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MARSHALL PROCEDURES AND GUIDELINES

AD01

MSFC CONFINED SPACE ENTRIES

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DOCUMENT HISTORY LOG

Status (Baseline/ Revision/ Canceled)	Document Revision	Effective Date	Description
Baseline		11/30/99	
Revision	A	7/02/01	Updated P.3 to remove obsolete directives; updated P.5 to correct name of document; corrected paragraph 1.2 to reflect correct OSHA document; paragraph 2.1.5 deleted "all"; added "onsite" in paragraph 2.1.7; deleted "other regulatory" in paragraph 2.2.1; corrected redundancies in 2.1.4.3; updated paragraph 4.0 to update disposition requirements; corrected paragraph numbering in the chapters; added "OMEHS will maintain the roster of employees (civil service and contractor) trained by their organization. The Contractor is responsible for maintaining the training record of their employees." in CH1.3; corrected requirement for forced air ventilation in paragraph CH2.1; paragraph CH3.4.8.3 and CH3.4.8.4 modified to remove load testing requirement.

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PREFACE

P.1 PURPOSE

The purpose of this Directive is to establish the Marshall Space Flight Center (MSFC) Confined Entry Space Program in compliance with the Occupational Safety and Health Administration (OSHA) Standards. This Directive should not be interpreted as regulating in any manner operations at any National Aeronautics and Space Administration (NASA) Center other than MSFC.

P.2 APPLICABILITY

This Directive is applicable to all operations at MSFC.

P.3 AUTHORITY

OSHA, 29 CFR 1910.146, "Permit-Required Confined Spaces"

P.4 APPLICABLE DOCUMENTS

- a. MWI 3410.1, "Personnel Certification Program"
- b. Interservice Support Agreement between MSFC and the U.S. Army Aviation Missile Command (AMCOM)

P.5 REFERENCES

MPG 8715.1, "Marshall Safety, Health, and Environmental (SHE) Program"

P.6 CANCELLATION

MPG 1840.1 dated November 30, 1999

Original Signed by
Sidney P. Saucier for

A. G. Stephenson
Director

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DOCUMENT CONTENT

1. DEFINITIONS

1.1 Acceptable Entry Conditions. The conditions that must exist in a permit-required confined space to allow entry and to ensure that employees involved with a permit-required confined space entry can safely enter into and work within the space.

1.2 Attendant. An individual stationed outside one or more permit-required confined spaces who monitors the authorized entrants and who performs all attendant's duties assigned in the employer's permit-required confined space program.

1.3 Authorized Entrant. An employee who is authorized by the employer to enter a permit-required confined space.

1.4 Blanking or Blinding. The absolute closure of a pipe, line, or duct by the fastening of a solid plate (such as a spectacle blind or a skillet blind) that completely covers the bore and is capable of withstanding the maximum pressure of the pipe, line, or duct with no leakage beyond the plate.

1.5 Confined Space. A space that: (a) Is large enough and so configured that an employee can bodily enter and perform assigned work; (b) has limited or restricted means for entry or exit (e.g., tanks, vessels, silos, storage bins, hoppers, vaults, trenches, and pits); and (c) is not designed for continuous employee occupancy.

1.6 Double Block and Bleed. The closure of a line, duct, or pipe by closing and locking and tagging two in-line valves and by opening and locking and tagging a drain or vent valve in the line between the two closed valves (reference MPG 8715.1).

1.7 Emergency. Any occurrence (including any failure of hazard control or monitoring equipment) or event internal or external to the permit-required confined space that could endanger entrants.

1.8 Engulfment. The surrounding and effective capture of a person by a liquid or finely divided (flowable) solid substance that can be aspirated to cause death by filling or plugging the respiratory system or that can exert enough force on the body to cause death by strangulation, constriction, or crushing.

1.9 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

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occurred as soon as any part of the entrant's body breaks the plane of an opening into the space.

1.10 Entry Permit (permit). The written or printed document that is provided by the employer to allow and control entry into a permit-required confined space and that contains the information specified in paragraph (f) of 29 CFR 1910.146.

1.11 Entry Supervisor. The person (such as the employer, foreman, or crew chief) responsible for determining if acceptable entry conditions are present at a permit-required confined space where entry is planned for authorizing entry, overseeing entry operations, and for terminating entry as defined in this section. **Note:** An entry supervisor also may serve as an attendant or as an authorized entrant, as long as that person is trained and equipped as defined by this section for each role he or she fills. Also, the duties of entry supervisor may be passed from one individual to another during the course of an entry operation.

1.12 Hazardous Atmosphere. An atmosphere that may expose employees to the risk of death, incapacitation, impairment of ability to self-rescue (i.e., escape unaided from a permit-required confined space), injury, or acute illness from one or more of the following causes: (a) Flammable gas, vapor, or mist in excess of 10 percent of its lower explosive limit (LEL); (b) Airborne combustible dust at a concentration that meets or exceeds its LEL; **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; (c) Atmospheric oxygen concentration below 19.5 percent or above 23.5 percent; (d) Atmospheric concentration of any substance for which a dose or a permissible exposure limit is published in Subpart G, Occupational Health and Environmental Control, or in Subpart Z, Toxic and Hazardous Substances, of 29 CFR 1910 and which could result in employee exposure in excess of its dose or permissible exposure limit [**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]; (e) Any other atmospheric condition that is immediately dangerous to life or health.

