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BUREAU OF LABOR STANDARDS
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Safety and Health Regulations for SHIPBUILDING

January 1970

U.S. DEPARTMENT OF LABOR
Wage and Labor Standards Administration
BUREAU OF LABOR STANDARDS

25900

Amendments to these regulations published in the Federal Register through JANUARY 1, 1970, are included in this pamphlet.

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AUTHORITY: The provisions of this P 1502 issued under sec. 41, 44 Stat. 1444; 1, 72 Stat. 835; 33 U.S.C. 941.

SOURCE: The provisions of this Part 1 appear at 29 F.R. 4028, Mar. 27, 1964; 29 F 6089, May 8, 1964, unless otherwise noted

Subpart A—General Provisions

§ 1502.1 Purpose, scope and responsibility.

(a) Section 41 of the Longshoreme and Harbor Workers' Compensation requires every employer to furnish maintain employment and places of e ployment which are reasonably safe his employees in all employments cove thereby (the Act applies to all injur sustained by employees on navigs waters of the United States if the e ployees are employed by an "employ as defined in section 2(4) of the A i.e., "an employer any of whose e ployees are employed in maritime e ployment, in whole or in part, upon navigable waters of the United St (including any drydock)." Calbeck

Travelers Insurance Co. and Donovan v. Avondale Shipyards, Inc. (52 S. Ct. 1196 (1962)) and to install, furnish, maintain, and use devices and safeguards (with particular reference to equipment used by such employers and working conditions established by them) determined by the Secretary of Labor to be reasonably necessary to protect the life, health, and safety of such employees, and to render safe such employment and places of employment and to prevent injury to such employees. The purpose of this part is to make determinations under this standard with respect to shipbuilding activity.

(b) This part does not apply to matters under the control of the United States Coast Guard within the scope of Title 52 of the Revised Statutes and acts supplementary or amendatory thereto (46 U.S.C. secs. 1–1388 passim) including, but not restricted to, the master, ship's officer, crew members, design, construction, and maintenance of the vessel, its gear and equipment; to matters within the regulatory authority of the United States Coast Guard to safeguard vessels, harbors, ports, and waterfront facilities under the provisions of the Espionage Act of June 17, 1917, as amended (50 U.S.C. 191 et seq.; 22 U.S.C. 401, et seq.); including the provisions of Executive Order 10173, as amended by Executive Orders 10277 and 10352 (3 CFR 1949–1953 Comp., pp. 356, 778, and 873); or to matters within the regulatory authority of the United States Coast Guard with respect to lights, warning devices, safety equipment and other matters relating to the promotion of safety of lives and property under section 4(e) of the Outer Continental Shelf Lands Act (43 U.S.C. 1333). Also, this part does not apply to owners, operators, agents, or masters of vessels unless they are acting as "employers". However, this part is not intended to relieve owners, operators, agents, or masters of vessels who are not "employers" from responsibilities or duties now placed upon them by law, regulations, or custom.

(c) The responsibilities placed upon the competent person herein shall be deemed to be the responsibilities of the employer.

§ 1502.2 Definitions.

(a) The term "shall", indicates provisions which are mandatory.

(b) The term "Secretary" means the Secretary of Labor.

(c) The term "employer" means an employer any of whose employees are employed in maritime employment, in whole or in part, upon the navigable waters of the United States, including dry docks, graving docks, and marine railways, and any of whose employees are employed, in whole or in part, in shipbuilding or related employments as defined in paragraphs (i) and (j) of this section, on the navigable waters of the United States, including drydocks, graving docks, and marine railways.

(d) The term "employee" means any person employed in shipbuilding or related employments on the navigable waters of the United States, including dry docks, graving docks and marine railways, by an employer as defined in paragraph (c) of this section.

(e) The term "gangway" means any ramp-like or stair-like means of access provided to enable personnel to board or leave a vessel including accommodation ladders, gangplanks and brows.

(f) The term "vessel" includes every description of watercraft or other artificial contrivance used or capable of being used as a means of transportation on water, including special purpose floating structures not primarily designed for or used as a means of transportation on water.

(g) For purposes of § 1502.44, the term "barge" means an unpowered, flat bottom, shallow draft vessel including scows, carfloats and lighters. For purposes of this section, the term does not include ship shaped or deep draft barges.

(h) For purposes of § 1502.44, the term "river tow boat" means a shallow draft, low free board, self-propelled vessel designed to tow river barges by pushing ahead. For purposes of this section, the term does not include other towing vessels.

(i) The term "shipbuilding" means the construction of a vessel, including the installation of machinery and equipment.

(j) The term "related employment" means any employments performed as an incident to or in conjunction with shipbuilding work including, but not restricted to, inspection, testing trials and employment as a watchman.

(k) The term "hazardous substance" means a substance which by reason of being explosive, flammable, poisonous, corrosive, oxidizing, irritant, or otherwise harmful is likely to cause injury.

(l) The term "competent person" for purposes of this part means a person who is capable of recognizing and evaluating employee exposure to hazardous substances or to other unsafe conditions and is capable of specifying the necessary protection and precautions to be taken to ensure the safety of employees as required by the particular regulation under the condition to which it applies. For the purposes of Subparts C and D of this part, except for § 1502.24(b)(8), to which the above definition applies, the competent person must also meet the additional requirements of § 1502.10.

(m) The term "confined space" means a compartment of small size and limited access such as a double bottom tank, cofferdam, or other space which by its small size and confined nature can readily create or aggravate a hazardous exposure.

(n) The term "enclosed space" means any space, other than a confined space, which is enclosed by bulkheads and overhead. It includes cargo holds, tanks, quarters and machinery and boiler spaces.

(o) The term "hot work" means riveting, welding, burning or other fire or spark producing operations.

(p) The term "cold work" means any work which does not involve riveting, welding, burning or other fire or spark producing operations.

(q) The term "portable unfired pressure vessel" means any pressure container or vessel used aboard ship, other than the ship's equipment, containing liquids or gases under pressure, excepting pressure vessels built to ICC regulations under 49 CFR Part 78, Subparts C and H.

(r) The term "powder actuated fastening tool" means a tool or machine which drives a stud, pin or fastener by means of an explosive charge.

(s) For purposes of § 1502.57, the term "hazardous material" means a material which has one or more of the following characteristics: (1) Has a flash point below 140° F., closed cup, or is subject to spontaneous heating; (2) has a threshold limit value below 500 p.p.m. in the case of a gas or vapor, below 500 mg./m.^{3} for fumes, and below 25 m.p.p.c.f. in case of a dust; (3) has a single dose oral LD_{50} below 500 mg./kg.; (4) is subject to polymerization with the release of large amounts of energy; (5) is a strong oxidizing or reducing agent; (6) causes first degree burns to skin in short time exposure, or is systemically toxic by skin contact; or (7) in the course of normal operations, may produ[illegible] dus gases, fumes, vapors, mists, [illegible]mok which have one or more of the abo characteristics.

§ 1502.3 Penalty.

(a) As provided in Public Law 85–7 any employer who, willfully, violates fails or refuses to comply with the p visions of the regulations of this p and any employer or other person v willfully interferes with, hinders, or lays the Secretary or his authori representative in carrying out his du under subsection (c) of section 41 of Act by refusing to admit the Secret or his authorized representative to place, or to permit the inspection or amination of any employment or plac employment, or who willfully hinders delays the Secretary or his authori representative in the performance of duties in the enforcement of the regu tions of this part, shall be guilty of offense, and, upon conviction there shall be punished for each offense b fine of not less than $100 nor more t $3,000; and in any case where such e ployer is a corporation, the officer v willfully permits any such violation occur shall be guilty of an offense, a upon conviction thereof, shall be p ished also for each offense by a fine not less than $100 nor more than $3,

(b) The liability under this provis of Public Law 85–742 shall not affect other liability of the employer under Longshoremen's and Harbor Work Compensation Act.

§ 1502.4 Variation from the regulat of this part.

(a) As provided in Public Law 85– in case of practical difficulties or un essary hardships, the Secretary in discretion may grant variations f the regulations of this part or part lar provisions thereof, and permit use of other or different devices if finds that the purpose of the regula will be observed by the variation the safety of employees will be equ secured thereby. Any person affecte such regulations or his agent, may quest the Secretary to grant such va tion, stating in writing the grounds which his request is based. Any auth ization by the Secretary of a variat shall be in writing, shall describe conditions under which the variat shall be permitted, and shall be publis as provided in section 3 of the Adm istrative Procedure Act (ch. 324, 60 S 237), as amended. A properly inde

record of all variations shall be kept in the Office of the Secretary and be open to public inspection.

§ 1502.5 Reference specifications, standards, and codes.

Specifications, standards, and codes of agencies of the U.S. Government, to the extent specified in the text, form a part of the regulations of this part: In addition, under the authority vested in the Secretary under the Act, the specifications, standards, and codes of organizations which are not agencies of the U.S. Government, in effect on the date of the promulgation of the regulations of this part as listed below, to the extent specified in the text, form a part of the regulations of this part:

National Fire Protection Association, 60 Batterymarch Street, Boston, Mass. 02110, Subpart B, § 1502.10(a).

Underwriters' Laboratories, Inc., 207 East Ohio Street, Chicago, Ill. 60611, Subpart C §§ 1502.24(b)(7), 1502.25(a)(4); Subpart H, § 1502.72(a).

United States of America Standard Safety Code for Portable Wood Ladders, A14.1–1959, United States of America Standards Institute, Inc., 10 East 40th Street, New York, N.Y. 10016, Subpart E, § 1502.42(a)(6).

American Society of Mechanical Engineers, Boiler and Pressure Vessel Code, Section VIII, Rules for Construction of Unfired Pressure Vessels, American Society of Mechanical Engineers, 345 East 47th Street, New York, N.Y. 10017, Subpart K, § 1502.101(a).

Threshold Limit Values, American Conference of Governmental Industrial Hygienists, 1014 Broadway, Cincinnati, Ohio 45202, Subpart C § 1502.21(b).

United States of America Standard Safety Code for the Use, Care, and Protection of Abrasive Wheels, B7.1–1964, United States of America Standards Institute, Inc., 10 East 40th Street, New York, N.Y. 10016, Subpart H, § 1502.74(c).

[32 F.R. 14047, Oct. 10, 1967]

§ 1502.6 Notification of accidents resulting in fatalities or serious injuries.

(a) Within 48 hours after the occurrence of an accident causing the death of an employee or resulting in an employee's admission to a hospital as a bed patient, the employer shall file a copy of Bureau of Employees' Compensation Form BEC—202 (approved by Budget Bureau No. 44–R 887.3) with the Field Safety Consultant of the Bureau of Labor Standards serving the area where the accident occurred (in addition to such filing as is required by 20 CFR 31.3) unless prior thereto and as soon after the accident as feasible the employer has given oral or written notice of the accident to the person in charge of such office in sufficient detail to permit the accident to be identified readily. (44 Stat. 1444; 33 U.S.C. 930.)

§ 1502.7 Amendment of the regulations of this part.

The Secretary may at any time, upon his own motion or upon written petition of any interested person setting forth reasonable grounds therefor, and after opportunity has been given to interested persons to present their views, amend or revoke any of the provisions of the regulations of this part.

Subpart B—Explosive and Other Dangerous Atmospheres

§ 1502.10 Competent person.

(a) *Designation.* (1) For the purposes of Subparts C, D, and H of this part, except for §§ 1502.24(b)(8) and 1502.25(a)(5), one or more competent persons shall be designated by the employer in accordance with the applicable requirements of this section unless the requirements of Subparts C, D, and H of this part are always carried out by a National Fire Protection Association Certified Marine Chemist.

(2) The employer shall indicate on U.S. Department of Labor Form MAR–8, "Designation of Competent Person" either those employees designated as competent persons or that the prescribed functions of such persons are always carried out by a National Fire Protection Association Certified Marine Chemist in addition to his professional duties. When additions or changes are made in the personnel so designated, a new Form MAR–8 shall be executed. A copy of this executed form shall be forwarded to the nearest office of the Bureau of Labor Standards.

(b) *Criteria.* The following criteria shall guide the employer in designating employees as competent persons:

(1) Ability to understand the meaning of designations on certificates and of any qualifications relating thereto and to carry out any instructions, either written or oral, left by the National Fire Protection Association Certified Marine Chemist or issued by a consultant or chemist who may be used by the employer to make the tests and inspections required by Subparts C and D of this part.

(2) Ability to use and interpret the readings of an oxygen indicator and a combustible gas indicator. The ability to use and interpret the readings of a carbon monoxide indicator and a carbon dioxide indicator, if the operations involve such hazardous gases.

(3) Familiarity with and understanding of Subparts C, D, and H of this part.

(4) Familiarity with the structure and knowledge of the location and designation of spaces of the types of vessels on which construction work is done.

(5) Capability to perform the tests and inspections required by Subparts C, D, and H of this part and to write the required logs.

(c) *Logging of inspections and tests.* (1) When tests and inspections required to be performed by a competent person by any provisions of Subparts C, D, and H of this part, except those referred to in § 1502.25(b)(8) and (a)(5), are made, a record of the locations, operations performed and date, time, and results of the tests and any instructions resulting therefrom shall be recorded on U.S. Department of Labor Form MAR–9, "Log of Inspections and Tests by Competent Person." A separate form shall be used for each vessel on which tests and inspections are made.

(2) This record shall be available for inspection in the immediate vicinity of the affected operations while they are in progress. This record or copy thereof shall be kept on file for a period of at least 3 months from the date of the completion of the job.

(d) *Application.* The provisions of this section are intended to apply in their entirety to employers engaged in general vessel construction. They do not apply in their entirety to employers whose work involves only certain portions of Subparts C and D of this part, such as the building of some wooden vessels, where only knowledge of the precautions to be taken when using flammable paints is necessary. In such cases employers may designate persons who are competent on the basis of the applicable portions of the criteria set forth in paragraph (b) of this section.

[29 F.R. 4028, Mar. 27, 1964; 29 F.R. 6089, May 8, 1964, as amended at 32 F.R. 14047, Oct. 10, 1967]

Subpart C—Surface Preparation and Preservation

§ 1502.21 Toxic cleaning solvents.

(a) When toxic solvents are used, the employer shall employ one or more of the following measures to safeguar health of employees expo to solvents.

(1) The cleaning operation sha completely enclosed to prevent th cape of vapor into the working s

(2) Either natural ventilation or chanical exhaust ventilation sha used to remove the vapor at the s and to dilute the concentration of v in the working space to a concentr which is safe for the entire work p

(3) Employees shall be prot against toxic vapors by suitable re tory protective equipment in accor with the requirements of § 1502.8 and (c), and, where necessary, a exposure of skin and eyes to co with toxic solvents and their vapo suitable clothing and equipment.

(b) The principles in the thre limit values to which attention rected in § 1502.5 will be used b Department of Labor in enforce proceedings in defining a safe conce tion of air contaminants.

(c) When flammable solvents used, precautions shall be taken i cordance with the requirement § 1502.25.

[32 F.R. 14047, Oct. 10, 1967]

§ 1502.22 Chemical paint and pre tive removers.

(a) Employees shall be prot against skin contact during the han and application of chemical paint preservative removers and shall be tected against eye injury by goggl face shields in accordance with th quirements of § 1502.31 (a) and (

(b) When using flammable pain preservative removers, precautions be taken in accordance with the re ments of § 1502.25.

