
Electrical -Non-Metallic Cable Wiring

Name: _____

Date: _____

Description

This activity will provide students with the knowledge and skill of wiring a three way switch with non-metallic cable to the National Electric Code.

Materials:

14/2 Nonmetallic sheathed cable
14/3 Nonmetallic sheathed cable
Wire Nuts
Plastic Boxes (3)
Lamp (1)
3 way switch (2)
Wood Base
NM Staples

Tools

NM Cable Cutter
Wire Strippers
Long Nose Pliers
Screwdriver
Claw hammer

Directions:

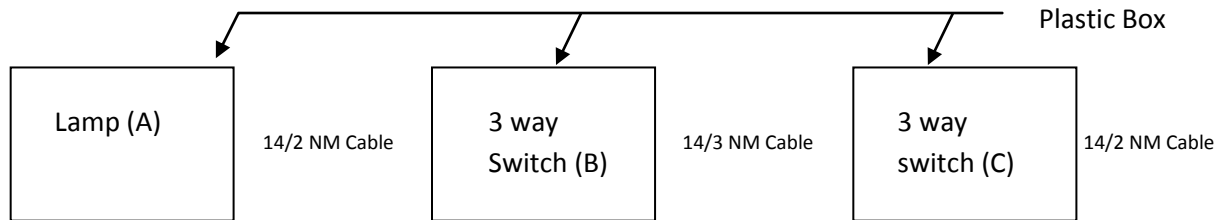
1. Identify all the parts of the project by name.
1. Neatly diagram your circuit on the worksheet. Show wire connections with a line and label each line with proper wire color.
2. Pull cable of the appropriate type to each box (remember 6" free conductor).
3. Fasten the cable with a staple.
4. Strip the cable sheath.
5. Strip the wires.
6. Install the devices as demonstrated (follow your circuit diagram).
7. Observe color-coding, grounding, and all other National Electrical Code (NEC) rules.
8. Secure the devices to the boxes with screws for testing.
9. Attach a temporary power cord to your source wires with wire nuts. Observe color-coding.
10. Using the testing circuit breaker box, plug in your board and test the circuit using a lamp and duplex tester. (Circuit grading is done here)
11. Disconnect board.
12. Remove the screws securing the devices to the boxes so the project can be graded.

Write your name on board and turn in for final grading with the worksheet.

Grading Rubric:

Criteria	Possible	Score
Correct circuit (live test)	8	
Correct Grounding	2	
Correct usage of wire colors and terminal color coding	2	
6" of free conductor	2	
Screw terminals neat and correct (wire clockwise, etc).	2	
Correct use of wire nuts (no bare conductor, not loose).	2	
Workmanship (neatness)	2	
TOTAL	20	

Drawing/Photo:



Notes:

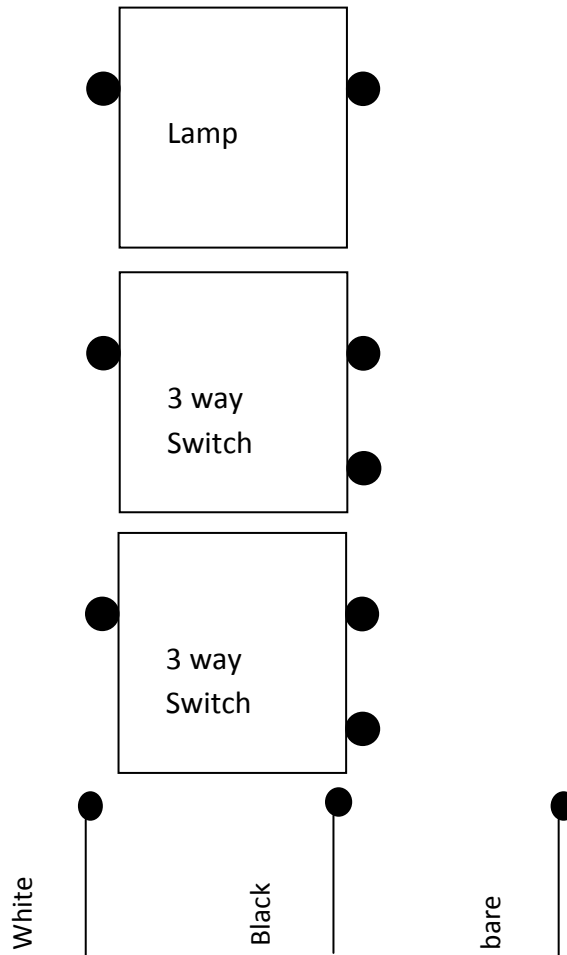
Electrical Work Sheet

Name: _____

Date: _____

1. What color is the "neutral" wire? _____
1. What colors are the "hot" wires? _____
2. What color is the "ground" wire? _____
3. What are the "traveler" wires? _____
4. How much "free conductor" is required to extend from the box? _____

