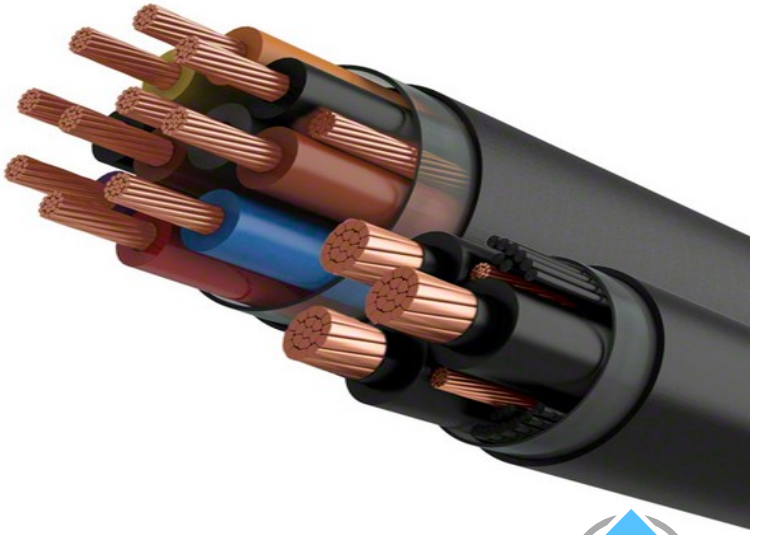
2020 NEC Example D3(a)

NEC Feeder Load Calculations, Over-current Device Selection and Conductor Selection Based on De-rating



iEi LABS.COM

Introduction

Given Information

Load Calculations

Non-Continuous Loads

Continuous Loads

Conductor De-rating

Conductor Ampacity

Termination Temperature Rating

iEi LABS.COM

Given Information

- 480V/277 V three phase feeder
- 8 Current carrying conductors
- 150 Feet long
- 35 Deg. C ambient temperature
- Equipment terminations are rated at 75 Deg. C. and 80% of the Ampere nameplate.
- Use XHHW-2 wire
- 11.6KW Lighting load
- 22 125V receptacles
- 1 Air compressor three phase 460V 5HP
- 1 Grinder 460V three phase 1,5HP
- 3 Welders 480V 60% duty cycle 23A nameplate
- 3 Industrial dryers 480V three phase 15KW each

iEi LABS.COM

Find

- The over-current protective device rating
- The ungrounded conductor size

LABS.COM

Non-Continuous Loads

- Receptacle Loads 220.44, 22 * 180VA = 3960 VA
- Welders 630.11A demand factors, 1.0*8610 + 1.0*8610 + 0.85*8610 = 24,500 VA
- Motor Loads 430.24, 1.25*7.6A*480*1.73 + 3A * 480*1.73 = 10,400VA
- Total for Non-Continuous Loads 3,960+24,400+10,400 = 38,900VA

iEi LABS.COM

Continuous Loads

- General Lighting 11,600 VA
- 3 Industrial 15KW Dryers 45,000 VA
- Total Continuous Load
- 11,600 + 45,000 = 56,600 VA

