



SNS COLLEGE OF ENGINEERING

Kurumbapalayam (Po), Coimbatore – 641 107

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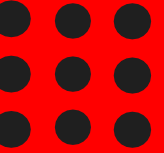
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DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

**COURSE NAME : 19EE01 BASIC ELECTRICAL AND ELECTRONICS
ENGINEERING**

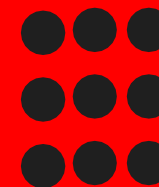
I YEAR /II SEMESTER CST

Unit 3 – Wiring Grounding and Safety



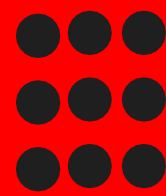


NEED FOR WIRING





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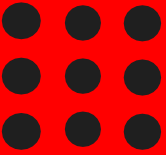


Introduction to Domestic Wiring

Tools used for wiring:

Screw drivers

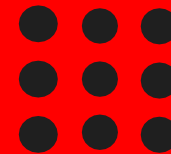
- Thin blade type
- Square blade type





Hammer

- Ball pen type
- Claw hammer





Pliers

- Side cutting plier
- Diagonal cutting plier
- Long nose
- Slip joint



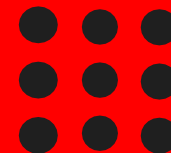
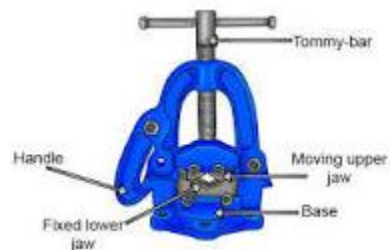


- Pocket knife
- Hand drill
- Chisel
- Wooden saw
- Hack saw
- Centre punch





- Pipe vice
- Pipe cutter
- Wrenches
- Scratch awl



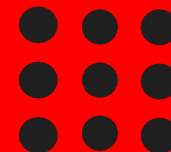


Wire Specifications

Standard Wire Gauge SWG	Diameter	
	<i>inches</i>	<i>mm</i>
7/0	0.500	12.700
6/0	0.464	11.786
5/0	0.432	10.973
4/0	0.400	10.160
3/0	0.372	9.449
2/0	0.348	8.839
1/0	0.324	8.236
1	0.300	7.620
2	0.276	7.010
3	0.252	6.401
4	0.232	5.893
5	0.212	5.385
6	0.192	4.877
7	0.176	4.470
8	0.160	4.064
9	0.144	3.658
10	0.128	3.251
11	0.116	2.946
12	0.104	2.642
13	0.092	2.337
14	0.080	2.032
15	0.072	1.829
16	0.064	1.626
17	0.056	1.422
18	0.048	1.219
19	0.040	1.016
20	0.036	0.914

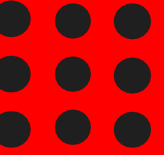


20	0.036	0.914
21	0.032	0.813
22	0.028	0.711
23	0.024	0.610
24	0.022	0.559
25	0.020	0.508
26	0.018	0.457
27	0.0164	0.417
28	0.0148	0.376
29	0.0136	0.345
30	0.0124	0.315
31	0.0116	0.295
32	0.0108	0.274
33	0.0100	0.254
34	0.0092	0.234
35	0.0084	0.213
36	0.0076	0.193
37	0.0068	0.173
38	0.006	0.152
39	0.0052	0.132
40	0.0048	0.122
41	0.0044	0.112
42	0.004	0.102
43	0.0036	0.091
44	0.0032	0.081
45	0.0028	0.071





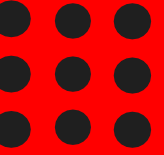
- Higher the number of gauge value smallest is the diameter.
- Number of wire standard depends on the current carrying capacity.
- British standard wire gauge value.





