Frontera Space Emergency Procedure: Pressurant Release & Oxygen Deficiency Hazard (ODH)

Revision: 01

Frontera Space Document: 000015

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1 PURPOSE

The purpose of Document 000015 is to define the required response actions for any pressurant-gas release and resulting oxygen-deficiency hazard (ODH) at the PTSD (Portable Test Stand by Dan).
This procedure establishes:

- Mitigation of GN_2 and other inert-gas pressurant releases
- ODH monitoring, atmospheric verification, and re-entry criteria
- Exclusion-zone establishment and pressure-vessel stabilization
- Personnel evacuation, rescue posture, and scene-safety workflows
- Post-incident documentation and return-to-operations requirements

This ensures safe, compliant, and effective response to pressure-system events.

2 SCOPE

This document applies to:

- All personnel working in or around the PTSD test stand
- All systems utilizing high-pressure inert gases (GN_2, He, Ar, or system-specific pressurants)
- All unplanned releases, regulator failures, hose ruptures, burst-disk vents, or rapid depressurizations
- All evacuation, monitoring, and rescue actions associated with ODH or pressurant hazards

3 IMMEDIATE RELEASE RESPONSE

Pressurant releases can rapidly displace oxygen and create hazardous mechanical energy. Standardized response steps ensure personnel safety and hazard stabilization.

3.1 Initial Response Workflow

Upon discovery of a pressurant release when there are Personel on the Stand:

- Announce “Pressurant Release Emergency”
- Stop all hazardous operations immediately
- Safe the stand—halt flow, shut valves, and inhibit pressurization
- Move crosswind or upwind from any plume or jet
- Don required PPE posture
  – Posture B for mechanical/ODH hazards
  – Posture C only if system-adjacent contamination is suspected
- Activate emergency shutdown (remote actuation only)

- Notify the Safety Officer and Operations Controller
- The Safety Officer assumes control of the scene until hazards are resolved.

3.2 Oxygen Deficiency Hazard (ODH) Response

Pressurant gases can rapidly displace oxygen without leaving visible indicators. For any suspected ODH condition:

- Treat all gas plumes and releases as immediately hazardous
- Evacuate the stand immediately until the Control Room and Test Director confirm the source of the leak
- Evaluate and confirm the leak source remotely using the camera system
- Minimum PPE Posture B is required until the source of the leak is confirmed and the stand is returned to a safe condition
- The stand remains closed to PPE Posture A until return-to-operations is formally approved

Any symptomatic personnel require EMS evaluation.

3.3 High-Pressure Mechanical Hazards

Pressurant failures may involve:

- Jet-force hazards
- Fragmentation from fittings or regulators
- Frostbite injuries from cold gas expansion

Responders maintain distance until pressure is confirmed stable.

4 PRESSURE VESSEL RUPTURE MITIGATION

4.1 Scene Safety Assessment

Before approaching the vessel:

- Confirm stand is in a safed configuration
- Verify ongoing venting or deformation from a safe distance
- Do not manually manipulate valves or hardware
- Establish a safe access path if needed

Rescue or further action begins only when the area is safe.

4.2 Exclusion Zone Requirements

For emergency venting or suspected instability:

- PTSD Fence line represents the exclusion zone

- Remove all personnel and equipment from the zone
- Permit entry only to essential emergency personnel
- Maintain the zone until:
    - Vessel is depressurized
    - Venting stops
    - Safety Officer approves re-entry

4.3 Stabilization Procedure

Once the area is secured:

- Allow the vessel to depressurize naturally or through remote vent controls
- Monitor pressure using remote instrumentation only
- Do not attempt manual venting or disconnection
- After stabilization, inspect the tank and hardware
- Tag out and remove damaged components

5 Coordination With External Resources

5.1 EMS Integration

EMS shall be activated for:

- Any ODH symptoms
- Frostbite or mechanical trauma
- Loss of consciousness
- Any injury outside the capability of on-site responders

A designated escort meets EMS and leads them to the stand.

5.2 Hazard Communication

If relevant:

- Provide EMS with SDSs for system-adjacent chemicals
- Inform them of possible residual pressure hazards
- Identify any components that remain under stored energy

6 Documentation & Incident Reporting

6.1 Immediate Documentation

After hazard stabilization:

- Record incident time, location, and conditions
- Document pressure readings and detector data
- Capture photos if safe
- Preserve evidence (failed fittings, hoses, regulators)

6.2 Formal Incident Report

A written report must be completed within 24 hours and include:

- Narrative description
- Timeline
- Witness statements
- Photos
- PPE posture used
- Medical evaluations (if applicable)

6.3 Root-Cause Analysis & Corrective Actions

Required for:

- Any ODH-related hazard
- Any component failure
- Any injury or near-miss

Corrective actions must be assigned, tracked, and integrated into training and procedures.

7 RETURN-TO-OPERATIONS AUTHORIZATION

Operations may resume only when:

- All hazards are cleared
- ODH risk is eliminated
- All systems are inspected and restored
- Documentation is complete
- Corrective actions are in progress
- The Test Director formally authorizes restart

8 PROGRAM MAINTENANCE

Document 000015 shall be:

- Reviewed annually
- Updated after any pressurant-related release

- Revised whenever system hardware, pressure limits, or procedures change