



# Ames Procedural Requirements

APR 8715.1

Effective Date: June 5, 2023

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**COMPLIANCE IS MANDATORY**

**Subject: Chapter 26 – Confined Space Entry**

**Responsible Office: Code QH / Occupational Safety, Health, and Medical Service Division**

### CHANGE LOG

Status [Baseline /Revision /Cancelled]	Document Revision	Date of Change	Description
Baseline	-	6/5/2023	Establish new baseline. Removal of reference materials that are covered by the training program. Alignment of entry team responsibilities with OSHA requirements. Clarification of the confined space rescue service. Removed requirements of confined space entry for Construction Contractors, which are provided in APR 8715.1 Chapter 27.

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## **PREFACE**

### **P.1 PURPOSE**

- a. This chapter provides requirements for the management and control of entries into confined spaces.

### **P.2 APPLICABILITY**

- a. This directive is applicable to Ames Research Center (ARC) and associated facilities.
- b. This directive applies to contractors, grant recipients, or parties to agreements only to the extent specified or referenced in the appropriate contracts, grants, or agreements.
- c. In this directive, all mandatory actions (i.e., requirements) are denoted by statements containing the term "shall." The terms "may" or "can" denote discretionary privilege or permission, "should" denotes a good practice and is recommended, but not required, "will" denotes an expected outcome, and "are/is" denotes descriptive material.
- d. In this directive, all document citations are assumed to be the latest version unless otherwise noted.

### **P.3 AUTHORITY**

- a. NPR 1800.1, NASA Occupational Health Program Procedures
- b. NPR 8715.1, NASA Safety and Health Programs

### **P.4 APPLICABLE DOCUMENTS AND FORMS**

- a. Occupational Safety and Health Standards, 29 CFR pt. 1910.146
- b. APR 8715.1 Chapter 27, Construction Safety Management
- c. Form ARC 230, Entry Permit for Permit Required Confined Spaces
- d. Form ARC 875, Confined Space Alternate Entry Form
- e. Form ARC 876, Non-Permit Confined Space Checklist
- f. Form ARC 877, Confined Space Evaluation Form

### **P.5 MEASUREMENT/VERIFICATION**

- a. Verification of conformance to requirements in this directive are measured through Center and Responsible Organizational management reviews, self-assessments, and subsequent analysis and reports of conformance to requirements, as well as periodic internal audits.

### **P.6 CANCELLATION**

- a. APR 8715.1, Chapter 26, Confined Space Entry dated May 23, 2018.

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Eugene Tu  
Director

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**DISTRIBUTION STATEMENT:**

Internal and external distribution. APR 8715.1 Ames Health and Safety Manual Chapters are made available via the procurement website to anyone bidding a job at Ames Research Center. The exceptions are Chapter 7 – Ames Radiation Safety, Chapter 10 – Pressure System Safety, Chapter 12 – Explosives Safety, and Chapter 23 – Control of Narcotics and Other Controlled Substances, which are not made public but can be viewed onsite.

## CHAPTER 26 CONFINED SPACE ENTRY

### 26.1 Responsibility

#### 26.1.1 Supervisors shall:

- a. Ensure that evaluations (Form ARC 877) of confined spaces their employees may enter are completed and on file with the Safety, Health & Medical Services Division (Code QH). The flow chart in appendix C may be used for the determination of a confined space.
- b. Ensure that confined spaces are re-evaluated when there are changes in the use or configuration that might increase the hazards to entrants.
- c. Ensure employees who enter confined spaces are properly trained.
- d. Ensure employees who enter confined spaces have been medically certified per NPR 1800.1.
- e. Ensure that employees who may enter permit required confined spaces are aware of the location, and dangers posed by the permit spaces.
- f. Ensure the proper equipment required for safe entry into confined spaces is available.
- g. Ensure appropriate confined space signs are posted as required (see section 26.3.3).
- h. Ensure the cancelled entry permit and associated monitoring forms are returned to Code QH at M/S N237-14 at completion of entry, including any contractor confined space entry forms.