Note: For air contaminants for which OSHA has not determined a dose or permissible exposure limit, other sources of information, such as Materials Safety Data Sheets that comply with the Hazard Communication Standard, §1910.1200 of this part, published information, and internal documents can provide guidance in establishing acceptable atmospheric conditions.

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1.13 Hot Work Permit. The employer's written authorization to perform operations (e.g., riveting, welding, grinding, cutting, burning, and heating) capable of providing a source of ignition.

1.14 Immediately Dangerous to Life or Health (IDLH). Any condition that poses an immediate or delayed threat to life, causes irreversible adverse health effects, or interferes with an individual's ability to escape unaided from a permit-required confined space. **Note:** Some materials--hydrogen fluoride gas and cadmium vapor, for example--may produce immediate transient effects that, even if severe, may pass without medical attention, but are followed by sudden, possibly fatal collapse 12-72 hours after exposure. The victim "feels normal" from recovery from transient effects until collapse. Such materials in hazardous quantities are considered to be "immediately" dangerous to life or health.

1.15 Inerting. The displacement of the atmosphere in a permit-required confined space by a noncombustible gas (such as nitrogen) to such an extent that the resulting atmosphere is noncombustible. **Note:** This procedure produces an IDLH oxygen-deficient atmosphere.

1.16 Isolation. The process by which a permit-required confined space is removed from service and completely protected against the release of energy and material into the space by such means as: blanking or blinding; misaligning or removing sections of lines, pipes, or ducts; a double block and bleed system; lockout or tagout of all sources of energy; or blocking or disconnecting all mechanical linkages.

1.17 Line Breaking. The intentional opening of a pipe, line, or duct that is or has been carrying flammable, corrosive, or toxic material, an inert gas, or any fluid at a volume, pressure, or temperature capable of causing injury.

1.18 Non-Permit Confined Space. A confined space that does not contain or, with respect to atmospheric hazards, have the potential to contain any hazard capable of causing death or serious physical harm.

1.19 Oxygen Deficient Atmosphere. An atmosphere containing less than 19.5 percent oxygen by volume.

1.20 Oxygen Enriched Atmosphere. An atmosphere containing more than 23.5 percent oxygen by volume.

1.21 Permit-Required Confined Space. A confined space that has one or more of the following characteristics: (a) Contains or

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has a potential to contain a hazardous atmosphere; (b) contains a material that has the potential for engulfing an entrant; (c) 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 (d) contains any other recognized serious safety or health hazard.

1.22 Permit-Required Confined Space Program. The employer's overall program for controlling, and, where appropriate, for protecting employees from hazards and for regulating employee entry into permit-required confined spaces.

1.23 Permit System. The employer's written procedure for preparing and issuing permits for entry and for returning the permit-required confined space to service following termination of entry.

1.24 Prohibited Condition. Any condition in a permit-required confined space that is not allowed by the permit during the period when entry is authorized.

1.25 Rescue Service. The personnel designated to rescue employees from permit-required confined spaces.

1.26 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-required confined spaces.

1.27 Testing. The process by which the hazards that may confront entrants of a permit-required confined space are identified and evaluated. Testing includes specifying the tests that are to be performed in the permit-required confined space.

Note: Testing enables employers both to devise and implement adequate control measures for the protection of authorized entrants and to determine if acceptable entry conditions are present immediately prior to, and during, entry.

2. RESPONSIBILITIES

2.1 Manager, Management Support Office, Center Operations Directorate, or designated representative, is responsible for:

2.1.1 Implementing and administering the Confined Space Entry Program.

2.1.2 Assisting in the determination and posting of all permit-required confined spaces on the Center.

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2.1.3 Developing and updating the MSFC Confined Space Entry Permit.

2.1.4 Determining requirements for entry, use of personal protective equipment and respiratory protection, and atmospheric monitoring as they pertain to the Occupational Medicine and Environmental Health Services (OMEHS).

2.1.5 Conducting preentry evaluation of permit-required confined spaces and issuing entry permits.

2.1.6 Evaluating and accepting onsite and offsite contractors' standard operating procedures (SOP) and/or permit confined space entry plan prior to entry of a permit-required confined space.

2.1.7 Providing confined space entry training, as required by OSHA, to applicable onsite MSFC and onsite contractor personnel.

2.2 Director, Safety & Mission Assurance (S&MA) Office, or designated representative, is responsible for:

2.2.1 Evaluating each entry to assure compliance with safety standards.

2.2.2 Assisting with issuance of the confined space entry permit.

2.2.3 Evaluating lockout/tagout procedures, as required, for confined spaces.

2.2.4 Issuing hot work permits.

2.2.5 Certifying MSFC civil service personnel as authorized confined space entry personnel in accordance with MWI 3410.1.

