Safety Human Factors Information

Prepared by WG16 for the Safety Advisory Council

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Task Factor
Design and Effectiveness of Procedures

Procedure: a written description of the steps, identified through proper analysis, which you need to follow, to safely perform a task or to carry out an activity (series of tasks).

A procedure may be on paper or be presented electronically, including diagrams, flowcharts, checklists etc. to make the content easier to understand.

Safety Critical Procedure: describes a procedure for a task which if carried out incorrectly or not at all could lead to injury, fatality, serious damage to plant or environment or loss of containment.

Learning more about design and effectiveness of procedures.

If the answer to any of the questions below is 'no', then you need to take action

1.	Do the existing procedures cover the scope of expected activities? • Maintenance tasks. • Plant start up and shutdown. • Plant operation. • Abnormal or emergency tasks. • Troubleshooting. • Training and competence arrangements.	☐
2.	Is there a formal process of risk assessment in place to determine which tasks or safety critical operations need clear procedures (additional sources of information may include Seveso scenario assessments, incident/accident root cause analyses, job hazard assessments or analyses, HAZOPs)?	☐
3.	Where a hazard review or layer of protection analysis references operator actions based on procedure, is this actually reflected in that procedure (and is the consequence highlighted or cross referenced to the process safety document)?	☐
4.	Are procedures for identical tasks or operations across sites or plants consistent?	☐
5.	Are task performers involved in the identification and writing of new or revised procedures?	☐
6.	Do the procedures clearly identify responsibilities for tasks, especially where duties are shared?	☐
7.	Is there a procedure which describes how the work of contractors or temporary staff is managed?	☐
8.	Are the procedures reviewed periodically, after any incident and as part of changes?	☐
9.	Is there a document control process for procedures? This should include: - who is authorised as competent to approve procedures, - management of change process for change of procedures, and - revision control.	☐
10.	Are the formats (layout, structure and presentation) of the procedures (checklists, instructions, flow sheets etc.) appropriate for ease of understanding and application?	☐

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	• for routine operation, • for safety critical operation • for emergency and upset conditions.	
11.	Are new or revised procedures validated in the field to match how the task should be carried out?	☐
12.	Are task performers informed of or trained in new or changed procedures?	☐
13.	Is there an ongoing monitoring system to ensure compliance to procedures?	☐
14.	Are procedures easily accessible to task performers?	☐
15	Is the language used appropriate to the audience?	☐
16.	Are procedures written so that the steps and sequence can be unambiguously understood and followed easily?	☐
17.	Do the procedures include key safety information?	☐
18.	Is the readability (layout, font type, size etc.) of safety critical or emergency procedures considered?	☐

What can we do about it?

Management Responsibility

Management should make sure they are familiar with good practice for designing procedures.

Management should periodically monitor and check that procedures are being used properly, actively encourage initiatives to improve existing procedures, be open to feedback from operators on any issues and address comments promptly. This may involve amendments to procedures or training materials, or changes to work practices.

If people are not following procedures, find out why. They may have discovered a better method of doing the work; on the other hand, their method may involve more risk. An assessment should be made in the field with task performers to properly understand the risk and benefits of the differences, before agreeing and document the practice to be followed.

Ensure there is a formal system for suggesting changes to procedures.

Have Effective Procedures

Procedures, especially operating and maintenance procedures are important for the prevention of incidents and occupational ill health. They are a key element of a safety management system.

As well as being technically accurate, procedures need to be well-written, usable and up to date. Poorly written procedures can be a reason for people to develop alternative practices. Effectively written procedures are vital in maintaining consistency and in ensuring that everyone has the same information.

Remember that in addition to written procedures there may also be established, complementary but undocumented work practices that need to be considered.

Procedures ideally need to:

- be accurate and complete;
- be clear and concise with an appropriate level of detail;
- be current and valid;
- be supported by training;
- be readily accessible to the task performer;
- be consistent with hazards and precaution identified in risk assessment or other documents;
- state necessary additional precautions that need to be taken by task performer to mitigate task hazards;

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- use language appropriate to the audience;
- use consistent terminology;
- explicitly and accurately reference equipment names or tag numbers;
- be consistent with how tasks are actually carried out; and
- be presented in a suitable format.

NOTE: in some countries, legislation can require that key hazards with significant consequences be clearly identified in procedures.

Writing and maintaining well designed procedures

First Steps.

Start by collecting information about the activity, tasks and users. To do this you could carry out an analysis of that activity. You will also need to have the results of any relevant risk assessments so that the procedure can reflect arrangements to maintain adequate control of identified hazards.

Here are some topics to think about:

- consider both the complexity and criticality of the task(s) to be documented;
- find out how often the task is to be carried out and the potential hazards;
- think about who will use the procedure and the level of information they need (providing too much information may lead to less use of the procedure if users find it too detailed and hard to follow, too little information may mean that an inexperienced person will be less likely to carry out the task safely);
- establish the existing competence of the users of the procedure;
- understand whether additional training will be needed to support the procedure.

