Benha University

Dr : Mohamed Ahmed Ebrahim

Benha University
Faculty of Engineering at Shoubra
Electrical Engineering Dept.

Ameeria Integrated
Technology Education Cluster

Undergraduate Course

Electric Installation Design

Dr. Mohamed Ahmed Ebrahim

E-mail: mohamed.mohamed@feng.bu.edu.eg

Web site: http://bu.edu.eg/staff/mohamedmohamed033

Lecture (5)

Dr : Mohamed Ahmed Ebrahim

Street light

Street light design criteria

- There are some points that must be defined in the distribution of lighting Poles in the streets:

1. **Lighting Pole Height**

- The height of the lighting Poles almost equals the street width.

2. **Lighting poles length.**

The length of lighting poles equal 60 cm.

3. **Arm Tilt angle.**

- If the columns on both sides of the road the angle =20 degree.
- If the columns on one side of the road the angle =45 degree.

4. **The different ways in distributing lighting poles.**

- If the street view up to 16 meters be lighting in one side.
- If the street width greater than 16 meters be lighting on both sides of the street.
- If the road less than 16 meters and there's an island in the road preferably put the lighting poles in the island.
- If there was an island in the road and the road was greater than 16 meters and less than 32 meters preferably put the lighting poles in the island so that it is the one lighting poles its contains two luminaries.
- If there was an island in the road and the road was greater than 32 meters preferably put the lighting poles in the island and on both sides of the road.

5. The distance between lighting poles.

$$D = \frac{\varphi \times MF \times Uf}{E * W}$$

Where:

Φ : Lumen per lamp

MF : maintenance factor

Uf : utilization factor

E : lux (lighting level)

W : Street width (m)

D : Distance between lighting poles (m)

1st step Summary (Lighting Design)

LUX Standard

Choose Lamp type ,Luminears

Number of luminaires

Dr : Mohamed Ahmed Ebrahim

Continue

- According to Egyptian Company for Distribution maximum demand load (VA) is calculated by knowing the area and building application as following:

A. **For buildings less than 15 floors:**

The following table gives required KVA for each 100 m^2

Application Type	Residential Building	Commercial Building
Low Density	1.5-2	6-12
Medium Density	2.5-4	6-12
High Density	6-10	6-12

B. **For buildings more than 15 floors:**

The following table gives required KVA for each 100 m^2

Residential Building	Commercial Building
8-10	12

- **Note**

Height of building is calculated by 1.5 of street width.

Control of Lighting Circuit

1. **Switches.**

* One way one gang.
* One way two gang
* One way three gang
* two way one gang
* two way two gang
* three way three gang

2. **Contactors.**
3. **Control.**

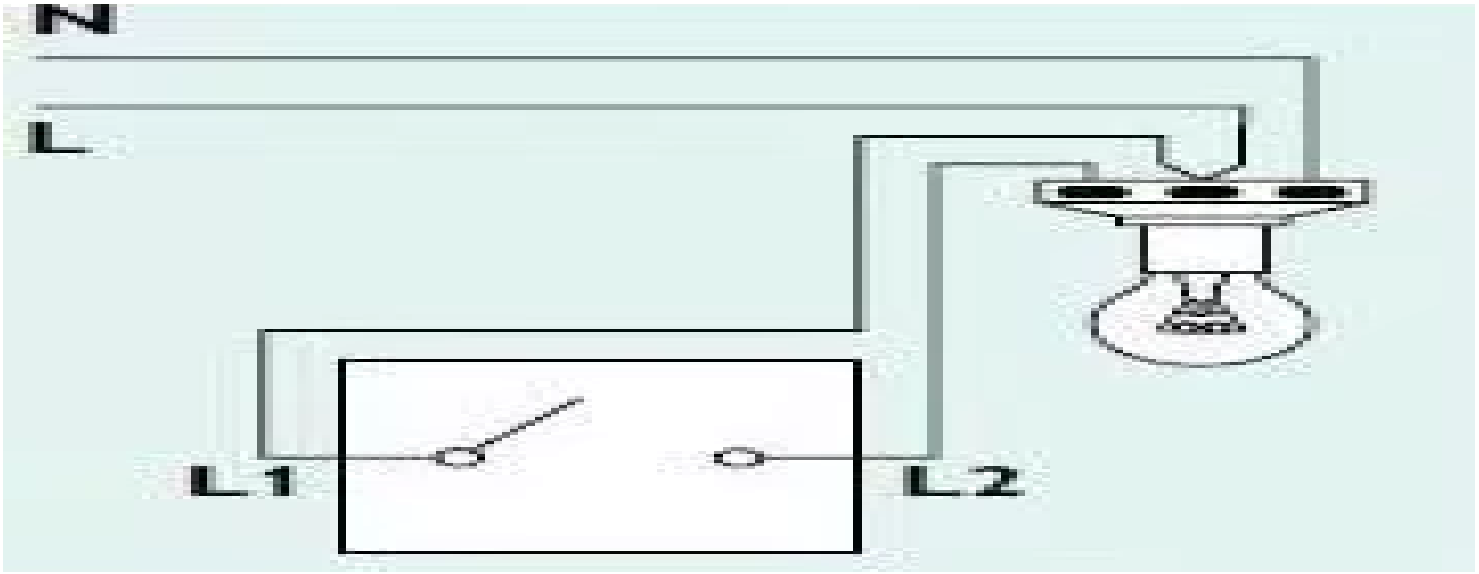
* Dimmer switch
* Automatic Switch-Off Staircase Light(timer)

