Electrical Level 1

Device Boxes 26106-14

Objectives

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

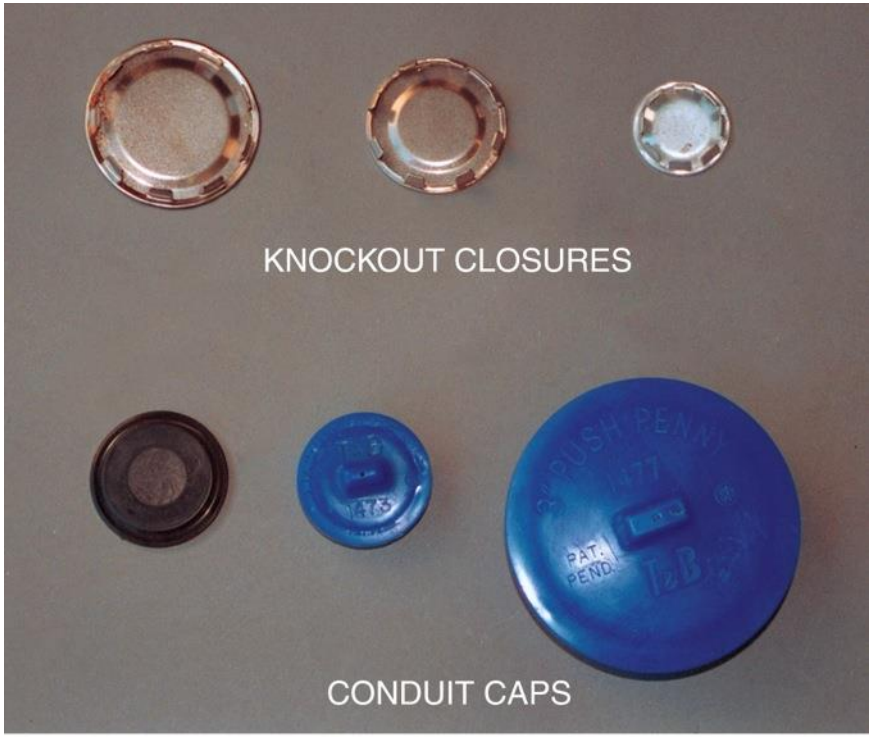
1. Describe the different types of nonmetallic and metallic boxes.
2. Calculate the *NEC*® fill requirements for boxes under 100 cubic inches.
3. Identify the appropriate box type and size for a given application.
4. Select and demonstrate the appropriate method for mounting a given box.

Performance Tasks

1. Identify the appropriate box type and size for a given application.
2. Select the minimum size pull or junction box for the following applications:
   - Conduit entering and exiting for a straight pull.
   - Conduit entering and exiting at an angle.

Introduction

- Boxes must be properly selected for the application, and then sized and installed correctly in order to minimize costs and ensure safety.
- All openings in outlet boxes must be closed per ***NEC Section 314.17(A)***.



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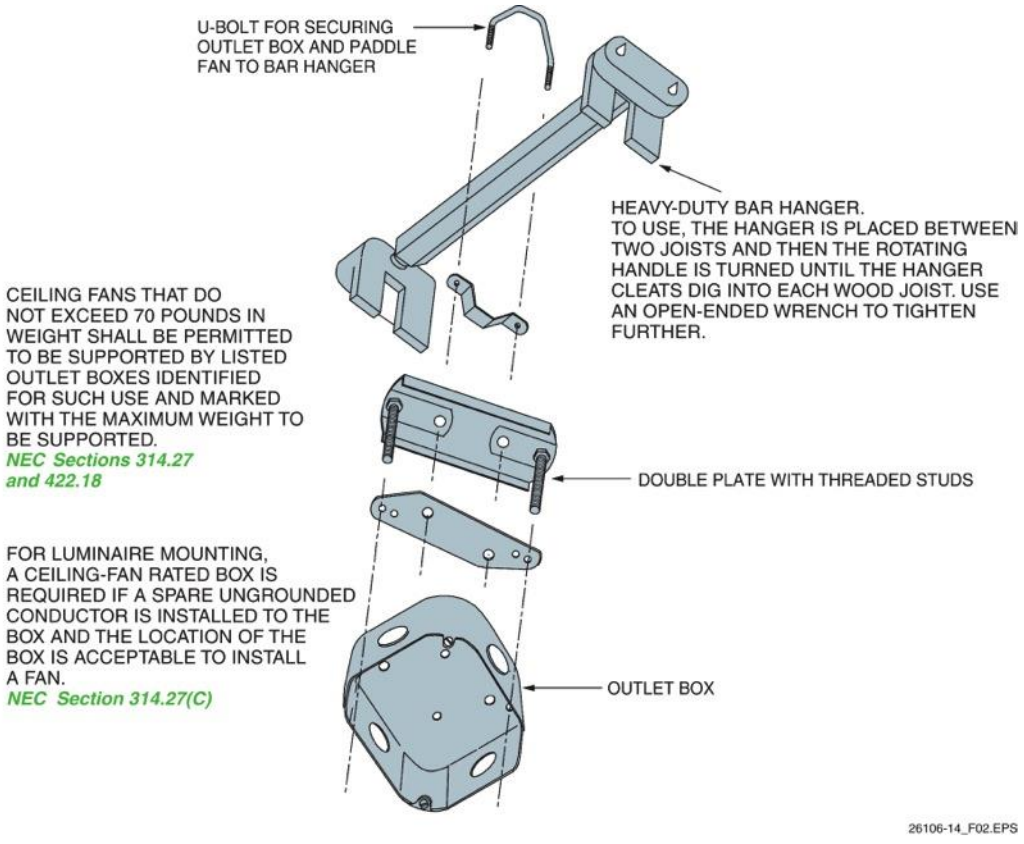
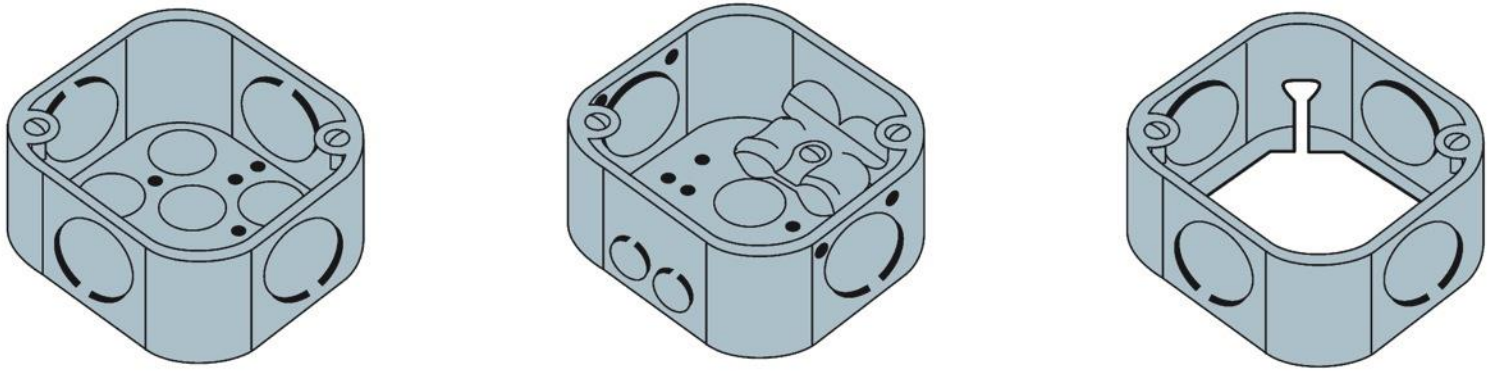
Types of Boxes

