



CONSTRUCTION

Helper Electrician

(Facilitator's Guide)

REFERENCE ID: CON / Q 0601



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Unit 1 - Introduction to Construction Industry

TH Duration: 04 Hours

PR Duration: 04 Hours

Total: 08 Hours

Unit Objectives:

- Understand and learn about structure of the construction organization
- Understand and learn about types of electrical works at construction site
- Understand and learn about role & responsibilities of a helper electrician

Introduction to Construction Organization

30 Minutes

The construction industry plays a key role in the development of a nation, as it provides one of the three basic needs of human life; “A House” to the society.

A construction organization may consist of an individual contractor or it may be a big construction organization. The scope of the work may be limited to constructing a small house or it may extend to the construction of a township of row bungalows, row houses and residential apartments.



Structure of the Construction Organization

1 Hr

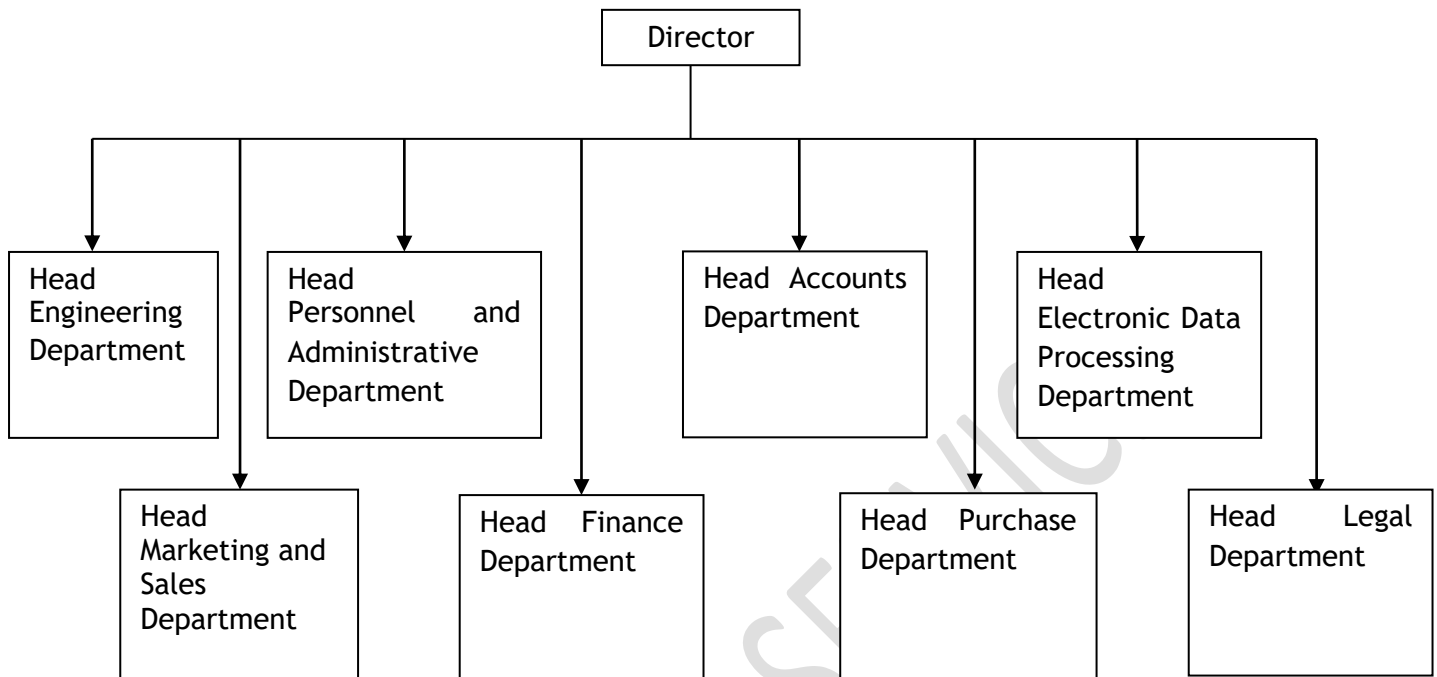
The building construction organization is a centralized type of organization. Here, individual departments such as engineering, finance, purchase, sales etc. with their Head of the Departments (H.O.D.) report directly to management.