Dr : Mohamed Ahmed Ebrahim

1. Switches

a) **One way one gang** **b) One way two gang** **c) One way three gang**

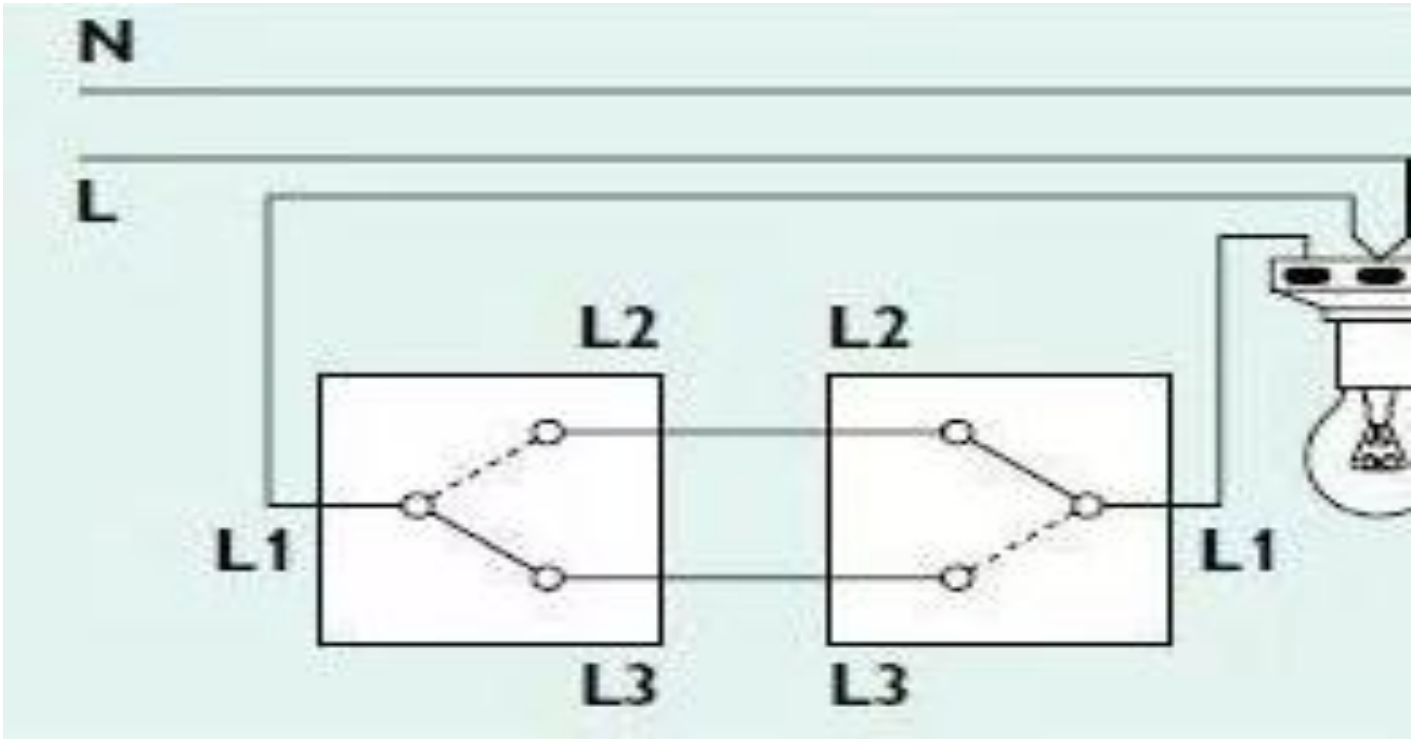
A '1 way' means it is just an on/off switch. This is the simplest type of switch that you can get. The single switch controls a single light (or lighting circuit).