The black dots represent the screw terminals on the devices. Label each dot with the color of the screw (e.g., brass, silver). Connect the black dots on the diagram below to illustrate how you will wire your project. Label each wire color.



Electrical Teaching Notes:

Agricultural Standards Met:

- 4.0 Technology. Students know how to use contemporary and emerging technological resources in diverse and changing personal, community, and workplace environments:
 - 4.6 Differentiate among, select, and apply appropriate tools and technology.
- 5.0 Problem Solving and Critical Thinking. Students understand how to create alternative solutions by using critical and creative thinking skills, such as logical reasoning, analytical thinking, and problem-solving techniques:
 - 5.1 Apply appropriate problem-solving strategies and critical thinking skills to work-related issues and tasks.
 - 5.3 Use critical thinking skills to make informed decisions and solve problems.
- 6.0 Health and Safety. Students understand health and safety policies, procedures, regulations, and practices, including the use of equipment and handling of hazardous materials:
 - 6.1 Know policies, procedures, and regulations regarding health and safety in the workplace, including employers' and employees' responsibilities.
 - 6.2 Understand critical elements of health and safety practices related to storing, cleaning, and maintaining tools, equipment, and supplies.
 - 6.4 Maintain safe and healthful working conditions.
 - 6.5 Use tools and machines safely and appropriately.
 - 6.6 Know how to both prevent and respond to accidents in the agricultural industry.
- B1.0 Students understand personal and group safety:
 - B1.1 Practice the rules for personal and group safety while working in an agricultural mechanics environment.
 - B1.2 Know the relationship between accepted shop management procedures and a safe working environment.
- B3.0 Students understand the basic electricity principles and wiring practices commonly used in agriculture
 - B3.1 Understand the relationship between voltage, amperage, resistance, and power in single-phase alternating current (AC) circuit.
 - B3.2 Know how to use proper electrical test equipment for AC and direct current (DC)
 - B3.3 Know Analyze and correct basic circuit problems (e.g. open circuit, short circuit, incorrect grounding)
 - B3. 4 Understand proper basic electrical circuit and wiring techniques with nonmetallic cable and conduit as defined by the National Electric Code
 - B3.5 Interpret basic agriculture electrical plans.

Alternate Tools/Materials:

This project could have been laid out on variety of boards. Simpler or more complex circuits can be made.

Safety Review:

High voltage circuits will be tested.

Project Time:

Demonstration: 15-20 minutes

Build: 2 hours

Demonstration Notes:

(Tips, methods to stage the project)

1. Review the following rules:
 - a. Where NM cable can be used (residential)
 - b. 6" free conductor
 - c. Color coding of wires and screw terminals. Discuss marking of white wires as "hot" with tape when needed in NM wiring.
 - d. Proper length to strip wire for wire nuts and screw terminals
 - e. Wiring of screw terminals (clockwise)
 - f. Grounding with NM cable
 - g. Stapling of NM cable
1. Review the wiring of three way switch. How to identify the "travelers" that connect the two switches.
2. Pull cable to the boxes
3. Staple (within 6" of box)
4. Demonstrate stripping of the cable sheath
5. Attach ground wires to each other.
6. Tip: Make screw eyes by bending backwards first.
7. Install devices
8. Tip: Show how to "fold" wire into the box.
9. Test circuit

Bill of Materials

(Excel, update with local prices)

Projects: 18

Size	Desc	Units	Qty/Project	Cost/Unit	Order	Amount
14 ga	14/2 w/ Gnd NM Cable	100' roll	0.04	\$ 30.00	1	\$ 30.00
14 ga	14/3 w/ Gnd NM Cable	100' roll	0.02	\$ 40.00	1	\$ 40.00
					0	\$ -
					0	\$ -
					0	\$ -
					0	\$ -
					0	\$ -
					TOTAL	\$ 70.00

Project from: Mike Spiess