Wiring accessories

- Switches
- Lamp holders
- Socket outlets
- Ceiling roses
- Plugs
- Flexible cords
- Distribution board
- Fuse
- Cables





Switches

Tumbler switch : Projected outwards from the wall



Flush switch : fixed with flush on the wall, it ll not be projected out





Pull switches: used for heaters and air conditioners



Rotary switches: used in heaters to change the rate of heat
insulated handles to which blades are fixed
blades move in steps make contact with terminals





Push button switch: used in starting motors



Iron clad switch:





Knife switch:



Two way switch:

2-WAY SWITCH





Lamp Holders

Pendent Holder



Batten Holder



Screw Lamp Holder



Fluorescent Lamp Holder



Starter Holder



Ceiling Rose



Mounting blocks



Socket Outlet





Wiring Materials

Plug



Plug Adaptor



Main Switch



Power Indicator



Electrical Fuse Board

Distribution Fuse Board





Wiring Material - Cables

SINGLE-CONDUCTOR WIRES

Solid-core wire



Stranded wire



MULTICONDUCTOR CABLES

Type NM (nonmetallic sheathed) cable "12-2"

For interior circuits; routed behind walls, ceilings, floors



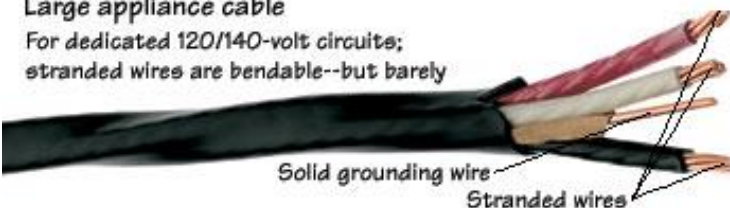
Type NM (nonmetallic sheathed) cable "14-3"

For interior circuits; contains two hot wires



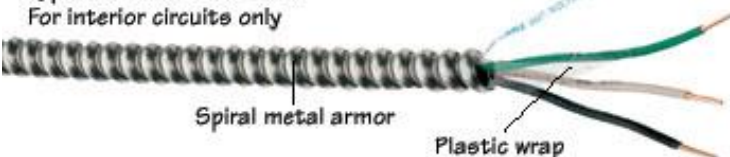
Large appliance cable

For dedicated 120/140-volt circuits; stranded wires are bendable--but barely



Type MC armored cable

For interior circuits only



Types of Cables

On basis of conductors

- Single core cable
- Multi core cable

On basis of no. of voltage grading

- 250/440 volt cables
- 650/1100 volt cables

On basis of conductor used

- Copper conductor cables
- Aluminium conductor cables

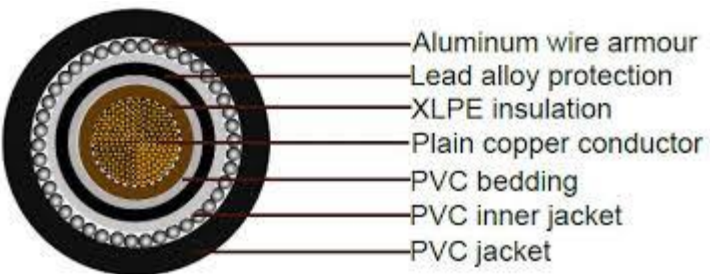
On basis of insulation

- 1 VIR insulated Cables
- 2 TRS/CTS Cables
- 3 Lead sheathed Cables
- 4 PVC Cables

- 5 Weather proof Cables
- 6 Flexible Chord Cables
- 7 XLPE Cables



Wiring Material -



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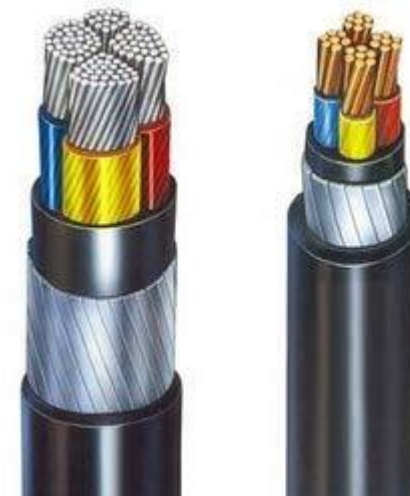
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Cables

- A cable consists of a copper wire surrounded by insulation and a sheath.
 - Types
 - Vulcanized Indian Rubber (VIR) insulated cables
 - Poly – Vinyl Chloride (PVC) insulated cables
 - Tough Rubber Sheathed (TRS) cables
 - Cable Tyre Sheathed (CTS) cables
 - Lead Sheathed cables
 - Weather proof cables.





