

## Use of habitats

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### Working Together for Safety Recommendation 036E/2015



**SfS**  
Samarbeid for Sikkerhet

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## Introduction

Within the petroleum industry, the term 'habitat' is used to describe an enclosed area with overpressure. Habitats are constructed from flame retardant materials. The overpressure prevents flammable gas from reaching hot work (e.g. welding) inside the habitat and igniting. With an associated control and shutdown system, a habitat is able to ensure the safe execution of hot work in classified areas under normal operating and production conditions. Conditions in unclassified areas may also make it necessary to use a habitat.

This recommendation assumes that a risk assessment has already been carried out, including an assessment of alternative methods (cold work, shutdown, etc.), and it has been decided that a habitat shall be used.

## Objective

This best practice (method) describes how a habitat should be planned, designed, inspected, operated, maintained and removed if it is to constitute a safety barrier.

## Definitions

**Habitat:** A temporarily enclosed area with overpressure and associated control and shutdown systems.

**Competent habitat installer:** A habitat installer who is approved in accordance with internal company requirements and able to lead the construction, approval and inspection of habitats.

**Safe area:** 'Safe area' refers to an area, generally unclassified, where there is the lowest possible risk of the presence of gas in the air intake.

**Classified area:** 'Classified area' refers to Zones 0, 1 and 2, as defined below:

Zone 0: Areas where a potentially explosive atmosphere exists continually or for long periods.

Zone 1: Areas where a potentially explosive atmosphere occasionally exists continually or for long periods.

Zone 2: Areas where a potentially explosive atmosphere exists only rarely and for short periods.

**Hazop (HAZard and OPerability Analysis):** An overall and systematic assessment of potential hazards associated with the operation and maintenance of a process plant. Generally carried out during the planning/design phase (ref. IEC 61882 – HAZOP studies – Application guide).

**Hazid (HAZard IDentification):** The systematic assessment of a plant, system or work operation, undertaken to identify potential hazards and plan necessary measures.

## Reference

In this context, the ignition source control system and other habit equipment are defined as temporary equipment in accordance with Norsok Standard Z-015N.

## List of changes

The following changes have been made in version 01, compared to version 00:

- Changed requirement in the event of loss of overpressure or detection of gas – requirement for automatic isolation
- Added requirement for new review of checklist A following interruptions in the work
- Added requirement for appropriate ducts for hoses and cables inside the habitat
- Changed wording of requirement regarding strength of habitat in relation to wind – added point about compensatory measures
- Miscellaneous clarifications and clearer wording in main text – no policy changes
- ‘Competent habitat installer’ defined
- Changes made to checklist, Appendix A:
  - Clarifications and clearer wording added in points 10, 14 and 16 – no policy changes
  - Point 19 removed (already covered by point 1)
  - Signature list updated in line with document text
  - Time of signature added

## Best practice

### *Planning*

Thorough planning prior to the use of a habitat is important in order to ensure safe execution of the work. Planning forms the basis for being able to manage the risks associated with all sub-tasks involved in establishing a habitat.

Best practice in planning a habitat includes:

- Reviewing area classification drawings and undertaking an inspection to ensure that the drawings match the actual conditions. This includes a review of the physical conditions, such as electrical connections, air supply to the habitat, the size of the job (with regard to potential heat and air flow) and special conditions at the installation/facility.
- Identifying risks associated with the planning, design, control, operation, use, maintenance and removal of the habitat. The identification of risks may involve an assessment of HAZID/HAZOP needs, including an assessment of the activity level at the installation, operating conditions, concurrent operations, relevant nonconformities, review of the QRS (Quantitative Risk Analysis) summary, etc.
- Clarifying how compensatory measures should be implemented.

### *Design – construction of the habitat*

It should be verified that the necessary resources (scaffolding, electricity, air, etc.) identified through the planning work are available at the location where the habitat shall be constructed.

