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Standard Guide for Selection of Hardline Communication Systems for Confined-Space Rescue[1]

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1. Scope

1.1 This guide covers recommended criteria for the selection of hardwire communication systems for use in permit-required confined-space rescue operations.

1.2 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

2. Referenced Documents

2.1 *ASTM Standards:*[2]

F1490 Terminology Relating to Search and Rescue (Withdrawn 2011)[3]

2.2 *Federal Standards:*

29 Code of Federal Regulations 1910.146 Permit Required Confined Spaces[4]

29 Code of Federal Regulations 1910.7 Definition and Requirements for a National Recognized Testing Laboratory[4]

2.3 *National Code:*

National Electrical Code (NEC)/NFPA 70[5]

3. Terminology

3.1 *Definitions of Terms Specific to This Standard:*

3.1.1 *confined space rescue*—rescue operations within spaces that meet the definition of "permit-required confined space" in Fed. Std. 29 CFR 1910.146.

3.1.2 *hardline communication system*—any communication system where all users are connected to the system by a hardline or wire.

4. Significance and Use

4.1 Because of the many unique requirements of permit-required confined space rescue operations and the specific construction and composition of some confined spaces, hardline communications systems may be the only type that will meet the requirements for working within these spaces. Some of these requirements are set forth in Federal Regulation and some by safe operating procedures developed for working in confined spaces by industry.

4.2 This guide is not meant to preclude the use of other types of communication systems in confined-space rescue.

5. System Requirements

5.1 *System Safety*—The system must be safe for use in the atmosphere, or potential atmosphere, within the space.

NOTE 1—See Annex A1.

5.2 The system must have continuous, hands-free voice communications capability.

NOTE 2—See X1.1.

5.3 The system must be dedicated and private so operations cannot be interfered with by outsiders not involved with the rescue.

5.4 The system shall not affect the readings of other safety equipment (that is, gas detectors).

5.5 Systems that are battery powered must have a low-battery warning or a backup power source that provides a minimum of 30 min before communications are lost.

5.6 The system must accommodate a minimum of three users.

NOTE 3—See X1.2.

5.7 The system should allow for communication between all entrants as well as with the attendant.

NOTE 4—See X1.3.

5.8 The system must work in conjunction with the personal protective equipment (PPE) necessary to work in the environment within the space.

NOTE 5—See X1.4.

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[2] For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

[3] The last approved version of this historical standard is referenced on www.astm.org.

[4] Available from Occupational Safety and Health Administration (OSHA), 200 Constitution Ave., NW, Washington, DC 20210, http://www.osha.gov.

[5] Available from National Fire Protection Association (NFPA), 1 Batterymarch Park, Quincy, MA 02169-7471, http://www.nfpa.org.

5.9 The system must be impervious to the chemicals within the space.

6. Keywords

6.1 confined space; hardline

ANNEX

(Mandatory Information)

A1. INHERENT SAFETY

A1.1 Equipment that requires electrical power to operate may be a source of ignition in the presence of flammable gases or vapors, combustible dusts, or ignitable fibers. Equipment that must operate in potentially flammable atmospheres must be unable to cause ignition (inherently safe) in those atmospheres. They can be certified as intrinsically safe or explosion-proof. Rescue teams that only work in known hazards, such as on-site rescue teams, may use equipment approved for only those hazards. Rescue teams that respond to unknown hazards, such as fire departments and other off-site rescue teams, must have equipment with the highest possible level of approval available, that is, equipment approved for atmospheres that are classified as: Class I Division 1 Groups A, B, C, D; Class II Division 1 Groups E, F, G; and Class III Division 1.[6] (See Note A1.1.) Division 1 locations are more hazardous than Division 2, therefore the test protocols for Division 1 are more stringent. As such, equipment certified for Division 1 is also approved for Division 2. Hardline systems that only have limited approval, when used only in atmospheres for which they are approved, meet this guide. (See Note A1.2.) The NFPA does not certify equipment. Testing and certification must be done by a Nationally Recognized Test Laboratory (NRTL) that has been accredited by OSHA in accordance with 29 CFR 1910.7. All certified equipment must be clearly and permanently marked to show the class, division, and group it is approved for use in and the name or mark of the NRTL that granted the approval. It is insufficient to be simply labeled intrinsically safe.

NOTE A1.1—See X1.5.

NOTE A1.2—See Appendix X2.

[6] Classifications for hazardous locations are in the National Electrical Code (NEC).

APPENDIXES

(Nonmandatory Information)

X1. RATIONALE

X1.1 Continuous hands-free communication allows the rescue team to communicate with each other and with the attendant without stopping what they are doing to operate a push-to-talk switch. More importantly, it allows the attendant to monitor operations and entrant status inside the space. Slurred speech, out-of-character responses or irregular breathing patterns can all be signs of exposure to gases, vapors, or chemicals within the space. The attendant is required by Federal regulation to know the effects of exposure and be able to recognize if the entry team exhibits them.

X1.2 The system must accommodate a minimum of three users, the attendant, at least one person on the entry team, and one person on the backup or standby team.

X1.3 Most rescues are safer if the entry team consists of at least two members and the system should expand to include all members of both the entry and backup teams.

X1.4 The PPE used in confined-space rescue may include; breathing apparatus, protective clothing, and helmets or hard-hats. Communication equipment must work in or under this equipment. Breathing apparatus may incorporate a microphone to overcome the problem of transmitting voice communication through the speaking diaphragm or the communication system may have a throat microphone which eliminates the need for a speaking diaphragm. Headphones that don't fit well under helmets may be replaced with earpieces or other listening devices that fit under the helmet. Earpieces that may fall out of the ear and are hard to replace under protective hoods while wearing gloves, may be replaced by small speakers held near the ear with a harness or attached to the breathing apparatus.

X1.5 Atmospheric hazards in confined spaces are the cause of a vast majority of confined-space incidents. Flammable or explosive atmospheres are just one type of hazardous atmosphere. The level of inherent safety approval of any electrically

powered equipment that is used in confined spaces is of the utmost importance. Rescuers will not usually enter a space unless the atmosphere is at or below 10 % of the lower explosive limit (LEL) of the gas or vapor within the space. However, atmospheres in confined spaces are subject to rapid changes and what might have been acceptable upon entry may change dramatically in a very short period of time. Confined-space rescue teams must prepare for the worst possible scenario and have equipment that is safe in a wide variety of situations.

X2. EXAMPLES OF CLASSIFICATIONS AND CORRESPONDING RESCUE SITES

X2.1 *Class I, Division 1 and 2*—Examples include petroleum refineries, dry cleaning plants, petrochemical plants, hospitals, utilities, aircraft hangers, paint manufacturers, dip tanks containing flammable or combustible liquids, and spray finishing areas.

X2.2 *Class II, Division 1 and 2*—Examples include grain elevators, some coal handling or preparation plants, flour and feed mills, confectionary plants, fireworks manufacturing and storage, grain ships, areas for packaging and handling of pulverized sugar and cocoa, manufacturing and storage of magnesium, and spice grinding mills.

X2.3 *Class III, Division 1*—Examples include woodworking plants, textile mills, cotton gins, cotton seed mills, flax-producing plants, knitting mills, and weaving mills.

NOTE X2.1—Individual group classifications also apply to Appendix X2 and were omitted for brevity. Appendix X2 is meant as a guideline only. If you have specific sites you wish to categorize, please refer to the National Electrical Code.