Addition to this:

Junction boxes

Elbows

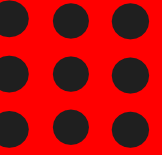
Bends

Hooks

Earth wire

Screw

Wooden plugs etc are used.





Rating of wiring materials

Wiring material	Rating
Switches	6A, 240 V 16A, 240 V
Socket outlets	6A, 240 V, 2 pin / 3 pin 16A, 240 V, 3 pin
Ceiling roses	6A, 240 V, 2 plate
Plugs	6A, 2 pin / 3 pin 16A, 3 pin
Distribution Box	16A, 240 V, one way 16A, 240 V, two way

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WIRING AND ITS TYPES

Points to be considered for selection of wiring:

Initial cost : It should be economical.

Durability : It must be able to withstand wear and tear due to weather.

Safety from fire : It should be free from risk of fire as far as possible.

Mechanical Protection : It must provide good mechanical protection to the cables.

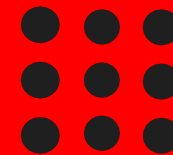
Permanency : The wiring must not be affected by the action of weather, fumes, dampness, chemicals etc.,

Appearance : It is an architectural point of view.

Accessibility : It should be easy to extend or repair the wiring.

Life : The System adopted should have good life.

Maintenance Cost : It should be low.





Types of wiring

- Cleat Wiring System
- Wooden casing – capping wiring system
- Tough Rubber sheath wiring system
- Lead sheathed wiring system
- Conduit wiring system





Cleat wiring system

- Conductors are supported by porcelain cleats.
- Very cheap and can be done easily
- It has base and a cap.
- Life is very less so not suggested for permanent wiring.
- Types
 - Having one
 - Two or three grooves for receiving one, two or three wires respectively.



USES:

- Industries and workshops for temporary wiring.

Points to be remembered

- Distance between cleats – 30cm to 60 cm.
- Wires should not run near water and gas pipe lines.



Wooden casing capping wiring system

- Though its costly , commonly used in residential buildings.
- Casings are made of seasoned teak wood.
- Casing are covered – rectangular strips of wood of same width known as capping and its screwed to it.
- It is available in pieces of 3 to 6 meters length.

Points to be remembered:

- To avoid white ants – seasoned wood should be used.
- Casing should be properly fixed at the wall.





Tough Rubber Sheath Wiring

- PVC or TRS or CTS cables are used.
- The cables are placed on wooden batten - Batten wiring system
- Battens – clips and then screwed.
- Distance – 6cm to 15 cm.





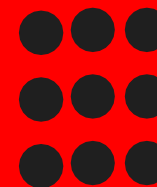
Lead sheathed wiring system

- Similar to TRS.
- Cable – Lead sheathed cable.
- Longer life but costly.
- Avoids mechanical injury- Properly moulded.
- Earthed.





SURFACE CONDUIT WIRING



Non-metallic Conduit
(PVC)



Metallic Conduit Wiring (Steel)

Surface Conduit Wiring

PVC or GI conduits are laid on the surface of the wall or ceiling. These conduits are attached to the walls with a 2-hole strap and base clip at a regular certain distances. Electrical wires are laid inside the conduits





CONCEALED CONDUIT WIRING



PVC conduit pipes are placed inside the chiselled brick/block wall before plaster. The wall is later completely plastered and painted. Electrical wires are laid inside the conduits. This type of wiring are aesthetically appealing since they are no electrical wires/conduits seen on the top of the wall.



REFERENCES

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3. Mehta V K, Mehta Rohit, “Principles of Electrical Engineering and Electronics”, S.Chand & Company Ltd, (2010)- UNIT I and II
4. Mehta V K, Mehta Rohit, “Principles of Electronics”, S.Chand & Company Ltd, (2005)- UNIT IV and V
5. <https://happho.com/install-concealed-conduit-electrical-wiring-system-properly/>

THANK YOU