409.30 Disconnecting Means
Disconnecting means that supply motor loads shall comply with Part IX of Article 30.

410.81 Control
(A) Disconnection Luminaires (fixtures) or lamp installation shall be controlled either singly or in groups by an externally operable switch or circuit breaker that opens all ungrounded primary conductors.
(B) Within Sight or Locked Type The switch or circuit breaker shall be located within sight from the luminaires (fixtures) or lamps, or it shall be permitted elsewhere if it is provided with a means for locking in the open position. The requirement in 410.81(B) is intended to help protect the service person from the disconnecting means being turned on or closed while the equipment is being serviced.

422.31 Disconnection of Permanently Connected Appliances
(A) Rated at Not Over 300 Volt-Amperes or 1/8 Horsepower For permanently connected appliances rated at not over 300 volt-amperes or 1/8 hp, the branch-circuit overcurrent device shall be permitted to serve as the disconnecting means.
(B) Appliances Rated Over 300 Volt-Amperes or 1/8 Horsepower For permanently connected appliances rated over 300 volt-amperes or 1/8 hp, the branch-circuit switch or circuit breaker shall be permitted to serve as the disconnecting means where the switch or circuit breaker is within sight from the appliance or is capable of being locked in the open position. The provision for locking or adding a lock to the disconnecting means shall be installed on or at the switch or circuit breaker used as the disconnecting means and shall remain in place with or without the lock installed. Section 422.31(B) has been expanded to increase safety to maintenance and service personnel working on electrical appliances. The requirement now provides detailed information pertaining to the method of providing the disconnection required by Article 422, Part III. A device that is attached to the circuit breaker handle by a set screw is not an acceptable means to serve as a safe method of locking the device in the off position. The device must have provisions for placement of a lock on it to secure the device in the off position. The lock-out device must be part of the disconnect assembly and must remain in place after the padlock is removed, whether it is a fused disconnect switch, a single circuit breaker, or a circuit breaker in a
422.32 Disconnecting Means for Motor-Driven Appliance
If a switch or circuit breaker serves as the disconnecting means for a permanently connected motor-driven appliance of more than 1/8 hp, it shall be located within sight from the motor controller and shall comply with Part IX of Article 430.

422.33 Disconnection of Cord-and-Plug-Connected Appliances
(A) Separable Connector or an Attachment Plug and Receptacle For cord-and-plug-connected appliances, an accessible separable connector or an accessible plug and receptacle shall be permitted to serve as the disconnecting means. Where the separable connector or plug and receptacle are not accessible, cord-and-plug-connected appliances shall be provided with disconnecting means in accordance with 422.31. means in accordance with 422.31.

(B) Connection at the Rear Base of a Range
For cord-and-plug-connected household electric ranges, an attachment plug and receptacle connection at the rear base of a range, if it is accessible from the front by removal of a drawer, shall be considered as meeting the intent of 422.33(A).

(C) Rating The rating of a receptacle or of a separable connector shall not be less than the rating of any appliance connected thereto.

424.19 Disconnecting Means
Means shall be provided to disconnect the heater, motor controller(s), and supplementary overcurrent protective device(s) of all fixed electric space-heating equipment from all ungrounded conductors. Where heating equipment is supplied by more than one source, the disconnecting means shall be grouped and marked. Section 424.19(C) permits a unit switch to serve as the disconnecting means, provided that it has a marked "off" position and disconnects all ungrounded conductors and that other means are also provided in accordance with paragraphs 424.19(C)(1) through 424.19(C)(4). Such other means are not required to be capable of being locked in the open position as required by 424.19(B)(1). See 424.20 for thermostatically controlled switching devices.

(A) Heating Equipment with Supplementary Overcurrent Protection The disconnecting means for fixed electric space-heating equipment with supplementary overcurrent protection shall be within sight from the supplementary overcurrent
protective device(s), on the supply side of these devices, if fuses, and, in addition, shall comply with either 424.19(A)(1) or (A)(2).

(1) **Heater Containing No Motor Rated Over 1/8 Horsepower** The above disconnecting means or unit switches complying with 424.19(C) shall be permitted to serve as the 424.19(C) shall be permitted to serve as the required disconnecting means for both the motor controller(s) and heater under either of the following conditions:
   (1) The disconnecting means provided is also within sight from the motor controller(s) and the heater. (2) The disconnecting means provided is capable of being locked in the open position.

(2) **Heater Containing a Motor(s) Rated Over 1/8 Horsepower** The above disconnecting means shall be permitted to serve as the required disconnecting means for both the motor controller(s) and heater by one of the following means:
   (1) Where the disconnecting means is also in sight from the motor controller(s) and the heater.
   (2) Where the disconnecting means is not within sight from the heater, a separate disconnecting means shall be installed, or the disconnecting means shall be capable of being locked in the open position, or unit switches complying with 424.19(C) shall be permitted. (3) Where the disconnecting means is not within sight from the motor controller location, a disconnecting means complying with 430.102 shall be provided. (4) Where the motor is not in sight from the motor controller location, 430.102(B) shall apply.

