



# State of Connecticut

## Continuing Education for Electricians 2020 License Renewal Year

License Types: E-1,E-2,E-9

State of CT Statutes includes new apprentice ratio  
2018 CT. State Building Code & Amendments per NEC 2017  
Calculation Questions as per Chapter 4  
OSHA PPT presentations to include but not limited to:

- Head, Hearing, Eye and Face Protection
- Excavations
- Electrical Safety- Construction
- Fall Protection
- Heat Stress
- Silica
- Confined Spaces
- Cranes, Lifts, Derricks
- Lock Out Tag Out



## CHAPTER 393\*

ELECTRICIANS, PLUMBERS, SOLAR, HEATING,  
PIPING  
AND COOLING CONTRACTORS AND  
JOURNEYMEN,  
ELEVATOR AND FIRE PROTECTION SPRINKLER  
CRAFTSMEN,  
IRRIGATION CONTRACTORS AND JOURNEYMEN,  
AND  
GAS HEARTH INSTALLER CONTRACTORS AND  
JOURNEYMEN

## Definitions

(1) "Contractor" means any person regularly offering to the general public services of such person or such person's employees in the field of electrical work, plumbing and piping work, solar work, heating, piping, cooling and sheet metal work, fire protection sprinkler systems work, elevator installation, repair and maintenance work, irrigation work, automotive glass work or flat glass work, as defined in this section;

(2) "Electrical work" means the installation, erection, maintenance, alteration or repair of any wire, cable, conduit, busway, raceway, support, insulator, conductor, appliance, apparatus, fixture or equipment that generates, transforms, transmits or uses electrical energy for light, heat, power or other purposes, but does not include low voltage wiring, not exceeding twenty-four volts, used within a lawn sprinkler system;

(6) "Apprentice" means any person registered with the Labor Department for the purpose of learning a skilled trade;

(18) "Solar electricity work" means the installation, erection, repair, replacement, alteration, or maintenance of photovoltaic or wind generation equipment used to distribute or store ambient energy for heat, light, power or other purposes to a point immediately inside any structure or adjacent to an end use

## Examining Boards

(a) There shall be in the Department of Consumer Protection separate examining boards for each of the following occupations: (1) Electrical work; (2) plumbing and piping work; (3) heating, piping, cooling and sheet metal work; (4) elevator installation, repair and maintenance work; (5) fire protection sprinkler systems work; and (6) automotive glass work and flat glass work.

(b) The Electrical Work Board shall consist of twelve members who shall be residents of this state, one of whom shall be a general contractor or an unlimited contractor licensed for such occupation under this chapter, two of whom shall be unlimited contractors licensed for such occupation under this chapter, neither of whom at the time of appointment shall be a member or an employee of a member of a trade union or a party or an employee of a party to a contract with a trade union, one of whom shall be an electronic technician licensed under chapter 394, four of whom shall be unlimited journeymen licensed for such occupation under this chapter, who at the time of appointment shall be members of a trade union and four of whom shall be public members.

Sec. 20-332b. Hiring ratios re apprentices, journeymen and contractors. Electrical, plumbing, heating, piping and cooling, sprinkler fitter and sheet metal work. Regulations.

. The Commissioner of Consumer Protection shall amend existing regulations of Connecticut state agencies adopted pursuant to section 20-332 to specify the following allowable hiring ratios regarding apprentices, journeymen and contractors for the following trades:

TRADE  
Electrical, Plumbing, Heating,  
Piping and Cooling,  
Sprinkler Fitter and Sheet  
Metal Work

1 apprentice to 1 Journey man or Contractors

2 Apprentices to 2 journeymen or contractors

3 apprentices to 5 Journeymen or contractors

4 apprentices to 8 Journeymen or contractors

This continues on a ratio of 3 Journeymen to 1 apprentice

## Sec. 20-333. Examinations.

To obtain a license under this chapter, an applicant shall have attained such applicant's eighteenth birthday and shall furnish such evidence of competency as the appropriate board, with the consent of the Commissioner of Consumer Protection, shall require. The applicant shall satisfy such board that such applicant is of good moral character, possesses a diploma or other evidence of graduation from the eighth grade of grammar school, or possesses an equivalent education to be determined on examination and has the requisite skill to perform the work in the trade for which such applicant is applying for a license and can comply with all other requirements of this chapter and the regulations adopted under this chapter.



The department shall conduct such written, oral and practical examinations as the appropriate board, with the consent of the commissioner, deems necessary to test the knowledge of the applicant in the work for which a license is being sought. Any person completing the required apprentice training program for a journeyman's license under section 20-334a shall, within thirty days following such completion, apply for a licensure examination given by the department.

If an applicant does not pass such licensure examination, the commissioner shall provide each failed applicant with information on how to retake the examination and a report describing the applicant's strengths and weaknesses in such examination. Any apprentice permit issued under section 20-334a to an applicant who fails three licensure examinations in any one-year period shall remain in effect if such applicant applies for and takes the first licensure examination given by the department following the one-year period from the date of such applicant's third and last unsuccessful licensure examination

#### Sec. 20-333a. Reciprocity.

The Commissioner of Consumer Protection may, upon the payment of the appropriate fee, as provided in section 20-335, grant a license or a card of registration provided for in this chapter, without an examination, to any currently practicing, competent person who holds a similar license or card of registration granted by any other state, licensure jurisdiction within another state, the District of Columbia or any territory or commonwealth of the United States having licensure or registration requirements substantially similar to, or higher than, those of this state, if the licensing authority in such other state, licensure jurisdiction within another state, the District of Columbia or any territory or commonwealth of the United States may grant such similar license or card of registration, without an examination, to any currently practicing, competent licensee or registrant from this state. The commissioner, with the advice and consent of the appropriate examining board, may adopt regulations in accordance with the provisions of chapter 54 in order to carry out the provisions of this section.

#### Sec. 20-334. License or card of registration. Requirements. Suspension or revocation.

(a) No person shall engage in, practice or offer to perform the work of any occupation subject to this chapter in this state, including offering to perform such work in any print, electronic, television or radio advertising or listing, unless such person has first obtained a license as provided in section 20-333, or possesses a card of registration from the Labor Department or the board and is subject to all of the regulations adopted under this chapter for the purpose of governing apprenticeship training, or has been issued a license for such particular work under this chapter prior to July 6, 1967.

(b) The Department of Consumer Protection shall furnish to each qualified applicant a license certifying that the holder thereof is entitled to engage in the work or occupation for which the person has been issued a license under this chapter, and the holder of such license shall carry it on his person while engaging in such work or occupation. Such license shall be shown to any properly interested person on request. No such license shall be transferred to or used by any person other than the person to whom the license was issued. Contractors shall display their state license number on all commercial vehicles used in their business and shall display such number in a conspicuous manner on all printed advertisements, bid proposals, contracts, invoices and on all stationery used in their business. The department shall keep a register in which shall be entered the names of all persons to whom such licenses are issued. The register shall be at all times open to public inspection.

(c) Each board established under section 20-331 may suspend or revoke any license or certificate granted or issued by it under this chapter if the holder of such license or certificate is convicted of a felony, is grossly incompetent, engages in malpractice or unethical conduct or knowingly makes false, misleading or deceptive representations regarding his work or violates the regulations adopted under this chapter. Before any such license is suspended or revoked, such holder shall be given notice and opportunity for hearing as provided in regulations adopted by the Commissioner of Consumer Protection. Any person whose license has been suspended or revoked may, after ninety days, apply to the board to have such license reinstated.

Sec. 20-334a. Types of licenses. (a) Except as otherwise provided in this section, the following licenses may be issued by the Department of Consumer Protection, upon authorization of the boards, under the provisions of section 20-333:

(1) (A) An unlimited contractor's license may be issued to a person who has served as a journeyman in the trade for which such person seeks a license for not less than two years and, if such service as a journeyman was outside this state, has furnished evidence satisfactory to the appropriate state board that such service is comparable to similar service in this state, or has furnished satisfactory evidence of education and experience and has passed an examination which has demonstrated that such person is competent in all aspects of such trade to be an unlimited contractor. (B) A limited contractor's license may be issued to a person who fulfills the requirements of subparagraph (A) of this subdivision as to a specific area or areas within the trade for which such person seeks a license.

(C) The holder of an unlimited or a limited contractor's license may, within the trade, or the area or areas of the trade, for which such holder has been licensed, furnish supplies and do layout, installation, repair and maintenance work and distribute and handle materials, provided nothing in this subdivision shall be construed to authorize the performance of any action for which licensure is required under the provisions of chapter 390 or 391. Such licensee shall furnish the board with evidence that such licensee will comply with all state requirements pertaining to workers' compensation and unemployment insurance and that such evidence shall be available to any properly interested person prior to the issuance of a license under this subdivision.

(2) (A) An unlimited journeyman's license may be issued to any person who has completed a bona fide apprenticeship program, including not less than four years' experience in the trade for which such person seeks a license, and has demonstrated such person's competency to perform all services included in the trade for which a license is sought by successfully completing the applicable state licensure examination. (B) A limited journeyman's license may be issued to a person who fulfills the requirements of subparagraph (A) of this subdivision in a specific area or areas of the trade for which such person seeks a license, provided the length of experience required may be less than four years for such area or areas of the trade.

(i) The Electrical Work Board shall authorize any person to install, service and repair residential security systems limited to twenty-five volts and five amperes in one to three-family residential dwellings, provided the person is in the employ of an electrical contractor holding an E-1 unlimited contractor license or an L-5 contractor license issued pursuant to subdivision (1) of subsection (a) of this section and the person has successfully completed an apprenticeship and training program established and approved by the Labor Department with the advice of the Connecticut State Apprenticeship Council.

Any person authorized to work under this subsection shall not perform telecommunications electrical work, as defined in section 20-340b, with the exception of work involving interface wiring from a residential security system to an existing telephone connection for monitoring purposes. Any person who is authorized to work under this subsection shall, no later than fifteen months after being issued said authorization, secure an L-6 limited electrical journeyman's license pursuant to subdivision (2) of subsection (a) of this section.

Sec. 20-334d. Continuing professional education requirements for electricians and plumbers.  
Regulations. Exemptions. (a) As used in this section:

(1) "Accredited continuing professional education" means any education of an electrician or plumber that is designed to maintain professional competence in the pursuit, practice and standards of electrical work or plumbing and piping work and that is approved by the commissioner and is provided by an organization, institution or agency that is approved by the commissioner;

(2) "Certificate of continuing education" means a document issued to an electrician or plumber by an organization, institution or agency approved by the commissioner that offers accredited continuing professional education, which (A) certifies that an electrician or plumber has satisfactorily completed a specified number of continuing education hours, and (B) bears the name of such organization, institution or agency, the title of the program, the dates during which the program was conducted, the number of continuing education hours satisfactorily completed and the signature of the director of such organization, institution or agency or the signature of the director's authorized agent;

(3) "Commissioner" means the Commissioner of Consumer Protection.



(b) The commissioner, with the advice and assistance of the Electrical Work Board established pursuant to subsection (b) of section 20-331, shall adopt regulations, in accordance with chapter 54, to (1) establish requirements for accredited continuing professional education for electricians licensed pursuant to sections 20-330 to 20-341, inclusive; (2) establish qualifying criteria for accredited continuing professional education programs and establish qualifying criteria for acceptable certificates of continuing education; and (3) provide for the waiver of required accredited continuing professional education for electricians for good cause. Such regulations shall require not less than four hours per year of accredited continuing professional education for such electricians, except upon request of the Electrical Work Board, the commissioner may increase such hours to a maximum of seven hours.

Sec. 20-334e. Eligibility of holders of L-5 or L-6 licenses to take licensure examination for C-5 or C-6 license.

Any person who has been issued an L-5 or L-6 license pursuant to subdivision (1) of subsection (a) of section 20-334a shall be eligible to take the licensure examination for a C-5 or C-6 license issued pursuant to subdivision (1) of subsection (a) of section 20-334a, provided such person submits a complete license application and a nonrefundable application fee pursuant to section 20-333 and provides satisfactory evidence of experience in the field of telecommunications work to the Electrical Work Board.

Sec. 20-335. License fee. Continuing professional education requirements. Expiration and renewal.

Any person who has successfully completed an examination for such person's initial license under this chapter shall pay to the Department of Consumer Protection a fee of one hundred fifty dollars for a contractor's license or a fee of one hundred twenty dollars for any other such license. All such licenses shall expire annually. No person shall carry on or engage in the work or occupations subject to this chapter after the expiration of such person's license until such person has filed an application bearing the date of such person's registration card with the appropriate board. Such application shall be in writing, addressed to the secretary of the board from which such renewal is sought and signed by the person applying for such renewal. A licensee applying for renewal shall, at such times as the commissioner shall by regulation prescribe, furnish evidence satisfactory to the board that the licensee has completed any continuing professional education required under sections 20-330 to 20-341, inclusive, or any regulations adopted thereunder.

The board may renew such license if the application for such renewal is received by the board no later than one month after the date of expiration of such license, upon payment to the department of a renewal fee of one hundred fifty dollars in the case of a contractor and of one hundred twenty dollars for any other such license. For any completed renewal application submitted pursuant to this section that requires a hearing or other action by the applicable examining board, such hearing or other action by the applicable examining board shall occur not later than thirty days after the date of submission for such completed renewal application. The department shall issue a receipt stating the fact of such payment, which receipt shall be a license to engage in such work or occupation. A licensee who has failed to renew such licensee's license for a period of over one year from the date of expiration of such license shall have it reinstated only upon complying with the requirements of section 20-333. All license fees and renewal fees paid to the department pursuant to this section shall be deposited in the General Fund.

Sec. 20-336. Appeals. Any person aggrieved by any action of any board may appeal there from in accordance with the provisions of section 4-183.

Sec. 20-338. License as contractor and journeyman. Valid throughout state.

The Department of Consumer Protection shall issue a separate license to persons qualified to engage in work as contractors and as journeymen. Any person licensed under this chapter shall be permitted to perform the work or occupation covered by such license in any town or municipality of this state without further examination or licensing by any town or municipality.

Sec. 20-338a. Work required to be performed by licensed persons.

Any contractor who applies for a building permit from a local building official for any work required to be performed by a person licensed under the provisions of this chapter, shall cause such work to be performed by a person licensed under the provisions of this chapter.

Sec. 20-338b. Building permit applications. Who may sign.

Any licensed contractor who seeks to obtain a permit from a building official may sign the building permit application personally or delegate the signing of the building permit application to an employee, subcontractor or other agent of the licensed contractor, provided, the licensed contractor's employee, subcontractor or other agent submits to the building official a dated letter on the licensed contractor's letterhead, signed by the licensed contractor, stating that the bearer of the letter is authorized to sign the building permit application as the agent of the licensed contractor. The letter shall not be a copy or a facsimile, but shall be an original letter bearing the original signature of the licensed contractor. The letter shall also include: (1) The name of the municipality where the work is to be performed; (2) the job name or a description of the job; (3) the starting date of the job; (4) the name of the licensed contractor; (5) the name of the licensed contractor's agent; and (6) the license numbers of all contractors to be involved in the work.

Sec. 20-338c. Work not to commence until permit obtained.

No person licensed pursuant to sections 20-330 to 20-341, inclusive, shall commence work within the scope of sections 20-330 to 20-341, inclusive, unless each applicable permit with respect to the specific work being performed by such licensee has been obtained as required pursuant to local ordinances and the general statutes.

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## INTRODUCTION

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### Adopted and Referenced Publications

Pursuant to Connecticut General Statute §29-252, as amended by Public Act 16-215, the following national model codes, as amended herein, are adopted and shall be known as the 2018 Connecticut State Building Code:

- 2015 International Building Code
- 2009 ICC/ANSI A117.1 Accessible and Usable Buildings and Facilities
- 2015 International Existing Building Code
- 2015 International Plumbing Code
- 2015 International Mechanical Code
- 2015 International Energy Conservation Code
- 2017 NFPA 70, National Electrical Code, of the National Fire Protection Association Inc.
- 2015 International Residential Code of the International Code Council, Inc.

Copies of the International Codes may be obtained from the International Code Council, Inc., 4051 West Flossmoor Road., Country Club Hills, IL 60478-5795 (website: [www.iccsafe.org](http://www.iccsafe.org)).