(c) When using chemical paint preservative removers which co volatile and toxic solvents, such as zol, acetone and amyl acetate, the visions of § 1502.21 shall be applica

(d) When using paint and rus movers containing strong acids or lies, employees shall be protecte suitable face shields to prevent che burns on the face and neck.

(e) When steam guns are use employees working within range o blast shall be protected by suitable shields. Metal parts of the steam itself shall be insulated to protec operator against heat burns.

§ 1502.23 Mechanical paint removers.

(a) *Power tools.* (1) Employees engaged in the removal of paints, preservatives, rusts or other coatings by means of power tools shall be protected against eye injury by goggles or face shields in accordance with the requirements of § 1502.81(a).

(2) All portable rotating tools used for the removal of paints, preservatives, rusts or other coatings shall be adequately guarded to protect both the operator and nearby workers from flying missiles.

(3) Portable electric tools shall be grounded in accordance with the requirements of § 1502.72 (a) and (b).

(4) In a confined space, mechanical exhaust ventilation sufficient to keep the dust concentration to a minimum shall be used, or employees shall be protected by respiratory protective equipment in accordance with the requirements of § 1502.82 (a) and (d).

(b) *Flame removal.* (1) Hardened preservative coatings shall not be removed by flame in enclosed spaces unless the employees exposed to fumes are protected by air line respirators in accordance with the requirements of § 1502.82 (a). Employees performing such an operation in the open air, and those exposed to the resulting fumes, shall be protected by a fume filter type respirator in accordance with requirements of paragraphs (a) and (d)(2)(iv) of §1502.82.

(2) Flame or heat shall not be used to remove soft and greasy preservative coatings.

(c) *Abrasive blasting*—(1) *Equipment.* Hoses and fittings used for abrasive blasting shall meet the following requirements:

(i) *Hoses.* Hose of a type to prevent shocks from static electricity shall be used.

(ii) *Hose couplings.* Hose lengths shall be joined by metal couplings secured to the outside of the hose to avoid erosion and weakening of the couplings.

(iii) *Nozzles.* Nozzles shall be attached to the hose by fittings that will prevent the nozzle from unintentionally becoming disengaged. Nozzle attachments shall be of metal and shall fit onto the hose externally.

(iv) *Dead man control.* A dead man control device shall be provided at the nozzle end of the blasting hose either to provide direct cut off or to signal the pot tender by means of a visual and audible signal to cutoff the flow, in the event the blaster loses control of the hose. The pot tender shall be available at all times to respond immediately to the signal.

(2) *Replacement.* Hoses and all fittings used for abrasive blasting shall be inspected frequently to insure timely replacement before an unsafe amount of wear has occurred.

(3) *Personal protective equipment.* (i) Abrasive blasters working in enclosed spaces shall be protected by hoods and air fed respirators or by air helmets of a positive pressure type in accordance with the requirements of § 1502.82(a).

(ii) Abrasive blasters working in the open shall be protected as indicated in subdivision (i) of this subparagraph except that when synthetic abrasives containing less than one percent free silica are used filter type respirators approved by the Bureau of Mines for exposure to lead dusts may be used in accordance with § 1502.82 (a) and (d).

(iii) Employees, other than blasters, including machine tenders and abrasive recovery men, working in areas where unsafe concentrations of abrasive materials and dusts are present shall be protected by eye and respiratory protective equipment in accordance with the requirements of §§ 1502.81 (a) and (b) and 1502.82 (a) and (d).

(iv) The blaster shall be protected against injury from exposure to the blast by appropriate protective clothing, including gloves.

(v) Since surges from drops in pressure in the hose line can be of sufficient proportions to throw the blaster off the staging, the blaster shall be protected by a safety belt when blasting is being done from elevations where adequate protection against falling cannot be provided by railings.

[29 F.R. 4028, Mar. 27, 1964; 29 F.R. 6089, May 8, 1964, as amended at 32 F.R. 14047, Oct. 10, 1967]

§ 1502.24 Painting.

(a) *Paints mixed with toxic vehicles or solvents.* (1) When paints mixed with toxic vehicles or solvents are sprayed, the following conditions shall apply:

(i) In confined spaces, employees continuously exposed to such spraying shall be protected by air line respirators in accordance with the requirements of § 1502.82(a).

(ii) In tanks or compartments, employees continuously exposed to such

spraying shall be protected by air line respirators in accordance with the requirements of §1502.82(a). Where mechanical ventilation is provided, employees shall be protected by respirators in accordance with the requirements of § 1502.82 (a) and (e).

(iii) In large and well ventilated areas, employees exposed to such spraying shall be protected by respirators in accordance with the requirements of § 1502.82 (a) and (e).

(2) Where brush application of paints with toxic solvents is done in confined spaces, or other areas where lack of ventilation creates a hazard, employees shall be protected by filter respirators in accordance with the requirements of § 1502.82 (a) and (c).

(3) When flammable paints or vehicles are used, precautions shall be taken in accordance with the requirements of § 1501.25.

(4) The metallic parts of air moving devices, including fans, blowers, and jet-type air movers, and all duct work shall be electrically bonded to the vessel's structure.

(b) *Paints and tank coatings dissolved in highly volatile toxic and flammable solvents.* Several organic coatings, adhesives and resins are dissolved in highly toxic, flammable and explosive solvents with flash points below 80° F. Work involving such materials shall be done only when all of the following special precautions have been taken:

(1) Sufficient exhaust ventilation shall be provided to keep the concentration of solvent vapors below ten (10) percent of the lower explosive limit. Frequent tests shall be made by a competent person to ascertain the concentration.

(2) If the ventilation fails or if the concentration of solvent vapors rises above ten (10) percent of the lower explosive limit, painting shall be stopped and the compartment shall be evacuated until the concentration again falls below ten (10) percent of the lower explosive limit. If the concentration does not fall when painting is stopped, additional ventilation to bring the concentration down to ten (10) percent of the lower explosive limit shall be provided.

(3) Ventilation shall be continued after the completion of painting until the space or compartment is gas free. The final determination as to whether the space or compartment is gas free shall be made after the ventilating equipment has been shut off for at least ten minutes.

(4) Exhaust ducts shall discharge clear of working areas and away sources of possible ignition. Pe tests shall be made to ensure thi exhausted vapors are not accumu in other areas within or around th sel or dry dock.

(5) All motors and control equi shall be of the explosion-proof type shall have nonferrous blades. Po air ducts shall also be of nonferrou terials. All motors and associated c equipment shall be properly main and grounded.

(6) Only non-sparking paint b spray guns and tools shall be Metal parts of paint brushes and shall be insulated. Staging sh erected in a manner which ensure it is non-sparking.

(7) Only explosion proof light proved by the Underwriters' Labor for use in Class I, Group D atmosp or approved as permissible by th Bureau of Mines or the U.S. Coast shall be used.

(8) A competent person shall all power and lighting cables to that the insulation is in excellen dition, free of all cracks and worn that there are no connections fifty (50) feet of the operation, tha are not overloaded, and that th suspended with sufficient slack to p undue stress or chafing.

(9) The face, eyes, head, hands other exposed parts of the bodies ployees handling such highly v paints shall be protected. All fo shall be non-sparking, such as r rubber boots or rubber soled shoes out nails. Coveralls or other outer ing shall be of cotton. Rubber, than plastic gloves shall be used b of the danger of static sparks.

(10) No matches, lighted ciga cigars, or pipes, and no cigarette l or ferrous articles shall be take the area where work is being don

(11) All solvent drums taken in compartment shall be placed on ferrous surfaces and shall be groun the vessel. Metallic contact sh maintained between containers drums when materials are being ferred from one to another.

(12) Spray guns, paint pots, metallic parts of connecting tubing be electrically bonded, and the b assembly shall be grounded t vessel.

(13) All employees continuously

compartment in which such painting is being performed, shall be protected by air line respirators in accordance with the requirements of § 1502.82(a) and by suitable protective clothing. Employees entering such compartments for a limited time shall be protected by filter cartridge type respirators in accordance with the requirements of § 1502.82 (a) and (e).

(14) All employees doing exterior paint spraying with such paints shall be protected by suitable filter cartridge type respirators in accordance with the requirements of § 1502.82 (a) and (e) and by suitable protective clothing.

[29 F.R. 4028, Mar. 27, 1964; 29 F.R. 6089, May 8, 1964, as amended at 32 F.R. 14048, Oct. 10, 1967]

§ 1502.25 Flammable liquids.

(a) In all cases when liquid solvents, paint and preservative removers, paints or vehicles, other than those covered by § 1502.24(b), are capable of producing a flammable atmosphere under the conditions of use the following precautions shall be taken:

(1) Smoking, open flames, arcs and spark-producing equipment shall be prohibited in the area.

(2) Ventilation shall be provided in sufficient quantities to keep the concentration of vapors below ten (10) percent of their lower explosive limit. Frequent tests shall be made by a competent person to ascertain the concentration.

(3) Scrapings and rags soaked with these materials shall be kept in a covered metal container.

(4) Only explosion proof lights, approved by the Underwriters' Laboratories for use in Class I, Group D atmospheres, or approved as permissible by the U.S. Bureau of Mines or the U.S. Coast Guard shall be used.

(5) A competent person shall inspect all power and lighting cables to ensure that the insulation is in excellent condition, free of all cracks and worn spots, that there are no connections within fifty (50) feet of the operation, that lines are not overloaded, and that they are suspended with sufficient slack to prevent undue stress or chafing.

(6) Suitable fire extinguishing equipment shall be immediately available in the work area and shall be maintained in a state of readiness for instant use.

Subpart D—Welding, Cutting and Heating

§ 1502.31 Ventilation and protection in welding, cutting and heating.

(a) *Mechanical ventilation; requirements.* (1) For purposes of this section, mechanical ventilation shall meet the following requirements:

(i) Mechanical ventilation shall consist of either general mechanical ventilation systems or local exhaust systems.

(ii) General mechanical ventilation shall be of sufficient capacity and so arranged as to produce the number of air changes necessary to maintain welding fumes and smoke within safe limits.

(iii) Local exhaust ventilation shall consist of freely movable hoods intended to be placed by the welder or burner as close as practicable to the work. This system shall be of sufficient capacity and so arranged as to remove fumes and smoke at the source and keep the concentration of them in the breathing zone within safe limits.

(iv) Contaminated air exhausted from a working space shall be discharged into the open air or otherwise clear of the source of intake air.

(v) All air replacing that withdrawn shall be clean and respirable.

(vi) Oxygen shall not be used for ventilation purposes, comfort cooling, blowing dust or dirt from clothing, or for cleaning the work area.

(b) *Welding, cutting and heating in confined spaces.* (1) Except as provided in paragraphs (b)(3) and (c)(2) of this section, either general mechanical or local exhaust ventilation meeting the requirements of paragraph (a) of this section shall be provided whenever welding, cutting or heating is performed in a confined space.

(2) The means of access shall be provided to a confined space and ventilation ducts to this space shall be arranged in accordance with § 1502.46(b)(1) and (2).

(3) When sufficient ventilation cannot be obtained without blocking the means of access, employees in the confined space shall be protected by air line respirators in accordance with the requirements of § 1502.82(a), and an employee on the outside of such a confined space shall be assigned to maintain communication with those working within it and to aid them in an emergency.

(c) *Welding, cutting or heating of metals of toxic significance.* (1) Welding, cutting or heating in any enclosed spaces aboard the vessel involving the metals specified in this subparagraph shall be performed with either general mechanical or local exhaust ventilation meeting the requirements of paragraph (a) of this section.

(i) Zinc-bearing base or filler metals or metals coated with zinc-bearing materials.

(ii) Lead base metals.

(iii) Cadmium-bearing filler materials.

(iv) Chromium-bearing metals or metals coated with chromium-bearing materials.

(2) Welding, cutting or heating in any enclosed spaces aboard the vessel involving the metals specified in this subparagraph shall be performed with local exhaust ventilation in accordance with the requirements of paragraph (a) of this section or employees shall be protected by air line respirators in accordance with the requirements of § 1502.82(a).

(i) Metals containing lead, other than as an impurity, or metals coated with lead-bearing materials.

(ii) Cadmium-bearing or cadmium coated base metals.

(iii) Metals coated with mercury-bearing metals.

(iv) Beryllium-containing base or filler metals.

Because of its high toxicity, work involving beryllium shall be done with both local exhaust ventilation and air line respirators.

(3) Employees performing such operations in the open air shall be protected by filter type respirators in accordance with the requirements of paragraphs (a) and (d)(2)(iv) of § 1502.82, except that employees performing such operations on beryllium-containing base or filler metals shall be protected by air line respirators in accordance with the requirements of § 1502.82(a).

(4) Other employees exposed to the same atmosphere as the welders or burners shall be protected in the same manner as the welder or burner.

(d) *Inert-gas metal-arc welding.* (1) Since the inert-gas metal-arc welding process involves the production of ultraviolet radiation of intensities of 5 to 30 times that produced during shielded metal-arc welding, the decomposition of chlorinated solvents by ultraviolet rays, and the liberation of toxic fumes and gases, employees shall not be permitted to engage in, or be exposed to the process until the following special precautions have been taken:

(i) The use of chlorinated solv shall be kept at least two hundred (feet from the exposed arc, and surf prepared with chlorinated solvents be thoroughly dry before welding is mitted on such surfaces.

(ii) Helpers and other employee the area not protected from the ar screening as provided in § 1502.3 shall be protected by filter lenses me the requirements of § 1502.81 (a) an When two or more welders are ex to each other's arc, filter lens gogg a suitable type meeting the requiren of § 1502.81 (a) and (c) shall be under welding helmets or hand sh to protect the welder against flashe radiant energy when either the h is lifted or the shield is removed.

(iii) Welders and other employee are exposed to radiation shall be sui protected so that the skin is co completely to prevent burns and damage by ultraviolet rays. We helmets and hand shields shall be of leaks and openings, and free of h reflective surfaces.

(iv) When inert-gas metal-arc ing is being performed on stainless the requirements of paragraph (c) this section shall be met to p against dangerous concentration nitrogen dioxide.

(e) *General welding, cutting and ing.* (1) Welding, cutting and he not involving conditions or materia scribed in paragraphs (b), (c) or this section may normally be done out mechanical ventilation or respir protective equipment, but where, be of unusual physical or atmospheric ditions, an unsafe accumulation of taminants exists, suitable mech ventilation or respiratory prot equipment shall be provided.

(2) Employees performing any t welding, cutting or heating shall b tected by suitable eye protective ment in accordance with the re ments of § 1502.81 (a) and (c).

[29 F.R. 4028, Mar. 27, 1964; 29 F.R May 8, 1964, as amended at 32 F.R. Oct. 10, 1967]

§ 1502.32 Fire prevention.[1]

(a) When practical, objects welded, cut or heated shall be mo

[1] 46 CFR 146.02-20 contains Coast regulations pertaining to welding and while explosives and dangerous carg being handled.

ircuit. Electrodes shall not be struck gainst a cylinder to strike an arc.

(3) Fuel gas cylinders shall be placed vith valve end up whenever they are in ıse. They shall not be placed in a ocation where they would be subject to ɔpen flame, hot metal, or other sources of artificial heat.

(4) Cylinders containing oxygen or acetylene or other fuel gas shall not be taken into confined spaces.

(c) *Treatment of cylinders.* (1) Cylinders, whether full or empty, shall not be used as rollers or supports.

(2) No person other than the gas supplier shall attempt to mix gases in a cylinder. No one except the owner of the cylinder or person authorized by him shall refill a cylinder. No one shall use a cylinder's contents for purposes other than those intended by the supplier. Only cylinders bearing Interstate Commerce Commission identification and inspection markings shall be used.