- The construction of the habitat must be managed by a competent habitat installer. Common competence requirements for habitat installers do not currently exist, but work is being carried out to establish a norm. Until such a norm is in place, the individual supplier must set internal competence requirements and document these. The requirements must also be approved by the individual operator.
- The habitat, including its door, must be constructed from flame retardant materials, be adequately stiffened, and constructed so that heat and sparks from the planned activity do not constitute an ignition source risk outside the habitat.
- The habitat must be equipped with a window so that the habitat guard can monitor the work inside the habitat. The window should be positioned so that flame detectors can remain operational.
- The habitat must be equipped with a manual emergency stop device, which cuts off the electricity supply to equipment within the habitat.
- A habitat must be constructed so that potential hydrocarbon leakage points are not located inside the habitat. However, if it is decided that, for example, a flanged joint must be built in, compensatory measures must be implemented.
- Welding and heat treatment equipment must be placed inside the habitat, or in a separate habitat if necessary.
- The habitat must be able to withstand the relevant wind stresses in the area in which it is placed. Habitats are normally designed to be able to withstand wind speeds of up to 30 m/s – in some cases this means that compensatory measures must be implemented. Habitats located near a helideck require extra follow-up due to the turbulence caused by helicopter operations.
- A habitat should be equipped with “airtight access” – such as an airlock or a self-closing door (a habitat can lose overpressure after just a few seconds of the door being open). Creating good, labelled evacuation routes from the habitat to a safe area must be prioritized. The construction of alternative evacuation routes must be considered, and there must always be another escape option in addition to the door of the habitat.
- For work in the habitat which represents an ignition source (for example heat), even after the electricity or gas supply to the habitat has been cut off, the fan unit and damper must be independent of the working electrical current to ensure continued overpressure in such situations. Electrical and pneumatic fans shall be EX approved for Zone 1. Fans must be shut down and dampers closed automatically if gas is detected in the air intake. The air inlet for fans should be placed in a safe area (well away from classified areas), in order to ensure sufficient air supply to the habitat.
- The habitat must be equipped with at least three external gas detectors. If gas is detected (over 10% LEL) by one of these detectors, all equipment within the habitat shall be isolated (trip) automatically. If overpressure within the habitat is lost, all equipment within the habitat must also be isolated (trip) automatically. EX certified lights must be set up inside the habitat. EX certified flashlights should be available in the habitat as a back-up in the event of a loss of power.

- Communication must be established with the central control room, and the habitat system must be equipped with both audible and visual alarms.
- If gases are used (propane – oxygen/acetylene) the gas bottles must be placed outside the habitat and the supply physically removed/disconnected before any hot work starts. One of the gas detectors must also be connected to the automatic disconnection system for ignition sources and gas sources (e.g. solenoid valves on propane bottles) and placed at the lowest possible level in the habitat together with a hand-held O<sub>2</sub> meter. Gas equipment, including hoses, shall be tested for leaks and found to be in order.
- The habitat must be constructed so that an overpressure of a minimum of 50 Pascals (Pa) can be established. If the job requires it (e.g. during string bead welding), the overpressure can be reduced for a short period (but to no lower than 15 Pa). This must be risk assessed/documentated in each individual instance.
- There must be appropriate ducts for hoses and cables in the habitat. All cables and pipes that pass through the habitat shall be identified and protected.

See the attached checklists for detailed requirements.

### ***Inspection prior to use***

- The area responsible/area technician, together with the habitat installer, HSE function and executing worker, should carry out a checklist-based final inspection (ref. Appendix A). This is done in order to verify that the habitat is constructed in accordance with requirements. A copy of the checklist must be placed in a folder hung on the outside of the habitat.
- A visual inspection is carried out in the form of a self-inspection, and the safety functions inside the habitat are checked in accordance with Appendix B.

### ***Operation of the habitat***

- The habitat installer should be available while the habitat is in use, unless other personnel with competence in ensuring the habitat's integrity are present during this period.
- The detection of gas at the installation/facility shall automatically shut down ignition sources inside the habitat.
- Use of the habitat requires a dedicated habitat guard, whose main task is to monitor the work site. A complete list of the habitat guard's tasks can be found in Appendix C.