#### 26.1.2 Safety, Health, and Medical Service Division (Code QH) shall:

- a. Maintain the written confined space safety program for ARC.
- b. Provide consultation to project management and employees for confined space safety.
- c. Perform an annual review of the confined space program, including a review of cancelled entry permits, alternate entry forms, and non-permit checklists periodically for compliance and to improve the program.
- d. Provide the training class Confined Space Entry to civil servants and on-site contractors.
- e. Review contract and specifications as requested by ARC management.
- f. Maintain records of cancelled entry permits received and the locations of confined spaces.
- g. Maintain records of confined space evaluations and provide them on request.
- h. Function as the liaison with regulatory agencies as needed for confined space safety.

#### 26.1.3 Employees shall:

- a. Ensure a safe work environment at ARC that follows safety standards, regulations, codes, and guidelines starting with the Center Director, management, supervisors, contractors, and employees.
- b. Follow all safety precautions and specifications that apply to their tasks being performed or be subject to dismissal proceedings.

#### 26.1.4 **Contractors** shall:

- a. Not allow employees to enter confined spaces unless they have a written confined space entry program, properly trained personnel, and have evaluated the confined space to determine whether it is a permit required confined space or not.
- b. Provide a copy of the confined space program to the COR.
- c. Obtain all equipment, medical authorizations, and training necessary to conduct a safe entry, including calibrated monitoring equipment.
- d. Coordinate entry operations with the Contracting Officer (CO) or Contracting Officer's Representative (COR) when both NASA personnel and contractor personnel will be working in or near permit spaces.
- e. Notify the Ames Fire Department via Ames Emergency Dispatch Center at 650-604-5416, prior to each entry into a permit required confined space.
- f. Inform the CO or COR and the project manager of any hazards found during the confined space evaluation.
- g. Provide proof of confined space training upon request (see section 26.4).

26.1.5 **Construction Contractors** shall comply with the confined space entry requirements of APR 8715.1 Chapter 27, Construction Safety Management.

## **26.2 Permit Required Confined Space Entry Team**

### 26.2.1 **Entry Supervisor**

26.2.1.1 The entry supervisor shall determine the need to set up a retrieval system, or not, prior to entry to support self-rescue and document the retrieval equipment used on Form ARC 230.

- a. A retrieval system (tripod with harness and retrieval line) is required for vertical entry for a single entrant. The retrieval line should not be disconnected while in use under normal circumstances.
- b. A retrieval system should not be used:
  - (1) Where lines could become entangled with equipment.
  - (2) Where lines of multiple entrants can become crossed.
  - (3) For horizontal entries into confined spaces.

26.2.1.2 The Entry Supervisor is responsible for the following:

- a. Complete initial and annual training requirements.
- b. Complete Form ARC 230 for each entry and list the names of all team members on the form.
- c. The Entry Supervisor can determine additional requirements for safe entry such as:
  - (1) First aid qualifications for the entry team, including an automated electronic defibrillator to be used by qualified individuals.
  - (2) Personal gas detector requirements for the entry crew including constant monitoring and monitoring for a specific gas.

- d. Review the confined space and project hazards for the confined space to be entered each time the space is entered. Consult the Safety Division if you need assistance at 650-604-5602.
- e. Make the entry permit available to employees and post the form near the entry point for the confined space during the entire entry.
- f. Verify the Entrants and Attendants are qualified, required Personal Protective Equipment (PPE) is worn by entrants, and necessary equipment is in place including non-entry rescue, and communications when required.
- g. Perform a pre-entry atmospheric test on the confined space. This is a test conducted with a calibrated direct reading gas detector for oxygen content, flammable gases, and for potential toxic contaminants.

*Note: If testing equipment for potential toxic contaminants are not commonly available, contact Code QH for assistance.*

- h. Ensure that conditions are continuously monitored, that they do not degrade from initial evaluation, and that conditions remain consistent with the entry permit.
- i. Ensure hazards listed on the confined space entry forms are controlled or eliminated.
- j. Isolate the confined space and protect the entrants from external hazards.
- k. Document on the entry permit or checklist when a confined space entry is cancelled.
- l. Return the cancelled entry permit to Code QH at M/S N237-14 at completion of entry.

