



HOW-TO BOOKLET #3074

INSTALL RECESSED LIGHTING



TOOL & MATERIAL CHECKLIST

- | | |
|--|--|
| <input type="checkbox"/> Recessed Light Fixtures | <input type="checkbox"/> Wire Hanger |
| <input type="checkbox"/> Stud Locator | <input type="checkbox"/> Keyhole Saw |
| <input type="checkbox"/> Hammer | <input type="checkbox"/> Punch |
| <input type="checkbox"/> Romex Cable | <input type="checkbox"/> Linesman Pliers |
| <input type="checkbox"/> Insulation Stripper | <input type="checkbox"/> Wire Connectors |

Read This Entire How-To Booklet for Specific Tools and Materials Not Noted in The Basics Listed Above.

Recessed lights are funnel-shaped fixtures installed in a ceiling (**Fig. 1**). Boasting a width of approximately 130 degrees, the beam cast by a recessed light is more than sufficient for reading and working. Recessed fixtures, also referred to as high hats, are available either fixed or adjustable (**Fig. 2**). A special kind of recessed fixture called a wall washer is used primarily to focus the light on a painting or photograph.

SPECIAL CONSIDERATIONS

Makeup of the Ceiling. A drywall ceiling with an unfinished attic makes it possible to wire fixtures together from above, so doing the job is relatively easy.

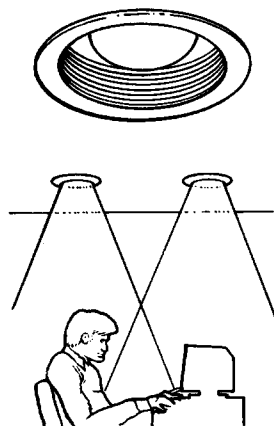
If the ceiling is drywall, but the area above is closed (for example, another room or a finished attic), the task involves cutting slots in the drywall and notching the joists, if this is structurally feasible. This makes it possible to run cable from one fixture to another. Obviously, the ceiling must then be repaired.

NOTE: Although smaller (5" high) recessed fixtures can be special ordered, standard size fixtures need about 8" of space between the ceiling and the floor above.

If the ceiling is plaster, installing recessed fixtures is a much more difficult task. Furthermore, if the level above the plaster ceiling is closed, it is suggested that you stay with the lighting system you have or install track lighting. (See How-To Booklet #3077: Track Lighting.)

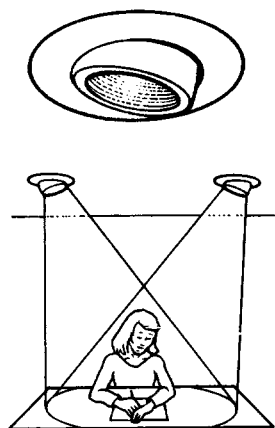
Fire Prevention Considerations. If the recessed fixtures don't have thermal protectors, make sure the literature accompanying them states that they meet the performance characteristics for thermally protected fixtures as established by the National Electrical Code before buying them.

Fig. 1



A recessed light casts a beam with a spread of 130 degrees.

Fig. 2



Adjustable recessed lights can be rotated and tilted.

If insulation is packed between joists, remove enough to allow a minimum of 3" of open space all around the fixture—or make certain the fixture is identified as being safe to be in contact with insulation (Fig. 3).

Wiring Choices. If a ceiling light or chandelier is hanging from the ceiling, take it down and use the existing wires and wall switch for the recessed fixtures.

NOTE: Don't install a number of recessed fixtures that will exceed the maximum wattage output of the ceiling light or chandelier. For example, if a ceiling light has been handling 450 watts without tripping the circuit breaker or blowing a fuse, map the circuit to judge if fixtures can be installed to take in more than 450 watts. Exceeding this limit may overload the circuit.

If there isn't a ceiling light or chandelier in the room, but there is an end-of-the-run wall switch, tap that switch as a power source for the recessed fixtures.

If neither of the above options exist, install a wall switch and run wire from the recessed fixtures to the switch. Then run wire from the switch to a wall outlet or to the main electrical service panel.

