ANSI Z49.1:2005
An American National Standard

Safety in Welding, Cutting, and Allied Processes

American Welding Society

Key Words—Welding safety and health, cutting, welding fumes, hazard communication, fire prevention, respirators, electric shock, eye protection, noise

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Safety in Welding, Cutting, and Allied Processes

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Prepared by
Accredited Standards Committee Z49,
Safety in Welding and Cutting

Secretariat
American Welding Society

Abstract

This standard covers all aspects of safety and health in the welding environment, emphasizing oxygen gas and arc welding processes with some coverage given to resistance welding. It contains information on protection of personnel and the general area, ventilation, fire prevention and protection, and confined spaces. A significant section is devoted to precautionary information, showing examples, and an extensive bibliography is included.

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Foreword

(This Foreword is not a part of ANSI Z49.1:2005, *Safety in Welding, Cutting, and Allied Processes*, but is included for informational purposes only.)

The huge demands for production placed on the United States by World War II brought a tremendous expansion to the use of welding. In mid 1943, it was recognized that some type of code or standard was needed relating to safe practices for performing welding. Under the auspices of the American Standards Association, the standard was drafted and published in 1944. It was entitled American War Standard Z49.1, *Safety in Electric and Gas Welding, and Cutting Operations*.

Following the war, the standard was first revised in 1950. Subsequent revisions occurred in 1958, 1967, 1973, and 1983. Each updated the standard in accordance with changing technology and welding practices. The revisions up to and including 1973 were largely evolutionary and closely preserved the format of the original war standard.

In 1983, a major rewrite was undertaken to take proper account of the vast changes in welding which had occurred in the 40 years of the standard's existence and to clarify the somewhat patchwork presentation that had built up during the evolutionary revisions. The scope was redefined to address in greater detail the safety rules to be practiced by the welder and enforced by welding supervision and management. Provisions which had appeared in earlier editions, but which dealt more with building construction and piping installation over which the welder had little control, were deleted. The 1988, 1994, 1999, and 2005 revisions follow this same philosophy.

During the period of its publication, the American Standards Association has become the American National Standards Institute and War Standard ASA Z49.1-1944 has now become ANSI Z49.1:2005.

SUGGESTIONS

Comments and suggestions for the improvement of this standard are welcome. They should be sent to the Secretary, Z49 Committee, American Welding Society, 550 N.W. LeJeune Road, Miami, FL 33126.

REQUESTS FOR STANDARD INTERPRETATION

Official interpretations of any of the technical requirements of this standard may be obtained by sending a request, in writing, to:

Managing Director, Technical Services
American Welding Society
550 N.W. LeJeune Road
Miami, FL 33126

Requests not in writing cannot be considered for an official interpretation (see Annex E).

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Standard Requirements

Explanatory Information

Part I
General Aspects

1. Purpose and Scope

1.1 Purpose. This standard is for the protection of persons from injury and illness and the protection of property (including equipment) from damage by fire and explosions arising from welding, cutting, and allied processes.

E1.1 Beginning with the revision of 1983, the scope of ANSI Standard Z49.1 has been refocused towards those safe practices for performing welding, cutting, and allied processes, which are generally within the implementation control of the welder or the weld shop management. It is written in a manner suitable for issuance to the welder and shop management to give practical information to help them perform these functions safely. It also contains information useful to educators, industrial hygienists, engineers, and similar parties also responsible for safety and health in welding. With this refocused scope, some provisions which appeared in prior editions have been deleted. Those were provisions which dealt more in matter of building design and construction, facility pipelines, and electrical installations. Those provisions, of course, are still important and necessary and must be followed. They are not provisions usually under the immediate control of welding and cutting operations.

1.2 Scope and Applicability. This standard shall be for the guidance of educators, operators, managers, and supervisors in the safe setup and use of welding and cutting equipment, and the safe performance of welding and cutting operations.

E1.2 Specific provisions are included for oxyfuel gas and arc welding and cutting, resistance welding, electron beam welding, laser beam cutting and welding, and brazing and soldering.

However, the requirements of this standard are generally applicable to the other welding processes such as submerged arc welding and allied processes shown in the American Welding Society Master Chart of Welding and Allied Processes, included in Annex D.

1.3 Exclusions. This standard shall not pertain to the following:

(1) Guidelines for the design or manufacture of equipment

(2) Building piping systems

(3) Pipeline protection systems and station outlet equipment

(4) Bulk gas supply systems

(5) Building electrical installations.

E1.3 Some of these were included in former issues of the standard. These items were eliminated from ANSI Z49.1 to avoid their being included in two separate standards under separate auspices which can lead to conflict or confusion between standards.

These are contained in standards and codes of the National Fire Protection Association (NFPA) as follows:

(1) Oxyfuel gas piping systems, pipeline protective devices, and station outlet equipment—ANSI/NFPA 51, *Standard for the Design and Installation of Oxygen-Fuel Gas Systems for Welding, Cutting, and Allied Processes*

(2) Storage and manifolding of multiple gas cylinders—ANSI/NFPA 51

(3) Acetylene generators and calcium carbide storage—ANSI/NFPA 51

(4) Bulk oxygen systems—ANSI/NFPA 50, *Standard for Bulk Oxygen Systems at Consumer Sites*

(5) Bulk LP-Gas and MPS systems—ANSI/NFPA 58, *Storage and Handling of Liquefied Petroleum Gases*

(6) Building electrical installations—ANSI/NFPA 70, *National Electrical Code®*

(7) Industrial machinery—ANSI/NFPA 79, *Electrical Standard for Industrial Machinery*.

2. Definitions

The following definitions shall apply to this standard.

2.1 Approved. *Approved* and *approval* as used in this standard mean acceptable to the authority having jurisdiction.

2.1.1 Authority Having Jurisdiction. This term refers to the organization, office, or individual responsible for "approving" equipment, an installation, or a procedure.

2.1.2 Listed. This term means the equipment or material included in a list published by a nationally recognized testing laboratory that maintains periodic inspection of production of listed equipment or materials.

2.2 Confined Space. Refers to a relatively small or restricted space such as a tank, boiler, pressure vessel, or small compartment. Confinement implies poor ventilation as a result of construction, size, or shape rather than restriction of egress of personnel.

E2.2 For additional information, see ANSI Z117.1, *Safety Requirements for Confined Spaces*, or the pertaining OSHA standard.

2.3 Cylinder Storage. Refers to cylinders of compressed gas standing by on the site (not those in use or attached ready for use).

2.3.1 Cylinders in Use. This term refers to the following:

(1) Cylinders connected for use,

(2) A single cylinder for each gas to be used, in the use location, ready to be connected, or