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SA F E T Y C O D E F O R T H E
P R O T E C T I O N O F I N D U S T R I A L
W O R K E R S I N F O U N D R I E S

NATIONAL FOUNDERS' ASSOCIATION
AMERICAN FOUNDRYMEN'S ASSOCIATION
SPONSORS

—
TENTATIVE AMERICAN STANDARD
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CONTENTS.

	Page.
Preliminary statement.....	1, 2
Introduction:	
Section 1. Scope.....	2
Section 2. Interpretations and exceptions.....	2
Section 3. Application of regulations.....	2
Section 4. Suspension of regulations.....	2
Section 5. Mandatory and advisory requirements.....	2
Section 6. Definitions—	
Rule 60. Foundry.....	2
Rule 61. Entrances or exits.....	2
Section 7. General hazards and sanitation.....	3
Part I.—Plant layout:	
Section 10. Entrances—	
Rule 100. Protection.....	3
Rule 101. Exception to protection.....	3
Section 11. Floors, pits, and galleries—	
Rule 110. Floor at cupola.....	3
Rule 111. Cleaning and finishing floors.....	3
Rule 112. Floor adjoining tracks.....	3
Rule 113. Pits.....	3
Rule 114. Galleries.....	3
Section 12. Gangways—	
Rule 120. Definitions.....	3
Rule 121. General gangways.....	3
Rule 122. Condition.....	3
Rule 123. For crane, trolley, or sulky ladles.....	4
Rule 124. For truck ladles.....	4
Rule 125. For crucibles.....	4
Rule 126. For crucibles.....	4
Rule 127. For hand or bull ladles.....	4
Rule 128. For hand or bull ladles.....	4
Rule 129. For hand or bull ladles.....	4
Section 13. Aisles—	
Rule 130. Definitions.....	4
Rule 131. Condition.....	4
Rule 132. For hand or bull ladles or crucibles.....	4
Rule 133. For hand or bull ladles or crucibles.....	4
Rule 134. For crane, trolley, or sulky ladles.....	4
Part II.—Machines and equipment:	
Section 20. Equipment—	
Rule 200. Slag spouts.....	5
Rule 201. Lip-pouring ladles.....	5
Rule 202. Crane, truck, and trolley ladles.....	5
Rule 203. Single shank ladles.....	5
Rule 204. Crown plate of furnace.....	5
Rule 205. Sand buckets.....	5
Rule 206. Sling beams.....	5
Rule 207. Trunnions on flasks.....	5
Rule 208. Slings.....	5
Section 21. Finishing and cleaning—	
Rule 210. How cleaned.....	6
Rule 211. Finishing rails or benches.....	6
Rule 212. Dry tumbling mills.....	6
Rule 213. Dry grinding, buffing or polishing machines.....	6
Rule 214. Swing frame grinding machines.....	6
Rule 215. Sand blasting.....	5
Rule 216. Arc welding.....	6

Part III.—Lighting, heating, and ventilation:	
Section 30. Lighting—	Page.
Rule 300. Intensity.....	6
Section 31. Heating—	
Rule 310. Working temperatures.....	6
Rule 311. Salamanders.....	6
Section 32. Ventilation—	
Rule 320. General requirements.....	7
Rule 321. Removing smoke, fumes, etc.....	7
Rule 322. Drying ladles.....	7
Rule 323. Ovens.....	7
Rule 324. Height of ceilings.....	7
Part IV.—Operating rules:	
Section 40. Inspection and maintenance—	
Rule 400. Daily inspection of equipment.....	7
Rule 401. Weekly inspection of equipment.....	7
Rule 402. Defective equipment.....	7
Rule 403. Condition of tools.....	7
Rule 404. Riding chains and crane loads.....	7
Rule 405. Swinging or dangling crane chains.....	7
Rule 406. Removing crucibles from furnace.....	7, 8
Rule 407. Use of explosives and drop balls.....	8
Rule 408. Locomotives in foundries.....	8
Section 41. Clothing and protection worn by workers—	
Rule 410. General requirements.....	8
Rule 411. Goggles.....	8
Rule 412. Helmets and hoods.....	8
Rule 413. Protection for welders.....	8
Rule 414. Respirators.....	8
Rule 415. Shoes and leggings.....	8
Section 42. Qualifications and duties of female workers—	
Rule 420. Examination.....	8
Rule 421. Effort allowed.....	8
Rule 422. Handling hot cores.....	8
Part V.—Safety and welfare:	
Section 50. Recommendations—	
Rule 500. Safety committees.....	9
Rule 501. Enforcement of regulations.....	9
Rule 502. Educational methods.....	9
Rule 503. Room for meals.....	9
Rule 504. First-aid kits.....	9

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SAFETY CODE FOR THE PROTECTION OF INDUSTRIAL WORKERS IN FOUNDRIES.

