</td></tr>
</table>

(Table continues overleaf)

Recommended Use of Numbers, Units of Measurement, Symbols, Acceptance Criteria and Tolerance Ranges *(continued)*	
Guideline	**Explanation**
Units of Measurement	Units of measurement should be consistent throughout a procedure document. Using different unit systems for the same physical quantity is not acceptable (e.g., using *30 meters* in one instance and *98.4 feet* in another instance to describe water level). **Provide local and international units**, a practice that offers these advantages: • Primary units of measurement are familiar to local workers and therefore easily understood. • Units of measurement identified on equipment will always be represented in the procedure. • Workers will not have to undertake difficult or complex conversions. Consider including both Imperial and Metric units unless there is an overriding reason not to include both. Specify local units first followed by the alternative unit in parentheses. For example, 3.3 ft (1 m). If conversions are needed, provide a conversion chart, table, or graph in the procedure. Avoid making the worker perform difficult or complex calculations or conversions to determine acceptance criteria or tolerance ranges.
Acceptance Criteria	Make sure that acceptance criteria, including tolerance range, are traceable to specific design requirements, technical specifications, supplier data, or other verifiable data. If acceptance criteria are quantitative, use numbers instead of words. **Be as specific as possible, and avoid vague words such as *good*, *normal*, and *satisfactory*.** In addition: • Give tolerances where possible. • Give nominal values and ranges in terms that the worker can understand. • Avoid having the worker perform addition and subtraction to determine a range. • For desired or nominal values, specify the value followed by a range of acceptable tolerance within parentheses.
Tolerances	If there is no specific desired value, provide the tolerance as a range. Use percentages only when an unknown value is being calculated. **Use:** 4.980 to 5.020 psig **Avoid:** 5.0 ± 0.4% psig; 5.0 ± 0.020 psig

8.9 Abbreviations and Other Shortened Terms

Guideline: Use familiar and easily understood abbreviations and shortened terms.

Explanation: Abbreviations and shortened terms that are not standard or familiar can lead to confusion, especially when they have multiple meanings. A worker should not have to frequently cross-refer between documents to confirm the meaning of abbreviations. **Such activity can lead the worker to omit steps or perform them incorrectly.**

A shortened form of a word or words may be an abbreviation, a contraction, a truncated word, or a symbol. Provide a definition for unfamiliar terms when first introducing the shortened form.

Abbreviations and Other Shortened Terms	
Abbreviations	Writers can avoid repetition of long words or phrases by using abbreviations. Abbreviations are shortened forms of a word or phrase. Examples of abbreviations include *U.S.* (United States), *TV* (television), and *WWII* (World War Two). Latin abbreviations include *e.g.* (for example), *i.e.* (that is), *vs.* (versus) and *p.m.* (post meridiem).
Acronyms and Initialisms	*Acronyms* and *initialisms* are types of abbreviations. An **acronym** is comprised of the first letters, syllables, or parts of a name or phrase and is pronounced as a word (such as *NATO* and *RADAR*). An **initialism** is comprised of the first letter of each word in a name or term and is pronounced letter by letter (such as *ABU*).
Abbreviations should be kept to a minimum in procedures to avoid confusion.	
Where Abbreviations and Shortened Terms are used: • Develop a limited list of abbreviations that workers are familiar with and use only the abbreviations on the list. • Always spell out all terms upon first use with the abbreviated form in parentheses, particularly if using the abbreviation later in the document. For example: The facility is monitored using a Remote Telemetry Unit (RTU). • Ensure that each abbreviation is uniquely associated with a single, specific term. Do not use the same abbreviation for two different terms. Avoid abbreviations that could be confused as actions (e.g., START, GO). • Throughout a procedure, be consistent with the terminology that refers to components, equipment, labels' tools. Include tag numbers, in addition to component names, to add clarity or distinguish between similar items of equipment. • Avoid using abbreviations that end in a period so as not to suggest the end of a sentence. For example, etc.	

Important: When writing a procedure, consider the following regarding abbreviations and other shortened terms:

- Use terms that are familiar to workers.
- Use an abbreviation only when it has a single meaning; otherwise, spell out the word.
- Do not abbreviate simple words.
- Avoid using acronyms that spell out words that can be confused as actions.
- **When in doubt, spell it out.**

8.10 Tables and Figures

Guideline: Present tables and figures in a format that aids a worker in understanding procedure content. Ensure tables and figures are compatible with the procedure steps. Ensure tables and figures reproduce legibly.