Normally, a construction organization consists of the following departments:

- 1) Engineering department
- 2) Purchase department
- 3) Finance department
- 4) Personnel and Administrative department
- 5) Marketing and Sales department
- 6) Accounts department
- 7) Legal department
- 8) Electronic Data Processing Department



Structure of the Construction Organization



Types of Electrical Works at Construction Site

1 Hr

Electrical works at construction site involve the following:

- Laying of cables/ wires from power source to desired equipments,
- Installation and maintenance of common electrical equipments and machineries at construction sites.
- Installation and maintenance of LV wiring and electrical fixtures at industrial, residential and commercial buildings.

Note: All the activities must be carried out as per organizational HSE norms conforming to relevant electrical standard operating procedures, guidelines or specifications applicability.

Role & Responsibilities of an Helper Electrician

1 Hr

- To measure, cut, and bend wire and conduit, using measuring instruments and hand tools.
- To trace out short circuits in wiring, using test meter.
- To measure, cut, and bend wire and conduit, using measuring instruments and hand tools.
- To measure, cut, and bend wire and conduit, using measuring instruments and hand tools.
- To strip insulation from wire ends, using wire stripping pliers, and attach wires to terminals for subsequent soldering.
- To examine electrical units for loose connections and broken insulation and tighten connections, using hand tools.
- To construct controllers and panels, using power drills, drill presses, taps, saws and punches.
- To drill holes and pull or push wiring through openings, using hand and power tools.
- To clean work area and wash parts.
- To maintain tools, vehicles, and equipment and keep parts and supplies in order.
- To transport tools, materials, equipment, and supplies to work site by hand, hand truck, or



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- heavy, motorized truck.
- To thread conduit ends, connect couplings, and fabricate and secure conduit support brackets, using hand tools.
- To support helper electrician in preparing a list of requisition materials, using warehouse requisition or release forms.
- To string transmission lines or cables through ducts or conduits, under the ground, through equipment, or to towers.
- To perform semi-skilled and unskilled laboring duties related to the installation, maintenance and repair of a wide variety of electrical systems and equipment.
- To solder electrical connections, using soldering iron.
- To dig trenches or holes for installation of conduit or supports.
- To trim trees and clear undergrowth along right-of-way.
- To raise, lower, or position equipment, tools, and materials, using hoist, scaffolding.
- To break up concrete, using air hammer, to facilitate installation, construction, or repair of equipment.
- To operate cutting torches and welding equipment, while working with conduit and metal components to construct devices associated with electrical functions.
- To paint a variety of objects related to electrical functions.

Practical

4 Hrs

- I. Brief about training session and training delivery plan
- II. Basic knowledge of Unit of measurement and their conversion
- III. Basic knowledge of arithmetic calculation



Discuss in class - What is the learning from this module/unit?



Summarize the Lesson



Ask Questions/Solve the Exercise



Unit 2 - Select and Use Hand, Power Tools and Electrical Devices

TH Duration: 10 Hours

PR Duration: 20 Hours

Total: 30 Hours

Unit Objectives:

- Understand and learn about selection and use of hand, measuring, cutting & chasing tools
- Understand and learn about selection and use of power tools
- Understand and learn about use of testing tools and electrical devices
- Understand and learn about tools used for cable preparation
- Understand and learn about other supporting tools & equipments

Introduction

30 Minutes

An Electrician should use equipments which provide protection against shock while working on a live wire. To detect an error and rectify the fault element without experiencing a shock, safety should be considered of primary importance by an electrician. Some of the tools specially designed for electricians are mentioned here:

Hand Tools

1 Hr

Basic electric hand tools used at construction site consist of combination pliers, screw driver set, line tester, nose pliers, ball pane, cross pin, sledge hammers, electric knife, etc. Various types of tools and equipments used for installation are given here:

Basic electric hand tools used at construction site consist of combination pliers, screw driver set, line tester, nose pliers, ball pane, cross pin, sledge hammers, electric knife, etc. Various types of tools and equipments used for electrical installation are given here:

i. Open Ended Spanners

This tool is used to provide a grip to turn objects such as nuts and bolts.





