Chapter 5
Maintenance and Repair of Transmission Lines

Transmission lines can be for high or low tension, whereas distribution lines are normally for 220V. The main components associated with transmission lines are transformers, lightning arresters, and the actual transmission lines themselves with their conductor wires, insulators, and supporting poles. The most common problems encountered with transmission lines are breaking of conductors, and breaking, loosening, or falling of poles.

5.1 Transformers

Many MHP installations do not have any transformers installed because the distance over which electricity is to be distributed is not long enough to warrant the additional cost and complexity of stepping the voltage up and down. When transformers are installed, they tend to be very reliable and to work well for many years without much attention. Nevertheless they can fail, mainly as a result of mishandling, and some routine maintenance and checks for security are necessary.

The transformer should be checked for cleanliness at least once a year. Excessive deposits of oil or dust on the insulators can cause a short circuit and damage to the insulators. Any damaged insulators should be replaced as soon as possible, including distribution switch gear insulators. The fence around the transformer should also be checked and maintained for security. Gaps in the fence could result in trespassers receiving an electric shock, leading to serious injury or even death.

Silica gel in the transparent container on the side of the transformer (to absorb moisture from the air cavity above the oil in the transformer) should be checked at least twice a year and replaced if it has turned pink. The oil level in the transformer should also be checked at least annually and new oil added as necessary.

Serious damage to a transformer can result from burned or short-circuited windings. The windings can be redone in a properly equipped workshop. A skilled person should check the continuity of the windings and the presence of any short circuit using a multimeter and a meggar. If the transformer is damaged, the whole assembly should be taken to a proper workshop for repairs and subsequent testing.

5.2 Transmission Lines

Usually, aluminum conductor steel reinforced (ACSR) wires/cables are used for transmission and distribution lines. Armoured cables are used for underground transmission lines and may also be used for overhead transmission lines if these are located in a densely populated area or one with snowfall.

Damage can be caused to the transmission cables and poles by high winds, landslides, over-tightening, and breaking or sinking of poles. Sometimes, rain or lightning can also damage the cables, as can people or animals who may unwittingly shake the poles and loosen them. The cables may break or sag, and the space between two conductors may become less or they may even touch. Poles may become loose, fall down, sink or break.

5.2.1 Broken wires

If a conductor wire is broken, it is usually necessary to add an extra piece of wire for overlapping and joining. In order to make a proper joint, all the strands at the end of each conductor wire must be opened to a length of about 300 mm and each strand twisted together with another strand from the opposite wire and then wrapped around the joint (Figure 5.1). In this way, all the strands should be twisted and wrapped to form a smooth tight and unbreakable joint. Clearly, it would be difficult to join two pieces of wire in space so as to give the exact length needed to ensure that the wire does not sag. Thus it is better to join with the broken wire a length of wire that is long enough to reach the next pole, and to tie this to the insulator on the pole. Excessive length, if any, should then be cut off. The other broken end of the wire should be trimmed and tied to another insulator on the same pole, and a jumper installed to connect the two wires (Figure 5.2).

5.2.2 Unequally sagging wires

Unequal sag of wires between two poles can be adjusted to some extent by tying the wires to an insulated stick, say a wooden piece; in vertical position (Figure 5.3). The wires should be tied to this stick in such a way that the distance between any two wires is not the same but instead a maximum for the wire that is sagging most. In this way, the chances of the wires touching at some other place will be reduced. Even so, it is better to disassemble the line and re-install all the wires and set the sag properly.

5.2.3 Leaning poles

Leaning poles can be straightened easily by pulling the wires in opposite directions. If the portion in the ground is not damaged or broken, then the same poles can be re-erected and earth and stones compacted well around the pole base so that they stay in position. If necessary, stay wires can be attached to the poles to keep them in position. If a pole is

