Staircase wiring circuit layout for multi storey building

Experiment no.
Date:

Aim:

To control one lamp from two-way switches in staircase light wiring

Apparatus Required:

1. One Lamp
2. Two two-way switches

Tools Required:

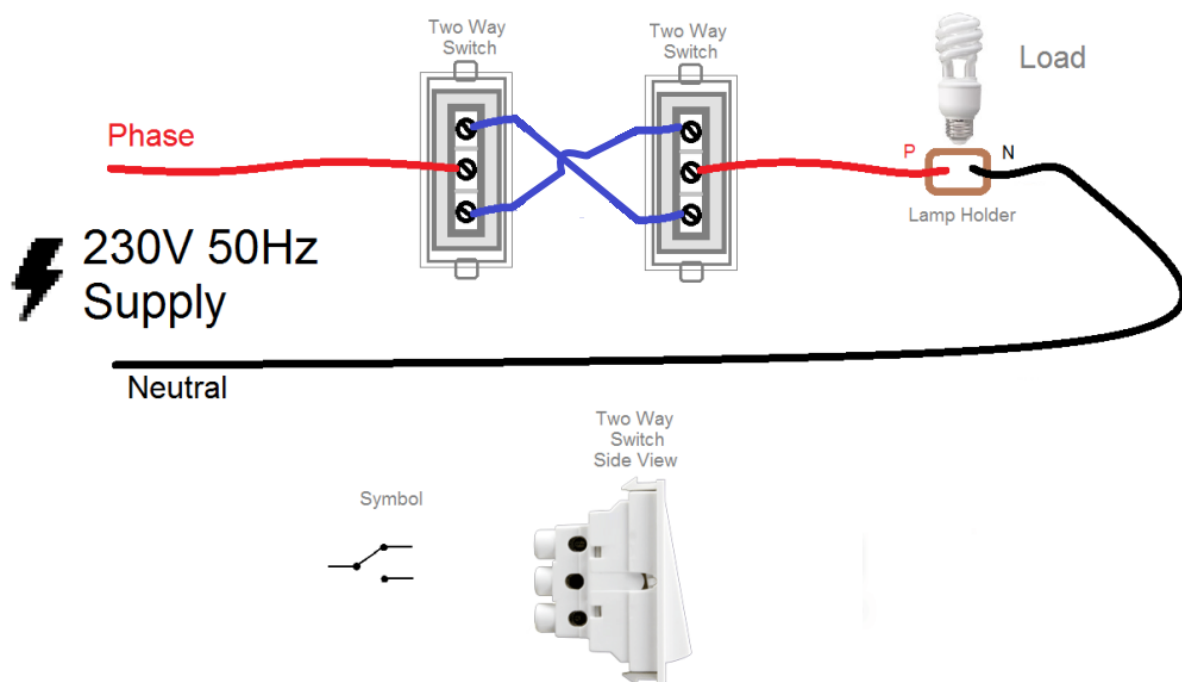1. Clamps
2. PVC pipes

Circuit Diagram:

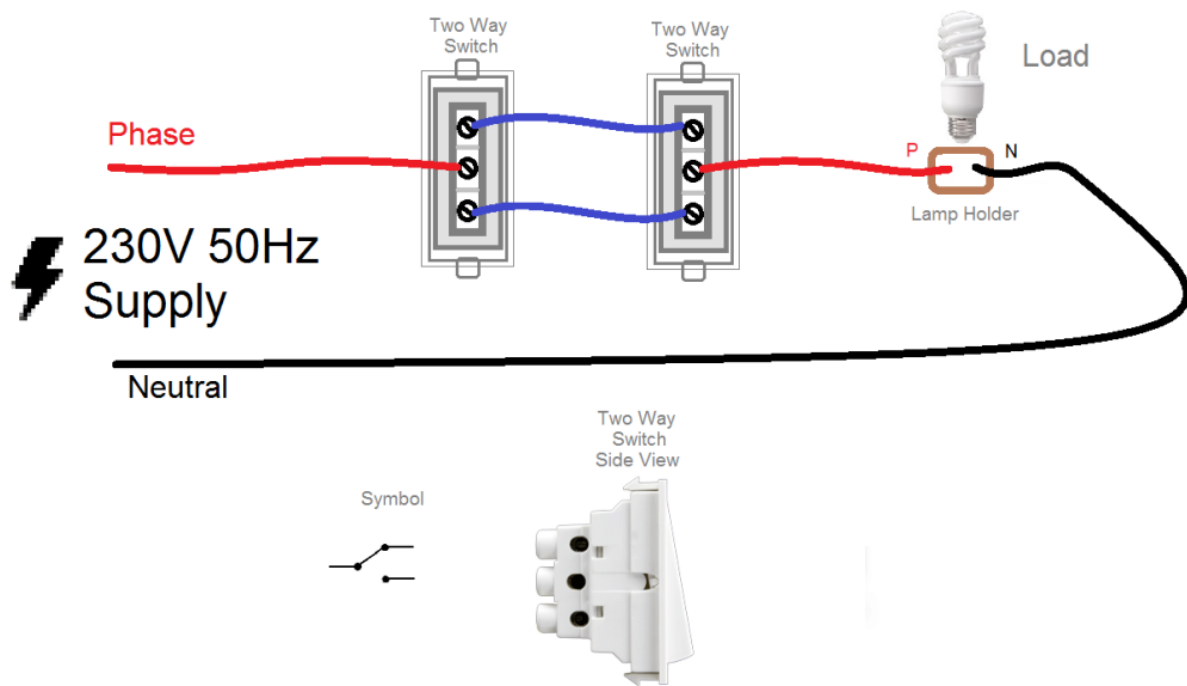**Figure 1.** Staircase Wiring Circuit using XOR

Figure 2. Staircase Wiring Circuit using XNOR

Theory:

One light point is to be controlled by two switches placed at two different places so that the light can be switched ON and OFF by either switch. This type of control of lamps is often used in staircase lighting, where it is necessary that the person going up the stairs should be able to switch ON and after reaching upstairs should be able to switch OFF the lamp.

Procedure:

(A) Method 1 (XOR)

The staircase light wiring using XOR is shown in the Figure 1. Two numbers of two way switches are used for staircase light wiring

1. Two-way Switches have a central terminal.
2. The central terminal of the two switches is connected to the either end of the bulb.
3. The phase wire (red) of switch 1 is connected to the phase wire (red) of switch 2.
4. The neutral wire (black) of switch 1 is connected to the neutral wire (black) of switch 2.
5. The bulb will glow when the switches are in alternate states (ON & OFF, OFF &ON)
6. The bulb will not glow when the switches are in the same state (ON & ON, OFF & OFF)

(B) Method 2 (XNOR)

The staircase light wiring using XNOR gate is shown in the Figure 2.

1. Two numbers of two way switches are used for staircase light wiring
2. Two-way Switches have a central terminal.

3. The central terminal of the two switches is connected to the either end of the bulb.
4. The phase wire (red) of switch 1 is connected to the neutral wire (black) of switch 2.
5. The neutral wire (black) of switch 1 is connected to the phase wire (red) of switch 2.
6. The bulb will glow when the switches are in the same state (ON & ON, OFF & OFF)
7. The bulb will not glow when the switches are in the alternate state (ON & OFF, OFF & ON)
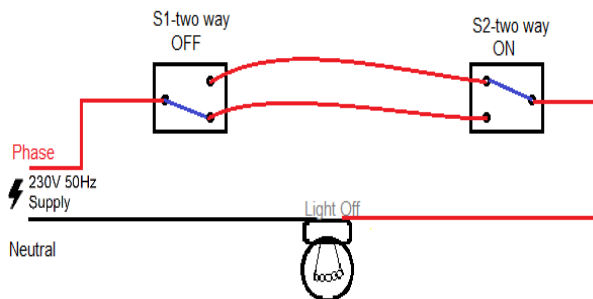
Switch Condition: S1 – OFF, S2 – ON

Switch Condition: S1 & S2 – ON

Observation

The XOR gate connection works when the switches are in alternate states i.e. ON & OFF or OFF & ON.

XOR Truth Table		
0	0	0
0	1	1
1	0	1
1	1	0

The XNOR gate connection works when the switches are in the same states i.e. ON & ON, OFF & OFF

XNOR Truth Table		
0	0	1
0	1	0
1	0	0
1	1	1

Result:

Thus, it is inferred that the XOR gate connection is a better design decision because the user needs to switch it ON from one end of the passage or stairway and then switch it OFF on reaching the end of the passage or stairway.