6.6 SERVICE MAINS

Having brought the supplier's service line into the consumer's premises it is now to be connected to the consumer's internal wiring. The supply authorities have to charge the consumer for electrical energy consumed. For this purpose the supplier's service line will be connected to the input terminal of the energy meter to be provided by the supply authority. After the energy meter the service line is connected to cut-out as shown in Fig 6.3. The cut-out contains a fuse wire so that if the consumer draws heavier current than the rating of the meter, the fuse will blow off. The cut-out also serves the purpose of enabling the supply authority to disconnect the supply if the consumer fails to pay his bill. The cut-out and the meter are the supply authority's property and are sealed. The consumer's distribution starts after the energy meter and cut-out. The leads from the output terminals via the cut-out are connected to the consumer's main switch.

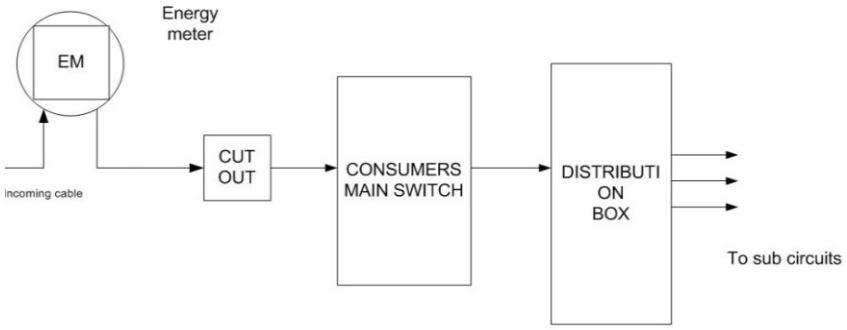

Fig.6.3: Single Line Diagram Of The Meter Distribution Board

A Service main is an arrangement of connections from service pole to consumer premises. From the distribution line consumers are given connection from the nearest pole. The service connection may be given in:

i) Overhead System
ii) Underground System.

The service connection terminates at the point of commencement of supply to the consumer.

The service cable from distributor terminate at the main cut-out and metre

The supply from metre goes to main switch for control purpose.

The service connections are provided by the supplier (Electricity Department) up to metre.

6.7 METER BOARD AND DISTRIBUTION BOARD

Meter board is a board on which the following accessories are installed:

(i) Cut Out
(ii) Neutral Link
(iii) Meter (Kwh metre)

The consumer is given connection through metre board. The distribution board and other accessories of the meter board are to be installed by the consumer. The metre board is to be provided by the electricity department. The metre and the fuse cut out is sealed by electricity department. The fuse (cut-out) is provided on phase wire after the metre to avoid theft of electricity. Fig.6.4 shows a typical diagram of meter board and distribution board.

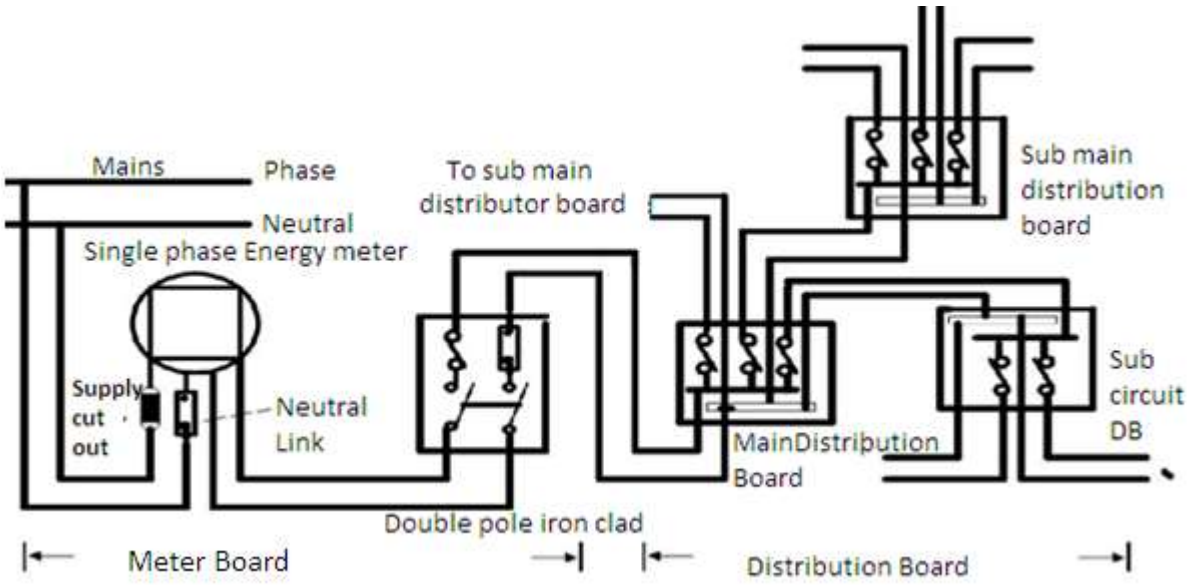

Fig.6.4: Detailed Wiring Diagram Of Meter Board And Distribution Board

Distribution Board

Every installation of any load is controlled by the main switch at main board. The main switch (Switch Gear) may be installed at a place readily accessible to the consumer and as near as possible to the supplier of service board. The type and size of the main switch depends upon the consumer's maximum load. The advantage of keeping main switch near the meter board is to save the cable length for connection and also voltage drop.