- Boxes are typically constructed of steel; other metals, such as cast iron, aluminum, or brass; or nonmetallic materials, such as fiberglass-reinforced polyester.
- Boxes are designed for various uses, such as in floors, walls, and ceilings. Ceiling boxes must be attached to a structural member of the building and must be rated for the weight of the attached fixture.



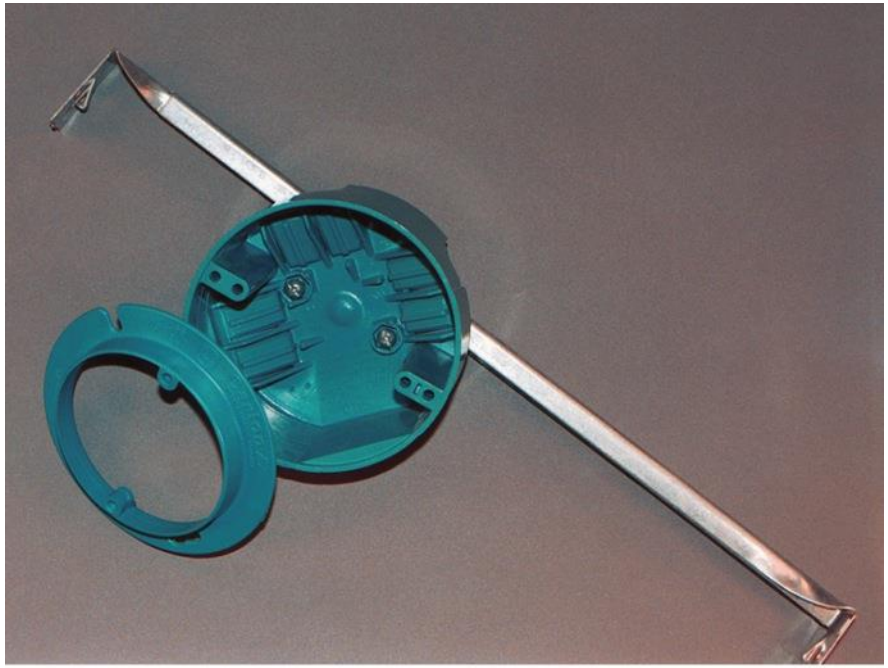
Octagon and Round Boxes

- Octagon and round boxes are used for wall-mounting lighting fixtures (luminaires).
- Extension rings are used where necessary to add to capacity or bring the box flush with the finished surface.



Nonmetallic Round Box and Fixture Ring with Bar Hanger

Fixture hangers are used to support a fixture between two ceiling joists.