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ii. Ring Spanner

This spanner grips the faces of the bolt or nut.

It is generally a six-point or twelve-point opening for use with nuts or bolt heads with a hexagonal shape.



iii. Short Screw Driver

It is a hand tool for turning screws. This screw driver has two types of tips; plain and star headed.



iv. Long Screw Driver

These are used to open screws which are placed deep inside.





Cutting Tools

1 Hr

Cutting tools include the following:

i. Cutting Pliers, Nose Pliers & Sleeve Remover

These are the cutting tools which are used to cut the wire and to remove the sleeve without damaging the conductor material.



ii. Wire Stripper

A wire stripper is a small, hand-held device used to strip the insulation from wires. A centre notch makes it easier to cut the insulation without cutting the wire. This type of wire stripper is used by rotating it around the insulation while applying pressure in order to make a cut around the insulation. Since the insulation is not bonded to the wire, it then pulls easily off the end.



iii. Heavy Duty Pliers

Heavy duty pliers are used to pull out any hard material.





iv. Nose Pliers

Its long gripping nose provides excellent control and reach for fine work in small or crowded electrical area. Given their long shape, they are useful for reaching into cavities where cables (or other materials) have become stuck or unreachable to fingers or other means.



v. Hand Saw, Tennon Saw, Knife, Chisels & Drilling Tools





Chasing Tools

30 Minutes

- Chase cutter - blades set to single chase
- Chisel
- Lump hammer
- Large bolster
- Medium bolster



Measuring Tools

1 Hr

Measuring Tools consist of measuring tape, analog meters, digital meters, wire gauge, tri-square, etc.,

i. Measuring Tape

It is used to measure distance between 2 points. It is useful while marking holes for drilling, cutting the casing capping etc.

ii. Inclinator

Inclinometer is used to measure elevation angle.



iii. Magnetic Compass

Magnetic compass is used to measure Azimuth angle.

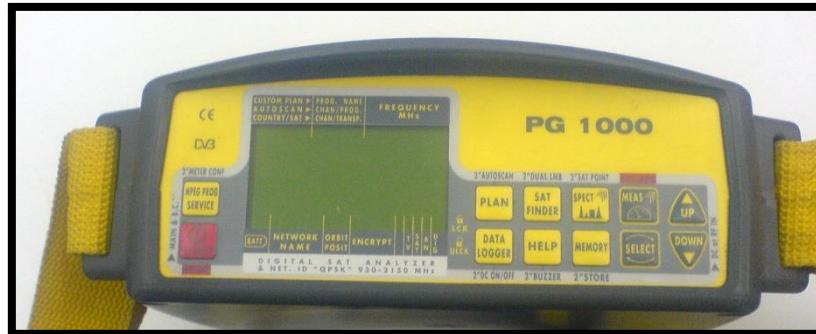




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iv. Sat Meter

Sat meter is used to measure signal strength and quality of signal at LNBF & STB end.



v. Service Cable

It is used to connect Sat meter with LNBF. its length is usually 1 meter.



vi. TV Meter

TV Meter is used to measure signal strength and quality in absence of Sat meter.





Power Tools

00:30 Hrs

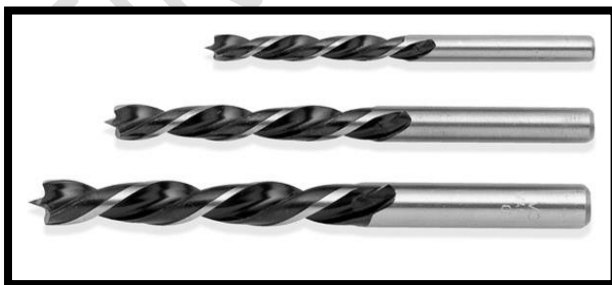
These tools consist of drilling machine, chasing machine, cutting machine, demolition machine, etc.