Copies of the 2017 NFPA 70, National Electrical Code, may be obtained from the National Fire Protection Association Inc., 1 Batterymarch Park, P.O. Box 9101, Quincy, MA 02169-7471 (website: [www.nfpa.org](http://www.nfpa.org)).

Copies of the 2018 Connecticut State Building Code document may be downloaded from the website: [www.portal.ct.gov/DAS](http://www.portal.ct.gov/DAS).

The requirements of the 2018 State Building Code shall apply to all work for which a permit application was made on or after the date of adoption.

### As used in this document, these annotations have the following meaning:

**Add:** A section or subsection preceded by (Add) indicates the addition of this section or subsection to the adopted referenced standard.

**Amd:** A section or subsection preceded by (Amd) indicates the substitution of this section or subsection in the adopted referenced standard.

**Del:** A section or subsection preceded by (Del) indicates the deletion of this section or subsection from the adopted referenced standard.





DEPARTMENT OF ADMINISTRATIVE SERVICES

# 2018 Connecticut State Building Code

**DIVISION OF  
CONSTRUCTION SERVICES**  
Office of the State Building Inspector

450 Columbus Boulevard  
Hartford, CT 06103

**MELODY A. CURREY**  
Commissioner

**JOSEPH V. CASSIDY, P.E.**  
State Building Inspector



DRAFT  
FOR PUBLIC COMMENT  
JANUARY 2, 2018



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## AMENDMENTS TO THE 2017 NFPA 70, NATIONAL ELECTRICAL CODE

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### ARTICLE 90 – INTRODUCTION

(Amd) **90.2 Scope.**

**(A) Covered.** This Code covers the installation of electrical conductors, equipment and raceways; signaling and communications conductors, equipment and raceways; and optical fiber cables and raceways for the following:

(1) Public and private premises, including:

- a. buildings and structures;
- b. installations in detached one- and two-family dwellings and multiple single-family dwellings (townhouses) not more than three stories in height with a separate means of egress and their accessory structures shall be in accordance with the requirements of this code or with the requirements of the 2015 International Residential Code portion of the State Building Code;
- c. utility connections, additions and alterations to mobile homes;
- d. utility connections to recreational vehicles; and
- e. floating buildings.

(2) Yards, lots, parking lots, carnivals and industrial substations.

(3) Installations of conductors and equipment that connect to the supply of electricity.

(4) Installations used by the electric utility, such as office buildings, warehouses, garages, machine shops and recreational buildings that are not an integral part of a generating plant, substation or control center.

**(B) Not covered.** This code does not cover the following:

(1) Installations in ships, watercraft other than floating buildings, railway rolling stock, aircraft or automotive vehicles other than mobile homes and recreational vehicles

(2) Installations underground in mines and self-propelled mobile surface mining machinery and its attendant electrical trailing cable

(3) Installations of railways for generation, transformation, transmission or distribution of power used exclusively for operation of rolling stock or installations used exclusively for signaling and communications purposes

(4) Installations of communications equipment under the exclusive control of communications utilities located outdoors or in building spaces used exclusively for such installations

(5) Installations under the exclusive control of an electric utility where such installations

- a. Consist of service drops or service laterals, and associated metering; or



- b. Are located in legally established easements, rights-of-way or by other agreements either designated by or recognized by public service commissions, utility commissions or other regulatory agencies having jurisdiction for such installations; or
- c. Are on property owned or leased by the electric utility for the purpose of communications, metering, generation, control, transformation, transmission or distribution of electric energy; or
- d. Are located by other written agreements either designated by or recognized by public service commissions, utility commissions, or other regulatory agencies having jurisdiction for such installations. These written agreements shall be limited to installations for the purpose of communications, metering, generation, control, transformation, transmission, or distribution of electric energy where legally established easements or rights-of-way cannot be obtained. These installations shall be limited to federal lands, Native American reservations through the U.S. Department of the Interior Bureau of Indian Affairs, military bases, lands controlled by port authorities and state agencies and departments, and lands owned by railroads.

(6) Installations in one- and two-family dwellings and multiple single-family dwellings (townhouses) not more than three stories in height with a separate means of egress and their accessory structures not more than three stories above grade plane in height, that are in accordance with the provisions of the 2015 International Residential Code portion of the State Building Code.

**(C) Special permission.** The State Building Inspector may grant an exception for the installation of conductors and equipment that are not under the exclusive control of the electric utilities and are used to connect the electric utility supply system to the service-entrance conductors of the premises served, provided such installations are outside a building or terminate immediately inside a building wall.

**(Amd) 90.4 Enforcement.** Administration of this code shall be in accordance with the provisions of Chapter 1 of the 2015 International Building Code portion of the State Building Code. For the purposes of this code, the authority having jurisdiction for interpreting the rules and for granting the special permission contemplated in a number of rules is the State Building Inspector. Interpretations shall be requested verbally or in writing from the Office of the State Building Inspector. Special permission shall be requested in writing using the Request for Modification of the State Building Code form available from local building departments or from the Office of the State Building Inspector, 450 Columbus Boulevard, Hartford CT 06103. [www.portal.ct.gov/DAS](http://www.portal.ct.gov/DAS).

## CHAPTER 1 – GENERAL

### ARTICLE 100 – Definitions.

**(Amd) Accessible, readily (Readily Accessible).** Capable of being reached quickly for operation, renewal, or inspections without requiring those to whom ready access is requisite to actions such as to use tools, to climb over or remove obstacles, or to resort to portable ladders, and so forth. For overcurrent devices located within listed enclosures or assemblies for which access requires the use of a tool, the readily accessible requirement of this section shall not apply.

**(Amd) Authority having jurisdiction.** The organization, office or individual responsible for approving equipment, material, an installation, or a procedure. The local building official has the responsibility for approving construction documents, issuing permits, approving materials and procedures and for making inspections from time to time as the construction process requires.



The State Building Inspector has the responsibility for administering the State Building Code, interpreting the State Building Code and for granting exceptions from specific rules of the State Building Code. See the definition of "Special Permission," and Article 90.4.

(Amd) **Special Permission.** For the purposes of this code, the authority having jurisdiction for granting the special permission contemplated in a number of rules is the State Building Inspector. Special permission shall be requested in writing using the Request for Modification of the State Building Code form available from local building departments or from the Office of the State Building Inspector, 450 Columbus Boulevard, Hartford CT 06103. [www.portal.ct.gov/DAS](http://www.portal.ct.gov/DAS).

## CHAPTER 2 – WIRING AND PROTECTION

(Del) **240.67 Arc Energy Reduction.** Delete in its entirety without substitution.

(Amd) **250.50 Grounding Electrode System.** If available on the premises at each building or structure served, each item in 250.52 (A)(1) to (A)(7), inclusive, shall be bonded together to form the grounding electrode system. Where none of these grounding electrodes are available, one or more of the grounding electrodes specified in 250.52 (A)(4) to (A)(8), inclusive, shall be installed and used.

## CHAPTER 3 – WIRING METHODS AND MATERIALS

(Add) **300.4.1 Drilling and notching.**

**(A) Structural floor, wall, ceiling and roof members.**

**(1) Solid sawn lumber.** Notches in solid lumber joists, rafters and beams shall not exceed one-sixth of the depth of the member, shall not be longer than one-third of the depth of the member and shall not be located in the middle one-third of the span. Notches at the ends of the member shall not exceed one-fourth the depth of the member. The tension side of members 4 inches or greater in nominal thickness shall not be notched except at the ends of the members. The diameter of holes bored or cut into members shall not exceed one-third the depth of the member. Holes shall not be closer than 2 inches to the top or bottom of the member, or to any other hole located in the member. Where the member is also notched, the hole shall not be closer than 2 inches to the notch.

**Exception:** Notches on cantilevered portions of rafters are permitted provided the dimension of the remaining portion of the rafter is not less than 4-inch nominal and the length of the cantilever does not exceed 24 inches.

**(2) Engineered wood products.** Cuts, notches and holes bored in trusses, structural composite lumber, structural glue-laminated members or I-joists are prohibited except where permitted by the manufacturer's recommendations or where the effects of such alterations are specifically considered in the design of the member by a registered design professional.

**(3) Studs.** Any stud in an exterior wall or interior bearing partition may be cut or notched to a depth not exceeding 25 percent of its width. Studs in nonbearing interior partitions may be notched to a depth not to exceed 40 percent of a single stud width. Any stud may be bored or drilled, provided that the diameter of the resulting hole is no greater than 40 percent of the stud width, the edge of the hole is no closer than 5/8 inch to the edge of the stud and the hole is not located in the same section as a cut or notch.

**Exceptions:**

1. A stud may be bored or drilled to a diameter not exceeding 60 per cent of its width, provided that such studs located in exterior walls or interior bearing partitions are doubled and not more than two successive studs are bored.
2. Approved stud shoes may be used when installed in accordance with the manufacturer's recommendations.

**(4) Top plates.** When wiring, conduit, piping or ductwork is placed in or partly in an exterior wall or interior bearing wall, necessitating cutting, drilling or notching of the top plate by more than 50 per cent of its width, a galvanized metal tie of not less than 0.054 inch thick (1.37 mm) (16 ga) and 1 ½ inches (38 mm) wide shall be fastened across and to the plate at each side of the opening with not less than eight 10d (0.148 inch diameter) nails at each side or equivalent. The metal tie must extend a minimum of 6 inches past the opening.

**Exception:** When the entire side of the wall with the notch or cut is covered by wood structural panel sheathing.

## **CHAPTER 4 – EQUIPMENT FOR GENERAL USE**

### **(Amd) 404.2 Switch Connections.**

**(A) Three-Way and Four-Way Switches.** Three-way and four-way switches shall be wired so that all switching is done only in the ungrounded circuit conductor. Where in metal raceways or metal-armored cables, wiring between switches and outlets shall be in accordance with 300.20(A).

**Exception:** Switch loops shall not require a grounded conductor.

**(B) Grounded Conductors.** Switches or circuit breakers shall not disconnect the grounded conductor of a circuit.

**Exception:** A switch or circuit breaker shall be permitted to disconnect a grounded circuit conductor where all circuit conductors are disconnected simultaneously, or where the device is arranged so that the grounded conductor cannot be disconnected until all the ungrounded conductors of the circuit have been disconnected.

**(C) Switches Controlling Lighting Loads.** The grounded circuit conductor for the controlled lighting circuit shall be installed at the location where switches control lighting loads that are supplied by a grounded general-purpose branch circuit serving bathrooms, hallways, stairways, or rooms suitable for human habitation or occupancy as defined in the applicable building code. Where multiple switch locations control the same lighting load such that the entire floor area of the room or space is visible from the single or combined switch locations, the grounded circuit conductor shall only be required at one location. A grounded conductor shall not be required to be installed at lighting switch locations under any of the following conditions:

- (1) Where conductors enter the box enclosing the switch through a raceway, provided that the raceway is large enough for all contained conductors, including a grounded conductor
- (2) Where the box enclosing the switch is accessible for the installation of an additional or replacement cable without removing finish materials
- (3) Where snap switches with integral enclosures comply with 300.15(E)
- (4) Where lighting in the area is controlled by automatic means
- (5) Where a switch controls a receptacle load

The grounded conductor shall be extended to any switch location as necessary that require line-to-neutral voltage to operate the electronics of the switch in the standby mode and shall meet the requirements of 404.22.

Informational Note: The provision for a (future) grounded conductor is to complete a circuit path for electronic lighting control devices.

(Amd) **404.22 Electronic Lighting Control Switches.** Electronic lighting control switches shall be listed.

(Amd) **406.4 General Installation Requirements**

(D) **Replacements.** Replacement of receptacles shall comply with 406.4(D)(1), 406.4(D)(2), 406.4(D)(3), 406.4(D)(5) and 406.4(D)(6).

(D)(4) **Arc-Fault Circuit-Interrupter Protection.** Replacement receptacles are not required to be provided with arc-fault circuit-interrupter protection

(Amd) **440.14 Location**

(Add) **Exception No. 3:** Where the interior section of a factory packaged split system is fed solely from the exterior section of the system and the disconnecting means for the exterior section is capable of being locked in the open position, a separate disconnecting means for the interior section shall not be required within sight from that section. The provisions for locking or adding a lock to the disconnecting means shall remain in place with or without the lock installed.

## **CHAPTER 5 - SPECIAL OCCUPANCIES**

(Amd) **525.5 Overhead Conductor Clearances**

(B) **Clearances to Portable Structures**

(2) **Over 600 Volts.**

(Add) **Exception:** Tents erected and dismantled under the supervision of a licensed electrician or other person approved by the authority having jurisdiction may be placed within the 15 feet (4.5 m) space provided the finished height of the tent is a minimum of 10 feet (3.0 m) below the conductors.

## **Chapter 6 – SPECIAL EQUIPMENT**

(Amd) **690.12 Rapid Shutdown of PV Systems on Buildings.** PV system circuits installed on or in buildings shall include a rapid shutdown function to reduce shock hazard for emergency responders in accordance with 690.12(A) through (D).

**Exception:** Ground mounted PV system circuits that enter buildings, of which the sole purpose is to house PV system equipment, shall not be required to comply with 690.12.

(A) **Controlled Conductors.** Requirements for controlled conductors shall apply to PV circuits supplied by the PV system.





(Amd) **105.1 Required.** Any owner or owner's authorized agent who intends to construct, enlarge, alter, repair, move, demolish or change the occupancy of a building or structure, or to move a lot line that will affect any existing building or structure, or to erect, install, enlarge, alter, repair, remove, convert or replace any electrical, gas, mechanical or plumbing system, the installation of which is regulated by this code, or to cause any such work to be performed, shall first make application to the building official and obtain the required permit.

(Add) **105.1.3 Connecticut State Fire Safety Code abatement.** Where conflicts exist between the requirements of this code and the requirements of a Connecticut State Fire Safety Code abatement order issued in writing by the local fire marshal with respect to an existing building, the requirements of that portion of the Connecticut State Fire Safety Code that regulates existing buildings shall take precedence.

**Exceptions:**

1. New fire protection systems shall meet the requirements of Chapter 9 of this code.
2. Electrical work shall meet the requirements of the NFPA 70, National Electrical Code.
3. Structural, plumbing and mechanical work shall conform to the requirements of this code.

(Amd) **105.2 Work exempt from permit.** Exemption from the permit requirements of this code shall not be deemed to grant authorization for any work to be done in any manner in violation of the provisions of this code or any other laws, statutes, regulations or ordinances of the jurisdiction. Permits shall not be required for the following:

**Building:**

1. One-story detached accessory structures used as tool and storage sheds, playhouses and similar uses, provided the floor area is not greater than 200 square feet (18.58 m<sup>2</sup>).
2. Fences, other than swimming pool barriers, not over 7 feet (2134 mm) high.
3. Oil derricks.
4. Retaining walls that are not higher than 3 feet (914 mm) measured from finished grade at the bottom of the wall to finished grade at the top of the wall, unless supporting a surcharge or impounding Class I, II or III-A liquids.
5. Water tanks supported directly upon grade if the capacity does not exceed 5,000 gallons (18 927 L) and the ratio of height to diameter or width does not exceed 2 to 1.
6. Sidewalks, driveways and on-grade concrete or masonry patios not more than 30 inches (762 mm) above adjacent grade and not over any basement or story below and which are not part of an accessible route.
7. Painting, papering, tiling, carpeting, cabinets, countertops and similar finish work not involving structural changes or alterations.
8. Temporary motion picture, television and theater stage sets and scenery.
9. Prefabricated swimming pools accessory to a Use Group R-3 occupancy, as applicable in Section 101.2, which are equal to or less than 24 inches (610 mm) deep, do not exceed 5,000 gallons (18 927 L) capacity and are installed entirely above ground.
10. Shade cloth structures constructed for nursery or agricultural purposes and not including service systems.
11. Swings and other playground equipment.
12. Window awnings in Group R-3 and U occupancies, supported by an exterior wall that do not project more than 54 inches (1372 mm) from the exterior wall and do not require additional support.