(3) No damaged or defective cylinder shall be used.

(d) *Use of fuel gas.* The employer shall thoroughly instruct employees in the safe use of fuel gas, as follows:

(1) Before connecting a regulator to a cylinder valve, the valve shall be opened slightly and closed immediately. (This action is generally termed "cracking" and is intended to clear the valve of dust or dirt that might otherwise enter the regulator). The person cracking the valve shall stand to one side of the outlet, not in front of it. The valve of a fuel gas cylinder shall not be cracked where the gas would reach welding work, sparks, flame or other possible sources of ignition.

(2) The cylinder valve shall always be opened slowly to prevent damage to the regulator. To permit quick closing, valves on fuel gas cylinders shall not be opened more than 1½ turns. When a special wrench is required, it shall be left in position on the stem of the valve while the cylinder is in use so that the fuel gas flow can be shut off quickly in case of an emergency. In the case of manifolded or coupled cylinders, at least one such wrench shall always be available for immediate use. Nothing shall be placed on top of a fuel gas cylinder, when in use, which may damage the safety device or interfere with the quick closing of the valve.

(3) Fuel gas shall not be used from cylinders through torches or other devices which are equipped with shut-off valves without reducing the pressure through a suitable regulator attached to the cylinder valve or manifold.

(4) Before a regulator is removed from a cylinder valve, the cylinder valve shall always be closed and the gas released from the regulator.

(5) If, when the valve on a fuel gas cylinder is opened, there is found to be a leak around the valve stem, the valve shall be closed and the gland nut tightened. If this action does not stop the leak, the use of the cylinder shall be discontinued, and it shall be properly tagged and removed from the vessel. In the event that fuel gas should leak from the cylinder valve rather than from the valve stem and the gas cannot be shut off, the cylinder shall be properly tagged and removed from the vessel. If a regulator attached to a cylinder valve will effectively stop a leak through the valve seat, the cylinder need not be removed from the vessel.

(6) If a leak should develop at a fuse plug or other safety device, the cylinder shall be removed from the vessel.

(e) *Fuel gas and oxygen manifolds.* (1) Fuel gas and oxygen manifolds shall bear the name of the substance they contain in letters at least one (1) inch high which shall be either painted on the manifold or on a sign permanently attached to it.

(2) Fuel gas and oxygen manifolds shall be placed in safe and accessible locations in the open air. They shall not be located within enclosed spaces.

(3) Manifold hose connections, including both ends of the supply hose that lead to the manifold, shall be such that the hose cannot be interchanged between fuel gas and oxygen manifolds and supply header connections. Adapters shall not be used to permit the interchange of hose. Hose connections shall be kept free of grease and oil.

(4) When not in use, manifold and header hose connections shall be capped.

(5) Nothing shall be placed on top of a manifold, when in use, which will damage the manifold or interfere with the quick closing of the valves.

(f) *Hose.* (1) Fuel gas hose and oxygen hose shall be easily distinguishable from each other. The contrast may be made by different colors or by surface characteristics readily distinguishable by the sense of touch. Oxygen and fuel gas hoses shall not be interchangeable. A single hose having more than one gas passage, a wall failure of which would permit the flow of one gas into the other gas passage, shall not be used.

(2) When parallel sections of oxygen and fuel gas hose are taped together, not more than 4 inches out of 8 inches shall be covered by tape.

(3) All hose carrying acetylene, oxygen, natural or manufactured fuel gas, or any gas or substance which may ignite or enter into combustion or be in any way harmful to employees, shall be inspected at the beginning of each shift. Defective hose shall be removed from service.

(4) Hose which has been subjected to flashback or which shows evidence of severe wear or damage shall be tested to twice the normal pressure to which it is subject, but in no case less than two hundred (200) psi. Defective hose or hose in doubtful condition shall not be used.

(5) Hose couplings shall be of the type that cannot be unlocked or disconnected by means of a stralght pull without rotary motion.

(6) Boxes used for the stowage of gas hose shall be ventilated.

(g) *Torches.* (1) Clogged torch tip openings shall be cleaned with suitable cleaning wires, drills or other devices designed for such purpose.

(2) Torches shall be inspected at the beginning of each shift for leaking shut-off valves, hose couplings, and tip connections. Defective torches shall not be used.

(3) Torches shall be lighted by friction lighters or other approved devices, and not by matches or from hot work.

(h) *Pressure regulators.* Oxygen and fuel gas pressure regulators including their related gauges shall be in proper working order while in use.

[29 F.R. 4028, Mar. 27, 1964; 29 F.R. 6089, May 8, 1964, as amended at 32 F.R. 14048, Oct. 10, 1967]

§ 1502.36 Arc welding and cutting.

(a) *Manual electrode holders.* (1) only manual electrode holders which are specifically designed for arc welding and cutting and are of a capacity capable of safely handling the maximum rated current required by the electrodes shall be used.

(2) Any current carrying parts passing through the portion of the holder which the arc welder or cutter grips in his hand, and the outer surfaces of the jaws of the holder, shall be fully insulated against the max[illegible]n vol countered to ground.

(b) *Welding cables and cor* (1) All arc welding and cuttin shall be of the completely ir flexible type, capable of hand maximum current requirement work in progress, taking into acc duty cycle under which the ar or cutter is working.

(2) Only cable free from r splices for a minimum distanc (10) feet from the cable end t the electrode holder is connect be used, except that cables witl ard insulated connectors or wit whose insulating quality is equa of the cable are permitted.

(3) When it becomes nece connect or splice lengths of cab another, substantial insulated tors of a capacity at least equi that of the cable shall be used. nections are effected by means lugs, they shall be securely together to give good electrical and the exposed metal parts of shall be completely insulated.

(4) Cables in poor repair sha used. When a cable, other t cable lead referred to in subp (2) of this paragraph, becomes the extent of exposing bare co the portion thus exposed shall tected by means of rubber and tapes or other equivalent insul

(c) *Ground returns and grounding.* (1) A ground retu shall have a safe current carr pacity equal to or exceeding the maximum output capacity of welding or cutting unit which it When a single ground return ca ices more than one unit, its saf carrying capacity shall equal c the total specified maximum capacities of all the units whic ices.

(2) Structures or pipe line pipe lines containing gases or fl liquids or conduits containing circuits, may be used as par ground return circuit, provided pipe or structure has a current capacity equal to that required paragraph (1) of this paragra

(3) When a structure or pi employed as a ground retur it shall be determined that the electrical contact exists at a The generation of an arc, spark at any point shall cause rejecti

...shall ... of not less than 1⅝ x 2¾ inch lumber.

(4) Trestle ladders and base sections of extension trestle ladders shall be so spread that when in an open position the spread of the trestle at the bottom, inside to inside, shall be not less than 5½ inches per foot of the length of the ladder.

(5) The width between the side rails at the bottom of the trestle ladder or of the base section of the extension trestle ladder shall be not less than 21 inches for all ladders and sections 6 feet or less in length. For longer lengths of ladder the width shall be increased at least 1 inch for each additional foot of length. The width between the side rails of the extension section of the trestle ladder shall be not less than 12 inches.

(6) In order to limit spreading, the top ends of the side rails of both the trestle ladder and of the base section of the extension trestle ladder shall be beveled, or of equivalent construction, and shall be provided with a metal hinge.

(7) A metal spreader or locking device to hold the front and back sections in an open position, and to hold the extension section securely in the elevated position, shall be a component of each trestle ladder or extension trestle ladder.

(8) Rungs shall be parallel and level. On the trestle ladder, or on the base section of the extension trestle ladder, rungs shall be spaced not less than 8 inches nor more than 18 inches apart; on the extension section of the extension trestle ladder, rungs shall be spaced not less than 6 inches nor more than 12 inches apart.

(9) Platform planking shall be in accordance with the requirements of paragraph (h) of this section, except that the width of the platform planking shall not exceed the distance between the siderails.

(10) Backrails and toeboards shall be in accordance with the requirements of paragraph (i) of this section.

(e) *Painters' suspended scaffolds.* (1) The supporting hooks of swinging scaffolds shall be constructed to be equivalent in strength to mild steel or wrought iron, shall be forged with care, shall be not less than ⅞ inch in diameter, and shall be secured to a safe anchorage at all times.

(2) The ropes supporting a swinging scaffold shall be equivalent in strength to first-grade ¾ inch diameter manila rope properly rigged into a set of standard 6 inch blocks consisting of at least one double and one single block.

(3) Manila and wire ropes shall be carefully examined before each operation and thereafter as frequently as may be necessary to ensure their safe condition.

(4) Each end of the scaffold platform shall be supported by a wrought iron or mild steel stirrup or hanger, which in turn is supported by the suspension ropes.

(5) Stirrups shall be constructed so as to be equivalent in strength to wrought iron ¾ inch in diameter.

(6) The stirrups shall be formed with a horizontal bottom member to support the platform, shall be provided with means to support the guardrail and midrail and shall have a loop or eye at the top for securing the supporting hook on the block.

(7) Two or more swinging scaffolds shall not at any time be combined into one by bridging the distance between them with planks or any other form of platform.

(8) No more than two men shall be permitted to work at one time on a swinging scaffold built to the minimum specifications contained in this paragraph. Where heavier construction is used, the number of men permitted to work on the scaffold shall be determined by the size and the safe working load of the scaffold.

(9) Backrails and toeboards shall be in accordance with the requirements of paragraph (i) of this section.

(10) The swinging scaffold platform shall be one of the three types described in subparagraphs (11), (12) and (13) of this paragraph.

(11) The ladder-type platform consists of boards upon a horizontal ladder-like structure, referred to herein as the ladder, the side rails of which are parallel. If this type of platform is used the following requirements shall be met:

(i) The width between the side rails shall be no more than 20 inches.

(ii) The side rails of ladders in ladder-type platforms shall be equivalent in strength to a beam of clear straight-grained spruce of the dimensions contained in Table E-2 in § 1502.68.

(iii) The side rails shall be tied together with tie rods. The tie rods shall be not less than ⅜ inch in diameter, located no more than 5 feet apart, pass through the rails, and be riveted up tight against washers at both ends.

(iv) The rungs shall be of straight-grained oak, ash, or hickory, not less than 1⅛ inches diameter, with ⅞ inch tenons mortised into the side rails not less than ⅞ inch and shall be spaced no more than 18 inches on centers.

(v) Flooring strips shall be spaced no more than ⅝ inch apart except at the side rails, where 1 inch spacing is permissible.

(vi) Flooring strips shall be cleated on their undersides.

(12) The plank-type platform consists of planks supported on the stirrups or hangers. If this type of platform is used, the following requirements shall be met:

(i) The planks or plank-type platforms shall be of not less than 2 x 10 inch lumber.

(ii) The platform shall be no more than 24 inches in width.

(iii) The planks shall be tied together by cleats of not less than 1 x 6 inch lumber, nailed on their undersides at intervals of not more than 4 feet.

(iv) The planks shall extend not less than 6 inches nor more than 18 inches beyond the supporting stirrups.

(v) A cleat shall be nailed across the platform on the underside at each end outside the stirrup to prevent the platform from slipping off the stirrup.

(vi) Stirrup supports shall be not more than 10 feet apart.

(13) The beam-type platform consists of longitudinal side stringers with cross beams set on edge and spaced not more than 4 feet apart on which longitudinal platform planks are laid. If this type platform is used the following requirements shall be met:

(i) The side stringers shall be of sound, straight-grained lumber, free from knots, and of not less than 2 x 6 inch lumber, set on edge.

(ii) The stringers shall be supported on the stirrups with a clear span between stirrups of not more than 16 feet.

(iii) The stringers shall be bolted to the stirrups by U-bolts passing around the stirrups and bolted through the stringers with nuts drawn up tight on the inside face.

(iv) The ends of the stringers shall extend beyond the stirrups not less than 6 inches nor more than 12 inches at each end of the platform.

(v) The platform shall be supported on cross beams of 2 x 6 inch lumber between the side stringers securely nailed thereto and spaced not more than 4 feet on centers.

(vi) The platform sha... than 24 inches wide.

(vii) The platform sha... boards ⅞ inch in thickn... than 6 inches in width, ... together, and extending ... face of the stringers.

(viii) The ends of all pl... shall rest on the top of th... shall be securely nailed, ar... mediate points in the lengt... form shall there be any ca...

(f) *Horse scaffolds.* (1) ... dimensions of lumber usec... struction of horses shall be ... with Table E-3 in § 1502.6...

(2) Horses constructed ... other than lumber shall ... strength, rigidity and secu... of horses constructed of lu...

(3) The lateral spread of t... be equal to not less than ... the height of the horse.

(4) All horses shall be kep... pair, and shall be properly se... used in staging or in locat... they may be insecure.

(5) Platform planking sha... cordance with the requiremer... graph (h) of this section.

(6) Backrails and toeboard... accordance with paragraph ... section.

(g) *Other types of sca...* Scaffolds of a type for whic... tions are not contained in t... shall meet the general requi... paragraphs (a), (h) and (i) ... tion, shall be in accordance ... nized principles of design ar... constructed in accordance wit... standards covering such equi...

(h) *Scaffold or platform ...* (1) Except as otherwise p... paragraph (e) (11) and (1... section, platform planking s... not less than 2 x 10 inch lum... form planking shall be straig... and free from large or loose ... may be either rough or dresse...

(2) Platforms of staging sl... less than two 10 inch plank... except in such cases as the s... the vessel or the width of ... ladders make it impossible ... such a width.

(3) Platform planking sh... beyond the supporting membe... end by at least 6 inches but ... shall project more than 12 inc... the planks are fastened to the ... members.

structure as a ground circuit.

(4) When a structure or pipe line is continuously employed as a ground return circuit, all joints shall be bonded, and periodic inspections shall be conducted to ensure that no condition of electrolysis or fire hazard exists by virtue of such use.

(5) The frames of all arc welding and cutting machines shall be grounded either through a third wire in the cable containing the circuit conductor or through a separate wire which is grounded at the source of the current. Grounding circuits, other than by means of the vessel's structure, shall be checked to ensure that the circuit between the ground and the grounded power conductor has resistance low enough to permit sufficient current to flow to cause the fuse or circuit breaker to interrupt the current.

(6) All ground connections shall be inspected to ensure that they are mechanically strong and electrically adequate for the required current.

(d) *Operating instructions.* Employers shall instruct employees in the safe means of arc welding and cutting as follows:

(1) When electrode holders are to be left unattended, the electrodes shall be removed and the holders shall be so placed or protected that they cannot make electrical contact with employees or conducting objects.

(2) Hot electrode holders shall not be dipped in water, since to do so may expose the arc welder or cutter to electric shock.

(3) When the arc welder or cutter has occasion to leave his work or to stop work for any appreciable length of time, or when the arc welding or cutting machine is to be moved, the power supply switch to the equipment shall be opened.

(4) Any faulty or defective equipment shall be reported to the supervisor.

(e) *Shielding.* Whenever practicable, all arc welding and cutting operations shall be shielded by noncombustible or flame-proof screens which will protect employees and other persons working in the vicinity from the direct rays of the arc.

[29 F.R. 4028, Mar. 27, 1964; 29 F.R. 6089, May 8, 1964, as amended at 32 F.R. 14048, Oct. 10, 1967]

§ 1502.37 Uses of fissionable material in shipbuilding.

