



Group Protection Using PKZ Motor Protectors



Building Branch Circuits Without Getting Burned



Group Protection Using PKZ Motor Protectors

Where Are We In The NEC ?

**PKZ
+
DIL**

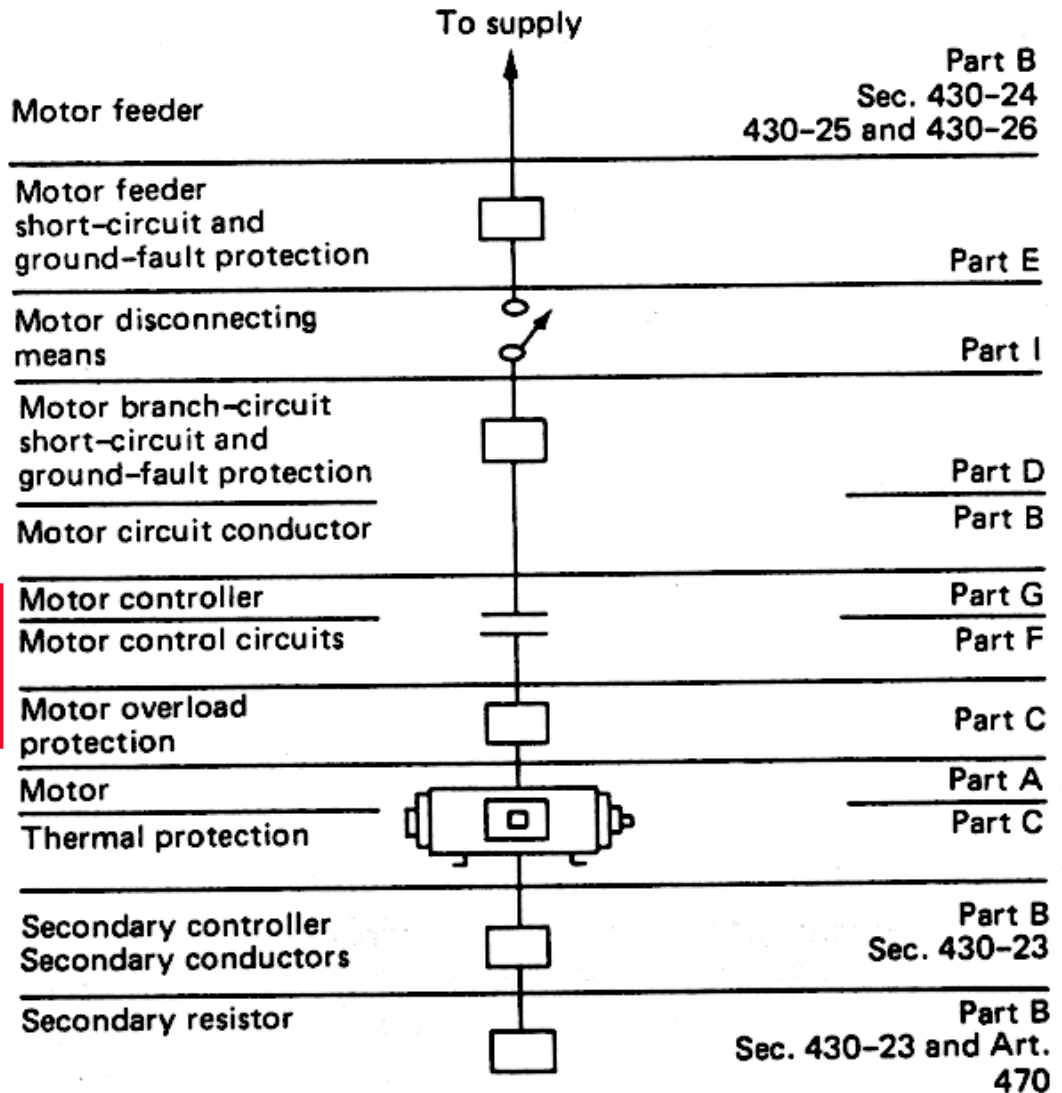
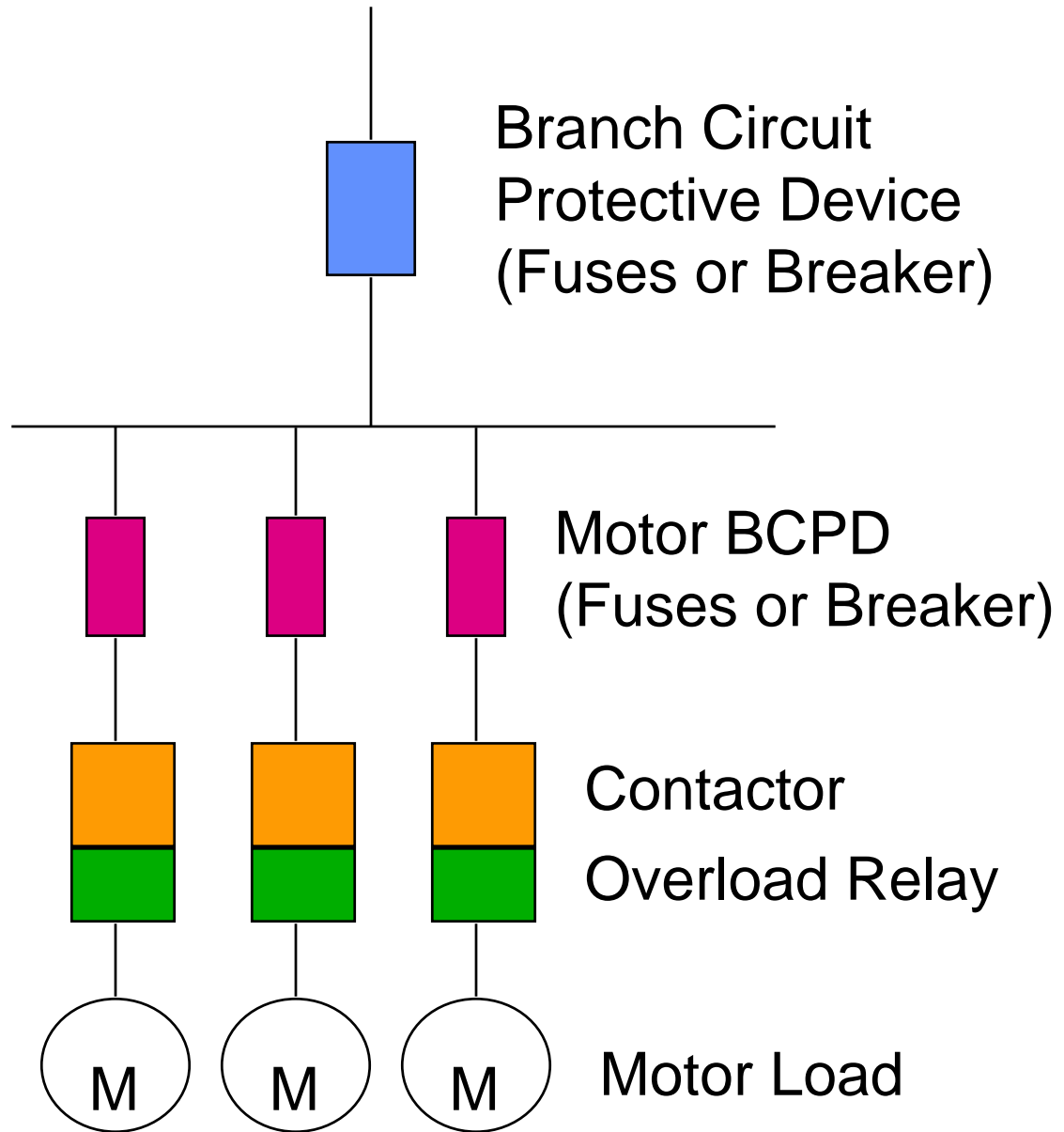


