

NOTICE: If the film image below is less clear than this notice, it is due to the quality of the document being filmed.



ASA
U.S. Pat. Off.
Z2.1-1959
Revision of
Z2-1938
UDC 614.891/894

"SUPERSEDED BY LATER ISSUE"



American Standard Safety Code for

Head, Eye, and Respiratory Protection

Sponsors

Department of the Navy
National Bureau of Standards
U.S. Bureau of Mines

Approved November 27, 1959

AMERICAN STANDARDS ASSOCIATION

INCORPORATED

✓
620
A0032m
Z 2.1 (1459)

F

CIV RESEARCH
Box 0109

American Standard

Registered United States Patent Office

An American Standard implies a consensus of those substantially concerned with its scope and provisions. The consensus principle extends to the initiation of work under the procedure of the Association, to the method of work to be followed, and to the final approval of the standard.

An American Standard is intended as a guide to aid the manufacturer, the consumer, and the general public. The existence of an American Standard does not in any respect preclude any party who has approved of the standard from manufacturing, selling, or using products, processes, or procedures not conforming to the standard.

An American Standard defines a product, process, or procedure with reference to one or more of the following: nomenclature, composition, construction, dimensions, tolerances, safety, operating characteristics, performance, quality, rating, certification, testing, and the service for which designed.

American Standards are subject to periodic review. They are reaffirmed or revised to meet changing economic conditions and technological progress. Users of American Standards are cautioned to secure the latest editions.

Producers of goods made in conformity with an American Standard are encouraged to state on their own responsibility in advertising, promotion material, or on tags or labels, that the goods are produced in conformity with particular American Standards. The inclusion in such advertising and promotion media, or on tags or labels, of information concerning the characteristics covered by the standard to define its scope is also encouraged.

Published by
AMERICAN STANDARDS ASSOCIATION

INCORPORATED
70 East Forty-fifth Street
New York 17, N. Y.

Copyright 1960 by American Standards Association, Incorporated
Universal Decimal Classification 614.891/.894

Printed in U.S.A.

D4M160/300

00202

Foreword

(This Foreword is not a part of American Standard Safety Code for Head, Eye, and Respiratory Protection, Z21-1959.)

The first edition of this code was completed in the fall of 1920 and issued early in 1921. It was prepared with the cooperation of an advisory committee of 19 men who had been selected because of their interest in and knowledge of the subject and as being typical representatives of the interests most closely concerned. The code was developed from a set of safety standards originally prepared in cooperation between the War and Navy Departments and the National Bureau of Standards.

The second edition was issued in 1922, after revision by a sectional committee organized under the procedures of the American Standards Association, and was published as National Bureau of Standards Handbook H2.

The scope of the Z2 project was enlarged to include respiratory protection because of the many processes where simultaneous protection of lungs and eyes was needed, and a revision was published in 1938 as National Bureau of Standards Handbook H24.

In 1946 the sectional committee was reconvened and started work on a revision. A subcommittee on eye protection was organized under the direct supervision of the National Bureau of Standards; a subcommittee on respiratory protection was organized under the supervision of the U.S. Bureau of Mines; and a subcommittee on head protection was organized under supervision of the Department of the Navy. All parts of the standard had to be reviewed and brought up to date in order to include new materials and devices which had been developed since 1938, particularly the use of plastics for eye protection.

Suggestions for improvement gained in the use of this standard will be welcomed. They should be sent to the American Standards Association, Incorporated, 70 East Forty-fifth Street, New York 17, N. Y.

The committee that developed this standard is as follows:

DR LEONARD GREENBURG, Chairman

R. L. LLOYD, Secretary

Organization Represented	Name and Business Affiliation
American Ceramic Society.....	JOHN PARR, Ray-O-Vac Company
American Conference of Governmental Industrial Hygienists.....	J. EARL DUNCAN, Pittsburgh Plate Glass Company (All)
American Foundrymen's Society.....	ROBERT M. BROWN, St. Louis Health Division
American Gas Association.....	J. W. YOUNG, International Harvester Company
American Industrial Hygiene Association.....	EDWARD C. BAUMANN, Public Service Electric and Gas Company
American Society of Mechanical Engineers.....	H. H. SCHENCK, Industrial Hygiene Foundation of America
American Society of Safety Engineers.....	W. E. MCCORMICK, The B. F. Goodrich Company (All)
American Welding Society.....	THEODORE F. HATCH, University of Pittsburgh
Associated General Contractors of America.....	THOMAS A. WALSH, JR., American Optical Company
Association of American Railroads.....	CHARLES W. WYMAN, Western Electric Company, Inc.
Association of Casualty and Surety Companies.....	W. F. SCHOLTZ, Allis-Chalmers Manufacturing Company (All)
Bausch and Lomb Optical Company.....	FREDERICK C. SAACKER, Air Reduction Company, Inc.
General Services Administration.....	ARTHUR L. SCHMIDT
Granite Cutters' International Association of America.....	M. B. CLAYTON, Southern Railway System
Industrial Medical Association.....	WILLIAM M. FIERCE, Employers Liability Assurance Corporation, Ltd.
	V. O. BONN, The Employers Group (All)
	CONSON TAYLOR
	I. B. LOUCK (All)
	JOHN F. KIRBY
	EDWARD MEARS
	CARL DEANER, Union Carbide Corporation
	L. HOLLAND WHEAT, American Telephone and Telegraph Company (All)