## ***Working environment***

### **Ergonomics**

- The habitat should be constructed in a way that facilitates good working conditions. Good communication with the executing personnel should therefore be maintained while the habitat is constructed.

### **Noise**

- Work in the habitat often generates noise, in addition to other sources of noise in the area. This must be taken into consideration when selecting equipment, assessing whether hearing protection should be used, and evaluating how long personnel should be permitted to work in the area.

### **Dust – Chemicals**

- Work in overpressure habitats creates turbulent air conditions, and overpressure respirators should therefore be used.

### **Fire**

- The habitat should be equipped with a zinc bucket for used welding electrodes, an appropriate fire extinguishing medium (such as water or foam), flashlights, a knife, and water bottles/water tanks for cooling the workpiece.
- The need for extra personnel to monitor the work (in addition to the habitat guard) must be assessed.
- The area around the work site inside the habitat must be covered with fire retardant material so that no sparks or hot work can damage equipment or the habitat.

## ***Maintenance of the habitat***

- During continual use, the habitat should be checked daily by the executing personnel in accordance with the relevant checklist (Appendix B). If the habitat must be reconstructed or the gas detectors replaced, or if the habitat is not in operation for over 48 hours, checklist A shall be reviewed again, as for newly constructed habitats.
- When the habitat is not in use, it should be opened to allow air to flow through it.

- The supplier/owner of the habitat equipment must have a system for the maintenance and inspection of all the elements included in the habitat system. Any need for help from the operator, such as for routine checks of gas detectors and electrical equipment, should be clarified at the individual installation/facility.
- The habitat should be inspected frequently during periods with cold temperatures and a risk of ice forming, and in the event of heavy rain.

### ***Removal of the habitat***

- After use, the habitat and other temporary equipment should be removed as quickly as possible so that the installation/facility's operations can be returned to normal.
- There is often dust, etc. inside the habitat after use, so appropriate personal protective equipment must be used when removing this.
- The control room should be contacted to return any temporary safety measures (for use of the habitat) to normal operation.

### **Risk management**

The identification of risks should be based on single activities associated with the planning, design, inspections, operation and maintenance, and removal of the habitat as described above. It can be helpful to divide the individual activities into requirements, best practice, assessment by the executing team and the actual execution of the activities as follows:

#### **Requirements**

Identify requirements relating to the activity in order to ensure an understanding of what shall be achieved.

#### **Method (procedure)**

Identify best practice and ensure the understanding and use of this.

#### **Assessment by the executing work team**

The planning must ensure involvement from the executing team. This is in order to ensure that the best practice (method) is sufficient to manage the risks and meet the requirements.

#### **Execution**

In the event of changes/any stop in the work, a new risk assessment should be carried out before the work is resumed.

### **Appendices**

- A: Checklist for approval of habitats
- B: Daily checklist for habitats
- C: Duties of the habitat guard