PRELIMINARY STATEMENT.

In January, 1920, the American Engineering Standards Committee invited the American Foundrymen's Association and the National Founders' Association to act as joint sponsors for a safety code for the protection of industrial workers in foundries. These associations accepted this sponsorship, and according to the rules of procedure of the American Engineering Standards Committee appointed a sectional committee to draft such a code. This committee consisted of the following members:

Name and address.	Association, society, or firm represented.	Sectional committee group.
Chairman, Wm. H. Barr, president National Founders' Association, Buffalo, N. Y.	National Founders' Association.....	Employers.
Secretary, H. J. Boggis, Cleveland, Ohio. H. S. Echternach, Harrisburg, Pa....	National Founders' Association..... Industrial board, Department of Labor and Industry	Employers. Governmental bodies.
J. P. Frey, Cincinnati, Ohio.....	Iron Molders Union of North America...	Employees.
Benj. D. Fuller, Niagara Falls, N. Y....	American Foundrymen's Association ...	Employers.
W. W. Green, New York, N. Y.....	Employers Mutual Insurance Companies	Insurance organizations.
F. J. Hartman, secretary, Harrisburg, Pa.....	Industrial Board, Department of Labor and Industry.	Governmental bodies.
S. E. Hassel, Safety Director, Pittsburgh, Pa.....	Safety Department of American Steel & Wire Co.	Technical associations.
Edward Keener, president, Buffalo, N. Y.	Buffalo Cooperative Stove Co.....	Employers.
F. G. Lange, Columbus, Ohio.....	International Association of Industrial Accident Boards and Commissions.	Governmental bodies.
H. D. Miles, Buffalo, N. Y.....	National Association of Manufacturers and American Foundrymen's Association.	Employers.
B. C. Riffel, New York, N. Y.....	National Bureau of Casualty and Surety Underwriters.	Insurance organizations.
G. E. Sanford, safety engineer, West Lynn, Mass.	National Society of Safety Engineers.....	Technical associations.
R. C. Williams, Washington, D. C.....	United States Public Health Service.....	Governmental bodies.

At a meeting held February 9, 1921, and attended by a majority of the sectional committee, a code was drafted which was later submitted to the entire sectional committee and to various technical organizations for criticisms. At a meeting held February 14, 1922, and attended by a majority of the sectional committee, these criticisms were considered and some changes were made.

This code in its present form is the net result of this work and was approved by The National Founders' Association, The American

Foundrymen's Association, Sectional Committee, by letter ballot, American Engineering Standards Committee, June, 1922.

The membership of the two associations sponsoring this code is composed of some three thousand of the leading foundries of the United States.

INTRODUCTION.

SECTION 1. SCOPE.

This code deals with foundry conditions only, omitting such subjects as building construction, exits, stairways, elevators, lighting, sanitation, etc., as these subjects are covered by other codes.

SECTION 2. INTERPRETATIONS AND EXCEPTIONS.

The purpose of this code is to provide reasonable safety for life, limb, and health. It shall be liberally construed to secure results, by the enforcing officers of body, who shall have the authority in cases of practical difficulty or unnecessary hardship, to grant exceptions from the literal requirements of this code, as long as equivalent protection is thereby secured. When the safeguarding of particular types of machines is covered by other approved codes, these codes shall be given the preference. Where specific devices or methods are mentioned in this code, other devices or methods which will secure equally good results may be used, subject to the approval of enforcing officer of body.

SECTION 3. APPLICATION OF REGULATIONS.

Regulations affecting industrial establishments generally in respect to the safeguarding of transmission machinery, miscellaneous machinery, elevators, stairways, platforms, or relating to sanitary conveniences and first-aid equipments, not included in this code, shall apply with equal force to foundries.