LABS.COM

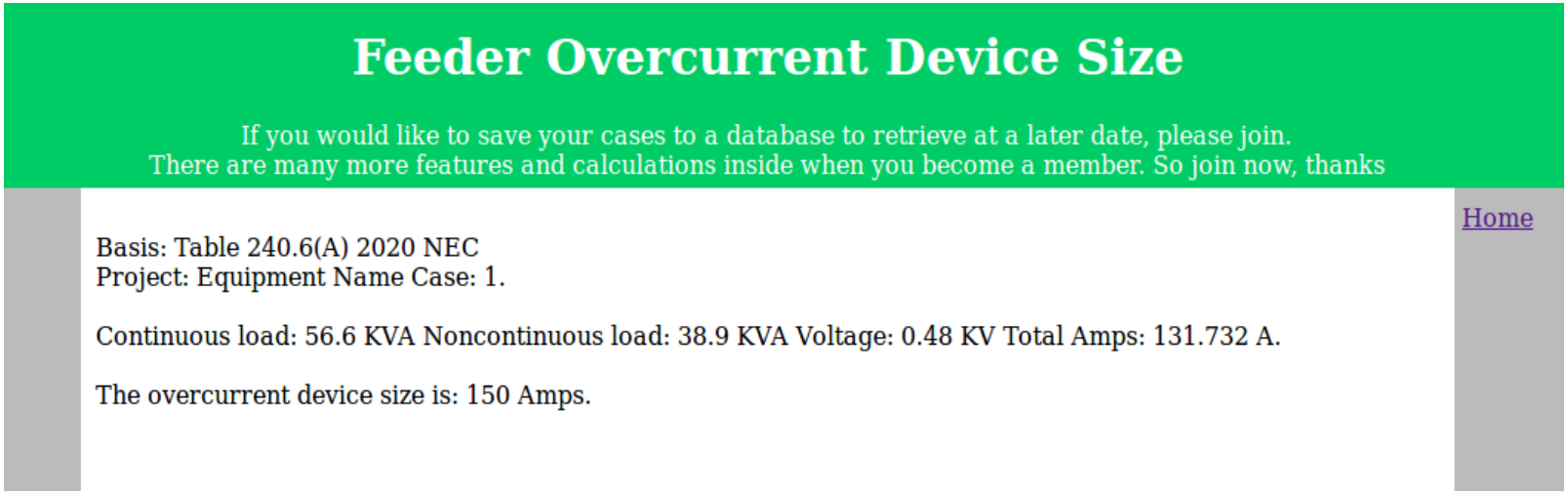
Total Load

- Non-Continuous Load = 38,900 VA
- Continuous Load = 56,600 VA
- Total Load = 95,500 VA
- 25% of the Continuous Load = 14,200 VA
- Total feeder load to size the 80% rated over-current device, 38,900 + 56,600 + 14,200 = 109,700 VA

iEi LABS.COM

Select Over-Current Device Rating

- Feeder Amps = 109,700 VA / (480V * 1.73) = 132 Amps
- Select Over-current device size of 150A see 215.3, 240.6
- https://industrialengineeringllc.com/NEC/feeder.php



Feeder Overcurrent Device Size

If you would like to save your cases to a database to retrieve at a later date, please join.
There are many more features and calculations inside when you become a member. So join now, thanks

Home

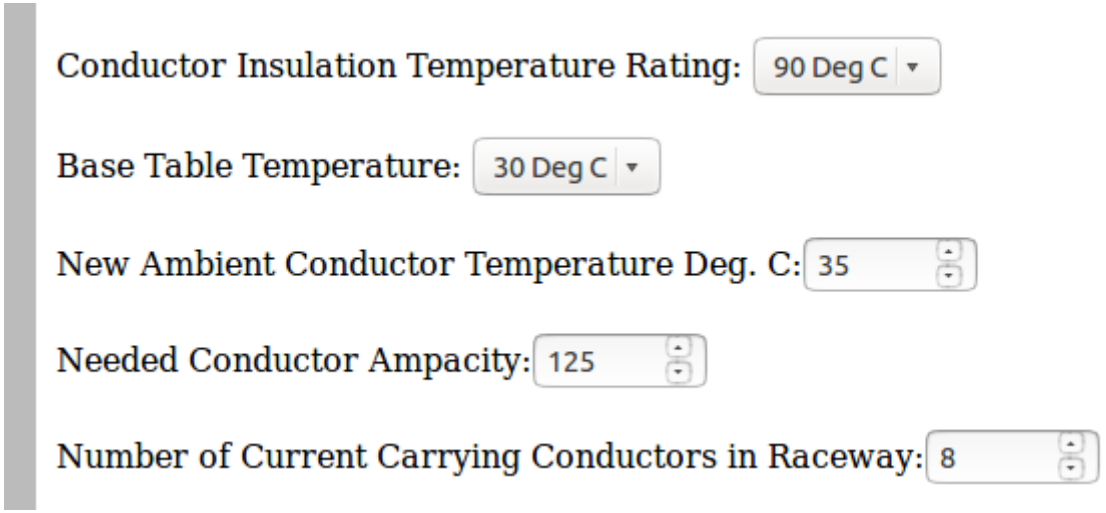
Basis: Table 240.6(A) 2020 NEC
Project: Equipment Name Case: 1.

Continuous load: 56.6 KVA Noncontinuous load: 38.9 KVA Voltage: 0.48 KV Total Amps: 131.732 A.

The overcurrent device size is: 150 Amps.

Conductor De-rating

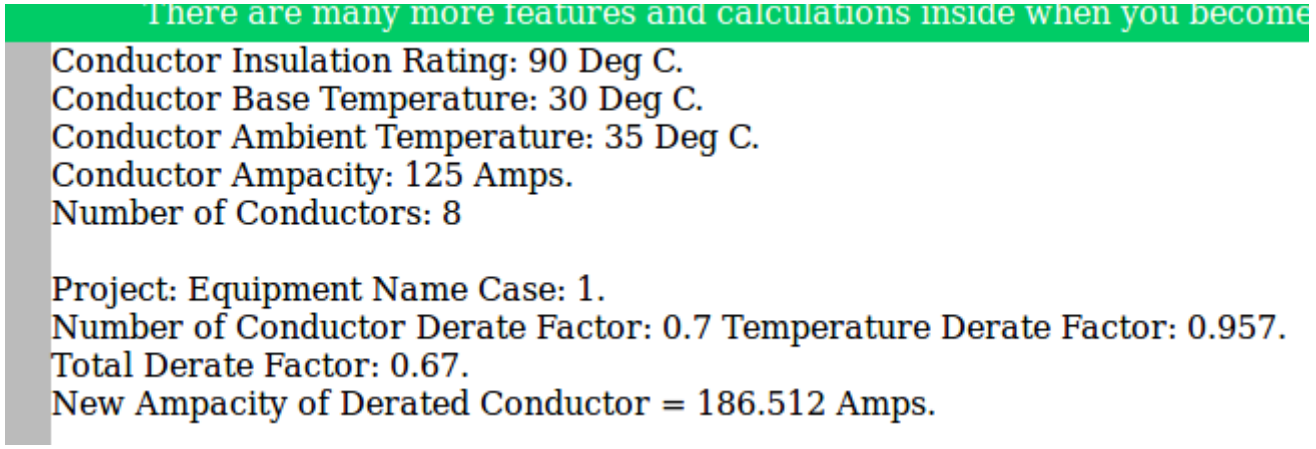
- 8 current carrying conductors 90 Deg C XHHW-2
- 35 Deg C ambient temperature 310.16
- https://industrialengineeringllc.com/NEC/CondDerate.php
- Needed ampacity, use the continuous load + non-continuous load.
- Needed ampacity = next lowest down over-current device from 150A size = 125 Amps Table 240.6A



