Voltage Drop in final and distribution circuits.

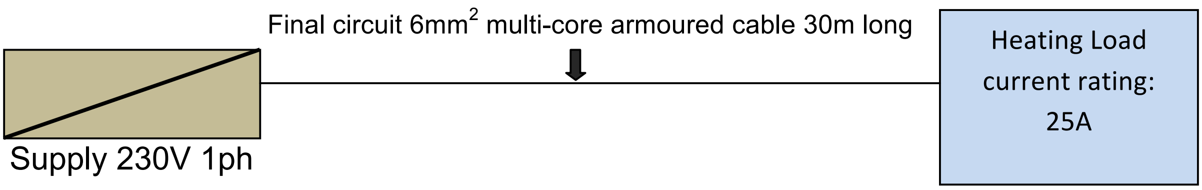
The following questions concern voltage drop in consumers' installations.

Reference: *BS7671:2008 +A1 2011, Appendix 4, Section 6.4*

Question 1: Complete the following table by expressing the maximum voltage drop as a percentage (%)

Supply arrangement	Lighting	Other
Low voltage installations supplied directly from a public low voltage distribution system	3%	5%
Low voltage installation supplied from private low voltage supply. **Note:** voltage drop in each final circuit should not exceed the values given for low voltage public distribution systems	6%	8%

Example 1: Calculate the voltage drop for the following arrangement



The actual voltage drop (AVD) can be determined from the formula:

$$\mathbf{AVD} = \frac{\mathbf{mV/A/m \times Ib \times Length\ of\ cable\ run}}{\mathbf{1000}}$$

From cable table 4D4B the mV/A/m for the cable is 7.3 then the voltage drop can be determined

$$AVD = \frac{7.3 \times 25 \times 30}{1000} = \mathbf{5.48\ Volts}$$

Check that the voltage drop does not exceed the allowance of 5% nominal voltage:

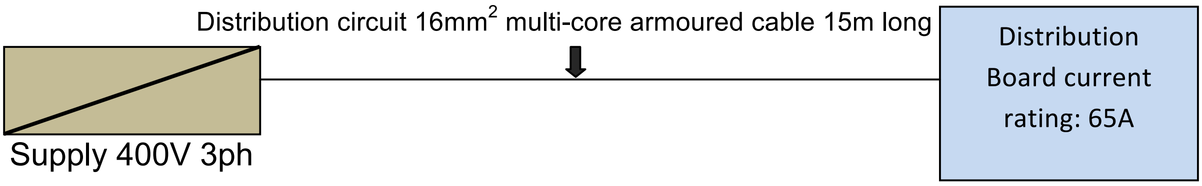
Voltage drop allowed = % x 230

$$\text{Voltage drop allowed} = \frac{5}{100} \times 230 = \mathbf{11.5\ Volts}$$

Conclusion: The cable is suitable.
Try these problems:

Question 2:

Calculate the voltage drop for the following arrangement



$$\textbf{AVD} = \frac{\textbf{mV/A/m x Ib x Length of cable run}}{\textbf{1000}}$$

From Table 4D4B the mV/A/m for the cable is 2.4, therefore the AVD is:-

$$AVD = \frac{2.4 \times 65 \times 15}{1000} = \textbf{2.34 Volts}$$

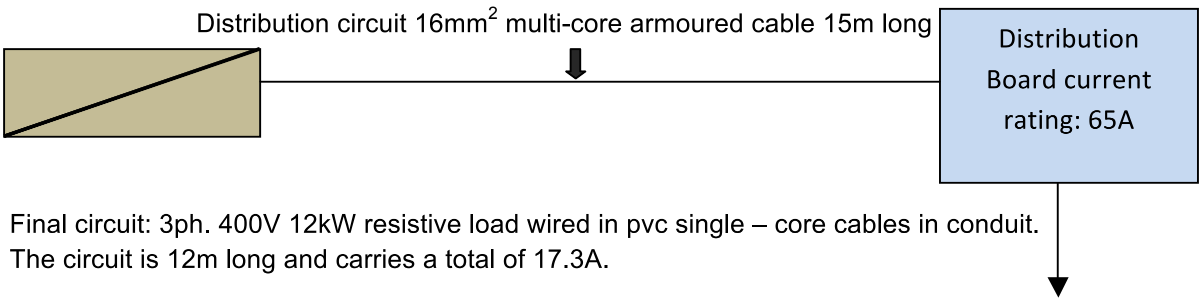
Voltage drop allowed = % x 400

$$\text{Voltage drop allowed} = \frac{5}{100} \times 400 = \textbf{20 Volts}$$

Conclusion: The cable is suitable.

Question 3:

Calculate the voltage drop of a final circuit originating at the distribution board in question 2 above if the circuit details are as follows:



$$\textbf{AVD} = \frac{\textbf{mV/A/m x Ib x Length of cable run}}{\textbf{1000}}$$

From Table 4D1B the mV/A/m for the cable is 15, therefore the AVD is:-

$$AVD = \frac{15 \times 17.3 \times 12}{1000} = \textbf{3.14 Volts}$$

Conclusion: The cable is suitable.

Note:

The voltage drop between the origin of an installation and the load - end of a final circuit should not be greater than the percentages stated in Table 4Ab of BS7671. In the case of questions 2 and 3 above, the voltage drop for the distribution circuit should be added to the voltage drop of the final circuit to ensure the percentage allowed, (5% of nominal voltage), is not exceeded.

Voltage drop from origin to load of final circuit is:

2.34V (Distribution circuit) + 3.14V (final circuit) = **5.48V** (this is fine)