Use of habitats

Working Together for Safety Recommendation 036E/2025

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1. 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.

2. 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.

3. 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 occassionally 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.

4. 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.

5. List of changes

The following changes have been made in version 02, compared to version 01:

- Clarification of points in chapter 6.2 and 6.6 has been made and the setpoint for tripping of control unit has been specified
- Signatur from HSE rep on checklists has been removed
- Requirement for gas detectors inside the habiat included in checklist (Appendix A)
- Sequence of points in checklists have been altered to be in accordance with TR 2136 App. A (Equinor) and there are som minor text changes for clarity
- Verification of checklist has been changed to one signature at the bottom instead of one signature for evere point
- A new checklist for robotic welding has been added
- The document set-up has been changed the current SfS standard

6. Best practice

6.1 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.

6.2 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. 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 in the area outside the habitat 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 loses overpressure when the door is being opened). The door should be placed in the direction of the evacuation route. 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.

- The air intake should be equipped with a gas tight damper that shuts off air supply if the fan stops. 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 supply channel must be long enough for the damper to close before the concentration of flammable gas reaches the damper. 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.

- When welding with gas, the gas bottles must be placed outside the habitat. If propane is used to pre-heat the welding area, a minimum of one gas detector (suitable for detecting propane) must be place at the lowest level in the habitat together with a handheld Oxygen meter. The supply of propane should be physically removed/disconnected before any hot work starts. Gas detector(s) must be connected to the automatic disconnection system for ignition sources and gas sources (e.g. solenoid valves on propane bottles). 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 and the control units set to trip at minimum 25Pa. 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 and documented 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.

6.3 Inspection prior to use

- The area responsible/area technician, together with the habitat installer 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. Attachment B is an abbreviated checklist for robotic welding

- 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 C.

6.4 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 D.

6.5 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.

6.6 Maintenance of the habitat

- During continual use, the habitat should be checked daily by the executing personnel in accordance with the relevant checklist (Appendix C). 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 habitat located in a zone 2 area is not in use, it should be opened to allow air to flow through it to avoid zone 1 inside the habitat.

- The supplier/owner of the habitat equipment must have a system for the maintenance and inspection of all the elements 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.

7. 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.

8. Appendices

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

Appendix A: Checklist for approval of habitats

No.	Contents:	Responsible	Sign.
1	The habitat, is constructed from flame retardant materials, adequately stiffened, and constructed and habitat is equipped with a window for visibility.	Habitat installer	
2	The window is shielded to avoid flame detections from welding flashes	Habitat inst.	
3	A self-closing door is fastened to the frame and the closing mechanism functions correctly.	Habitat inst.	
4	The seal around the door is checked and OK.	Habitat inst.	
5	Habitat fabric is secured against leaks around pipes/structures with straps/ tape.	Habitat inst.	
6	Valves that are not in use on the habitat are closed in a secured position	Habitat inst.	
7	Overpressure inside the habitat is tested to min.50 Pa. Electrical contacts and valves for air used to run fans are labelled “For habitat, must not be closed/switched off” + secured in the open position.	Habitat installer	
8	Completed functional test of control unit(s) according to the habitat's Cause & Effect, including testing with gas.	Hab. installer +FG/Autom.	
9	When using an automatic shutdown system, the operator must undergo training on the system.	Habitat inst.	
10	A pressurised fire hose is positioned outside the habitat. The fire water valve is labelled “For habitat, not to be closed” and secured in the open position. If there is risk of frost, lay the hose dry and mark the valve “for habitat, don’t disconnect”.	Area technician	
11	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	
12	The valves on fire water and instrument air are marked, "to habitat, valves must not be closed" and secured in the open position.	Area technician	
13	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 tech.	
14	The location of gas detectors connected to the control unit is approved by the area technician	Area tech.	
15	The method of communication between the executing worker and habitat guard has been agreed on, e.g. for opening the door of the habitat. The habitat guard is familiar with the task in checklist C.	Area technician	
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	Gas detectors are in position, two gas detectors/meters are placed inside the habitat if potential internal HC sources exist.	Executing worker	
18	Installed EX certified lights (with battery pack) that do not shut off when the electricity supply for welding is disconnected.	Executing worker	
19	All electrical equipment that is used inside the habitat, with the exception of EX certified emergency lighting, is connected to a control unit.	Executing worker	
20	Assess the need for protection against heat development above 200 degrees under the floor, in the ceiling or at pipe penetrations.	Executing worker	
21	If propane heating: a) An O2 meter is placed inside the habitat. b) The propane gas meter is placed at the lowest level inside the habitat. c) The control valve on gas cylinder (preheating) must be physically disconnected before welding. d) The gas cylinder must be placed outside the habitat. e) Gas equipment incl. hoses tested for leaks and found to be in good condition.	Executing worker	
22	The air inlet to the habitat is located in a safe area.	Habitat inst.	
23	An “Approved” sign is installed when the habitat has been approved. The habitat must be re-approved in the event of changes.	Executing worker	
24	For welding: There is a zinc bucket for used electrodes inside the habitat, as well as water for cooling the workpiece/weld.	Executing worker	
25	Welding equipment and heat treatment transformers are placed inside the habitat	Executing worker	
26	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	