Diagram 430-1



Group Protection Using PKZ Motor Protectors

The Individual Approach:





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**Where In The NEC Is
“Group Protection” ??**

**Article 430-53 of the NEC
deals with “Several Motors
or Loads on One Branch
Circuit” (*Motor Groupings*)**



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What Does Art. 430-53 Say ??

There are 3 methods covered:

- ✓ Motor NOT Over 1 HP**
- ✓ Protect Smallest Motor**
- ✓ Use Group-Rated Devices**
 - PKZ/S or (PKZ+ Contactor)**
 - Requires Coordinated Back-Up Protective Device**



Motor Protection Using PKZ Motor Protectors

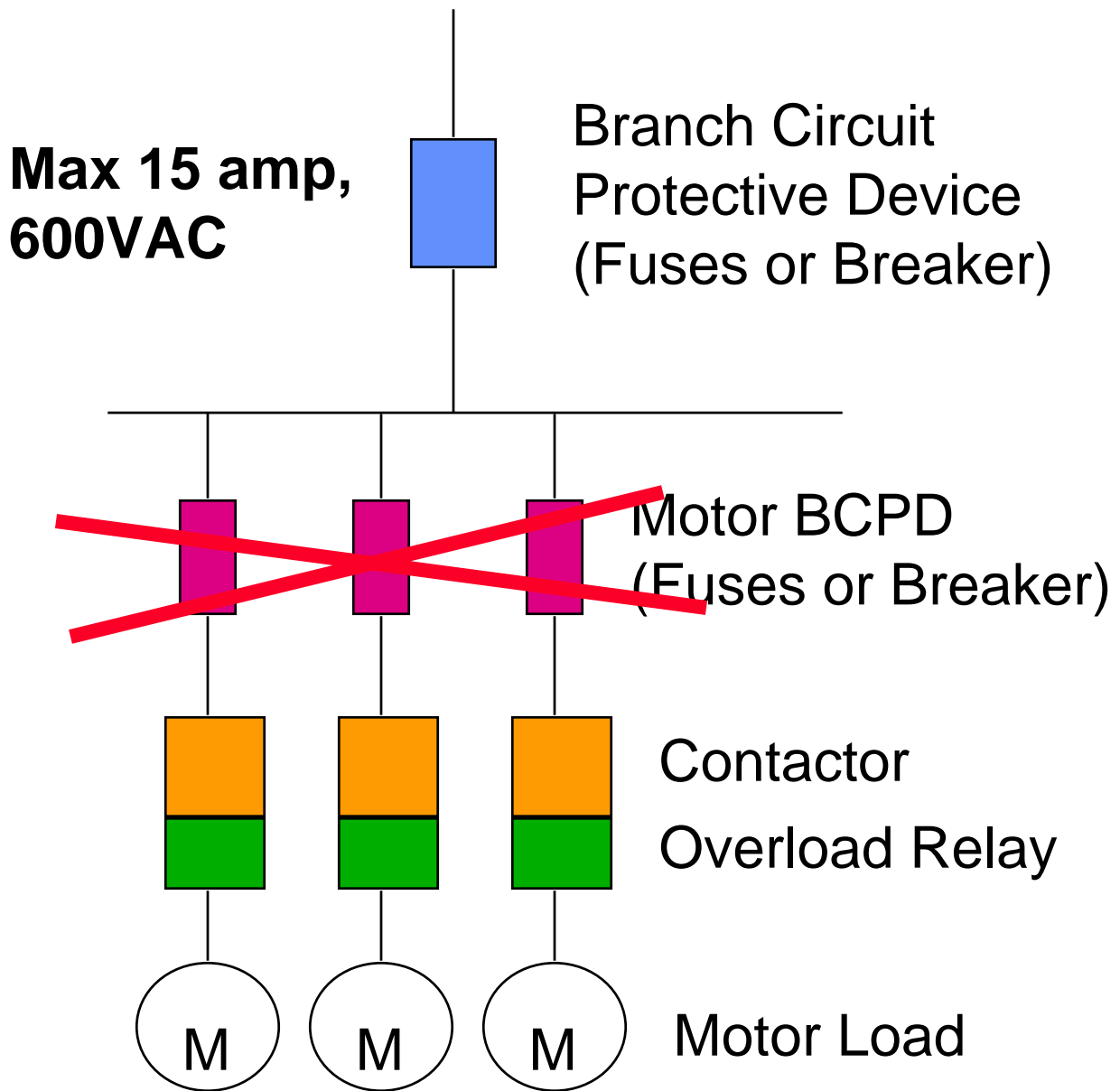
Motors NOT Over 1HP

- **Branch circuit max 15 amps**
- **The full-load rating of each motor does not exceed 6 amps**
- **The rating of the branch circuit protective device does not exceed any limitation marked on the motor controller**
- **Individual overload protection conforms to Section 430-32**



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Motors 1HP or Less:





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Protect Smallest Motor:

- **Using Section 430-52 (Table 430-152), select the BCPD to protect the smallest motor.**
- **Each motor to have individual overload protection**
- **The BCPD time-current curves should be reviewed to insure that there is no nuisance tripping under most severe “normal” conditions of service**



