SHIPMENT IN DRY NITROGEN AND INSTRUCTIONS FOR UNPACKING

SHIPMENT

When transformers are shipped in dry nitrogen they may be shipped in their own tank, or in a special shipping tank.

Transformers with radiators when shipped in their own tank generally have some or all of the radiators removed. The radiator flanges on the tank are covered by blind flanges or by radiator valves and blind flanges. The detached radiators are always crated and shipped separately.

The transformer oil is shipped in tightly sealed metal drums or tank cars.

Transformers which are too high to ship standing up may sometimes be shipped by laying them down on the car. In such cases special bracing must be placed inside the tank. This bracing must be removed when the transformer is installed, unless specified otherwise on the outline drawing of the transformer.

It is frequently necessary with large transformers to have a joint in the tank so that the top section may be removed for shipment. Either the regular cover or a special shipping cover is bolted on the top of the lower section of the tank for shipment. If a special cover is used it is sometimes made with a box-like structure which makes room for terminal boards, etc., which extend up beyond the top of the lower section of the tank.

Some of the bracing in a transformer is put on for shipment only. The transformer core is always tied securely to the tank wall in large transformers to take care of shocks received in shipment. If the transformer is removed from the tank for inspection during installation, it is unnecessary to replace these ties.

On shell form transformers vertical braces are placed against the stacked iron punchings to brace them for shipment. These vertical braces known as punching braces are required for shipment only and may be removed when installed. It is not essential that they be removed, but since they perform no useful function once the transformer is installed, they may be removed, if readily accessible during installation, and if there is no possibility of reshipment.

If a shell type transformer is shipped with the plane of the opening in the tongue at right angles to the length of the car, it is usually necessary to place a wood block at each end of the opening in the tongue behind the coil support rods. Where these braces are used, it is recommended that they be removed during installation.

UNPACKING

When the transformer is shipped in dry nitrogen, special precautions must be observed in unpacking, so that the conditions of the coils and insulation may be determined. The case, in which the transformer is shipped, is sealed and contains dry nitrogen at a pressure slightly in excess of 3 pounds per square inch. *Inside the case is mounted a receptacle containing a charge of calcium chloride for the purpose of absorbing residual moisture at time of sealing and moisture that may have entered with air in transit.

Checking Transformer on Arrival—To determine the condition of the transformer on arrival at its destination, it is necessary to make several measurements. These measurements should be made in the same order and in the manner outlined below.

Pressure—A low reading pressure gauge, preferably one with a negative scale extension, should be used and can be attached to one of the filter press valves of the tank. Care should be taken not to allow any gas to escape or air to enter. The temperature should be noted and should preferably have been fairly constant for several hours previously. The absolute pressure (gauge reading plus 14.7 lbs.) should vary directly with the absolute temperature (degree C. temperature reading plus 273).

Oxygen Content—This can be determined by the Standard Orsat apparatus for analyzing flue gases, using pyrogallic acid as a reagent for oxygen. When the gas pressure in the tank is very low, great care should be taken not to allow the outside air to affect the reading. A complete discussion of a method of making gas analysis will be found in the Instruction Book for Inertaire equipment. The increase in oxygen content over that reported at shipment is an indication of the amount of air that has entered during shipment. There will, however, always be a slight increase in oxygen due to the diffusion of that normally contained in the core and insulation. The only factor of importance is the amount of moisture that may have entered with the air admitted from outside the tank.

***Weight of Calcium Chloride**—The increase in weight of container with calcium chloride over that reported on the instruction card will be the net amount of moisture absorbed. The calcium chloride will absorb most of the very small amount of residual moisture remaining after sealing the transformer for shipment, and this moisture alone should not measurably increase the weight of the chloride.

The chloride container must be entirely removed before filling the transformer with oil.

***Calcium Chloride is used only for domestic shipment.**

Interpretation of Results—No limits of pressure, oxygen content or moisture content can be given for determining whether or not the transformer may be put into service without drying out. It is therefore essential that full advantage be taken of the indications afforded by the measurements outlined above, supplemented when necessary by insulation resistance measurements.

The following combination of results may be taken as indicating that the transformer is in a dry condition:

1. All readings close to those reported on instruction card.
2. Low pressure with low oxygen and low moisture content.
3. High pressure, low moisture and high oxygen (not exceeding 5%).

If the combination of readings is not reassuring, insulation resistance measurements should be made to aid in making a decision as to the advisability of drying out the transformer before placing in into service.

The transformer will undoubtedly require drying out in the following cases:

1. Obvious damage during transit to the shipping container, resulting in complete loss of pressure and complete diffusion of air into the container.
2. Low pressure, high oxygen, high moisture content.

Damage in Transit—In all cases of loss of pressure due to damage in transit, the transformer should be thoroughly inspected and dried out without delay.

Storing Transformers in Nitrogen—It is recommended that the transformer be immersed in Wemco "C" transformer oil of standard insulation strength as soon as practicable after arrival at its destination. If absolutely necessary, it is permissible to store the transformer in nitrogen as received for a short time before filling with oil. In this case only the pressure and oxygen measurements should be made on receipt to avoid admission of air. If the pressure is low but the oxygen content indicates negligible admission of air, the pressure should be restored to approximately 3 pounds per square inch by introducing dry nitrogen under pressure. In case of high oxygen content, the tank should be blown out by dry nitrogen until an oxygen content of 1% or less is obtained, after which the pressure should be built up to 3 pounds.

The cause of low pressure should be determined and eliminated.

Nitrogen—Commercial nitrogen is not satisfactory for use in transformers on account of its relatively high humidity. The nitrogen used by the W. E. & M. Co. for shipping purposes and for preparing Inertaire transformers is specially processed to insure a uniformly low moisture content. This nitrogen is put up in cylinders which may be obtained from several different suppliers. For complete information in regard to ordering this nitrogen, see Instructions for Inertaire equipment.

Reports—It is requested that reports of readings taken on each transformer as received be forwarded to the nearest Service Branch or Sales Office of the Westinghouse Electric & Manufacturing Company.

Westinghouse Electric & Manufacturing Company
Sharon, Pa.

Westinghouse Press
Printed in U.S.A. Rep. (10-42)