

SECTION .0400 - SHOPS FABRICATING STRUCTURALSTEEL AND STEEL PLATE

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13 NCAC 07F .0401 GENERAL REQUIREMENTS

Application. The Shops Fabricating Structural Steel and Steel Plate standard establishes safety requirements for handling, storing, preparing, fitting, fastening, and shipping structural and plate steel at fabricated structural steel fabricating shops of firms primarily engaged in fabricating structural steel and steel plate. This standard does not apply to businesses where fabrication of structural steel and steel plate is incidental to the principal business, or to the final in-place field erection site.

*History Note: Authority G.S. 95-131;
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13 NCAC 07F .0402 DEFINITIONS APPLICABLE TO THIS STANDARD

The following definitions apply to this Section:

- (1) Administrative or Regulatory Authority. Governmental agency or, in the absence of governmental jurisdiction, the employer;
- (2) Airless Spray Gun. A device that disperses liquid by the use of high pressure exerted on the liquid for atomization (1200 to 3500 p.s.i.);
- (3) Arc Radiation. The rays emanating from a welding arc by emission and transmission; These include infrared and ultraviolet rays;
- (4) Approved. Acceptable to the authority having jurisdiction;
- (5) Authorized. Approved by the authority having jurisdiction;
- (6) Bars. Round or square rods up to and including six inch cross section;
- (7) Blocking. Wood blocks, timbers, or other material of various dimensions used to support and separate piles of material;
- (8) Buggy. A small cart or truck, usually on rails, for transportation of material;
- (9) Buggy Rails. The rails upon which the buggy operates;
- (10) Burning Goggles. Personal protective equipment that protects the eyes from harmful light, sparks, molten metal globules, and impacts associated with oxygen-fuel cutting operations;
- (11) Cantilever. A projecting beam or member extending beyond the supports; Example: material which overhangs beyond its supports;
- (12) Carbon Arc. An electric arc produced with a carbon electrode; commonly used, in conjunction with compressed air for metal removal;
- (13) Chocked Wheels. Wheels blocked to prevent movement of the railroad car or other wheels;
- (14) Competent Person. A person who has the requisite ability and knowledge of the process or procedure to ensure the safety of the operation;
- (15) Crib Blocking. Multiple layers of blocking arranged so that each layer is at right angles to the preceding layer;
- (16) Crop Ends. Leftover or unused pieces resulting from the processing of the original structural shapes;
- (17) Electrodes. The terminals of a source of electricity used to establish an arc; used in both metal depositing and metal removal processes;
- (18) Employee. A person employed by the employer;
- (19) Fillet. The radius provided between adjacent steel surfaces to reduce stress concentrations; a triangular-shaped weld between two surfaces at an angle to each other;

- (20) Fillet Weld. A weld of approximately triangular cross section joining two surfaces approximately at right angles to each other in a lap joint, tee joint, or corner joint;
- (21) Flame-arrested Lids. Covers with flame-arrester screens or baffles, used on safety cans, plunger cans, drum vents, etc., to prevent flashback of flame into the container from outside;
- (22) Flange Toes. The ends of the parallel components of the I-beam or webbed flange rolled sections;
- (23) Flat Gage Material. Flat material usually under one-eighth inch thickness;
- (24) Flat Material. Material 3/16 inch or less in thickness; either in strips one inch to eight inches or in sheets over eight inches wide;
- (25) Galvanizing. Applying a zinc coating to iron or steel by immersing in a molten bath or by electroplating;
- (26) Good Housekeeping. Clean, orderly, uncluttered, and neatly arranged car of material and tools;
- (27) Harmful Exposure. The state or condition of being exposed to a hazard or unsafe conditions;
- (28) Harmful Irritants. Any element or compound that may adversely affect human physical conditions;
- (29) Hazardous. Involving risk; depending on chance;
- (30) Hazardous Materials. Any elements or compounds which possess properties that have the potential of causing physical harm to employees;
- (31) Head Ends. The ends of structural shapes from which the original measurements are made;
- (32) Hook. A device of curved shape used on chains, blocks of cranes, wire rope slings, etc., to secure, hold, or sustain a lift;
- (33) Interlocking. Piling angles or beams so that the leg of one angle or flange of one beam is set inside the leg or flange of the adjoining piece;
- (34) Inverted Courses. The practice of turning rows of angles in piles upside down to lock the pile for stability;
- (35) Lanyard Ropes. Ropes used with safety belts to limit the distance of fall;
- (36) Leg Thickness. Thickness of the angle leg of structural profile;
- (37) Lift. To elevate, raise, or hoist a load;
- (38) Multiple Piles. Material stacked in piles, one above the other, separated by blocking;
- (39) Nominal Depth Range. The permissible depth range on rolled sections as they are purchased from the mill; Example: 24 inch beams 84 pounds per foot will range from 23-7/8 inches to 24-3/16 inches;
- (40) Pants Guards. Devices worn to prevent trousers from hanging loosely around the legs in order to prohibit their becoming entangled in revolving machinery;
- (41) Periodic Check. The act of testing or verifying for safety at regular predetermined intervals of one to 12 months;
- (42) Permanent Deformation. Change in physical configuration that will not be restored when the external forces which caused the deformation are removed;
- (43) Pickling Operations. Processes of removing mill scale and foreign material from steel surfaces by treating with a dilute acid solution;
- (44) Plant Employees. Employees whose regular duties require them to work in the plant;
- (45) Plates. Flat material having dimensions of over 3/16 inch thickness and eight inches or more in width;
- (46) Pockets Between Stacks. The area between the upright supports used for storing material;
- (47) Pyramiding. The practice of tapering piles from bottom to top for stability;
- (48) Reamer Bit. A rotating tool normally driven by a motor powered spindle used to enlarge holes already present in various materials; The diameters of bits vary in size;
- (49) Receiving Yard. An area provided for storage such as rolled shapes, bar stock, plate, coiled wire, sheet steel, and other materials awaiting movement into the shop;
- (50) Restricted Area. An area designated as being limited in availability to employees and to others;

