

Electrical Level 3



Load Calculations – Branch and Feeder Circuits 26301-14



Objectives

When trainees have completed this lesson, they should be able to do the following:

1. Calculate loads for single-phase and three-phase branch circuits.
2. Size branch circuit overcurrent protection devices (circuit breakers and fuses) for noncontinuous duty and continuous duty circuits.
3. Apply derating factors to size branch circuits.
4. Calculate ampacity for single-phase and three-phase loads.
5. Use load calculations to determine branch circuit conductor sizes.
6. Use **NEC Table 220.55** to calculate residential cooking equipment loads.
7. Select branch circuit conductors and overcurrent protection devices for electric heat, air conditioning equipment, motors, and welders.

This is a knowledge-based module; there are no Performance Tasks.



1.0.0 – 1.3.0

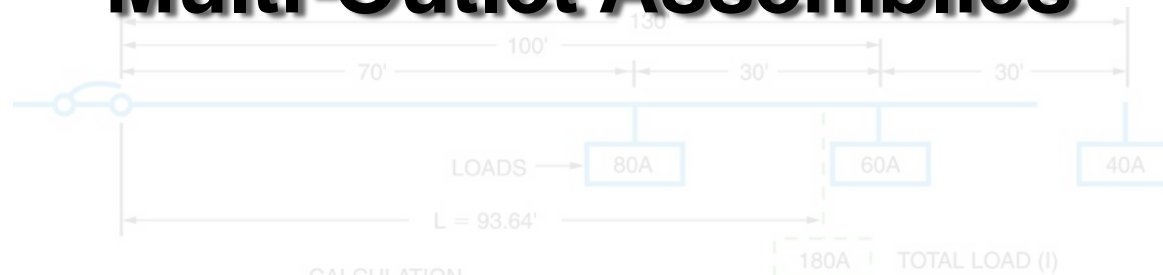
Next Session... Introduction

- To determine the load center length for a branch circuit with multiple outlets, multiply each outlet load by its distance from the circuit supply end.

- Add the products for all loads fed by the circuit and

divide by the sum of the individual loads. The result is the load center length.

Lighting Loads; Receptacle Loads; Multi-Outlet Assemblies



CALCULATION			
LOAD 1 =	70'	\times 80A	= 5,600
LOAD 2 =	100'	\times 60A	= 6,000
LOAD 3 =	130'	\times 40A	= 5,200
TOTALS		180A	16,800 = 93.33'
TOTAL LOAD (I) = 180A			
LOAD CENTER LENGTH (L) = 16,800 \div 180A = 93.33'			

26301-14_F01.EPS



2.0.0 – 4.0.0

Next Session...Think About It – Multi-Outlet Assemblies

This assembly is 5' in length and will be used in an other-than-residential application. Window appliances are *not* likely to be used simultaneously. According to **NEC Section 220.14(H)(1)**, what is the load for this device?

Show Window Loads; Sign Loads



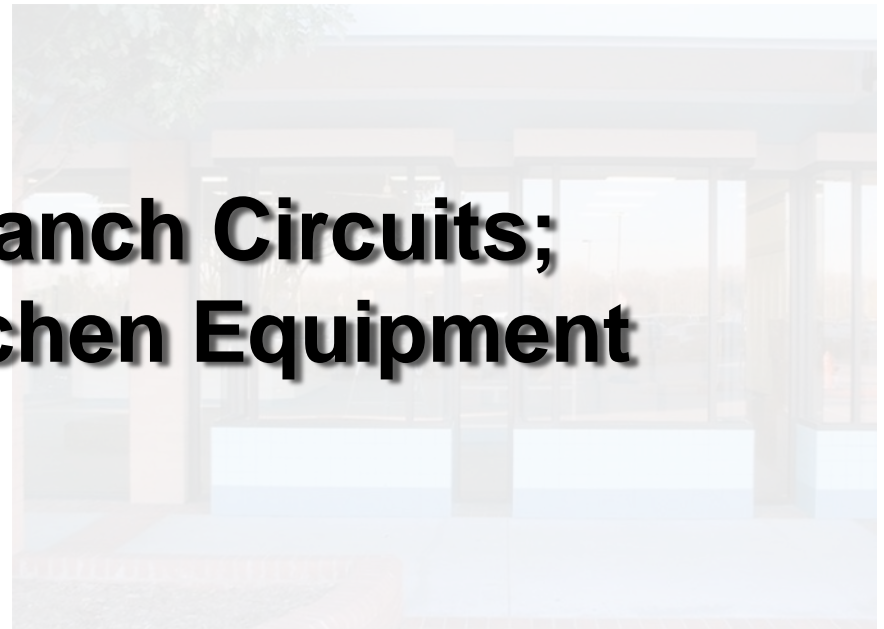
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5.0.0 – 6.0.0