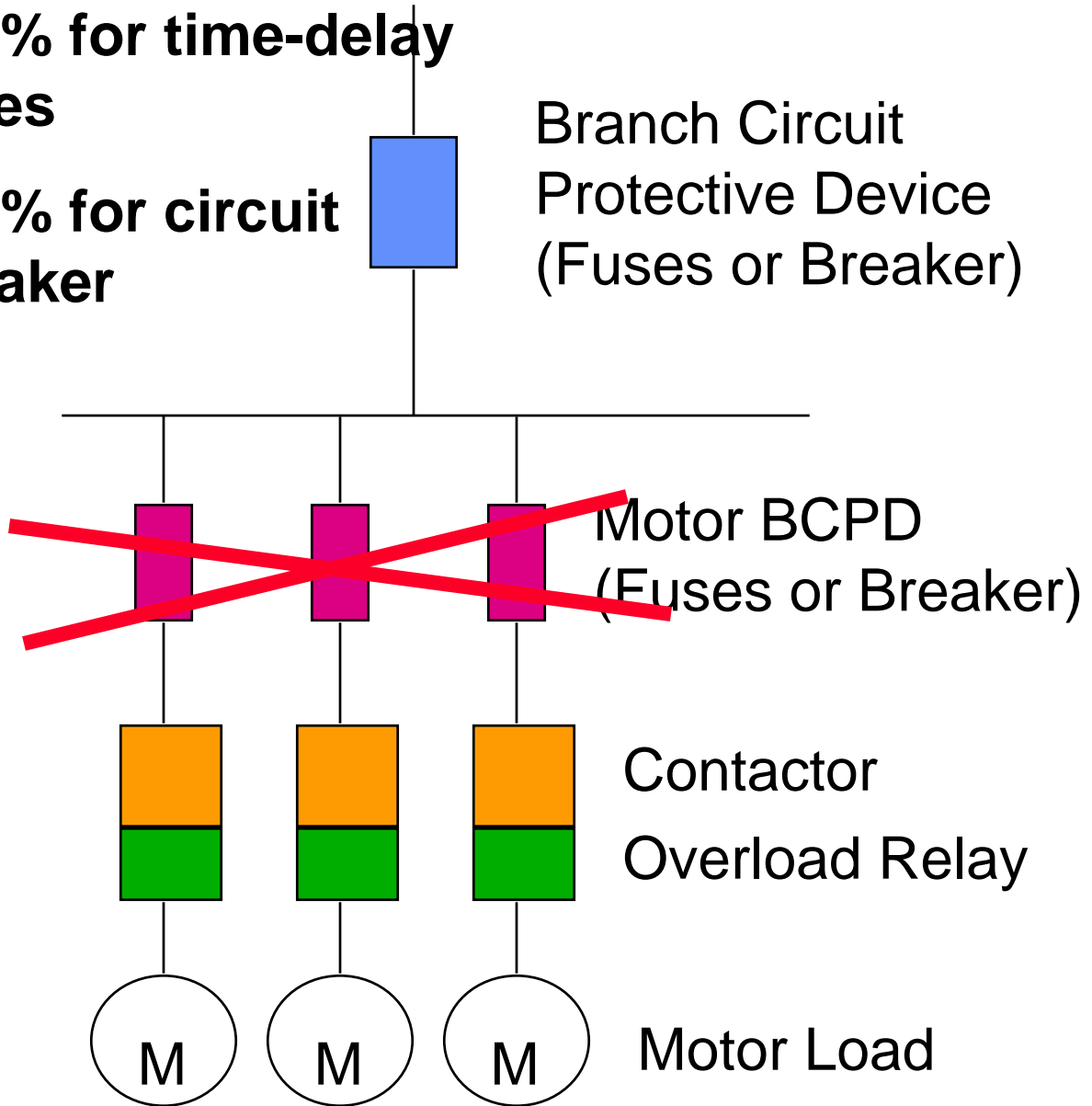
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Protect Smallest Rated Motor:

**175% for time-delay
fuses**

**250% for circuit
breaker**

Branch Circuit
Protective Device
(Fuses or Breaker)





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Protect smallest rated motor:

Example: 3 x 460VAC, 3-PH motors:

1/2HP (1.0 full load amps)

2HP (3.4 full load amps)

3HP (4.8 full load amps)

Protection for smallest motor:

- **Time-Delay Fuses:** 175% of 1A = 1.75 amp fuse (not workable ... 2HP & 3HP cannot be started)
- **Circuit Breaker:** 250% of 1A = 2.50 amp breaker ... select closest size .. 15 amp breaker, which will allow other motors to turn on.



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Other (PKZ) Groupings:

Section 430-53 (c) allows motors of any rating to be grouped together either as part of a UL Listed assembly or field-installed per manufacturer's instructions provided the following conditions are complied with:





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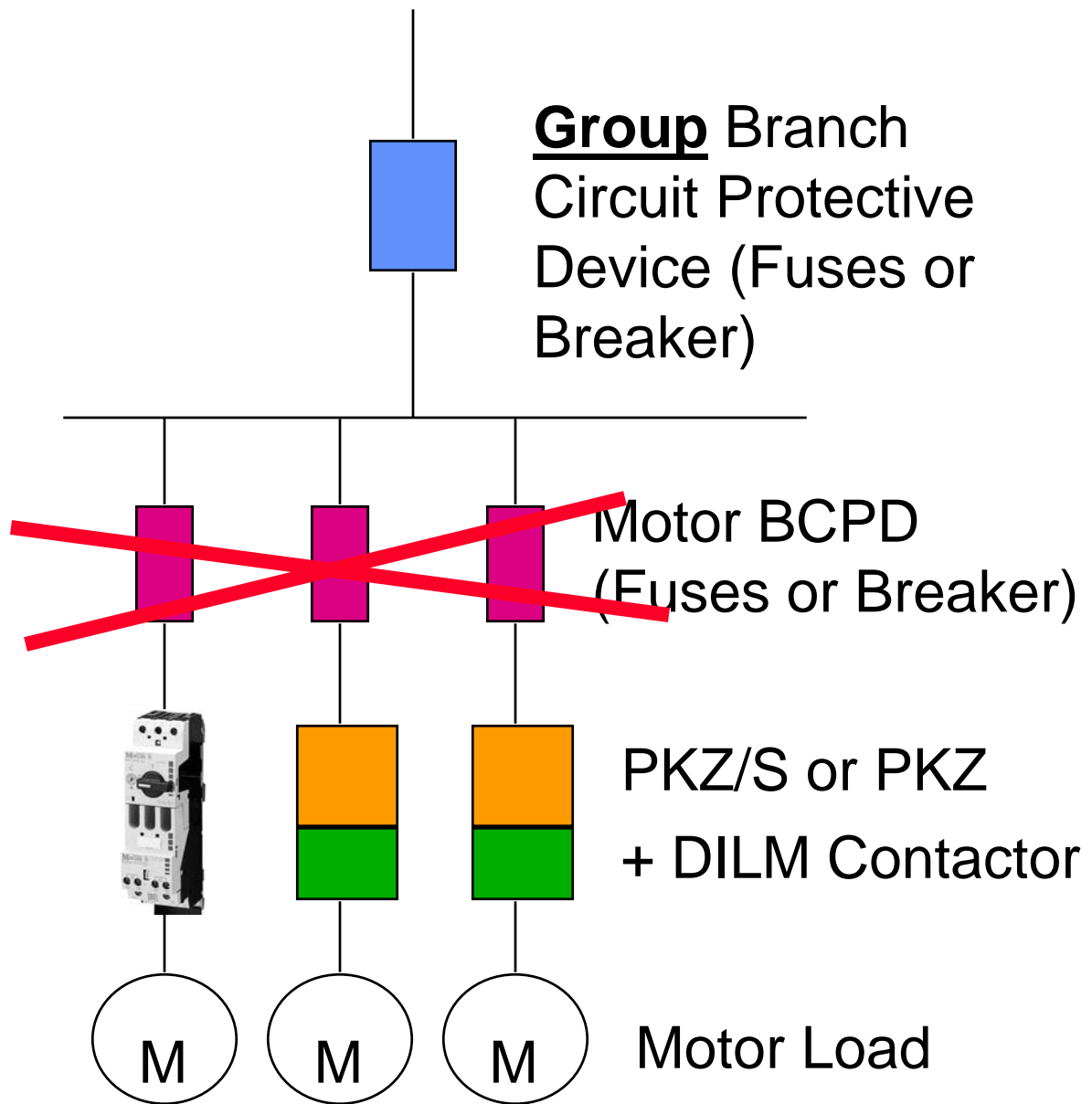
Other (PKZ) Groupings:

- 1 Each motor overload device (PKZ) must be UL Listed for group installation**
- 2 Each motor controller (PKZ/S or PKZ+Contactor) must be UL Listed for group installation**
- 3 The circuit breaker(s) must be of the inverse time type**
- 4 Select BCPD per Sect. 430-52 for biggest motor + others**
- 5 BCPD must still protect smallest motor**



Group Protection Using PKZ Motor Protectors

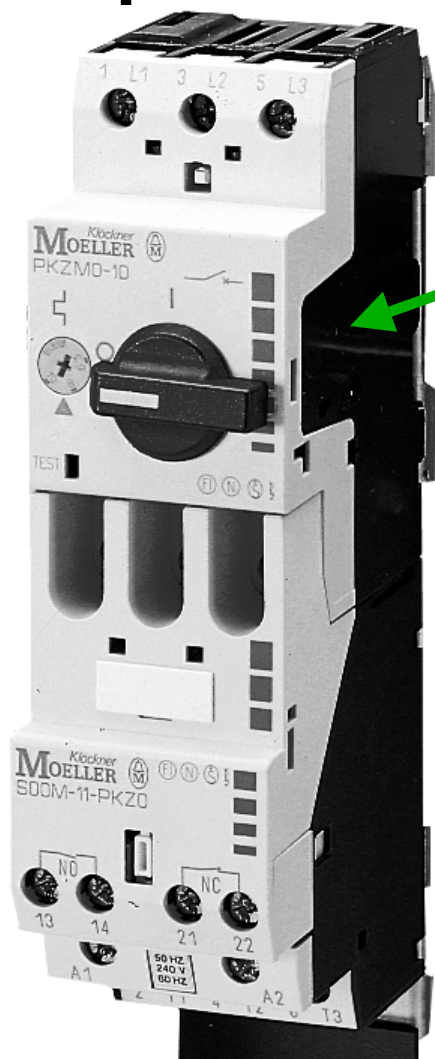
Other Group Installations:





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**Condition 1: Each motor
overload (PKZ) is UL Listed for
Group Installation**



Suitable for
group
installations
when
protected by
max 150 amp
fuses or 125
amp circuit
breaker ...