- (51) Revolving Drill. A rotating tool normally driven by a motor-powered spindle used to put holes in various materials; The diameter of drills varies;
- (52) Rivet Stock. Round stock usually ranging from three-fourths inch to one and one-fourth inches, used in the manufacture of rivets;
- (53) Safety Belt. A safety device worn to restrict the length of an accidental fall; Basically, a waistband with lanyards attached to fasteners for tying off;
- (54) Safety Line. A line used to control, retrieve, or otherwise secure a person or object;
- (55) Secure Loads. To band, chain, or otherwise fasten a load of material to prevent its movement;
- (56) Shall. The word "shall" is to be understood as mandatory;
- (57) Shop Buggies. Unpowered vehicles used to move material in the shop;
- (58) Should. The word "should" is to be understood as advisory;
- (59) Sign. A surface on which letters or other markings appear for the warning of, or safety instructions for, employees or members of the public;
- (60) Single Pile. A pile of material not separated by blocking;
- (61) Small Flats. Material such as bars and strips;
- (62) Soft-headed Hammers. Lead, copper, nylon, polytetrafluoroethylene or rawhide-headed hammers of the type used for inserting tool-steel drills, etc;
- (63) Sound Lumber. Lumber that is reasonably free from defects and decay;
- (64) Spring-clip Die Holder. Clip used to hold a die in a rivet hammer;
- (65) Squares. Material having a cross section of equal height and width dimensions;
- (66) Stanchion. An upright bar, brace, or support which is used to contain or restrain material;
- (67) Tier. A row or layer, one or two or more, one above the other, such as angles, plates, etc., in receiving yard piles;
- (68) Upright Girders. Girders positioned with the web in a vertical position;
- (69) Washing Facilities. Facilities that can be used by employees to cleanse by a solution or by dipping, rubbing, or scrubbing with a cleaning agent such as water, waterless soap, etc;
- (70) Webs. The plate connecting the flanges of I-beam or webbed flange rolled sections or girders;
- (71) Weep Holes (Galvanizing Area). Drain holes located in the material being galvanized, to eliminate trappings of molten zinc and air.

History Note: Authority G.S. 95-131;
 Eff. February 1, 1976;
 Readopted Eff. September 30, 1977.

13 NCAC 07F .0403 COLOR CODING AND WARNING SIGNS FOR PHYSICAL HAZARDS

- (a) Color coding for physical hazards shall be in accordance with requirements of 29 CFR 1910.144.
- (b) Accident prevention signs and tags shall be constructed and used in accordance with the requirements of 29 CFR 1910.145.

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13 NCAC 07F .0404 PERSONAL PROTECTIVE EQUIPMENT

- (a) Clothing
 - (1) When burning, welding, grinding, or performing other types of work where sparks or hot metal are present, long-sleeve shirts shall be worn with cuffs fastened. Loose, ragged, or torn clothing shall not be worn.

- (2) Clothing contaminated or smeared with flammable liquids, grease, corrosive substances, irritants, or oxidizing agents shall not be worn.
 - (3) Employees engaged in pickling operations shall wear acid-resistant aprons, gloves, protective footwear, and face shields.
 - (4) Pants guards shall be worn when performing operation where the pants leg could be caught by revolving tools or other revolving equipment.
- (b) Gloves
- (1) Gloves shall be worn by employees handling steel and other rough surfaces to prevent injury to hands or fingers from sharp objects, rough edges and friction burns.
 - (2) Gloves to protect against heat, spatter, and arc radiation shall be worn when burning or welding.
- (c) Foot Protection
- (1) Safety-toe shoes shall be required to protect employees who either handle solid objects weighing 15 pounds or greater, routinely more than once per eight hours or are exposed in areas where such handling occurs, where objects can fall on the exposed employee's toes from a height exceeding one foot.
 - (2) Safety shoes shall meet the design requirements specified in American National Standard for Men's Safety-Toe Footwear 1967, Z41.1-1972 (R-1967).
- (d) Eye and Face Protection
- (1) Approved eye protection shall be worn in all areas of the plant when there is danger from flying particles or injurious chemicals. Suitable face protection in addition to eye protection shall be worn by chippers and grinders exposed to the hazard of flying particles. Welders shall wear approved eye protection.
 - (2) Burning goggles which will protect the burner's eyes from sparks, glare, dust, cinders, etc., shall be worn when burning.
 - (3) Where the eyes or body of any person may be exposed to irritants or injurious corrosive materials, suitable facilities for quick drenching or flushing of the eyes and body shall be provided within the work area for immediate emergency use. They shall be periodically inspected and tested for operability.
 - (4) Eyeglass cleaning materials shall be provided.
 - (5) Eye and face protection equipment shall meet the design requirements specified in American National Standard Practice for Occupational and Educational Eye and Face Protection, Z87.1-1968.
- (e) Safety Belts
- (1) Safety belts shall be worn by employees when they are exposed to platforms that do not meet the requirements of 29 CFR 1910.23. The line shall be secured so that it limits the free fall of the employee to a maximum of six feet. It shall remain secured except that when the employee moves or changes work location when the wearing of this protective equipment is impossible, equivalent protection shall be provided and used. This shall be in the form of safety nets or similar equivalent protection.
 - (2) Safety belt safety lines shall be a minimum of one-half inch nylon, or the equivalent. The rope shall have a nominal breaking strength of 5400 pounds. A safety belt and lanyard hardware shall be drop-forged or pressed steel, cadmium plated in accordance with Type 1, Class B plating specified in Federal Specifications QQ-P-416. The surface shall be smooth and free of sharp edges.
 - (3) All safety belt and lanyard hardware, except rivets, shall be capable of withstanding a tensile loading of 4000 pounds without cracking, breaking, or taking a permanent deformation.
 - (4) Belts shall be visually inspected before each use, and worn and damaged equipment shall be taken out of service.
- (f) Respiratory protection shall be provided and used in accordance with the requirements of 29 CFR 1910.134.
- (g) Hearing Protection. An effective hearing conservation program shall be administered when employees are exposed to noise levels exceeding the values given in 29 CFR 1910.95. The hearing conservation plan shall meet the requirements of the North Carolina Noise Compliance Plan which is contained in the Industrial Extension Service, North Carolina State University, Bulletin Number SAH-1.