(a) In shipbuilding and related activities involving the use of an exposure to sources of ionizing radiation not only on conventionally powered but also on nuclear powered vessels, the applicable provisions of the Atomic Energy Commission's Standards for Protection Against Radiation (10 CFR Part 20), relating to protection against occupational radiation exposure, shall apply.

(b) Any activity which involves the use of radioactive material, whether or not under license from the Atomic Energy Commission, shall be performed by competent persons specially trained in the proper and safe operation of such equipment. In the case of materials used under Commission license, only persons actually licensed, or competent persons under direction and supervision of the licensee, shall perform such work.

Subpart E—Scaffolds, Ladders and Other Working Surfaces

§ 1502.41 Scaffolds or staging.

(a) *General requirements.* (1) All scaffolds and their supports, whether of lumber, steel or other material, shall be capable of supporting the load they are designed to carry with a safety factor of not less than four (4).

(2) All lumber used in the construction of scaffolds shall be spruce, fir, long leaf yellow pine, Oregon pine or wood of equal strength. The use of hemlock, short leaf yellow pine or short fiber lumber is prohibited.

(3) Lumber dimensions as given in this subpart are nominal except where given in fractions of an inch.

(4) All lumber used in the construction of scaffolds shall be sound, straight-grained, free from cross grain, shakes and large, loose or dead knots. It shall also be free from dry rot, large checks, worm holes or other defects which impair its strength or durability.

(5) Scaffolds shall be maintained in a safe and secure condition. Any component of the scaffold which is broken, burned or otherwise defective shall be replaced.

(6) Barrels, boxes, cans, loose bricks, or other unstable objects shall not be used as working platforms or for the support of planking intended as scaffolds or working platforms.

(7) No scaffolds shall be erected, moved, dismantled or altered except under the supervision of competent persons.

(8) No welding, burning, riveting or open flame work shall be performed on any staging suspended by means of fiber rope.

(9) Lifting bridles on working platforms suspended from cranes shall consist of four legs so attached that the stability of the platform is assured.

(10) Unless the crane hook has a safety latch or is moused, the lifting bridles on working platforms suspended from cranes shall be attached by shackles to the lower lifting block or other positive means shall be taken to prevent them from becoming accidentally disengaged from the crane hook.

(b) *Independent pole wood scaffolds.* (1) All pole uprights shall be set plumb. Poles shall rest on a foundation of sufficient size and strength to distribute the load and to prevent displacement.

(2) In light-duty scaffolds not more than 24 feet in height, poles may be spliced by overlapping the ends not less than 4 feet and securely nailing them together. A substantial cleat shall be nailed to the lower section to form a support for the upper section except when bolted connections are used.

(3) All other poles to be spliced shall be squared at the ends of each splice, abutted, and rigidly fastened together by not less than two cleats securely nailed or bolted thereto. Each cleat shall overlap each pole end by at least 24 inches and shall have a width equal to the face of the pole to which it is attached. The combined cross sectional area of the cleats shall be not less than the cross sectional area of the pole.

(4) Ledgers shall extend over two consecutive pole spaces and shall overlap the poles at each end by not less than 4 inches. They shall be left in position to brace the poles as the platform is raised with the progress of the work. Ledgers shall be level and shall be securely nailed or bolted to each pole and shall be placed against the inside face of each pole.

(5) All bearers shall be set with their greater dimension vertical and shall extend beyond the ledgers upon which they rest.

(6) Diagonal bracing shall be provided between the parallel poles, and cross bracing shall be provided between the inner and outer poles or from the outer poles to the ground.

(7) Minimum dimensions and spacing of members shall be in accordance with Table E-1 in § 1502.68.

(8) Platform planking shall be in accordance with the requirements of paragraph (h) of this section.

(9) Backrails and toeboards shall be

in accordance with the [illegible]ffer paragraph (i) of this section.

(c) *Independent pole metal s*

(1) Metal scaffold members [illegible] maintained in good repair and corrosion.

(2) All vertical and horizonta[illegible] bers shall be fastened together coupler or locking device which w[illegible] a positive connection. The lock[illegible] vice shall be of a type which loose parts.

(3) Posts shall be kept plumb erection and the scaffold shall sequently kept plumb and rigid b[illegible] of adequate bracing.

(4) Posts shall be fitted wit[illegible] supported on a firm foundation tribute the load. When wooden used, the bases shall be fastened

(5) Bearers shall be located at of posts, at each level, and at eac[illegible] mediate level where working pl[illegible] are installed.

(6) Tubular bracing shall be both lengthwise and crosswise quired.

(7) Platform planking shall accordance with the requirem[illegible] paragraph (h) of this section.

(8) Backrails and toeboards [illegible] in accordance with the requiren[illegible] paragraph (i) of this section.

(d) *Wood trestle and extensio[illegible] ladders.* (1) The use of trestle[illegible] or extension sections or base sec[illegible] extension trestle ladders longer[illegible] feet is prohibited. The total h[illegible] base and extension may, howe[illegible] more than 20 feet.

(2) The minimum dimensions side rails of the trestle ladder, base sections of the extension ladder, shall be as follows:

(i) Ladders up to and includin[illegible] 16 feet long shall have side rails less than 1⅝ x 2¾ inch lumber.

(ii) Ladders over 16 feet long to and including those 20 feet lor[illegible] have side rails of not less than [illegible] inch lumber.

(3) The side rails of the ex[illegible] section of the extension trestle shall be parallel and shall have mi[illegible] dimensions as follows:

(i) Ladders up to and including[illegible] long shall have side rails of not le[illegible] 1⅝ x 2¼ inch lumber.

(ii) Ladders over 12 feet long [illegible] to and including those 16 feet lon[illegible] have side rails of not less than 1⅝ inch lumber.

(iii) Ladders over 16 feet long

(4) Table E–4 in § 1502.68 shall be used as a guide in determining safe loads for scaffold planks.

(i) *Backrails and toeboards.* (1) Scaffolding, staging, runways, or working platforms which are supported or suspended more than 5 feet above a solid surface, or at any distance above the water, shall be provided with a railing which has a top rail whose upper surface is from 42 to 45 inches above the upper surface of the staging, platform, or runway and a midrail located halfway between the upper rail and the staging, platform, or runway.

(2) Rails shall be of 2 x 4 inch lumber, flat bar or pipe. When used with rigid supports, taut wire or fiber rope of adequate strength may be used. If the distance between supports is more than 8 feet, rails shall be equivalent in strength to 2 x 4 inch lumber. Rails shall be firmly secured. Where exposed to hot work or chemicals, fiber rope rails shall not be used.

(3) Rails may be omitted where the structure of the vessel prevents their use. When rails are omitted employees working more than 5 feet above solid surfaces shall be protected by safety belts and life lines meeting the requirements of § 1502.84(b), and employees working over water shall be protected by buoyant work vests meeting the requirements of § 1502.84(a).

(4) Employees working from swinging scaffolds which are triced out of a vertical line below their supports or from scaffolds on paint floats subject to surging, shall be protected against falling toward the vessel by a railing or a safety belt and line attached to the backrail.

(5) When necessary, to prevent tools and materials from falling on men below, toeboards of not less than 1 x 4 inch lumber shall be provided.

(j) *Access to staging.* (1) Access from below to staging more than 5 feet above a floor, deck or the ground shall consist of well secured stairways, cleated ramps, fixed or portable ladders meeting the applicable requirements of § 1502.42 or rigid type non-collapsible trestles with parallel and level rungs.

(2) Ramps and stairways shall be provided with 36-inch handrails with midrails.

(3) Ladders shall be so located or other means shall be taken so that it is not necessary for employees to step more than one foot from the ladder to any intermediate landing or platform.

(4) Ladders forming integral parts of prefabricated staging are deemed to meet the requirements of these regulations.

(5) Access from above to staging more than 3 feet below the point of access shall consist of a straight, portable ladder meeting the applicable requirements of § 1502.42 or a Jacob's ladder properly secured, meeting the requirements of § 1502.44(d).

[29 F.R. 4028, Mar. 27, 1964; 29 F.R. 6089, May 8, 1964, as amended at 32 F.R. 14048, Oct. 10, 1967]

§ 1502.42 Ladders.

(a) *General requirements.* (1) The use of ladders with broken or missing rungs or steps, broken or split side rails, or other faulty or defective construction is prohibited. When ladders with such defects are discovered, they shall be immediately withdrawn from service. Inspection of metal ladders shall include checking for corrosion of interiors of open end, hollow rungs.

(2) When sections of ladders are spliced, the ends shall be abutted, and not fewer than 2 cleats shall be securely nailed or bolted to each rail. The combined cross sectional area of the cleats shall be not less than the cross sectional area of the side rail. The dimensions of side rails for their total length shall be those specified in paragraphs (b) or (c) of this section.

(3) Portable ladders shall be lashed, blocked or otherwise secured to prevent their being displaced. The side rails of ladders used for access to any level shall extend not less than 36 inches above that level. When this is not practical, grab rails which will provide a secure grip for an employee moving to or from the point of access shall be installed.

(4) Portable metal ladders shall be of strength equivalent to that of wood ladders. Manufactured portable metal ladders provided by the employer shall be in accordance with the provisions of the United States of America Standard Safety Code for Portable Metal Ladders, A14.2.

(5) Portable metal ladders shall not be used near electrical conductors nor for electric arc welding operations.

(6) Manufactured portable wood ladders provided by the employer shall be in accordance with the provisions of the United States of America Standard Safety Code for Portable Wood Ladders, A14.1

(b) *Construction of portable wood cleated ladders up to 30 feet in length.* (1) Wood side rails shall be made from West Coast hemlock, Eastern spruce, Sitka spruce, or wood of equivalent strength. Material shall be seasoned, straight-grained wood, and free from shakes, checks, decay or other defects which will impair its strength. The use of low density woods is prohibited.

(2) Side rails shall be dressed on all sides, and kept free of splinters.

(3) All knots shall be sound and hard. The use of material containing loose knots is prohibited. Knots shall not appear on the narrow face of the rail and, when in the side face, shall be not more than ½ inch in diameter or within ½ inch of the edge of the rail or nearer than 3 inches to a tread or rung.

(4) Pitch pockets not exceeding ⅛ inch in width, 2 inches in length and ½ inch in depth are permissible in wood side rails, provided that not more than one such pocket appears in each 4 feet of length.

(5) The width between side rails at the base shall be not less than 11½ inches for ladders 10 feet or less in length. For longer ladders this width shall be increased at least ¼ inch for each additional 2 feet of length.

(6) Side rails shall be at least 1⅝ x 3⅝ inches in cross section.

(7) Cleats (meaning rungs rectangular in cross section with the wide dimension parallel to the rails) shall be of the material used for side rails, straight-grained and free from knots. Cleats shall be mortised into the edges of the side rails ½ inch, or filler blocks shall be used on the rails between the cleats. The cleats shall be secured to each rail with three 10d common wire nails or fastened with through bolts or other fasteners of equivalent strength. Cleats shall be uniformly spaced not more than 12 inches apart.

(8) Cleats 20 inches or less in length shall be at least $25/32$ x 3 inches in cross section. Cleats over 20 inches but not more than 30 inches in length shall be at least $25/32$ x 3¾ inches in cross section.

(c) *Construction of portable wood cleated ladders from 30 to 60 feet in length.* (1) Ladders from 30 to 60 feet in length shall be in accordance with the specifications of paragraph (b) of this section with the following exceptions:

(i) Rails shall be of not less than 2 x 6 inch lumber.

(ii) Cleats shall be of not less 1 x 4 inch lumber.

(iii) Cleats shall be nailed to eacl with five 10d common wire nai fastened with through bolts or fastenings of equivalent strength.

[29 F.R. 4028, Mar. 27, 1964; 29 F.R. May 8, 1964, as amended at 32 F.R. Oct. 10, 1967]

§ 1502.43 Guarding of deck ope and edges.

(a) When employees are workir the vicinity of flush manholes and small openings of comparable size i deck and other working surfaces, openings shall be suitably covere guarded to a height of not less 30 inches, except where the use of guards is made impracticable by the actually in progress.

(b) When employees are wor around open hatches not protecte coamings to a height of 24 inche around other large openings, the of the opening shall be guarded ir working area to a height of 36 t inches, except where the use of guards is made impracticable by work actually in progress.

(c) When employees are expose unguarded edges of decks, platfc flats, and similar flat surfaces, more 5 feet above a solid surface, the e shall be guarded by adequate guard meeting the requirements of § 1502. (1) and (2), unless the nature of the in progress or the physical condi prohibit the use or installation of guardrails.

(d) When employees are working the unguarded edges of decks of ve afloat, they shall be protected by buo work vests, meeting the requiremen § 1502.84(a).

(e) Section of bilges in which plates or gratings have not been inst shall be guarded by guardrails ex where they would interfere with the in progress. If these open sections ar a walkway at least two 10-inch pl placed side by side, or equivalent, sha laid across the opening to provide a walking surface.

(f) Gratings, walkways, and catwa in which sections of gratings and lad have not been installed shall be ba caded with adequate guardrails.

[29 F.R. 4028, Mar. 27, 1964; 29 F.R. May 8, 1964, as amended at 32 F.R. 1 Oct. 10, 1967]

§ 1502.44 Access to vessels.

(a) *Access to vessels afloat.* The employer shall not permit employees to board or leave any vessel, except a barge or river towboat, until the following requirements have been met:

(1) Whenever practicable, a gangway of not less than 20 inches walking surface, of adequate strength, maintained in safe repair and safely secured shall be used. If a gangway is not practicable, a substantial straight ladder, extending at least 36 inches above the upper landing surface and adequately secured against shifting or slipping shall be provided. When conditions are such that neither a gangway nor a straight ladder can be used, a Jacob's ladder meeting the requirements of paragraph (d) (1) and (2) of this section may be used.

(2) Each side of such gangway, and the turn table if used, shall have a railing with a minimum height of approximately 33 inches measured perpendicularly from rail to walking surface at the stanchion, with mid rail. Rails shall be of wood, pipe, chain, wire, or rope and shall be kept taut at all times.

(3) The gangway shall be kept properly trimmed at all times.

(4) When a fixed tread accommodation ladder is used, and the angle is low enough to require employees to walk on the edge of the treads, cleated duckboards shall be laid over and secured to the ladder.

(5) When the lower end of a gangway overhangs the water between the ship and the dock in such a manner that there is danger of employees falling between the ship and the dock, a net or other suitable protection shall be rigged at the foot of the gangway in such a manner as to prevent employees from falling from the end of the gangway.

(6) If the foot of the gangway is more than one foot away from the edge of the apron, the space between them shall be bridged by a firm walkway equipped with railings, with a minimum height of approximately 33 inches with mid rails on both sides.

(7) Supporting bridles shall be kept clear so as to permit unobstructed passage for employees using the gangway.

(8) When the upper end of the means of access rests on or flush with the top of the bulwark, substantial steps properly secured and equipped with at least one substantial handrail approximately 33 inches in height shall be provided between the top of the bulwark and the deck.

(9) Obstructions shall not be laid on or across the gangway.

(10) The means of access shall be adequately illuminated for its full length.

(11) Loads shall not be passed over the means of access while employees are on it.

(b) *Access to vessels in drydock or between vessels.* Gangways meeting the requirements of paragraph (a) (1), (2), (8), (9) and (10) of this section shall be provided for access from wing wall to vessel or, when two or more vessels, other than barges or river towboats, are lying abreast, from one vessel to another.

