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Sizing Circuit Protection and Conductors for a Branch Circuit Supplying Multiple Motors

Program: Electrician Technician

Course: EL170 – Motor and Industrial Motor Controls

Objectives: Under the supervision of your instructor, you should be able to do the following:

- Size branch circuits and feeders for electric motors.
- Size motor short circuit protectors
- Size multi-motor branch circuits

Lab Equipment:

- N/A

Required Tools:

- Calculator

Materials:

- Pencil
- Paper

Safety (PPE): N/A

Resources

- Latest edition of the *National Electrical Code*® **Instructor Notes:**
- Refer to *NEC Table 430.250* for all motor full-load amperage ratings.
- *NEC 430.52(C)(1), Exception No. 1* permits using the next higher standard amperage rating for short circuit protective devices when the calculated amperage is not a standard rating for a circuit breaker. Refer to *NEC Section 240.6* for standard ratings.
- Refer to *NEC Sections 430.24, 240.4(D)* and *Table 310.15(B)(16)* when sizing the branch circuit conductors.
- Have the trainees read *NEC Sections 430.24* and *430.51* through *430.53(B)* before starting the project.
- You may change the horsepower ratings of the motors for additional practice.
- The solution is located at the end of this project

Time Required: 120 Minutes

Shop Maintenance:

- All work will cease 20 minutes prior to the end of class.
- All work areas must be cleaned.
- Tools and equipment must be cleaned and returned to the designated areas (cage, tool room, cabinets etc.)
- Any broken or missing tools must be reported immediately.
- Tools and equipment are student's responsibility

Procedures:

This performance project requires the trainee to determine the full-load amperage of given motors based on horsepower and *NEC Table 430.250*. In addition, the trainee will calculate the maximum branch circuit short-circuit protection rating based on *NEC Table 430.52* and determine the minimum size branch circuit conductors based on *NEC Sections 240.4(D), 430.24,* and *Table 310.15(B)(16)*.

1. Read *NEC Sections 430.24* and *430.51* through *430.53(B)*.
2. 2. Reference Figure 1 to complete this project.
3. 3. Refer to *NEC Table 430.250* and find the full-load current based on horsepower for each motor shown in Figure 1.
4. Calculate the maximum value of short circuit protection (250 percent) of the smallest motor of the group shown in Figure 1.
5. If the calculated amperage in Step 4 is not a standard rating for circuit breakers, refer to *NEC Section 240.6* to determine the next higher standard rating. Write this value in the space provided on Figure 1.
6. Calculate branch circuit conductor ampacity. Refer to *NEC Section 430.24*.
7. Use *NEC Table 310.15(B)(16)* to locate the minimum size THHN copper conductors that may be installed in this application, based on the results of Step 6.
8. Have your instructor check your work.

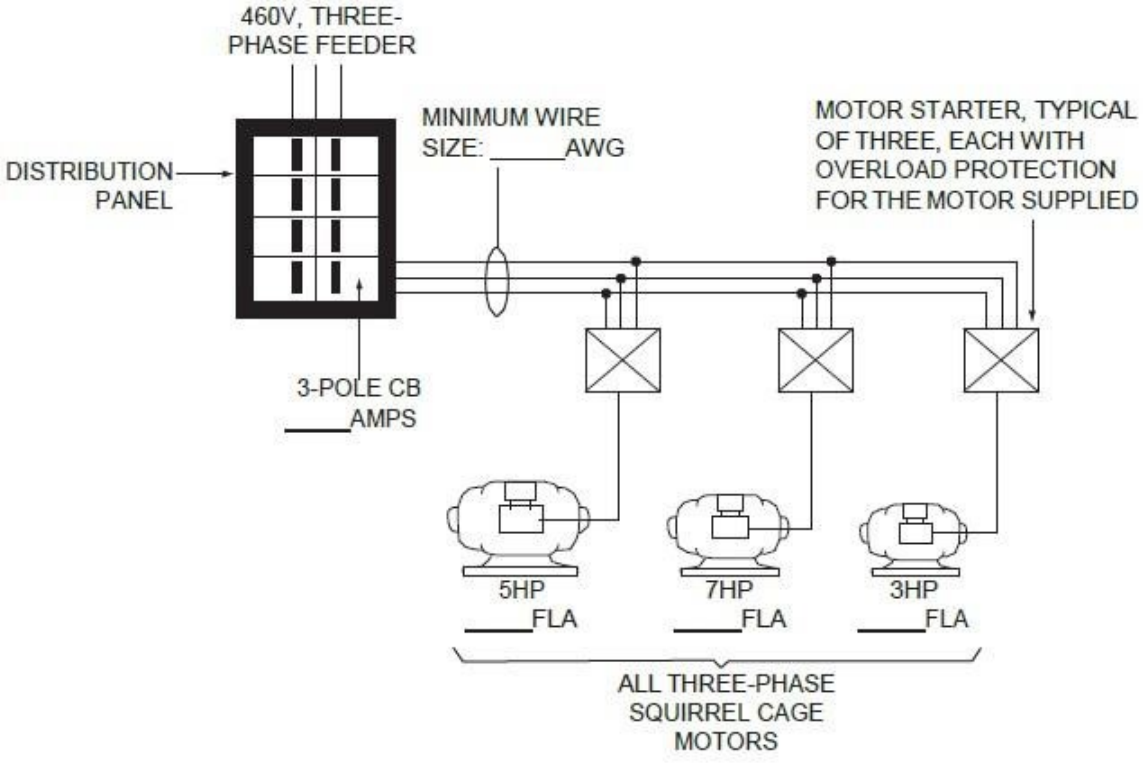

Figure 1 ■ Multiple-Motor Branch Circuit