Explanation: Tables are used to organize information systematically. They can help the reader comprehend procedure content and utilize it to perform an action. In addition, tables can serve as a tool for recording information.

Poor text quality and complicated or imprecise table formatting can lead to errors in interpretation by a worker.

A figure can convey important information to a worker without including detailed text. A figure must contain the right level of detail so the worker can find it easily and infer the correct information from it.

However, to be effective, figures must be clear, legible, labeled, indexed, and appropriate in terms of complexity.

The following pages offer guidance in presenting tables and figures, but it is recommended that company branding guides and house styles are consulted first.

Text in Tables

Place table captions (or table description) above tables. A table caption should be clear and concise but explain the purpose of the table adequately.

Use fonts that are clear and easy to read. Use a recommended font size of 11 or 12 point for text within a procedure and 9 point for text within tables.

Left-align text within a procedure as left-aligned text is easier to read than justified text. Ensure text alignment is consistent for bulleted and numbered lists.

In addition, ensure that clarity and readability of tables is maintained in print. Note that some background shades and colours can affect the legibility of content.

Use:

Table 4.2 Tolerance Envelopes

Basic Size (mm)		Standard Tolerance Grades				
		IT1	IT2	IT3	IT4	IT5
Above	Up to	Tolerance (micrometre)				
-	3	0.8	1.2	2	3	4
3	6	1	1.5	2.5	4	5
6	10	1	1.5	2.5	4	6
10	18	1.2	2	3	5	8
18	30	1.5	2.5	4	6	9
30	50	1.5	2.5	4	7	11

Avoid:

Table 4.2 Tolerance Envelopes

Basic Size (mm)		Standard Tolerance Grades				
		IT1	IT2	IT3	IT4	IT5
Above	Up to	Tolerance (micrometre)				
-	3	0.8	1.2	2	3	4
3	6	1	1.5	2.5	4	5
6	10	1	1.5	2.5	4	6
10	18	1.2	2	3	5	8
18	30	1.5	2.5	4	6	9
30	50	1.5	2.5	4	7	11

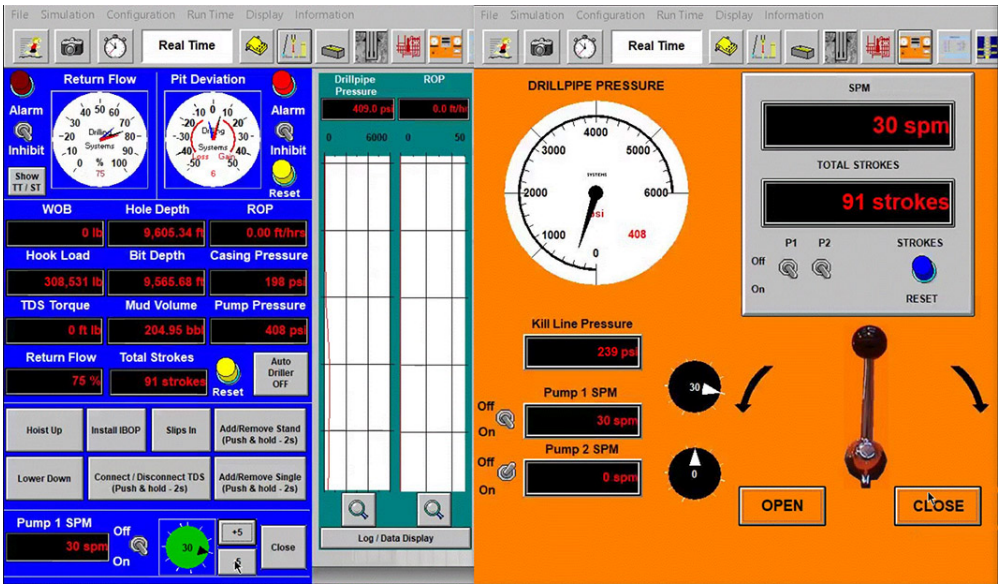
8.10 Tables and Figures *(continued)*

Figure Content and Action Steps

Graphs, charts, plots, drawings (including piping and instrumentation diagrams), and photographs (images) are types of figures.

A figure should provide necessary information to improve worker understanding and should be included with a procedure step only if it achieves this purpose. **If a figure is irrelevant, omit it.**

When including an image of a device, make sure the image matches the actual device in place.