(h) Head Protection

- (1) Workers, in areas where there is a danger of falling or flying objects or exposure to high voltage electrical shock and burns, shall be protected by approved head protection designed to resist the impact of falling or flying objects or high voltage electrical shock and burns.
- (2) Head protection for the protection of the employees against impact or penetration of falling and flying objects shall meet the specifications contained in American National Standard Safety Requirements for Industrial Head Protection, Z89.2-1971.
- (3) Head protection of employees exposed to high voltage electrical shock and burns shall meet the specification contained in American National Standard Safety Requirements for Industrial Protective Helmets for Electrical Workers, Class B, Z89.2-1971.

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13 NCAC 07F .0405 LIGHTING

Where daylight does not provide sufficient illumination, artificial illumination shall be provided in all work areas and other parts of the building to which employees have access so that reasonable illumination will be provided to prevent accidents. For adequate safety levels, minimum illumination levels in foot-candles at the type of work area shall be provided in accordance with the table in this Rule. These provide minimum illumination for safety of personnel and are absolute minimums at any time and any location:

MINIMUM ILLUMINATION LEVELS AT TYPE OF WORK AREA

<u>Type of Work Area</u>	<u>Footcandles*</u>
Maintenance shops	
Rough bench, rough machine work, and rough grinding	5
Medium bench and medium machine work	5
Assembly	
Rough assembly and rough inspection	5
Medium assembly and medium inspection	5
Stairways, passageways (at floor levels)	1
Sanitary building	
Washrooms, restrooms, etc.	5
Yard lighting	
Plant entrance	1
Internal roadways	0.5
General yard storage	0.5
Shipping yards and receiving yards	1
Designated parking lots	1
Storage areas	
Dead storage	0.5
Live storage	2

*Designates footcandles at the point of hazard.

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13 NCAC 07F .0406 VENTILATION

(a) Whenever harmful dusts, fumes, mists, vapors, or gases exist that exceed the requirements of 29 CFR 1910.93, they shall be controlled by the use of general ventilation, or other effective mechanical means.

(b) Local exhaust ventilation when used as described in (a) of this Rule, shall be designed to prevent dispersion into the air of dusts, fumes, mists, vapors, and gases in concentrations causing harmful exposures. Such exhaust system shall be so designed that dusts, fumes, mists, vapors, or gases are not drawn through the breathing zone of employees.

(c) Design and Operation. Exhaust fans, jets, ducts, hoods, separators, and all necessary appurtenances, including dust receptacles, shall be designed, constructed, maintained, and operated as to ensure protection by maintaining a volume and velocity of exhaust air sufficient to gather dusts, fumes, vapors, or gases from said equipment of process, and to convey them to suitable points of safe disposal, thereby preventing their dispersion in harmful quantities into the atmosphere where employees work. Exhaust systems shall be designed and operated in accordance with American National Standard Fundamentals Governing the Design and Operation of Local Exhaust Systems, ANSI Z9.2-1972.

(d) Duration of Operations

- (1) The exhaust system shall be in operation during all operations which it is designed to serve. If the employee remains in the protected zone, the system shall continue to operate after cessation of said operations.
- (2) Since dust capable of causing disability is of microscopic size, tending to remain for hours in still air, it is essential that the exhaust system be continued in operation for a time after the work process or equipment served by the same shall have ceased in order to ensure the removal of the harmful elements to the required extent.
- (3) Collecting systems which return air to work area may be used if concentrations which accumulate in the work area do not result in harmful exposure to employees. Discharges from an exhaust system shall be disposed of in a manner that will not result in harmful exposure to employees.

History Note: Authority G.S. 95-131;
Eff. February 1, 1976;
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13 NCAC 07F .0407 CLEANERS AND SOLVENTS

Because cleaners and solvents may be caustic, flammable, poisonous, or explosive, they shall be selected, handled, stored, and applied with considerable care. All persons handling them shall be carefully instructed in their selection, handling and application.

History Note: Authority G.S. 95-131;
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13 NCAC 07F .0408 IONIZING RADIATION

Radiography shall be performed in accordance with the requirements of 29 CFR 1910.96 and 29 CFR 1910.97.