**Substitute Senate Bill No. 353**

**Public Act No. 17-76**

**AN ACT ESTABLISHING AN APPRENTICE, JOURNEYMEN AND CONTRACTOR WORKING GROUP.**

Be it enacted by the Senate and House of Representatives in General Assembly convened:

Section 1. (NEW) (*Effective from passage*) (a) There is established a working group to discuss hiring ratios for apprentices, journeymen and contractors and study the hiring ratio relief process. The working group shall meet at least three times annually and shall study and make recommendations related to apprentices, journeymen and contractors.

(b) The working group shall consist of ten members, and shall be evenly divided between members of the following union and nonunion industry trade groups: The International Brotherhood of Electrical Workers, the Independent Electrical Contractors of New England, the Associated Builders and Contractors of Connecticut, Sheet Metal Local 40, Sprinkler Fitters Local 669, the Connecticut Chapter of American Fire Sprinkler Association, the United Association of Plumbers and Pipefitters Local 777, the Plumbing Heating and Cooling Contractors of Connecticut, the Connecticut Heating and Cooling Contractors and the Connecticut State Building and Construction Trades Council. Each union industry trade group member shall be either the business manager of such group or such





***Substitute Senate Bill No. 353***

business manager's designee from such group. Each nonunion industry trade group member shall be either the president of such group or such president's designee from such group.

(c) Such members shall be selected as follows:

(1) Two union members appointed by the speaker of the House of Representatives;

(2) Two union members appointed by the president pro tempore of the Senate;

(3) One nonunion member appointed by the majority leader of the House of Representatives;

(4) One union member appointed by the majority leader of the Senate;

(5) Two nonunion members appointed by the minority leader of the House of Representatives; and

(6) Two nonunion members appointed by the minority leader of the Senate.

(d) All appointing authorities shall consult with the chairpersons and ranking members of the joint standing committee of the General Assembly having cognizance of matters relating to the Department of Consumer Protection prior to making any appointments pursuant to this section.

(e) All appointments to the working group shall be made not later than thirty days after the effective date of this section. Any vacancy shall be filled by the appointing authority.

(f) The members of the working group shall select the chairpersons of the working group from among the members of the group. One



**Substitute Senate Bill No. 353**

chairperson shall be a union member and one chairperson shall be a nonunion member. Such chairpersons shall schedule the first meeting of the working group.

(g) The administrative staff of the joint standing committee of the General Assembly having cognizance of matters relating to the Department of Consumer Protection shall serve as administrative staff of the working group.

(h) Not later than December 1, 2017, and annually thereafter, the working group shall submit a report on its recommendations to the joint standing committee of the General Assembly having cognizance of matters relating to the Department of Consumer Protection, in accordance with the provisions of section 11-4a of the general statutes.

Sec. 2. Section 20-332b of the general statutes is repealed and the following is substituted in lieu thereof (*Effective from passage*):

The Commissioner of Consumer Protection shall amend existing regulations of Connecticut state agencies adopted pursuant to section 20-332 to specify the following allowable hiring ratios regarding apprentices, journeymen and contractors for the following trades:

**TRADE**

**Electrical, Plumbing, Heating, Piping and Cooling,  
Sprinkler Fitter and Sheet Metal Work**

**Apprentices**

1  
2  
3  
4

**Licensees**

**(Journeymen or Contractors)**

1  
2  
[5] 3  
[8] 6



***Substitute Senate Bill No. 353***

5	[11]	<u>9</u>
6	[14]	<u>12</u>
7	[17]	<u>15</u>
8	[20]	<u>18</u>
9	[23]	<u>21</u>
10	[26]	<u>24</u>

**Ratio continues at 3 Journeypersons  
To 1 Apprentice**

Approved June 27, 2017





# OSHA<sup>®</sup> FactSheet

## Personal Protective Equipment

Personal protective equipment, or PPE, is designed to protect workers from serious workplace injuries or illnesses resulting from contact with chemical, radiological, physical, electrical, mechanical, or other workplace hazards. Besides face shields, safety glasses, hard hats, and safety shoes, protective equipment includes a variety of devices and garments such as goggles, coveralls, gloves, vests, earplugs, and respirators.

### Employer Responsibilities

OSHA's primary personal protective equipment standards are in Title 29 of the Code of Federal Regulations (CFR), Part 1910 Subpart I, and equivalent regulations in states with OSHA-approved state plans, but you can find protective equipment requirements elsewhere in the General Industry Standards. For example, 29 CFR 1910.156, OSHA's Fire Brigades Standard, has requirements for firefighting gear. In addition, 29 CFR 1926.95-106 covers the construction industry. OSHA's general personal protective equipment requirements mandate that employers conduct a hazard assessment of their workplaces to determine what hazards are present that require the use of protective equipment, provide workers with appropriate protective equipment, and require them to use and maintain it in sanitary and reliable condition.

Using personal protective equipment is often essential, but it is generally the last line of defense after engineering controls, work practices, and administrative controls. Engineering controls involve physically changing a machine or work environment. Administrative controls involve changing how or when workers do their jobs, such as scheduling work and rotating workers to reduce exposures. Work practices involve training workers how to perform tasks in ways that reduce their exposure to workplace hazards.

As an employer, you must assess your workplace to determine if hazards are present that require the use of personal protective equipment. If such hazards are present, you must select protective equipment and require workers to use it, communicate your protective equipment selection decisions to your workers, and select personal protective equipment that properly fits your workers.

You must also train workers who are required to wear personal protective equipment on how to do the following:

- Use protective equipment properly,
- Be aware of when personal protective equipment is necessary,
- Know what kind of protective equipment is necessary,
- Understand the limitations of personal protective equipment in protecting workers from injury,
- Put on, adjust, wear, and take off personal protective equipment, and
- Maintain protective equipment properly.

### Protection from Head Injuries

Hard hats can protect your workers from head impact, penetration injuries, and electrical injuries such as those caused by falling or flying objects, fixed objects, or contact with electrical conductors. Also, OSHA regulations require employers to ensure that workers cover and protect long hair to prevent it from getting caught in machine parts such as belts and chains.

### Protection from Foot and Leg Injuries

In addition to foot guards and safety shoes, leggings (e.g., leather, aluminized rayon, or other appropriate material) can help prevent injuries by protecting workers from hazards such as falling or rolling objects, sharp objects, wet and slippery surfaces, molten metals, hot surfaces, and electrical hazards.

### Protection from Eye and Face Injuries

Besides spectacles and goggles, personal protective equipment such as special helmets or shields, spectacles with side shields, and faceshields can protect workers from the hazards of flying fragments, large chips, hot sparks,



optical radiation, splashes from molten metals, as well as objects, particles, sand, dirt, mists, dusts, and glare.

### **Protection from Hearing Loss**

Wearing earplugs or earmuffs can help prevent damage to hearing. Exposure to high noise levels can cause irreversible hearing loss or impairment as well as physical and psychological stress. Earplugs made from foam, waxed cotton, or fiberglass wool are self-forming and usually fit well. A professional should fit your workers individually for molded or preformed earplugs. Clean earplugs regularly, and replace those you cannot clean.

### **Protection from Hand Injuries**

Workers exposed to harmful substances through skin absorption, severe cuts or lacerations, severe abrasions, chemical burns, thermal burns, and harmful temperature extremes will benefit from hand protection.

### **Protection from Body Injury**

In some cases workers must shield most or all of their bodies against hazards in the workplace, such as exposure to heat and radiation as well as hot metals, scalding liquids, body fluids, hazardous materials or waste, and other hazards. In addition to fire-retardant wool and fire-retardant cotton, materials used in whole-body personal protective equipment include rubber, leather, synthetics, and plastic.

### **When to Wear Respiratory Protection**

When engineering controls are not feasible, workers must use appropriate respirators to protect against adverse health effects caused by breathing air contaminated with harmful dusts, fogs, fumes, mists, gases, smokes, sprays, or vapors. Respirators generally cover the nose and mouth or the entire face or head and help prevent illness and injury. A proper fit is essential, however, for respirators to be effective. Required respirators must be NIOSH-approved and medical evaluation and training must be provided before use.

### **Additional Information**

For additional information concerning protective equipment view the publication, *Assessing the Need for Personal Protective Equipment: A Guide for Small Business Employers* (OSHA 3151) available on OSHA's web site at [www.osha.gov](http://www.osha.gov). For more information about personal protective equipment in the construction industry, visit [www.osha-slc.gov/SLTC/constructionppe/index.html](http://www.osha-slc.gov/SLTC/constructionppe/index.html).

### **Contacting OSHA**

To report an emergency, file a complaint or seek OSHA advice, assistance or products, call (800) 321-OSHA or contact your nearest OSHA regional or area office.

**This is one in a series of informational fact sheets highlighting OSHA programs, policies or standards. It does not impose any new compliance requirements. For a comprehensive list of compliance requirements of OSHA standards or regulations, refer to Title 29 of the Code of Federal Regulations. This information will be made available to sensory impaired individuals upon request. The voice phone is (202) 693-1999; teletypewriter (TTY) number: (877) 889-5627.**

For more complete information:



U.S. Department of Labor

[www.osha.gov](http://www.osha.gov)

(800) 321-OSHA

DOC 4/2006

## Portable Ladder Safety



Falls from portable ladders (step, straight, combination and extension) are one of the leading causes of occupational fatalities and injuries.

- Read and follow all labels/markings on the ladder.
- Avoid electrical hazards! – Look for overhead power lines before handling a ladder. Avoid using a metal ladder near power lines or exposed energized electrical equipment.
- Always inspect the ladder prior to using it. If the ladder is damaged, it must be removed from service and tagged until repaired or discarded.



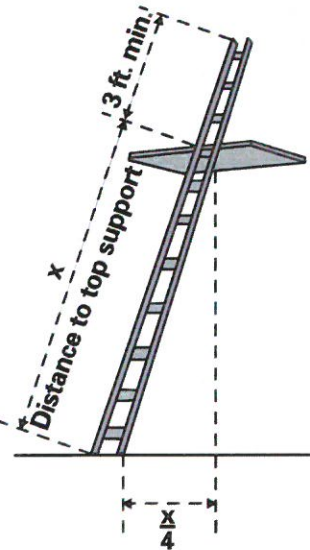
3-Point Contact

- Always maintain a 3-point (two hands and a foot, or two feet and a hand) contact on the ladder when climbing. Keep your body near the middle of the step and always face the ladder while climbing (see diagram).
- Only use ladders and appropriate accessories (ladder levelers, jacks or hooks) for their designed purposes.
- Ladders must be free of any slippery material on the rungs, steps or feet.
- Do not use a self-supporting ladder (e.g., step ladder) as a single ladder or in a partially closed position.
- Do not use the top step/rung of a ladder as a step/rung unless it was designed for that purpose.

*(continued on reverse)*



- Use a ladder only on a stable and level surface, unless it has been secured (top or bottom) to prevent displacement.
- Do not place a ladder on boxes, barrels or other unstable bases to obtain additional height.
- Do not move or shift a ladder while a person or equipment is on the ladder.
- An extension or straight ladder used to access an elevated surface must extend at least 3 feet above the point of support (see diagram). Do not stand on the three top rungs of a straight, single or extension ladder.
- The proper angle for setting up a ladder is to place its base a quarter of the working length of the ladder from the wall or other vertical surface (see diagram).
- A ladder placed in any location where it can be displaced by other work activities must be secured to prevent displacement or a barricade must be erected to keep traffic away from the ladder.
- Be sure that all locks on an extension ladder are properly engaged.
- Do not exceed the maximum load rating of a ladder. Be aware of the ladder's load rating and of the weight it is supporting, including the weight of any tools or equipment.



For more information:

**OSHA**® Occupational  
Safety and Health  
Administration  
U.S. Department of Labor  
[www.osha.gov](http://www.osha.gov) (800) 321-OSHA (6742)

OSHA 3246-10N-05

## GROUNDING AND BONDING TERMS

**Grounded:** connected to earth or to some conducting body that serves in place of earth

**Bonding:** the permanent joining of metallic parts to form an electrically conductive path that ensures electrical continuity and the capacity to conduct safety any current likely to be imposed.

Now some commonly used terms.

**Bonding Jumper:** A conductor installed to ensure the required electrical conductivity between metal parts required to be electrically connected, such as around conduits

**Bonding Jumper; Equipment** The connection between two or more portions of the equipment grounding conductor, such as at devices.

**Bonding Jumper; Main** The connection between the grounded circuit conductor (neutral) and the equipment grounding conductor at the service. This is sometimes a screw in the panel from the neutral bar.

**Bonding Jumper; System** The connection between the grounded circuit conductor and the equipment grounding connector at a separately derived system, such as at a transformer.

**Grounding Conductor** A conductor used to connect equipment or the grounded circuit of a wiring system to a grounded electrode.

**Grounding Conductor; Equipment** A conductor used to connect the non-current carrying metal parts of equipment, raceways, etc, to the system grounded conductor at the service, such as the bare conductor in NM cable

**Grounding Electrode** A device that establishes an electrical connection to earth, such as a water pipe, ground rod, footing rebar, etc

**Grounding Electrode Conductor** A conductor used to connect the grounding electrodes to the grounded conductor.





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National Fire  
Protection Association  
The authority on fire, electrical, and building safety

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## LIST OF NFPA CODES & STANDARDS

### All NFPA Codes and Standards:

Code No.	Code Name
NFPA 1	Fire Code
NFPA 2	Hydrogen Technologies Code
NFPA 3	Standard on Commissioning and Integrated Testing of Fire Protection and Life Safety Systems
NFPA 10	Standard for Portable Fire Extinguishers
NFPA 11	Standard for Low-, Medium-, and High-Expansion Foam
NFPA 11A	Standard for Medium- and High-Expansion Foam Systems
NFPA 11C	Standard for Mobile Foam Apparatus
NFPA 12	Standard on Carbon Dioxide Extinguishing Systems
NFPA 12A	Standard on Halon 1301 Fire Extinguishing Systems
NFPA 13	Standard for the Installation of Sprinkler Systems
NFPA 13D	Standard for the Installation of Sprinkler Systems in One- and Two-Family Dwellings and Manufactured Homes
NFPA 13E	Recommended Practice for Fire Department Operations in Properties Protected by Sprinkler and Standpipe Systems
NFPA 13R	Standard for the Installation of Sprinkler Systems in Residential Occupancies up to and Including Four Stories in Height
NFPA 14	Standard for the Installation of Standpipes and Hose Systems
NFPA 15	Standard for Water Spray Fixed Systems for Fire Protection
NFPA 16	Standard for the Installation of Foam-Water Sprinkler and Foam-Water Spray Systems
NFPA 17	Standard for Dry Chemical Extinguishing Systems
NFPA 17A	Standard for Wet Chemical Extinguishing Systems
NFPA 18	Standard on Wetting Agents
NFPA 18A	Standard on Water Additives for Fire Control and Vapor Mitigation
NFPA 20	Standard for the Installation of Stationary Pumps for Fire Protection
NFPA 22	Standard for Water Tanks for Private Fire Protection
NFPA 24	Standard for the Installation of Private Fire Service Mains and Their Appurtenances
NFPA 25	Standard for the Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems
NFPA 30	Flammable and Combustible Liquids Code
NFPA 30A	Code for Motor Fuel Dispensing Facilities and Repair Garages
NFPA 30B	Code for the Manufacture and Storage of Aerosol Products
NFPA 31	Standard for the Installation of Oil-Burning Equipment
NFPA 32	Standard for Drycleaning Plants
NFPA 33	Standard for Spray Application Using Flammable or Combustible Materials
NFPA 34	Standard for Dipping and Coating Processes Using Flammable or Combustible Liquids
NFPA 35	Standard for the Manufacture of Organic Coatings