d) Two way one gang

e) Two way two gang

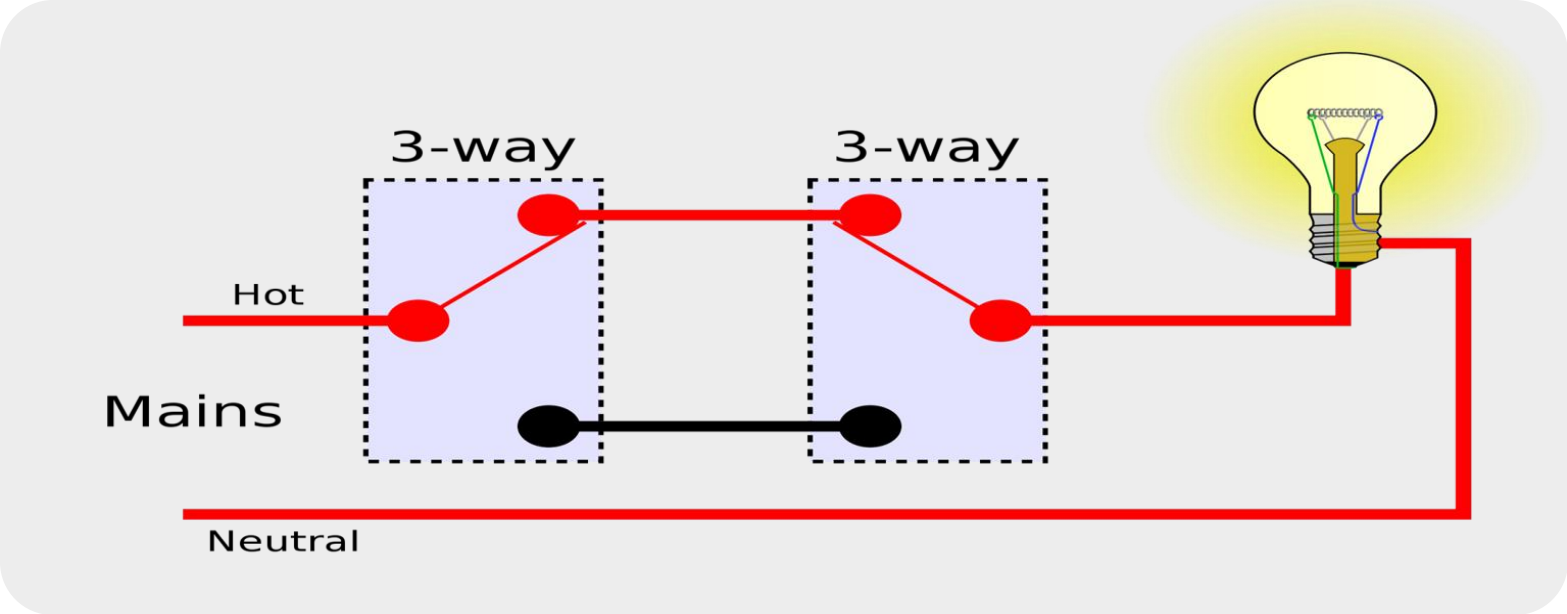
A '2 way' switch means there is another switch controlling the same light. These are often used on a stair case, large room with switches by each door



Dr : Mohamed Ahmed Ebrahim

f) three way three gang

needed to control the lights from three places, say you have 3 entrances to a large room and need a light switch next to each one, you will need an intermediate switch. The light(s) can be switched on and off from anyone of 3 places.