SECTION 4. SUSPENSION OF REGULATIONS.

This code may be modified or suspended in whole or in part by the proper State authority in respect to existing foundries if good and sufficient reason therefor is submitted.

SECTION 5. MANDATORY AND ADVISORY REQUIREMENTS.

The word "shall" where used, is to be understood to be mandatory, and the word "should" advisory.

SECTION 6. DEFINITIONS.

Rule 60. Foundry.—A foundry shall mean a building where iron, steel, tin, zinc, lead, aluminum or compositions containing any of the baser metals are melted and poured into molds for the making of castings, and shall include all molding, coremaking, melting, cleaning, toilet and washrooms used in connection therewith.

Rule 61. Entrances or exits.—The term "entrances" or "exits" shall mean passages for common use between the foundry and the open air, provided for employees during working hours.

SECTION 7.

For standard method of guarding general hazards and for sanitation reference should be made to codes prepared under the procedure of the American Engineering Standards Committee.

PART I.—PLANT LAYOUT.

SECTION 10. ENTRANCES.

Rule 100. Protection.—Entrances to foundries located in cold climates shall be protected during the winter by covered vestibules or their equivalents, which shall be so constructed as to eliminate harmful drafts, and of such dimensions as to answer ordinary purposes, such as the passage of wheelbarrows, trucks, and industrial cars.

Rule 101. Exception to protection.—Section 10 shall not apply to entrances used for railroad or industrial cars handled by locomotives, or for traveling cranes, horse-drawn vehicles, or automobiles; these entrances may remain open during the winter only for such time as is necessary for the ingress and egress of such cars, cranes, horse-drawn vehicles, or automobiles.

SECTION 11. FLOORS, PITTS, AND GALLERIES.

Rule 110. Floor at cupola.—The floor beneath and immediately surrounding a foundry cupola shall be kept free from collection of water.

Rule 111. Cleaning and finishing floors.—All cleaning and finishing floors shall be cleaned and leveled as often as necessary to secure safe working conditions.

Rule 112. Floor adjoining tracks.—The floor immediately adjoining industrial tracks over which workmen frequently pass shall be reasonably hard and flush with the top of the rails. Sufficient clearance for easy passage of truck wheels shall be provided between floor and rails.

Rule 113. Pits.—All pits or openings located in foundry floors shall be guarded by suitable coverings or railings where practicable; where impracticable a watchman should be provided.

Rule 114. Galleries.—Galleries where molten metal is poured into molds shall be provided with a solid partition of fire-resisting material not less than 3 feet 6 inches high, installed on open side of such gallery.

SECTION 12. GANGWAYS.

Rule 120. Definitions.—The term "gangway" shall mean a well-defined passageway dividing the working floors of a foundry. The width of a gangway shall be understood to be the clear distance between molds, posts, partitions or other obstructions on one side of the gangway and similar objects on the other side.

Rule 121. General gangways.—Gangways other than those for carrying molten metal shall be of sufficient width to allow the passage of employees and materials, and shall be illuminated in accordance with the requirements of the factory lighting code.

Rule 122. Condition.—Every gangway in which molten metal is being handled shall, during the progress of pouring, be kept in good condition, clear of obstructions and free from undue dampness.

Rule 123. For crane, trolley, or sulky ladles.—Gangways where molten metal is carried in crane, trolley, or sulky ladles shall be sufficiently wide to allow employees safely to handle and empty the ladles.

Rule 124. For truck ladles.—Gangways where molten metal is carried in truck ladles exclusively shall be not less than 18 inches wider than the extreme width of the truck ladle.

Rule 125. For crucibles.—Gangways where molten metal is carried in crucibles by not more than two men per crucible and poured into molds placed on one or both sides of the gangway shall be not less than 3 feet wide.

Rule 126. For crucibles.—Gangways where molten metal is carried in crucibles by more than two men per crucible and poured into molds placed on one or both sides of the gangway shall be not less than 4 feet wide.

Rule 127. For hand or bull ladles.—Gangways where molten metal is carried in hand or bull ladles by not more than two men per ladle and poured into molds placed on only one side of the gangway shall be not less than 3 feet wide.

Rule 128. For hand or bull ladles.—Gangways where molten metal is carried in hand or bull ladles by not more than two men per ladle and poured into molds placed on both sides of the gangway shall be not less than 4 feet wide.