NFPA 36	Standard for Solvent Extraction Plants
NFPA 37	Standard for the Installation and Use of Stationary Combustion Engines and Gas Turbines
NFPA 40	Standard for the Storage and Handling of Cellulose Nitrate Film
NFPA 42	Code for the Storage of Pyroxylin Plastic
NFPA 45	Standard on Fire Protection for Laboratories Using Chemicals
NFPA 46	Recommended Safe Practice for Storage of Forest Products
NFPA 50	Standard for Bulk Oxygen Systems at Consumer Sites
NFPA 50A	Standard for Gaseous Hydrogen Systems at Consumer Sites
NFPA 50B	Standard for Liquefied Hydrogen Systems at Consumer Sites
NFPA 51	Standard for the Design and Installation of Oxygen-Fuel Gas Systems for Welding, Cutting, and Allied Processes
NFPA 51A	Standard for Acetylene Cylinder Charging Plants
NFPA 51B	Standard for Fire Prevention During Welding, Cutting, and Other Hot Work
NFPA 52	Vehicular Gaseous Fuel Systems Code
NFPA 53	Recommended Practice on Materials, Equipment, and Systems Used in Oxygen-Enriched Atmospheres
NFPA 54	National Fuel Gas Code
NFPA 55	Compressed Gases and Cryogenic Fluids Code
NFPA 57	Liquefied Natural Gas (LNG) Vehicular Fuel Systems Code
NFPA 58	Liquefied Petroleum Gas Code
NFPA 59	Utility LP-Gas Plant Code
NFPA 59A	Standard for the Production, Storage, and Handling of Liquefied Natural Gas (LNG)
NFPA 61	Standard for the Prevention of Fires and Dust Explosions in Agricultural and Food Processing Facilities
NFPA 68	Standard on Explosion Protection by Deflagration Venting
NFPA 69	Standard on Explosion Prevention Systems
NFPA 70	National Electrical Code®
NFPA 70A	National Electrical Code® Requirements for One- and Two-Family Dwellings
NFPA 70B	Recommended Practice for Electrical Equipment Maintenance
NFPA 70E	Standard for Electrical Safety in the Workplace®
NFPA 72	National Fire Alarm and Signaling Code
NFPA 73	Electrical Inspection Code for Existing Dwellings
NFPA 75	Standard for the Protection of Information Technology Equipment
NFPA 76	Standard for the Fire Protection of Telecommunications Facilities
NFPA 77	Recommended Practice on Static Electricity
NFPA 79	Electrical Standard for Industrial Machinery
NFPA 80	Standard for Fire Doors and Other Opening Protectives
NFPA 80A	Recommended Practice for Protection of Buildings from Exterior Fire Exposures
NFPA 82	Standard on Incinerators and Waste and Linen Handling Systems and Equipment
NFPA 85	Boiler and Combustion Systems Hazards Code
NFPA 86	Standard for Ovens and Furnaces
NFPA 86C	Standard for Industrial Furnaces Using a Special Processing Atmosphere
NFPA 86D	Standard for Industrial Furnaces Using Vacuum as an Atmosphere
NFPA 87	Recommended Practice for Fluid Heaters
NFPA 88A	Standard for Parking Structures
NFPA 88B	Standard for Repair Garages
NFPA 90A	Standard for the Installation of Air-Conditioning and Ventilating Systems
NFPA 90B	Standard for the Installation of Warm Air Heating and Air-Conditioning Systems
NFPA 91	Standard for Exhaust Systems for Air Conveying of Vapors, Gases, Mists, and

	Noncombustible Particulate Solids
NFPA92	Standard for Smoke Management Systems
NFPA92A	Standard for Smoke-Control Systems Utilizing Barriers and Pressure Differences
NFPA92B	Standard for Smoke Management Systems in Malls, Atria, and Large Spaces
NFPA96	Standard for Ventilation Control and Fire Protection of Commercial Cooking Operations
NFPA97	Standard Glossary of Terms Relating to Chimneys, Vents, and Heat-Producing Appliances
NFPA99	Standard for Health Care Facilities
NFPA99B	Standard for Hypobaric Facilities
NFPA101	Life Safety Code®
NFPA101A	Guide on Alternative Approaches to Life Safety
NFPA101B	Code for Means of Egress for Buildings and Structures
NFPA102	Standard for Grandstands, Folding and Telescopic Seating, Tents, and Membrane Structures
NFPA105	Standard for the Installation of Smoke Door Assemblies and Other Opening Protectives
NFPA110	Standard for Emergency and Standby Power Systems
NFPA111	Standard on Stored Electrical Energy Emergency and Standby Power Systems
NFPA115	Standard for Laser Fire Protection
NFPA120	Standard for Fire Prevention and Control in Coal Mines
NFPA121	Standard on Fire Protection for Self-Propelled and Mobile Surface Mining Equipment
NFPA122	Standard for Fire Prevention and Control in Metal/Nonmetal Mining and Metal Mineral Processing Facilities
NFPA123	Standard for Fire Prevention and Control in Underground Bituminous Coal Mines
NFPA130	Standard for Fixed Guideway Transit and Passenger Rail Systems
NFPA140	Standard on Motion Picture and Television Production Studio Soundstages, Approved Production Facilities, and Production Locations
NFPA150	Standard on Fire and Life Safety in Animal Housing Facilities
NFPA160	Standard for the Use of Flame Effects Before an Audience
NFPA170	Standard for Fire Safety and Emergency Symbols
NFPA203	Guide on Roof Coverings and Roof Deck Constructions
NFPA204	Standard for Smoke and Heat Venting
NFPA211	Standard for Chimneys, Fireplaces, Vents, and Solid Fuel-Burning Appliances
NFPA214	Standard on Water-Cooling Towers
NFPA220	Standard on Types of Building Construction
NFPA221	Standard for High Challenge Fire Walls, Fire Walls, and Fire Barrier Walls
NFPA225	Model Manufactured Home Installation Standard
NFPA230	Standard for the Fire Protection of Storage
NFPA231	Standard for General Storage
NFPA231C	Standard for Rack Storage of Materials
NFPA231D	Standard for Storage of Rubber Tires
NFPA231E	Recommended Practice for the Storage of Baled Cotton
NFPA231F	Standard for the Storage of Roll Paper
NFPA232	Standard for the Protection of Records
NFPA232A	Guide for Fire Protection for Archives and Records Centers
NFPA241	Standard for Safeguarding Construction, Alteration, and Demolition Operations
NFPA251	Standard Methods of Tests of Fire Resistance of Building Construction and Materials
NFPA252	Standard Methods of Fire Tests of Door Assemblies
NFPA253	Standard Method of Test for Critical Radiant Flux of Floor Covering Systems Using a Radiant Heat Energy Source
NFPA255	Standard Method of Test of Surface Burning Characteristics of Building Materials



NFPA256	Standard Methods of Fire Tests of Roof Coverings
NFPA257	Standard on Fire Test for Window and Glass Block Assemblies
NFPA258	Recommended Practice for Determining Smoke Generation of Solid Materials
NFPA259	Standard Test Method for Potential Heat of Building Materials
NFPA260	Standard Methods of Tests and Classification System for Cigarette Ignition Resistance of Components of Upholstered Furniture
NFPA261	Standard Method of Test for Determining Resistance of Mock-Up Upholstered Furniture Material Assemblies to Ignition by Smoldering Cigarettes
NFPA262	Standard Method of Test for Flame Travel and Smoke of Wires and Cables for Use in Air-Handling Spaces
NFPA265	Standard Methods of Fire Tests for Evaluating Room Fire Growth Contribution of Textile Coverings on Full Height Panels and Walls
NFPA266	Standard Method of Test for Fire Characteristics of Upholstered Furniture Exposed to Flaming Ignition Source
NFPA267	Standard Method of Test for Fire Characteristics of Mattresses and Bedding Assemblies Exposed to Flaming Ignition Source
NFPA268	Standard Test Method for Determining Ignitibility of Exterior Wall Assemblies Using a Radiant Heat Energy Source
NFPA269	Standard Test Method for Developing Toxic Potency Data for Use in Fire Hazard Modeling
NFPA270	Standard Test Method for Measurement of Smoke Obscuration Using a Conical Radiant Source in a Single Closed Chamber
NFPA271	Standard Method of Test for Heat and Visible Smoke Release Rates for Materials and Products Using an Oxygen Consumption Calorimeter
NFPA272	Standard Method of Test for Heat and Visible Smoke Release Rates for Upholstered Furniture Components or Composites and Mattresses Using an Oxygen Consumption Calorimeter
NFPA274	Standard Test Method to Evaluate Fire Performance Characteristics of Pipe Insulation
NFPA275	Standard Method of Fire Tests for the Evaluation of Thermal Barriers Used Over Foam Plastic Insulation
NFPA276	Standard Method of Fire Tests for Determining the Heat Release Rate of Roofing Assemblies with Combustible Above-Deck Roofing Components
NFPA285	Standard Fire Test Method for Evaluation of Fire Propagation Characteristics of Exterior Non-Load-Bearing Wall Assemblies Containing Combustible Components
NFPA286	Standard Methods of Fire Tests for Evaluating Contribution of Wall and Ceiling Interior Finish to Room Fire Growth
NFPA287	Standard Test Methods for Measurement of Flammability of Materials in Cleanrooms Using a Fire Propagation Apparatus (FPA)
NFPA288	Standard Methods of Fire Tests of Floor Fire Door Assemblies Installed Horizontally in Fire Resistance-Rated Floor Systems
NFPA289	Standard Method of Fire Test for Individual Fuel Packages
NFPA290	Standard for Fire Testing of Passive Protection Materials for Use on LP-Gas Containers
NFPA291	Recommended Practice for Fire Flow Testing and Marking of Hydrants
NFPA295	Standard for Wildfire Control
NFPA297	Guide on Principles and Practices for Communications Systems
NFPA298	Standard on Foam Chemicals for Wildland Fire Control
NFPA299	Standard for Protection of Life and Property from Wildfire
NFPA301	Code for Safety to Life from Fire on Merchant Vessels
NFPA302	Fire Protection Standard for Pleasure and Commercial Motor Craft
NFPA303	Fire Protection Standard for Marinas and Boatyards
NFPA306	Standard for the Control of Gas Hazards on Vessels
NFPA307	Standard for the Construction and Fire Protection of Marine Terminals, Piers, and Wharves
NFPA312	Standard for Fire Protection of Vessels During Construction, Conversion, Repair, and Lay-

Up

NFPA 318	Standard for the Protection of Semiconductor Fabrication Facilities
NFPA 326	Standard for the Safeguarding of Tanks and Containers for Entry, Cleaning, or Repair
NFPA 328	Recommended Practice for the Control of Flammable and Combustible Liquids and Gases in Manholes, Sewers, and Similar Underground Structures
NFPA 329	Recommended Practice for Handling Releases of Flammable and Combustible Liquids and Gases
NFPA 385	Standard for Tank Vehicles for Flammable and Combustible Liquids
NFPA 386	Standard for Portable Shipping Tanks for Flammable and Combustible Liquids
NFPA 395	Standard for the Storage of Flammable and Combustible Liquids at Farms and Isolated Sites
NFPA 400	Hazardous Materials Code
NFPA 402	Guide for Aircraft Rescue and Fire-Fighting Operations
NFPA 403	Standard for Aircraft Rescue and Fire-Fighting Services at Airports
NFPA 405	Standard for the Recurring Proficiency of Airport Fire Fighters
NFPA 407	Standard for Aircraft Fuel Servicing
NFPA 408	Standard for Aircraft Hand Portable Fire Extinguishers
NFPA 409	Standard on Aircraft Hangars
NFPA 410	Standard on Aircraft Maintenance
NFPA 412	Standard for Evaluating Aircraft Rescue and Fire-Fighting Foam Equipment
NFPA 414	Standard for Aircraft Rescue and Fire-Fighting Vehicles
NFPA 415	Standard on Airport Terminal Buildings, Fueling Ramp Drainage, and Loading Walkways
NFPA 418	Standard for Heliports
NFPA 422	Guide for Aircraft Accident/Incident Response Assessment
NFPA 423	Standard for Construction and Protection of Aircraft Engine Test Facilities
NFPA 424	Guide for Airport/Community Emergency Planning
NFPA 430	Code for the Storage of Liquid and Solid Oxidizers
NFPA 432	Code for the Storage of Organic Peroxide Formulations
NFPA 434	Code for the Storage of Pesticides
NFPA 450	Guide for Emergency Medical Services and Systems
NFPA 471	Recommended Practice for Responding to Hazardous Materials Incidents
NFPA 472	Standard for Competence of Responders to Hazardous Materials/Weapons of Mass Destruction Incidents
NFPA 473	Standard for Competencies for EMS Personnel Responding to Hazardous Materials/Weapons of Mass Destruction Incidents
NFPA 480	Standard for the Storage, Handling, and Processing of Magnesium Solids and Powders
NFPA 481	Standard for the Production, Processing, Handling, and Storage of Titanium
NFPA 482	Standard for the Production, Processing, Handling, and Storage of Zirconium
NFPA 484	Standard for Combustible Metals
NFPA 485	Standard for the Storage, Handling, Processing, and Use of Lithium Metal
NFPA 490	Code for the Storage of Ammonium Nitrate
NFPA 495	Explosive Materials Code
NFPA 496	Standard for Purged and Pressurized Enclosures for Electrical Equipment
NFPA 497	Recommended Practice for the Classification of Flammable Liquids, Gases, or Vapors and of Hazardous (Classified) Locations for Electrical Installations in Chemical Process Areas
NFPA 498	Standard for Safe Havens and Interchange Lots for Vehicles Transporting Explosives
NFPA 499	Recommended Practice for the Classification of Combustible Dusts and of Hazardous (Classified) Locations for Electrical Installations in Chemical Process Areas
NFPA 501	Standard on Manufactured Housing
NFPA 501A	Standard for Fire Safety Criteria for Manufactured Home Installations, Sites, and



	Communities
NFPA 502	Standard for Road Tunnels, Bridges, and Other Limited Access Highways
NFPA 505	Fire Safety Standard for Powered Industrial Trucks Including Type Designations, Areas of Use, Conversions, Maintenance, and Operations
NFPA 513	Standard for Motor Freight Terminals
NFPA 520	Standard on Subterranean Spaces
NFPA 550	Guide to the Fire Safety Concepts Tree
NFPA 551	Guide for the Evaluation of Fire Risk Assessments
NFPA 555	Guide on Methods for Evaluating Potential for Room Flashover
NFPA 556	Guide on Methods for Evaluating Fire Hazard to Occupants of Passenger Road Vehicles
NFPA 557	Standard for Determination of Fire Load for Use in Structural Fire Protection Design
NFPA 560	Standard for the Storage, Handling, and Use of Ethylene Oxide for Sterilization and Fumigation
NFPA 600	Standard on Industrial Fire Brigades
NFPA 601	Standard for Security Services in Fire Loss Prevention
NFPA 610	Guide for Emergency and Safety Operations at Motorsports Venues
NFPA 650	Standard for Pneumatic Conveying Systems for Handling Combustible Particulate Solids
NFPA 651	Standard for the Machining and Finishing of Aluminum and the Production and Handling of Aluminum Powders
NFPA 654	Standard for the Prevention of Fire and Dust Explosions from the Manufacturing, Processing, and Handling of Combustible Particulate Solids
NFPA 655	Standard for Prevention of Sulfur Fires and Explosions
NFPA 664	Standard for the Prevention of Fires and Explosions in Wood Processing and Woodworking Facilities
NFPA 701	Standard Methods of Fire Tests for Flame Propagation of Textiles and Films
NFPA 703	Standard for Fire-Retardant Treated Wood and Fire-Retardant Coatings for Building Materials
NFPA 704	Standard System for the Identification of the Hazards of Materials for Emergency Response
NFPA 705	Recommended Practice for a Field Flame Test for Textiles and Films
NFPA 720	Standard for the Installation of Carbon Monoxide(CO) Detection and Warning Equipment
NFPA 730	Guide for Premises Security
NFPA 731	Standard for the Installation of Electronic Premises Security Systems
NFPA 750	Standard on Water Mist Fire Protection Systems
NFPA 780	Standard for the Installation of Lightning Protection Systems
NFPA 790	Standard for Competency of Third Party Field Evaluation Bodies
NFPA 791	Recommended Practice and Procedures for Unlabeled Electrical Equipment Evaluation
NFPA 801	Standard for Fire Protection for Facilities Handling Radioactive Materials
NFPA 803	Standard for Fire Protection for Light Water Nuclear Power Plants
NFPA 804	Standard for Fire Protection for Advanced Light Water Reactor Electric Generating Plants
NFPA 805	Performance-Based Standard for Fire Protection for Light Water Reactor Electric Generating Plants
NFPA 806	Performance-Based Standard for Fire Protection for Advanced Nuclear Reactor Electric Generating Plants Change Process
NFPA 820	Standard for Fire Protection in Wastewater Treatment and Collection Facilities
NFPA 850	Recommended Practice for Fire Protection for Electric Generating Plants and High Voltage Direct Current Converter Stations
NFPA 851	Recommended Practice for Fire Protection for Hydroelectric Generating Plants
NFPA 853	Standard for the Installation of Stationary Fuel Cell Power Systems
NFPA 900	Building Energy Code
NFPA 901	Standard Classifications for Incident Reporting and Fire Protection Data