CAUTION: If you don't have experience doing the electrical work required by this project, do the mechanical tasks and leave the wiring to a licensed electrician.

ROUGHING-IN

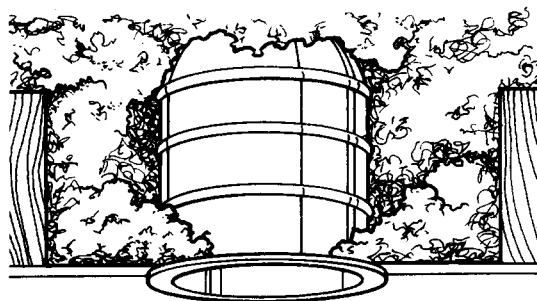
For the purpose of installing recessed lights, the remainder of this pamphlet assumes that the ceiling is drywall, the level above is closed (not an open attic), and there is a ceiling light or chandelier in the room.

- 1 Measure the square footage of the ceiling, draw a diagram to scale, and decide where the fixtures are to be placed.

CAUTION: At the circuit breaker or fuse panel, turn off the power to the ceiling light or chandelier. Turn on the wall switch controlling the light or chandelier to make sure the circuit is inactive.

- 2 Take down the ceiling light or chandelier. Unscrew the wire connectors holding together the hot (normally black) and neutral (normally white) wires and the ground (normally green or bare), as shown in Fig. 4.

Fig. 3



Make sure the recessed fixture is approved for contact with insulation.

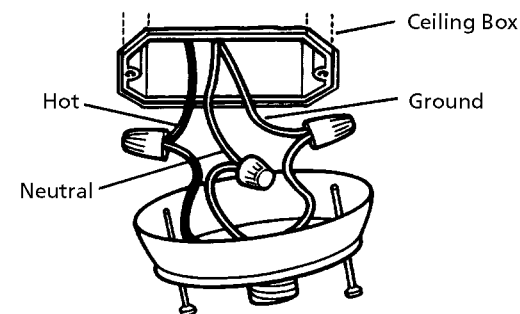
CAUTION: If other wires are tucked into the box, do not remove the wire connectors holding them together. For the time being, stay away from them. Although the circuit for the light is dead, these wires are for other outlets. They may be on a different circuit that is very much alive.

- 3 Begin with the recessed light fixture nearest to the exposed ceiling box. Hold the fixture template on the desired ceiling location, and lightly scribe the diameter of the template onto the ceiling.

CAUTION: Put on eye protection before continuing.

- 4 Drill a hole through the ceiling in the center of the scribed circle.
- 5 Measure the diameter of the recessed fixture housing, then add 1" to this measurement. Measure down the length of a straightened wire hanger to this dimension and put a 90-degree bend into the hanger at this point.

Fig. 4



Take down the ceiling light and unscrew the wire connectors.

- 6 Push the hanger through the hole in the ceiling to bend and rotate the hanger to check for the necessary clearance for the fixture. If the hanger hits a joist, move the location for the fixture to attain the necessary clearance.
- 7 Mark off the locations for the other recessed fixtures, keeping in mind that joists are normally 16" apart, center to center. To be on the safe side before cutting holes in the ceiling, use the coat hanger method or a stud locator to make sure a joist won't be in the way of any fixtures.
- 8 Cut the holes for the fixtures (Fig. 5).
- 9 Use the hanger or a stud locator to pinpoint joists blocking the path for cable from one fixture to another.
- 10 Cut 3" square slots in the ceiling under each obstructing joist. Try not to damage the pieces of drywall that are removed. They can be used later to repair the ceiling.

NOTE: If there are no joists in the way, it won't be necessary to cut slots.

Fig. 5



Use a keyhole or drywall saw to cut holes for the fixtures.

- 11 Using a chisel and hammer, make a 1/2" long by 1/2" deep notch across each joist for the Romex cable to pass through.