(c) *Access to barges and river towboats.* (1) Ramps for access of vehicles to or between barges shall be of adequate strength, provided with side boards, well maintained and properly secured.

(2) Unless employees can step safely to or from the wharf, float, barge, or river towboat, either a ramp in accordance with the requirements of subparagraph (1) of this paragraph or a safe walkway in accordance with the requirements of paragraph (a) (7) of this section shall be provided. When a walkway is impracticable, a substantial ladder, extending at least 36 inches above the upper landing surface and adequately secured against shifting or slipping shall be provided. When conditions are such that neither a walkway nor a straight ladder can be used, a Jacob's ladder in accordance with the requirements of paragraph (d) of this section may be used.

(3) The means of access shall be in accordance with the requirements of paragraph (a) (8), (9) and (10) of this section.

(d) *Jacob's ladders.* (1) Jacob's ladders shall be of the double rung or flat tread type. They shall be well maintained and properly secured.

(2) A Jacob's ladder shall either hang without slack from its lashings or be pulled up entirely.

§ 1502.45 Access to and guarding of drydocks and marine railways.

(a) A gangway, ramp or permanent stairway of not less than 20 inches walking surface, of adequate strength, maintained in safe repair and securely fastened, shall be provided between a floating dry dock and the pier or bulkhead.

(b) Each side of such gangway, ramp or permanent stairway, including those which are used for access to wing walls from dry dock floors, shall have a railing with a mid rail. Such railings on gangways or ramps shall be approximately 42 inches in height; and railings on permanent stairways shall be not less than approximately 30 or more than approximately 34 inches in height. Rails shall be of wood, pipe, chain, wire, or rope and shall be kept taut at all times.

(c) Railings meeting the requirements of paragraph (b) of this section shall be provided on the means of access to and from the floors of graving docks.

(d) Railings approximately 42 inches in height, with a mid rail, shall be provided on the edges of wing walls of floating dry docks and on the edges of graving docks. Sections of the railings may be temporarily removed where necessary to permit line handling while a vessel is entering or leaving the dock.

(e) When employees are working on the floor of a floating dry dock where they are exposed to the hazard of falling into the water, the end of the dry dock shall be equipped with portable stanchions and 42-inch railings with a mid rail. When such a railing would be impracticable or ineffective, other effective means shall be provided to prevent men from falling into the water.

(f) Access to wingwalls from floors of dry docks shall be by ramps, permanent stairways or ladders meeting the applicable requirements of § 1502.42.

(g) Catwalks on stiles of marine railways shall be no less than 20 inches wide and shall have on at least one side a guardrail and midrail meeting the requirements of § 1502.41(1) (1) and (2).

[29 F.R. 4002, Mar. 27, 1964; 29 F.R. 6089, May 8, 1964, as amended at 32 F.R. 14049, Oct. 10, 1967]

§ 1502.46 Access to cargo spaces and confined spaces.

(a) *Cargo spaces.* (1) There shall be at least one safe and accessible ladder in any cargo space which employees must enter.

(2) When any fixed ladder is visibly unsafe, the employer shall prohibit its use by employees.

(3) Straight ladders of adequate strength and suitably secured against shifting or slipping shall be provided as necessary when fixed ladders in cargo

spaces do not meet the requiren
subparagraph (1) of this pa
When conditions are such that a
ladder cannot be used, a Jacob'
meeting the requirements of § 15
may be used.

(4) Fixed ladders or straight
provided for access to cargo spac
not be used at the same time tha
ment, materials or other loa
entering or leaving the hold.
using these ladders to enter or le
hold, the employee shall be req
inform the winchman or the
signalman of his intention.

(b) *Confined spaces.* (1) Mo
one means of access shall be pro
a confined space in which emplo
working and in which the wo
generate a hazardous atmospher
space except where the structure
rangement of the vessel makes t
vision impractical.

(2) When the ventilating du
quired by these regulations mu
through these means of access, th
shall be of such a type and so a
as to permit free passage to an e
through at least two of these m
access.

§ 1502.47 Working surfaces.

(a) When firebox floors prese
ping hazards of exposed tubing
missing or removed refractory, s
planking to afford safe footing
laid while work is being carried or
the boiler.

(b) When employees are workir
or elsewhere at elevations more
feet above a solid surface, either s
or a sloping ladder, meeting the
ments of this subpart, shall be
afford safe footing, or the employe
be protected by safety belts and
meeting the requirements of § 150
Employees visually restricted by
hoods, welding helmets, and
goggles shall work from scaffol
from ladders, except for the initi
final welding or burning opera
start or complete a job, such as t
tion and dismantling of hung scaf
or other similar, nonrepetitive
brief duration.

(c) For work performed in re
quarters, such as behind boilers
between congested machinery ur
piping, work platforms at least 2(
wide meeting the requireme
§ 1502.41(h) (1) shall be used. B
may be omitted if bulkheading,

machinery units, or piping afford proper protection against falling.

(d) When employees are boarding, leaving, or working from small boats or floats, they shall be protected by buoyant work vests meeting the requirements of § 1502.84(a).

[32 F.R. 14049, Oct. 10, 1967]

Subpart F—General Working Conditions

§ 1502.51 Housekeeping.

(a) Good housekeeping conditions shall be maintained at all times. Adequate aisles and passageways shall be maintained in all work areas. All staging platforms, ramps, stairways, walkways, aisles, and passageways on vessels or drydocks shall be kept clear of all tools, materials, and equipment except that which is in use, and all debris such as welding rod tips, bolts, nuts, and similar material. Hose and electric conductors shall be elevated over or placed under the walkway or working surfaces or covered by adequate crossover planks.

(b) All working areas on vessels and dry docks shall be kept reasonably free of debris, and construction material shall be so piled as not to present a hazard to employees.

(c) Slippery conditions on walkways or working surfaces shall be eliminated as they occur.

(d) Free access shall be maintained at all times to all exits and to all fire-alarm boxes or fire-extinguishing equipment.

(e) All oils, paints, thinners, solvents, waste, rags, or other flammable substances shall be kept in fire resistant covered containers when not in use.

[29 F.R. 4028, Mar. 27, 1964; 29 F.R. 6089, May 8, 1964, as amended at 32 F.R. 14049, Oct. 10, 1967]

§ 1502.52 Illumination.

(a) All means of access and walkways leading to working areas as well as the working areas themselves shall be adequately illuminated.

(b) Temporary lights shall meet the following requirements:

(1) Temporary lights shall be equipped with guards to prevent accidental contact with the bulb, except that guards are not required when the construction of the reflector is such that the bulb is deeply recessed.

(2) Temporary lights shall be equipped with heavy duty electric cords with connections and insulation maintained in safe condition. Temporary lights shall not be suspended by their electric cords unless cords and lights are designed for this means of suspension. Splices which have insulation equal to that of the cable are permitted.

(3) Cords shall be kept clear of working spaces and walkways or other locations in which they are readily exposed to damage.

(c) Exposed non-current-carrying metal parts of temporary lights furnished by the employer shall be grounded either through a third wire in the cable containing the circuit conductors or through a separate wire which is grounded at the source of the current. Grounding shall be in accordance with the requirements of § 1502.72(b).

(d) Where temporary lighting from sources outside the vessel is the only means of illumination, portable emergency lighting equipment shall be available to provide illumination for safe movement of employees.

(e) Employees shall not be permitted to enter dark spaces without a suitable portable light. The use of matches and open flame lights is prohibited.

(f) Temporary lighting stringers or streamers shall be so arranged as to avoid overloading of branch circuits. Each branch circuit shall be equipped with overcurrent protection of capacity not exceeding the rated current carrying capacity of the cord used.

[29 F.R. 4028, Mar. 27, 1964; 29 F.R. 6089, May 8, 1964, as amended at 32 F.R. 14049, Oct. 10, 1967]

§ 1502.53 Utilities.

(a) *Steam supply and hoses.* (1) Prior to supplying a vessel with steam from a source outside the vessel, the employer shall install a pressure gauge and a relief valve of proper size and capacity at the point where the temporary steam hose joins the vessel's steam piping system or systems. The relief valve shall be set and capable of relieving at a pressure not exceeding the safe working pressure of the vessel's system in its present condition, and there shall be no means of isolating the relief valve from the system which it protects. The pressure gauge and relief valve shall be located so as to be visible and readily accessible.

(2) Steam hose and fittings shall have a safety factor of not less than five (5).

(3) When steam hose is hung in a bight or bights, the weight shall be relieved by appropriate lines. The hose shall be protected against chafing.

(4) Steam hose shall be protected from damage and hose and temporary piping shall be so shielded where passing through normal work areas as to prevent accidental contact by employees.

(b) *Electric power.* (1) When the vessel is supplied with electric power from a source outside the vessel, the following precautions shall be taken prior to energizing the vessel's circuits:

(i) If in dry dock, the vessel shall be adequately grounded.

(ii) The employer shall insure that all of the vessel's circuits to be energized are in a safe condition.

(iii) All circuits to be energized shall be equipped with overcurrent protection of capacity not exceeding the rated current carrying capacity of the cord used.

(c) *Infrared electrical heat lamps.* (1) All infrared electrical heat lamps shall be equipped with guards that surround the lamps with the exception of the face, to minimize accidental contact with the lamps.

[29 F.R. 4028, Mar. 27, 1964; 29 F.R. 6089, May 8, 1964, as amended at 32 F.R. 14049, Oct. 10, 1967]

§ 1502.54 Work in confined or isolated spaces.

When any work is performed in a confined space, except as provided in § 1502.-31(b)(3), or when an employee is working alone in an isolated location, frequent checks shall be made to ensure the safety of the employees.

§ 1502.55 Work on or in the vicinity of radar and radio.

(a) No employees other than radar or radio repairmen shall be permitted to work on masts, king posts or other aloft areas unless the radar and radio are secured or otherwise made incapable of radiation. In either event, the radio and radar shall be appropriately tagged.

(b) Testing of radar or radio shall not be done until the employer can schedule such tests at a time when no work is in progress aloft or personnel can be cleared from the danger area according to minimum safe distances established for and based on the type, model, and power of the equipment.

§ 1502.56 Work in or on lifeboats.

(a) Before employees are permitted to work in or on a lifeboat, either stowed or in a suspended position, [illegible] shall ensure that the boat is independently of the releasing prevent the boat from falling accidental tripping of the releas and movements of the davits or c of a boat in chocks.

(b) Employees shall not be p to remain in boats while the b being hoisted into final stowed

(c) Employees shall not be p to work on the outboard side boats stowed on their chocks u boats are secured by gripes or o secured to prevent them from outboard.

§ 1502.57 Health and sanitatio

(a) No chemical product, s solvent or preservative; no s material, such as cadmium or zi steel, or plastic material; and n material, such as welding fille which is a hazardous materi the meaning of § 1502.2(s), shal until the employer has ascerta potential fire, toxic, or reactivity which are likely to be encounter handling, application, or utili such a material.

(b) In order to ascertain the as required by paragraph (a) section, the employer shall ob following items of information v applicable to a specific produc terial to be used:

(1) The name, address, and t number of the source of the inf specified in this paragraph, p those of the manufacturer of th or material.

(2) The trade name and sync a mixture of chemicals, a basic s material, or for a process mate the chemical name and s chemical family, and formula fo chemical.

(3) Chemical names of haza gredients, including, but not li those in mixtures, such as thos Paints, preservatives, and solv alloys, metallic coatings, fille and their coatings or core flu (iii) other liquids, solids, or g abrasive materials).

(4) An indication of the pe by weight or volume, which eac ent of a mixture bears to the w ture, and of the threshold limi each ingredient, in appropriate

welds, deformation and increase in length or stretch.

(3) Interlink wear, not accompanied by stretch in excess of 5 percent, shall be noted and the chain removed from service when maximum allowable wear at any point of link, as indicated in Table G–9 in § 1502.68 has been reached.

(4) Chain slings shall be removed from service when, due to stretch, the increase in length of a measured section exceeds five (5) percent; when a link is bent, twisted or otherwise damaged; or when raised scarfs or defective welds appear.

(5) All repairs to chains shall be made under qualified supervision. Links or portions of the chain found to be defective as described in subparagraph (4) of this paragraph shall be replaced by links having proper dimensions and made of material similar to that of the chain. Before repaired chains are returned to service, they shall be proof tested to the proof test load recommended by the manufacturer.

(6) Wrought iron chains in constant use shall be annealed or normalized at intervals not exceeding six months when recommended by the manufacturer. The chain manufacturer shall be consulted for recommended procedures for annealing or normalizing. Alloy chains shall never be annealed.

(7) A load shall not be lifted with a chain having a kink or knot in it. A chain shall not be shortened by bolting, wiring or knotting.

§ 1502.63 Shackles and hooks.

(a) *Shackles.* (1) Table G–10 in § 1502.68 shall be used to determine the safe working loads of various sizes of shackles, except that higher safe working loads are permissible when recommended by the manufacturer for specific, identifiable products, provided that a safety factor of not less than five (5) is maintained.

(b) *Hooks.* (1) The manufacturer's recommendations shall be followed in determining the safe working loads of the various sizes and types of specific and identifiable hooks. All hooks for which no applicable manufacturer's recommendations are available shall be tested to twice the intended safe working load before they are initially put into use. The employer shall maintain a record of the dates and results of such tests.

(2) Loads shall be applied to the throat of the hook since loading the point overstresses and bends or springs the hook.

(3) Hooks shall be inspected periodically to see that they have not been bent by overloading. Bent or sprung hooks shall not be used.

§ 1502.64 Chain falls and pull-lifts.

(a) Chain falls and pull-lifts shall be clearly marked to show the capacity and the capacity shall not be exceeded.

(b) Chain falls shall be regularly inspected to ensure that they are safe, particular attention being given to the lift chain, pinion, sheaves and hooks for distortion and wear. Pull-lifts shall be regularly inspected to ensure that they are safe, particular attention being given to the ratchet, pawl, chain and hooks for distortion and wear.

(c) Straps, shackles, and the beam or overhead structure to which a chain fall or pull-lift is secured shall be of adequate strength to support the weight of load plus gear. The upper hook shall be moused or otherwise secured against coming free of its support.

(d) Scaffolding shall not be used as a point of attachment for lifting devices, such as tackles, chain falls, and pull-lifts unless the scaffolding is specifically designed for that purpose.

[29 F.R. 4028, Mar. 27, 1964; 29 F.R. 6089, May 8, 1964, as amended at 32 F.R. 14049, Oct. 10, 1967]

§ 1502.65 Hoisting and hauling equipment.

(a) Derrick and crane certification: (1) Derricks and cranes which are part of, or regularly placed aboard, barges, other vessels, or on wingwalls of floating drydocks, and are used to transfer materials or equipment from or to a vessel or drydock, shall be tested and certificated in accordance with the standards provided in Part 1505 of this chapter by persons accredited for that purpose.

(2) Subparagraph (1) of this paragraph shall take effect 180 days after the effective date of this amendment.

(b) The moving parts of hoisting and hauling equipment shall be guarded.

(c) Mobile crawler or truck cranes used on a vessel: (1) The maximum manufacturer's rated safe workingloads for the various working radii of the boom and the maximum and minimum radii at which the boom may be safely used with and without outriggers shall be conspicuously posted near the controls and shall be visible to the operator. A radius indicator shall be provided.

(2) The posted safe working loads of mobile crawler or truck cranes under the conditions of use shall not be exceeded.

(d) Accessible areas within the swing radius of the outermost part of the body of a revolving derrick or crane either permanently or temporarily mounted, shall be guarded in such a manner as to prevent an employee from being in such a position as to be struck by the crane or caught between the crane and fixed parts of the vessel or of the crane itself.