Box 0109

CAV RESEARCH

<i>Organization Represented</i>	<i>Name and Business Affiliation</i>
Industrial Safety Equipment Association.....	DANIEL E. ALBERT, Mine Safety Appliances Company F. R. DAVIS, JR, Davis Emergency Equipment Company, Inc. C. H. GALLAGHER, American Optical Company S. C. HERRING, Ray-O-Vac Company A. F. PARRELLE, United States Safety Service Company V. P. CORCORAN, Industrial Safety Equipment Association (Alt)
International Association of Governmental Labor Officials.....	MONROE KLEINFELD, New York State Department of Labor CARL H. HAAREN, New Jersey Department of Labor and Industry (Alt)
International Association of Machinists.....	W. C. FLINN WILLIAM DANBORN (Alt)
International Brotherhood of Boilermakers, Iron Shipbuilders, and Helpers of America.....	JOHN V. KEARNEY
Metropolitan Life Insurance Company.....	J. WILLIAM FERNEL
National Association of Mutual Casualty Companies.....	E. G. METTER, Employers Mutuals of Women J. C. STERNETT (Alt)
National Bureau of Standards.....	RALPH STAM R. L. LLOYD (Alt) E. K. FLETCHER (Alt)
National Electrical Manufacturers Association.....	H. W. SPEICHER, Westinghouse Electric Corporation
National Foundry Association.....	C. T. SHEERMAN
National Safety Council.....	KAREL L. DOWN, Corning Glass Works L. W. HACKETT, Lumbermen's Mutual Casualty Company (Alt)
National Society for the Prevention of Blindness.....	LEONARD GREENBERG, Commissioner of Air Pollution of the City of New York JAMES E. O'NEIL (Alt)
Pennsylvania Department of Labor and Industry.....	THOMAS A. ORAVEC
Telephone Group.....	EILE S. MINER, American Telephone and Telegraph Company CHARLES W. WYMAN, Western Electric Company, Inc. (Alt)
U.S. Bureau of Mines, Department of the Interior.....	S. J. PEARCE LAWRENCE B. BERGER (Alt)
U.S. Department of Labor, Bureau of Labor Standards.....	SHELDON W. HONAN WILLIAM C. GRIFFIN (Alt)
U.S. Department of the Navy.....	H. L. MATHEWS R. W. WELSTER (Alt)
U.S. Post Office Department.....	EDWARD B. LANDRY
U.S. Public Health Service.....	DONALD J. BIRMINGHAM
Member-at-Large	SAMUEL RENEHAN, Ohio State University

Contents

1. Purpose and Scope	7
1.1 Purpose	7
1.2 Scope	7
2. Exceptions	7
3. Definitions	7
3.1 General Information	7
3.2 Specific Definitions	7
4. General Requirements	10
5. Head Protection	10
5.1 Hats	10
5.1.1 Types and Classes	10
5.1.2 Materials	10
5.1.3 General Requirements	10
5.1.4 Detailed Requirements	11
5.1.5 Physical Requirements and Methods of Test	12
5.1.6 Selection of Head-Protective Devices	13
5.1.7 Training Aids	13
5.1.8 Marking	15
5.2 Helmets and Hand Shields	15
5.2.1 Function	15
5.2.2 Types	15
5.2.3 Styles	15
5.2.4 Detailed Requirements	15
5.2.5 Marking	17
5.3 Face Shields	17
5.3.1 Function	17
5.3.2 Intended Uses	17
5.3.3 Styles and Types	17
5.3.4 Materials	17
5.3.5 General Requirements	17
5.3.6 Detailed Requirements	18
5.3.7 Marking	18
5.3.8 Physical Requirements and Methods of Test	19
6. Eye Protection	19
6.1 Styles and Functions of Protectors	19
6.1.1 Goggles, Eyecup	19
6.1.2 Spectacles, Metal or Plastic Frame	20
6.1.3 Goggles, Flexible Fitting	22
6.1.4 Goggles, Plastic Eyeshield	22
6.1.5 Spectacles, Plastic Eyeshield	22
6.1.6 Goggles, Foundrymen's	22
6.2 Materials and Methods of Test of Protectors	23
6.2.1 Materials	23
6.2.2 Disinfection	23
6.2.3 Corrosion Resistance	23
6.2.4 Water Absorption	23
6.2.5 Flammability	23
6.3 Lenses	23
6.3.1 Types of Lenses	23
6.3.2 General Requirements	24
6.3.3 Detailed Requirements	24
6.3.4 Methods of Test and Examination of Lenses	24