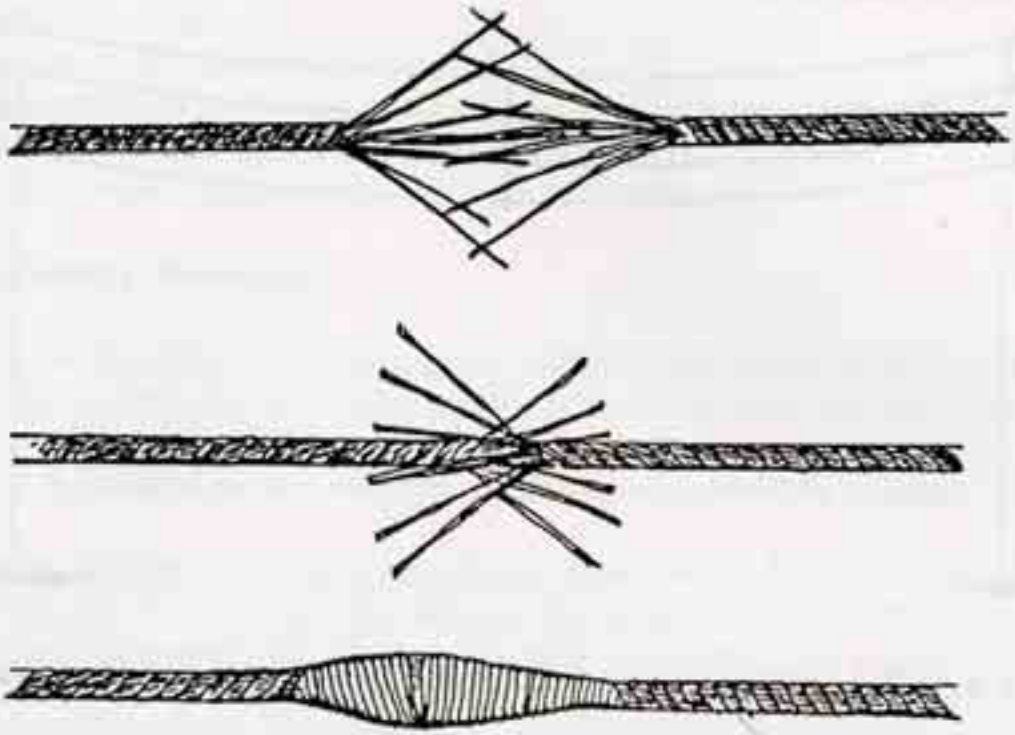

Figure 5.1: Joining Two Cable Ends

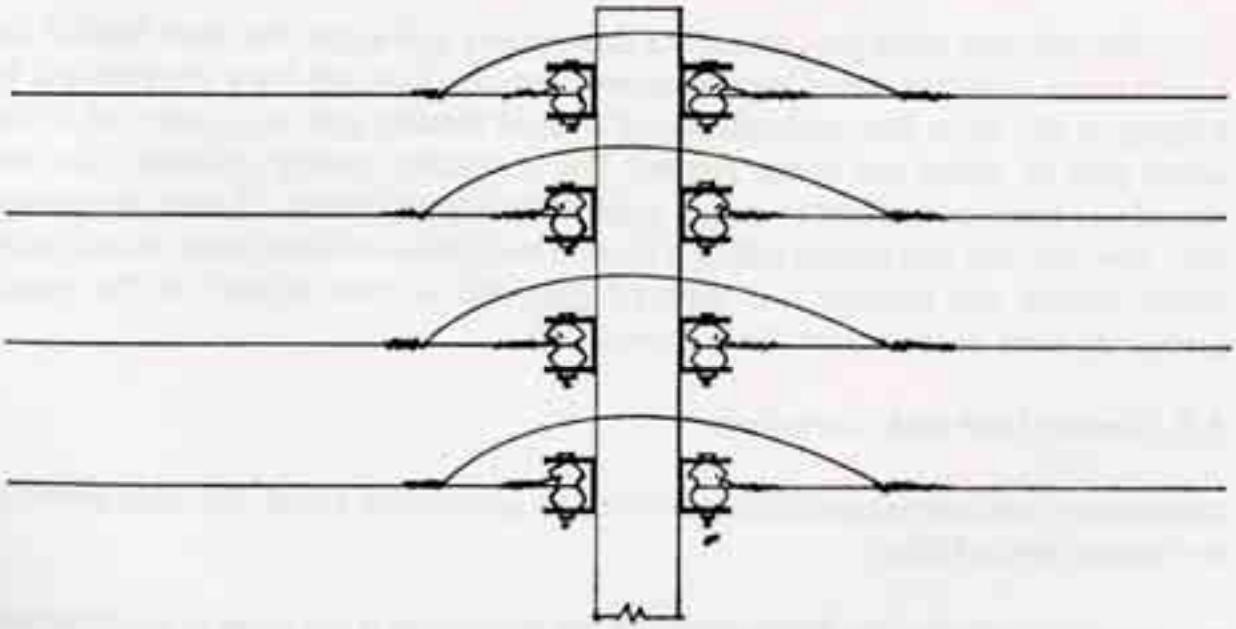

Figure 5.2: Connecting Wires at a Pole with Jumpers

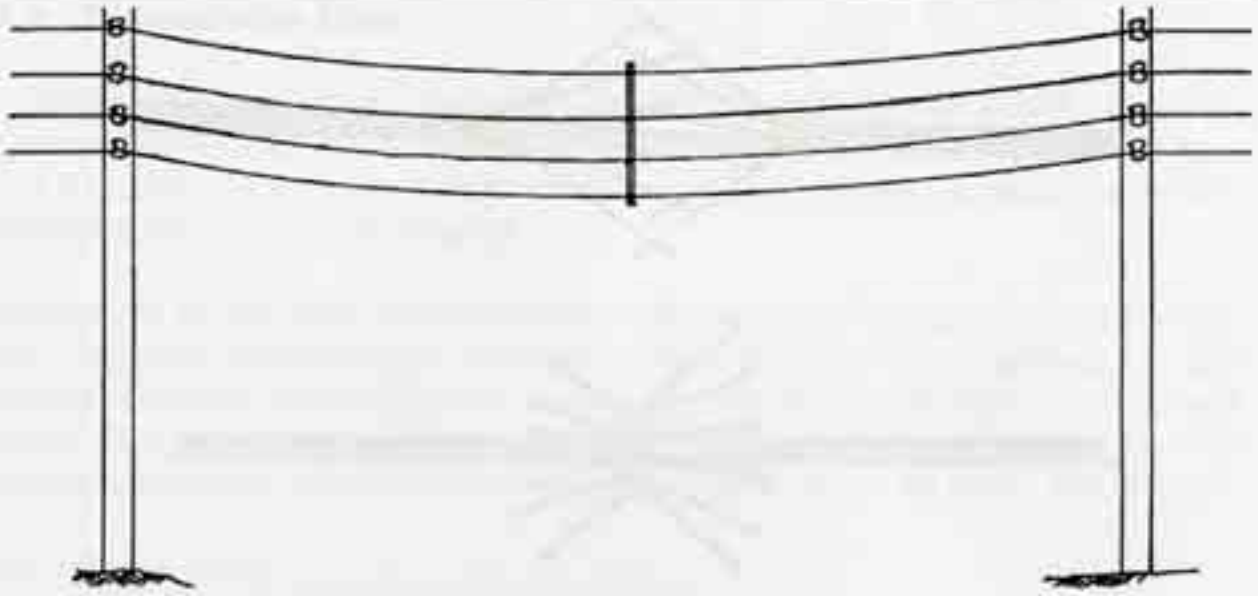

Figure 5.3: Tying Wires to an Insulated Stick to Control Unequal Sag

broken or otherwise damaged, cracked for example, then it is good practice to replace it. If the insulators on the poles are damaged or broken, they must be replaced.

5.2.4 Dislodged Poles and Wires

If the transmission wires pass through a sloping area and a pole has been fixed at the lowest point, then the wires may sometimes get disconnected from the pole and be hanging in the air, or the upper portion of a round metallic pole may come out or the whole pole be pulled out of the ground. This is actually a design problem, the pole should not have been placed in such a position during installation. If such damage occurs, then the best way to deal with it is to erect two poles, instead of one, on both sides of the original pole location, but slightly higher, and fix them properly in the ground using stay wires or foundation bolts if necessary.

5.2.5 Service Lines and Connection

Service lines and connections should be checked about once a year. The main points to be checked are as follow.

- Connection between the distribution line and service line is not loose or unauthorised.
- Insulation of the service line is ok.
- Any meters or current limiting devices installed in the houses are properly connected and not bypassed.

- The meters are calibrated.
- Faulty devices are replaced regularly.
- Distribution boxes containing connector switches or fuses are also provided where the distribution lines branch to go into different streets.
- These switches/fuses are checked and replaced if faulty.

5.3 Lightning Arresters

Lightning arrester units can be damaged if a high voltage passes through them many times. If this happens, the MCB may trip in the powerhouse, fuses may get blown, or the earth wire may show some voltage. In such a case, remove the arrester unit and check its continuity. A damaged arrester will show continuity and should be replaced.

The earthing resistance of a lightning arrester should be checked to ensure that it is within limits, i.e., less than five ohm between the earth plate and another point on the ground about five metres away. At the same time, the connections between the buried plate and the wires connected to it should be checked and, if found loose, rusted, or damaged, be disconnected, the surfaces cleaned with emery paper, and rejoined by soldering or using bolts.