LABS.COM

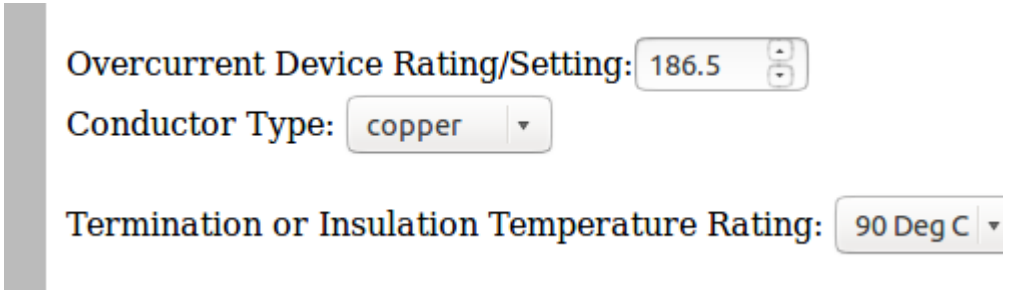
Conductor De-rating

- https://industrialengineeringllc.com/NEC/CondDerate.php
- De-rating = 125A / 0.7 / 0.957 = 186.5 Amps 310.15(C)(1), Table 310.16.
- This is the needed conductor ampacity



Select Conductor Size

- https://industrialengineeringllc.com/NEC/cond.php
- Choose de-rated conductor



iELABS.com

Select Conductor Size

- De-rated conductor is selected at 2/0 copper XHHW-2

Basis: Table 310.16 2020 NEC
Project: Equipment Name Case: 1 Overcurrent Device: 186.5 amps.

Conductor size is: 2/0 copper at 90C.

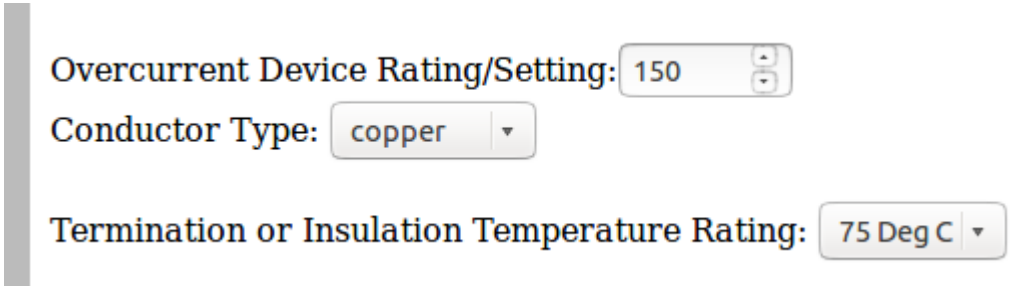
Select Conductor Size

- Check the derated conductor ampacity against the over-current device rating
- 2/0 XHHW-2 95 Dec C column Table 310.16 195 Amps.
- 195 * 0.7 * 0.96 = 131 Amps
- The next highest device is 150 Amps
- Choose 2/0 XHHW-2 Copper Conductor

iEi LABS.COM

Termination Temperature Rating

- 150A over-current device rating
- 75 Deg C. termination rating
- Copper conductor
- https://industrialengineeringllc.com/NEC/cond.php



iEi LABS.COM

Termination Temperature Rating

- 1/0 AWG XHHW-2 Copper conductor could be used if there was no de-rating
- Choose the large 2/0 conductor from the de-rating

Basis: Table 310.16 2020 NEC
Project: Equipment Name Case: 1 Overcurrent Device: 150 amps.

Conductor size is: 1/0 copper at 75C.

LABS.COM

Conclusion

Load Calculations: total feeder load calculated at 132 Amps

150A over-current device was chosen

2/0 XHHW-2 Copper was chosen at a de-rating of 131 Amps. The next size up circuit breaker is 150A.

Termination Temperature Rating showed 1/0 XHHW-2 copper so 2/0 was chosen.

iEi LABS.COM