NFPA 902	Fire Reporting Field Incident Guide
NFPA 903	Fire Reporting Property Survey Guide
NFPA 904	Incident Follow-up Report Guide
NFPA 906	Guide for Fire Incident Field Notes
NFPA 909	Code for the Protection of Cultural Resources Properties - Museums, Libraries, and Places of Worship
NFPA 914	Code for Fire Protection of Historic Structures
NFPA 921	Guide for Fire and Explosion Investigations
NFPA 1000	Standard for Fire Service Professional Qualifications Accreditation and Certification Systems
NFPA 1001	Standard for Fire Fighter Professional Qualifications
NFPA 1002	Standard for Fire Apparatus Driver/Operator Professional Qualifications
NFPA 1003	Standard for Airport Fire Fighter Professional Qualifications
NFPA 1005	Standard for Professional Qualifications for Marine Fire Fighting for Land-Based Fire Fighters
NFPA 1006	Standard for Technical Rescuer Professional Qualifications
NFPA 1021	Standard for Fire Officer Professional Qualifications
NFPA 1026	Standard for Incident Management Personnel Professional Qualifications
NFPA 1031	Standard for Professional Qualifications for Fire Inspector and Plan Examiner
NFPA 1033	Standard for Professional Qualifications for Fire Investigator
NFPA 1035	Standard for Professional Qualifications for Public Fire and Life Safety Educator
NFPA 1037	Standard for Professional Qualifications for Fire Marshal
NFPA 1041	Standard for Fire Service Instructor Professional Qualifications
NFPA 1051	Standard for Wildland Fire Fighter Professional Qualifications
NFPA 1061	Standard for Professional Qualifications for Public Safety Telecommunicator
NFPA 1071	Standard for Emergency Vehicle Technician Professional Qualifications
NFPA 1081	Standard for Industrial Fire Brigade Member Professional Qualifications
NFPA 1122	Code for Model Rocketry
NFPA 1123	Code for Fireworks Display
NFPA 1124	Code for the Manufacture, Transportation, Storage, and Retail Sales of Fireworks and Pyrotechnic Articles
NFPA 1125	Code for the Manufacture of Model Rocket and High Power Rocket Motors
NFPA 1126	Standard for the Use of Pyrotechnics Before a Proximate Audience
NFPA 1127	Code for High Power Rocketry
NFPA 1141	Standard for Fire Protection Infrastructure for Land Development in Suburban and Rural Areas
NFPA 1142	Standard on Water Supplies for Suburban and Rural Fire Fighting
NFPA 1143	Standard for Wildland Fire Management
NFPA 1144	Standard for Reducing Structure Ignition Hazards from Wildland Fire
NFPA 1145	Guide for the Use of Class A Foams in Manual Structural Fire Fighting
NFPA 1150	Standard on Foam Chemicals for Fires in Class A Fuels
NFPA 1192	Standard on Recreational Vehicles
NFPA 1194	Standard for Recreational Vehicle Parks and Campgrounds
NFPA 1201	Standard for Providing Emergency Services to the Public
NFPA 1221	Standard for the Installation, Maintenance, and Use of Emergency Services Communications Systems
NFPA 1231	Standard on Water Supplies for Suburban and Rural Fire Fighting
NFPA 1250	Recommended Practice in Emergency Service Organization Risk Management
NFPA 1401	Recommended Practice for Fire Service Training Reports and Records
NFPA 1402	Guide to Building Fire Service Training Centers

NFPA 1403	Standard on Live Fire Training Evolutions
NFPA 1404	Standard for Fire Service Respiratory Protection Training
NFPA 1405	Guide for Land-Based Fire Fighters Who Respond to Marine Vessel Fires
NFPA 1407	Standard for Fire Service Rapid Intervention Crews
NFPA 1410	Standard on Training for Initial Emergency Scene Operations
NFPA 1451	Standard for a Fire Service Vehicle Operations Training Program
NFPA 1452	Guide for Training Fire Service Personnel to Conduct Dwelling Fire Safety Surveys
NFPA 1500	Standard on Fire Department Occupational Safety and Health Program
NFPA 1521	Standard for Fire Department Safety Officer
NFPA 1561	Standard on Emergency Services Incident Management System
NFPA 1581	Standard on Fire Department Infection Control Program
NFPA 1582	Standard on Comprehensive Occupational Medical Program for Fire Departments
NFPA 1583	Standard on Health-Related Fitness Programs for Fire Department Members
NFPA 1584	Standard on the Rehabilitation Process for Members During Emergency Operations and Training Exercises
NFPA 1600	Standard on Disaster/Emergency Management and Business Continuity Programs
NFPA 1620	Standard for Pre-Incident Planning
NFPA 1670	Standard on Operations and Training for Technical Search and Rescue Incidents
NFPA 1710	Standard for the Organization and Deployment of Fire Suppression Operations, Emergency Medical Operations, and Special Operations to the Public by Career Fire Departments
NFPA 1720	Standard for the Organization and Deployment of Fire Suppression Operations, Emergency Medical Operations and Special Operations to the Public by Volunteer Fire Departments
NFPA 1801	Standard on Thermal Imagers for the Fire Service
NFPA 1851	Standard on Selection, Care, and Maintenance of Protective Ensembles for Structural Fire Fighting and Proximity Fire Fighting
NFPA 1852	Standard on Selection, Care, and Maintenance of Open-Circuit Self-Contained Breathing Apparatus (SCBA)
NFPA 1901	Standard for Automotive Fire Apparatus
NFPA 1906	Standard for Wildland Fire Apparatus
NFPA 1911	Standard for the Inspection, Maintenance, Testing, and Retirement of In-Service Automotive Fire Apparatus
NFPA 1912	Standard for Fire Apparatus Refurbishing
NFPA 1914	Standard for Testing Fire Department Aerial Devices
NFPA 1915	Standard for Fire Apparatus Preventive Maintenance Program
NFPA 1925	Standard on Marine Fire-Fighting Vessels
NFPA 1931	Standard for Manufacturer's Design of Fire Department Ground Ladders
NFPA 1932	Standard on Use, Maintenance, and Service Testing of In-Service Fire Department Ground Ladders
NFPA 1936	Standard on Powered Rescue Tools
NFPA 1951	Standard on Protective Ensembles for Technical Rescue Incidents
NFPA 1952	Standard on Surface Water Operations Protective Clothing and Equipment
NFPA 1961	Standard on Fire Hose
NFPA 1962	Standard for the Inspection, Care, and Use of Fire Hose, Couplings, and Nozzles and the Service Testing of Fire Hose
NFPA 1963	Standard for Fire Hose Connections
NFPA 1964	Standard for Spray Nozzles
NFPA 1965	Standard for Fire Hose Appliances
NFPA 1971	Standard on Protective Ensembles for Structural Fire Fighting and Proximity Fire Fighting
NFPA 1975	Standard on Station/Work Uniforms for Emergency Services
NFPA 1976	Standard on Protective Ensemble for Proximity Fire Fighting

NFPA 1977	Standard on Protective Clothing and Equipment for Wildland Fire Fighting
NFPA 1981	Standard on Open-Circuit Self-Contained Breathing Apparatus (SCBA) for Emergency Services
NFPA 1982	Standard on Personal Alert Safety Systems (PASS)
NFPA 1983	Standard on Life Safety Rope and Equipment for Emergency Services
NFPA 1984	Standard on Respirators for Wildland Fire Fighting Operations
NFPA 1989	Standard on Breathing Air Quality for Emergency Services Respiratory Protection
NFPA 1991	Standard on Vapor-Protective Ensembles for Hazardous Materials Emergencies
NFPA 1992	Standard on Liquid Splash-Protective Ensembles and Clothing for Hazardous Materials Emergencies
NFPA 1994	Standard on Protective Ensembles for First Responders to CBRN Terrorism Incidents
NFPA 1999	Standard on Protective Clothing for Emergency Medical Operations
NFPA 2001	Standard on Clean Agent Fire Extinguishing Systems
NFPA 2010	Standard for Fixed Aerosol Fire-Extinguishing Systems
NFPA 2112	Standard on Flame-Resistant Garments for Protection of Industrial Personnel Against Flash Fire
NFPA 2113	Standard on Selection, Care, Use, and Maintenance of Flame-Resistant Garments for Protection of Industrial Personnel Against Flash Fire
NFPA 5000	Building Construction and Safety Code®
NFPA 8501	Standard for Single Burner Boiler Operation
NFPA 8502	Standard for the Prevention of Furnace Explosions/Implosions in Multiple Burner Boilers
NFPA 8503	Standard for Pulverized Fuel Systems
NFPA 8504	Standard on Atmospheric Fluidized-Bed Boiler Operation
NFPA 8505	Standard for Stoker Operation
NFPA 8506	Standard on Heat Recovery Steam Generator Systems

**NFPA (National Fire Protection Association)**

1 Batterymarch Park, Quincy, MA 02169-7471 USA

Telephone: +1 617 770-3000 Fax: +1 617 770-0700







## CONNECTICUT DEPARTMENT OF LABOR

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# THE OFFICE OF APPRENTICESHIP TRAINING

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## Journey Person to Apprentice Ratio

ALL TRADES	
Apprentices	Licensee (Journey person or Contractor)
1	1
2	2
3	3
4	6
5	9
6	12
7	15
8	18
9	21
10	24
Ratio continues at 3 journeyperson to 1 apprentice	

200 Folly Brook Boulevard, Wethersfield, CT 06109 / Phone: 860-263-6000

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## CONNECTICUT DEPARTMENT OF LABOR APPLICATION FOR APPRENTICESHIP RATIO RELIEF

*\*Ratio Relief applicants must advertise open journey person position(s) for 30 days on CThires.com prior to subcommittee review of application beginning January 1, 2018\**

**\*Ratio Relief is intended to help when qualified Journey workers cannot be found\***

**GENERAL INFORMATION**

1. Name of Firm/Sponsor \_\_\_\_\_ Date of Application \_\_\_\_\_  
 dba Name, if any \_\_\_\_\_  
 Mailing Address \_\_\_\_\_ Zip Code \_\_\_\_\_  
 Physical Location \_\_\_\_\_ Zip Code \_\_\_\_\_  
 City \_\_\_\_\_ County/State \_\_\_\_\_  
 Trade \_\_\_\_\_ License Category \_\_\_\_\_  
 Email \_\_\_\_\_ Phone # \_\_\_\_\_ Fax # \_\_\_\_\_
2. Type of Firm (Check only one) ☐ Corporation ☐ Partnership ☐ Proprietorship ☐ Joint Venture ☐ LLC
3. How many years has the Firm been in business? \_\_\_\_\_ Under the same name? \_\_\_\_\_ Program Approval Date \_\_\_\_\_
4. Number of previous requests for ratio relief within the past five years \_\_\_\_\_
5. Please answer the following questions & attach the proper documentation:  
☐ yes ☐ no A. Is the Firm actively seeking Journey workers? ☐ yes ☐ no B. Is the Firm actively seeking Apprentices?  
☐ yes ☐ no C. Registered and posted job listing with CT Hires? [www.cthires.com](http://www.cthires.com) Job # \_\_\_\_\_  
 Please attach a copy of the CT Hires job listing. **\*THIS IS A REQUIREMENT\***  
☐ yes ☐ no D. Advertising for licensed position(s)? Please attach all copies.
6. Within the past five years has the firm, any affiliate, (including any contractor of record), any predecessor company or entity, owner of 5.0% or more of the firm's shares, director, officer, partner, or proprietor been subject of: (check any that apply and explain under sponsor remarks. It is imperative that a full explanation of the circumstances relating to a "yes" statement be submitted to ensure an objective evaluation by the Department. Attach additional pages if necessary).  
☐ yes ☐ no A. A judgment or conviction of any business related conduct constituting a crime under state or federal law?  
☐ yes ☐ no B. A currently pending indictment for any business-related conduct constituting a crime under state or federal law?  
☐ yes ☐ no C. A grant of immunity for any business-related conduct constituting a crime under state or federal law or regulation?  
☐ yes ☐ no D. Any final determination of a violation of any federal labor law or regulation?  
☐ yes ☐ no E. Any OSHA violation that was categorized as willful, repeat, failure to abate, or was based on retaliating against an employee for filing a safety or health complaint.  
☐ yes ☐ no F. Any final determination of a violation of any state labor law or regulation?  
 Public work violation? ☐ yes ☐ no Was this violation willful? ☐ yes ☐ no  
☐ yes ☐ no G. A consent order with the Connecticut Department of Environmental Protection, or a federal or state enforcement determination involving a construction-related violation of federal or state environmental laws?  
☐ yes ☐ no H. A debarment from federal contracts for violation of the Davis-Bacon Act, 49 Stat. 101(1931), 40 USC 278a-2?  
☐ yes ☐ no I. A debarment from state contracts for violation of Connecticut's prevailing wage law pursuant to Conn. Gen. Stat. Section 31-53a?  
☐ yes ☐ no J. A debarment or suspension for violation of any other state prevailing wage law?  
☐ yes ☐ no K. Rejection of any bid or proposed subcontract or general contract for lack of responsibility pursuant to state law?  
☐ yes ☐ no L. Any final determination of a violation of any state occupational licensing statute or regulation?  
☐ yes ☐ no M. A consent order entered into with the Connecticut Department of Consumer Protection or any other state or federal government agency?  
☐ yes ☐ no N. Any pending enforcement proceeding by a federal, state or municipal agency regarding an alleged violation of the law?  
☐ yes ☐ no O. Are all current apprentices attending related instruction (if required)?



SPONSOR \_\_\_\_\_ TRADE \_\_\_\_\_

CURRENT NUMBER OF JOURNEYPEOPLE EMPLOYED \_\_\_\_\_

CURRENT NUMBER OF PRE-APPRENTICES REGISTERED \_\_\_\_\_

CURRENT NUMBER OF APPRENTICES REGISTERED \_\_\_\_\_

## CURRENT NUMBER OF APPRENTICES (STATUS)

YEAR 1 \_\_\_\_\_ YEAR 2 \_\_\_\_\_ YEAR 3 \_\_\_\_\_ YEAR 4 \_\_\_\_\_ YEAR 5 \_\_\_\_\_ YEAR 6 \_\_\_\_\_

NUMBER OF APPRENTICES RATIO RELIEF IS REQUESTED FOR? \_\_\_\_\_ TRADE \_\_\_\_\_

Is this request for a CT Technical High School graduate? ☐ yes ☐ no

School Attended? \_\_\_\_\_

Is this request for a pre-apprentice student? ☐ yes ☐ noIs this request for a U.S. Military Veteran? ☐ yes ☐ no

## CUMULATIVE APPRENTICESHIP RECORD (based on previous five years)

Registered \_\_\_\_\_ \*Completed \_\_\_\_\_

\* Completed is defined as those individuals who have been awarded a certificate of completion per the Regulations of Connecticut State Agencies, Sec. 31-51d-2(h).