(B) **Heating Equipment Without Supplementary Overcurrent Protection**

(1) **Without Motor or with Motor Not Over 1/8 Horsepower** For fixed electric space-heating equipment without a motor rated over 1/8 hp, the branch-circuit switch or circuit breaker shall be permitted to serve as the disconnecting means where the switch or circuit breaker is within sight from the heater or is capable of being locked in the open position.

(2) **Over 1/8 Horsepower** For motor-driven electric space-heating equipment with a motor rated over 1/8 hp, a disconnecting means shall be located within sight from the motor controller or shall be permitted to comply with the requirements in 424.19(A)(2).

(C) **Unit Switch(es) as Disconnecting Means**

A unit switch(es) with a marked "off" position that is part of a fixed heater and disconnects all ungrounded conductors shall be permitted as the disconnecting means required by this article
430.102 Location

(A) Controller An individual disconnecting means shall be provided for each controller and shall disconnect the controller. The disconnecting means shall be located in sight from the controller location. The installation shown in Exhibit 430.18 is an example of compliance with the main requirement of 430.102(A).

Exhibit 430.18 The disconnecting means for each controller, which must be within sight of the controller location. (Courtesy of International Association of Electrical Inspectors)

Exception No. 1: For motor circuits over 600 volts, nominal, a controller disconnecting means capable of being locked in the open position shall be permitted to be out of sight of the controller, provided the controller is marked with a warning label giving the location of the disconnecting means.

Exception No. 2: A single disconnecting means shall be permitted for a group of coordinated controllers that drive several parts of a single machine or piece of apparatus. The disconnecting means shall be located in sight from the controllers, and both the disconnecting means and the controllers shall be located in sight from the machine or apparatus.

(B) Motor A disconnecting means shall be located in sight from the motor location and the driven machinery location.

Exception: The disconnecting means shall not be required to be in sight from the motor and the driven machinery location under either condition (a) or (b), provided the disconnecting means required in accordance with 430.102(A) is individually capable of being locked in the open position. The provision for locking or adding a lock to the disconnecting means shall be installed on or at the switch or circuit breaker used as the disconnecting means and shall remain in place with or without the lock installed.

(a) Where such a location of the disconnecting means is impracticable or introduces additional or increased hazards to persons or property (b) In industrial installations, with written safety procedures, where conditions of safety procedures, where conditions of maintenance and supervision ensure that only qualified persons service the equipment

The main rules of 430.102(A) and 430.102(B) require that the disconnecting means be in sight of the controller, the motor location, and the driven-machinery
location. For motors over 600 volts, the controller disconnecting means may be out of sight of the controller, as illustrated in Exhibit 430.19, provided that the controller has a warning label indicating the location and identification of the disconnecting means, which must be capable of being locked in the open position.

Exhibit 430.19 A motor installation over 600 volts, where the motor controller is not located within sight of its disconnecting means.

A single disconnecting means may be located adjacent to a group of coordinated controllers, as illustrated in Exhibit 430.20, where the controllers are mounted on a multimotor continuous process machine.

The exception to 430.102(B) was revised for the 2002 Code. The disconnecting means may only be out of sight of the motor, as illustrated in Exhibit 430.21, if the disconnecting means complying with 430.102(A) is individually capable of being locked in the open position and meets the criteria of either (a) or (b) in the exception. If locating the disconnecting means close to the motor location and driven machinery is impracticable due to the type of machinery, the type of facility, the lack of space for locating large equipment such as disconnecting means rated over 600 volts, or any increased hazard to persons or property, then the disconnecting means is permitted to be located remotely. Industrial facilities that comply with OSHA, CFR 1910.147, The Control of Hazardous Energy (Lockout/Tagout), are permitted to have the disconnecting means located remotely. Section 430.102 clearly requires that individual disconnect switches or circuit breakers must be capable of being locked in the open position. Disconnect switches or the open position. Disconnect switches or circuit breakers that are only located behind the locked door of a panelboard or located within locked rooms do not comply with the requirements of 430.102. The provision for locking or attaching a lock to the disconnecting means must be part of the disconnect and a permanent component of the switch or circuit breaker.
Exhibit 430.20 A single disconnecting means located adjacent to a group of coordinated controllers mounted on a multimotor continuous process machine.

Exhibit 430.21 A controller disconnecting means that is out of sight of the motor. The disconnecting means required in accordance with 430.102(A) shall be permitted to serve as the disconnecting means for the motor if it is located in sight from the motor location and the driven machinery location.