2.3 Entry Supervisors are responsible for:

2.3.1 Entry and working in confined spaces and ensuring the requirements of this Directive are implemented.

2.3.2 Knowing the hazards that may be faced during the entry, including information on the signs, symptoms, and consequences of the exposure.

2.3.3 Verifying all tests specified by the entry permit have been conducted and all procedures and equipment specified by the entry permit are in place before endorsing the permit and allowing entry to begin.

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2.3.4 Terminating the entry and canceling the permit when:

2.3.4.1 The entry operations covered by the entry permit have been completed; or

2.3.4.2 A condition not allowed under the entry permit develops in or near the permit-required confined space.

2.3.5 Verifying rescue services are available and the means for summoning them are available.

2.3.6 Removing unauthorized individuals who enter or attempt to enter the permit-required confined space during entry operations.

2.3.7 Assuring entry operations remain consistent with terms of the entry permit and that acceptable entry conditions are maintained.

2.3.8 Notifying OMEHS and S&MA at least 24 hours in advance prior to entry.

2.3.9 Notifying Redstone Arsenal Fire Department prior to entry.

2.4 Manager, Facilities Engineering Department, or designated representative, is responsible for:

2.4.1 Including in the statement of work for subcontracts where the contractor will be required to work in permit-required confined spaces:

2.4.1.1 Notification that the workplace contains permit-required confined spaces and that confined space entry is allowed through compliance with a confined space program meeting the requirements of 29 CFR 1910.146.

2.4.1.2 All necessary equipment including atmospheric monitoring required to comply with 29 CFR 1910.146 will be provided by the contractor.

2.4.1.3 A copy of the contractor's confined space entry program will be submitted to OMEHS and approved prior to commencement of work.

2.4.2 Coordinating entry operations with the subcontractor and other employees when employees of more than one employer will work in or near the permit-required spaces to assure the work performed by one employer does not endanger the employees of another employer.

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2.5 Chief, Redstone Arsenal Fire Department, or designated representative, in accordance with the Interservice Support Agreement between MSFC and the AMCOM, is responsible for:

2.5.1 Providing confined space rescue services in the event of a rescue emergency.

2.5.2 Ensuring rescue personnel are adequately trained for confined space rescues.

2.5.3 Notifying the MSFC onsite emergency medical services contractor of rescue emergencies and preentry notifications.

2.6 Contracting Officers are responsible for ensuring this Directive or the intent and provision of this Directive are incorporated into contracts governing operations at this Installation and offsite MSFC-managed operations.

3. PROCEDURE

Procedures are outlined in Chapters 1 through 6.

4. RECORDS

The following records are maintained/dispositioned by OMEHS for at least 3 years. At the end of the retention period the records will either be retained for historical purposes or destroyed.

MSFC Form 4226, "NASA-MSFC Confined Space Entry Procedure"

MSFC Form 2519, "NASA-MSFC Confined Space Entry Permit"

Training roster for those trained by OMEHS

The following documents are required to be maintained by the contractor for at least 3 years and then either retained for historical purposes or destroyed:

Training records

Confined Space entry procedures and permits

MSFC Form 4083, "Safety Personnel Certification" is maintained and dispositioned in accordance with MWI 3410.1.

5. FLOW DIAGRAM

None

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CHAPTER 1

GENERAL REQUIREMENTS

CH1.1 Identification

The workplace shall be evaluated to determine which areas at MSFC are confined spaces. These spaces shall be further evaluated to determine if they are considered permit-required confined spaces.

To prevent inadvertent entries, all entrances to confined spaces shall be posted with the following sign:

DANGER - CONFINED SPACE ENTER BY PERMIT ONLY

Before entry into a confined space is initiated, a decision must be made on the classification of the confined space. This decision will be made by the person writing the entry procedure and will be evaluated by MSFC OMEHS and S&MA Office.

Work operations to be performed inside the space as listed on the procedure may change the normal classification of the space. Classification of a confined space may be upgraded or downgraded due to the operational circumstances. This determination will be made by OMEHS and the S&MA Office when the procedure for the operation is reviewed.

CH1.2 Written Entry Procedures

For either a specific job task or a task that is repetitive in nature, a current, approved written confined space entry procedure or MSFC Form 4226 is required for all confined space entries, both permit and non-permit-required confined spaces. The confined space entry procedures must be approved annually by the MSFC OMEHS, S&MA Office, and the organizational safety representative.

Any variation from the scope of work as outlined in the approved written entry procedure including, but not limited to, the introduction of hazardous materials into the space is, without prior approval from the OMEHS and S&MA Office, strictly prohibited.

Each written entry procedure shall contain the following:

CH1.2.1 The organization performing the entry.

CH1.2.2 The location, description, and classification of the

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space to be entered.

CH1.2.3 The purpose and maximum duration of entry into the space.

CH1.2.4 Entry hazards and symptoms of overexposure.

CH1.2.5 Preentry notifications and other permits required.

CH1.2.6 Required equipment to be obtained, checked, and assembled prior to entry.

CH1.2.7 Isolation measures and ventilation required.