#### 26.2.2 **The Attendant** shall:

- a. Complete initial and annual training requirements.
- b. Have a means of communication with the Ames Fire Department via Ames Emergency Dispatch Center during the entry.
- c. Notify the Ames Fire Department via Ames Emergency Dispatch Center at 650-604-5416, prior to each entry into a permit required confined space.
- d. Be stationed outside a permit required confined space to monitor the conditions of the entrants. The Attendant may not leave the area or be assigned other duties until the entry permit is cancelled (an attendant can be replaced with another qualified person). In the event of an emergency the Attendant will provide needed information to the Fire Department.
- e. Maintain Entrant identification and effective communications with all entrants at all times during the entry.
- f. Summon emergency services at 911 from a landline or from a cell phone call 650-604-5555 if entrants need assistance to escape from permit confined space hazards.
- g. Monitor entry activities inside and outside the permit space and ensure entry conditions remain consistent with the terms of the entry permit.
- h. Ensure the removal of unauthorized individuals who attempt to enter the permit required confined space during entry operations.

- i. Order the Entrants to cease all activities and exit the confined space if either:
  - (1) An unsafe condition occurs.
  - (2) The Attendant is unable to fulfill their duties.
- j. Formally document orders to cease activities and exit as a significant incident on the back of the entry permit.
- k. Document on the Entry Permit (ARC Form 230) all deviations and inconsistencies that occur during the entry.

#### 26.2.3 Authorized Entrants shall:

- a. Complete initial and annual training and obtain medical evaluations as required by their supervisors or employer.
- b. Understand the hazards that are present in the space with the assistance of the Entry Supervisor.
- c. Alert the Attendant when:
  - (1) The entrant recognizes any warning signs or symptoms of exposure to a dangerous substance.
  - (2) The entrant detects an unsafe condition.
- d. Maintain communication with the Attendant during the entry process.
- e. Exit from the permit space as quickly as possible whenever:
  - (1) An order to evacuate is given by the Attendant or the entry supervisor.
  - (2) The entrant recognizes any warning sign or symptom of exposure to a dangerous situation.
  - (3) An evacuation alarm is activated.
  - (4) Atmospheric monitoring equipment indicates an unsafe atmosphere.
- f. Ensure that proper PPE is worn and functional and that required equipment is on site and functional.
- g. Communicate inconsistencies from the approved procedure to the Attendant.

### 26.3 Confined Space Evaluation and Classification

26.3.1 Supervisors shall ensure that an evaluation is completed for every confined space their employees may enter. The evaluation will be completed on Form ARC 877 and will determine if a space is a permit required confined space or a non-permit required confined space. A copy of each evaluation for a confined space shall be forwarded to Code QH and one copy must be retained by the supervisor.

26.3.2 All confined spaces in the area shall be properly labeled (see Appendix D, E, and F for examples). If there are spaces in the area that are not labeled, incorrectly labeled or have not yet been evaluated, an evaluation is required to be performed. Code QH can be contacted to assist with evaluation of a confined space. This evaluation must be completed prior to any confined space entry.

#### 26.3.3 Danger and Caution Signs

26.3.3.1 The purpose of the sign is to inform employees of the existence, location, and danger posed by the permit required or non-permit required confined space.



26.3.3.2 Danger signs shall be posted at all permit required confined spaces and warning signs shall be posted at all non-permit required confined spaces by the area or employee supervisor.

- a. A danger sign to be posted at the entry to a permit required confined space is shown in Appendix D.
- b. A danger sign that can be posted at an unevaluated confined space is shown in Appendix E.
- c. A caution sign to be posted at the entry to a non-permit confined space is shown in Appendix F.

#### 26.3.4 Non-Permit Confined Space Entry Control

26.3.4.1 A Non-Permit Required Confined Space is one that has been evaluated and found to be free of hazards. An Entry Supervisor and Attendant is not required for this type of confined space entry. The following entry control procedures are required:

- a. Pre-entry: Before entry into a non-permit space is authorized, the Entrant shall complete Form ARC 876.
- b. If a new confined space entry team arrives, another ARC 876 form must be completed.
- c. The completed ARC 876 shall be signed and dated and returned to M/S N237-14, Code QH.