2. Contactors

- A **contactor** is an electrically controlled switch used for switching an electrical power circuit, similar to a relay except with higher current ratings.
- Its typically controlled by a circuit which has a much lower power level than the switched circuit.

- **The contactors are specified according to:**
- Operating voltage and its value.
- Current type (AC/DC).
- Number of poles.
- Rated current.
- Load nature (resistive or inductive/ single phase or 3 phase).
- Switching time.

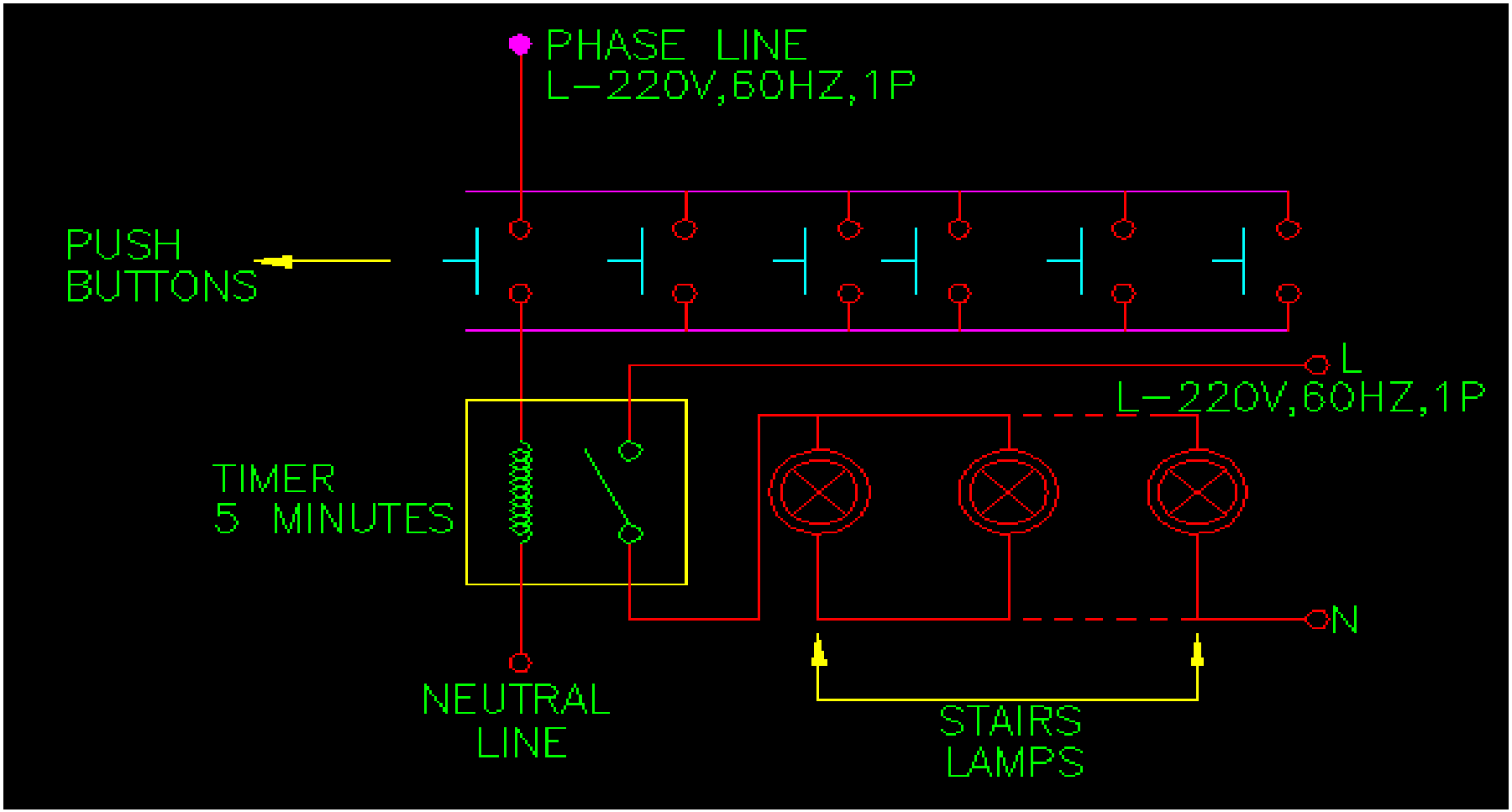
3. Control

a) Dimmer

b) Timer

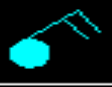
Dr : Mohamed Ahmed Ebrahim

Circuit of stairs lighting controlled by timer



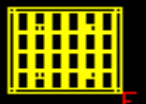
Dr : Mohamed Ahmed Ebrahim

Legend – lighting switches

	SYMBOL	DESCRIPTION
S1		One way–one Gang SWITCH–10A
S2		One way–two Gang SWITCH–10A
S3		One way–three Gang SWITCH –10A
S4		One way–FOUR Gang SWITCH–10A
S5		One way–one Gang SWITCH, ANTI EXPLOSION –10A
S6		Two way–one Gang SWITCH–10A
S7		Two Way Two Gang Switch–10A.
S8		Two Way Three Gang Switch–10A.
S9		Two Way Four Gang Switch–10A.

Dr : Mohamed Ahmed Ebrahim

Legend – luminaires

	SYMBOL	DESCRIPTION
F1		4 x 18W Louvre HIGH POLISH mirror Recessed luminaries body. based on 600mm modular dimensions.