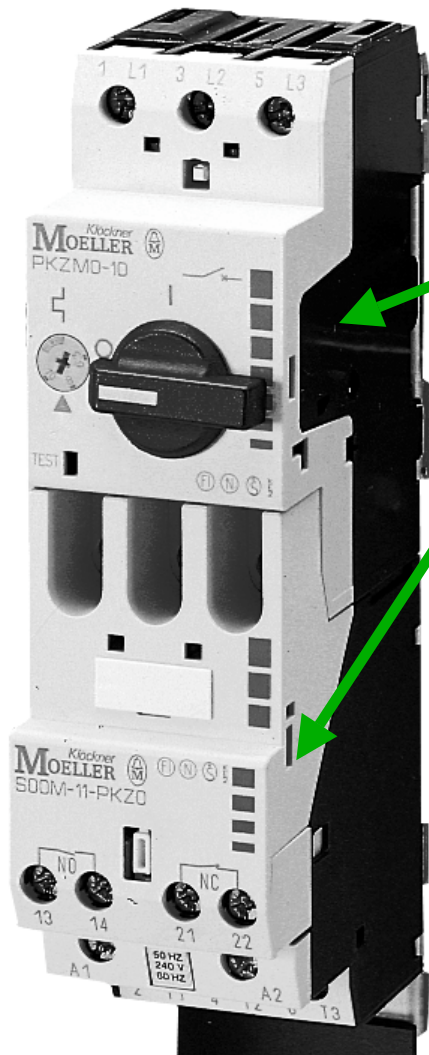
Short circuit
withstand
rating ...





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Condition 2: Each motor controller is suitable for group installation



Suitable for group installations when protected by max 150 amp fuses or 125 amp circuit breaker ...

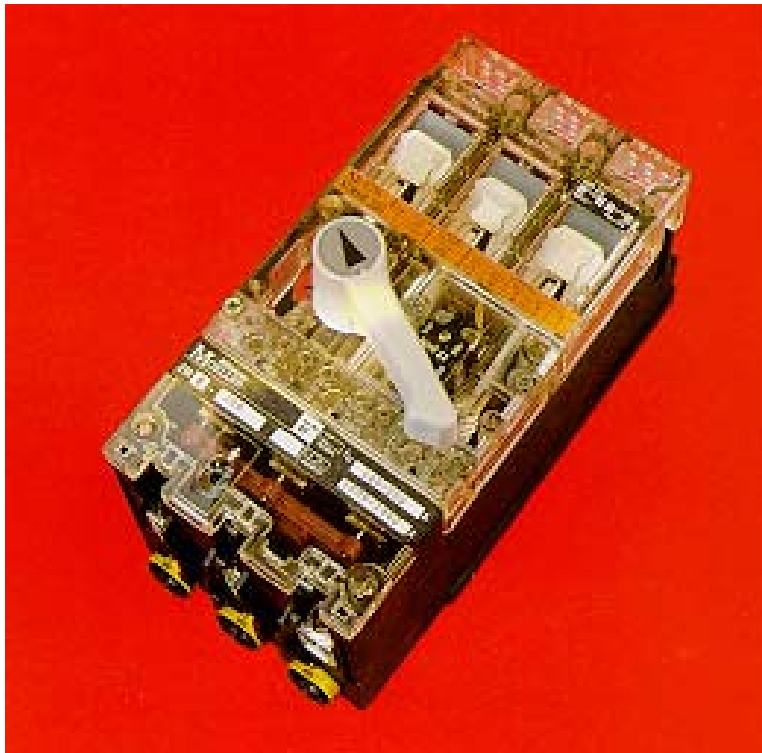
Short circuit withstand rating ...





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**Condition 3: The back-up
circuit breaker must be of the
“inverse time” type**



**UL Listed Molded-Case
Circuit Breaker**



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Condition 4: Select BCPD Per Sect. 430-52

- █ Take the highest-rated motor and select a BCPD per 430-52 (multiply FLA by 1.75 to 2.5, depending on BCPD type)**
- █ Now add the FLA's of all the remaining motors to the above calculation**
- █ Use Sect. 240-3(b), if ampacity of conductors is greater than grand total determined above, and select next higher rating**



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Condition 5: The BCPD must protect the smallest overload relay in the group

- Per Sect. 240-3(b), the BCPD amp rating should not exceed the maximum allowed for the smallest overload (PKZ).**
- At 480VAC, K-M's PKZ/SE devices require maximum 150 amp fuses or 125 amp circuit breaker**



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PKZ Grouping Example:

480V, 3PH, 50-60Hz System:
Qty 2 x 5HP (7.6 FLA each)
Qty 10 of 1HP (1.8 FLA each)

BCPD per 430-52 for largest motor:

- **Time-Delay Fuses:** 175% of 7.6A = 13.3 amps
- **Circuit Breaker:** 250% of 7.6A = 19.0 amps



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PKZ Grouping Example contd...