CH1.2.8 Atmospheric tests required and their frequency.

CH1.2.9 Acceptable entry conditions.

CH1.2.10 Required number of entry attendants.

CH1.2.11 Method of communication with entrants.

CH1.2.12 Maximum number of entrants.

CH1.2.13 Work procedures.

CH1.2.14 Emergency procedures including the following:

CH1.2.14.1 Method of contacting emergency rescue services.

CH1.2.14.2 Contingency plans for loss of communication with entrants, ventilation, breathing air, or consciousness of entry personnel.

CH1.2.14.3 Extrication procedures.

The procedure shall describe the fastest means of notifying emergency rescue services. Rescue will not be attempted until emergency rescue services have been notified.

CH1.3 Training Requirements

Training shall be provided by the MSFC OMEHS or by other qualified organizations to applicable MSFC employees and onsite contractors so that all employees required to perform duties in confined space entries acquire the understanding, knowledge, and skill necessary for the safe performance of the duties assigned. OMEHS will maintain the roster of employees (civil service and contractor) trained by their organization. The contractor is

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responsible for maintaining the training record of their employees. Training shall be provided to each affected employee:

CH1.3.1 Before the employee is first assigned duties under this section.

CH1.3.2 Before there is a change in assigned duties.

CH1.3.3 Whenever there is a change in permit-required confined space operations that presents a hazard about which an employee has not previously been trained.

CH1.3.4 Whenever there is reason to believe either there are deviations from the permit-required confined space entry procedures required by this section or there are inadequacies in the employee's knowledge or use of these procedures.

The training shall establish employee proficiency in the duties required by this section and shall introduce new or revised procedures, as necessary, for compliance with this section. The training certification will be good for 1 year only, and all affected employees will be retrained on an annual basis. A certification card will be issued to each employee following satisfactory completion of the training. The certification card shall contain each employee's name, social security number, the signatures or initials of the trainer(s), and the dates of training. The certification shall be available for inspection by employees and their authorized representatives. All attendants and authorized entrants shall provide their certification cards to the confined space entry supervisor completing the entry permit prior to the entry for verification of training.

CH1.4 Training Requirements for Entry Supervisors

Training of entry supervisors shall include at least the following:

CH1.4.1 Confined space regulations and the MSFC Confined Space Entry Program.

CH1.4.2 Definitions and types of confined spaces.

CH1.4.3 The hazards that may be faced during entry, including information on the mode, signs or symptoms, and consequences of the exposure.

CH1.4.4 The possible behavioral effects of hazard exposure in authorized entrants.

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CH1.4.5 Duties of entry supervisors, attendants, and authorized entrants.

CH1.4.6 Entry permit system including proper completion of a permit.

CH1.4.7 Isolation, lockout, cleaning, and ventilation requirements.

CH1.4.8 Proper calibration and use of atmospheric monitoring equipment.

CH1.4.9 Personal protective equipment including respiratory protective devices.

CH1.4.10 Emergency procedures.

CH1.4.11 Proper setup and use of retrieval systems and devices.

CH1.5 Training requirements for entry attendants and authorized entrants.

Training of attendants and authorized entrants shall include at least the following:

CH1.5.1 Confined space regulations and the MSFC Confined Space Entry Program.

CH1.5.2 Definitions and types of confined spaces.

CH1.5.3 The hazards that may be faced during entry, including information on the mode, signs or symptoms, and consequences of the exposure.

CH1.5.4 The possible behavioral effects of hazard exposure in authorized entrants.

CH1.5.5 Duties of entry supervisors, attendants, and authorized entrants.

CH1.5.6 Entry permit system.

CH1.5.7 Personal protective equipment including respiratory protective devices.

CH1.5.8 Emergency procedures.

CH1.5.9 Proper setup and use of retrieval systems and devices.

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CHAPTER 2

VENTILATION

CH2.1 Forced Air Ventilation

Prior to entry of personnel, confined spaces having a hazardous atmosphere shall be forced air ventilated with clean air until the hazard has been eliminated unless an exemption has been granted by MSFC OMEHS and S&MA Office.

The forced air ventilation, if required, shall be so directed as to ventilate the immediate areas where an employee is or will be present within the space and shall continue until all employees have left the space. The air supply for the ventilation shall be from a clean source and shall not increase the hazards in the space.

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CHAPTER 3

PERMIT-REQUIRED CONFINED SPACE ENTRY REQUIREMENTS

CH3.1 Entry Permits

All entries involving a permit-required confined space require a completed and endorsed entry permit form, MSFC Form 2519, or approved equivalent.

Before entry is authorized, the entry supervisor shall document the implementation of all measures required in the written entry procedure by completing an entry permit form and shall sign the entry permit form to authorize entry of personnel.

The completed permit shall be made available at the time of entry to all authorized entrants by posting it at the entry portal or by any other equally effective means so that the entrants can confirm that preentry preparations have been completed.

The duration of the permit shall not exceed the time required to complete the assigned task or job identified on the permit and shall only be valid for one working shift. If longer durations are required, the approval of the OMEHS and S&MA Office must be obtained.