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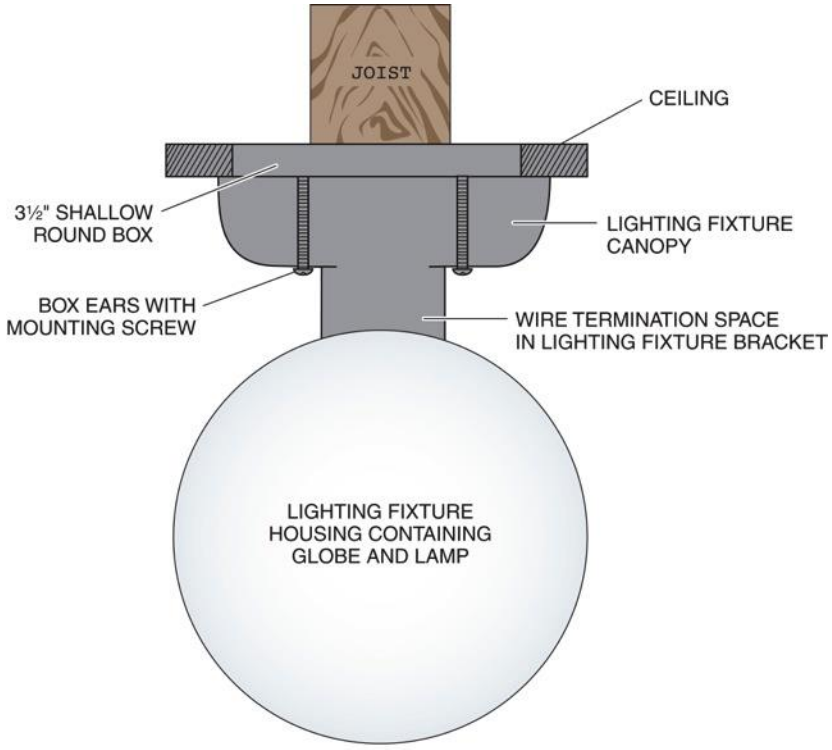
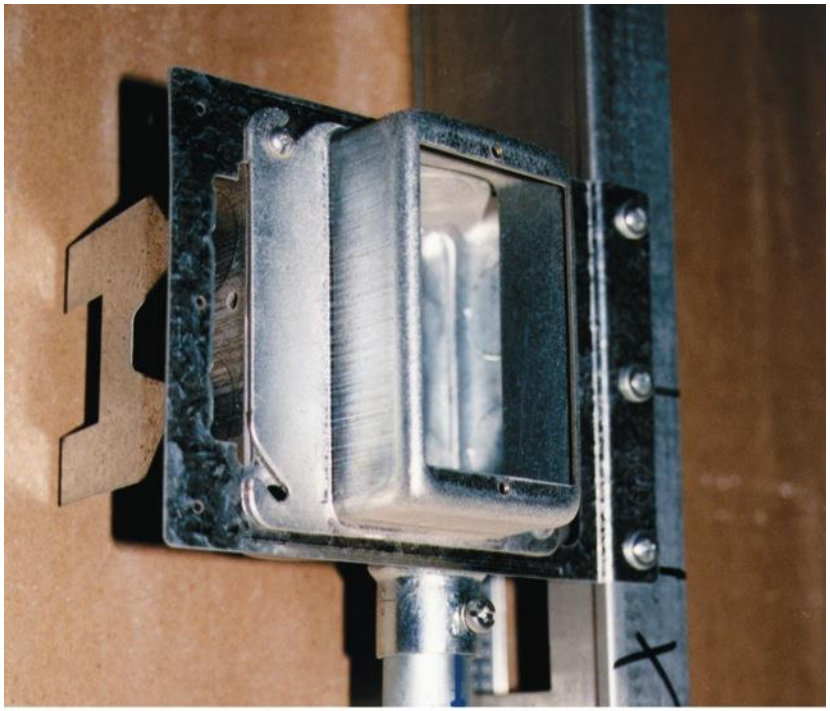
Shallow Round Box Used for Mounting a Lighting Fixture

- Some fixtures include a wire termination space and can be used with shallow ceiling boxes supported by a joist.
- The *NEC*® requires that boxes have a minimum depth based on the size of the conductors contained in the box.



Square Boxes

- Square boxes are available in various sizes and depths. Extension rings can be used to increase capacity.
- Square boxes may be screwed/nailed directly to structural members or attached using brackets.



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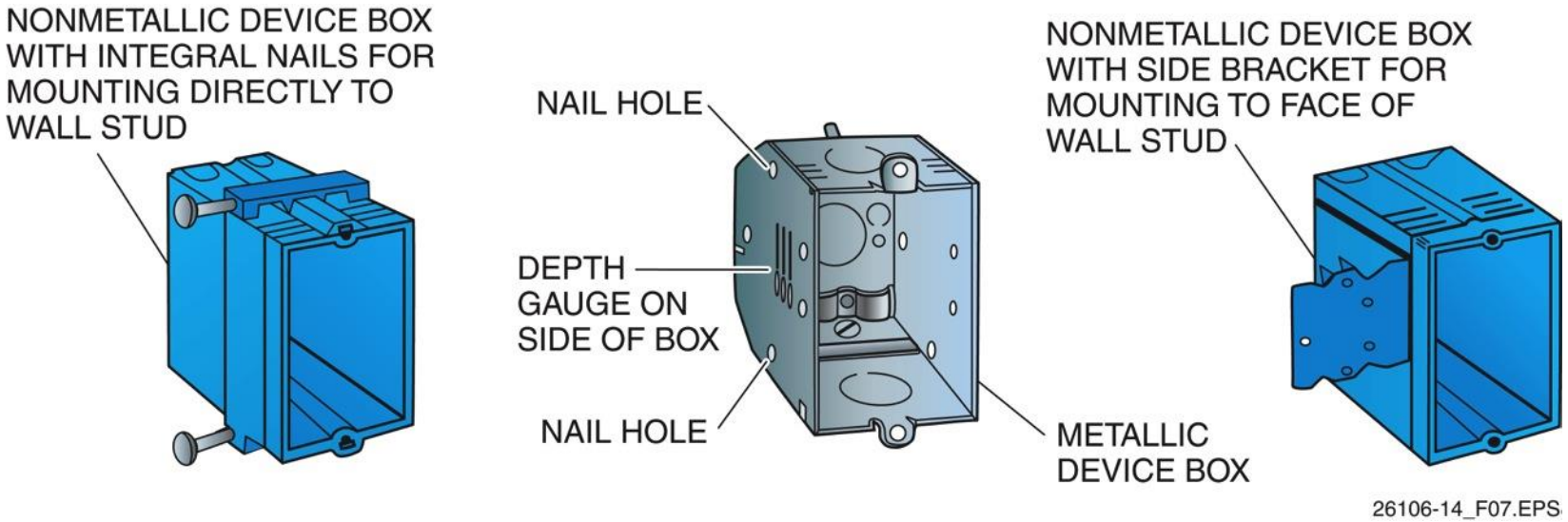
Device Boxes

