Conductor Sizing Lab

Program: Electrician Technician

Course: EL140 – Residential Applications

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

- Select electrical conductors for specific applications (*Objective 1*).
- Calculate voltage drop in both single-phase and three-phase applications (*Objective 2*).
- Size conductors for the load (*Objective 5*).
- Derate conductors for fill, temperature, and voltage drop (*Objective 6*).
- Select conductors for various temperature ranges and atmospheres

Lab Equipment:

- N/A

Required Tools:

- Pencil and Paper
- Calculator
- *National Electrical Code®* Book

Materials: N/A

Safety (PPE) : N//A

Resources: N/A

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

Instructors Notes:

- This is a feeder circuit installation, and the voltage drop may not exceed 5 percent.
- This project assumes that we are calculating voltage drop for only two of the six current-carrying conductors in the conduit, but we must still derate for the total number of current-carrying conductors in the conduit and the ambient temperature in the equipment room.
- Remember that VD represents the actual voltage dropped and not the percentage. To calculate the percentage, use the following formula: %VD = (VD ÷ supply voltage) X 100.

Student Notes:

- No safety equipment is required for this project unless the environment in which the project is completed requires safety equipment.
- The conductor type is THHN stranded copper wire.
- This project assumes that voltage drop is being calculated for only two of the six current- carrying conductors in the conduit, but you must still derate for the total number of current-carrying conductors and the ambient temperature in the equipment room.
- The voltage drop percentage may not exceed 5 percent of supply voltage.
- If voltage drop percentage exceeds 5 percent of supply voltage, you must increase the size of the conductors until the voltage drop percentage is less than 5 percent of the supply voltage.
- All voltage drop calculations are assuming copper conductors with a K value (constant) of 12.9, which represents the resistance in ohms per mil foot.
- The circuit is a single-phase, 240-volt feeder circuit.
- Use the voltage drop formula: VD = 2 X L X K X I CM Where*:*
  VD = voltage drop
  L = length of run
  K = constant of 12.9
  I = current
  CM = circular mil dimension of the conductor
- Remember that VD represents the actual voltage that is dropped and not the percentage. In order to calculate the percentage of VD, use the following formula:
  %VD = (VD ÷ supply voltage) X 100
- Round off numbers to no decimal points.

Procedures:

1. Refer to Figure 1. Determine the minimum size THHN copper conductor that can be used in a 40-ampere feeder circuit.
2. Derate the ampacity of the conductor size found in Step 1 for the ambient temperature and the number of current-carrying conductors in the raceway, as shown in Figure 1.

3. If the derated amperage is less than 40 amperes, select the next larger size conductor and derate its ampacity.
4. Continue this process until the derated ampacity is 40 amperes or greater.
5. Locate the circular mil dimension for the AWG size conductor determined in Step 4.
6. Calculate the voltage drop using the following formula: VD = 2 X L X K X I CM
7. If the voltage drop calculated exceeds 5 percent of the supply voltage, increase the size of the conductor to the next higher AWG number and recalculate the voltage drop using the larger conductor's circular mil dimension.
8. Remember that VD represents the actual voltage that is dropped and not the percentage. In order to calculate the percentage, use the following formula:
9. %VD = (VD ÷ 240V) X 100
10. Continue to increase the conductor size, if necessary, until the voltage drop percentage calculates out to be 5 percent or less.
11. Enter your answers in the spaces provided on Figure 1.
12. Have your instructor check your work.

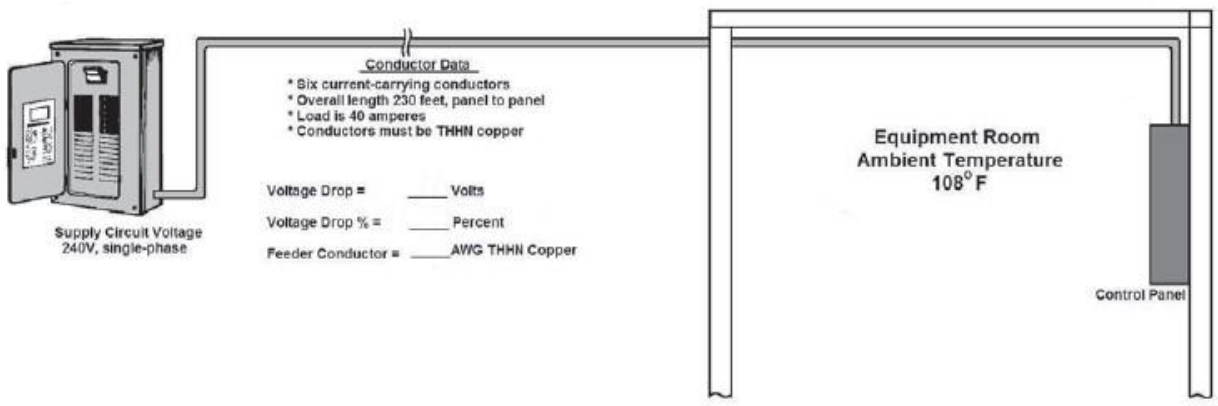

Figure 1 ■ Branch Circuit Installation, Panel-to-Panel