PRE-APPRENTICE STARTING (WAGE) RATE \$ \_\_\_\_\_

APPRENTICE STARTING (WAGE) RATE \$ \_\_\_\_\_ or \_\_\_\_\_ %

JOURNEYPEOPLE COMPLETION (WAGE) RATE \$ \_\_\_\_\_

TOTAL NUMBER OF JOURNEYPEOPLE TERMINATED IN THE PAST FIVE YEARS? \_\_\_\_\_

TOTAL NUMBER OF JOURNEYPEOPLE WHO VOLUNTARILY QUIT IN THE PAST FIVE YEARS? \_\_\_\_\_

TOTAL NUMBER OF APPRENTICES TERMINATED IN THE PAST FIVE YEARS? \_\_\_\_\_ PRE-APPRENTICES \_\_\_\_\_

TOTAL NUMBER OF APPRENTICES WHO VOLUNTARILY QUIT IN THE PAST FIVE YEARS? \_\_\_\_\_ PRE-APPRENTICES \_\_\_\_\_

## TERMINATION DATA (based on previous five years)

<u>TERMINATION CODES</u>	<u>NUMBER OF APPRENTICES TERMINATED</u>
1. Discharged/Released	_____
2. Left to accept related employment	_____
3. Left to accept other employment	_____
4. Unsatisfactory Performance	_____
5. Lack of work	_____
6. Entered military service	_____
7. Illness/death	_____
8. Voluntarily quit	_____
9. Probationary period – discharge/voluntary quit	_____
Total	_____

SPONSOR REMARKS (Reason(s) for request, attach additional sheet if necessary):



**CERTIFICATION:** The undersigned acknowledges that this questionnaire is submitted for the express purpose of inducing the Connecticut Labor Department to authorize the hiring of apprentices in a certain ratio to journeypersons under its state apprenticeship program pursuant to Section 31-51d-5(l) of the Regulations of Connecticut State Agencies. Applicant acknowledges that the Department may, in its discretion, determine the truth and accuracy of all statements made herein. Applicant further acknowledges that intentional submission of false or misleading information in this application may constitute reasonable cause for institution of a formal de-registration proceeding against applicant's apprenticeship program pursuant to Section 31-51d-7 of the Regulations of Connecticut State Agencies. Applicant states and certifies under penalty of law (Conn. Gen. Stat. Section 53a-175 Class A Misdemeanor) that the information submitted in this questionnaire and any attached pages is true, to the best of his or her knowledge.

_____ Signature of Officer	_____ Date	_____ Signature of Contractor of Record
_____ Printed or Typed Name of Officer	_____ Title	_____ Printed or Typed Name of Contractor of Record

**Please return to:**  
  
Connecticut Department of Labor  
Office of Apprenticeship Training  
200 Folly Brook Boulevard  
Wethersfield, CT 06109

For Office Use Only	
Date Received at OAT: _____	Reviewed & Verified by: _____
Date Received CO: _____	Initials: _____
CT DOL OAT Recommendation	
<input type="checkbox"/> Approved <input type="checkbox"/> Denied <input type="checkbox"/> Partial    Approval for: _____	
If Denied, explain _____	
Signature: _____	Program Manager
<input type="checkbox"/> Approved <input type="checkbox"/> Partial Approval for: _____ <input type="checkbox"/> Denied	
Signature: _____	Commissioner
The Connecticut Department of Labor	





# TOOLBOXTOPICS.COM

Company Name \_\_\_\_\_ Job Name \_\_\_\_\_ Date \_\_\_\_\_

## SAFE OPERATING RULES AND PRACTICES

Safe operating rules and practices are to be established during the planning meeting at the start of the job as dictated by the hazards inherent in the nature of the work, federal and state Safety and Health Regulations, company policies, and owner and other regulatory agency requirements. Other safety rules may have to be added as the work progresses due to changed conditions, new methods, new equipment, and as an outgrowth of accident experience.

General safe operating rules and practices apply to all employees, regardless of the nature of their duties. These rules are to be explained to each new hire during indoctrination and must be reemphasized at toolbox meetings and in day-to-day contacts. These are minimum requirements, and are to be rigidly enforced. Examples of general rules follow:

Wear personal protective equipment as required.

Wear suitable shoes and work clothes in good repair

Lift correctly. Get help on the heavy loads.

Do not smoke in prohibited areas.

Avoid off-balanced positions when pulling, pushing, or prying, especially at heights

Report all injuries promptly, even though minor in nature,

Keep alert around moving equipment

Always inspect ladders prior to use and use ladders correctly.

Always follow the approved lock and tag procedures.

Operate equipment and vehicles only if authorized

Correct unsafe conditions as noted, or if you can't correct them, call them to the attention of your foreman immediately.

Keep tools and materials away from the edge of scaffolds or floor openings where they can be knocked off on employees working below.

Be considerate of the welfare of fellow employees. Do not distract their attention or engage in horseplay.

Replace all guards removed for servicing or other reasons,

Pressure cylinders should be used and stored in an upright position and secured against accidental tipping.

Keep all stairways, ladders, ramps, scaffold platforms, walkways and work areas free from loose materials and trash.

Riding on loads, hooks and hoists is prohibited.



Always wear eye protection when grinding, drilling, burning, or performing any operation which may produce flying particles or objects.

Safety  
Recommendations: \_\_\_\_\_

Job Specific  
Topics: \_\_\_\_\_

M.S.D.S  
Reviewed: \_\_\_\_\_

Attended By: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_



# TOOLBOXTOPICS.COM

Company Name \_\_\_\_\_ Job Name \_\_\_\_\_ Date \_\_\_\_\_

## ELECTRICAL

All electrical work, installation and wire capacities shall be in accordance with provisions of the National Electrical Code.

Job sites will have a Ground Fault Circuit Interrupter system, or an Assured Equipment Grounding Conductor Program. This is required for all 120 volt, single phase 15 and 20 ampere receptacle outlets which are not a part of the permanent wiring of the building or structure in use by employees.

The company shall not permit an employee to work in such proximity to any part of an electric power circuit that he/she may come in contact with it in the course of his/her work unless the employee is protected against electric shock by de-energizing the circuit and grounding it or by guarding it by effective insulation or other means. In work areas where the exact location of underground electric power lines is unknown, workmen using jackhammers, bars, or other hand tools which may come in contact with a line shall be provided with insulated protective gloves.

Before work is begun, the cognizant supervisor shall ascertain by inquiry, direct observation, or instruments whether any part of an electric power circuit, exposed or concealed, is located so that the performance of the work may bring any person, tool, or machine into physical or electrical contact with it. The company shall post and maintain proper warning signs where such a circuit exists. Employees shall be advised of the location of such lines, the hazards involved, and the protective measures to be taken.

Suitable barriers or other means shall be provided to ensure that workspace for electrical equipment will not be used as a passageway during periods when energized parts of electrical equipment are exposed.

Sufficient space shall be provided and maintained in the area of electrical equipment to permit ready and safe operation and maintenance of such equipment. When parts are exposed, the minimum clearance for the workspace shall be not less than 6-1/4 feet high nor less than a radius of 3 feet wide. There shall be a clearance sufficient to permit at least a 90 degree opening of all doors or hinged panels. All working clearances shall be maintained in accordance with the National Electrical Code.

Equipment or circuits that are de-energized shall be rendered inoperative and have tags attached at all points where such equipment or circuits can be energized. Controls that are to be deactivated during the course of work or energized or de-energized equipment or circuits shall be tagged. Tags shall be placed to identify plainly the equipment or circuits being worked on. Unexpected energizing of any electrical line can cause death, shock, serious injury, etc. In addition to the tag, the circuit at the switch box should be padlocked in the "OFF" position. A lockout hoop should be provided and used.

Safety  
Recommendations: \_\_\_\_\_

Job Specific  
Topics: \_\_\_\_\_

M.S.D.S  
Reviewed: \_\_\_\_\_





# TOOLBOXTOPICS.COM

Company Name \_\_\_\_\_ Job Name \_\_\_\_\_ Date \_\_\_\_\_

## LOCKOUT/TAGOUT PROCEDURES

### Lockout/Tagout Procedures

Before any maintenance, construction, demolition, tie-in, inspection or servicing of equipment (electrical, mechanical, steam or other) that requires entrance into or close contact with machinery, equipment, power sources or line breaking, the power shall be disconnected and locked out.

### Electrical

Electrical sources will have the main power switch locked out, and if possible, the fuses removed. Locks with dissimilar keys will be provided to each person working on the affected job. Only the person attaching the lock shall remove it. Multiple locking devices shall be provided. Tags will be attached to each lock indicating the name of the person attaching the lock, the location where he/she is working and the person's foreman or supervisor. Hot work will be avoided, if possible.

### Moving Equipment

The main power source, or sources, shall be locked out; drive gear disengaged and locked out; and appropriate tags applied.

### Piping

Piping shall be blanked or valves shall be closed, chained and locked. Where possible, at least two valves before and after the affected section should be chained, locked and tagged. Piping shall be de-pressurized, drained and purged, if necessary.

### Other Energy Sources

Other power sources shall be rendered inoperative as directed by a qualified supervisor or manager

### Locks And Tags

Locks and tags will be attached and removed only by the individual employee directly involved in the operation. The last person removing his/her lock shall ensure that there are no persons exposed should the power be turned on.

Safety

Recommendations: \_\_\_\_\_

Job Specific

Topics: \_\_\_\_\_

M.S.D.S

Reviewed: \_\_\_\_\_

Attended By: \_\_\_\_\_



# TOOLBOXTOPICS.COM

Company Name \_\_\_\_\_ Job Name \_\_\_\_\_ Date \_\_\_\_\_

## AERIAL LIFTS

Aerial lifts include the following types of vehicle-mounted aerial devices used to elevate personnel to work at above ground elevations:

- 1 Extensible boom platforms
- 2 Articulating boom platforms
- 3 Vertical towers
- 4 Aerial ladders
- 5 A combination of any of the above

Aerial equipment may be powered or manually operated and are deemed aerial lifts whether or not they are capable of rotating about a substantially vertical axis. Specific requirements:

- 1 Ladder trucks and tower trucks - Ladders shall be locked in lowered and stowed position prior to highway travel.
- 2 Extensible and articulating boom platforms
  - a. Lift controls shall be tested each day prior to use to determine that such controls are in safe working condition.
  - b. Only authorized persons shall operate an aerial lift.
  - c. Belting off to an adjacent pole, structure, or equipment while working from an aerial lift shall not be permitted.
  - d. Employees shall always stand firmly on the floor of the basket, and shall not sit or climb on the edge of the basket or use planks, ladders or other devices for a work position.
  - e. A body belt shall be worn and a lanyard attached to the boom or basket when working from an aerial lift.
  - f. Boom and basket load limits specified by the manufacturer shall not be exceeded.
  - g. The brakes shall be set and when outriggers are used, they shall be positioned on pads or a solid surface. Wheel chocks shall be installed before using an aerial lift on an incline, provided they can be safely installed.
  - h. An aerial lift truck shall not be moved when the boom is elevated in a working position with men in the basket, except for equipment which is specifically designed for this type of operation in accordance with the provisions of 1926.556(a)(1) and (2).
  - i. Articulating boom and extensible boom platforms, primarily designed as personnel carriers, shall have both platform (upper) and lower controls. Upper controls shall be in or beside the platform within easy reach of the operator. Lower controls shall provide for overriding the upper controls. Controls shall be plainly marked as to





their function. Lower level controls shall not be operated unless permission has been obtained from the employee in the lift, except in case of emergency.

j. Climbers shall not be worn while performing work from an aerial lift

κ. The insulated portion of an aerial lift shall not be altered in any manner that might reduce its insulating value.

l. Before moving an aerial lift for travel, the boom(s) shall be inspected to see that it is properly cradled and outriggers are in stowed position except as provided in paragraph h. above.

Safety

Recommendations: \_\_\_\_\_

Job Specific

Topics: \_\_\_\_\_

M.S.D.S

Reviewed: \_\_\_\_\_

Attended By:

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_





## Calculations 2020 Continuing Education for Electricians

Considering a 120 Volt(V), 1500 Watt(W) Heater

### Question 1

What is the minimum size OCPD (Breaker) for this installation?

- A. 15 A
- B. 20 A
- C. 30 A
- D. 40 A

### Question 2

What is the minimum size Cu conductor for this installation?

- A. 14
- B. 12
- C. 10
- D. 6

Considering Snow-Melt equipment at 500(W), 208(V) 3 phase

### Question 3

What is the minimum size OCPD (Breaker) for this installation?

- A. 15 A
- B. 20 A
- C. 30 A
- D. 40 A

### Question 4

What is the minimum size Cu Conductor for this installation?

- A. 14
- B. 12
- C. 10
- D. 6

### Question 5

What size inverse time CB is required to start and run a 30hp, 3 phase, 460 volt Design B motor? (Determine maximum size, including exceptions that may apply)

- A. 125 Amp
- B. 150 Amp
- C. 175 Amp
- D. 200 Amp

### Question 6

Using a circuit breaker, what size feeder, short circuit and ground fault protection device is permitted for a feeder supplying 1-20hp, 1-30hp & 1-40hp 3 phase 208 volt motors?

- A. 350 Amps
- B. 400 Amps
- C. 450 Amps
- D. 500 Amps

### Question 6

What is the minimum overload protection (time-delay fuse) for a 60Hp, 3 phase 230 volt, Design B motor with a nameplate rating of 67 amps, temperature rise of 40 C and service factor of 1.15?

- A. 70 Amps
- B. 75 Amps
- C. 80 Amps
- D. 90 Amps

### Question 7

What size OCPD and THWN conductors are required to supply power to a single motor compressor with a full load current of 24 amps and a condenser motor having a nameplate of 1.5 amps, with terminals rated at 75 C at both sides (AC & OCPD)

- A. 12 AWG Cu
- B. 10 AWG Cu
- C. 8 AWG Cu
- D. 6 AWG Cu

### Question 8

You have a 480 volt, 3 phase panel and you need to supply a 208 volt, 3 phase load of 175 amps. What size transformer do you need?

- A. 30 kVA
- B. 45 kVA
- C. 75 kVA
- D. 112.5 kVA

### Question 9

What max size primary OCPD would you need for a 75 kVA 600 volt transformer when feeding a panel-board? \*Hint 408.36(B)

- A. 175 A
- B. 200 A
- C. 225 A
- D. 250 A

### Question 10

What max size secondary OCPD would you need for a 75kVA, 600 volt transformer when feeding a panel-board?

- A. 200 A
- B. 250 A
- C. 300 A
- D. 350 A

### Question 11

What is the Cu wire size for the primary?

- A. 3/0
- B. 4/0
- C. 250
- D. 300

### Question 12

What is the Cu wire size for the secondary?

- A. 3/0
- B. 4/0
- C. 250
- D. 300

### Question 13

Using a dual-element fuse for overload protection. What size fuse do you need for a 5 hp, 230v, single phase motor with a service factor of 1.16 if the motor nameplate current rating is 28A?

- A. 25A
- B. 35A
- C. 30A
- D. 40A

### Bonus Question

Why do transformers hum?

- A. The differential resistance causes parts to vibrate
- B. The copper coil inside is failing
- C. They don't know the words
- D. It is undersized



## Continuing Education for Electricians

Connecticut Calculations  
2020 Renewals

Equipment for General  
Use

Articles 400-490

Branch Circuit Size and  
Overcurrent Protection  
for Electric Heat

Branch Circuits  
Article 210  
210.2 Special Purpose  
Branch Circuits  
Table 210.2

Article 424  
Fixed Electric Space-  
Heating Equipment

424.3 B  
Fixed Electric Space  
heating Equipment and  
Motors SHALL be  
considered Continuous  
Duty

( see Def. Article 100 )

### Question 1

Nameplate on Heater is 1500  
watts (W) at 120 Volt (V)

### Important to know

Voltage drop will not exceed  
NEC recommendations  
All terminations are at 75 C  
Ambient Temperature 30 C

What is the minimum size  
conductor for this  
installation and what is  
the minimum ampere  
rating for the OCPD in  
this case a breaker?





Calculate heaters draw  
using Ohms law

Divide Nameplate (W)atts  
by Nameplate (V)oltage

$$1500/120 = 12.5 \text{ Amps}$$

Continuous Duty

$$12.5 \times 125\% = 15.6 \text{ or } 16$$

20 Amp Breaker

Table 310.15.(B) 16  
Minimum Size is # 12  
AWG

Calculate Branch Circuit  
size, Overcurrent device  
and GFCI for Electric De-  
icing and Snow Melting  
Equipment

GFCI required ?

210.8  
Dwelling Units  
(BE CAREFUL)

210.8 (A) (3) Outdoors  
  
Yes !!

Exception to (3)

Receptacles that are not readily  
accessible and are supplied by a branch  
circuit dedicated to electric snow  
melting, de icing or pipeline and vessel  
heating equipment shall be permitted  
to be installed in accordance with  
426.28 or 427.22, as applicable

426.28  
Ground Fault Protection  
of Equipment

Ground-fault Protection of equipment SHALL be  
provided for fixed Electric deicing and snow-  
melting Equipment



210.8 (B)  
Other than Dwelling  
Units

210.8 (B) (4) Outdoors  
Yes??