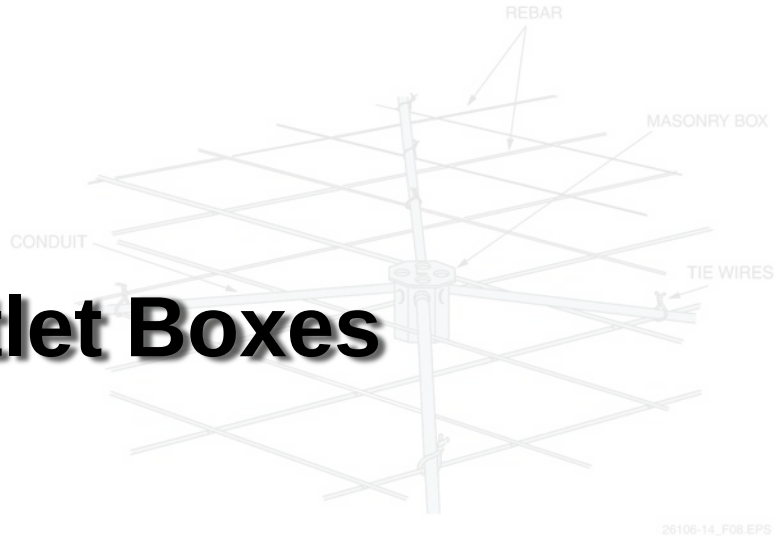
- Device boxes are used for flush-mounted applications in residential and light commercial construction.
- Some boxes include integral nails for rapid installation.



Next Session…

Masonry Boxes; Boxes for Damp and Wet Locations

- Masonry boxes are attached to the rebar before a slab is poured. To avoid offsets, use a tall enough box so that the knockouts are located above the rebar.
- Boxes used in concrete or underground applications require the use of weatherproof equipment.



Sizing Outlet Boxes

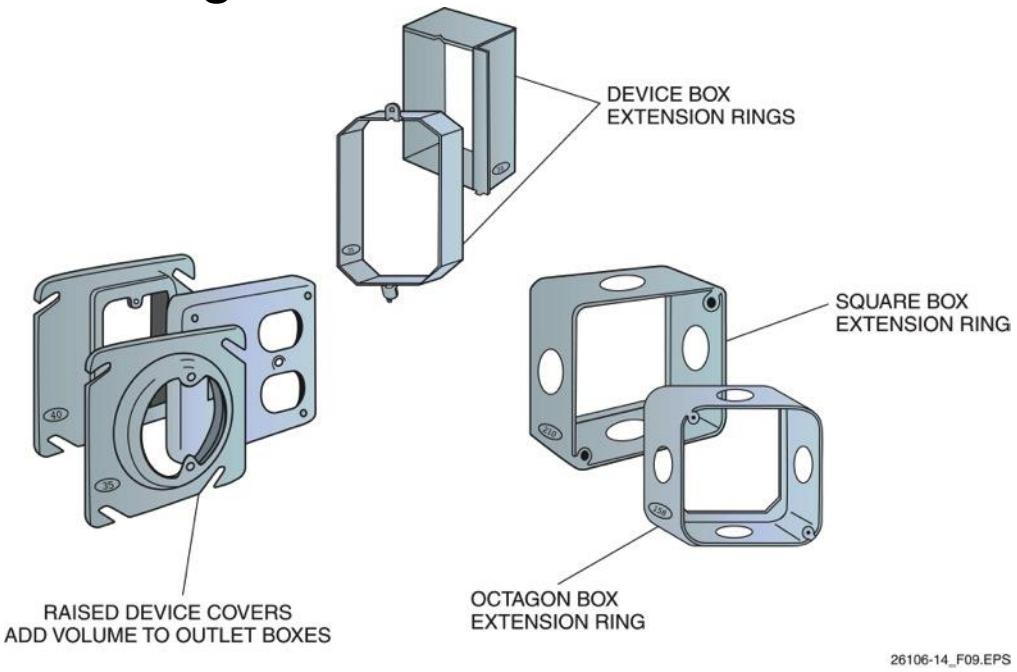
Performance Task

Identify the appropriate box type and size for a given application.

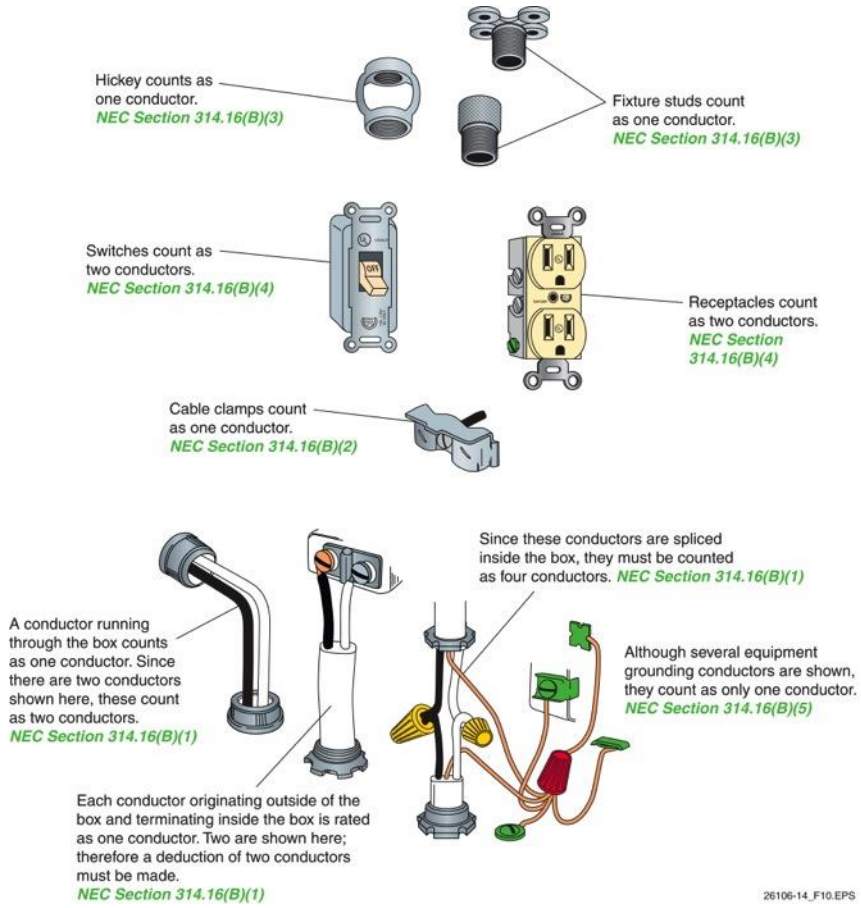
This session will conclude with trainees practicing identifying the appropriate type of box for a given application.