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13 NCAC 07F .0409 GENERAL REQUIREMENTS FOR ALL MACHINES AND EQUIPMENT

(a) General Requirements

- (1) Equipment Operation. Only employees authorized by the employer shall be permitted to operate machines and equipment.
- (2) Employment of Minors. The employer shall permit no one under 18 years of age to operate or assist in the operation of machinery, except that 16 and 17-year-olds may be employed when consistent with federal and state training provisions.
- (3) Instruction to Operators. The employer shall train and instruct the operator in the safe method of work before starting work on any operation. The employer shall insure that correct operating procedures are being followed.
- (4) Work Area. The employer shall provide clearance between machines so that movement of one operator will not interfere with the work of another. Space for cleaning machines, handling material, work pieces and scrap shall also be provided. All surrounding floors shall be kept in good condition and free from obstructions. Discharges or spillages of grease, oil, and water shall be eliminated by the employer's housekeeping practices.
- (5) Mechanical Power Transmission Apparatus. Belts, gears, shafts, pulleys, sprockets, spindles, drums, flywheels, chains, and other mechanical power transmission apparatus shall be guarded in accordance with the requirements of 29 CFR 1910.219.
- (6) Visual Inspection. Machines and equipment shall be visually checked for unsafe conditions prior to the start of each workshift and unsafe machines and equipment shall be taken out of service and tagged until repairs are made.
- (7) Unattended Machines. All electric switches normally used to start and stop the machine shall be in the "off" position when a machine is to be unattended.
- (8) Lockouts. Power sources (for example: electric, pneumatic, hydraulic) shall be locked in the "off" position when making repairs, performing maintenance, or in any way exposing an employee to the danger of mechanical operation of the machinery.

(b) Safeguarding Machines and Equipment

- (1) Safeguards. Safeguards, point of operation guards or devices shall be installed and used when the application or manufacturing process requires the operator or any other employee to be in the danger area of the point of operation of the machine.
- (2) General Requirements for Machine Guards. Guards shall be affixed to the machine where possible and secured elsewhere, if for any reason attachment to the machine is not possible. The guard shall be such that it does not offer an injury hazard in itself. Guards shall be constructed in accordance with 29 CFR 1910.219(m) and (o).
- (3) Point of Operation Guarding. Point of operation guarding shall be so designed and constructed as to prevent the operator from having any part of his body in the danger zone during the operating cycle.
- (4) Material Handling. Special handtools for placing and removing material shall be such as to permit easy handling of material without the operator placing a hand in the danger zone. Hand tools are not a point of operation guard or protection device and shall not be used in lieu of guards or devices.
- (5) Hazards to Personnel Associated with Broken or Fallen Machine Components. Machine components shall be designed, secured, or covered to minimize hazards caused by breakage, or loosening and falling, or release of mechanical energy (such as, broken springs).

(c) Mechanical Power Presses

- (1) Care and Use of Mechanical Power Presses. The requirements of this Section pertaining to the care and use of mechanical power presses shall apply to all mechanical power-press operations, including design, construction, setting, and feeding of dies, in accordance with the requirements of 29 CFR 1910.217.
- (2) Additional Requirements

- (A) Chip Removal. Brushes and scrapers to remove chips shall be provided and used by the operators of punches and shears and constructed to prevent the employee from placing his hands in the danger zone of the point of operation of the machines.
- (B) Special Tools. Soft-headed hammers shall be provided and used for striking punch dies, spindle holders, or other hardened tools.

History Note: Authority G.S. 95-131;
Eff. February 1, 1976;
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13 NCAC 07F .0410 CRANES: DERRICKS: AND HOISTS

Cranes, derricks, and hoists shall be constructed, installed, tested, inspected, operated, and maintained in accordance with the requirements of 29 CFR 1910.179, 29 CFR 1910.180, and 29 CFR 1910.181.

History Note: Authority G.S. 95-131;
Eff. February 1, 1976;
Readopted Eff. September 30, 1977.

13 NCAC 07F .0411 MATERIAL HANDLING DEVICES

- (a) Material handling devices shall be visually checked for worn, damaged, or broken parts before use, and shall not be used unless in proper working order.
- (b) Chains requiring repairs shall be returned to the manufacturer or shall be repaired by a competent person with proper facilities.
- (c) Instructions for the proper selection and use of material handling devices shall be given all individuals whose duties require the handling of materials.

History Note: Authority G.S. 95-131;
Eff. February 1, 1976;
Readopted Eff. September 30, 1977.

13 NCAC 07F .0412 SLINGS AND ALLOY-STEEL CHAINS

Slings and alloy-steel chains shall be used, maintained and inspected in accordance with the requirements of American National Standard Safety Code for Slings B30.9-1971.

History Note: Authority G.S. 95-131;
Eff. February 1, 1976;
Readopted Eff. September 30, 1977.

13 NCAC 07F .0413 MOBILE EQUIPMENT

- (a) All powered industrial trucks shall be serviced, maintained, and operated in accordance with the requirements of 29 CFR 1910.178.
- (b) Additional Requirements
 - (1) Forklifts and tractors shall be equipped with roll-over protective structure and seat belts.
 - (2) Signs instructing operators to shut off the engines when refueling their vehicles shall be conspicuously located at all fueling stations. Smoking in these areas shall be absolutely prohibited and a "no smoking" sign shall be prominently displayed. All fueling stations shall be located outside building.

- (3) At blind corners, mirrors or other aids shall be provided to assist in the safe movement of mobile equipment.
- (4) When vehicles are used to move shop buggies, there shall be provided tow bards, chains, or cables to attach the buggy to the vehicles so the operator can control the movement of the buggy while towing.

History Note: Authority G.S. 95-131;
 Eff. February 1, 1976;
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13 NCAC 07F .0414 JACKS: LEVER: RATCHET: SCREW: AND HYDRAULIC

All jacks shall be designed and constructed in accordance with the requirements of 29 CFR 1910.244(a).