430.103 Operation
The disconnecting means shall open all ungrounded supply conductors and shall be designed so that no pole can be operated independently. The disconnecting means shall be permitted in the same enclosure with the controller. The Code requires that a switch, circuit breaker, or other device serve as a breaker, or other device serve as a disconnecting means for both the controller and the motor, thereby providing safety during maintenance and inspection shutdown periods. The disconnecting means also disconnects the controller; therefore, it cannot be a part of the controller. However, separate disconnects and controllers may be mounted on the same panel or contained in the same enclosure, such as combination fused-switch,
magnetic-starter units. Depending on the size of the motor and other conditions, the
type of disconnecting means required may be a motor circuit switch, a circuit breaker,
a general-use switch, an isolating switch, an attachment plug and receptacle, or a
branch-circuit short-circuit and ground-fault protective device, as specified in 430.109.
If a motor is stalled or under heavy overload and the motor controller fails to properly
open the circuit, the disconnecting means, which must be rated to interrupt
locked-rotor current, can be used to open the circuit. For motors larger than 100 hp ac
or 40 hp dc, the disconnecting means is, in accordance with 430.109(E), permitted to
be a general-use or an isolating switch where plainly marked "Do not operate under
load."

430.109 Type
The disconnecting means shall be a type specified in 430.109(A), unless otherwise
permitted in 430.109(B) through 430.109(G), under the conditions specified.
(A) General
(1) Motor Circuit Switch A listed motor-circuit switch rated in horsepower.
(2) Molded Case Circuit Breaker A listed molded case circuit breaker.
(3) Molded Case Switch A listed molded case switch.
(4) Instantaneous Trip Circuit Breaker An instantaneous trip circuit breaker that is
part of a listed combination motor controller.
(5) Self-Protected Combination Controller
Listed self-protected combination controller.
(6) Manual Motor Controller Listed manual motor controllers additionally marked
"Suitable as Motor Disconnect" shall be permitted as a disconnecting means where
installed between the final motor branch-circuit short-circuit protective device and the
motor. Listed manual motor controllers additionally marked "Suitable as Motor
Disconnect" shall be permitted as disconnecting means on the line side of the fuses
permitted in 430.52(C)(5). In this case, the fuses permitted in 430.52(C)(5) shall be
considered supplementary fuses, and suitable branch-circuit short-circuit and
ground-fault protective devices shall be
installed on the line side of the manual motor controller additionally marked
"Suitable as Motor Disconnect."
(7) System Isolation Equipment System isolation equipment shall be listed for
disconnection purposes. System isolation equipment shall be installed on the load side
of the overcurrent protection and its disconnecting means. The disconnecting means
shall be one of the types permitted by 430.109(A)(1) through (A)(3).
The impetus for development of system isolation equipment (SIE) comes from today's large and often complex machines where repeated operation of disconnecting means for maintenance or servicing is inherent to the process and the risk of injury to personnel is increased due to moving parts and multiple points of entry. The safety for personnel servicing this equipment includes detailed lock-out, tag-out protocols for all sources of mechanical and electrical energy. System isolation equipment helps simplify electrical lock-out, tag-out procedures and can also be used as a means to isolate other energy sources such as pneumatic energy. In accordance with its definition in 430.2, system isolation equipment is "a redundantly monitored, remotely operated, contactor-isolating system, packaged to provide the disconnection/isolation function." This type of equipment was first introduced in 5.5.4 in the 2002 edition of NFPA 79, Electrical Standard for Industrial Machinery, as a means to disconnect and isolate separately operable parts of a large industrial machine.

440.14 Location
Disconnecting means shall be located within sight from and readily accessible from the air-conditioning or refrigerating equipment. The disconnecting means shall be permitted to be installed on or within the air-conditioning or refrigerating equipment. The disconnecting means shall not be located on panels that are designed to allow access to the air-conditioning or refrigeration equipment.

Exception No. 1: Where the disconnecting means provided in accordance with 430.102(A) is capable of being locked in the open position, and the refrigerating or air-conditioning equipment is essential to an industrial process in a facility with written safety procedures, and where the conditions of maintenance and supervision ensure that only qualified persons service the equipment, a disconnecting means within sight from the equipment shall not be required. The provision for locking or adding a lock to the disconnecting means shall be permanently installed on or at the switch or circuit breaker used as the disconnecting means.

Exception No. 1 accommodates special conditions associated with process refrigeration equipment. Typically, this equipment is very large, so rated disconnects may not be available. Additionally, this equipment may be in hazardous locations, and locating disconnecting means within sight of the motor may introduce additional hazards. The provision for locking or attaching a lock to the disconnecting means must be part of the disconnect and a permanent component of the switch or circuit breaker. The term permanent component is used to preclude portable or transferrable-type lock-out devices from transferrable-type lock-out devices from
being used as the method to provide the ability to lock the switch or circuit breaker in the open (off) position. An example of `permanent-type" locking hardware is shown in Exhibit 440.1.

Exhibit 440.1 Four circuit breakers equipped with locking hardware that is not readily removable or transferable. (Courtesy of International Association of Electrical Inspectors)