6.8 EARTHING

Earth's potential is taken as zero for all practical purposes. Hence any electrical appliance, part, machine when connected to earth attains zero potential and is said to be 'Earthed'. Voltage of this earthed appliance will fall or increase to zero if its voltage is higher or lower than the earth potential.

The frames, bodies of machineries are earthed so that in case of any ground or leakage the chances for electric shock and fire are eliminated by allowing the leakage current to flow to earth at once and the circuit's fuse blows off, thus disconnecting the machinery, appliance from the supply.

6.8.1 Necessity of Earthing

Fig.6.5 shows path of fault current through human body when no earth wire is provided. When metal frame is connected to the earth through an earth wire of low resistance, a person touching the metal frame even when the live wire is in touch with it, will provide two parallel paths through which the circuit will be completed: one through the human body and other through the earth wire. The earth wire will offer an easier path for the current to flow through the circuit and heavy current flows. This blows of the fuse isolating the equipment from the supply mains. Thus the earth wire works a protective device against any electric shock in case of fault in the circuit. Equipments are earthed using three pin socket, where the bigger pin serves as earth.

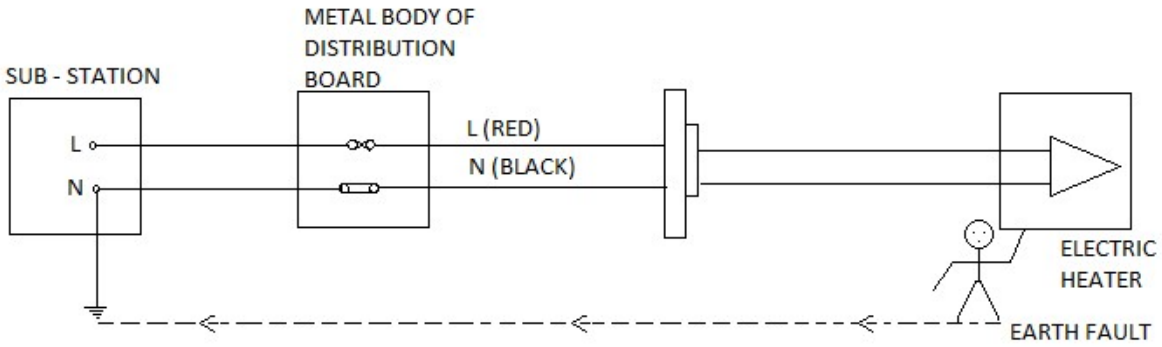

Fig.6.5: Path Of Fault Current Through Human Body When No Earth Wire Is Provided

General Requirements of Earthing

Earthing means connecting earth terminals to electrodes installed solidly in the mass of earth. It should generally be carried out in accordance with the requirements of Indian electricity rules, 1956 and the relevant regulations of the concerned electricity supply authority. I.E Rule Nos. 32, 51, 61, 62, 67, 69, 88(2) and 90 are particularly applicable. The normal expected value of earth resistance is below 5 ohms.

Methods of Earthing

There are three methods of earthing

1. Earthing through a water main
2. Pipe earthing
3. Plate earthing

First method is however not popular as water means are of concrete or cement.

6.8.2 Plate Earthing

The earth connection can again be provided with the help of a copper plate or a G.I. plate as shown in Fig 6.6. When G.I plate is used it should not be less than 60 cm. × 60 cm. × 6.35 mm while for copper plate these dimensions may be 60 cm. × 60 cm. × 3.18 mm. However, the use of the copper plate in these days, is limited .The plate is kept with its face vertical at a depth of 3m. (10 ft.) and is so arranged that it is embedded in an alternate layer of coke and salt for a minimum thickness of about 15 cm. in case earthing is done by copper plate and in coke layers of 15 cm. if it is done with G.I. plate. The earth wire is securely bolted to the earth plate with the help of bolt nut and washer. The other details of plate earthing are same as that of G.I. pipe earthing.