Sizing Outlet Boxes

- The maximum number of conductors permitted in standard outlet boxes is listed in ***NEC Table 314.16(A)***.
- Devices that add to box capacity include device covers and extension rings.

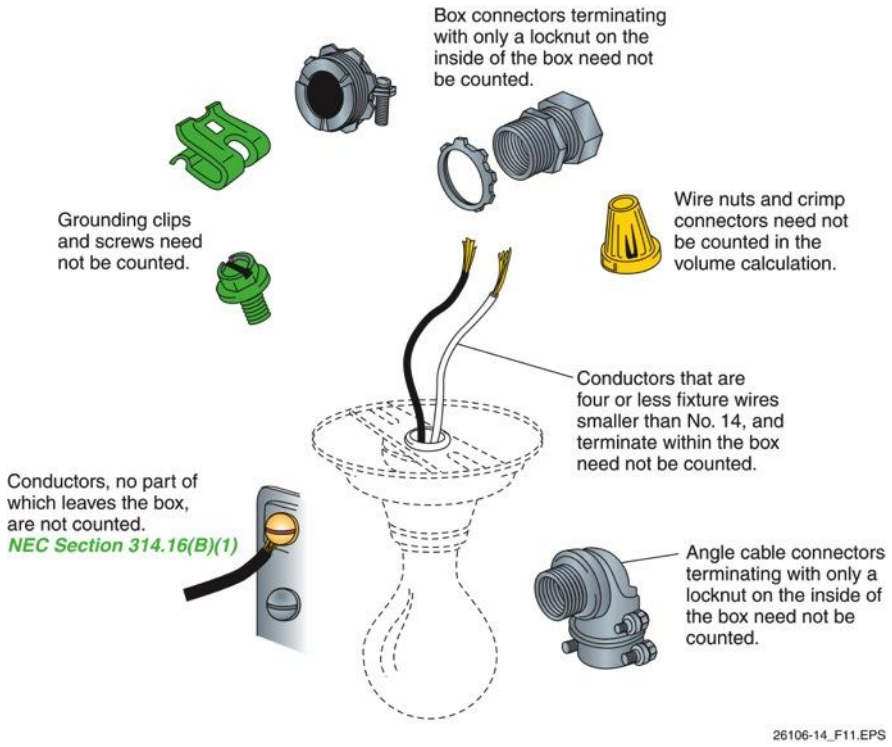


Devices and Components That Require Deductions in Outlet Box Capacity



- Deductions must be made for fixture studs, hickeys, cable clamps, switches, receptacles, and conductors.
- One conductor is deducted for each fitting and any number of ground wires. Two conductors are deducted for each yoke-mounted device (receptacle or switch).

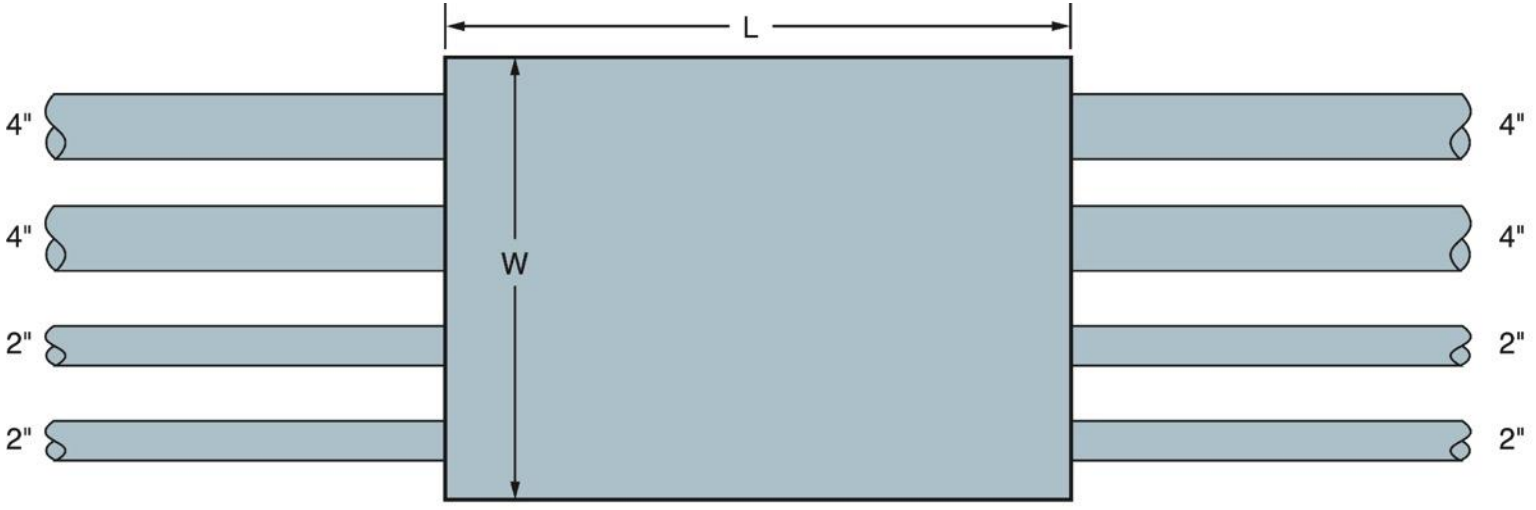
Items That May be Disregarded When Calculating Outlet Box Capacity



- Items disregarded when calculating box capacity include grounding clips and screws, wire nuts, cable connectors, prewired fixture wires, and pigtails.
- To determine the size of an outlet box, count the number of conductors and equivalents, then determine the space required for each conductor using ***NEC Table 314.16(B)*** and multiply that by the equivalent number.
- Use ***NEC Table 314.16(A)*** to find the correct box size.