CH3.1.1 The entry supervisor shall terminate entry and cancel the entry permit when:

CH3.1.1.1 The entry operations covered by the entry permit have been completed; or

CH3.1.1.2 A condition that is not allowed under the entry permit arises in or near the permit-required confined space.

Each canceled entry permit shall be retained for at least 3 years to facilitate the review of the permit-required confined space program. Any problems encountered during an entry operation shall be noted on the pertinent permit so that appropriate revisions to the permit-required confined space program can be made.

CH3.1.2 The entry permit shall include the following at a minimum:

CH3.1.2.1 The permit-required confined space to be entered.

CH3.1.2.2 The purpose of the entry.

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CH3.1.2.3 The date and the authorized duration of the entry permit.

CH3.1.2.4 The authorized entrants, by name, within the permit-required confined space.

CH3.1.2.5 The personnel, by name, currently serving as attendants.

CH3.1.2.6 The individual, by name, currently serving as entry supervisor, with a space for the signature or initials of the entry supervisor who originally authorized entry.

CH3.1.2.7 The hazards of the permit-required confined space to be entered.

CH3.1.2.8 The measures used to isolate the permit-required confined space and to eliminate or control hazards before entry, including lockout or tagging of equipment and procedures for purging, inserting, ventilating, and flushing.

CH3.1.2.9 The acceptable entry conditions.

CH3.1.2.10 The results of initial and periodic tests performed, accompanied by the names or initials of the testers and an indication of when the tests were performed.

CH3.1.2.11 The means for summoning emergency rescue services.

CH3.1.2.12 The communication procedures used by authorized entrants and attendants to maintain contact during entry.

CH3.1.2.13 Equipment, such as personal protective equipment, testing equipment, communications equipment, alarm systems, and rescue equipment required.

CH3.1.2.14 Any other information for which inclusion is necessary, given the circumstances of the particular confined space, to ensure employee safety.

CH3.1.2.15 Any additional permits, such as for hot work, required to authorize work in the permit-required confined space.

CH3.2 Preentry Procedures

CH3.2.1 Removing Entrance Covers

Any conditions making it unsafe to remove an entrance cover shall be eliminated before the cover is removed.

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When the covers are removed, the entrance shall be promptly guarded by a temporary barrier that will prevent an accidental fall through the opening and that will protect each employee working in the space from foreign objects entering the space.

CH3.2.2 Atmospheric Testing

CH3.2.2.1 Before an employee enters the space, the internal atmosphere shall be tested with a calibrated direct reading instrument from outside the space, for the following conditions in the order given, and the results of testing shall be recorded on the entry permit form:

- Oxygen content
- Flammable gases and vapors
- Potential toxic air contaminants.

The initial atmospheric testing of permit-required confined spaces shall be conducted by a qualified individual as designated on the approved written entry procedure. Qualified personnel includes authorized representative of OMEHS or trained confined space entry supervisors.

CH3.2.2.2 In a confined space, any deviation from outside the range of 19.5 percent to 23.5 percent oxygen level or any positive indication of a combustible or toxic gas or vapor, will require additional ventilation for 30 minutes and a retest of the atmosphere. If subsequent retests still indicate an atmospheric hazard, OMEHS shall be notified to conduct further air quality testing before entry is made.

CH3.2.2.3 The atmosphere within the space shall be periodically tested as necessary to ensure that acceptable entry conditions are being maintained during entry operations.

CH3.2.2.4 Continuous testing shall be performed if isolation of the space is not feasible because the space is large or is part of a continuous system.

CH3.2.2.5 All instruments used in the evaluation of the atmosphere will be calibrated according to the manufacturer's guidelines and will be verified for proper operation prior to use. Calibration dates and cycles shall be labeled on the instruments to show that they are within the calibration period.

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CH3.2.3 Isolation

CH3.2.3.1 Electrical Sources

a. All portable electrical equipment must be properly insulated and/or grounded (double insulated electrical hand tools are acceptable). All electrical equipment will be inspected prior to start of the entry.

b. All case-grounded handheld electrical equipment shall have a groundfault circuit interrupter (GFCI) circuit breaker (4 to 6 mA where possible) at the power source unless the power source is an ungrounded portable generator, an ungrounded battery source less than 28 volts, or an ungrounded isolation transformer of less than 28 volts.

c. Electrical or pneumatic equipment within the space must be deenergized. In addition, all control devices for the fixed equipment must be locked and tagged out. This does not include fixed lighting or ventilation equipment unless repair or modification is being performed to those systems.

d. Where possible, it is recommended pneumatically driven power tools be used instead of electrical tools. The pneumatic tools must be equipped with conductive air supply hoses. Nitrogen or other inert pressure medium shall not be used as a substitute for air in confined spaces. A breathable grade of air (Grade D or better) shall be used.

e. Cordless rechargeable portable power tools, with an intrinsically safe rating, are recommended for use in confined spaces. If they are used, they shall have an explosion-proof or intrinsically safe rating for spaces that could contain or develop an explosive atmosphere.

f. Temporary lighting shall be equipped with bulb guards or protected by recessing. The temporary lighting in locations that are wet or have standing fluids will be powered by battery or by low-voltage circuits.

g. Heavy-duty electric cords must be equipped with GFCI and all metallic housing components must be grounded and double insulated.