F1-E		DITTO F1 BUT WITH ONE TUBE MAINTAIN EMERGENCY OF –DUARATION 3HRS NI–CD BACK UP BATTERY .
F2		4 x 18W LOUVER SURFACE MOUNTED luminaries body. based on 600mm modular dimensions.
F2-E		DITTO F2 BUT WITH ONE TUBE MAINTAIN EMERGENCY OF –DUARATION 3HRS NI–CD BACK UP BATTERY .
F3		4 x 18W high mirror with secuirt glass cover recessed luminaries body.– anti bacteria–IP65 based on 600mm modular dimensions.

Dr : Mohamed Ahmed Ebrahim

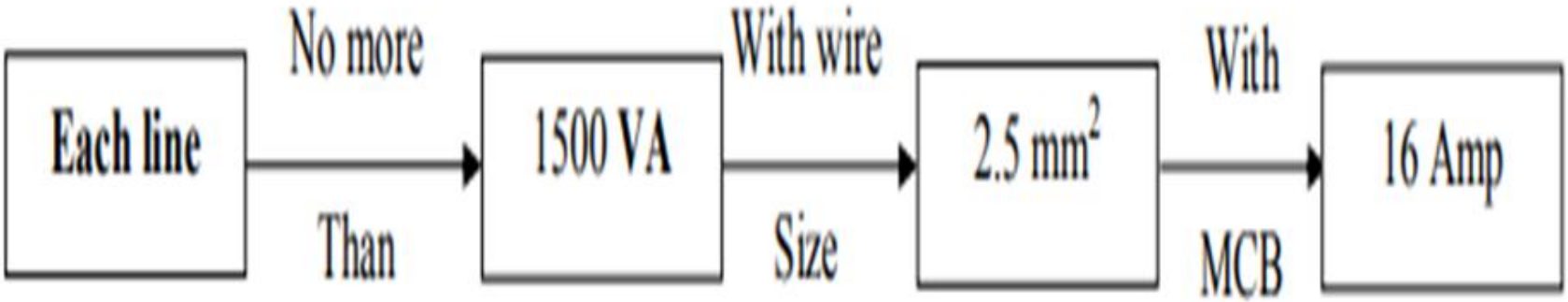
Wiring for lighting circuits

1. The luminaires are distributed either to the emergency circuits or to the general circuits (emergency circuits from 20% to 50% of normal loads).
2. Do not increase the number of luminaires in a circuit from 10 - not more than 1500 watts in lighting circuit.
3. Connect the lighting circuit with a copper cable as cross secession area (3 * 2.5 mm^2), and circuit breaker 10 or 16 amp.
4. Connecting a number of rooms with one on the same lighting circuit (Prefer not to connect one room to two different circuits, except in case of emergency).

Dr : Mohamed Ahmed Ebrahim

- Connect the corridors together to connect them to the same control circuit.
- should not increase the length of the lighting circuit to a large degree to prevent voltage drop (about 30 m).

Electric lines calculations for Lighting



Dr : Mohamed Ahmed Ebrahim