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13 NCAC 07F .0415 PORTABLE POWER AND HAND TOOLS

(a) Guarding of Portable Power Tools

- (1) Portable power tools shall meet the requirements of 29 CFR 1910.243.
- (2) Additional Requirements
 - (A) Power-operated Tools. When power-operated tools, not specifically described in (a) of this Rule, are designed to accommodate guards, they will be equipped with such guards while in use.
 - (B) Electric Tools. The use of electric cords for hoisting or lowering electric tools shall not be permitted.
 - (C) Pneumatic Tools
 - (i) Pneumatic power tools shall be secured to the hose or whip by some positive means such as safety clips or wire to prevent the tool from becoming accidentally disconnected.
 - (ii) Safety clips or retainers shall be securely installed and maintained on pneumatic impact (percussion) tools to prevent attachments from being accidentally expelled.
 - (iii) The manufacturer's safe operating pressure for hoses, pipes, valves, filters, and other fittings on pneumatic tools shall not be permitted.
 - (D) Fuel Powered Tools
 - (i) All fuel powered tools shall be stopped while being transported, refueled, serviced or maintained or while left unattended.
 - (ii) Fire-resistant fluids used in hydraulic powered tools shall be fire-resistant fluids approved under Schedule 30 of the Bureau of Mines, U.S. Department of Interior and shall retain their operating characteristics at the most extreme temperatures to which they will be exposed.
 - (iii) The manufacturer's safe operating pressures for hoses, valves, pipes, filters, and other fittings shall not be exceeded.
 - (E) Explosive Actuated Tools
 - (i) Explosive actuated tools shall meet the requirements of 29 CFR 1910.243(d).
 - (ii) Only employees who have been trained in the operation of the particular tool in use and have been issued a "Qualified Operator's Card" shall be allowed to operate a power actuated tool.

(b) Hand Tools

- (1) Employers shall not issue or permit the use of defective hand tools.
 - (2) Wrenches, including adjustable, pipe, end, and sprocket wrenches, shall not be used when jaws are sprung to the point that slippage occurs.
- (c) Impact Hand Tools
- (1) Impact hand tools, such as drift pins, wedges and chisels, shall be kept free of mushroomed heads.
 - (2) The wooden handle of tools shall be unpainted or covered and kept free of splinters, and cracks and shall be kept tight in the tool.

*History Note: Authority G.S. 95-131;
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13 NCAC 07F .0416 ELECTRICAL

The installation, operation, and maintenance of all electrical apparatus shall comply with the requirements of 29 CFR 1910.308 and 29 CFR 1910.309.

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13 NCAC 07F .0417 HANDLING AND STORING MATERIAL

- (a) Yard Arrangement
- (1) The specific location of material in a receiving yard or a shipping yard is beyond the scope of this standard. It is assumed, however, that insofar as possible the mill material and the fabricated material will be located in close proximity to the fabrication facility for minimum crane travel.
 - (2) A minimum clearance of four feet shall be provided along the outside of the rails of an operating railroad track.
 - (3) Where 30 inch clearance cannot be provided along the outside rails of an operating buggy track, signs indicating close clearance shall be installed.
 - (4) Where 11 foot roadway width cannot be provided, signs indicating close clearance shall be installed.
- (b) Storage Area
- (1) Areas used for the storage of mill material or fabricated material shall be reasonably level, free from obstructions, and sufficiently compacted or paved.
 - (2) Skids placed on the storage area surface shall be adequate to support the maximum loads anticipated.
 - (3) During periods of freezing and thawing weather, and during periods of heavy rainfall, support skids shall be inspected for stability.
- (c) Timber Blocking
- (1) Timber blocking, for use in the receiving yard or shipping yard, shall be of sound lumber.
 - (2) Recommended sizes of timber blocking are three by four inches, four by four inches, four by six inches, and six by eight inches. Length shall be selected as required for end use. Timbers of lesser dimension shall not be used, except in storage of plates and sheets in which case the wide dimension of the block shall be horizontal.
 - (3) In general where blocking is used, it must be placed directly over points of skid support. Rectangular blocks supporting steel shall be placed with the long dimension horizontal.
 - (4) Blocking shall not extend beyond piles of steel so as to interfere with adjacent lifts. Blocking subjected to concentrated loading as from beam flanges shall extend at least one and one-half inches beyond the face of edge of steel.
- (d) Receiving Yard Handling and Storing Practices

- (1) General. Good receiving-yard practice involves the piling of material so as to obtain the greatest yield in tons per square foot compatible with safety and expeditious handling. This is best accomplished by constructing single, solid piles. The requirements listed in (2) to (9) of this Paragraph limit the height and extent of such piles, and describe the methods of nesting, interlocking and blocking necessary to their integrity.
- (2) Single Solid Piles of Standard and Webbed Flange Shapes. Standard and webbed flange shapes, including H and column sections as well as beams, shall be stacked in single, solid piles spaced at least three inches apart, with maximum heights above skid tops as indicated in (A) to (C) of this Subparagraph:
 - (A) All shapes shall be nested with webs horizontal and flange toes resting on the flat position of the supporting web, entirely free of the fillet:
 - (i) Standard I -- beam and webbed flange shapes -- nested.

Nominal Depth Range

six to eight inches
10 to 16 inches
18 to 36 inches

Approximate Pile Height

[see also (d)(2)(B)!
six feet no inches
11 feet no inches
18 feet no inches

- (ii) Standard channels - nested.