CH3.2.3.2 Ignition Sources

a. Explosion-proof or intrinsically safe lighting, ventilation equipment, and tools shall be used in potentially flammable atmospheres.

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b. No sources of ignition shall be permitted into or in contact with permit-required confined spaces until tests by confined space monitors have ensured that combustible/flammable gases or vapors are not present in the space. In certain permit-required confined spaces, personnel may perform tasks in atmospheres where less than 10 percent of the lower explosive limit (LEL) is present if previous approval has been granted by OMEHS and S&MA Office.

c. Where the possibility of explosive atmospheres exists, polyethylene and other materials that generate static electricity shall not be used, and tents erected over or around the space shall be of a conductive material and properly grounded.

CH3.2.3.3 Pipelines

When feasible, pipelines containing flammable, toxic, irritating, or oxygen-displacing gases or vapors must be isolated to prevent a hazardous atmosphere from developing inside a permit-required confined space while work operations are underway. Isolation may consist of at least one of the following:

- a. Complete depressurization and disconnection of the possible contaminant supply lines, and a blank flange placed on the pipe leading into the confined space.
- b. Two blocking valves with a vent valve open between them.
- c. Other configurations of blank, block, and bleed valves that have been approved by the S&MA Office prior to use.

CH3.3 Duties of Entry Personnel

CH3.3.1 Entry Supervisors

For each entry the designated entry supervisor shall:

CH3.3.1.1 Know the hazards that may be faced during entry, including information on the mode, signs or symptoms, and consequences of the exposure.

CH3.3.1.2 Make the appropriate preentry notifications, including coordinating all entries with their designated safety representatives:

- a. The Redstone Arsenal Fire Department shall be notified immediately before the entry begins in all permit-required confined spaces.

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b. If hot work is to be performed in the area, a permit must be obtained from S&MA prior to entry.

CH3.3.1.3 Evaluate conditions inside and outside the confined space including temperature extremes, humidity, noise, and vibration prior to entry to determine what measures are necessary for a safe entry and to ensure that those measures are implemented.

CH3.3.1.4 Obtain an entry permit and verify, by checking that the appropriate entries have been made on the permit, that all tests specified by the permit have been conducted, and that all procedures and equipment specified by the permit are in place before endorsing the permit and allowing entry to begin. Once completed, the entry supervisor shall post the permit at the job site and distribute copies of the permit as designated.

CH3.3.1.5 Ensure that all attendants and authorized entrants have received the appropriate training prior to initiation of entry operations.

CH3.3.1.6 Ensure that all other required permits (including hot work, if necessary) have been obtained prior to entry.

CH3.3.1.7 Ensure that oxygen and combustible gas monitoring devices are available and maintained in calibration and perform atmospheric testing for permit-required confined space entries if designated on the approved written entry procedure.

CH3.3.1.8 Terminate the entry and cancel the permit when operations are completed or when unacceptable conditions have arisen.

CH3.3.1.9 Verify that rescue services are available and means for summoning them are operable.

CH3.3.1.10 Remove unauthorized individuals who enter or who attempt to enter the permit-required confined space during entry operations.

CH3.3.1.11 Determine, whenever responsibility for a permit-required confined space entry operation is transferred and at intervals dictated by the hazards and operations performed within the space, that entry operations remain consistent with terms of the entry permit and that acceptable entry conditions are maintained.

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CH3.3.2 Attendants

There shall be at least one attendant positioned in the immediate vicinity outside the permit-required space at all times during permit-required confined space entry operations to monitor activities inside and outside the space and to give assistance in cases of emergency. All employees serving as attendants shall:

CH3.3.2.1 Know the hazards that may be faced during entry, including information on the mode, signs or symptoms, and consequences of the exposure.

CH3.3.2.2 Be aware of possible behavioral effects of hazard exposure in authorized entrants.

CH3.3.2.3 Continuously maintain an accurate count of authorized entrants in the permit-required confined space on the entry permit form.

CH3.3.2.4 Remain outside the permit-required confined space during entry operations until relieved by another attendant.

CH3.3.2.5 Remain in visual or voice contact with authorized entrants as necessary to monitor entrant status. (If the personnel in the space will be required to leave visual contact and the range of verbal contact, provisions for mechanical or electronic contact must be provided.)

CH3.3.2.6 Monitor activities inside and outside the space to determine if it is safe for entrants to remain in the space and order the authorized entrants to evacuate the space immediately under any of the following conditions:

- a. A prohibited condition is detected.
- b. The behavioral effects of hazard exposure in an authorized entrant are detected.
- c. A situation outside the space could endanger the authorized entrants.
- d. The attendant cannot effectively and safely perform all the duties required.

CH3.3.2.7 Audible voice, radio/telephone, constant visual, or other suitable forms of communication between the persons in confined spaces (entrants) and attendant personnel shall be continuously maintained. The system shall be tested to confirm its effectiveness immediately upon entry. Also, attendant

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personnel shall have a communication link with additional persons who can render help in emergencies.