**Appendix A: Checklist for approval of habitats**

No.	Contents:	Responsible:	Signature:	Verified:
1	The habitat, including its door, is constructed from flame retardant materials, adequately stiffened, and constructed so that heat and sparks not constitute an ignition source risk outside the habitat.	Habitat installer		
2	The habitat is equipped with a window for visibility and constructed so that the fire watcher outside the habitat can monitor the activity inside	Habitat installer		
3	A self-closing door is fastened to the frame and the closing mechanism functions correctly. The seal around the door is checked and OK.	Habitat installer		
4	The habitat fabric is secured against leaks around pipes and structures with straps or tape.	Habitat installer		
5	The air inlet to the habitat is located in a safe area.	Habitat		
6	Overpressure inside the habitat is tested to at least 50 Pa. Electrical contacts and valves for air used to run the fans are labelled: "For habitat, must not be closed/switched off" and secured in the open position.	Habitat installer		
7	The executing worker, area technician and habitat guard are familiar with the automatic shutdown system and checklists.	Habitat installer		
8	The escape routes are checked and cleared – also with respect to how a stretcher can be evacuated. Alternative escape routes are labelled inside the habitat, along with any knives installed by the escape routes.	Habitat installer		
9	A pressurised fire hose is positioned outside the habitat. The fire water valve is labelled "For habitat, must not be closed" and secured in the open position. A suitable fire extinguisher is located inside and also outside the habitat if req'd.	Area technician		
10	A function test of the control unit(s), including testing with gas, has been done..	Area tech		
11	The habitat has been evaluated for HC leaks/sweating in the vicinity of the habitat, e.g. plug leaks, deck drains and pipes located inside the habitat.	Area technician		
12	Exposed flame detectors are shielded or set to "bypass". (If in doubt, this must be tested in collaboration with the CCR).	Area technician		
13	Gas detectors are in position, connected to the control unit and the placement is approved by the area technician.	Area technician		
14	The method of communication between the executing worker and habitat guard has been agreed upon, e.g. for opening the door of the habitat. The habitat guard is familiar with the task in checklist C.	Area technician		
15	For welding: There is a zinc bucket for used electrodes inside the habitat, as well as water for cooling the workpiece/weld.	Executing worker		
16	The welding site has been defined and sufficient welding cloths are hung up to protect the fabric of the habitat. Joins in the welding cloth are covered with flame retardant material. There are no flammable materials inside the habitat. Use of a thin metal sheet has been assessed as preferable protection, vs a fire blanket.	Executing worker		
17	EX certified lights that do not shut off when the electricity supply for welding is disconnected are installed.	Executing worker		
18	All electrical equipment that is used inside the habitat, with the exception of EX certified emergency lighting, is connected to a control unit. Welding equipment and heat treatment transformers are placed inside the habitat. Preventive maintenance has been carried out on the electrical equipment.	Executing worker		
19	When the habitat is used with any gas sources (propane – oxygen/acetylene) inside the habitat itself: One of the gas detectors connected to the automatic disconnection system for ignition sources is placed at the lowest possible level inside the habitat together with a hand-held O <sub>2</sub> meter. Gas bottles are placed outside and the control valves on these are physically disconnected before welding. Gas equipment, incl. hoses, is tested for leaks and found to be in order.	Executing skilled worker		
20	The need for fresh air has been assessed. In the event of welding inside the habitat, a fresh-air mask connected to fresh/breathing air shall be used.	Executing worker		
21	An "Approved" sign is installed when the habitat has been approved. The habitat must be re-approved in the event of changes.	Executing worker		

Habitat No.: \_\_\_\_\_ Approved Date: \_\_\_\_\_ Time: \_\_\_\_\_ Area/ Module: \_\_\_\_\_ SJA No.: \_\_\_\_\_

**Area Responsible / Area Technician:**

**HSE Function:**

**Competent Habitat Installer:**

**Completed checklists shall be stored together with the active work permit.**

**Appendix B: Checklist for daily inspection of habitats**

No.	Contents:	Responsible:	Signature:
1	A pressurised fire hose is positioned outside the habitat. The fire water valve is labelled "For habitat, valve must not be closed" and secured in the open position. (If there is a risk of frost, the hose should be positioned while dry and the valve labelled "For habitat, must not be disconnected").	Executing worker	
2	The escape routes are checked and cleared – also with respect to how a stretcher can be evacuated. Alternative escape routes are labelled inside the habitat.	Executing worker	
3	Sufficient welding/emery cloths are hung up to protect the fabric of the habitat, and there are no flammable materials inside the habitat. None of the components of the habitat's door are flammable.	Executing skilled worker	
4	Gas detectors are in position.	Executing skilled worker	
5	All electrical equipment that is used inside the habitat, with the exception of EX certified emergency lighting, has been inspected and is connected to a control unit. Welding equipment and heat treatment transformers are placed inside the habitat. Normal preventive maintenance (PM) has been carried out on the electrical equipment.	Executing worker	
6	EX certified lights that do not shut off when the electricity supply for welding is disconnected are installed.	Executing worker	
7	Heat from the planned activity does not constitute an ignition source risk outside the habitat. The need for protection under the floor, in the ceiling or around pipes has been assessed.	Executing worker	
8	When the habitat is used with any gas sources (propane – oxygen/acetylene) inside the habitat itself: One of the gas detectors connected to the automatic disconnection system for ignition sources is placed at the lowest possible level inside the habitat together with a hand-held O <sub>2</sub> meter. Gas bottles are placed outside the habitat and the control valves on these are physically disconnected before welding starts. Gas equipment, including hoses, is tested for leaks and found to be in order.	Executing worker	