#### 26.3.5 Permit Required Entry Control

26.3.5.1 The Entry Supervisor shall evaluate permit space conditions:

- a. Test conditions in the permit space using a properly calibrated gas detector to determine if acceptable entry conditions exist.
- b. Test the permit space continuously to determine if acceptable conditions are being maintained during the entry operation.
- c. Document test results every 15 minutes on Form ARC 230.

26.3.5.2 The permit space shall be evacuated immediately under any of the following conditions:

- a. An order to evacuate is given by any entry team member.
- b. A hazard is discovered that was not evaluated by the entry supervisor.
- c. A gas detection alarm goes off.
- d. The Entrant recognizes any warning signs or symptoms of exposure or a dangerous situation.
- e. Communication between the Entrants and the Attendant is lost.

#### 26.3.5.3 Post-Entry

- a. When the job is completed and all Entrants have exited the space, and the space is ready to return to its initial configuration, the Entry Supervisor shall note on the entry permit (ARC Form 230) any problems encountered during the entry so that appropriate revision to the confined space entry program can be made.
- b. The duration of the permit shall not exceed the time required to complete the task identified. The duration must not extend beyond one shift with the same crew. If a new crew arrives, new entry permit (ARC Form 230) must be completed by the new Entry Supervisor.
- c. The Entry Supervisor must indicate the time and date the Permit is terminated and return the completed entry permit (ARC Form 230) to M/S N237-14 within ten days of completion.

d. Any undocumented hazard or difficulty encountered during the PRCS entry shall be documented on the entry permit (ARC Form 230) for review by the QH Mishap Investigation Program.

#### **26.3.6 Alternate Entry Control**

26.3.6.1 Alternate entry procedures for permit required confined spaces are allowed in accordance with 29 CFR 1910.146(c)(5).

26.3.6.2 If a confined space is to be entered through alternate entry procedures it must be documented that the only primary hazard posed by the space is an actual or potential atmospheric hazard.

26.3.6.3 Alternate entry will only be performed when a non-construction contractor performs alternate entry by a separate procedure that is submitted to and approved by Code QH. Form ARC 875 can be used for alternate entry plans approved by QH.

#### **26.3.7 Permit Required Confined Space Rescue**

26.3.7.1 The NASA Ames Fire Department is the ARC permit required confined space rescue service.

26.3.7.2 If the Attendant becomes aware of an emergency during a confined space entry, the Attendant shall contact the rescue service at 911 from a landline or from a cell phone call 650-604-5555 and remain outside of the entry to provide needed information to the Fire Department.

### **26.4 Training and Certification**

26.4.1 Each member of the confined space entry team (Entry Supervisors, Attendants, Entrants, and rescue service members) shall be qualified for the position they fill.

26.4.2 Each member of the confined space entry team at ARC shall receive annual refresher training after the initial training course has been taken, and/or if there are any change to job duties or in the confined spaces to ensure employee proficiency in the duties required of authorized Entrants, Attendants, Entry Supervisors, and rescue service.

26.4.3 Training shall be provided to each affected employee before the employee is assigned confined space operations duties and may be required to be repeated if an employee demonstrates poor understanding of required procedures.

26.4.4 Training records shall include each employee's name, the signature or initials of the trainer, and the dates of the training. Training records will be available for inspection by authorized confined space team members and their authorized representatives.

26.4.5 Training shall, at a minimum, include the following:

- a. The operations of the Confined Space Program.
- b. The specific duties of each person involved in confined space operations.
- c. The hazards of confined spaces including information on the mode, signs or symptoms, and consequences of exposure.
- d. The proper use of equipment required during confined space operations including testing and monitoring equipment, ventilating equipment, communication equipment, personal protective equipment, lighting equipment, barriers and shields, ingress/egress equipment, rescue and emergency equipment used for non-entry rescue.

- e. The methods and importance of communication between all confined space entry teams as well as Dispatch.
- f. The conditions under which the space should be evacuated.
- g. The procedures for summoning rescuers.
- h. The procedures for a non-entry rescue.