CH3.3.2.8 Summon emergency rescue services as soon as it is determined that authorized entrants may need assistance to escape from hazards within the permit-required confined space.

CH3.3.2.9 Take the following actions when unauthorized persons approach or enter a permit-required confined space while entry is underway:

- a. Warn the unauthorized persons that they must stay away from the permit-required confined space.
- b. Advise the unauthorized persons that they must exit immediately if they have entered the permit-required confined space.
- c. Inform the authorized entrants and the entry supervisor if unauthorized persons have entered the permit-required confined space.

CH3.3.2.10 Perform non-entry rescues when necessary and feasible after notifying emergency rescue services.

CH3.3.2.11 Perform no duties that might interfere with the attendant's primary duty to monitor and protect the authorized entrants.

Under no circumstances shall an attendant enter a confined space to attempt a rescue unless a backup attendant is present and the attendant has been trained as part of an emergency rescue team.

CH3.3.3 Entrants

All personnel authorized to enter a confined space shall:

CH3.3.3.1 Know the hazards that may be faced during entry, including information on the mode, signs or symptoms, and consequences of the exposure.

CH3.3.3.2 Properly use equipment as required by this program.

CH3.3.3.3 Communicate with the attendant as necessary to enable the attendant to monitor entrant status and to enable the attendant to alert entrants of the need to evacuate the space as required.

CH3.3.3.4 Alert the attendant whenever:

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a. The entrant recognizes any warning sign or symptom of exposure to a dangerous situation.

b. The entrant detects a prohibited condition.

CH3.3.3.5 Exit from the permit-required confined space as quickly as possible whenever:

a. An order to evacuate is given by the attendant or the entry supervisor.

b. The entrant recognizes any warning sign or symptom of exposure to a dangerous situation.

c. The entrant detects a prohibited condition.

d. An evacuation alarm is activated.

CH3.4 Equipment

The following criteria shall be used in determining what equipment is required for a specific confined space entry:

CH3.4.1 Testing and monitoring equipment shall be made available as required for atmospheric testing.

CH3.4.2 Portable ventilating equipment shall be provided for spaces without permanent mechanical ventilation, if required.

CH3.4.3 Communications equipment shall be made available as required for communication with authorized entrants and with emergency services if necessary.

CH3.4.4 Personal protective equipment shall be provided as required to protect authorized entrants from exposure to hazards present inside the space, including:

CH3.4.4.1 Hard hats are required for protection against falling objects or overhead bump hazards.

CH3.4.4.2 Impervious personal protective clothing is required for corrosive or irritating products or skin penetrating toxic chemicals.

CH3.4.4.3 Eye or face protective devices are required for eye or face damaging exposures.

CH3.4.4.4 Respiratory protective devices are required for

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hazardous atmospheres.

a. All personnel who may be required to wear respirators while working in confined spaces shall have periodic medical examinations to determine their ability to wear respiratory protective devices.

b. Self-contained breathing apparatus (SCBA) shall be used only when the authorized entrants can enter the entry openings with SCBA strapped on. When this cannot be accomplished or when the free space opening is less than or equal to 18 inches in diameter, airline supplied-air breathing apparatus shall be available.

c. All breathing air shall, at least, meet the Compressed Gas Association specifications for Grade D.

CH3.4.5 Lighting equipment shall be provided for safe operation inside the confined space and for egress.

CH3.4.6 Barriers and shields shall be provided as required to prevent inadvertent entries into confined spaces while work is in progress. All entrances to permit-required spaces shall be posted with the following sign:

DANGER - CONFINED SPACE ENTER BY PERMIT ONLY

CH3.4.7 Equipment, such as ladders, needed for safe entry and egress by authorized entrants shall be provided.

CH3.4.8 Rescue and emergency equipment shall be provided as follows: To facilitate non-entry rescue, retrieval systems or methods shall be used whenever an authorized entrant enters a permit-required confined space, unless the retrieval equipment would increase the overall risk of entry or would not contribute to the rescue of the entrant. Retrieval systems shall meet the following requirements:

CH3.4.8.1 Each authorized entrant shall use a chest or full-body harness, with a retrieval line attached at the center of the entrant's back near shoulder level or above the entrant's head. Wristlets may be used in lieu of the chest or full-body harness if the employer can demonstrate that the use of a chest or full-body harness is infeasible or creates a greater hazard and that the use of wristlets is the safest and most effective alternative.

CH3.4.8.2 The other end of the retrieval line shall be attached to a mechanical device or fixed point outside the permit-required

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confined space in such a manner that rescue can begin as soon as the rescuer becomes aware that rescue is necessary. A mechanical device shall be available to retrieve personnel from vertical type permit-required confined spaces more than 5 feet deep.

CH3.4.8.3 For top openings into permit-required confined spaces, a mechanical hoist and supporting structure must be set up at the opening before the workers enter to begin work. At the discretion of the entry supervisor, the hoist/support may also be necessary at non-permit confined space openings when top opening entries are being made.