Next Session... Think About It – Show Window Load Calculations

These individual show windows are each 5' in length. According to the requirements given in *NEC Section 220.14(G)(2)*, what is the branch circuit load for each window?

Residential Branch Circuits; Commercial Kitchen Equipment



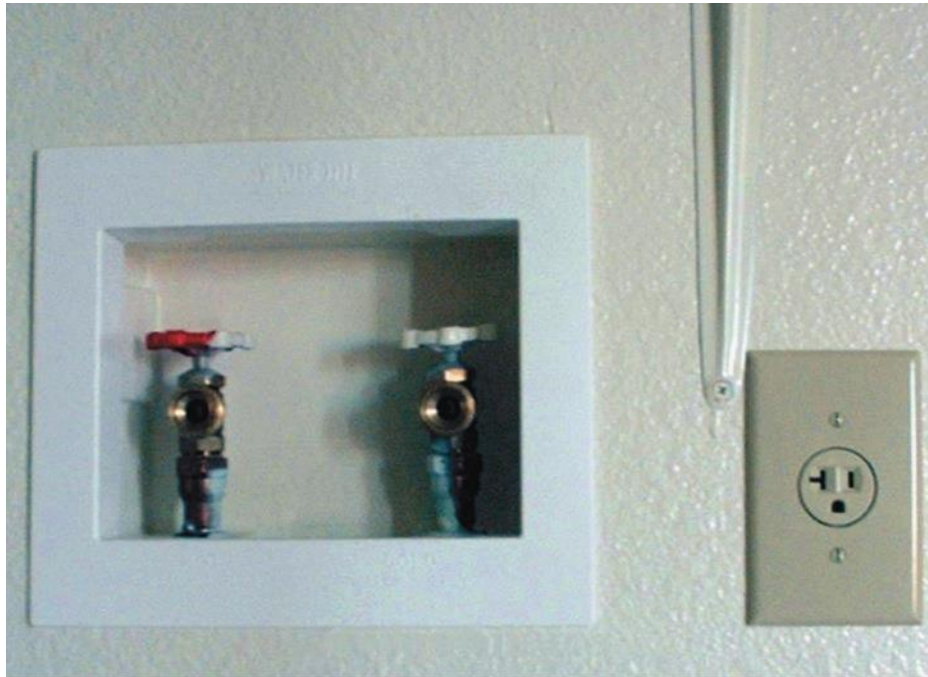
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7.0.0 – 8.0.0

Think About It – Laundry Room Circuit

Does the *NEC*[®] specifically require a dedicated branch circuit for a washing machine?