**Habitat No.:** \_\_\_\_\_ **Date:** \_\_\_\_\_ **Area/ Module:** \_\_\_\_\_

**Executing worker:**

**Completed checklists shall be stored together with the active work permit.**

### Appendix C: Duties of the habitat guard

*The habitat guard shall be clearly identifiable from clothing featuring the words “Habitat guard (Habitatvakt)” or “Fire watcher (Brannvakt)”*

<b>Duties of the habitat guard when using habitats in process areas</b>	
<b>Before the work starts, the habitat guard shall:</b>	<ul style="list-style-type: none"> <li>- Review all the habitat’s safety functions together with the person responsible for work in the habitat</li> <li>- Become familiar with the requirements for overpressure, breathing air and extra meters when using gas or propane</li> <li>- Become familiar with the use and operation of the gas meters</li> <li>- Agree upon stop signals with the personnel who shall work inside the habitat</li> <li>- Participate in Safe Job Analysis</li> <li>- Establish and maintain radio communication with the central control room (CCR)</li> <li>- Inform involved personnel of escape routes</li> <li>- Ensure that all lighting and other equipment is in accordance with instructions for equipment used inside welding habitats</li> <li>- Position the following equipment at the habitat and make it ready for immediate use:               <ul style="list-style-type: none"> <li>• EX certified flashlight</li> <li>• Pressurised fire hose</li> <li>• Foam/water fire extinguisher. Remember that CO<sub>2</sub> should never be used on fires in enclosed areas/habitats</li> <li>• Compressed air breathing apparatus with buddy mask or equivalent, if necessary</li> <li>• Other rescue equipment as required by the work permit.</li> </ul> </li> </ul>
<b>Before work starts, the habitat guard shall become familiar with:</b>	<ul style="list-style-type: none"> <li>- The nearest trigger for the sprinkler/deluge system</li> <li>- The circuit breaker for welding equipment/electrical equipment</li> <li>- The location of the nearest telephone/fire alarm</li> </ul>
<b>During the work, the habitat guard shall:</b>	<ul style="list-style-type: none"> <li>- Not participate in work that may disturb the task at hand</li> <li>- Remain at the entrance to the habitat and visually monitor the work and surroundings at all times</li> <li>- Stop the work if incidents occur that may affect the safety of personnel or the work that is being carried out</li> </ul>
<b>When the work is interrupted or completed, the habitat guard shall:</b>	<ul style="list-style-type: none"> <li>- Secure the equipment/work site</li> <li>- Turn off electrical equipment and shut off any gas bottles</li> <li>- Gas bottles shall be physically disconnected when personnel leave the habitat</li> <li>- Notify the area technician/CCR</li> </ul>
<b>In the event of an undesirable incident in the entry area, the habitat guard shall:</b>	<ul style="list-style-type: none"> <li>- Notify work colleagues, the CCR, and sound the alarm</li> <li>- Administer life-saving first aid if this is possible without exposing oneself to danger</li> <li>- Secure the work site and shut off any gas bottles</li> </ul>
<b>In an alarm situation, the habitat guard shall:</b>	<ul style="list-style-type: none"> <li>- Notify work colleagues and stop the work</li> <li>- Secure the work site, and shut off any electrical equipment and gas bottles</li> </ul>