Sum up the remaining motors:

$$1 \times (5\text{HP} = 7.6\text{A}) + 10 \times (1\text{HP} = 1.8\text{A}) = \\ 25.6 \text{ amps}$$

Add BCPD and above together:

- **Time Delay Fuses:** $13.3\text{A} + 25.6\text{A} = 38.9 \text{ amps}$ (closest fuse = 40 amps)
- **Circuit Breaker:** $19\text{A} + 25.6\text{A} = 44.6 \text{ amps}$ (closest breaker = 50 amps)

Smallest overload protected ?

- All PKZM0/SE's UL Listed with max 150A fuses & 125A breaker !!



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PKZ Grouping Example ... Selection of wire size

Sect. 430-53, Part (d):

- Size wire based on 125% of the TOTAL motor load

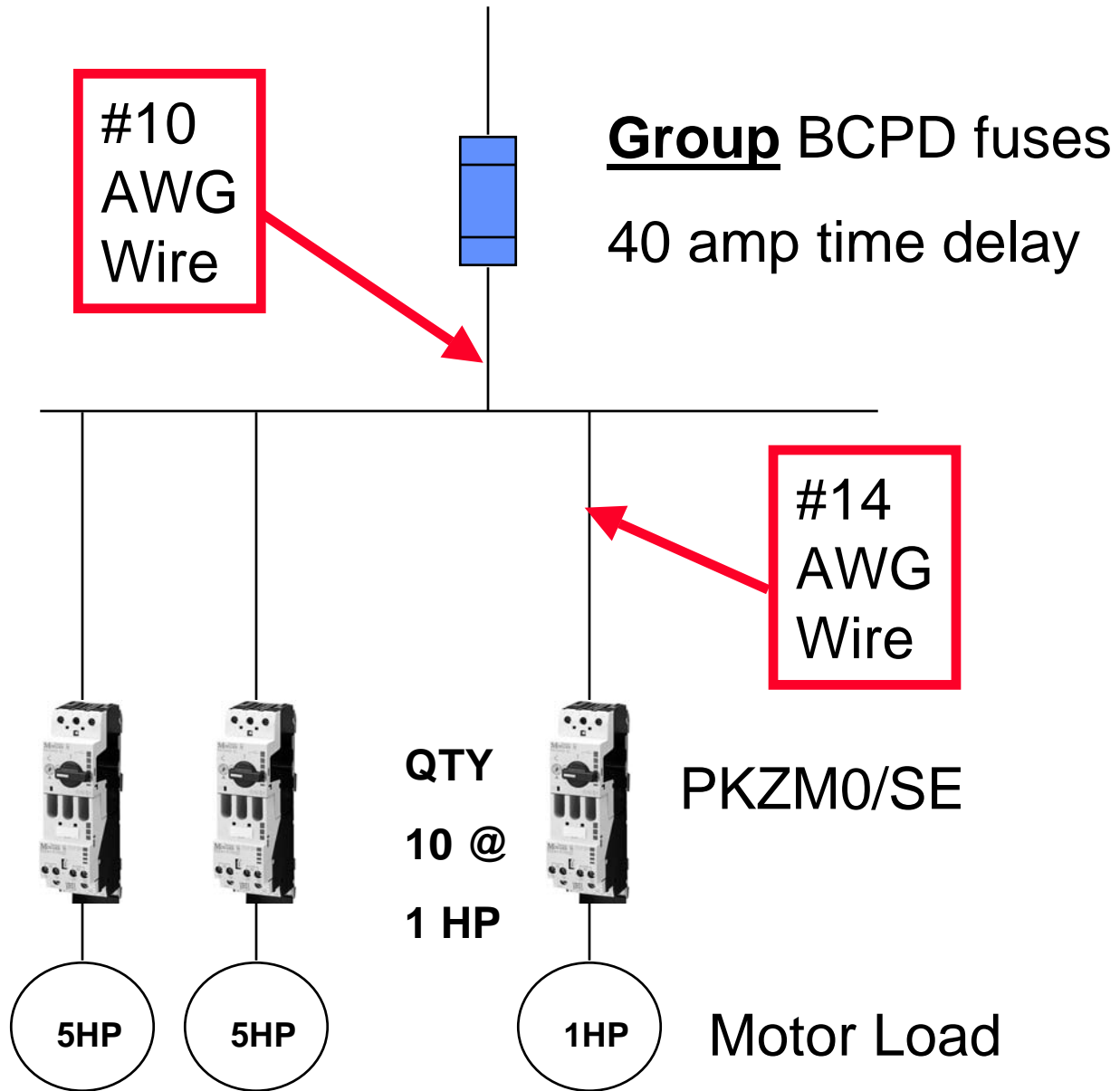
OR

- Size wire based on 1/3 the amp rating of the group BCPD, with following conditions:
 - Wire run is not over 25 feet
 - The wires are in a raceway or control panel (protected from physical damage)