Pull and Junction Boxes

- Pull and junction boxes must provide enough space in which to install the conductors.
- For conductors No. 4 or larger on a straight pull, the length of the box must be no less than eight times the trade diameter of the largest raceway.



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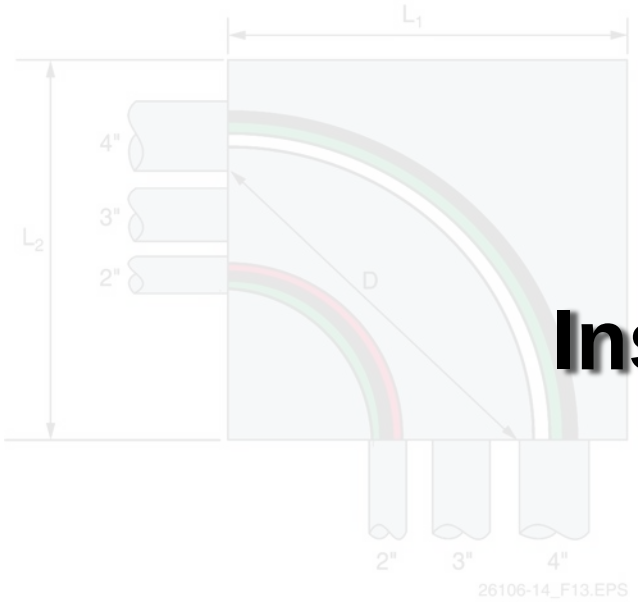
Next Session…

Pull Box with Conduit Runs Entering at Right Angles



- For conductors No. 4 or larger pulled at an angle, the length of the box must be no less than six times the trade diameter of the largest raceway.
- In addition to making a conductor pull easier, pull boxes can also be used to avoid conduit bends.

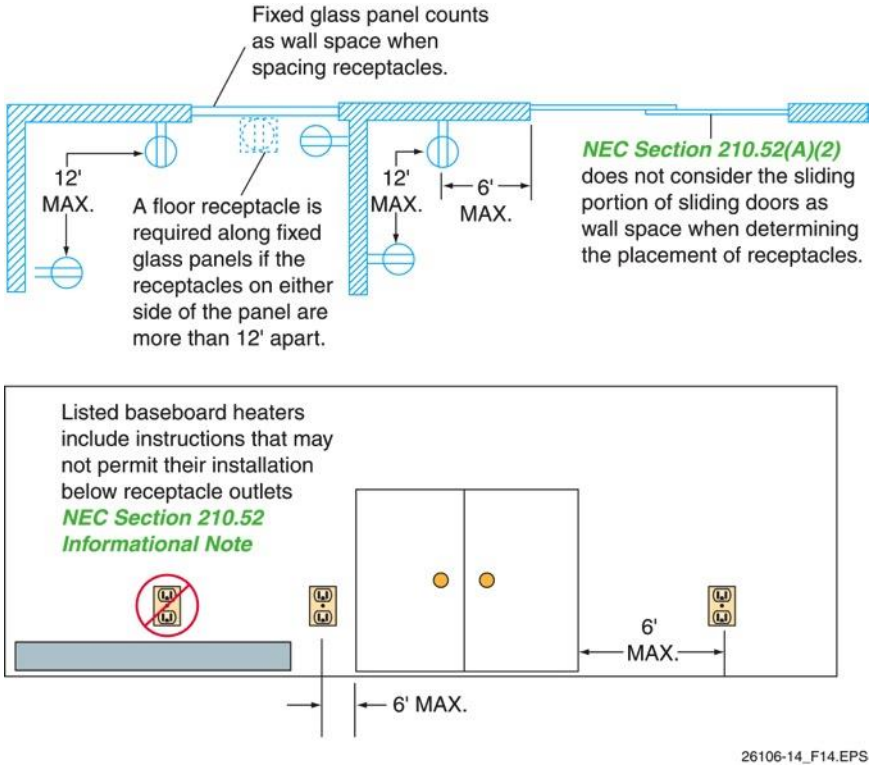
Installing Boxes

Performance Task

Select the minimum size pull or junction box for a given application.

This session will conclude with trainees practicing identifying the minimum size pull or junction box for a given application.