Drill Machine

Drill machine is used to make holes on walls. Drill machine components and their working mechanism are as follows:

- *Fixed chuck for twist:* Insert a drill bit and twist the chuck. It will get locked. Same way twist to open.
- *Function Switch-Hammer Drilling/Precise Hammering:* Hammer mode is used to make hole through the wall. Hammer mode makes drilling faster. When you are making a through hole and when you feel that the drill is coming out at other end, pull it out and change the mode precisely. It will make the whole smoothly.
- *Reverse Switch:* If your drill bit is stuck inside, stop the drill, switch the mode to anticlockwise and pull it out.
- *Electronic Switch:* When you press this switch, it gets locked and machine will run continuously. Press it again, it will release & stop the machine.
- *Rubber padded pistol grip:* Its grip is made up of rubber pad. So it easily sustains the pressure of hammering.



Wooden Drill Bit



Drill Chuck with Hey Key Adaptor



Testing Tools

01:00 Hr

Testing tools consist of test lamp, digital multi-meter, clamp meter, line tester 500v, test lamp, etc.



i. Line Tester

It is a type of the screwdriver with an ability to detect power in the socket/ wire. To do that, we have to TAP the tester inside the socket and touch the TOP. If the light glows, it indicates that a voltage is present in the circuit. It is used to check the presence of electric supply.



ii. Multi Meter

A multi meter or a multi tester, also known as a VOM (Volt-Ohm meter), is an electronic measuring instrument that combines several measurement functions in one unit.

A typical multi meter would include basic features such as the ability to measure voltage, current, and resistance. Analogue multi meters use a micro ammeter whose pointer moves over a scale calibrated for all the different measurements that can be made.

Digital multi meters (DMM, DVOM) display the measured value in numerals, and may also display a bar of a length proportional to the quantity being measured.



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Digital multi meters are now far more common than analogue ones, but analogue multi meters are still preferable in some cases, for example when monitoring a rapidly-varying value.

A multi meter can be a hand-held device useful for basic fault finding and field service work, or a bench instrument which can measure to a very high degree of accuracy.

They can be used to troubleshoot electrical problems in a wide array of industrial and household devices such as electronic equipment, motor controls, domestic appliances, power supplies, and wiring systems.

It is mainly used to measure Current, Voltage & Resistance.

Instructions to use Multi Meter

1. It should always be in *Voltage* mode when connected in parallel to check voltage
2. Should be in *Current* mode while connected in series
3. Should be in Resistance mode while checking closed circuit and its resistance.
4. If these instructions are not followed, the Multi meter will blow.



Tools Used for Cable Preparation

01:30 Hrs

i. RG 6 / RG 11 Cable Preparation Tool

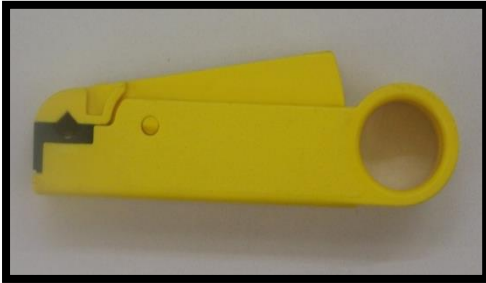
This tool is used while preparing the cable for connectorization. Never cut the cable with cutter or pliers. Always use preparation tool to prepare cable for connectorization.

In this tool, the blades are set to exact cut of jacket and dielectric of cable. So that the cable will fit in connector and there will be no signal loss.



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RG 6 Preparation tool is used to prepare RG 6 cable and RG 11 preparation tool is used to prepare RG 11 cable.



RG 6 Cable Preparation Tool



RG 11 Cable Preparation Tool

ii. Compression Tool

Once the cable is prepared, it is properly inserted in the connector and compression tool is used to compress the connector. After compression, the cap of the connector is pressed inwards. This fixes the cable gap.