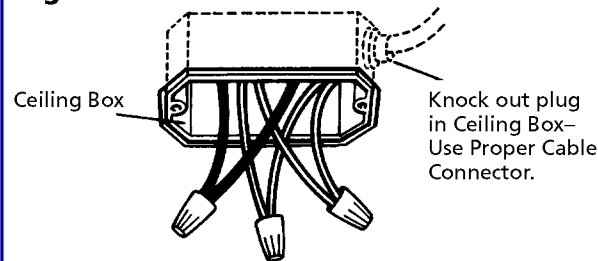
WIRING

CAUTION: If there are wires in the ceiling box that supported the ceiling light or chandelier other than those for that fixture, deactivate the circuit breaker or main fuse to kill all the circuits in the house just in case these wires are live.

- 1 Pull the wires out of the ceiling box to get at the knockout plug. Using a punch and hammer, knock out the plug (Fig. 6).
- 2 Run Romex cable from a roll through the cavity vacated by the knockout plug to the hole for the first recessed fixture. Draw at least 16" of the cable out of the hole.

CAUTION: The cable being installed must be the same gauge as the cable used in wiring the ceiling light or chandelier. In most cases, this will be 14-gauge cable having two wires (hot and neutral) and a ground.

Fig. 6



Knock out a plug in the ceiling box to pass new cable from the box to the first recessed fixture.

- 3 Back at the ceiling box, but the Romex cable so 6" to 8" project from the box.

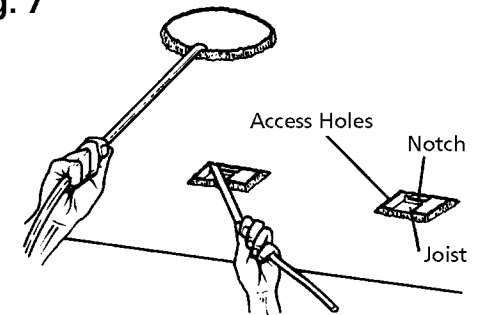
- 4 Run a cable from the hole for the first recessed fixture to the hole for the next recessed fixture, passing the cable through the notches in the joists (Fig. 7). In this same way, continue running cable to all of the fixture holes.

- 5 At the ceiling box, strip the insulation from the cable wires. Hold the bare ends of the two black wires side by side to see if they are straight and even. If they aren't, use linesman pliers to straighten them. Connect the two wires with a wire connector.

NOTE: Unless the instructions accompanying the wire connectors say otherwise, do not twist the wires together. Turning a wire connector as tightly as possible should be enough to ensure that the wires will be attached securely.

- 6 Following the method described in Step 5, connect the neutral (white) wires and grounds. The final wiring at the ceiling box is shown in Fig. 6.

Fig. 7



Run cable from hole to hole; note the slots beneath the joists and the notches in the slots.

- 7** Tuck the wires into the ceiling box and screw a cover plate over the box. If the power was killed throughout the house, turn it back on—but leave the circuit that served the ceiling light or chandelier turned off.
- 8** Have a helper hold the first recessed fixture at the hole while you make connections in the fixture junction box. Connect three hot (black) wires, three neutral (white) wires, and three grounds (**Fig. 8**). One black and one white wire come into the junction box from the fixture. The Romex cable coming from the ceiling box accounts for a second black and white wire, and one ground. The Romex cable extending from the first fixture to the next fixture in the series accounts for the third black and white wire, and a second ground. The third ground is attached to the ground screw in the junction box. Be sure to use wire connectors to secure hot (black) wires to each other, neutral (white) wires to each other, and grounds to each other.
- 9** Wire the remaining fixtures in the same way. The exception is the fixture at the end of the run, which will hold only two hot wires, two neutral wires, and two grounds (**Fig. 9**).

FINISHING

- 1** Push the fixtures into the ceiling (**Fig. 10**). Each type of fixture has a way of being secured—for example, some use expandable clips.
- 2** Install all of the trim pieces that accompany the fixtures. The bulbs can then be screwed in.
- 3** Turn the circuit on and see if the lights work. If they don't, there is an improper connection. Turn off the power and inspect the work.
- 4** Where Romex cable passes through notches in joists, reinforce the joists with metal stud plates (**Fig. 11**). Be careful not to pinch the cable.