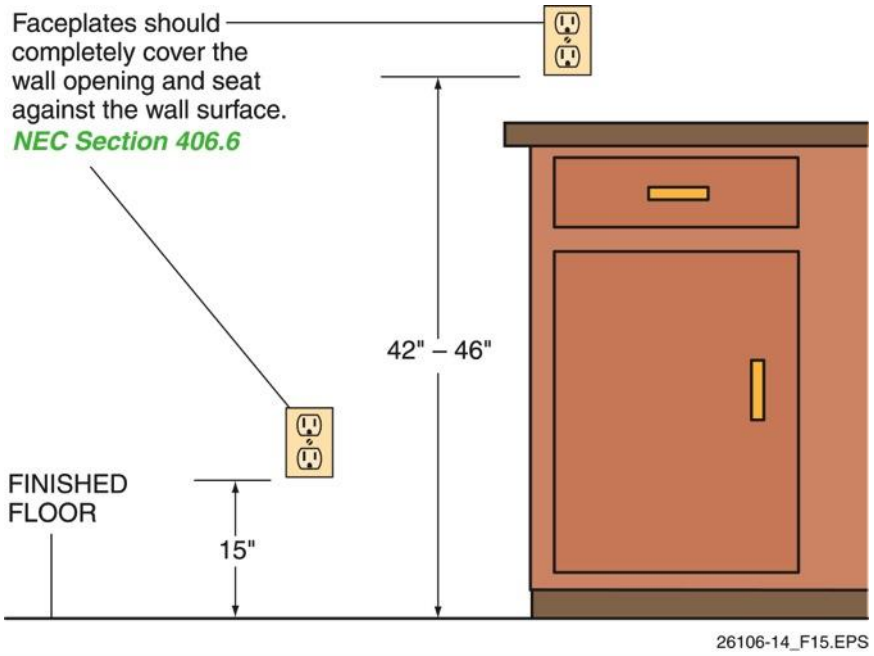
Installing Boxes



- When installing boxes, the box must be correctly sized and listed for the application. Conductors must be protected against abrasion and the box supported properly. Boxes must remain accessible for future repair/maintenance.
- The requirements for receptacle locations in dwelling units are listed in ***NEC Section 210.52***.

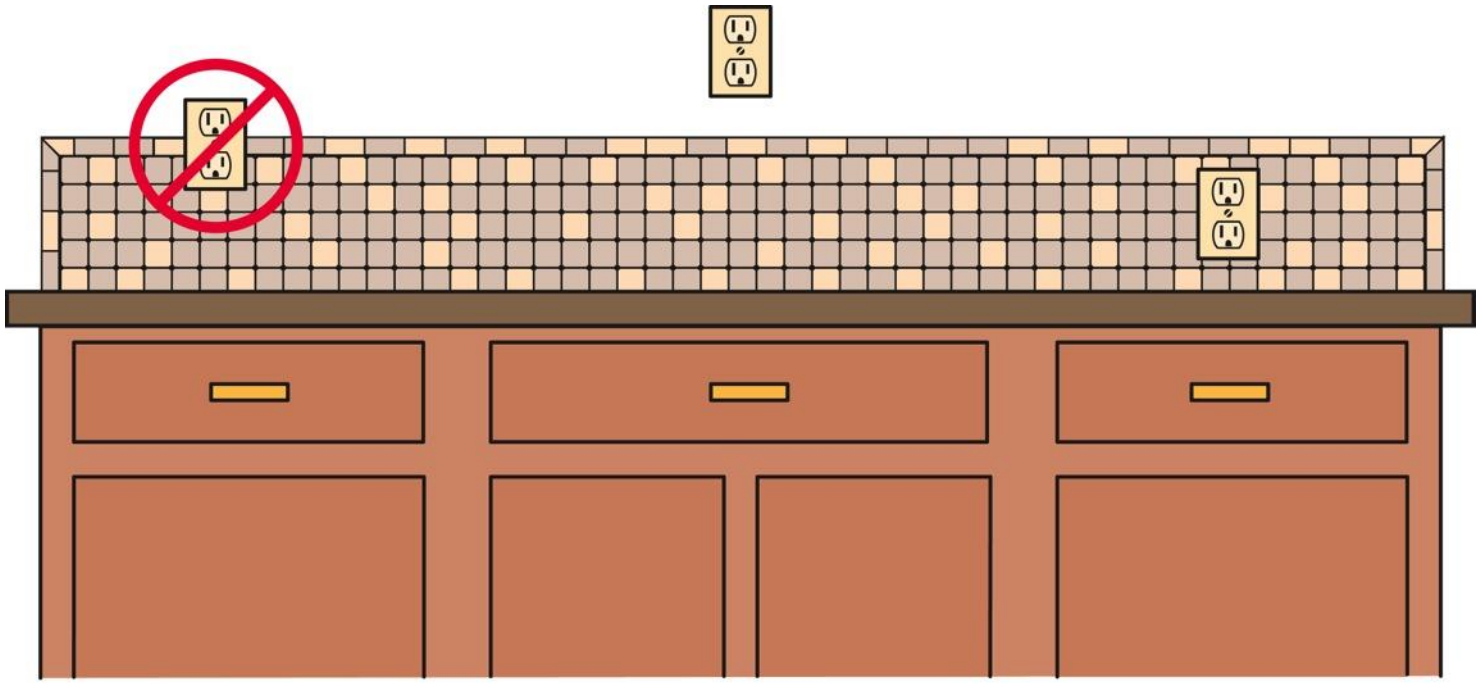
Mounting Heights of Duplex Receptacles

- Receptacle mounting heights may be varied to suit the building use and structure.
- Remember that dimensions on electrical drawings are often given to the center of the box.



Adjusting Mounting Heights

Avoid installing receptacles where they will cross the boundary between wall finishes.



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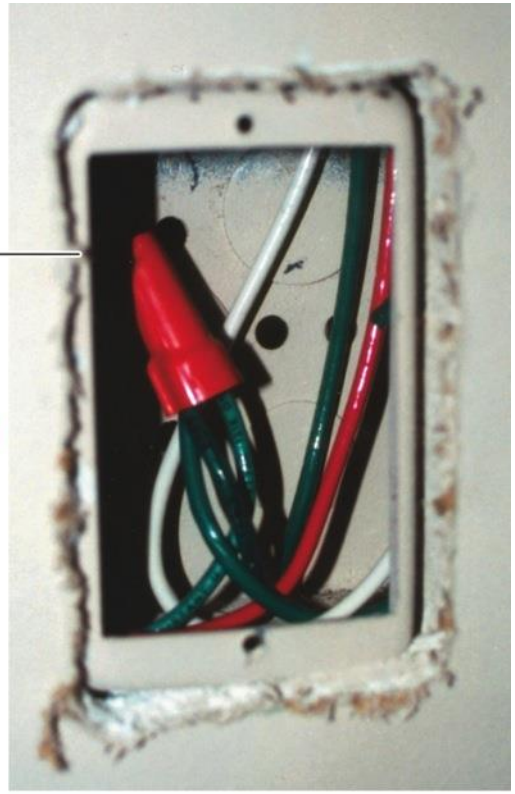
Gaps or Openings Around Outlet Boxes Must be Repaired