6.8.3 Pipe Earthing

A galvanised iron pipe of approved length and diameter can be used as earth pipe. The size of the pipe depends upon (a) the current to be carried and (b) the type of soil. According to I.S.I Standard No. 732 - 19653 the galvanised iron pipe shall not be less than 38.1mm. diameter and 2 m long for ordinary soil is dry and rocky, the length of the pipe should not be increased to 2.75 m.

The pipe is placed upright as shown in Fig 6.7 and must be placed in a permanently wet ground. The depth at which the pipe should be buried depends on the condition of ground moisture. According to Indian Standard, the pipe should be placed at a depth of 4.75 m , it can be less if soil provides sufficient moisture earlier. The pipe at the bottom should be surrounded be broken pieces of coke or charcoal for distance of about 15 cm. around the pipe. The coke increases the effective areas of earth practically to the outside of coke bed.

Impregnating the coke with salt decreases the earth resistance. Generally alternate layers of salt and coke are used for best results as represented in figure. In India in summer season the moisture in the soil will decrease to a large extent which will increase the earth resistance. So in order to have an effective earth, whenever needed, 3 to 4 buckets of water should be put into the funnel connected to the main G.I. pipe through 19mm dia. pipe.

The earth lead used must be G.I. wire or G.I. strip (not copper) of sufficient cross-sectional area to carry fault current safely. It should not be less than electrical equivalent of copper conductor of 12.97 sq. mm (8SWG) cross-sectional area. The earth wire from the G.I. pipe of 19 mm dia. should be carried in a G.I. pipe of dia. 12.7 mm at a depth of about 60 cm. below the ground. Further when the earth wire is carried over from one machine to the other, it should be well protected from mechanical injury, by carrying the earth wire in recessed portion.