- 5** Insert drywall backing plates on each side of the notch. Then secure the cut-out wall-board pieces to the plates.
- 6** Cover the entire ceiling box and all of the cracks around the wallboard pieces with spackle.
- 7** To complete the job, sand and paint the repair area.

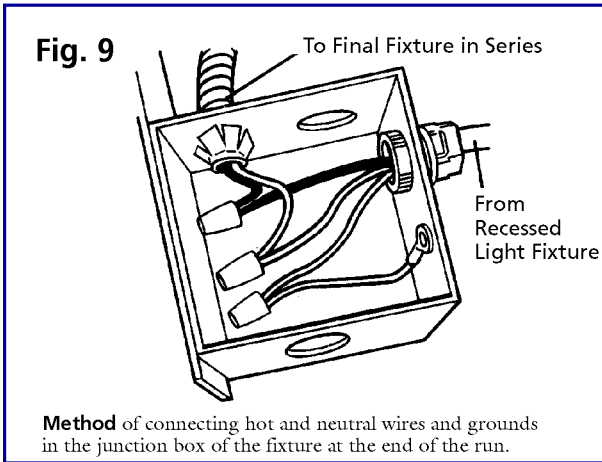
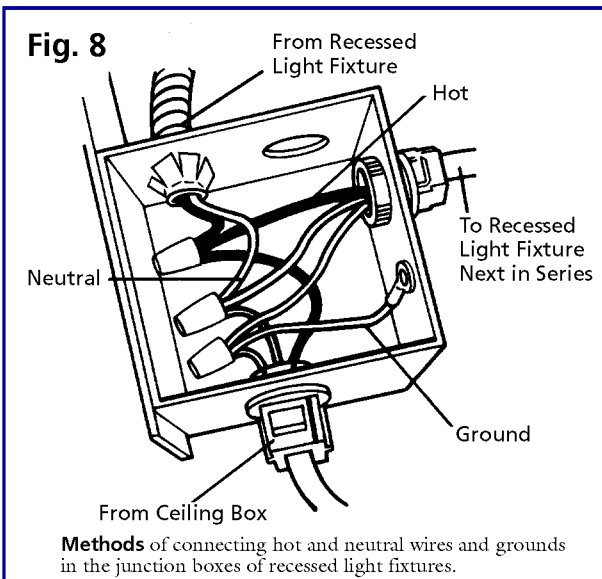
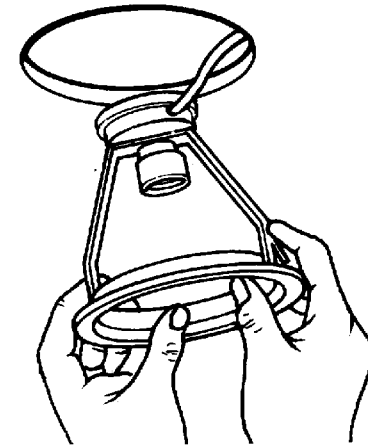
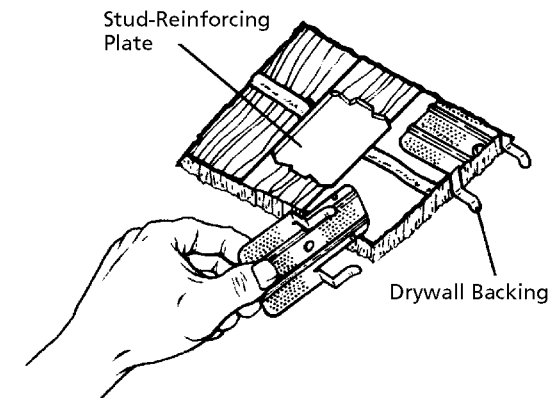


Fig. 10



Installing a wired fixture into the ceiling.

Fig. 11



Reinforce notched joists with metal stud plates and use drywall backing plates to hold patches.