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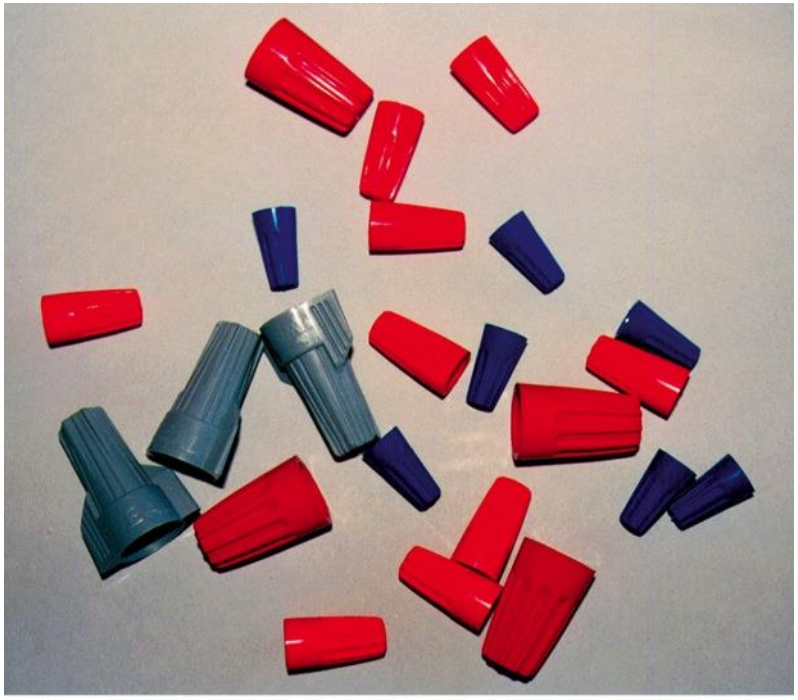
- Broken, jagged, or gapped wall surfaces must be repaired prior to installing the receptacle faceplate.
- Coordinate commercial installations to avoid interfering with the installation of other systems.

Wire Nuts



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- Wire nuts are color coded for different wire sizes. They are also categorized by voltage rating and application (e.g., copper to copper).
- Follow the manufacturer's instructions when installing wire nuts.

Stripping Tools

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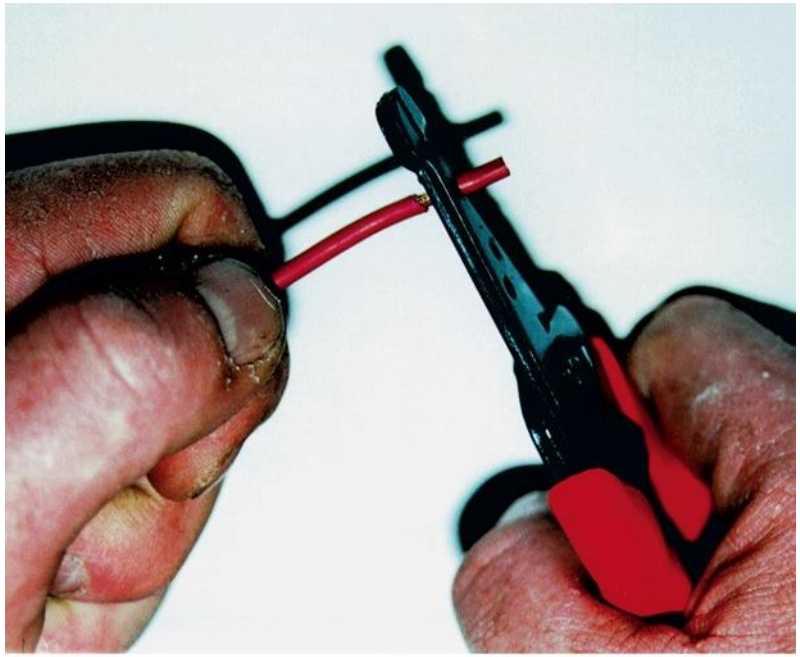
Be sure to choose the correct tool for the size of wire being stripped and make a clean, square cut.

Stripping the Insulation



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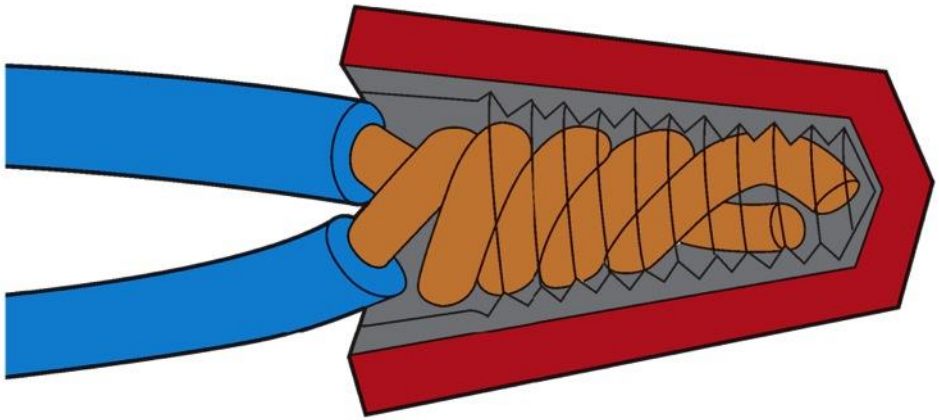
Insulation is typically stripped back by about half an inch, but may vary depending on the wire size and type of wire nut in use.

Wires Installed in Wire Nut



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- Turn the wire nut until the conductor is fully seated in the wire nut.
- A completed installation should provide a tight electrical connection between conductors.
- Always tuck the conductors back into the box so that they are not protruding when the final wall finish is applied.

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.