Rule 129. For hand or bull ladles.—Gangways where molten metal is carried in hand or bull ladles by more than two men per ladle shall be not less than 5 feet wide.

SECTION 13. AISLES.

Rule 130. Definitions.—The term "aisle" shall mean a passage-way between molds leading from the gangway. The width of an aisle shall be understood to be the clear distance between molds, posts, partitions, or other obstructions on one side of the aisle and similar objects on the other side.

Rule 131. Condition.—Every aisle in which molten metal is being handled shall, during the progress of pouring, be kept in good condition, clear of obstructions, and free from undue dampness.

Rule 132. For hand or bull ladles or crucibles.—Aisles where molten metal is carried in hand or bull ladles or crucibles and poured into molds on individual floors by not more than two men per ladle or crucible shall not be less than 12 inches wide except where molds alongside the aisle are more than 20 inches high above the aisle level, in which case the aisle shall be not less than 24 inches wide.

Rule 133. For hand or bull ladles or crucibles.—Aisles where molten metal is carried in hand or bull ladles or crucibles and poured into molds on individual floors by more than two men per ladle or crucible shall be not less than 36 inches wide.

Rule 134. For crane, trolley or sulky ladles.—Aisles where molten metal is carried and poured into molds on individual floors by crane, trolley, or sulky ladles shall be sufficiently wide to safely handle and empty the ladles.

PART II.—MACHINES AND EQUIPMENT.

SECTION 20. EQUIPMENT.

Rule 200. Slag spouts.—For protection against the spattering of slag, slag spouts should, where practicable, be equipped with suitable shields.

Rule 201. Lip-pouring ladles.—All lip-pouring ladles of 1,000 pounds capacity or more shall be equipped with a worm gear or other self-locking device.

Rule 202. Crane, truck, and trolley ladles.—All crane, truck, and trolley pouring ladles shall be equipped with a dog to prevent premature overturning and shall be so constructed that when they are full of metal the center of gravity shall be below the center of the trunnion, unless each ladle is equipped with a gear mechanism and a latch, either of which will prevent premature overturning of the ladle.

Rule 203. Single shank ladles.—All single shank ladles should be provided with sheet metal shields.

Rule 204. Crown plate of furnace.—Where the crown plate of an upright crucible furnace is elevated above the surrounding floor in excess of 12 inches, the furnace shall be equipped with a platform having a standard rail; such platform shall be constructed of metal or other fireproof material, and shall extend along the front and sides of the furnace, flush with the crown plate, and shall be clear of all obstructions. If the platform is elevated above the floor in excess of 12 inches the lowering from same of crucibles containing molten metal shall be by mechanical means.

Rule 205. Sand buckets.—Equipment for the movement of materials by overhead cranes, such as sand buckets, shall have a factor of safety of at least five including bolts where used. When buckets have movable bails, safety locks or catches shall be provided, and the use of such safety locks or catches shall be enforced. Substantial steel handles shall be provided on grab buckets to afford safe means of pulling or prying apart the jaws in case cylinders stick.

Rule 206. Sling beams.—Sling beams shall be so constructed that the slings can not be jarred off the beam, and so that the slings can be readily moved to accommodate different size flasks.

Rule 207. Trunnions on flasks.—Trunnions on flasks hereafter constructed shall be carefully designed for the loads they are to handle and constructed with a factor of safety of at least 10 including bolts where they are used. The diameter of the button shall be equal to the diameter of the groove plus one and one-half times the diameter of the sling used to handle the flask. Inside corners shall be well filleted and in order to prevent the sling sliding off or riding the button, the radius of the corner between groove and button shall be approximately equal to the radius of the sling used, the remainder of the inside edge of the button to be straight.

Rule 208. Slings.—All slings used to suspend flasks from jib crane beams shall either be so designed that there are safe clearances for a hand grip or handles shall be provided to hold the sling.

SECTION 21. FINISHING AND CLEANING.

Rule 210. How cleaned.—Where castings are cleaned or chipped in molding or casting rooms, there should be provided suitable screens, partitions, or other effective means to protect employees against flying chips and excessive dust. All castings shall, where practicable, be cleaned or chipped in rooms separated from rooms used for other purposes.