CH3.4.8.4 A suitable safety harness and attaching lanyard with double action snaps (ANSI A10.14) shall be worn by participants in all permit-required confined space entries. Safety harnesses will be inspected before each use.

CH3.4.8.5 Wristlet harnesses shall be worn by authorized personnel entering a permit-required confined space if the access to the confined space is less than 18 inches in unobstructed diameter. Exceptions must be approved by the OMEHS and S&MA. (**NOTE:** Wristlets are designed to help remove people from confined spaces by extending their arms, but are not designed to actually lift the person out of the space. This should be accomplished by a full-body harness.)

CH3.4.8.6 In all permit-required confined space entries, National Institute of Occupational Safety and Health (NIOSH) approved respiratory protective equipment shall be readily available at the point of entry as needed to support emergency rescue services. All life support equipment will be inspected and checked prior to start of the entry.

CH3.4.9 Any other equipment necessary for safe entry into, and rescue from, the permit-required space shall be provided prior to entry into the space.

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CHAPTER 4

EMERGENCY RESCUE SERVICES

CH4.1 Use of Onsite Emergency Rescue Services

In most cases emergency rescue services will be provided by the Redstone Arsenal Fire Department and the MSFC onsite ambulance contractor. In the event a confined space rescue is needed, onsite personnel will call **911** to summon emergency rescue services. Organizations relying on these services for entry rescues shall:

CH4.1.1 Inform the emergency rescue service by calling 911 of the hazards they may confront when called on to perform entry rescues.

CH4.1.2 Provide the emergency rescue service with access to all permit-required confined spaces from which rescue may be necessary so that they can develop appropriate rescue plans and practice rescue operations.

CH4.1.3 Ensure that if an injured entrant is exposed to a substance for which a MSDS or other similar written information is required to be kept at the worksite, that MSDS or written information shall be made available to the medical facility treating the exposed entrant.

CH4.2 Use of Emergency Rescue Teams Within an Organization

Organizations who desire to have their own emergency rescue teams shall develop a written plan which:

CH4.2.1 Ensures that each member of the rescue service is provided with, and is trained to use properly, the personal protective equipment and rescue equipment necessary for making rescues from permit-required confined spaces.

CH4.2.2 Ensures that each member of the rescue service receives training to perform the assigned rescue duties as well as the training required of authorized entrants.

CH4.2.3 Provides for permit-required confined space rescue drills at least once every 12 months, by means of simulated rescue operations in which they remove dummies, mannequins, or actual persons from the actual permit-required confined spaces or from representative permit-required confined spaces. Representative permit-required confined spaces shall, with

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respect to opening size, configuration, and accessibility, simulate the types of permit-required confined spaces from which rescue is to be performed.

CH4.2.4 Ensures that each member of the rescue service receives training in basic first aid and in cardiopulmonary resuscitation (CPR). At least one member of the rescue service holding current certification in first aid and in CPR shall be available.

CH4.2.5 Ensures that if an injured entrant is exposed to a substance for which a MSDS or other similar written information is required to be kept at the worksite, that MSDS or written information shall be made available to the medical facility treating the exposed entrant.

Those organizations choosing to have their own rescue team shall submit a copy of their rescue plan to OMEHS and S&MA for approval.

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CHAPTER 5

OFFSITE CONTRACTORS

CH5.1 Contracting Organization Requirements

When an organization arranges to have an offsite contractor perform work involving confined space entry, the contracting organization shall:

CH5.1.1 Inform the offsite contractor that the workplace contains confined spaces and entry is allowed only through compliance with 29 CFR 1910.146, "Permit-Required Confined Spaces," and adherence to the MSFC Confined Space Entry Program.

CH5.1.2 Apprise the offsite contractor of the elements involved, including the hazards identified and the host employer's experience with the space.

CH5.1.3 Apprise the offsite contractor of any precautions or procedures MSFC has implemented for the protection of employees.

CH5.1.4 Verify offsite contractor employees have received the appropriate training.

CH5.1.5 Coordinate entry operations with the offsite contractor.

CH5.2 Offsite Contractor Requirements

Offsite contractors who are retained to perform confined space entry operations at MSFC shall:

CH5.2.1 Obtain information regarding confined space hazards from the contracting organization.

CH5.2.2 Ensure employees have received the appropriate training and provide written verification to the contracting organization.

CH5.2.3 Coordinate entry operations with the contracting organization.

CH5.2.4 Provide to MSFC OMEHS and S&MA a completed confined space entry procedure or MSFC Form 4226 for approval prior to commencement of task.

CH5.2.5 Inform the contracting organization of any hazards confronted or created in confined spaces.

CH5.2.6 Provide all required equipment to safely perform

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confined space entries such as retrieval devices, air ventilating equipment, lighting equipment, personal protection equipment, air monitoring (O₂, LEL, toxics) instrumentation, respiratory protection equipment, etc. Verify all equipment is operable and in a well-maintained condition. Verify all test equipment and instrumentation are accurate and properly calibrated.

CH5.2.7 Follow all applicable requirements of this program and other OSHA regulations.