Exception No.1 to (3) and (4)

Receptacles that are not readily accessible and are supplied by a branch circuit dedicated to electric snow melting, de icing or pipeline and vessel heating equipment shall be permitted to be installed in accordance with 426.28 or 427.22, as applicable

426.28  
Ground Fault Protection  
of Equipment

Ground-fault Protection of equipment SHALL be provided for fixed Electric deicing and snow-melting Equipment

Question # 2  
Nameplate on snow melt  
is 5000 watts (W) at 208  
Volt (V)  
3 phase

AGAIN

Important to know

Voltage drop will not exceed  
NEC recommendations  
All terminations are at 75 C  
Ambient Temperature 30 C

What is the minimum size  
conductor for this  
installation and what is  
the minimum ampere  
rating for the OCPD in  
this case a breaker?

Divide Nameplate (W)atts  
by Nameplate (V)oltage  
 $208 \times 1.73 = 359.84$  or 360  
 $5000/360 = 13.8$  or 14 Amps

Continuous Duty

$14 \times 125\% = 17.5$  or 18  
20 Amp Breaker

Table 310.15.(B) 16  
Minimum Size is # 12  
AWG





Table 310.15.(B) 16  
Minimum Size is # 12  
AWG

Sizing a an Inverse Time  
Circuit Breaker

What size inverse time CB  
is required to start and run  
a 30 hp, 3 phase, 460 volt  
Design B motor  
(Determine Maximum  
size, including exceptions  
that may apply

Answers

- A. 125 Amp
- B. 150 Amp
- C. 175 Amp
- D. 200 Amp

Find FLA  
430.6 (A) (1) and table  
430.250  
30 HP = 40 amps

Find percentage  
430.52©(1) Ex.2(c) and  
table 430.52  
Maximum size is 400%

Calculating Minimum size  
430.52(C)(1) Ex.2(c)  
Max size is 40 amp x 400 %  
=Max size 160 Amp

Selecting inverse time  
Circuit Breaker

Max Size is 150 Amps  
the maximum Size inverse  
time Breaker is

ANSWER IS

B. - 150 Amps



### Sizing Overcurrent Protection for a Feeder

Using a Circuit Breaker  
What size feeder, short  
circuit and ground fault  
protection device is  
permitted for a feeder  
supplying 1-20 hp, 1-30  
hp and 1-40 hp 3 phase  
208 volt motors

### Answers

- A. 350 Amps
- B. 400 Amps
- C. 450 Amps
- D. 500 amps

Find FLC using 430.6(A)(1)  
and Table 430.250  
20 hp-59.4 amps  
30 hp- 88 amps  
40 hp- 114 amps ( largest)

### Calculate feeder OCPD

430.52(A) Table 430.52  
and 430.629(A)  
 $114 \text{ A} \times 250\% = 285 = 300 \text{ A OCPD}$   
plus 88 A plus 59.4  
= 447.4 Amps

### Selection of OCPD

430.62 (A)  
240.4 (G)  
240.6(A)

Answer C 450 Amps

### Question 3

What size THWN Cu  
conductors are required  
to supply a group of 3  
phase, 575 Volt, design B  
motors rated 20,30 and 40  
HP

### Answers

- A. 3AWG
- B. 2 AWG
- C. 1 AWG
- D. 1/0 AWG

### Sizing THWN Cu Conductors

Find FLC  
430.6(A)(1) and 430.250



20 HP= 27 Amps  
30 HP= 32 Amps  
  
40 HP = 41 Amps  
(Largest)

**Size Conductors**  
430.24  
41 A x 125%= 51.25 A  
plus 32 A plus  
27A =  
Total Load of 110.25 A

**Selection of Conductors**  
310.15(A)(3)  
& 310.15(B)(16)  
  
110 Amps requires  
a # 2 AWG  
Answer is B

**Question 4**  
What is the Minimum overload  
protection(time-delay fuse) for a 60  
Hp, 3 phase 230 Volt, Design B  
motor with a nameplate rating of  
67 amps, temperature rise of 40 C  
and a service factor of 1.15

**Answers**

- A. 70 Amps
- B. 75 Amps
- C. 80 Amps
- D. 90 amps

**Sizing Maximum  
Overload Protection**  
  
Find FLA 430.6 (A)(2)  
**Nameplate 67 Amps**

**Find Percentage**  
430.32(A)(1)  
Service factor = 125%  
Temperature Rise  
of=125%

Calculate FLA 430.32(A)(1)  
  
 $67.5 \times 125\% = 83.75 \text{ A}$   
  
(Round Down)

**Selection of Time-Delay Fuses**  
  
430.32(A)(1) and 240.6 (A)  
Minimum Size is 80 Amps  
  
The correct answer is C





**Question 5**

Whats size OCPD and THWN conductors are required to supply power to a single motor-compressor with a full load current of 24 amps and a condenser motor having a nameplate of 1.5 amps, with terminals rated at 75 C at both sides( AC and OCPD)

**Answers**

- A. 12 AWG Cu
- B. 10 AWG Cu
- C. 8 AWG Cu
- D. 6 AWG Cu

**Sizing Cu Conductors and OCPD**

Find FLC 440.32  
 $24 \text{ amps} \times 125\% = 30 \text{ amps}$   
 plus 1.5 amps

Total Load 31.5 Amps  
 (Round Down)

**Select Conductors and OCPD**

The minimum size of the OCPD is  
 30 Amperes

The minimum wire size is a # 10  
 THWN

Correct answer is

B

Transformer Sizing,  
 Primary and Secondary  
 Overcurrent Protection  
 and Feeder and Ground  
 Sizing

You have a 480 Volt 3 phase panel and you need to supply a 208 volt 3 phase load of 175 amps

**Question # 6**

What size transformer do you need?

Answer

- A. 30 kVA
- B. 45 kVA
- C. 75 kVA
- D. 112.5 kVA

Primary 480 Volt  
 Secondary 208 Volt  
 Load 175 Amp

$(208 \times 175 \times 1.732)/1000$   
 $= 63.05 \text{ KVA}$   
 Thus we would need a 75  
 kVA



Primary OCPD and  
Conductor Sizing

Article 450.3

Overcurrent Protection

What max. size primary OCPD  
would you need for a 75 kVA 600  
volt transformer when feeding a  
panelboard \*Hint 408.36(B)

Answers

- A.175 A
- B.200 A
- C.225 A
- D. 250 A

**Table 450.3 (B)**  
 $(75 \times 1000) / (480 \times 1.73)$   
 $75000 / 830 = 90.36$

$90.36 \times 250\% = 225.90$   
Correct answer is C

Equipment ground based  
on 250.122= 4 Cu or 2 Al

**Question 7**

Overcurrent Protection

What max. size secondary  
OCPD would you need  
for a 75 kVA 600 volt  
transformer when feeding  
a panel-board

Answers

- A.200 A
- B.250 A
- C.300 A
- D. 350 A

**Table 450.3 (B)**  
 $(75 \times 1000) / (208 \times 1.73)$   
 $75000 / 360 = 208.3$

$208.3 \times 125\% = 260.4$   
Correct answer is B

Cannot Round up as per  
Article 240

MBJ based on 250.66 =  
4 Cu or 2 Al





**Question 8**

What is the Cu wire size  
for the primary?

Please note more than 3 CCC

**Answers**

- A.3/0
- B.4/0
- C.250
- D. 300

Table 310.15(B)(16)

Even with de-rating  
Answer is B 4/0 Cu

**Question 9**

What is the Cu wire size  
for the Secondary?

Please note more than 3 CCC

**Answers**

- A.3/0
- B.4/0
- C.250
- D. 300

Table 310.15(B)(16)

Even with de-rating  
Answer is C 250 Cu

Main Bonding Jumper  
250.66  
# 4 Cu or 2 Al

Equipment Ground  
250.122  
# 4 Cu

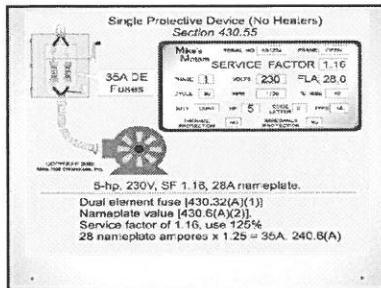
**Question 10**

Suppose you use a dual-element  
fuse for overload protection.  
What size fuse do you need for  
a 5-hp, 230V, single-phase motor  
with a service factor of 1.16 if  
the motor nameplate current  
rating is 28A?

Answer

- (a) 25A
- (c) 35A
- (b) 30A
- (d) 40A







**Question 1:** Suppose you use a dual-element fuse for overload protection. What size fuse do you need for a 5-hp, 230V, single-phase motor with a service factor of 1.16 if the motor nameplate current rating is 28A?

- (a) 25A
- (c) 35A
- (b) 30A
- (d) 40A

**Question 2:** Again, suppose you're using a dual-element fuse for the overload protection. What size fuse do you need for a 50-hp, 460V, 3-phase motor that has a temperature rise of 39°C and motor nameplate current rating of 60A (FLA)?

- 40A
- (c) 60A
- (b) 50A
- (d) 70A

**Question 3:** What size THHN conductor do you need for a 2-hp, 230V, single-phase motor?

- (a) 14 AWG
- (c) 10 AWG
- (b) 12 AWG
- (d) 8 AWG



## TRUE OR FALSE

1. The branch-circuit short-circuit protection (non-time delay fuse) for a 3-hp, 115V, single-phase motor shall not exceed 110A.

*Per Table 430.148,  $34A \times 3.00 = 102A$ . The next size up is 110A. So this is true.*

2. The branch-circuit short-circuit protection (dual-element fuse) for a 5-hp, 230V, single-phase motor shall not exceed 50A.

*Per Table 430.148,  $28A \times 1.75 = 49A$ . The next size up is 50A. So, this is also true.*

3. The branch-circuit short-circuit protection (inverse-time breaker) for a 25-hp, 460V, 3-phase synchronous motor shall not exceed 70A.

*Per Table 430.150,  $26A \times 2.50 = 65A$ . The next size up is 70A. This is also true.*

**Question 4:** Are any of the following statements true for a 1-hp, 120V motor, nameplate current rating of 14A? Refer to **Fig. 6**.

- (a) The branch-circuit conductors can be 14 AWG THHN.
- (b) Overload protection is from 16.1A.
- (c) Short-circuit and ground-fault protection is permitted to be a 40A circuit breaker.
- (d) All of these are true

## Motor Protection and Conductor Sizes Article 430

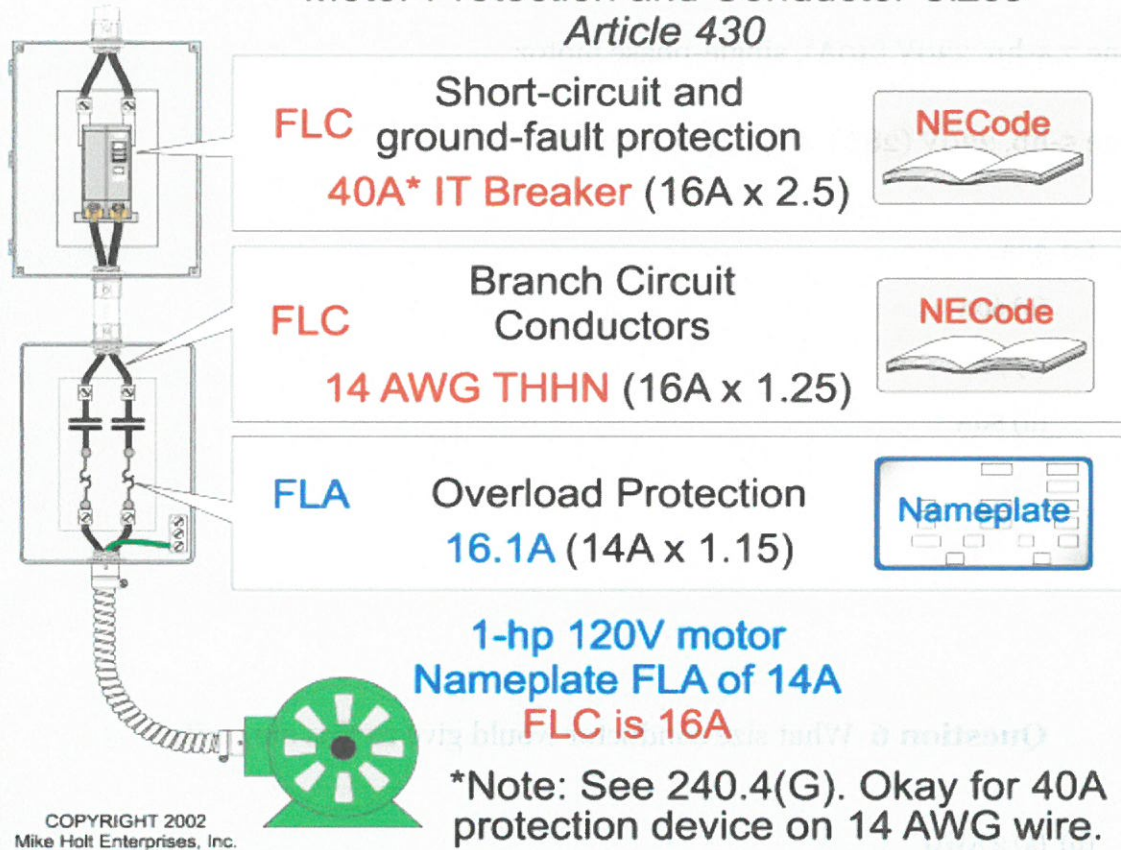


FIGURE 6

**Question 5** For what ampacity must you size the feeder conductor if it supplies the following two motors? The terminals are rated for 75°C.

- One 7.5-hp, 230V (40A), single-phase motor
- One 5-hp, 230V (28A), single-phase motor

- (a) 50A
- (b) 60A
- (c) 70A
- (d) 80A

**Question 6** What size conductor would give us this ampacity?

- (b) (a) 2 AWG
- (b) 4 AWG
- (c) 6 AWG
- (d) 8 AWG

*Question 6.* Using a slightly more complex example, try sizing the feeder conductor (THHN) and protection device (inverse-time breakers, 75°C terminal rating) for the following motors (**Fig. 3**):

- Three 1-hp, 120V, single-phase motors
- Three 5-hp, 208V, single-phase motors
- One wound-rotor, 15-hp, 208V, 3-phase motor

**Question 7.** What size feeder protection (inverse-time breaker) do you need for the following two motors?

- 5-hp, 230V, single-phase motor
- 3-hp, 230V, single-phase motor

(a) 30A breaker

(b) 40A breaker

(c) 50A breaker

(d) 80A breaker





## Motor Calculations

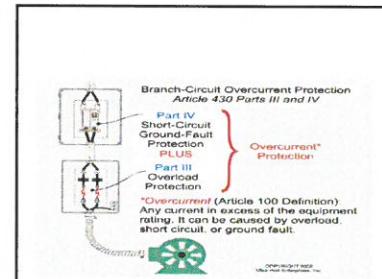
### Motors and Branch-Circuit Conductors

The best method for providing overcurrent protection for most circuits is to use a circuit breaker that combines overcurrent protection with short-circuit and ground-fault protection. However, this isn't usually the best choice for motors. With rare exceptions, the best method for providing overcurrent protection in these cases is to separate the overload protection devices from the short-circuit and ground-fault protection devices

Motor overload protection devices like heaters protect the motor, the motor control equipment, and the branch-circuit conductors from motor overload and the resultant excessive heating (430.31). They don't provide protection against short-circuits or ground-fault currents. That's the job of the branch and feeder breakers, which don't provide motor overload protection. This arrangement makes motor calculations different from those used for other types of loads. Let's look at how to apply Art. 430, starting at the motor.

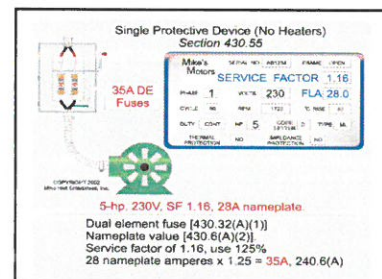
**Overload protection.** Motor overload devices are often integrated into the motor starter. But you can use a separate overload device like a dual-element fuse, which is usually located near the motor starter, not the supply breaker.