Nominal Depth Range

six to nine inches
10 to 18 inches

Approximate Pile Height

[see also (d)(2)(B)!
six feet no inches
12 feet no inches

- (B) It is recognized that even with the precautions given in (A) of this Subparagraph certain high piles may pose a hazard; if so, it shall be corrected by interlocking lifts, straightening the pile, bracing the pile, or reducing the pile height.
- (C) To avoid top-heavy piles, single, solid piles shall be limited to pieces of approximately the same length or of lengths generally diminishing from bottom to top of pile. The overhang of individual pieces at the tail end of a pile shall be limited to 25 percent of the piece length. The head (marked) ends of piles shall be vertically aligned adjacent to walkways. Individual lifts in a single pile may be staggered endwise to facilitate handling on and off. Likewise, individual heavy column sections with thick webs constituting a single pile may be staggered endwise to facilitate handling.
- (3) Blocked Piles of Standard and Webbed Flange Shapes
 - (A) For shorter standard and webbed flange shapes, including crop ends, lifts shall be separated by timber blocking, with pile arrangements.
 - (B) Nominal depths of webbed flange shapes and I-beams in succeeding tiers of single or multiple piles shall be stable. Succeeding tiers of channels, nested in single or multiple piles which present a flat surface to both upper and lower faces of the blocking, may be of differing nominal depths providing piles are aligned one above the other. For the stability of tiered single and multiple piles, shapes shall be arranged to diminish generally in weight per foot and length from bottom to top of piles. The over-hang of individual pieces at the tail end of a pile shall be limited to 25 percent of the piece length.

- (4) Interlocked Multiple Piles. In stacking standard I-beams, channels, and webbed flange shapes, particularly in the smaller sizes, it is necessary to construct piles which are interlocked as well as nested, to provide stability and to facilitate handling of multiple piles in single lifts. Single piles of angles, whether equal or unequal, shall be stable. Angles in a single pile are not limited to any particular size, but long heavy angles, where one or two piles make up a convenient crane lift, are best adopted to this method of stacking. There is no restriction on leg thickness of angles nested in any one pile.
- (5) Blocked Piles of Structural Angles
- (A) Blocked Multiple Piles. Solid piles may be extended in height by arranging piles in tiers with timber blocking between each tier. Tiered piles of all angles shall be proportioned so that the height of the pile does not exceed the base width. In tiered piles of unequal leg angles, larger angles and those with more nearly equal shall be placed in the lower tiers. Piles of angles in succeeding tiers shall be shifted laterally to avoid excessive overhang.
- (B) Interlocked and Blocked Multiple Piles. For maximum stability in stacking angles, equal and unequal leg angles shall be stacked multiple piles with inverted courses of locking angles. Although multiple piles with alternate interlocking courses provide the most stable arrangement, it will be satisfactory to nest several angles vertically and interlock the piles at intervals. Interlocking intervals shall be every fourth to sixth angle. Succeeding lifts of interlocked angles on blocking shall be placed so as to be supported substantially by the tops of piles below. Lifts shall not be placed so as to cantilever laterally over piles below. For maximum stability, a pyramidal arrangement of lifts shall be used. The head (marked) end of piles of angles shall be vertically aligned adjacent to walks. It will be permissible to offset lifts, or angles within lifts, endwise to allow identification. The maximum overhang of individual angles at the tail end of a pile shall not exceed 25 percent of the length of the angle.
- (C) Stacked Multiple Piles. Where space is available, maximum safety and convenience in handling shall be obtained by stacking angles in multiples of two or three piles in pockets between stakes. Since interlocking is not necessary, angles so stacked may be piled heels up for optimum drainage. Piles shall not extend above the tops of stakes.
- (6) Flat Material
- (A) Bars, Six to Eight Inches, and Plates to 30 Inches Wide. Flat material from 6 to 30 inches wide shall be stacked in solid piles, in multiple piles, blocked and tiered, or in single blocked and tiered piles. Bars and plates up to approximately 12 inches wide are frequently received in banded or wired bundles. They shall remain so unless it is necessary that they be broken to sort for handling. Plate widths and lengths in any one lift shall be approximately the same. For stability of piles, lifts shall be arranged to generally diminish in width and length from bottom to top of pile. Preference shall be given to a pyramidal arrangement of lifts in all piles. Offset or step stacking of plates to reveal identification marks is permissible. Plates may extend unsupported beyond the tail end of a pile, provided the overhang L_o is less than 25 percent of L , and provided further that L_o is limited as follows:

<u>Plate Thickness</u>	<u>Overhand L_o</u>
1/4 to 1/2 inch	six feet no inches
over 1/2 to 3/4 inch	nine feet no inches
over 3/4 to one inch	12 feet no inches
over one inch	15 feet no inches

Overhanging plates exceeding the above limits shall be supported from the ground or pavement by cribbed blocks. The use of blocks set vertically on end to support overhanging plates from the ground, or from plates below, shall not be permitted. The normal skid spacing of 7 feet to 10 feet is usually sufficient to

support plates without sagging. However, sheet or strip in gage thicknesses shall require more closely spaced supports.