When including an image of a control panel display, insert an image of the actual panel display as shown above.

Ensure that a figure and the action step it is associated with convey the same information.

Align the language used in figure captions and labels with text used in corresponding action steps.

To ensure workers have up-to-date information in the procedure document, replace any equipment imagery if that equipment originally pictured has been repaired or replaced.

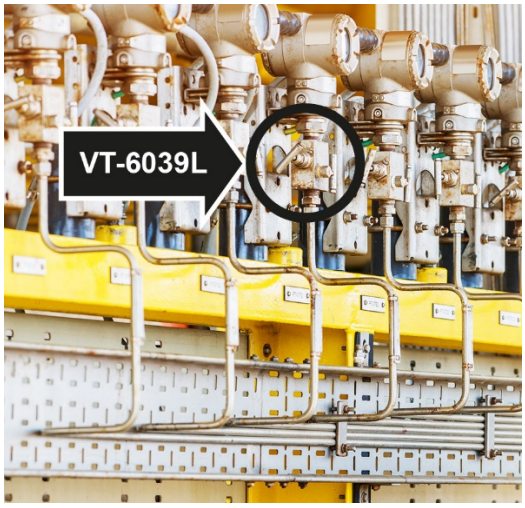
8.10 Tables and Figures *(continued)*

Figure Size, Display and Print Clarity

Figure size should ensure that the message to the worker can be delivered clearly without the content becoming blurred or distorted.

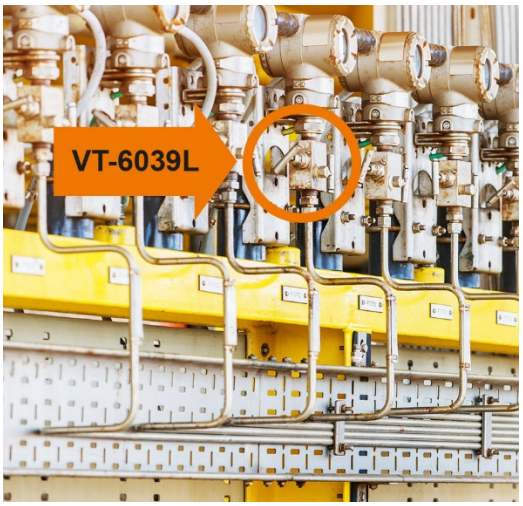
When printing color images in black and white, care should be taken to ensure the features in the image are not lost. The images below illustrate the importance of selecting colours that will ensure overlayed information will contrast clearly against the background.

Use:



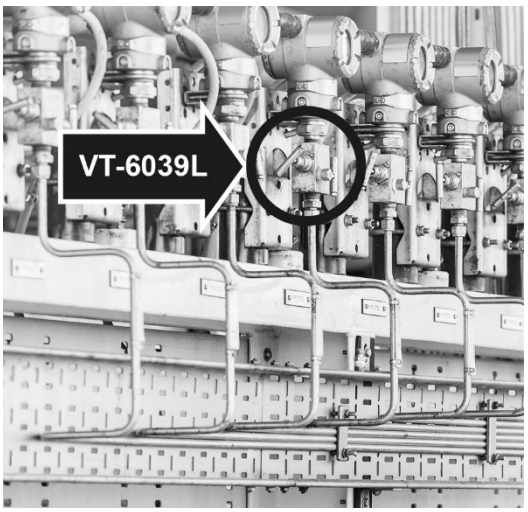
Use contrasting outlines on overlayed symbols to ensure clarity against the background image particularly in black and white.

Avoid:



Although the overlay arrow in the image above is clear in colour, the image below shows what this would appear like in black and white.

Use:



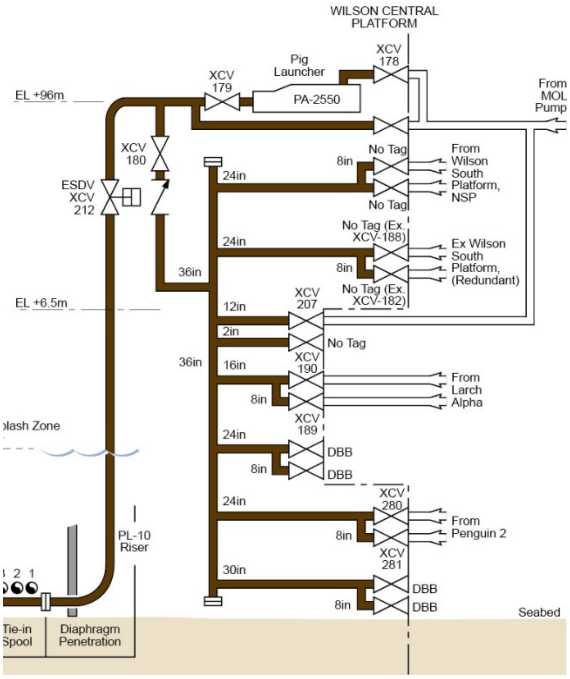
Avoid:

8.10 Tables and Figures *(continued)*

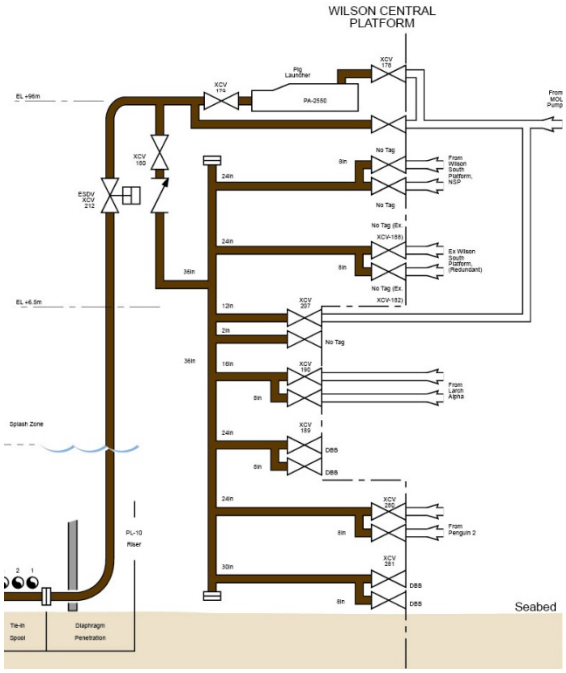
Figure Size and Clarity *(continued)*

Drawings and P&IDs may not be easy to read and may be read incorrectly by workers if the print is too small. Providing magnified drawings can help workers who have vision difficulties.

Use:



Avoid:



8.10 Tables and Figures *(continued)*

Arrows and Annotations in Figures

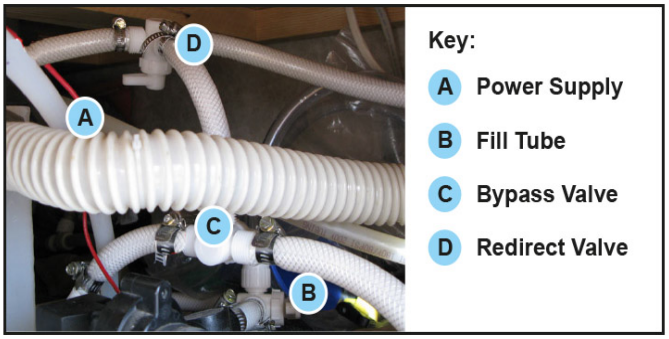
Arrows are typically used to annotate multiple items in a figure. The following examples present best practice and what to avoid.

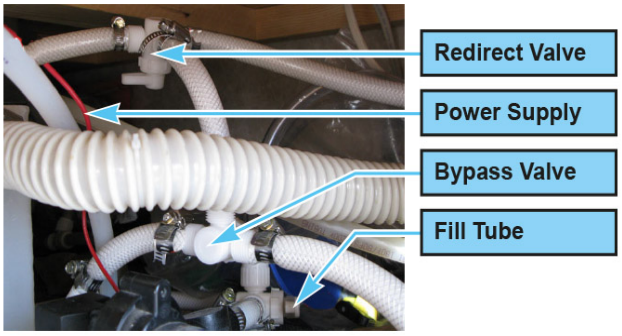
Ideally, to ensure the figure image is not hidden, it is better to overlay lettered or numbered icons with a descriptive key alongside.

Where arrows are to be used, thin arrows are best to point at parts of an image. Thick arrows can be distracting and hide important details in an image. When using multiple arrows with a single image, orient the text associated with the arrows in a consistent manner.