Fig. 1. Overcurrent protection is generally accomplished by separating the overload protection from the short-circuit and ground-fault protection device.



Motors rated more than 1 hp without integral thermal protection and motors rated 1 hp or less that are automatically started [430.32(C)] must have an overload device sized per the motor nameplate current rating [430.6(A)]. You must size the overload devices no larger than the requirements of 430.32. Motors with a nameplate service factor (SF) rating of 1.15 or more must have an overload protection device sized no more than 125% of the motor nameplate current rating

Fig. 2. When working with motors that have a service factor rating of 1.15 or higher, size overload protection devices no more than 125% of the motor nameplate rating.





**Question 1:** Suppose you use a dual-element fuse for overload protection. What size fuse do you need for a 5-hp, 230V, single-phase motor with a service factor of 1.16 if the motor nameplate current rating is 28A?

- (a) 25A
- (c) 35A
- (b) 30A
- (d) 40A

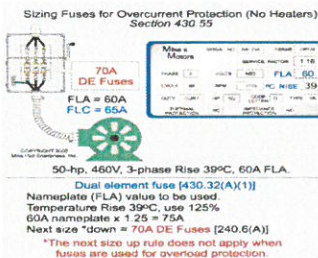
The overload protection shall be sized according to the motor nameplate current rating [430.6(A), 430.32(A)(1), and 430.55]. You also have to consider another factor: nameplate temperature rise. For motors with a nameplate temperature rise rating not over 40°C, size the overload protection device no more than 125% of the motor nameplate current rating. Thus,  $28A \times 1.25 = 35A$  [240.6(A)]

**Fig. 3.** Size the overload protection device of a motor with a nameplate temperature rise rating of 40°C or less at no more than 125% of the motor nameplate current rating.

**Question 2:** Again, suppose you're using a dual-element fuse for the overload protection. What size fuse do you need for a 50-hp, 460V, 3-phase motor that has a temperature rise of 39°C and motor nameplate current rating of 60A (FLA)?

- (a) 40A
- (c) 60A
- (b) 50A
- (d) 70A

**Sizing Fuses for Overcurrent Protection (No Heaters)**  
Section 430.55



70A DE Fuses  
FLA = 60A  
FLC = 65A

50-hp, 460V, 3-phase Rise 39°C, 60A FLA.

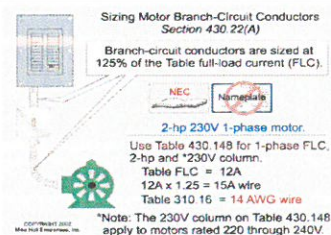
Dual element fuse [430.32(A)(1)]  
Nameplate (FLA) value to be used  
Temperature Rise 39°C, use 125%  
 $60A \text{ nameplate} \times 1.25 = 75A$   
Next size "down" = 70A DE Fuses [240.6(A)]

\*The next size up rule does not apply when fuses are used for overload protection.

The overload protection is sized per the motor nameplate current rating, not the motor full load current (FLC) rating. Thus,  $60A \times 1.25 = 75A$ . Overload protection shall not exceed 75A, so you need to use a 70A dual-element fuse [240.6(A) and 430.32(A)(1)]. Motors that don't have a service factor rating of 1.15 or higher or a temperature rise rating of 40°C and less must have an overload protection device sized at not more than 115% of the motor nameplate ampere rating [430.37].

**Fig. 4.** Refer to Table 310.16 when selecting the proper size conductor to serve a single motor.

**Sizing Motor Branch-Circuit Conductors**  
Section 430.22(A)



Branch-circuit conductors are sized at 125% of the Table full-load current (FLC).

2-hp 230V 1-phase motor.  
Use Table 430.148 for 1-phase FLC.  
2-hp and "230V" column.  
Table FLC = 12A  
 $12A \times 1.25 = 15A \text{ wire}$   
Table 310.16 = 14 AWG wire

\*Note: The 230V column on Table 430.148 apply to motors rated 220 through 240V.

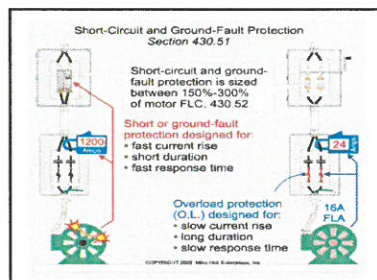
**Sizing branch-circuit conductors.** Branch-circuit conductors that serve a single motor must have an ampacity of not less than 125% of the motor's FLC as listed in Tables 430.147 through 430.150 [430.6(A)]. You must select the conductor size from Table 310.16 according to the terminal temperature rating (60°C or 75°C) of the equipment [110.14(C)]. Let's reinforce this concept by working through a sample calculation. Refer to Fig. 4.



**Question No. 3:** What size THHN conductor do you need for a 2-hp, 230V, single-phase motor?  
 (a) 14 AWG  
 (c) 10 AWG  
 (b) 12 AWG  
 (d) 8 AWG

Let's walk through the solution:  
**Step 1:** Conductor sized no less than 125% of motor FLC  
**Step 2:** Table 430.148 shows the FLC of 2-hp, 230V, single-phase as 12A  
**Step 3:**  $12A \times 1.25 = 15A$   
**Step 4:** Per Table 310.16, you need to use 14 AWG THHN rated 20A at 60°C

Fig. 5. Short-circuit and ground-fault protection devices are designed for fast current rise, short-duration events. On the other hand, overload protection devices are designed for slow current rate, long-duration situations



**Branch-circuit protection for short-circuits and ground-faults.** Branch-circuit short-circuit and ground-fault protection devices protect the motor, motor control apparatus, and conductors against short circuits or ground faults. They don't protect against an overload (430.51) (Fig. 5).

The short-circuit and ground-fault protection device required for motor circuits isn't the type required for personnel (210.8), feeders (215.9 and 240.13), services (230.95), or temporary wiring for receptacles (527.6).

Per 430.52(C), you must size the short-circuit and ground-fault protection for the motor branch circuit — except those that serve torque motors — so they're no greater than the percentages listed in Table 430.52.

Use the following two-step process to determine what percentage from Table 430.52 you should use to size the motor branch-circuit short-circuit ground-fault protection device.

**Step 1:** Locate the motor type on Table 430.52.

**Step 2:** Select the percentage from Table 430.52 according to the type of protection device, such as non-time delay (one-time), dual-element fuse, or inverse-time circuit breaker. Don't forget to use the next higher protection device size when necessary.

Let's see if you have this concept down with a short quiz. Of the following statements, which one is true? Use Table 430.52 to look up the numbers.

Let's address each question individually.

We'll be referring to 430.53(C)(1) Ex. 1 and Table 430.52.





When the short-circuit and ground-fault protection device value that you find in Table 430.52 doesn't correspond to the standard rating or setting of overcurrent protection devices as listed in 240.6(A), use the next higher protection device size [430.52(C)(1) Ex. 1].

Did that statement stop you? Does it strike you as incorrect? That's a common response, but remember, motors are different than other system components. Motor overload protection devices, such as heaters and fuses, protect the motor and other items from overload. The short-circuit and ground-fault protection doesn't need to perform this function. Therefore, oversizing won't compromise protection. Undersizing will prevent the motor from starting.

#### TRUE OR FALSE

The branch-circuit short-circuit protection (non-time delay fuse) for a 3-hp, 115V, single-phase motor shall not exceed 110A.

The branch-circuit short-circuit protection (dual-element fuse) for a 5-hp, 230V, single-phase motor shall not exceed 50A.

The branch-circuit short-circuit protection (inverse-time breaker) for a 25-hp, 460V, 3-phase synchronous motor shall not exceed 70A.

The branch-circuit short-circuit protection (non-time delay fuse) for a 3-hp, 115V, single-phase motor shall not exceed 110A.

Per Table 430.148,  $34A \times 3.00 = 102A$ . The next size up is 110A. So this is true.

The branch-circuit short-circuit protection (dual-element fuse) for a 5-hp, 230V, single-phase motor shall not exceed 50A

Per Table 430.148,  $28A \times 1.75 = 49A$ . The next size up is 50A. So, this is also true.

The branch-circuit short-circuit protection (inverse-time breaker) for a 25-hp, 460V, 3-phase synchronous motor shall not exceed 70A.

Per Table 430.150,  $26A \times 2.50 = 65A$ . The next size up is 70A. This is also true.

Remember the following important principles:

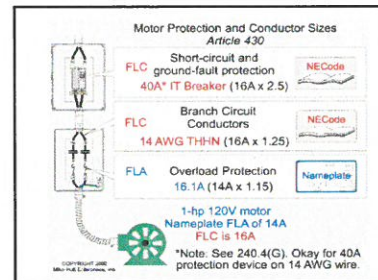


You must size the conductors at 125% of the motor FLC [430.22(A)].

You must size the overloads no more than 115% to 125% of the motor nameplate current rating, depending on the conditions [430.32(A)(1)].

You must size the short-circuit ground-fault protection device from 150% to 300% of the motor FLC [Table 430.52].

Fig. 6. Although this example may bother some people, the 14 AWG THHN conductors and motor are protected against overcurrent by the 16A overload protection device and the 40A short-circuit protection device.



(a) The branch-circuit conductors can be 14 AWG THHN.

(b) Overload protection is from 16.1A.

(c) Short-circuit and ground-fault protection is permitted to be a 40A circuit breaker.

(d) All of these are true

(a) The conductors are sized per 430.22(A):  $16A \times 1.25 = 20A$ ; Table 310.16 requires 14 AWG at 60°C.

(b) Per 430.32(A)(1), overload protection is sized as follows:  $14A \text{ (nameplate)} \times 1.15 = 16.1A$ .

(c) Short-circuit and ground-fault protection is determined based on 430.52(C)(1):  $16A \times 2.50 = 40A$  circuit breaker.

Therefore all three statements are true.

The 16A overload protection device protects the 14 AWG conductors from overcurrent, while the 40A short-circuit protection device protects them from short circuits. This example illustrates the sometimes confusing fact that when you're doing motor calculations, you're actually calculating overcurrent and short-circuit protection separately.

## Motor Calculations

### Feeders

*Example No. 1.* For what ampacity must you size the feeder conductor if it supplies the following two motors? The terminals are rated for 75°C.

One 7.5-hp, 230V (40A), single-phase motor

One 5-hp, 230V (28A), single-phase motor

- (a) 50A
- (b) 60A
- (c) 70A
- (d) 80A

Let's walk through the solution.

The largest motor is 40A.

$$40A \times 1.25 + 28A = 78A.$$

80A is the closest selection that's at least 78A.



What size conductor would give us this ampacity?

- (a) 2 AWG
- (b) 4 AWG
- (c) 6 AWG
- (d) 8 AWG

Per Table 310.16, a 6 AWG conductor rated at 75°C provides 65A of ampacity, so it's too small. However, a 4 AWG conductor provides 85A of ampacity, which will accommodate the necessary 78A. Therefore, you need to size this feeder conductor at 4 AWG.

Refer to 240.6(A), 430.52(C)(1), Table 430.148, and Table 430.52.

Start by determining the ampacities required for each size of motor, then walk through each step until you arrive at the correct OCPD size.

1-hp motor: FLC is 16A.  
 $16A \times 250\% = 40A$   
 5-hp motor: FLC is 30.8A.  
 $30.8A \times 250\% = 77A$  (Next size up is 80A.)  
 15-hp motor: FLC is 46.2A.  
 $46.2A \times 150\%$  (wound-rotor) 69A  
 (Next size up is 70A.)

Now, let's look at the feeder conductor. Conductors that supply several motors must have an ampacity of not less than 125% of the highest-rated motor FLC (430.17), plus the sum of the other motor FLCs [430.6(A)] on the same phase

Continuing with this example, add up all the ampacities, multiplying the highest rated motor by 125%.  
 Thus:

Table 310.16 shows you need 1/0 AWG THHN because at 150A it's the smallest conductor that accommodates the 136A of ampacity we're working with. When sizing the feeder conductor, be sure to include only the motors that are on the same phase. For that reason, these calculations only involve four motors

You must provide the feeder with a protective device with a rating or setting not greater than the largest rating or setting of the branch-circuit short-circuit and ground-fault protective device (plus the sum of the full-load currents of the other motors of the group) [430.62(A)]. Remember, motor feeder conductors must be protected against the overcurrent that results from short circuits and ground faults but not those that result from motor overload. When sizing the feeder protection, be sure to include only the motors that are on the same phase.

Let's walk through the solution.

*Step 1:* Get the motor FLC from Table 430.148.

A 5-hp motor FLC is 28A.

A 3-hp motor FLC is 17A.





*Step 2:* Size the branch-circuit protection per the requirements of 430.52(C)(1), Table 430.52, and 240.6(A)  
 5-hp:  $28A \times 2.5 = 70A$   
 3-hp:  $17A \times 2.5 = 42.5A$  (Next size up is 45A.)

*Step 3:* Size the feeder conductor per 430.24(A).  
 The largest motor is 28A.  
 $(28A \times 1.25) + 17A = 52A$   
 Table 310.16 shows 6 AWG rated 55A at 60°C as the smallest conductor with sufficient ampacity

*Step 4:* Size the feeder protection per 430.62.  
 It must not be greater than the 70A protection of the branch circuit plus the 17A of the other motor, which is the total of all loads on that feeder.  
 $70A + 17A = 87A$   
 Choose the next size down, which is 80A.

How can you be safe if you're selecting the next size down instead of the next size up?  
 Remember, you've already accounted for all the loads, and the NEC requires that you not exceed the protection of the branch circuit. Again, keep in mind that you aren't calculating for motor overload protection. Motor calculations are different from other calculations. With motor feeders, you're calculating for protection from short circuits and ground faults, only — not overload.

**Putting it all together**  
 Motor calculations get confusing if you forget there's a division of responsibility in the protective devices. To get your calculations right, you must separately calculate the motor overload protection (typically near the motor), branch-circuit protection (from short circuits and ground faults), and feeder-circuit protection (from short circuits and ground faults).  
 Remember that overload protection is only at the motor.  
 Any time you find yourself confused, just refer to NEC Figure 430.1. It shows the division of responsibility between different forms of protection in motor circuits. Example D8 in Annex D of the 2017 NEC illustrates this with actual numbers. Keeping this division of responsibility in mind will allow you to make correct motor calculations every time.



**STATE OF CONNECTICUT**  
DEPARTMENT OF CONSUMER PROTECTION  
OCCUPATIONAL & PROFESSIONAL LICENSING DIVISION

**EVALUATION FORM FOR ELECTRICAL CONTINUING EDUCATION COURSE**

**TO BE FILLED OUT BY THE STUDENT AND MAILED TO THE ADDRESS BELOW**  
**PROVIDERS ARE NOT PERMITTED TO COLLECT, PROCESS OR DELIVER THIS INFORMATION**

Date: \_\_\_\_\_ Email Address: \_\_\_\_\_ Phone: \_\_\_\_\_

Student Name: \_\_\_\_\_

School Name: \_\_\_\_\_ Course Name: \_\_\_\_\_

Location of Class: \_\_\_\_\_ Time: \_\_\_\_\_ Course Date: \_\_\_\_\_

Each instructor shall be evaluated by the students at the end of the course. Please rate your instructor and course in the following categories. Circle your choices.

INSTRUCTOR / FACILITY	POOR	FAIR	GOOD	VERY GOOD
1. Started and ended class on time	1	2	3	4
2. Instructor's delivery of subject matter	1	2	3	4
3. Level of preparation for the class	1	2	3	4
4. Knowledge of the subject	1	2	3	4
5. Ability to answer questions	1	2	3	4
6. Rapport with the class	1	2	3	4
7. Made learning enjoyable	1	2	3	4
8. Enthusiasm	1	2	3	4
9. Depth of coverage	1	2	3	4
10. Taught the course as it was advertised	1	2	3	4
11. Gave me information that will benefit	1	2	3	4
12. Overall evaluation of the Instructor	1	2	3	4
13. Registration process	1	2	3	4
14. Staff handled in a professional manner	1	2	3	4
15. Materials (handouts)	1	2	3	4
16. Course content	1	2	3	4
17. Overall evaluation of the course	1	2	3	4
18. Accommodations of Facility	1	2	3	4

Comments: \_\_\_\_\_

\_\_\_\_\_

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