## APPENDIX A. DEFINITIONS

Alternate Entry Procedures	Entry into a Permit Required Confined Space without using rescue standby or filling out the formal permit provided that the only hazard posed by the permit space is an actual or potential hazardous atmosphere and continuous forced air ventilation is applied to maintain safe entry conditions. If any other hazards exist within then the alternate entry procedure cannot be used.
Attendant	An individual stationed outside one or more permit spaces who monitors the authorized Entrants and who performs all attendant's duties.
Authorized Entrant	An employee who is authorized by the employer to enter a permit space.
Confined Space	A space that: <ul style="list-style-type: none"><li>• Is large enough and so configured that an employee can bodily enter and perform assigned work; and</li><li>• Has limited or restricted means for entry or exit (for example, tanks, vessels, silos, storage bins, hoppers, vaults, and pits are spaces that may have limited means of entry); and</li><li>• Is not designed for continuous employee occupancy.</li></ul>
Construction Contractor	An employer who conducts work that is subject to regulation by 29 CFR 1926 Subpart AA, Confined Spaces in Construction.
Emergency	Any occurrence (including any failure of hazard control or monitoring equipment) or event internal or external to the permit space that could endanger entrants.
Entry	The action by which a person passes through an opening into a permit required confined space. Entry includes ensuing work activities in that space and is considered to have occurred as soon as any part of the entrant's body breaks the plane of an opening into the space.
Entry Permit	The written or printed document that is provided by the employer to allow and control entry into a permit space.
Entry Supervisor	The person (such as the employer, foreman, or crew chief) responsible for determining if acceptable entry conditions are present at a permit space where entry is planned, for authorizing entry and overseeing entry operations, and for terminating the permit. Note: An entry supervisor also may serve as an attendant or as an authorized entrant if that person is trained and equipped for each role he or she fills. Also, the duties of entry supervisor may be passed from one individual to another during an entry operation.
Hazardous Atmosphere	An atmosphere that may expose employees to the risk of death, incapacitation, and impairment of ability to self-rescue (that is, escape unaided from a permit space), injury, or acute illness from one or more of the following causes:

- Flammable gas, vapor, or mist in excess of 10 percent of its lower flammable limit (LFL) or airborne combustible dust at a concentration that meets or exceeds its LFL. Note: This concentration may be approximated as a condition in which the dust obscures vision at a distance of 5 feet (1.52 m) or less.
- Atmospheric oxygen concentration below 19.5 percent or above 23.5 percent.
- Atmosphere concentration of any substance for which a dose or a Permissible Exposure Limit (PEL) is published in Subpart G, Occupational Health and Environmental Control, or in Subpart Z, Toxic and Hazardous Substances, of 29 CFR and which could result in employee exposure in excess of its dose or PEL.
- Note: An atmospheric concentration of any substance that is not capable of causing death, incapacitation, impairment of ability to self-rescue, injury, or acute illness due to its health effects is not covered by this provision.
- Any other atmospheric condition that is immediately dangerous to life or health.

Immediately Dangerous to Life or Health	Any condition that poses an immediate or delayed threat to life or that would cause irreversible adverse health effects or that would interfere with an individual's ability to escape unaided from a permit space.
Non-Permit Confined Space	A confined space that does not contain any hazard capable of causing death or serious physical harm.
Permit Required Confined Space (Permit Space)	A confined space that has one or more of the following characteristics: <ul style="list-style-type: none"> <li>• Contains or has potential to contain a hazardous atmosphere.</li> <li>• Contains a material that has the potential for engulfing an entrant.</li> <li>• Has an internal configuration such that an entrant could be trapped or asphyxiated by inwardly converging walls or by a floor that slopes downward and tapers to a smaller cross-section.</li> <li>• Contains any other recognized serious safety or health hazard (e.g., Traffic, chemical hazard, process hazard, mechanical hazard, electrical hazard, and biological hazard).</li> </ul>
Rescue Service	The personnel designated to rescue employees from permit spaces.
Retrieval System	The equipment (including a retrieval line, chest or full-body harness, wristlets, if appropriate, and a lifting device or anchor) used for non-entry rescue of persons from permit spaces.
Testing	The process by which the hazards that may confront entrants of a permit space are identified and evaluated. Testing includes specifying the tests that are to be performed in the permit space.