- (B) Plates Over 30 Inches Wide. Plates over 30 inches wide form stable piles in any convenient height. When piled solid, succeeding lifts shall be staggered laterally to facilitate handling. Where width variations occur, and plates are handled with hooks, the widest plate should be at the bottom of the lift. Edges of this plate should extend beyond the edges of the plate above. Plates and slabs too short to span skids shall be piled on temporary timber. Piles shall be tiered with timber blocks between each plate or lift of plates.
 - (C) Blocking for Material. Timber blocks separating tiers or lifts of flat material up to 30 inches wide shall be placed over each skid point.
 - (7) Edge Stacking of Plates. An alternate method of storing plates is to set them on edge in pockets formed by suitable stakes.
 - (8) Bar-size Material. Bar-size material shall be understood to include shapes, angles, rounds and pipe with a maximum cross-sectional dimension of less than three inches, and bar flats less than six inches wide. Much of this bar-size material is received banded or wired in lifts. Except when stored in racks, bundles shall be left intact, and any banding or wiring that may be broken shall be repaired:
 - (A) Bundled Bar-size Material. Material received bundled can be stacked as individual lifts or arranged in multiple piles with tiers separated by timber blocking. Small structural shapes, angles, square and rectangular bundles shall be multiple piles in tiers as are the larger sizes. Rivet stock, small rounds, squares, and small flats are usually received in random-packed bundles. This, and other similar material which is not subject to damage due to superimposed weight, shall be arranged in multiple piles. Structural shapes, angles, tee, pipe, and tubing received in random-packed bundles may be piled the same as rivet stock.
 - (B) Loose Bar-sized Material. Bar-sized material, not bundled, shall be stacked in pockets between stakes, with timber blocking separating the tiers.
 - (9) Coils-flat Gage Material. Flat-gage material received in coils shall be stacked tiered in pyramidal form. Tiers shall be pyramided metal-to-metal with no blocking between tiers. The length and width of piles is limited only by the space available and the carrying capacity of the floor. Banding on the coils as received shall remain in place. Broken bands permitting the free ends to uncoil shall be replaced:
 - (A) Coils-rod Stock. Coils of rod stock shall be stacked on edge, leaning at about 15 degrees against a substantial wall or framework. Coils may be tiered in pyramidal form and shall be chained together at the end coils so as to prevent the coils from falling apart. Blocking shall be placed at least along the outer edges of piles or isolated pyramids.
 - (B) Coil Banding. Banding on the coils as received shall be inspected and replaced if broken or missing.
- (e) Shipping Yard Handling and Storing Practices
- (1) When overhead equipment is used, long, flexible material shall be transferred from the fabrication area to the shipping yard by use of one overhead crane with a lifting device that provides adequate distance between support points, or by use of two overhead cranes.
 - (2) Fabricated material piles shall maintain stability.
 - (3) Intermediate layers of fabricated material may contain a mixture of structural shapes (beams, columns, angles, channels, etc.), so long as the top surfaces shall be blocked approximately level.
 - (4) Layers of fabricated material that will not nest shall be separated by timber blocking adequate to support anticipated loads.
 - (5) Timber blocking placed to support succeeding layers shall be aligned over one another.
 - (6) Beams and columns, with webs vertical, may be stored in layers provided the top blocking surfaces are approximately level.

- (7) Deep narrow members, such as trusses and girders, may be stored either upright or flat provided they are stable or secured.

*History Note: Authority G.S. 95-131;
Eff. February 1, 1976;
Readopted Eff. September 30, 1977.*

13 NCAC 07F .0418 HANDLING MATERIAL FROM A RAILROAD CAR

- (a) Before entering any railroad car, tracks shall be protected with flags or other warning devices so that the railroad crew will not couple to or bump the car.
- (b) Before entering the drop-end gondolas, the condition of the latches shall be checked on the end gates. The end gate shall be properly secured so it will not fail. Ladders, if not attached to the car, shall be provided for climbing in and out of cars.
- (c) Before cars are moved, the area shall be clear and brakes shall be checked. Employees shall not remain in cars while they are being moved.
- (d) The wheels of railroad cars shall be chocked while being loaded or unloaded. A railroad car shall be held on grade by brakes and chocks.
- (e) At open-ended rails, rail stops or other secure chocks shall be installed.
- (f) A car shall be blocked from tipping when loading or unloading material that would cause unbalancing of the car.

*History Note: Authority G.S. 95-131;
Eff. February 1, 1976;
Readopted Eff. September 30, 1977.*

13 NCAC 07F .0419 UNLOADING MATERIAL FROM A TRUCK

- (a) Slings shall be in place on the lift before the binders are loosened.
- (b) Stanchions shall be placed on the sides of flatbed trailers when the possibility exists that material might shift or fall off when the binders are removed.
- (c) Brakes shall be set and wheel blocks or other visible positive means shall be in place to prevent movement of trucks or trailers.

*History Note: Authority G.S. 95-131;
Eff. February 1, 1976.
Readopted Eff. September 30, 1977.*

13 NCAC 07F .0420 REAMING AND DRILLING

- (a) Adequate instruction, including a demonstration, shall be provided all new operators.
- (b) All equipment shall be checked at the start of each workshift and any that is damaged or inoperable shall be immediately returned to the storeroom for repairs.
- (c) Bits shall be checked for dull edges, burrs, nicks, or other defects and any that are defective shall be removed from service.
- (d) When mobile equipment is in use, procedures and traffic rules shall be established to protect workers in the area from such equipment.
- (e) Safety bars shall be provided and used by operators of portable hand reamers.
- (f) All portable reamers shall be provided with a deadman control.
- (g) Brushes shall be provided to remove chips or cuttings from work areas.
- (h) Clamps shall be provided to secure small material.
- (i) Safety chains shall be provided on all magnetic equipment when drilling in a horizontal position.

*History Note: Authority G.S. 95-131;
Eff. February 1, 1976;
Readopted Eff. September 30, 1977.*

13 NCAC 07F .0421 RIVETING

- (a) All rivet hammers shall be equipped with a spring-clip die holder. The plunger shall be removed when the hammer is not in use.
- (b) Both riveter and buckler-up shall be properly instructed to coordinate their movements before starting to drive rivets.
- (c) Hammers shall be disconnected from air supply when not in use.
- (d) Areas around rivet operations shall be kept free of bolts, pins, washers, combustible material, etc., at all times.
- (e) All rivet operations shall be performed as close to the rivet-heating furnace as practicable. Where stationary furnaces are generally used, portable furnaces shall also be provided to facilitate the operation when the work is away from the furnace.
- (f) Throwing rivets is prohibited.
- (g) When pins become exceptionally tight or frozen in a hole, they shall be burned off and drilled out of the hole.
- (h) Rivet heaters shall be properly instructed and shall demonstrate their ability to safely light in a heating furnace.
- (i) Gantry machines shall be provided with an alarm so the operator can warn other workers when he is preparing to move the machine.
- (j) When rivet heads are being backed out or knocked off, a protective shield shall be provided to prevent them from striking an employee.