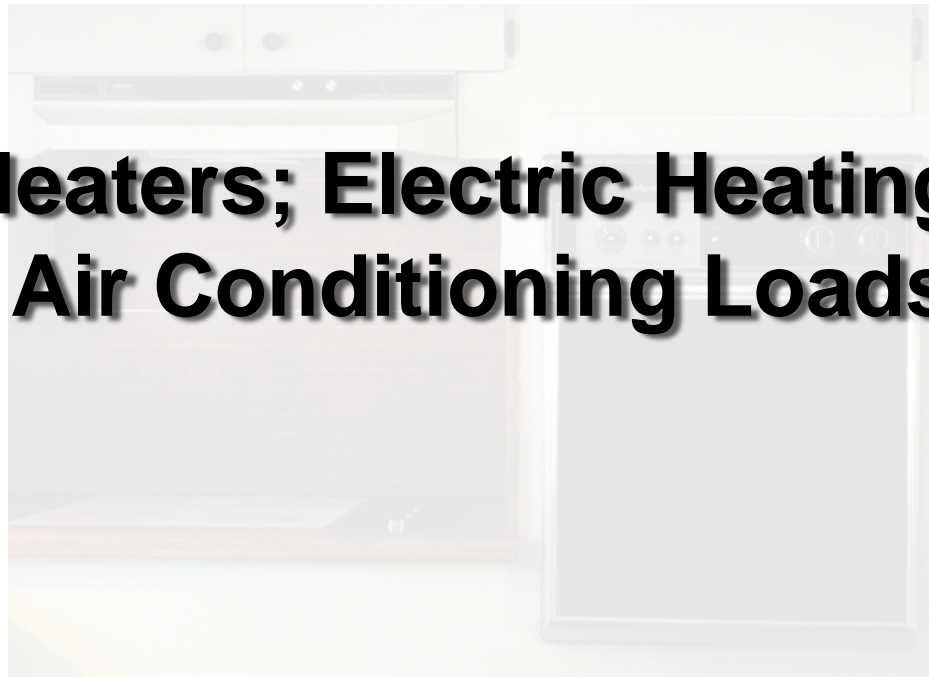
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7.0.0 – 8.0.0

Next Session!.. – One Cooktop and One Oven

Which note under *NEC Table 220.55* refers to this installation?

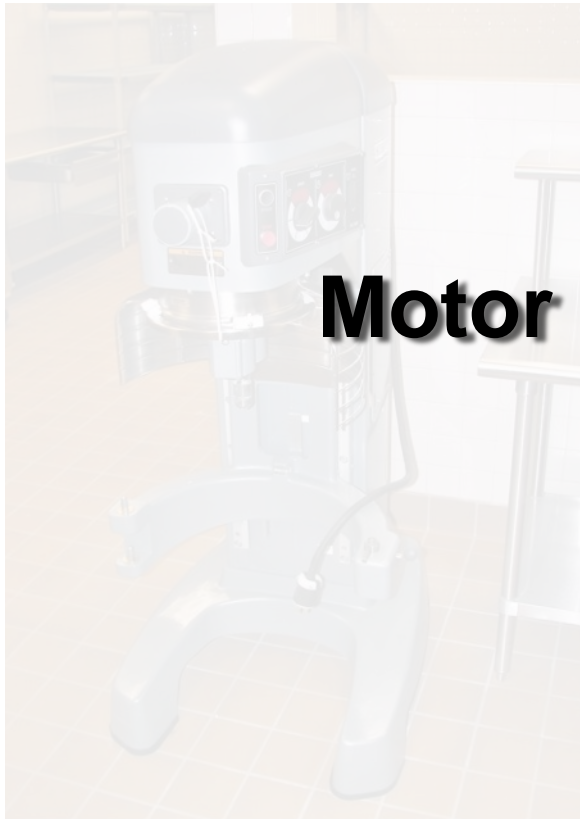
**Water Heaters; Electric Heating Loads;
Air Conditioning Loads**



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9.0.0 – 11.0.0

Next Session...Think About It – Buck-and-Boost Transformers



Motor Loads; Welders

This 240V commercial kitchen mixer is connected to a standard 120V/208V service using a buck-and-boost transformer. Will this affect the branch circuit load calculation? What would happen if a buck-and-boost transformer was *not* used?

26301-14_SA07.EPS



12.0.0 – 13.0.0

Next Session... Motor Loads; Welders

- The values given in *NEC Tables 430.247 through 430.250* are used to find the ampacities of branch circuit conductors and overcurrent protective devices.
- The requirements for welding equipment can be found in *NEC Article 630*. Branch circuit conductors and overcurrent protective devices are sized using the primary current and duty cycle of the welder.

Wrap Up



(A) TRANSFORMER WELDING MACHINE



(B) ENGINE-DRIVEN WELDING MACHINE

26301-14_F02.EPS

Wrap Up

3-2-1

- 3 – Write 3 important things learned during class
- 2 – Write 2 questions you have about the material
- 1 – Write 1 thought you had about the material



Next Session...

MODULE EXAM

Review the complete module to prepare for the module exam. Complete the Module Review as a study aid.