## APPENDIX B. ACRONYMS

APR	Ames Policy Requirement
ARC	Ames Research Center
CFR	Code of Federal Regulations
CO	Contracting Officer
COR	Contracting Officer's Representative
NASA	National Aeronautics and Space Administration
NPR	NASA Procedural Requirement
PPE	Personal Protective Equipment

## APPENDIX C. PERMIT REQUIRED CONFINED SPACE DECISION FLOW CHART

1. Does the workplace contain confined spaces as defined below? Confined space means: <ul style="list-style-type: none"> <li>• Is Large enough and so configured that an employee can bodily enter and perform assigned work; and</li> <li>• Has limited or restricted means for entry (for Example tanks vessels silos storage bins hoppers vaults and pits are spaces that may have limited means of entry); and</li> <li>• Is not meant for continuous employee occupancy</li> </ul> <p style="text-align: center;"><b>Yes!</b></p>	<b>No!</b> ➔	2. Consult other applicable OSHA Standards <b>STOP!</b>	
3. Does the workplace contain permit-required confined spaces as defined below? Permit-required confined-space (permit space) means a confined space that one or more of the following characteristics : <ul style="list-style-type: none"> <li>• Contains or has potential to contain a hazardous atmosphere;</li> <li>• Contains a material that has the potential for engulfing an entrant;</li> <li>• Has an Internal configuration such that an entrant could be trapped or asphyxiated by inwardly converging walls or by a floor which slopes downward and tapers to a smaller cross-section; or Contains any other recognized serious safety or health hazard</li> </ul> <p style="text-align: center;"><b>Yes!</b></p>	<b>No!</b> ➔	4. Consult other applicable OSHA Standards <b>STOP!</b>	
5. Inform employees as required by Section 26.4 and 26.5			
6. Will permit spaces be entered?		7. Prevent employee entry Do Task from outside of space <b>STOP!</b>	
<b>YES!</b>			
8. Will Contractors Enter?	<b>YES!</b> ➔	9. Task will be done by contractor employees. Inform contractor as required by section 26.1.8 Contractor obtains information required by Section 26.1 3 from host.	
		10. Both Contractors and Host will enter Space	<b>NO</b> go to 14
<b>YES!</b>			
		11. Coordinate entry operations as required by Section 26.1.3	<b>Go to 14</b>
12. Will Host employees enter to perform entry tasks	<b>NO!</b> ➔	13. Prevent Unauthorized entry <b>STOP!</b>	
14. Does Space have known or potential hazards	<b>NO!</b> ➔	15. Not a Permit-required confined space. Follow Non Permit confined space checklist or alternate entry form for confined spaces Consult OSHA standards	
<b>YES!</b>			
16. Can the Hazards be eliminated	<b>YES!</b> ➔	17. Employer may choose to re-classify space as non permit required confined space 26.3.2(a) or 26.3.2 <b>STOP!</b>	
<b>NO!</b>			
18. Can the space be maintained in a condition safe to enter by continuous forced air ventilation?	<b>Yes!</b> ➔	19. Space may be entered under section 26.2.3.2 (c) <b>STOP!</b>	
<b>NO!</b>			
20. Prepare for entry via permit procedures			
21. Certify acceptable entry conditions. (Test results recorded, space isolated, if needed rescue plan reviewed and means to summons available Entrants properly equipped, ect)	<b>NO !</b> ➔	22. Permit not valid until conditions meet permit specifications	
<b>YES!</b>			
23. Permit issued by authorizing signature Acceptable entry conditions maintained throughout entry.	<b>NO!</b> ➔	24. Emergency exists (prohibited condition) Entrants evacuated, . Entry aborts (call rescue if needed) Permit now void. Re-evaluate programs to correct/prevent prohibited conditions. Occurrence of emergency (usually) is proof of deficient planned entry! No entry until a new plan and permit is amended <b>Got to 8</b>	
<b>YES!</b>			
25 Entry tasks completed. Forms returned and cancelled. Audit permit program and permit based on evaluation of entry by entrants, attendants, testers, and preparers, ect..			







