

# TRANSFORMERS FOR PRECIPITATION SERVICE

## INSTRUCTIONS

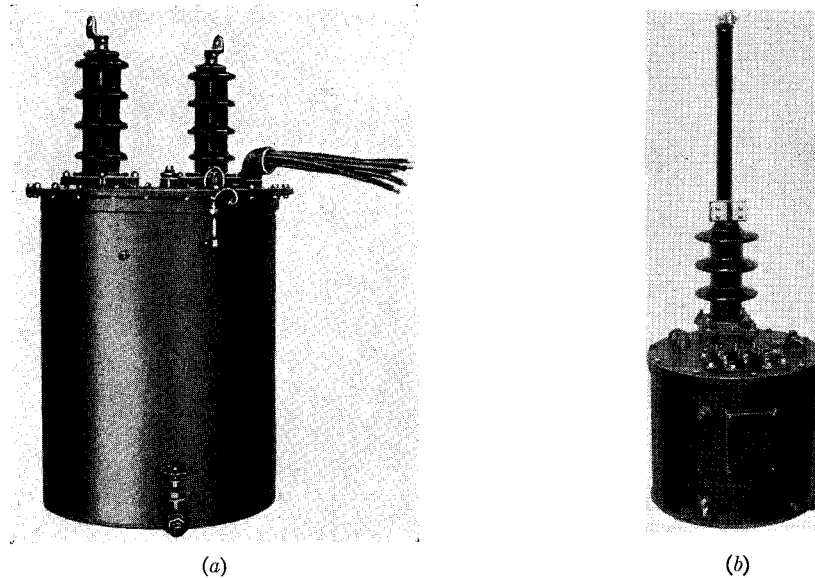


FIG. 1—PRECIPITATION TRANSFORMERS

### GENERAL

Fig. 1 shows two completely assembled Precipitation transformers. Fig. 1-(a) is an example of a Precipitation Transformer of 25 Kv-a. rating with a high voltage of 75000 volts. Other values of high voltage are made available by taps in the L.V. winding. Fig. 1-(b) is an example of a  $2\frac{1}{2}$  Kv-a., 35000 H.V., with internal filament transformer and tube mounting on H.V. bushing.

Fittings supplied with Precipitation transformers are drain plug or valve depending on the Kv-a. rating. An oil gage is supplied on all but the extremely small sizes. A thermometer connection is usually provided for the purpose of adding a Westinghouse standard dial type thermometer whenever customer so desires. A ground lug is supplied for the purpose of solidly grounding the tank.

Since the core and coils of Precipitation transformers are suspended from the cover all bushing leads are brought out through the cover. This construction makes it possible to lift core and coils, cover and bushings as a unit.

### SHIPMENT

In general, Westinghouse Precipitation transformers are shipped with oil in the tanks and all bushings in place. Under certain special conditions other methods of shipment will be required. These are described as follows:

### Methods of Shipment:

Transformers may be shipped by any one of a number of methods. The method used in a particular case depends upon the size of the transformer, type of case, transportation facilities from factory to destination and convenience in installing. The methods commonly used are:

1. Shipment in oil.
  - (a) Assembled in own case.
  - (b) Assembled in special shipping tank.
2. Shipment in dry nitrogen.
  - (a) Assembled in own case.
  - (b) Assembled in special shipping tank.
3. Shipment without oil in air.
  - (a) Assembled in own case.
  - (b) Assembled in special shipping tank.
4. Boxed and shipped separately from own case.

When a special method of shipment is required, a leaflet describing in detail the method of shipment and procedure in unpacking will be included in and form a part of the Instruction Book.

### UNPACKING

Since Westinghouse Precipitation transformers are usually shipped completely assembled unpacking is a simple matter. The crating or bracing should be removed and the transformer is then ready for setting in place.

All boxes containing accessories must be stored carefully and thoroughly protected against moisture. As soon as the transformer is unpacked, it should be examined carefully to ascertain whether it has been damaged in shipment and whether all parts are in place and in good condition.