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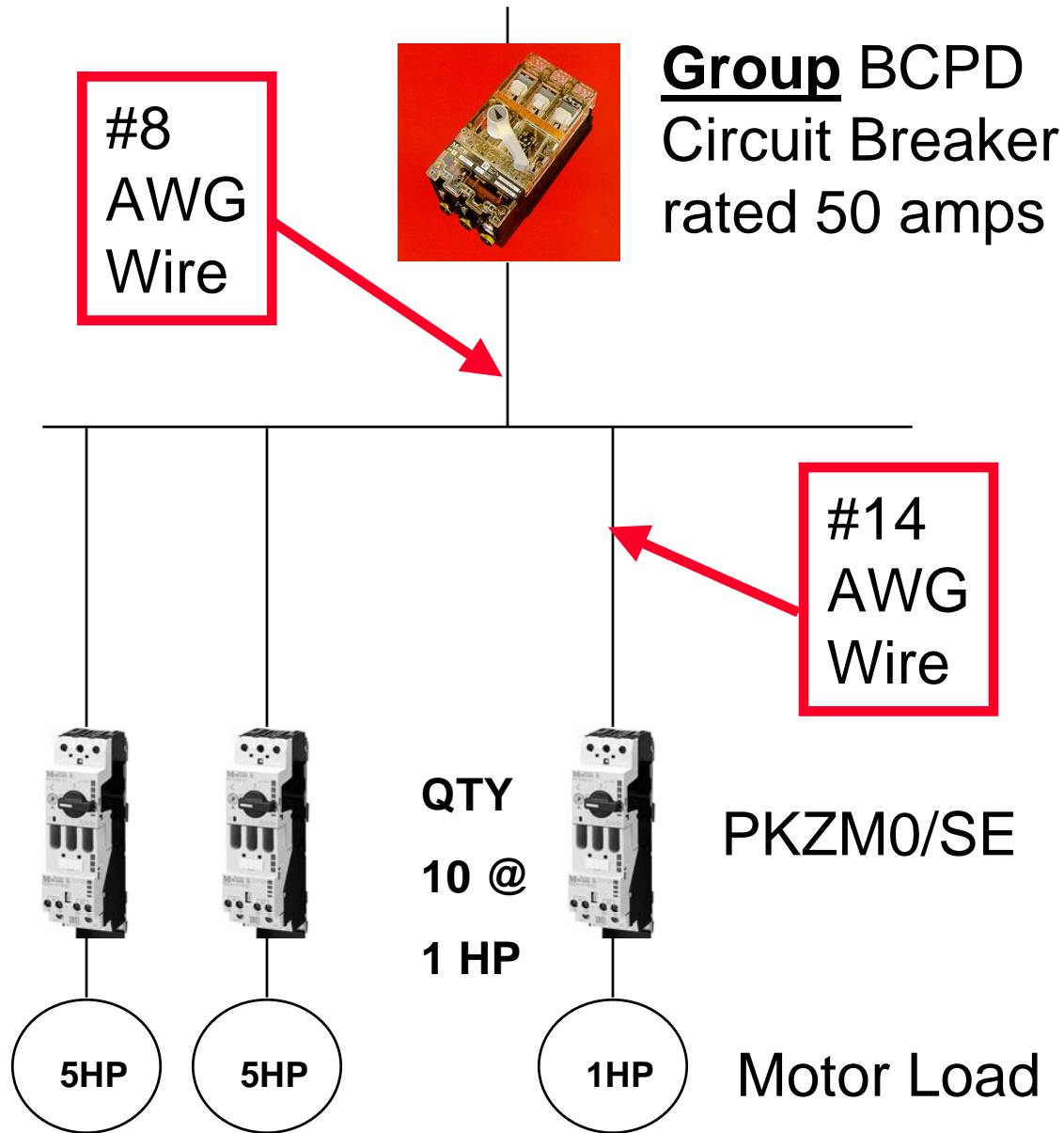
PKZ Example Using Fuses:





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PKZM1 Example Using Breakers:





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Selection Procedure

- Size of the Main Breaker
 - Minimum size is the Sum of all FLC x 125%
- Short Circuit Withstand rating
 - FLC of Transformer divided by the impedance = maximum SC of the transformer
- Select PKZ device to be within the above limits. Sized by HP/Voltage and/or FLC



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Klockner-Moeller PKZ devices:

- The world's best**
- Wide variety of types and accessories**
- High ratings and reliability**