Rule 211. Finishing rails or benches.—Where finishing rails or benches are used, they must be sufficiently far apart to allow the operators to pass between them without being endangered by falling castings.

Rule 212. Dry tumbling mills.—In new installations where dry tumbling mills are used within a foundry, exhaust apparatus shall be installed and operated that will effectively draw off the dust created by the operation of such mills; in existing installations such mills may be inclosed in reasonably dust-tight compartments while in operation. Tumbling mills, when not inclosed, shall be provided with substantial guards on open sides when in operation.

Rule 213. Dry grinding, buffing, or polishing machines.—Where dry grinding, buffing, or polishing machines are used, an exhaust apparatus or its equivalent that will effectively remove the dust created by the operation of such machines shall be installed and operated. This rule shall not apply to floor or bench stands used specially for tool grinding nor to portable grinders.

Rule 214. Swing frame grinding machines.—Where swing frame grinding, buffing or polishing machines are used, screens shall be provided when necessary to protect adjacent workmen.

Rule 215. Sand blasting.—Sand blasting by hand-operated apparatus shall be carried on in suitable sand-blast room or outside the foundry, and in both cases effective means shall be provided to protect passers-by from the sand blast. Dust shall not be exhausted into the open air but into a collector.

Rule 216. Arc welding.—A guard or shield shall be provided where necessary to protect other workers from exposure to the radiation from the electric arc, and no employee shall be required to work in such a position that his face is exposed to such radiation from any neighboring source. It is recommended that permanent inclosures be supplied, where practicable, for arc welding and cutting.

PART III.—LIGHTING, HEATING, AND VENTILATION.

SECTION 30. LIGHTING.

Rule 300. Lighting.—The light in every foundry shall be in accordance with the requirements of the factory lighting code.

SECTION 31. HEATING.

Rule 310. Working temperature.—A comfortable working temperature shall be maintained during working hours in all sections where employees are regularly working.

Rule 311. Salamanders.—Salamanders shall not be used except where it is clearly impracticable to use some other form of heating device. Where salamanders are used, the coke must not have a sulphur content exceeding 1 per cent.

SECTION 32. VENTILATION.

Rule 320. General requirements.—The ventilation and ventilating equipment shall be in accordance with the requirements of the safety code for ventilation.

Rule 321. Removing smoke, fumes, etc.—Where the natural circulation of air is not sufficient to remove smoke, gas fumes, or dust injurious to the health of employees, mechanical ventilating apparatus of sufficient capacity to do so shall be installed and operated.

Rule 322. Drying ladles.—Where the operation of drying ladles causes fumes or gases injurious to the health of employees within the foundry, ventilating hoods shall be provided and kept in repair for the purpose of effectively removing such fumes or gases.

Rule 323. Ovens.—All ovens from which fumes or gases injurious to the health of employees escape shall be provided with hoods of sufficient capacity to effectively remove such fumes or gases.

Rule 324. Height of ceilings.—No foundry in which zinc-bearing metals are melted or poured shall be operated in a room less than 14 feet in height from the floor to the lowest point of the ceiling, except that where the roof is of peak, saw-tooth or arch construction, the minimum height of the side walls may be 12 feet. If such foundry is installed in the front part of the building the ceiling shall be in every part not less than 6 feet, 6 inches above the curb level of the street in front of the building, and if such foundry is installed entirely in the rear part of a building or extends from the front of a building to its rear, the ceiling shall be not less than 3 feet above the curb level of the street in front of the building and the foundry shall open onto a yard or court which shall be not less than 6 inches below the level of the floor.

PART IV.—OPERATING RULES.

SECTION 40. INSPECTION AND MAINTENANCE.

Rule 400. Daily inspection of equipment.—All ladles, shanks, crucibles, crucible shanks, crucible tongs, yokes, skimmers, slag hoes, crane chains, cables, ropes, and slings used in handling or pouring of molten metal shall be inspected daily in regard to their safe condition by the men preparing and using such appliances.

Rule 401. Weekly inspection of equipment.—A weekly inspection in regard to the safe condition of all crane chains, cables and slings in use for suspending molten metal in mid-air shall be made by a man designated by the employer for that purpose. Written report of such inspection shall be kept.

Rule 402. Defective equipment.—Equipment found upon inspection to be defective shall not be used while in that condition.

Rule 403. Condition of tools.—All tools shall be kept properly dressed and free from mushroomed heads.