Habitat No.: _____Approved Date:_____ Time:____ Area/ Module: _____SJA No.:_____

Competent Habitat Installer:
Checked and verified by Area Responsible / Area Technician:
Completed checklists shall be stored together with the active work permit.

Appendix B: Checklist for approval of robot habitats

No.	Contents:	Responsible	Signature
1	The habitat, is constructed from flame retardant materials, adequately stiffened, and constructed and habitat is equipped with a window for visibility.	Habitat installer	
2	The window is shielded to avoid flame detections from welding flashes	Habitat inst.	
5	Habitat fabric is secured against leaks around pipes/structures with straps/ tape.	Habitat inst.	
6	Valves that are not in use on the habitat are closed in a secured poisition	Habitat inst.	
7	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	
8	Completed functional test of control unit(s) according to the habitat's Cause & Effect, including testing with gas.	Hab. installer +FG/Autom.	
9	When using an automatic shutdown system, the operator must undergo training on the system.	Habitat installer	
10	A pressurised fire hose is positioned outside the habitat. The fire water valve is labelled “For habitat, not to be closed” and secured in the open position. If there is risk of frost, lay the hose dry and mark the valve “for habitat, don’t disconnect”.	Area technician	
12	The valves on fire water and instrument air are marked, "to habitat, valves must not be closed" and secured in the open position.	Area technician	
13	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	
14	The location of gas detectors connected to the control unit is approved by the area technician	Area technician	
15	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	
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	Gas detectors are in position, Two gas detectors/meters are placed inside the habitat if potential internal HC sources exists.	Executing worker	
19	All electrical equipment that is used inside the habitat, with the exception of EX certified emergency lighting, is connected to a control unit.	Executing worker	
20	Assess the need for protection against heat development above 200 degrees under the floor, in the ceiling or at pipe penetrations.	Executing worker	
21	If propane heating: a) An O2 meter is placed inside the habitat.	Executing worker	
24	Compressed air is used to achieve overpressure in the robot habitat.	Area technician	

Habitat No.: _____Approved Date:_____ Time:____ Area/ Module: _____SJA No.:_____

Competent Habitat Installer:
Checked and verified by Area Responsible / Area Technician:

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

Appendix C: 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_2 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 D: Duties of the habitat guard

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

Duties of the habitat guard when using habitats in process areas	
Before the work starts, the habitat guard shall:	- Review all the habitat's safety functions together with the person responsible for work in the habitat - Become familiar with the requirements for overpressure, breathing air and extra meters when using gas or propane - Become familiar with the use and operation of the gas meters - Agree upon stop signals with the personnel who shall work inside the habitat - Participate in Safe Job Analysis - Establish and maintain radio communication with the central control room (CCR) - Inform involved personnel of escape routes - Ensure that all lighting and other equipment is in accordance with instructions for equipment used inside welding habitats - Position the following equipment at the habitat and make it ready for immediate use: • EX certified flashlight • Pressurised fire hose • Foam/water fire extinguisher. Remember that CO_2 should never be used on fires in enclosed areas/habitats • Compressed air breathing apparatus with buddy mask or equivalent, if necessary • Other rescue equipment as required by the work permit.
Before work starts, the habitat guard shall become familiar with:	- The nearest trigger for the sprinkler/deluge system - The circuit breaker for welding equipment/electrical equipment - The location of the nearest telephone/fire alarm
During the work, the habitat guard shall:	- Not participate in work that may disturb the task at hand - Remain at the entrance to the habitat and visually monitor the work and surroundings at all times - Stop the work if incidents occur that may affect the safety of personnel or the work that is being carried out
When the work is interrupted or completed, the habitat guard shall:	- Secure the equipment/work site - Turn off electrical equipment and shut off any gas bottles - Gas bottles shall be physically disconnected when personnel leave the habitat - Notify the area technician/CCR
In the event of an undesirable incident in the entry area, the habitat guard shall:	- Notify work colleagues, the CCR, and sound the alarm - Administer life-saving first aid if this is possible without exposing oneself to danger - Secure the work site and shut off any gas bottles
In an alarm situation, the habitat guard shall:	- Notify work colleagues and stop the work - Secure the work site, and shut off any electrical equipment and gas bottles