(e) Marine railways: (1) The cradle or carriage on the marine railway shall be positively blocked or secured when in the hauled position to prevent it from being accidentally released.

[32 F.R. 14049, Oct. 10, 1967]

§ 1502.66 Use of gear.

(a) Loads shall be safely rigged before being hoisted.

(b) Plates shall be handled on and off hulls by means of shackles whenever possible. Clips or pads of ample size shall be welded to the plate to receive the shackle pins when there are no holes in the plate. When it is not possible to make holes in or to weld pads to the plate, alligator tongs, grab hooks, grab clamps or screw clamps may be used. In such cases special precautions shall be taken to keep employees from under such lifts.

(c) Tag lines shall be provided on loads likely to swing or to need guidance.

(d) When slings are secured to eyebolts, the slings shall be so arranged, using spreaders if necessary, that the pull is within 20 degrees of the axis of the bolt.

(e) Slings shall be padded by means of wood blocks or other suitable material where they pass over sharp edges or corners of loads so as to prevent cutting or kinking.

(f) Skips shall be rigged to be handled by not less than 3 legged bridles, and all legs shall always be used. When open end skips are used, means shall be taken to prevent the contents from falling.

(g) Loose ends of idle legs of slings in use shall be hung on the hook.

(h) Employees shall not be permitted to ride the hook or the load.

(i) Loads (tools, equipment or materials) shall not be swung o pended over the heads of employe

(j) Pieces of equipment or str susceptible to falling or dislodg shall be secured as early as possible

(k) An individual who is familia the signal code in use shall be as to act as a signalman when the operator cannot see the load beinı dled. Communications shall be m means of clear and distinct vis auditory signals except that verb nals shall not be permitted.

(l) Pallets, when used, shall such material and construction maintained as to safely suppo carry the loads being handled on

(m) A section of hatch through materials or equipment are being lowered, moved, or otherwise manually or by a crane, winch, h derrick, shall be completely open beam or pontoon left in place a to an opening shall be sufficiently locked or otherwise secured to pr from being unshipped.

(n) Hatches shall not be ope closed while employees are in the of the hatch below.

(o) Before loads or empty lifti are raised, lowered, or swung, cl sufficient advance warning shall t to employees in the vicinity c operations.

(p) At no time shall an empl permitted to place himself in a ha position between a swinging loa fixed object

[29 F.R. 4028, Mar. 27, 1964; 29 F. May 8, 1964, as amended at 32 F Oct. 10, 1967]

§ 1502.67 Qualifications of oper

(a) When ship's gear is used materials aboard, a competent shall determine that the gear is r rigged that it is in safe conditi that it will not be overloaded by and weight of the lift.

(b) Only those employees whc stand the signs, notices, and o instructions, and are familiar v signal code in use, shall be perm operate a crane, winch, or othe operated hoisting apparatus.

(c) No employee known to have defective uncorrected eyesight or hearing, or to be suffering from heart disease, epilepsy, or similar ailments which may suddenly incapacitate him, shall be permitted to operate a crane, winch or other power operated hoisting apparatus.

(d) No minor under eighteen (18) years of age shall be employed in occupations involving the operation of any power-driven hoisting apparatus or assisting in such operations by work such as hooking on, loading slings, rigging gear, etc.

§ 1502.68 Tables.

TABLE E-1

DIMENSIONS AND SPACING OF WOOD INDEPENDENT-POLE SCAFFOLD MEMBERS

Structural Members	Light duty (Up to 25 pounds per square foot)			Heavy duty (25 to 75 pounds per square foot)		
	Height in feet			Height in feet		
	24 or less	24–40	40–60	24 or less	24–40	40–60
Poles or uprights (in inches)	2 x 4	3 x 4 or 2 x 6	4 x 4	3 x 4	4 x 4	4 x 6
Bearers (in inches)	2 x 6	2 x 6	2 x 6	2 x 8	2 x 8	2 x 10
Ledgers (in inches)	2 x 6	2 x 6	2 x 6	2 x 8	2 x 8	2 x 8
Stringers (not supporting bearers) (in inches)	1 x 6	1 x 6	1 x 6	1 x 6	1 x 6	1 x 6
Braces (in inches)	1 x 4	1 x 6	1 x 6	1 x 6	1 x 6	1 x 6
Pole spacing—longitudinally (in feet)	7½	7½	7½	7	7	7
Pole spacing—transversely (in feet)	6½ min	7½ min	8½ min	6½	10	10
Ledger spacing—vertically (in feet)	7	7	7	4½	4½	4½

TABLE E-2

SPECIFICATIONS FOR SIDE RAILS OF LADDERS

Length (in feet)	Cross section (in inches)	
	At ends	At center
16	1⅛ x 2¾	1⅛ x 3¾
16	1⅛ x 2¾	1⅛ x 3¾
18	1⅛ x 3	1⅛ x 4
20	1⅛ x 3	1⅛ x 4
24	1⅛ x 3	1⅛ x 4½

TABLE E-3

SPECIFICATIONS FOR THE CONSTRUCTION OF HORSES

Structural members	Height in feet		
	Up to 10	10 to 16	16 to 20
	Inches	*Inches*	*Inches*
Legs	2 x 4	3 x 4	4 x 6
Bearers or headers	2 x 6	2 x 8	4 x 6
Crossbraces	2 x 4 or 1 x 8	2 x 4	2 x 6
Longitudinal braces	2 x 4	2 x 6	2 x 6

TABLE E-4

SAFE CENTER LOADS FOR SCAFFOLD PLANK OF 1,100 POUNDS FIBRE STRESS

Span in Feet	Lumber dimensions in inches									
	A	B	A	B	A	B	A	B	A	B
	2 x 10	1⅝ x 9¼	2 x 12	1⅝ x 11¼	3 x 8	2⅝ x 7½	3 x 10	2⅝ x 9¼	3 x 12	2⅝ x 11¼
6	256	309	309	526	567	807				
8	192	232	395	395	500	605				
10	153	186	316	316	400	484				
12	128	155	263	263	333	404				
14	110	133	225	225	286	346				
16	-------	116	197	197	250	303				

(A)—Rough lumber.
(B)—Dressed lumber.

TABLE G-1
MANILA ROPE
(In pounds or tons of 2000 pounds)

Circumference	Diameter in Inches	Single Leg	60°	45°	30°
3/4	1/4	120 lbs.	204 lbs.	170 lbs.	120 lbs.
1	5/16	200	346	282	200
1-1/8	3/8	270	467	380	270
1-1/4	7/16	350	605	493	350
1-3/8	15/32	450	775	635	450
1-1/2	1/2	530	915	798	530
1-3/4	9/16	690	1190	973	690
2	5/8	880	1520	1240	880
2-1/4	3/4	1080	1870	1520	1080
2-1/2	13/16	1300	2250	1830	1300
2-3/4	7/8	1540	2660	2170	1540
3	1	1800	3120	2540	1800
3-1/4	1-1/16	1.0 Tons	1.7 Tons	1.4 Tons	1.0 To
3-1/2	1-1/8	1.2	2.1	1.7	1.2
3-3/4	1-1/4	1.35	2.3	1.9	1.35
4	1-5/16	1.5	2.6	2.1	1.5
4-1/2	1-1/2	1.8	3.1	2.5	1.8
5	1-5/8	2.25	3.9	3.2	2.25
5-1/2	1-3/4	2.6	4.5	3.7	2.6
6	2	3.1	5.4	4.4	3.1
6-1/2	2-1/8	3.6	6.2	5.1	3.6

TABLE G-2

RATED CAPACITIES FOR IMPROVED PLOW STEEL, INDEPENDENT WIRE ROPE CORE, WIRE ROPE AND WIRE ROPE SLINGS

(In tons of 2000 pounds)

Rope Dia. Inches	SINGLE LEG					
	Vertical			Choker		
	A	B	C	A	B	C
6x19 CLASSIFICATION						
1/4"	.59	.56	.53	.44	.42	.40
3/8"	1.3	1.2	1.1	.98	.93	.86
1/2"	2.3	2.2	2.0	1.7	1.6	1.5
5/8"	3.6	3.4	3.0	2.7	2.5	2.2
3/4"	5.1	4.9	4.2	3.8	3.6	3.1
7/8"	6.9	6.6	5.5	5.2	4.9	4.1
1"	9.0	8.5	7.2	6.7	6.4	5.4
1-1/8"	11.	10.	9.0	8.5	7.8	6.8
6x37 CLASSIFICATION						
1-1/4"	13.	12.	10.	9.9	9.2	7.9
1-3/8"	16.	15.	13.	12.	11.	9.6
1-1/2"	19.	17.	15.	14.	13.	11.
1-3/4"	26.	24.	20.	19.	18.	15.
2"	33.	30.	26.	25.	23.	20.
2-1/4"	41.	38.	33.	31.	29.	25.

(A) - Socket or Swaged Terminal attachment.
(B) - Mechanical Sleeve attachment.
(C) - Hand Tucked Splice attachment.

TABLE G-3

RATED CAPACITIES FOR IMPROVED PLOW STEEL, INDEPENDENT WIRE ROPE CORE, WIRE ROPE SLINGS

(In tons of 2000 pounds)

Rope Dia. Inches	TWO - LEG BRIDLE OR BASKET HITCH											
	Vertical			60°			45°			30°		
	A	B	C	A	B	C	A	B	C	A	B	C
6x19 CLASSIFICATION												
1/4"	1.2	1.1	1.0	1.0	.97	.92	.83	.79	.75	.59	.56	.53
3/8"	2.6	2.5	2.3	2.3	2.1	2.0	1.8	1.8	1.6	1.3	1.2	1.1
1/2"	4.6	4.4	3.9	4.0	3.8	3.4	3.2	3.1	2.8	2.3	2.2	2.0
5/8"	7.2	6.8	6.0	6.2	5.9	5.2	5.1	4.8	4.2	3.6	3.4	3.0
3/4"	10.	9.7	8.4	8.9	8.4	7.3	7.2	6.8	5.9	5.1	4.9	4.2
7/8"	14.	13.	11.	12.	11.	9.8	9.8	9.3	7.8	6.9	6.6	5.5
1"	18.	17.	14.	15.	15.	12.	13.	12.	10.	9.0	8.5	7.2
1-1/8"	23.	21.	18.	19.	18.	16.	18.	15.	13.	11.	10.	9.0
6x37 CLASSIFICATION												
1-1/4"	26.	24.	21.	23.	21.	18.	19.	17.	15.	13.	12.	10.
1-3/8"	32.	29.	25.	28.	25.	22.	22.	21.	18.	16.	15.	13.
1-1/2"	38.	35.	30.	33.	30.	26.	27.	25.	21.	19.	17.	15.
1-3/4"	51.	47.	41.	44.	41.	35.	36.	33.	29.	26.	24.	20.
2"	66.	61.	53.	57.	53.	46.	47.	43.	37.	33.	30.	26.
2-1/4"	83.	76.	66.	72.	66.	57.	58.	54.	47.	41.	38.	33.

(A) - Socket or Swaged Terminal Attachment.
(B) - Mechanical Sleeve Attachment.
(C) - Hand Tucked Splice Attachment.

TABLE G-4

RATED CAPACITIES FOR IMPROVED PLOW STEEL, FIBER CORE, WIRE ROPE AND WIRE ROPE SLINGS

(In tons of 2000 pounds)

Rope Dia. Inches	SINGLE LEG					
	Vertical			Choker		
	A	B	C	A	B	C
6x19 CLASSIFICATION						
1/4	.55	.51	.49	.41	.38	.37
3/8	1.2	1.1	1.1	.91	.85	.80
1/2	2.1	2.0	1.8	1.6	1.5	1.4
5/8	3.3	3.1	2.8	2.5	2.3	2.1
3/4	4.8	4.4	3.9	3.6	3.3	2.9
7/8	6.4	5.9	5.1	4.8	4.5	3.9
1	8.4	7.7	6.7	6.3	5.8	5.0
1-1/8	10.	9.5	8.4	7.9	7.1	6.3
6x37 CLASSIFICATION						
1-1/4	12.	11.	9.8	9.2	8.3	7.4
1-3/8	15.	13.	12.	11.	10.	8.9
1-1/2	17.	16.	14.	13.	12.	10.
1-3/4	24.	21.	19.	18.	16.	14.
2	31.	28.	25.	23.	21.	18.

(A) - Socket or Swaged Terminal attachment.
(B) - Mechanical Sleeve attachment.
(C) - Hand Tucked Splice attachment.

TABLE G-5

RATED CAPACITIES FOR IMPROVED PLOW STEEL, FIBER CORE, WIRE ROPE SLINGS

(In tons of 2000 pounds)

Rope Dia. Inches	TWO - LEG BRIDLE OR BASKET HITCH											
	Vertical			60°			45°			30°		
	A	B	C	A	B	C	A	B	C	A	B	C
6x19 CLASSIFICATION												
1/4	1.1	1.0	.99	.93	.88	.85	.77	.72	.70	.55	.51	.49
3/8	2.4	2.2	2.1	2.1	1.9	1.8	1.7	1.6	1.5	1.2	1.1	1.1
1/2	4.3	3.9	3.7	3.7	3.4	3.2	3.0	2.8	2.6	2.1	2.0	1.8
5/8	6.7	6.2	5.6	5.8	5.3	4.8	4.7	4.4	4.0	3.3	3.1	2.8
3/4	9.5	8.8	7.8	8.2	7.6	6.8	6.7	6.2	5.5	4.6	4.4	3.9
7/8	13.	12.	10.	11.	10.	8.9	9.1	8.4	7.3	6.4	5.9	5.1
1	17.	15.	13.	14.	13.	11.	12.	11.	9.4	8.4	7.7	6.7
1-1/8	21.	19.	17.	18.	16.	14.	15.	13.	12.	10.	9.5	8.4
6x37 CLASSIFICATION												
1-1/4	25.	22.	20.	21.	19.	17.	17.	16.	14.	12.	11.	9.8
1-3/8	30.	27.	24.	26.	23.	20.	21.	19.	17.	15.	13.	12.
1-1/2	35.	32.	28.	30.	27.	24.	25.	22.	20.	17.	15.	14.
1-3/4	48.	43.	38.	41.	37.	33.	34.	30.	27.	24.	21.	19.
2	62.	55.	49.	53.	48.	43.	43.	39.	35.	31.	28.	25.

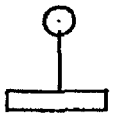
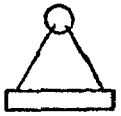
(A) - Socket or Swaged Terminal attachment.
(B) - Mechanical Sleeve attachment.
(C) - Hand Tucked Splice attachment.

TABLE G-6—NUMBER AND SPACING OF U-BOLT WIRE ROPE CLIPS

Improved plow steel, rope diameter, inches	Number of clips		Minimum spacing, inches
	Drop forged	Other material	
*	---	---	---
1/4	3	4	3
5/16	3	4	3 1/4
3/8	4	5	4 1/2
7/16	4	5	5 1/4
1/2	4	6	6
9/16	5	6	6 3/4
5/8	5	7	7 1/2
3/4	6	7	8 1/4
7/8	6	8	9

*Three clips shall be used on wire size less than 1/4-inch diameter.