### INSTALLATION

#### Location:

Accessibility, ventilation and ease of inspection should be given careful consideration in locating transformers. Indoor transformers must be so located that water cannot fall on the case or rain blow into or upon them.

Self-cooled transformers depend entirely upon the surrounding air for carrying away their heat. For this reason care must be taken to provide adequate ventilating facilities.

For indoor installation the room in which the transformers are placed must be well ventilated so that heated air can escape readily and be replaced by cool air from the outside. If the room is poorly ventilated this exchange of air takes place too slowly and the temperature of the air in the room may become excessively high. At any given load the temperature rise of a self-cooled transformer will be a fixed number of degrees above the temperature of the surrounding air. The temperature of the transformer is the sum of the rise and the air

## Transformers for Precipitation Service—Continued

### INSTRUCTIONS—Continued

temperature; therefore, care must be taken to provide a room sufficiently well ventilated to permit operation of transformers at a reasonable temperature. The ambient temperature should not exceed 40°C.

Self-cooled transformers should always be well separated from one another and from adjacent walls, partitions, etc., in order to permit free air circulation about the cases. This separation should not be less than 24 to 36 inches, depending on the size of the units.

**Fire Risk**—While the oil supplied with Westinghouse transformers will not take fire readily, it should be remembered that the possibility of catching fire is ever present and some precaution against fire should be taken. Transformers may be placed on a concrete floor surrounded by a ledge. Suitable means should be provided for drawing off the oil and extinguishing the fire.

### INSTALLATION OF TRANSFORMERS AND ACCESSORIES

**Caution**—Care must be taken in handling and installing transformers, particularly those wound for high voltage. As moisture is an enemy of insulation, a transformer should not be allowed to stand so that it can absorb moisture from the air or from any other source. A blow upon any part of the winding, stray pieces of solder or wire, tools, nuts, or foreign matter of any kind dropped into the transformer may cause a breakdown or burnout.

**Setting Up**—Where a transformer cannot be handled by a crane, it may be skidded or moved on rollers into place but in doing so care must be taken that it is not tipped over. A transformer with a round base is easily tipped over and should preferably be bolted to a temporary wooden frame or base before moving.

For convenience of handling, all cases are provided with lifting hooks or eyes, by means of which the case, transformer and oil may be lifted and handled as a unit. Jack lugs are also provided on the base or tank wall for lifting the complete unit. Do not use jacks on any part of the transformer except on lugs provided for this purpose.

In lifting a transformer when out of its case, a spreader may be necessary between the lifting ropes or chains in order to prevent their pressing against the terminal boards or insulation and damaging them.

Before being set up, a transformer should be inspected for breakage, injury, or displacement of parts during

shipment. It should then be tested for dryness and the condition of the oil should be determined.

An outline drawing is furnished showing the relative location of all fittings and this should be followed in setting up. The outline drawing will also list special features requiring attention during installation.

**Precaution**—When working about a transformer particular care must be taken in handling all tools and other loose articles, since material dropped into the windings and allowed to remain may cause a breakdown.

When a transformer has been shipped in its case with the oil, it should be inspected for breakage, injury or displacement of parts during shipment. This can generally be done without removing any of the oil. A sample of oil should be drawn from the bottom of case and tested. If the inspection and oil tests are satisfactory, the transformer is ready to be put into service. If the oil tests too low, it will have to be filtered and it may also be necessary to dry out the transformer. Whether drying will be necessary, can be determined by the Megger test.

**Connections**—The diagram, usually on a metal plate attached to the side of the case, shows the terminal connections for various voltages. Care should be taken to see that all connections are properly made, as a wrong connection may cause serious damage or a burnout. Then with the outlet bushings in place, the high voltage and low voltage leads should be connected to their proper terminals.