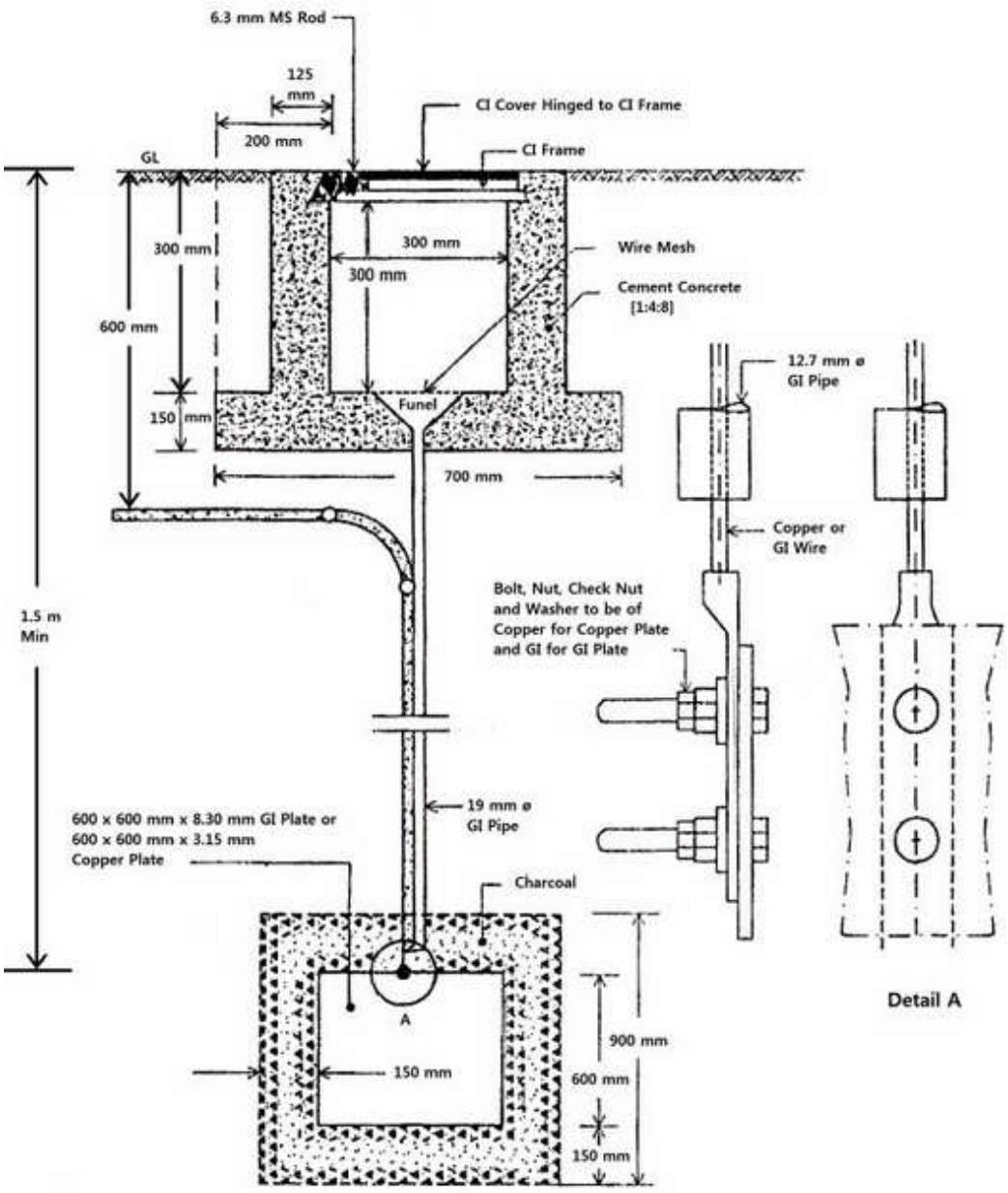

Fig.6.6: Plate Earthing

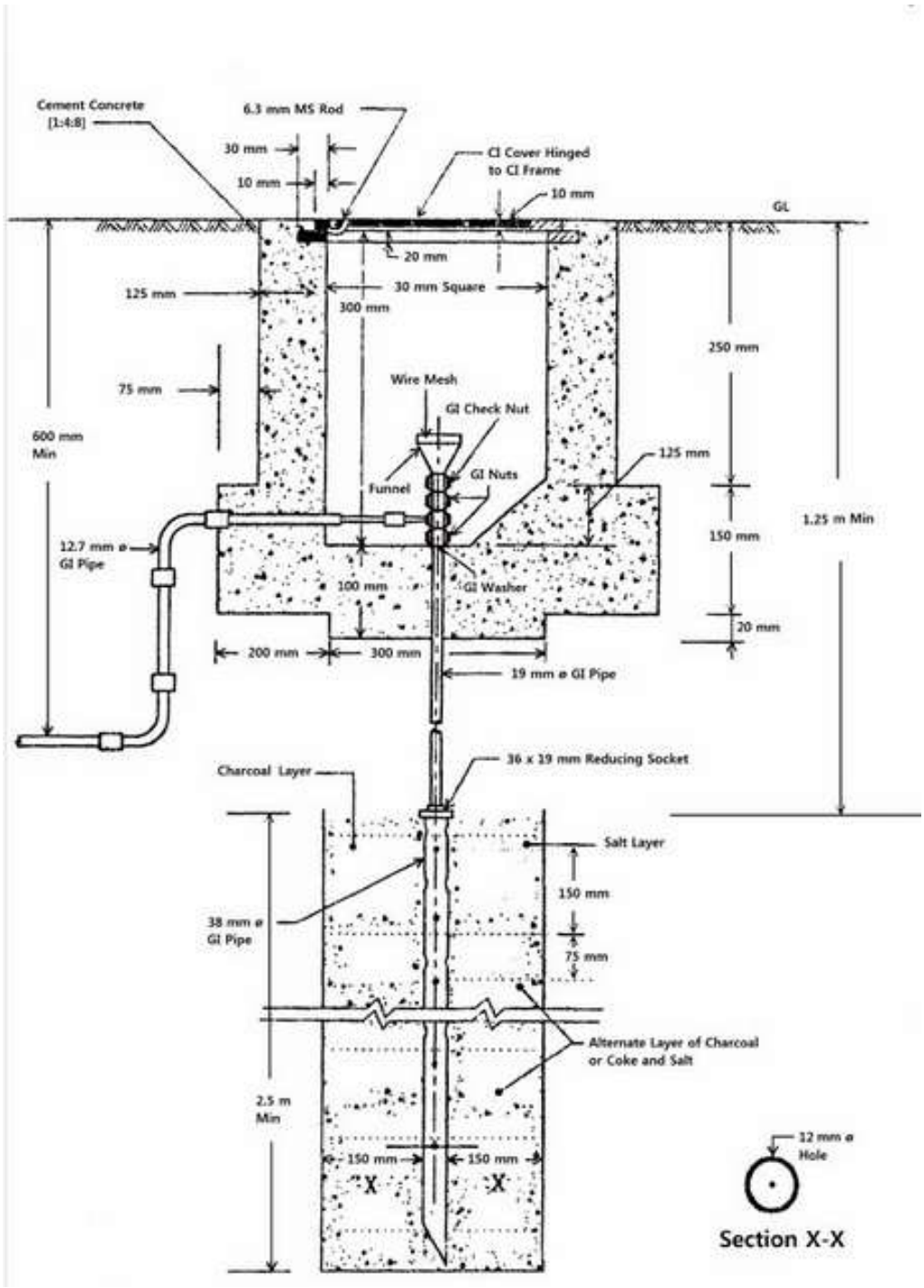

Fig.6.7: Pipe Earthing