Rule 404. Riding chains and crane loads.—The practice of riding chains and crane loads shall be forbidden.

Rule 405. Swinging or dangling crane chains.—Swinging or dangling crane chains must clear all obstructions when the crane is in motion or they must be guided by chainmen walking beneath.

Rule 406. Removing crucibles from furnace.—When the combined weight of a crucible containing molten metal and the crucible tongs

exceeds 100 pounds, the crucible shall be removed from the furnace by not less than two men or by mechanical means, and when the combined weight exceeds 300 pounds, three or more men or a mechanical device shall be employed.

Rule 407. Use of explosives and drop balls.—The use of high explosives or of a drop ball for breaking scrap shall not be permitted unless done under reasonably safe conditions and under expert supervision.

Rule 408. Locomotives in foundries.—No locomotive while discharging smoke shall remain inside a foundry during working hours except during such periods as may be necessary for its entrance and exit; but this regulation shall not apply to locomotive cranes nor steam charging machines.

SECTION 41. CLOTHING AND PROTECTION WORN BY WORKERS.

Rule 410. General requirements.—Head and eye protectors shall conform to the requirements of the National Safety Code for the Protection of the Head and Eyes of Industrial Workers.

Rule 411. Goggles.—When the eyes of employees are liable to injury by dust, flying chips or molten metal, they shall wear suitable safety goggles which shall be provided by the employer.

Rule 412. Helmets and hoods.—When engaged in sand blasting by hand apparatus workmen shall wear suitable helmets or hoods which shall be furnished by the employer.

Rule 413. Protection for welders.—When engaged in welding or burning operations by means of an oxyacetylene or other gas torch, employees shall wear suitable safety goggles which shall be provided by the employer; when engaged in similar operations by means of an electric arc, employees shall use suitable shields or wear suitable helmets which shall be provided by the employer. In both these operations employees shall wear slow combustion aprons or overalls.

Rule 414. Respirators.—When the dust arising from cleaning operations is injurious to the health of the cleaners, they shall wear suitable respirators which shall be provided by the employers.

Rule 415. Shoes and leggings.—When handling molten metal employees shall wear suitable congress or other approved shoes which shall be furnished by themselves, and, when necessary, shall wear suitable leggings to be provided by the employer.

SECTION 42. QUALIFICATIONS AND DUTIES OF FEMALE WORKERS.

Rule 420. Examination.—No female shall be employed in a foundry unless upon examination by a physician it has been determined that she is of normal size, health and weight for her age.

Rule 421. Effort allowed.—No female employed in a foundry shall lift any object exceeding 25 pounds in weight unless she uses mechanical means by which her physical effort is limited to 25 pounds.

Rule 422. Handling hot cores.—No female employed in a foundry shall be permitted to handle cores which have a temperature of more than 110° F.

PART V.—SAFETY AND WELFARE.**SECTION 50. RECOMMENDATIONS.**

Rule 500. Safety committees.—Accident prevention should be encouraged by the formation of safety committees among the men. All foremen should take a personal interest in accident prevention and are expected to set an example of carefulness.

Rule 501. Enforcement of regulations.—Strict enforcement of workshop regulations is one of the best methods of accident prevention.

Rule 502. Educational methods.—Experience has shown that most accidents can be prevented by supplementing mechanical safeguarding by educational methods; therefor, the use of safety meetings, bulletin boards, motion pictures, and suggestion boxes should be encouraged.

Rule 503. Room for meals.—A room should be provided and kept in sanitary condition for employees' use to eat their meals.

Rule 504. First-aid kits.—First-aid kits should contain—

- One tourniquet.
- One pair nickel-plated scissors.
- One pair nickel-plated tweezers.
- One triangular sling.
- One wire-gauze splint.
- Twelve assorted safety pins.
- Two 2-ounce tubes burnt ointment.
- One 2-ounce bottle castor oil.
- One 2-ounce bottle 3 per cent alcoholic iodine.
- Twelve-ounce bottle white wine vinegar.
- One 2-ounce bottle 4 per cent aqueous boric acid.
- One 2-ounce bottle aromatic spirits of ammonia.
- One 2-ounce bottle Jamaica ginger or substitute.
- Three paper drinking cups.
- Ten applicators.
- One roll absorbent cotton (1.5 ounces).
- One piece flannel 25 by 25 inches.
- One roll 3 inches by 10 yards gauze bandage.
- Two rolls 2 inches by 5 yards gauze bandage.
- Three rolls 1 inch by 5 yards gauze bandage.
- One spool 1 inch by 5 yards adhesive plaster.
- Six sealed packages 6 by 36 inches sterile gauze.
- One teaspoon.
- One aluminum cup.
- One medicine glass.
- Two medicine droppers.
- Six tongue depressors.
- Twelve first-aid record cards.
- Such other equipment as prescribed by the industrial sanitation code.