Box 0109

CAV RESEARCH

Box 0109

CIV RESEARCH

7. Respiratory Protection	27
7.1 Classification of Hazards	27
7.1.1 Oxygen Deficiency	27
7.1.2 Gaseous Contaminants	27
7.1.3 Particulate Contaminants (Dusts, Fumes, Smokes, Mists, Fogs)	28
7.1.4 Combination of Gaseous and Particulate Contaminants	28
7.2 Classification of Respiratory Protective Devices	28
7.2.1 Atmosphere-Supplying Respirators	28
7.2.2 Air-Purifying Respirators	30
7.3 Requirements for Respirators	33
7.4 Selection of Respirators	34
7.4.1 General Considerations	34
7.5 Use and Maintenance of Respirators	36
7.5.1 General Considerations	36
7.5.2 Precautions To Be Taken in the Use of Respirators	36
7.5.3 Instruction in Use of Respirators	39
7.5.4 Maintaining, Cleaning, Disinfecting, and Storing Respirators	40
Tables	
Table 1 Comparative Hat and Cap Sizes	15
Table 2 Transmittances and Tolerances in Transmittance of Various Shades of Filter Lenses ..	26
Table 3 Selection of Eye- and Face-Protective Devices	27
Table 4 Color Code for Gas-Mask Canisters	31
Table 5 Selection of Respiratory Protective Device	35
Figures	
Fig. 1 Brinell Hardness Penetrator Assembly	14
Fig. 2 Dimensions To Be Measured in Heat Deformation Test	21
Fig. 3 Apparatus for Heat Deformation Test	21
Appendix for Section 6	
A1. Visible-Light Transmission and Haze Test	43
A2. Water Absorption Test (For Weight and Dimensional Changes)	44
A3. Selection of Shade Numbers of Welding Filters	45
A4. Maintenance and Disinfection of Eye Protectors	45
A5. Fitting of Goggles and Spectacles	45

American Standard Safety Code for Head, Eye, and Respiratory Protection

1. Purpose and Scope

1.1 Purpose. The purpose of this standard is to provide reasonable and adequate means, ways, and methods for the proper selection and safe use of head, face, neck, eye, and respiratory protective equipment.

1.2 Scope. This standard shall apply to all operations or processes, excluding those relating to (1) communicable air-borne diseases, or (2) x-rays, gamma rays, and high-energy particulate radiations such as alpha, beta, or neutron rays.

2. Exceptions

Variations from the requirements of this standard may be granted by the administrative agency only when it is demonstrated to the satisfaction of the administrative agency that equivalent protection is afforded.

3. Definitions

3.1 General Information

3.1.1 Where the word "approved" is used with qualification, it refers to approval by the administrative agency having jurisdiction over the specific requirement.

3.1.2 In this standard, the use of the word "shall" indicates a mandatory requirement. The word "should" indicates a recommendation.

3.2 Specific Definitions. As used in this standard, the following words shall have the indicated definitions, and all other words shall have meaning according to their common usage.

Abrasive-Blasting Respirator: See Respirator.

Aerosol: A suspension of fine, solid, or liquid particles in air as dust, fume, mist, smoke, or fog.

Air-Line Respirator: See Respirator.

Air-Regulating Valve: An adjustable valve between the air-supply line and the breathing tube of an air-line respirator or an abrasive-blasting respirator whereby the flow of air to the facepiece, helmet, or hood may be regulated.

Air-Supply Device: A hand- or motor-operated blower for the hose mask or a source of respirable

compressed air for the air-line respirator and for the abrasive-blasting respirator.

Air-Supply Line: A hose to conduct respirable air from the air-supply device to that portion of a supplied-air respirator carried on the wearer's person.

Auxiliary Magnifier or Enlarger: A single lens or a pair of lenses joined together in a suitable manner to be inserted into the window in a welding helmet or hand shield to magnify or enlarge the area of the point of operation.

Breathing Tube: A flexible tube through which air or oxygen flows to the facepiece of a respirator.

Bridge Size: The distance between lenses on the nose side of each eye, expressed in millimeters.

Canister: A detachable container filled with granular materials that remove gases or vapors from the air that is drawn through the unit; it may also contain mechanical filters to remove dust, mist, and smoke particles.

Cartridge: A small canister.

Cartridge-Type Respirator: See Respirator.

Contaminant: A harmful material that is foreign to the normal atmosphere.

Cover Plate: A removable pane of colorless glass, plastic-coated glass, or plastic that covers the filter plate and protects it from damage.

Crown Strap(s): As applied to protective hats and caps, it is that part of the suspension that supports the shell in proper position on the wearer's head and acts as a shock absorber when the shell is subjected to impact; as applied to helmets and face shields, it is that part of the suspension that supports the device in proper position in front of the wearer's face.

Demand Respirator: See Respirator.

Detachable Coupling: A device by means of which the wearer of an air-line respirator may quickly detach the air-supply line from that part of the respirator worn on the person.

Disinfection: The act or process of destroying organisms that cause disease.

Dispersoid: A colloidal or finely divided substance.

Dust: Finely divided solid particles generated by processing (including handling, crushing, grinding, or pulverizing) materials such as rock, ore, metal, coal, wood, and grain.

Box 0109

CAV RESEARCH