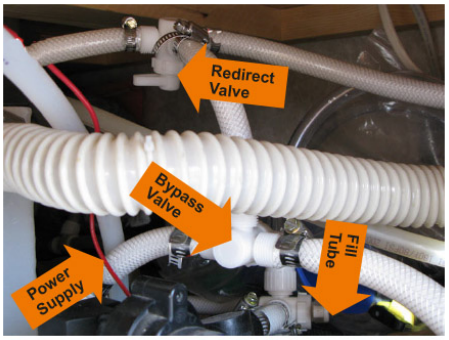
Select colors which contrast with the image and are not the same as those used to highlight safety-critical information.

Use:





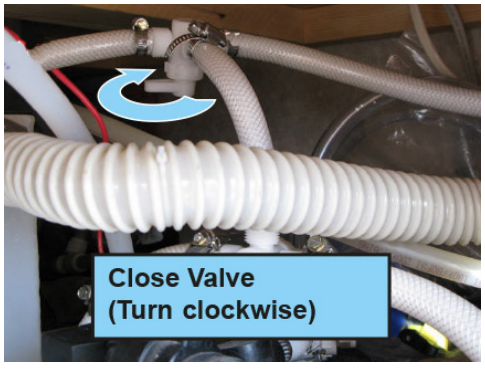
Avoid:



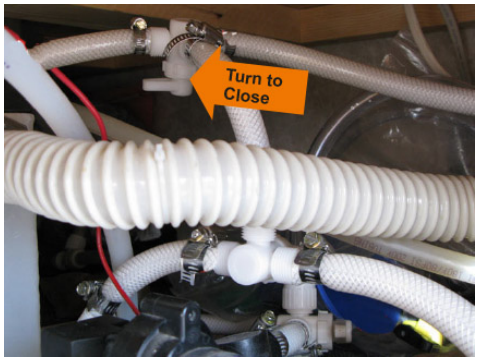
Do not orientate text inconsistently.

Directional arrows may be used to help an operator understand how to perform the action. When using a directional arrow to illustrate a step, ensure the arrow direction matches the actual motion that must be performed.

Use:



Avoid:



9 Review, Approval and Monitoring

At this stage, a draft procedure must be subjected to a thorough review and approval process with consideration given to engagement of end users and any training requirements.

9.1 Review and Verification

On completion of the draft procedure, it should be released for a full technical and usability review.

Ideally, this should be done as a group activity and include key stakeholders, relevant engineering backgrounds and, if possible, individuals with experience and knowledge in procedure usability.

Where possible, a Walk-Through Talk-Through (WTTT) should be conducted using the HPOG WTTT guidance available.

Download WTTT guidance and resource at https://www.hpog.org/resource-centre/wttt/

If any changes are made to the procedure at this stage, those changes must be reviewed by the group again.

9.2 Approval and Initial Roll-Out

Once the technical and usability reviews have been completed and fully signed off, the procedure can be formally issued.

If the procedure is new or has been updated with significant changes, it's important to arrange an appropriate training and briefing system to ensure all users are engaged.

Where it is important to have a continuous system in place for reviewing procedures, it is particularly important to encourage end users to provide feedback during the early stages. This can be done through existing company means, or a lessons learned table embedded at the start or end of the procedure itself, see example below.

If there are any issues with specific steps or if there are opportunities to improve this procedure, please note them below.		
Procedure Step Number	Comments	Name

All changes to the procedure made from gathering feedback must be subjected to another technical and usability review.

9.3 Periodic Review and Update

Once an initial roll-out phase has concluded and any necessary changes have been made to the procedure, the procedure should be fully released with details of any relevant training requirements.

In order to capture all changes a new procedure may have on operations, all new and updated procedures should be subjected to full Management of Change process.

Procedures should be periodically reviewed and updated if necessary. It is encouraged to maintain an open feedback mechanism in order to identify issues as they happen.

10 References

This document has been created through adapting, with permission, industry recognised documents.

“Designing Procedures to Improve Human Performance” from Chevron, and “Guidance on the Development of Site Operating Procedures” from Scandpower/LR in conjunction with BP, have both been used for reference and in many cases duplicated here.

For the section on Adaptation, the book “Human Factors for the Chemical and Process Industries” by the Keil Centre was used as reference and adapted.

“Designing Procedures to Improve Human Performance” from Chevron

“Guidance on the Development of Site Operating Procedures” from Scandpower/LR in conjunction with BP

HSE (Health and Safety Executive) https://www.hse.gov.uk/

“Human Factors for the Chemical and Process Industries” from the Keil Centre

“Preventing human error: developing a consensus led safety culture based on best practice.” Embrey, D. (2000). Human Reliability Associates Ltd. 14p.