



Frontera Space Emergency Procedure: Post-Incident Recovery & Decontamination

Revision: 01

Frontera Space Document: 000013

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1 PURPOSE

The purpose of Document 000013 is to define the required actions following any abnormal event, spill, vapor release, system failure, or emergency-shutdown condition at the PTSD (Portable Test Stand by Dan). This document establishes the structured recovery procedures needed to ensure safe re-entry, chemical decontamination, hazard verification, and corrective-action documentation in alignment with Frontera Space safety standards.

2 SCOPE

This procedure applies to all post-incident activities involving:

- Residual chemical neutralization
- PPE and contaminated materials disposal
- Waste segregation and hazardous-waste handling
- Air monitoring and atmospheric clearance verification
- Hardware inspection and return-to-service evaluation
- Incident documentation, investigation, and corrective-action implementation

All personnel participating in post-incident recovery or supporting cleanup, investigation, or decontamination operations must follow the requirements outlined in this document.

3 POST-INCIDENT RECOVERY OVERVIEW

All incidents—spills, vapor alarms, pressurant releases, contamination events, hardware failures, FireX activations, or emergency shutdowns—shall follow a structured recovery sequence:

- Stabilize the hazard
- Verify atmospheric conditions
- Perform decontamination and neutralization
- Segregate PPE and waste
- Inspect hardware and affected systems
- Authorize re-entry and system restoration
- Conduct incident investigation and documentation
- Implement corrective actions

The Test Director or designated Incident Commander directs and approves each step.

4 RESIDUAL CHEMICAL NEUTRALIZATION & DECONTAMINATION

4.1 Neutralization Procedures

Residual MMH, MON-3/N₂O₄, or associated byproducts must be neutralized using approved, hypergolic-compatible neutralizers.

Neutralization steps include:

- Identify and map contaminated surfaces (visual inspection + gas detector confirmation)
- Apply appropriate neutralizing agents for fuel or oxidizer residues
- Allow required dwell time for complete reaction
- Rinse or wipe down neutralized surfaces using DI water as needed
- Collect all rinse fluids as hazardous waste

All neutralization shall be performed under **PPE Posture C** unless otherwise authorized by the Safety Officer.

4.2 Hardware Decontamination

Unintended Hardware that has been exposed to hypergolic liquids or vapors must undergo:

- Surface neutralization
- DI water rinse
- IPA drying (if applicable)
- Visual and detector-assisted verification of cleanliness

Wetted components and test articles will follow standard decontamination procedure including required bake-out cycles if vapor persistence is detected.

5 PPE DISPOSAL & WASTE SEGREGATION

5.1 PPE Handling

Contaminated PPE—including SCAPE suits, gloves, boot covers, and disposable aprons—must be:

- Removed in designated doffing areas
- Segregated based on contamination category (fuel-side vs oxidizer-side)
- Placed in labeled hazardous-waste containers
- Logged for tracking and disposal

Reusable components (e.g., respirators, SCBA packs) must be cleaned, inspected, and function-checked before being returned to service.

5.2 Waste Segregation & Storage

All wastes generated during recovery and decontamination must be segregated into:

- Fuel-contaminated solids
- Oxidizer-contaminated solids
- Neutralized liquids
- DI water rinse waste
- IPA/solvent waste

Mixed hazardous waste

Waste must be transferred to **approved hazardous-waste storage** with appropriate labeling, documentation, and compatibility controls.

6 AIR MONITORING & ATMOSPHERIC CLEARANCE

6.1 Initial Atmospheric Assessment

Before any re-entry:

- Fixed detectors and portable gas monitors must be used to determine vapor concentration
- A Tier-1, Tier-2, or Tier-3 alarm history must be reviewed
- The area must remain unoccupied until vapor concentrations are confirmed trending downward

Only trained personnel in **PPE Posture C** may enter the hazard area before clearance confirmation.

6.2 All-Clear Verification

An area may be declared “all-clear” only when:

- MMH, NO₂/N₂O₄, and decomposition-product levels are below re-entry thresholds
- Two independent gas-monitor readings confirm non-detect or safe values
- Sources of Incident release have been Identified and secured
- No residual chemical detected or visible contamination remains
- The Test Director authorizes re-entry

Documentation of air-monitoring results is required for the incident record.

7 HARDWARE, SYSTEM, AND FACILITY INSPECTION

Post-incident inspection must include:

- Valves, fittings, and manifolds for leak evidence

- Lines and tubing for discoloration or integrity loss
- Electrical systems for damage or corrosion
- Pressure systems for abnormal readings
- FireX systems for activation, clogging, or contamination
- Cleanup areas for proper neutralization

Any compromised component must be isolated, labeled, and repaired or replaced before return to service.

8 INCIDENT INVESTIGATION & CORRECTIVE ACTIONS

8.1 Incident Documentation

Every incident requires completion of a formal report including:

- Description of the event
- Timeline of actions taken
- Detector and alarm data
- Environmental conditions
- PPE posture in use
- Personnel involved
- System performance
- Immediate corrective actions

Reports must be submitted within 24 hours

8.2 Root-Cause Analysis (RCA)

A formal RCA must be conducted to:

- Identify initiating factors
- Determine equipment or procedural failures
- Assess human-factors contributions
- Validate or revise risk controls

The Safety Officer or designee leads the RCA.

8.3 Corrective Actions

Corrective actions shall be:

- Assigned to responsible individuals
- Tracked to closure
- Verified for effectiveness
- Integrated into procedures or engineering controls as needed

Any required updates to SOPs, training, Preventative Maintenance, or the Prevention Program must be incorporated immediately.

9 RETURN-TO-OPERATIONS AUTHORIZATION

PTSD may only return to operations after:

- Decontamination is complete
- Air monitoring confirms safe conditions
- Hardware passes inspection
- Waste is properly manage
- Full documentation is filed
- Corrective actions are identified and initiated
- The Test Director issues formal authorization

10 PROGRAM MAINTENANCE

Document 000013 shall be:

- Reviewed annually
- Updated following any significant incident
- Revised when new procedures, chemicals, or systems are introduced