*History Note: Authority G.S. 95-131;
Eff. February 1, 1976;
Readopted Eff. September 30, 1977.*

13 NCAC 07F .0422 BOLTING

- (a) When bolts or drift pins are being knocked out, means shall be provided to keep them from falling.
- (b) Bolts, nuts washers and pins shall not be thrown. They shall be placed in bolt buckets or other approved containers and raised or lowered by using a line when they cannot be passed from hand to hand.
- (c) Impact wrenches shall be provided with a locking device for retaining the socket.
- (d) Impact wrenches shall be disconnected from the power source before they are adjusted or repaired.
- (e) Air-line hose sections shall be securely fastened together.
- (f) Containers shall be provided for storing or carrying bolts or drift pins.
- (g) Employees shall be instructed in the proper care and use of bolting equipment and in the proper method of bolt installation and tightening.
- (h) Impact wrenches shall not be passed from one employee to another by the air hose. If the impact wrench cannot be handed from one employee to another, a rope shall be provided to pass the wrench.
- (i) Open-end or spanner wrenches with sprung openings shall not be used.
- (j) Leverage devices, such as pipe extensions, shall not be used to give greater leverage to an open-end or spud wrench. If the wrench is designed for use with a pipe extension, only an approved length of pipe shall be used.
- (k) Open-end wrenches shall have jaw openings that match the bolts being tightened. Shims shall not be used to adjust the jaw opening.

*History Note: Authority G.S. 95-131;
Eff. February 1, 1976;
Readopted Eff. September 30, 1977.*

13 NCAC 07F .0423 MANUAL ABRASIVE BLASTING

- (a) Only employees authorized by the employer shall be permitted to operate manual abrasive blasting equipment.
- (b) Operators shall keep their hoods on at all times while blowing loose abrasive material, shoveling abrasives, blasting, or performing other work which causes dust.
- (c) Blasting nozzles shall be equipped with automatic cutoff valves or deadman controls in the event the operator loses control.
- (d) Blasting equipment shall be grounded to prevent static sparks when it is used on tanks, etc., that contain or have contained volatile substances. Such tanks shall be purged before blasting.
- (e) Blasting shall be done in a restricted area.
- (f) Abrasive blasting shall conform to the requirements of 29 CFR 1910.94.

*History Note: Authority G.S. 95-131;
 Eff. February 1, 1976;
 Readopted Eff. September 30, 1977.*

13 NCAC 07F .0424 PAINTING

- (a) All spray finishing using flammable or combustible liquids shall comply with the provisions of 29 CFR 1910.107.
- (b) Employees working with lead or other toxic materials shall be instructed concerning the various ways that toxic substances such as paint can enter the human body and in the importance of practicing good personal hygiene. Washing facilities shall be made available.
- (c) Respiratory protection in accordance with American National Standard Practices for Respiratory Protection, Z88.2-1969, shall be worn at all times while spraying or working within 10 feet of spraying operations.
- (d) No mixing or spray painting shall be done in areas where the probability exists that ignition might occur.
- (e) Painting between upright girders or other large members shall be prohibited unless the members are secured.
- (f) Flammable solvents shall be stored in approved safety cans equipped with flame arrestors.
- (g) Painting equipment shall be inspected regularly.

*History Note: Authority G.S. 95-131;
 Eff. February 1, 1976;
 Readopted Eff. September 30, 1977.*

13 NCAC 07F .0425 GALVANIZING AND PICKLING OPERATIONS

- (a) All personnel working in galvanizing areas shall be instructed in safe operating procedures.
- (b) A visual check of all chains, brackets, racks, pins, rods, hooks, etc., shall be made at the start of each workshift and defective or worn equipment shall be removed from service.
- (c) Anyone operating valves or switches in conjunction with galvanizing and pickling operations shall be given adequate instruction so that he is thoroughly familiar with their function.
- (d) Areas around galvanizing and pickling operations shall be kept clean and free of tripping hazards.
- (e) Employees working in galvanizing and pickling operations shall be instructed that the following conditions may cause eruption in the tank:
 - (1) charging wet material,
 - (2) charging cold material,
 - (3) rapid immersion,
 - (4) excessive charges,
 - (5) trapped air pockets.

- (f) All tools shall be preheated before being placed in molten zinc.
- (g) Cranes, crane runways, and all hoisting, pickling, and galvanizing equipment shall be visually inspected for unsafe conditions during every drossing period. Unsafe equipment shall be removed from service until repairs have been made.
- (h) Provisions shall be made so that no work will require employees to stand on the top edge of pickling or galvanizing vats.
- (i) Signs indicating that pickling and galvanizing are being performed in the area shall be conspicuously posted.
- (j) No galvanizing shall be done on pipe or tube without weep holes.
- (k) Acid shall be transported in containers that are of acid-resistant material.

*History Note: Authority G.S. 95-131;
Eff. February 1, 1976;
Readopted Eff. September 30, 1977.*

13 NCAC 07F .0426 SOURCE OF STANDARDS

The sources of the standards in this Section are ANSI Z 229.1 - 1973 and 29 CFR Part 1910.

*History Note: Authority G.S. 95-131;
Eff. February 1, 1976;
Readopted Eff. September 30, 1977;
Amended Eff. July 1, 1998.*