RG 6 Compression Tool

iii. Cable Cutter

Cable cutter is used to cut the cable. Never use any other tool to cut the cable. It will damage the shape of the cable.





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iv. Cable Pulling Spring

It is used to pull cable from concealed wiring.



v. Connector

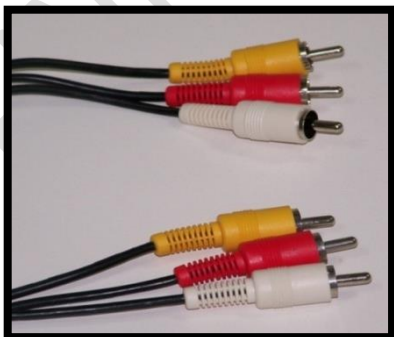


RG 6 F Type Compression Connector



RG 11 F Type Compression Connector

vi. Cable



AV Cord



RF Cord



Cable Roll

vii. Casing Caping**Support Tools & Accessories****02:00 Hrs****i. Insulation Tape**

An Insulation tape is an electric tape which is used to insulate manual joint. A wide variety of electrical tapes are available; some for highly specialized purposes. Electricians generally use only black tape for insulation purposes.

The other colours are used to indicate the voltage level and phase of the wire. (In fact, the colour tape is referred to as "phasing tape".) This is done on a large wire which is available only in black insulation.

When the wires are phased, a ring of tape is placed on each end near the termination so that the purpose of the wire is served.



ii. Hand Gloves

A glove is a garment covering the whole hand. Gloves have separate sheaths or openings for each finger and the thumb; if there is an opening, but no covering sheath for each finger, they are called "fingerless gloves".

Fingerless gloves with one large opening rather than individual openings for each finger are sometimes called "gauntlets" as well.

Gloves which cover the entire hand or fist, but do not have separate finger openings or sheaths are called "mittens".

Mittens are warmer than gloves, made of the same material because fingers maintain their warmth better when they are in contact with each other. It reduces the surface area and reduces the heat loss



iii. Torch



iv. Folding Ladder





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v. Snap Knife

It is used to open boxes like STB, installation components etc.



vi. Safety Goggle

Safety goggle is used during drilling. It protects the eyes from dust.

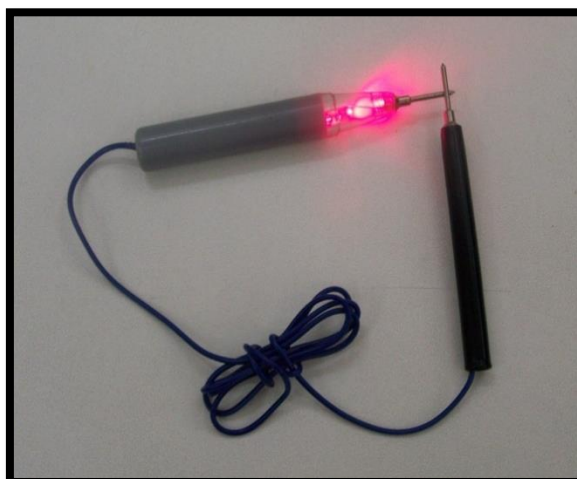
Note: Always test damaged appliances or equipment with damaged leads outdoors.



vii. Continuity Tester

It is used to check the continuity of cable. If we don't get signals at STB end, we can use this tester to check whether there is a cut within wire.

Make the centre conductor and braids short at one end and check the continuity of same at the other end. If the light in tester glows, then cable is fine.





viii. Claw Hammer

Claw Hammer is a tool primarily used for pounding nails into, or extracting nails from, some other object. Generally, a claw hammer is associated with woodworking but is not limited to use with wood products. It is not suitable for heavy hammering on metal surfaces.



ix. Hand Blower

Blower is used to clean the dust on tools.