INDEX.

	Part.	Section.	Rule.		Part.	Section.	Rule.
Accident prevention. Recommendations.....	5	50	500-504	Equipment.....	2	20	200-208
Advisory requirements.....		5		Daily inspection of.....	4	40	400
Aisles.....	1	13	130-134	Defective.....	4	40	402
Application of regulations.....		3		Weekly inspection of.....	4	40	401
Aprons, to be worn in welding operations.....	4	41	413	Examination of female employees.....	4	42	420
Arc welding. (<i>See</i> Welding, arc.)				Exceptions to rules.....		2	
				Entrances.....	1	10	101
				Exits, defined.....		6	61
				Explosives, restrictions on use.....	4	40	407
Buffing machines. Dust exhaust provisions.....	2	21	213	Eye protectors. General requirements. (<i>See</i> National Safety Code for the Protection of the Heads and Eyes of Industrial Workers.)			
Bull ladders:							
Aisles for.....	1	13	133				
Gangways for.....	1	12	128, 129				
Castings. Protection against chips and dust.....	2	21	210	Female workers, qualifications and duties.....	4	42	420-422
Ceilings, height of.....	3	32	324	Finishing:			
Cleaning:				Floors.....	1	11	111
Floors.....	1	11	110	Machines and equipment.....	2	21	210-216
Machines and equipment.....	2	21	210-216	Finishing rails or benches, distance apart.....	2	21	211
Clearance for passage of truck wheels.....	1	11	112	First aid. Recommended equipment.....	5	50	504
Clothing of workers.....	4	41	413, 415	Floors.....	1	11	110-114
Cores, temperature of.....	4	42	422	Foundry, defined.....		6	60
Crane chains, swinging or dangling. Clearance.....	4	40	405	Fumes, removal of.....	3	32	321-323
Crane ladders:				Furnace:			
Aisles for.....	1	13	134	Crown plate of, equipment.....	2	20	204
Equipment and construction.....	2	20	202	Removing crucibles from.....	4	40	406
Gangways for.....	1	12	123				
Crane loads. Practice forbidden.....	4	40	404	Galleries.....	1	11	114
Crown plate of furnace, equipment.....	2	20	204	Gangways.....	1	12	120-129
Crucibles:				General.....	1	12	121
Aisles for.....	1	13	132, 133	(<i>See also</i> Code of Lighting Factories, Mills, and Other Work Places.)			
Gangways for.....	1	12	124				
Removing from furnace.....	4	40	406	Gases, removal of.....	3	32	322, 323
Cupola, to be kept free from water.....	1	11	110	Goggles:			
				To be provided by employer.....	4	41	411
Defective equipment.....	4	40	402	To be worn in welding operations.....	4	41	413
Definitions.....		6	60, 61	Grinding machines:			
Aisle.....	1	13	130	Dry. Dust exhaust provisions.....	2	21	213
Gangway.....	1	12	120	Swing frame. Screens to be provided.....	2	21	214
Drop balls, restriction on use.....	4	40	407	Guarding general hazards, standard method of. (<i>See other codes prepared under the procedure of the American Engineering Standards Committee.</i>)			
Dry grinding machines. (<i>See</i> Grinding machines, dry.)							
Dry tumbling mills. (<i>See</i> Tumbling mills, dry.)				Hand ladders, gangways for.....	1	12	128, 129
Drying ladders, ventilating hoods for.....	3	32	322	Head protectors. General requirements. (<i>See</i> National Safety Code for the Protection of the Heads and Eyes of Industrial Workers.)			
Dust exhaust provisions.....	2	21	212	Heating of work place.....	3	31	310, 311
			213, 215	Helmets:			
Dust, protection against, in cleaning operations.....	4	41	414	To be worn in sand blasting operations.....	4	41	412
Duties of female workers.....	4	42	420-422	To be worn in welding operations.....	4	41	413
Educational methods.....	5	50	502				
Effort allowed. (<i>See</i> Lifting, by female employees.)							
Electric arc welding. (<i>See</i> Welding, arc.)							
Enforcement of regulations.....	5	50	501				
Entrances.....	1	10	100, 101				
Defined.....		6	61				
Protection of.....	1	10	100				