Write procedures

Involve the people who do the work in the early stages of developing procedures. This will encourage them to use the new procedures because they will not be seen as management-imposed.

Engaging users in the process also has the following advantages;

- They may have a more realistic view of what is practical in the job
- They can advise on the amount of detail needed in a procedure and on its wording and style
- They can advise on how and why people might break with procedure (not use it, make a genuine mistake or do the job a different way).

In order to make the writing process effective

- Support the writing team with expert guidance in hazard and risk assessment
- Provide guidance or training on how to write effective procedures.
- Use a good design guide and template for consistent layout, language, wording, font styles.
- ‘Walk through’ the steps of the draft procedure and correct any issues found before it is approved for implementation.
- Ensure that the task can be carried out as written and the procedure reflects how the task is actually done - ‘Write what you do and do what you write'

Approved procedures can appear in many different forms, e.g. as printed text documents, electronically, checklists, as quick reference cards, displayed instruction notices, photographs, or a combination of these.

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- It is important that users know where the procedures can be found and that this is convenient for them. If it takes too long to find a procedure users will be more reluctant to use it.
- Information which is duplicated, e.g. in displayed instruction notices as well as printed documents shall not contain conflicting instructions.

Think about the issue of style.

- Keep sentences short and avoid complex sentence structures. This will make the procedure easier to read and understand.
- Write the required actions that users need to do in positive active sentences and in the order in which they need to be carried out
    - 'Open valve A then valve B' is easier to follow than –
    - 'After opening valve A open valve B' or
    - 'Do not open valve B until valve A has been opened'.
- For activities which are complex, rarely carried out, or performed in adverse conditions it is helpful if each step of the task is written separately in the procedure so it can be clearly identified.

Where appropriate for the audience and activity, effective use can be made of:

- flow charts;
- decision tables (often in the form of 'if condition X, then go to step Y');
- questions, for example:
    - “Is the temperature greater than 1000°C?
    - Yes, go to step 1; No, go to step 2”.
- diagrams
- photographs.

Divide longer procedures into shorter parts. This helps users to go back to a particular step if they are interrupted or if the task or activity takes some time to carry out.

AVOID USING ALL CAPITAL LETTERS FOR THE TEXT. Research shows that this is slower and more difficult to read than the lower-case text.

Decide how features such as CAPITALS, **bold**, *italics*, and underlining will be used for emphasis. Overuse of these features is very distracting for users.

Care should be taken in use of colours, both regarding colour-blindness, **distraction** and print options.

Avoid using very small fonts (e.g. 8 point Arial or smaller). Research indicates that some fonts are easier to read on paper or electronically than others. This topic continues to evolve with technology and understanding of human factors involved.

Make good use of open space in the text. If the page appears too cluttered, people will be discouraged from reading it. Although this may result in a procedure with more pages, providing spaces between steps on the page will make it more readable.

Try to use the same format and structure for the same type of procedure. This will help users navigate the text. An inconsistent structure could confuse the user. Structural elements of a procedure could include:

- purpose of the procedure;

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- pre-requisites, initial conditions which must be satisfied before starting;
- references to other relevant documents, e.g. data sheets or manuals; and
- procedural steps to perform the task, including a warning where the consequence of an incorrect action or omission of a step can result in significant harm.

Use and management of procedures

- Train people in procedures: use the training to make them familiar with the content of the procedure but also to test the procedure itself – it may contain errors or may not be practical
- Make sure that when someone needs to use a procedure, they can find it quickly and easily
- Ensure that your management of change process identifies the requirement to amend procedures or training materials before the change is implemented [6].
- Have a formal system for managing and controlling procedures.
    - Include issue date and revision number on the procedure
    - Ensure that it is clear where the valid version is available.
    - Minimise printing of uncontrolled copies
    - Define the requirements for periodic review, revision or revalidation,
    - Require review of procedure including after an incident.
- periodically monitor and check that procedures are being used properly, and address any issues identified.

Useful Reference Information

1. *Safety Critical Procedures*. Human Factors Briefing Note No 6. Energy Institute. https://publishing.energyinst.org/
2. *Procedures*. HSE Human Factors Briefing Note No 4. Health and Safety Executive. https://www.hse.gov.uk/https://publishing.energyinst.org/topics/human-and-organisational-factors/procedures/human-factors-briefing-note-no.-6-safety-critical-procedures
3. *HSE Human Factors Inspectors Toolkit,* October 2005 Health and Safety Executive. https://www.hse.gov.uk/
4. Health and Safety Executive, Reducing Error and Influencing Behaviour, HSG48, 1999, HSE Books ISBN 9780717624522. https://www.hse.gov.uk/
5. EIGA Info HF 01 *Human Factors – An Overview*. www.eiga.eu
6. EIGA Doc 51 *Management of Change*. www.eiga.eu

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