TABLE G-7
WROUGHT IRON CHAIN
(In pounds or tons of 2000 pounds)

Nominal Size Chain Stock Inch.	Single Leg 	60° 	45° 	30° 
* 1/4	1060	1835	1500	1060
* 5/16	1655	2865	2340	1655
3/8	2385	2.1	3370	2385
* 7/16	3250	2.8	2.3	3250
1/2	2.1	3.7	3.0	2.1
* 9/16	2.7	4.6	3.8	2.7
5/8	3.3	5.7	4.7	3.3
3/4	4.8	8.3	6.7	4.8
7/8	6.5	11.2	9.2	6.5
1	8.5	14.7	12.0	8.5
1-1/8	10.0	17.3	14.2	10.0
1-1/4	12.4	21.4	17.5	12.4
1-3/8	15.0	25.9	21.1	15.0
1-1/2	17.8	30.8	25.2	17.8
1-5/8	20.9	36.2	29.5	20.9
1-3/4	24.2	42.0	34.3	24.2
1-7/8	27.6	47.9	39.1	27.6
2	31.6	54.8	44.8	31.6

* These sizes of wrought iron chain are no longer manufactured in the United States.

TABLE G-8
ALLOY STEEL CHAIN
(In tons of 2000 pounds)

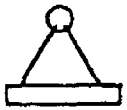
Nominal Size Chain Stock Inch.	Single Leg 	60° 	45° 	30° 
1/4	1.62	2.82	2.27	1.62
3/8	3.30	5.70	4.65	3.30
1/2	5.62	9.75	7.90	5.62
5/8	8.25	14.25	11.65	8.25
3/4	11.5	19.9	16.2	11.5
7/8	14.3	24.9	20.3	14.3
1	19.3	33.5	27.3	19.8
1-1/8	22.2	38.5	31.5	22.2
1-1/4	28.7	49.7	40.5	28.7
1-3/8	33.5	58.0	47.0	33.5
1-1/2	39.7	68.5	56.0	39.7
1-5/8	42.5	73.5	59.5	42.5
1-3/4	47.0	81.5	62.0	47.0

TABLE G-9

MAXIMUM ALLOWABLE WEAR AT ANY POINT OF LINK

Chain size in inches	Maximum allowable wear in fraction of inches
¼ (9/32)	3/64
5/16	5/64
3/8	7/64
7/16	9/64
½	5/32
9/16	11/64
⅝	3/16
¾	7/32
1⅛	¼
1¼	9/32
1⅜	5/16
1½	11/32
1¾	

TABLE G-10

SAFE WORKING LOADS FOR SHACKLES

[In tons of 2000 pounds]

Material size (inches)	Pin diameter (inches)	Safe working load
½	5/8	1.4
5/8	¾	2.2
¾	⅞	3.2
⅞	1	4.3
1	1⅛	5.6
1⅛	1¼	6.7
1¼	1⅜	8.2
1⅜	1½	10.0
1½	1⅝	11.9
1¾	2	16.2
2	2¼	21.2

TABLE I-1

FILTER LENSES FOR PROTECTION AGAINST RADIANT ENERGY

Operation	Shade No.
Soldering	2
Torch Brazing	3 or 4
Light cutting, up to 1 inch	3 or 4
Medium cutting, 1–6 inches	4 or 5
Heavy cutting, over 6 inches	5 or 6
Light gas welding, up to ⅛ inch	4 or 5
Medium gas welding, ⅛–½ inch	5 or 6
Heavy gas welding, over ½ inch	6 or 8
Shielded Metal-Arc Welding 1/16- to 5/32-inch electrodes	10
Inert-gas Metal Arc Welding (Nonferrous) 1/16- to 5/32-inch electrodes.	11
Inert-gas Metal-Arc Welding (Ferrous) 1/16- to 5/32-inch electrodes.	12
Shielded Metal-Arc Welding:	
3/16- to ¼-inch electrodes	12
5/16- and 3/8-inch electrodes	14
Atomic Hydrogen Welding	10 to 14
Carbon Arc Welding	14

[29 F.R. 4028, Mar. 27, 1964; 29 F.R. 6089, May 8, 1964, as amended at 32 F.R. 14050, Oct. 10, 1967]

Subpart H—Tools and Related Equipment

§ 1502.71 General precautions.

(a) Hand lines, slings, tackles of adequate strength, or carriers such as tool bags with shoulder straps, shall be provided and used to handle tools, materials, and equipment so that employees will have their hands free when using ship's ladders and access ladders. The use of hose or electric cords for this purpose is prohibited.

(b) When air tools of the reciprocating type are not in use, the discs and tools shall be removed.

(c) All portable, power-driven circular saws shall be equipped with guards above and below the base plate or shoe. The upper guard shall cover the saw to the depth of the teeth, except for the minimum arc required to permit the base to be tilted for bevel cuts. The lower guard shall cover the saw to the depth of the teeth, except for the minimum arc required to allow proper retraction and contact with the work. When the tool is withdrawn from the work, the lower guard shall automatically and instantly return to the covering position.

(d) The moving parts of machinery on dry docks shall be guarded.

(e) Before use, pneumatic tools shall be secured to the extension hose or whip by some positive means to prevent the tool from becoming accidentally disconnected from the whip.

(f) The moving parts of drive mechanisms, such as gearing and belting on large portable tools, shall be adequately guarded.

(g) Headers, manifolds, and widely spaced hose connections on compressed air lines shall bear the word "air" in letters at least 1 inch high, which shall be painted either on the manifold or separate hose connections, or on signs permanently attached to the manifolds or connections. Grouped air connections may be marked in one location.

(h) Before use, compressed air hose shall be examined. Visibly damaged and unsafe hose shall not be used.

[29 F.R. 4028, Mar. 27, 1964; 29 F.R. 6089, May 8, 1964, as amended at 32 F.R. 14050, Oct. 10, 1967]

§ 1502.72 Portable electric tools.

(a) The frames of portable electric tools and appliances, except double insulated tools approved by Underwriters' Laboratories, shall be grounded either through a third wire in the cable containing the circuit conductors or through a separate wire which is grounded at the source of the current.

(b) Grounding circuits, other than by means of the structure of the vessel on which the tool is being used, shall be checked to ensure that the circuit between the ground and the grounded power conductor has resistance which is low enough to permit sufficient current to flow to cause the fuse or circuit breaker to interrupt the current.

(c) Portable electric tools which are held in the hand shall be equipped with switches of a type which must be manually held in the closed position.

(d) Worn or frayed electric cables shall not be used.

[29 F.R. 4028, Mar. 27, 1964; 29 F.R. 6089, May 8, 1964, as amended at 32 F.R. 14050, Oct. 10, 1967]

§ 1502.73 Hand tools.

(a) Employers shall not issue or permit the use of unsafe hand tools.

(b) Wrenches, including crescent, pipe, end and socket wrenches, shall not be used when jaws are sprung to the point that slippage occurs.

(c) Impact tools, such as drift pins, wedges, and chisels, shall be kept free of mushroomed heads.

(d) The wooden handles of tools shall be kept free of splinters or cracks and shall be kept tight in the tool.

§ 1502.74 Abrasive wheels.

(a) Floor stand and bench mounted abrasive wheels used for external grinding shall be provided with safety guards (protection hoods). The maximum angular exposure of the grinding wheel periphery and sides shall be not more than 90 degrees, except that when work requires contact with the wheel below the horizontal plane of the spindle, the angular exposure shall not exceed 125 degrees. In either case the exposure shall begin not more than 65 degrees above the horizontal plane of the spindle. Safety guards shall be strong enough to withstand the effect of a bursting wheel.

(b) Floor and bench mounted grinders shall be provided with work rests which are rigidly supported and readily adjustable. Such work rests shall be kept a distance not to exceed ⅛ inch from the surface of the wheel.

(c) Cup type wheels used for external grinding shall be protected by either a revolving cup guard or a band type gu in accordance with the provisions of United States of America Stand Safety Code for the Use, Care, and P tection of Abrasive Wheels, B7.1. other portable abrasive wheels used external grinding shall be provided w safety guards (protection hoods) meet the requirements of paragraph (e) this section, except as follows:

(1) When the work location make impossible, in which case a wh equipped with safety flanges as descri in paragraph (f) of this section shal used.

(2) When wheels 2 inches or less diameter which are securely mounted the end of a steel mandrel are used.

(d) Portable abrasive wheels used internal grinding shall be provided w safety flanges (protection flanges) m ing the requirements of paragraph of this section, except as follows:

(1) When wheels 2 inches or less diameter which are securely mounted the end of a steel mandrel are used.

(2) If the wheel is entirely within work being ground while in use.

(e) When safety guards are requi they shall be so mounted as to maint proper alignment with the wheel, the guard and its fastenings shall b sufficient strength to retain fragment the wheel in case of accidental break The maximum angular exposure of grinding wheel periphery and sides s not exceed 180 degrees.

(f) When safety flanges are requi they shall be used only with wh designed to fit the flanges. Only sa flanges of a type and design and prop assembled so as to insure that the pi of the wheel will be retained in cas accidental breakage shall be used.

(g) All abrasive wheels shall be clo inspected and ring tested before mo ing to ensure that they are free f cracks or defects.

(h) Grinding wheels shall fit fi on the spindle and shall not be fo on. The spindle nut shall be tight only enough to hold the wheel in p

(i) The power supply shall be ficient to maintain the rated spi speed under all conditions of no grinding. The rated maximum spee the wheel shall not be exceeded.

(j) All employees using abr wheels shall be protected by eye pr tion equipment in accordance with requirements of § 1502.81 (a) and except when adequate eye protecti

afforded by eye shields which are permanently attached to the bench or floor stand.

[29 F.R. 4028, Mar. 27, 1964; 29 F.R. 6089, May 8, 1964, as amended at 32 F.R. 14050, Oct. 10, 1967]

§ 1502.75 Powder actuated fastening tools.

(a) *General precautions.* (1) Powder actuated fastening tools shall be tested each day before loading to ensure that the safety devices are in proper working condition. Any tool found not to be in proper working order shall be immediately removed from service until repairs are made.

(2) Powder actuated fastening tools shall not be used in an explosive or flammable atmosphere.

(3) All tools shall be used with the type of shield or muzzle guard appropriate for a particular use.

(4) Fasteners shall not be driven into very hard or brittle materials, such as cast iron, glazed tile, surface hardened steel, glass block, live rock, face brick or hollow tile.

(5) Fasteners shall not be driven into soft materials unless such materials are backed by a substance that will prevent the pin or fastener from passing completely through and creating a flying missile hazard on the opposite side.

(6) Unless a special guard, fixture or jig is used, fasteners shall not be driven directly into materials such as brick or concrete within 3 inches of the unsupported edge or corner, or into steel surfaces within ½ inch of the unsupported edge or corner. When fastening other material, such as 2 x 4 inch lumber to a concrete surface, fasteners of greater than 7/32-inch shank diameter shall not be used and fasteners shall not be driven within 2 inches of the unsupported edge or corner of the work surface.

(7) Fasteners shall not be driven through existing holes unless a positive guide is used to secure accurate alignment.

(8) No attempt shall be made to drive a fastener into a spalled area caused by an unsatisfactory fastening.

(9) Employees using powder actuated fastening tools shall be protected by eye protection equipment in accordance with the requirements of § 1502.81 (a) and (b).

(b) *Instruction of operators.* Before employees are permitted to use powder actuated fastening tools, they shall have been thoroughly instructed by a competent person with respect to the requirements of paragraph (a) of this section and the safe use of such tools as follows:

(1) Before using a tool, the operator shall inspect it to determine that it is clean, that all moving parts operate freely and that the barrel is free from obstructions.

(2) When a tool develops a defect during use, the operator shall immediately cease to use it and shall notify his supervisor.

(3) Tools shall not be loaded until just prior to the intended firing time and the tool shall not be left unattended while loaded.

(4) The tool, whether loaded or empty, shall not be pointed at any person, and hands shall be kept clear of the open barrel end.

(5) In case of a misfire, the operator shall hold the tool in the operating position for at least 15 seconds and shall continue to hold the muzzle against the work surface during disassembly or opening of the tool and removal of the powder load.

(6) Neither tools nor powder charges shall be left unattended in places where they would be available to unauthorized persons.

§ 1502.76 Internal combustion engines, other than ship's equipment.

(a) When internal combustion engines, furnished by the employer are used in a fixed position below decks, for such purposes as driving pumps, generators, and blowers, the exhaust shall be led to the open air, clear of any ventilation intakes and openings through which it might enter the vessel.

(b) All exhaust line joints and connections shall be checked for tightness immediately upon starting the engine, and any leaks shall be corrected at once.

(c) When internal combustion engines on vehicles, such as forklifts and mobile cranes, or on portable equipment such as fans, generators, and pumps exhaust into the atmosphere below decks, the competent person shall make tests of the carbon monoxide content of the atmosphere as frequently as conditions require to insure that dangerous concentrations do not develop. Employees shall be removed from the compartment involved when the carbon monoxide concentration exceeds 50 parts per million (0.005%). The employer shall use blowers sufficient in size and number and so arranged as to maintain the concentration below this allowable limit before work is resumed.

[32 F.R. 14050, Oct. 10, 1967]

Subpart I—Personal Protective Equipment

§ 1502.81 Eye protection.

(a) *General precautions.* (1) All eye protection equipment required by these regulations shall meet the specifications prescribed by the American Standard Safety Code for Head, Eye and Respiratory Protection, Z2.1.

(2) Eye protection equipment shall be maintained in good condition.

(3) Eye protection equipment which has previously been used shall be cleaned and disinfected before it is issued by the employer to another employee.

(4) Employees who wear corrective spectacles while engaged in eye hazardous work shall be protected by eye protection equipment of a type which can be worn over personal spectacles, except that glasses with prescription ground safety lenses may be worn in lieu of cover goggles when such glasses provide suitable protection against the hazard involved.

(b) *Protection against impact.* (1) In any operations such as chipping, caulking, drilling, riveting, grinding, and pouring babbitt metal, in which the eye hazard of flying particles, molten metal, or liquid chemical exists, employees shall be protected by suitable face shields or goggles meeting the requirements of paragraph (a) of this section.

(c) *Protection against radiant energy.* (1) In any operation in which the eye hazard of injurious light rays or other radiant energy exists, depending upon the intensity of the radiation to which employees are exposed, they shall be protected by spectacles, cup goggles, helmets, hand shields, or face shields equipped with filter lenses meeting the requirements of paragraphs (a) and (c) (2) of this section.

(2) Filter lenses shall be of a shade number appropriate to the type of work to be performed as indicated in Table I–1 in § 1502.68 except that variations of one or two shade numbers are permissible to suit individual preferences.

(3) If filter lenses are used in the goggles worn under the helmet, the shade number of the lens in the helmet may be reduced so that the sum of the shade numbers of the two lenses will equal the value shown in Table I § 1502.68.

[29 F.R. 4028, Mar. 27, 1964; 29 F.R May 8, 1964, as amended at 32 F.R. Oct. 10, 1967]

§ 1502.82 Respiratory protection.

(a) *General.* (1) All respirator tective equipment required by these lations shall carry the U.S. Bure Mines approval for the use for wh is intended. Respiratory pro equipment shall be used only for th pose intended and no modifications equipment shall be made.

(2) Respiratory protective equi shall be inspected regularly and tained in good condition. Gas mas isters and chemical cartridges sh replaced as necessary so as to p complete protection. Mechanical shall be cleaned or replaced as nec so as to avoid undue resistan breathing.

(3) Respiratory protective equi which has been previously used sh cleaned and disinfected before it is by the employer to another emp Emergency rescue equipment sh cleaned and disinfected immed after each use.