	Part.	Section.	Rule.		Part.	Section.	Rule.
Hoods:				Riding chains. Practice forbidden.	4	40	404
For removal of gases and fumes.	3	32	322, 323	Safety. Recommendations.	5	50	500-504
To be worn in sand blasting operations.	4	41	412	Safety committees.	5	50	500
Inspection.	4	40	400-408	Salamanders, when to be used.	3	31	311
Interpretations of rules.		2		Sand blasting:			
Ladles:				Dust exhaust provision.	2	21	215
Crane, trolley, or sulky, aisles for.	1	13	134	Helmets or hoods to be worn.	4	41	412
Crane, trolley, or sulky, gangways for.	1	12	123	Sand buckets, requirements.	2	20	205
Crane, truck, and trolley, equipment and construction.	2	20	202	Sanitation. (See other codes prepared under the procedure of the American Engineering Standards Committee.)			
Hand or bull, gangways for.	1	12	128, 129	Scope of code.		1	
Lip-pouring, equipment.	2	20	201	Shoes, to be provided by employee.	4	41	415
Single shank, to be provided with shields.	2	20	203	Single shank ladles, to be provided with shields.	2	20	203
Truck, gangways for.	1	12	124	Slag spouts, equipment.	2	20	200
Leggings, to be provided by employer.	4	41	415	Sling beams, construction of.	2	20	206
Lifting, by female employees.	4	42	421	Slings, clearance required.	2	20	208
Lighting. (See Code of Lighting Factories, Mills, and Other Work Places.)				Smoke, removal of.	3	32	321
Lip-pouring ladles, equipment.	2	20	201	Spouts, slag, equipment.	2	20	200
Locomotives, discharging smoke in foundries.	4	40	408	Sulky ladles:			
Machines and equipment.	2			Aisles for.	1	13	134
Maintenance.	4	40	400-408	Gangways for.	1	12	123
Mandatory requirements.		5		Suspension of regulations.		4	
Meals, room for.	5	50	503	Swing frame grinding machines. (See Grinding machines, swing frame.)			
Operating rules.	4			Temperature:			
Ovens. Hoods to remove fumes and gases.	3	32	323	Cores handled by female employees.	4	42	422
Overalls, to be worn in welding operations.	4	41	413	Work place.	3	31	310
Oxyacetylene welding. (See Welding, oxyacetylene.)				Tools, condition of.	4	40	403
Pits.	1	11	113	Tracks, floor adjoining.	1	11	112
Plant layout.	1			Trolley ladles:			
Platform, furnace to be equipped with.	2	20	204	Aisles for.	1	13	134
Polishing machines. Dust exhaust provisions.	2	21	213	Equipment and construction.	2	20	202
Protection of entrances.	1	10	100	Gangways for.	1	12	123
Exception.	1	10	101	Truck ladles:			
Protectors.	4	41		Equipment and construction.	2	20	202
Head and eye. General requirements. (See National Safety Code for the Protection of the Heads and Eyes of Industrial Workers.)				Gangways for.	1	12	124
Qualifications and duties of female workers.	4	42	420-422	Trunnions on flasks, specifications.	2	20	207
Radiation, protection against.	2	21	216	Tumbling mills, dry. Dust exhaust provisions.	2	21	212
Recommendations for safety and welfare.	5	50	500-504	Ventilation.	3	32	320-324
Respirators, in cleaning operations.	4	41	414	General requirements. (See Ventilation Safety Code.)			
				Watchman, to be provided for pits.	1	11	113
				Welding:			
				Arc. Protection against.	4	41	413
				Arc. Protection against radiation.	2	21	216
				Oxyacetylene. Protection against.	4	41	413
				Welfare. Recommendations.	5	50	500-504
				Zinc-bearing metals. Height of ceilings in foundries.	3	32	324

