Listed or Labeled Equipment
Listed or labeled equipment must be installed in accordance with instructions included in the listing or labeling [110.3(B)]. Be sure to observe maximum branch circuit fuse size labels. When the equipment label is marked with a maximum fuse amp rating rather than marked with maximum overcurrent device amp rating, only fuses can be used for protection of this equipment.

Panelboards
A maximum of 42 fuses (excluding main fuses) are permitted to be installed in a lighting and appliance branch circuit panelboard (408.35). Each lighting and appliance branch circuit panelboard must be individually protected on the supply side by not more than two sets of fuses having a combined rating not greater than that of the panelboard (408.36). Exception No. 1: Individual protection is not required when the panelboard feeder has overcurrent protection not greater than that of the panelboard. Exception No. 2: Individual protection in existing installations is not required for individual residential occupancy service entrance panelboards [408.36(A)]. A power panelboard having supply conductors which include a neutral and having more than 10% of its overcurrent devices protecting branch circuits of 30A or less, shall have individual protection on the line side not greater than the rating of the panelboard. Individual protection is not required when the power panel is used as service equipment in accordance with 230.71 [408.36(B)]. Panels with snap switches rated at 30A or less must be protected by fuses not larger than 200A [408.36(C)]. Fusible panelboards are available with heavy duty toggle switches rated more than 30A; these panelboards are not restricted by this 200A requirement.

If the panelboard is supplied through a transformer, the fuses for the protection of the panelboard must be located on the transformer secondary [408.36(D)] except when the fuse on the primary complies with 240.2(C)(1). [408.36(D) Exception].

Appliances
Appliance branch circuits shall be protected in accordance with 240.5. If a fuse rating is marked on an appliance, the branch circuit fuse rating cannot exceed that rating marked on the appliance [422.11(A)]. See 430.6(A)(1) exception No.3 for situations where the appliance is marked with both a horsepower rating and an amp rating.

For branch circuits which supply a single non-motor operated appliance rated more than 13.3A, the fuse rating shall not exceed 150% of the appliance rating [422.11(E)(3)].

Electric heating appliances using resistance heating elements rated more than 48A shall have the heating elements subdivided such that each subdivision does not exceed 48 amps and each subdivision shall be protected by a branch circuit listed fuse not to exceed 60A in rating. These fuses shall be factory installed by the heater manufacturer, be accessible, and be suitable for branch circuit protection [422.11(F)(1)].

Fixed appliances are considered protected when supplied from 15, 20, 25, or 30A branch circuits. Fixed cooking appliances are permitted to be protected by 40 or 50A branch circuits (210.23). Household appliances with surface heating elements that have a maximum rating greater than 60A must be divided into two or more circuits, each of which is protected by a fuse of no greater than 50A [422.11(B)].

Portable appliances are considered as protected when supplied from a 15, 20A, or 30A branch circuit (210-23).

Supplementary Protection
Supplementary overcurrent protection is permitted by the National Electrical Code® for specific uses such as in lighting fixtures, appliances, and other equipment or for certain internal control circuits and components of equipment. This type of protection must not be used as a substitute for branch circuit protection as described in Article 210. This type of protection is not required to be readily accessible as are branch circuit devices. There are a wide variety of supplementary fuses and fuse holders, which have small physical dimensions and are easily installed in or on equipment, appliances, or fixtures. The advantages of supplementary protection are closer fuse sizing for better individual protection, isolation of equipment on overcurrents so that the branch circuit fuse is not disturbed, ease in locating troubled equipment, and generally direct access to the fuse at the location of the equipment. For instance, the inline fuse and holder combination, such as the Type GLR or GMF fuses, protects and isolates fluorescent lighting fixtures in the event of an overcurrent.

The Tri-National Standard for supplementary fuses is UL/CSA/ANCE 248-14. When supplementary overcurrent protective devices are considered for proper use, it is important (1) not to use these devices as a substitute for branch circuit protection and (2) to be sure that the device’s interrupting rating equals or exceeds the available short-circuit current (see the discussion for 110.9 in this booklet).

Air Conditioning and Refrigeration
Air conditioning and refrigeration equipment requirements are covered in Article 440 of the National Electrical Code®. Hermetic motor-compressors are not rated in “full-load amps” as are standard motors. Instead, different terms are used, such as rated load current, branch circuit selection current, maximum continuous current, minimum circuit ampacity, and maximum overcurrent protection. This equipment has overcurrent protection requirements that differ from that for ordinary motors covered in Article 430. Some highlights are presented here.

Branch Circuit Protection HVAC
Individual Motor-Compressor(s) and HVAC Equipment
Having Motor-Compressor(s) and Other Loads
(Such as Fan Motors, Electric Heaters, Coils, etc.).

Fuses sized for branch circuit protection only must not exceed 175% of the hermetic motor-compressor rated-load current or branch circuit selection current (whichever is larger). If this size fuse cannot withstand the motor starting current, a higher amp rating is permitted, but in no case can the fuse size exceed 225% [440.22(A)].

Low-Peak dual-element and Fusetron dual-element fuses are recommended for branch circuit protection of air conditioning and refrigeration hermetic motor-compressors because these fuses have an adequate time-delay for motor starting surges.

Refer to the nameplate on the equipment. The sizing (amp rating) for the overcurrent protection has been determined by the manufacturer of the equipment. It is not necessary to apply any further multipliers to arrive at the proper size. This has already been done by the manufacturer.

The marked protective device rating is the maximum protective device rating for which the equipment has been investigated and found acceptable by nationally recognized testing laboratories.

See “Listed or Labeled Equipment” for requirement when nameplate states Maximum Size Fuse. This is a critical requirement, and must be followed without exception to be in compliance with 110.3(B) of the Code. NEC® 110.3(B) requires that listed or labeled equipment must be installed in accordance with any instructions included in the listing or labeling.
Selective Coordination

Essential Electrical Systems In Healthcare Facilities, Emergency Systems and Legally Required Standby Systems

Frequently Asked Questions: Fuse System

Q. How about when two different current-limiting fuses are plotted on a time current curve and there is a space between the lower ampere fuse total clear curve and the larger ampere fuse minimum melt curve — does this ensure selective coordination (if the selectivity ratio is not known)?

A. In this case, without knowing the selectivity ratio and having only time current curves, selective coordination can only be ensured for the level of overcurrent up to the point where the larger fuse curve crosses 0.01 seconds. For times where the fuse opening time is less than 0.01 seconds, selectivity ratios are necessary. It is not necessary to plot fuse time current curves; just adhere to the selectivity ratios.

Q. What about lighting branch circuits? There has not been a commercially available fusible lighting panelboards, so how can selective coordination be achieved for the 20A panelboard circuits?

A. In order to achieve a selectively coordinated fusible system, Cooper Bussmann has the Coordination Module™, which is a fusible branch circuit panelboard. So now it is easy to achieve selective coordination from main to branch circuit with an all fusible system, including branch circuit lighting panelboards, by adhering to the simple selectivity ratios. Information on Coordination Module on www.cooperbussmann.com data sheet 3115.

Selectivity Ratio Guide For Coordination Module

<table>
<thead>
<tr>
<th>Load-Side Fuse</th>
<th>HPJ_SP</th>
<th>LPN-RK_SP</th>
<th>LPS-RK_SP</th>
<th>FRN-R</th>
<th>FRS-R</th>
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<td>LP-CC</td>
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Ratios only apply to Cooper Bussmann Fuses. When fuses are in the same case size, consult Cooper Bussmann.