### PLACING IN SERVICE

When voltage is first applied to a transformer it should, if possible, be brought up slowly to its full value so that any wrong connection or other trouble may be disclosed before damage can result. After full voltage has been applied successfully, the transformer should preferably be operated in that way for a few hours without load. It should be kept under observation during this time and also during the first few hours that it delivers load.

Although oil has been tested for moisture just prior to applying voltage to the transformer, it is advisable to test the oil again for moisture after four or five days of service.

### MAINTENANCE

**Inspection**—Transformers require less care and attention than almost any other kind of electrical power apparatus. This, however, is not a reason for neglecting them. The conditions under

which they operate will determine to some extent the frequency with which they should be inspected. A regular program of inspection should be established and rigidly carried out.

The oil should be tested for dielectric strength and the presence of sludge. If there is an indication of moisture or sludge formation, the oil should be tested further and treated as described in Instruction Book on Insulating Oil, I.B. 44-820-1. If tests show the oil to be in bad condition an inspection should be made on the inside of the tank for possible cause of the trouble. However, if the oil tests satisfactorily the case should not be opened but a careful inspection of all accessories should be made to see that they are functioning properly. Transformers equipped with the Inertaire device cannot have sludge formation since oxygen is excluded. The record of deoxidizing compound, or nitrogen gas consumption should be studied and if excessive the case should be tested for leaks as described in Instruction Book for Inertaire Transformer Equipment.

Any increase in operating temperature at normal load should be investigated and if the cause cannot be determined the transformer should be taken out of service and given a thorough inspection.

Any symptoms such as unusual noises, high or low oil levels, rupturing of relief diaphragm, etc., should be investigated at once.

Transformers which have been subjected to unusually severe operating conditions such as overloads, frequent short circuits, or special units such as furnace transformers should be inspected internally at least once a year. This can usually be done adequately by lowering the oil level and inspecting with a light through the manhole.

### SPARE PARTS

The spare parts for Westinghouse Precipitation Transformers are described in detail under the sections covering the component parts of these transformers.

It is recommended that a spare set of bushing gaskets be carried in stock.

In writing with reference to any transformer always give full nameplate reading as this furnishes accurate information for identification.

### SERVICE DEPARTMENT

Westinghouse maintains a service department for the purpose of giving service to customers. It is recommended that questions of installation, operation or maintenance which are not covered in this instruction book be taken up with the nearest Service Department or Sales Office.

Westinghouse Electric Corporation

Sharon, Pa.

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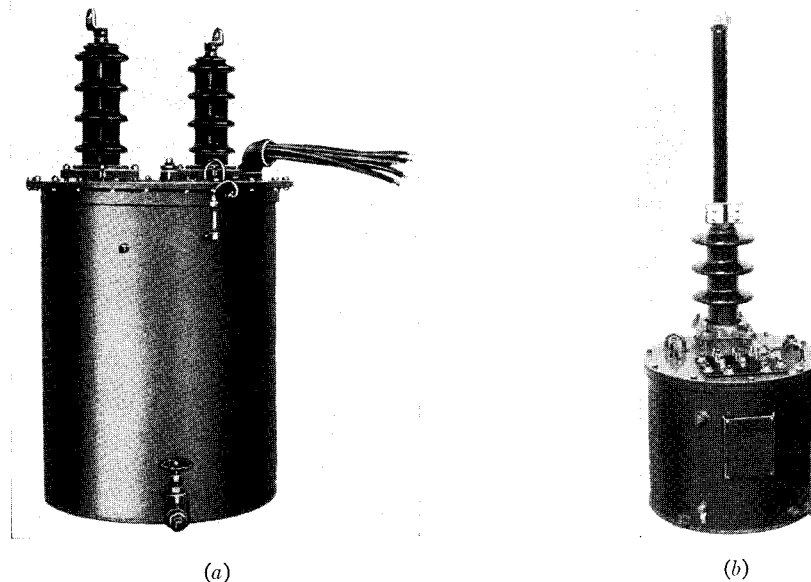


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