(4) Employees required to use ratory protective equipment appro use in atmospheres immediately da ous to life shall be thoroughly trai its use. Employees required to use types of respiratory protective ment shall be instructed in the u limitations of such equipment.

(5) When an air line respira used, the air line shall be fitted pressure regulating valve and a which will remove oil, water, an particles. The air intake shall b a source which is free from all con nants, such as the exhaust from in combustion engines.

(6) In all cases, when an empl stationed outside a compartment or space as a tender or safety m men working inside in an atmo immediately dangerous to life, the shall have immediately availab emergency use repiratory pro equipment equivalent to that re for the men in the compartment. a tender is stationed outside a co ment for men working inside in mosphere not immediately dange life, the tender shall wear resp protective equipment equivalent t required for the men in the co

ment if he is exposed for prolonged periods to the same concentration of atmospheric contaminants.

(b) *Protection in atmospheres immediately dangerous to life.* (1) Atmospheres immediately dangerous to life are those which contain less than 16.5 percent oxygen, or which by reason of the high toxicity of the contaminant, as in fumigation, or high concentration of the contaminant, as with carbon dioxide, would endanger the life of a person breathing them for even a short period of time.

(2) In atmospheres immediately dangerous to life the only approved types of respiratory protective equipment are the following:

(i) Self-contained breathing apparatus, in which the wearer carries with him a supply of oxygen, air, or an oxygen generating material.

(ii) Hose mask with blower, in which a hand or motor operated blower supplies air at high volume and low pressure through a large diameter hose through which the wearer can draw air in case the blower fails.

(iii) If there is known to be more than 16 percent oxygen and less than 2 percent gas by volume, a gas mask equipped with a canister approved for the particular type gas involved.

NOTE: A gas mask offers absolutely no protection in an atmosphere deficient in oxygen.

(3) Work in atmospheres immediately dangerous to life shall be performed only in an emergency, as when rescuing a man who has been overcome or when shutting off a source of contamination that cannot otherwise be controlled. When an employee enters such an atmosphere he shall be provided with and use an adequate, attended life line.

(4) In the vicinity of each vessel in which there is a danger of employees being exposed to an atmosphere immediately dangerous to life the employer shall have on hand and ready for use respiratory protective equipment approved for such use. When such equipment is required, one or more persons shall be thoroughly trained in the use of the equipment.

(c) *Protection against gaseous contaminants not immediately dangerous to life.* (1) Gaseous contaminants not immediately dangerous to life are gases present in concentrations that could be breathed for a short period without endangering the life of a person breathing them, but which might produce discomfort and possible injury after a prolonged single exposure or repeated short exposures.

(2) When employees are exposed to a gaseous contaminated atmosphere not immediately dangerous to life, they shall be protected by respiratory protective equipment approved for use in the type and concentration of the gaseous contaminant as follows:

(i) In high or unknown concentrations, a hose mask or an air line respirator. The use of either a hose mask or an air line respirator in lower concentrations is permissible.

(ii) In concentration of ammonia of less than 3 percent, or of other gases less than 2 percent, by volume, a canister type gas mask equipped with the proper type of canister. Different canisters are approved for specific use against the following gases or groups of gases: acid gases, hydrocyanic acid gas, chlorine gas, organic vapors, ammonia gas, carbon monoxide, or combination of the above.

(iii) In low concentrations (less than 0.1 percent by volume), a chemical cartridge respirator equipped with the type of cartridge approved for use against the particular gases or groups of gases listed in subdivision (ii) of this subparagraph.

(d) *Protection against particulate contaminants not immediately dangerous to life.* (1) When employees are exposed to unsafe concentrations of particulate contaminants, such as dusts and fumes, mists and fogs or combinations of solids and liquids, they shall be protected by either air line or filter respirators, except as otherwise provided in the regulations of this part.

(2) Filter respirators shall be equipped with the proper type of filter. Different filters are approved for specific protection against groups of contaminants, as follows:

(i) Pneumoconiosis-producing dust and nuisance dust filters which provide respiratory protection against pneumoconiosis-producing dusts, such as aluminum, cellulose, cement, charcoal, coal, coke, flour, gypsum, iron ore, limestone and wood.

(ii) Toxic dust filters which provide respiratory protection against toxic dusts that are not significantly more toxic than lead, such as arsenic, cadmium, chromium, lead, manganese, selenium, vanadium, and their compounds.

(iii) Mist filters which provide respiratory protection against pneumoconiosis-producing mists, chromic acid mists, and nuisance mists.

(iv) Fume filters which provide respiratory protection against fumes (solid dispersoids or particulate matter formed by the condensation of vapors, such as those from heated metals and other substances).

(v) Filters which provide respiratory protection against combinations of two or more of the contaminants described in subdivisions (i) through (iv) of this subparagraph.

(e) *Protection against combinations of gaseous and particulate contaminants not immediately dangerous to life.* (1) When employees are exposed to combinations of gaseous and particulate contaminants not immediately dangerous to life, as in spray painting, they shall be protected by respiratory protective equipment approved for use in the type and concentration of the contaminants, as follows:

(i) In high or unknown concentrations, a hose mask or an air line respirator. The use of either a hose mask or an air line respirator is permissible in lower concentrations.

(ii) In concentrations of gaseous contaminants of less than 2 percent by volume, a canister type gas mask with a combination canister approved for the particular type of gaseous contaminant as specified in paragraph (c)(2) of this section and a filter for the particular type of particulate contaminant as specified in paragraph (d)(1) of this section.

(iii) In low concentrations of gaseous contaminants (less than 0.1 percent by volume) a respirator equipped with the type of cartridge and filter as specified in subdivision (ii) of this subparagraph.

§ 1502.83 Head, foot and body protection.

(a) When employees are working in areas where there is danger of falling objects they shall be protected by protective hats.

(b) Protective hats shall meet the specifications contained in the United States of America Standard Safety Code for Head, Eye, and Respiratory Protection, Z2.1. Hats without dielectric strength shall not be used where there is the possibility of contact with electric conductors.

(c) Protective hats which have been previously worn shall be cleaned and disinfected before they are issued by employer to another employee.

(d) The employer shall arr through means, such as vendors or stores, or otherwise, to make safety s readily available to all employees, shall encourage their use. Metal caps from which the covering has worn shall be insulated when emplo are working on exposed energized cuits of the vessel's electrical system.

(e) Employees shall not be permi to wear excessively greasy clothing performing hot work operations.

(f) Employees shall be protecte suitable gloves when engaged in op tions hazardous to their hands.

[29 F.R. 4028, Mar. 27, 1964; 29 F.R. May 8, 1964, as amended at 32 F.R. 1 Oct. 10, 1967]

§ 1502.84 Life saving equipment.

(a) *Buoyant work vests.* (1) Buoy work vests shall not meet the requ ments of these regulations unless proved by the U.S. Coast Guard.

(2) Prior to each use, buoyant v vests shall be inspected for dry chemical damage, or other defects wh may affect their strength and buoya Defective buoyant work vests shall be used.

(b) *Safety belts and lifelines.* Safety belts shall be equipped with lines which in use are secured wit minimum of slack to a fixed structure

(2) Prior to each use, belts and lines shall be inspected for dry chemical damage, or other defects wh may affect their strength. Defec belts and lifelines shall not be use

(3) When employees are working any location requiring a safety belt a lifeline, care shall be exercised to sure that the lifeline is not cut, pinch or led over a sharp edge. In hot w operations or those involving the use acids, solvents, or caustics, the line sh be kept clear to avoid its being burn or weakened. In order to keep the li line continuously attached with a mi mum of slack to a fixed structure attachment point of the lifeline shall appropriately changed as the work p gresses.

(c) *Life rings and ladders.* (1) least three 30-inch Coast Guard appro life rings with lines attached shall kept in easily visible and readily acce

ble places aboard each vessel afloat on which work is being performed. Life rings shall be located, one forward, one aft, and one on the gangway, except on vessels under 200 feet in length, in which case one at the gangway will be sufficient.

(2) At least one life ring with a line attached shall be located on each staging float alongside a vessel on which work is being performed.

(3) At least 90 feet of line shall be attached to each life ring. Life rings and lines shall be maintained in good condition.

(4) In the vicinity of each vessel afloat on which work is being performed there shall be at least one portable or permanent ladder of sufficient length to assist employees to reach safety in the event that they fall into the water.

[29 F.R. 4028, Mar. 27, 1964; 29 F.R. 6089, May 8, 1964, as amended at 32 F.R. 14050, Oct. 10, 1967]

Subpart J—Ship's Machinery and Piping Systems

§ 1502.91 Ship's boilers.

(a) Before work is performed in the fire, steam, or water spaces of a boiler where employees may be subject to injury from the direct escape of a high temperature medium, such as steam, or water, oil, or other medium at a high temperature entering from an interconnecting system, the employer shall insure that the following steps are taken:

(1) The isolation and shutoff valves connecting the dead boiler with the live system or systems shall be secured, blanked, and tagged indicating that employees are working in the boiler. This tag shall not be removed nor the valves unblanked until it is determined that this may be done without creating a hazard to the employees working in the boiler, or until the work in the boiler is completed. Where valves are welded instead of bolted at least tw isolation and shutoff valves connecting the dead boiler with the live system or systems shall be secured, locked, and tagged.

(2) Drain connections to atmosphere on all of the dead interconnecting systems shall be opened for visual observation of drainage.

(3) A warning sign calling attention to the fact that employees are working in the boilers shall be hung in a conspicuous location in the engine room. This sign shall not be removed until it is determined that the work is completed and all employees are out of the boilers.

[29 F.R. 4028, Mar. 27, 1964; 29 F.R. 6089, May 8, 1964, as amended at 32 F.R. 14051, Oct. 10, 1967]

§ 1502.92 Ship's piping systems.

(a) Before work is performed on a valve, fitting, or section of piping in a piping system where employees may be subject to injury from the direct escape of steam, or water, oil, or other medium at a high temperature, the employer shall insure that the following steps are taken:

(1) The isolation and shutoff valves connecting the dead system with the live system or systems shall be secured, blanked, and tagged indicating that employees are working on the system. This tag shall not be removed nor the valves unblanked until it is determined that this may be done without creating a hazard to the employees working on the system, or until the work on the system is completed. Where valves are welded instead of bolted at least two isolation and shutoff valves connecting the dead system with the live system or systems shall be secured, locked, and tagged.

(2) Drain connections to atmosphere on all of the dead interconnecting systems shall be opened for visual observation of drainage.

[32 F.R. 14051, May 10, 1967]

§ 1502.93 Ship's propulsion machinery.

(a) Before work is performed on the main engine, reduction gear, or connecting accessories, the employer shall ensure that the following steps are taken:

(1) The jacking gear shall be engaged to prevent the main engine from turning over. A sign shall be posted at the throttle indicating that the jacking gear is engaged. This sign shall not be removed until the jacking gear can be safely disengaged.

(2) If the jacking gear is steam driven, the stop valves to the jacking gear shall be secured, locked, and tagged indicating that employees are working on the main engine.

(3) If the jacking gear is electrically driven, the circuit controlling the jacking gear shall be deenergized by tripping the circuit breaker, opening the switch or removing the fuse, whichever is appropriate. The breaker, switch, or fuse location shall be tagged indicating that employees are working on the main engine.

(b) Before the jacking engine is operated, the following precautions shall be taken:

(1) A check shall be made to ensure that all employees, equipment, and tools are clear of the engine, reduction gear, and its connecting accessories.

(2) A check shall be made to ensure that all employees, equipment and tools are free of the propeller.

(c) Before work is started on or in the immediate vicinity of the propeller, a warning sign calling attention to the fact that employees are working in that area shall be hung in a conspicuous location in the engine room. This sign shall not be removed until it is determined that the work is completed and all employees are free of the propeller.

(d) Before the main engine is turned over (e.g., when warming up before departure or testing after an overhaul) a check shall be made to ensure that all employees, equipment, and tools are free of the propeller.

§ 1502.94 Ship's deck machinery.

(a) Before work is performed on the anchor windlass or any of its attached accessories, the employer shall ensure that the following steps are taken:

(1) The devil claws shall be made fast to the anchor chains.

(2) The riding pawls shall be in the engaged position.

(3) In the absence of devil claws and riding pawls, the anchor chains shall be secured to a suitable fixed structure of the vessel.

Subpart K—Portable, Unfired Pressure Vessels, Drums, and Containers, Other Than Ship's Equipment

§ 1502.101 Portable air receivers and other unfired pressure vessels.

(a) Portable, unfired pressure vessels, built after the effective date of this regulation, shall be marked and reported indicating that they have been designed and constructed to meet the standards of the American Society of Mechanical Engineers Boiler and Pressure Vessel Code, Section VIII, Rules for Construction of Unfired Pressure Vessels, 1963. They shall be subjected to a hydrostatic pressure test of one and one-half times the working pressure of the vessels.

(b) Portable, unfired pressure ves not built to the code requirements paragraph (a) of this section, and b prior to the effective date of this regu tion, shall be examined quarterly b competent person. They shall be s jected yearly to a hydrostatic press test of one and one-half times the wo ing pressure of the vessels.

(c) The relief valves on the porta unfired pressure vessels in paragra (a) and (b) of this section shall be to the safe working pressure of the sels, or set to the lowest safe work pressure of the systems, whichever lower.

(d) A record of such examinations tests made in compliance with the quirements of paragraphs (a) and of this section shall be maintained.

§ 1502.102 Drums and containers.

(a) Shipping drums and contain shall not be pressurized to remove th contents.

(b) A temporarily assembled pr surized piping system conveying haza ous liquids or gases shall be provi with a relief valve and by-pass to p vent rupture of the system and the esc of such hazardous liquids or gases.

(c) Pressure vessels, drums and c tainers containing toxic or flamma liquids or gases shall not be stored used where they are subject to op flame, hot metal, or other sources of ar ficial heat.

(d) Unless pressure vessels, drums a containers of 30-gallon capacity or o containing flammable or toxic liquids gases are placed in an out-of-the-v area where they will not be subject physical injury from an outside sour barriers or guards shall be erected to p tect them from such physical injury.

(e) Containers of 55 gallons or m capacity containing flammable or to liquid shall be surrounded by dikes pans which enclose a volume equal to least 25 percent of the total volume the containers.

(f) Fire extinguishers adequate number and suitable for the hazard sh be provided. These extinguishers sh be located in the immediate area wh pressure vessels, drums, and contain containing flammable liquids or gases stored or in use. Such extinguish shall be ready for use at all times.

Subpart L—Electrical Machinery

§ 1502.111 Electrical circuits and distribution boards.

(a) Before an employee is permitted to work on an electrical circuit, except when the circuit must remain energized for testing and adjusting, the circuit shall be deenergized and checked at the point at which the work is to be done to insure that it is actually deenergized. When testing or adjusting an energized circuit, a rubber mat, duck board, or other suitable insulation shall be used underfoot where an insulated deck does not exist.

(b) Deenergizing the circuit shall be accomplished by opening the circuit breaker, opening the switch, or removing the fuse, whichever method is appropriate. The circuit breaker, switch, or fuse location shall be tagged to indicate that an employee is working on the circuit. Such tags shall not be removed nor the circuit energized until it is definitely determined that the work on the circuit has been completed.

(c) When work is performed immediately adjacent to an open-front energized board or in back of an energized board, the board shall be covered or some other equally safe means shall be used to prevent contact with any of the energized parts.