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Health in the Arts

LASER-CUTTING-SAFETY 3D PRINTING

Eye and Face Protection



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The revised American National Standard Practice for Occupational and Educational Eye and Face Protection (Z87.1-1989), was approved in February 1989 by the American National Standards Institute, Inc. (ANSI).

The eyes and face must be protected from a variety of hazards, including impact (chipping, grinding, etc.), radiation (welding, glassblowing, carbon arcs, kilns, foundries) and chemical splash (acids, caustics, etc.). Safety equipment chosen should state that it meets the ANSI standard. All eye and face protection devices meeting this standard have "Z87" stamped on them. Z87.1-1989 states that its scope applies to occupational and educational operations and processes where face and eye hazards exist, including machining, welding, cutting, chemical handling, and assembly.

(Not applicable under this standard are hazards related to x-rays, gamma rays, high energy particulate radiation, microwaves, radio-frequency radiation, lasers and masers, and sports).

There are a few revisions between Z87.1-1979 and Z87.1-1989 that are worth mentioning. There is now identification of primary versus secondary eye and face protection.

Those protective devices that are secondary protectors are NOT adequate without additional primary protection.

Primary protectors include spectacles and goggles. While spectacles and goggles are primary protectors, they certainly may be used in conjunction with secondary protectors such as welding helmets and face shields. Spectacles commonly protect the eye from impact and optical radiation. They sometimes are equipped with sideshields. Goggles protect the eye from a variety of hazards, and can be fitted to the eye like an eyecup, or fitted to the eye area on the face. This second type can be used in conjunction with spectacles worn underneath.

Face shields cover the whole face by means of headgear, and, as mentioned above, need to be used in conjunction with either goggles or spectacles to provide adequate protection. Similarly, welding helmets and hand shields provide additional protection from optical radiation and impact.

Z87.1-1989 has specific considerations concerning the ability to both remove and clean lenses or windows, optical requirements, flammability resistance, corrosion resistance, prescription lens, fit, ventilation, and lens shade and transmission for all four types of eye protectors. CSA's revised data sheet Eye and Face Protection will itemize and include this information in table form.

Z87.1-1989 also has instructions on use and maintenance, and a description of the tests that were conducted to account for recommendations and requirements.

The old standard, Z87.1-1979, included a table on the choice of filter lens shades. Different lens shades were specified for different welding and cutting operations. While Z87.1-1989 provides almost exactly the same ranges of lens shades for the same operations, the table with exact shade number recommendations is deleted. In discussing the table with the Z87 chairman, it seems that the Z87 Committee felt that it was impossible to specify each situation because of the great variation in welding processes.

They determined that if one selected a lens that was appropriate for the operation being done and the one with the darkest shade possible, safety conditions would be met. For more detailed itemization for welding procedures, one can consult ANSI Z49.1-1988 Safety in Welding and Cutting. There is a decrease in the shade number recommended for soldering; in Z87.1-1989, a lens shade from 1.5-3 is adequate, while previously a range from 3-4 was the shade recommended.

The Occupational Safety and Health Administration (OSHA) includes in their proposed Personal Protective Equipment Standard (CFR 1910.133) a table much like the previous ANSI table of filter lens shades for protection against radiant energy. The adoption of this table was due to its practical format and easy readability. The only change between the proposed OSHA table and the old ANSI table is the decrease of the minimum lens shade recommended for soldering. OSHA suggests a shade number of 2, decreased from the previous ANSI minimum level of 3.

Infrared radiation is not specifically addressed in the new ANSI standard. In Table 1, which lists transmittance requirement for clear lens and general-purpose filters, there is a column for maximum infrared transmission, with lenses ranging from 25% transmission to a low of 0.3 transmission. Infrared transmission decreases with shade number. For looking in pottery or enameling kilns, use eye protection with a shade number between 1.7 and 3. For glassblowing and foundry work, a shade number of 3 is often used. Again, select the darkest lens or filter shade possible that allows accurate vision to meet safety conditions for both shade number and infrared transmission recommendations. Consult CSA's revised data sheet on eye and face protection or ANSI at 1430 Broadway, New York, NY 10018 for more information on this topic.

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