x. Junior Hacksaw

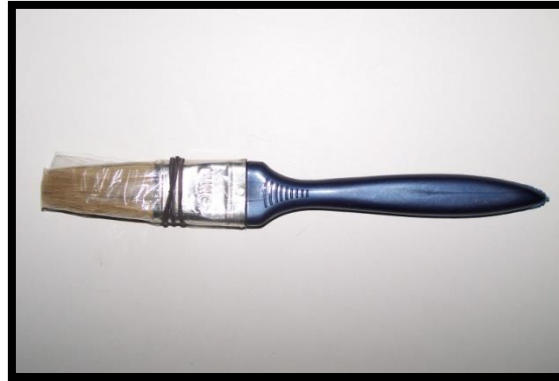
Junior hacksaw is used to cut the casing or capping.





xi. Brush

Brush is used to clean the tools and equipments.



xii. Extension Board

Extension board is used to extend the electrical supply up to its limit.



xiii. Component Box

Component boxes are used to carry small components like connectors, P Clips etc.





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xiv. Dust Pan with Brush

Dust pan is used to clean the workplace.

The electrician should always clean the workplace after finishing the work.



Outdoor Equipments Used by Electricians

01:00 Hr

i. Walk Behind Trencher

Residential electricians often use these trenchers to dig a ditch for underground electrical conduit or wire that is rated for direct burial. Wires might have to be run from the house to some post lights out in the front yard or a tool shed out in the back. The name "walk behind trencher" mistakenly gives the impression that the man in the picture is pushing the trencher but in reality the trencher is moving towards him as he walks backwards occasionally pulling on the handles to keep the trencher moving in the right direction.



ii. Scissor Lift

This is used more in commercial than residential construction. These scissor lifts are usually controlled with a joystick that has 2 functions; flip a switch one way and the joystick controls lift, up and down. Flip the switch the other way and the joystick controls the drive, forward, backward, left, right, fast and slow. The drive will only go fast when the lift is below a safe height. All the controls are dead when the stop switch is set and your foot is off the floor safety switch.

The platform can be extended manually by removing some pins, pulling the extension out and resetting the pins. Most scissor lifts





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are battery powered and might have to be plugged in at the end of the work day.

Usually this requires a standard extension cord plugged into a wall receptacle. If you don't recharge the lift at day's end you may be without power in the morning.

Practical (Hands on Practice on Tools)

20 Hrs

Equipment Required for Practical:

Hand Tools

1. Pliers
2. Screw Drivers (set)
3. Crimping tools
4. Wire strippers
5. Neon tester

Measuring devices

1. Ammeter
2. Voltmeter
3. Wattmeter
4. Ohmmeter
5. Digital Multimeter
6. Megger
7. Tong tester

Measuring Instruments

1. Measuring tape
2. Spirit level
3. Marking tools

Power tools

1. Drilling machine
2. Cutting machine
3. 22. Chasing machine

Materials and Fixtures

1. Electrical distribution board
2. Electrical socket (set)
3. Tungsten bulb/ CFL/FSL bulb
4. Halogen lamp
5. Wall socket
6. Simple switchboard
7. Mains breaker switch
8. Earth Leakage Circuit
9. Breaker (ELCB)
10. Miniature Circuit Breaker
11. (MCB)



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PPEs & Safety Equipment

1. Helmet
2. Face shield
3. Safety goggles
4. Safety shoes
5. Safety belt
6. Insulated rubber gloves
7. Ear plugs
8. Particle masks
9. Reflective jackets
10. Safety message boards
11. Fire extinguishers
12. Sand buckets



Video Links:

1. Electrical Hand Tools - <https://www.youtube.com/watch?v=Ok6QhKTCXDU>
2. Electrician Tools - <https://www.youtube.com/watch?v=SXZXtD60t2g>
3. Electrician's Hand Tools - https://www.youtube.com/watch?v=E-yvB4W_1o
4. Electrical Power Tools - <https://www.youtube.com/watch?v=ECDpTv00a6s>
5. How to Use a Multimeter <https://www.familyhandyman.com> › Electrical



Discuss in class - What is the learning from this module/unit?



Summarize the Lesson



Ask Questions/Solve the Exercise



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