

INSTALLATION OPERATION AND MAINTENANCE INSTRUCTION MANUAL FOR 11/0.433 KV DISTRIBUTION TRANSFORMERS OF RATING 400 KVA, 630 KVA & 1000 KVA FOR DELHI ELECTRIC SUPPLY UNDERTAKING

INTRODUCTION

MARSON'S Transformers are designed, manufactured, and tested to high standards of practice, and are reputed for their quality, and reliability in service.

This manual covers the installation, operation and maintenance of oil immersed distribution and power transformers.

Careful observation of the instructions presented in this manual, and regular maintenance, will ensure continuous trouble-free performance of the transformers.

The instruction provided in this manual are given for information and guidance, and the company cannot accept the responsibility for the manner in which they are observed and for any consequences thereof.

INSPECTION ON ARRIVAL :

Transformers are despatched from our works. Completely filled with the oil and ready for service.

STORAGE :

Transformers received at site and not expected to be installed immediately are likely to absorb moisture. Hence it is desirable to erect and commission the transformer with minimum delay.

HANDLING :

Transformers should be lifted by the lugs provided for the purpose and simultaneous use should be made of all such lugs in order to avoid any unbalance in lifting. Before lifting the complete transformer, it should be ensured that all cover bolts are tightened.

LOCATION OF TRANSFORMERS :

The installation site should be such that there is easy accessibility for inspection. The transformer installation position should be such that the breather, oil level indicator, rating and diagram plate, dial thermometers etc., can be safely examined with the transformer energized. It should also be possible to have access to the operating mechanisms of the on load tap changer/off circuit tap switch, marshalling box etc. The sampling valve, drain valve etc. should be of convenient locations.

When transformers are installed indoors, proper ventilation should be provided and adequate space should be provided around the transformer to enable it to dissipate the losses properly. If adequate spacing is not provided, the temperature of the transformer will increase, and this will adversely affect the insulation of the windings and the condition of the oil.

FOUNDATIONS :

Special foundation is not required for the installation of a transformer, except a level floor strong enough to support the weight and to prevent accumulation of water. The transformer foundation should be provided with adequate oil soak pits and drains.

For outdoor installations, a level concrete plinth of correct size to accommodate the transformer in such a way that no person may step on the plinth, should be provided for transformers.

TESTING AND COMMISSIONING :

If the foregoing instructions have been carefully followed, the transformer can now be safely put into service after precommissioning tests.

TAP CHANGER :

Check that the taps operate simultaneously on all the phases. The transformer provided with off circuit tap switch, check whether the mechanical operation including the locking arrangement is satisfactory.

BUSHINGS :

Check whether line connections have been properly done. Also ensure that arcing horn gaps have been properly set.

GENERAL CHECKS :

- Check whether all oil valves are in correct position, closed or open as required.
- Check that no air pockets are left in the tank.
- Check that all thermometer pockets are filled with oil.
- Check whether oil is at the correct level in the conservator, on load tap changer tank, bushings etc.
- Check whether earthing connections have been properly done.
- Check that the transformer is properly installed and there is no possibility of any movement during operation.

COMMISSIONING :

If all the above pre-commissioning tests/checks are found satisfactory, allow settling time of at least 24 hours for oil and release air from all points. The transformer can now be energized at no load with the tap changer at normal position, after setting the protective relays to the minimum extent possible. The voltage should be built up in steps wherever possible. Check whether the primary voltages and currents are balanced. Also check if there is any undue noise or vibration during commissioning. After a few hours of energisation at no load, the transformer should be switched off. The Buchholz relay should be checked for collection of air/gas. Abnormalities noticed should be corrected. All protective relays should be reset to normal values. The transformer can now be energised and loaded gradually. Check whether the voltage and currents on the HV & LV sides are balanced, increase the load to the rated value and check that the noise is not appreciable. A good transformer operates with a healthy hum. Observe the operation for a few hours. If the operation is satisfactory, the transformer is kept on load and readings of voltage and currents on all the phases of both HV & LV sides are checked. Check the temperature of top oil at regular intervals.

MAINTENANCE GENERAL :

If a transformer is to give long and trouble free service it should receive a reasonable amount of attention and maintenance. The causes of breakdown of transformers may be classified as follows :-

- a) Faulty design or construction
- b) Incorrect installation or use
- c) Overload
- d) Neglect
- e) Wear and tear and other deterioration
- f) Accidents

A rigorous system of inspection and preventive maintenance will ensure long life, trouble-free service and low maintenance cost. Maintenance consists of regular inspection, testing and reconditioning where necessary.

Records should be kept of the transformer, giving details of all inspections and tests made, and of unusual occurrences if any.

The principal object of maintenance is to maintain the insulation in good condition. Moisture dirt and excessive heat are the main causes of insulation deterioration and avoidance of these will in general keep the insulation in good condition.

MAINTENANCE PROCEDURE :

SAFETY PRECAUTIONS :

Before starting any maintenance work the transformer should be isolated from the supply and the terminals earthed. The level of oil in the transformer should be borne in mind when undoing nuts and bolts and before unsealing the tank. No fire should be kept near the transformer while maintenance work is going on.

OIL :

The oil level varies with the oil temperature. The indicator generally shows the 'cold' level when the oil is at a temperature of about 25 Deg.C The transformer should be tapped up as necessary with clean transformer oil. If the oil level drops appreciably over a short period, the tank should be checked for leaks. In case there is a leak on a welded joint, it should be rewelded. A leaking gasket may be remedied by tightening the bolts. If this is not sufficient, the gasket should be replaced.

CONSERVATOR :

Conservators are so arranged that the lower part acts as a sump in which any impurities entering the conservator can collect. A valve/plug is fitted at the lowest point of the conservator for draining oil. The inside of the conservator should be cleaned every two or three years.

The oil level indicators should be kept clean and examined at regular intervals, and oil should be added when the level indicated is low.

SOME POSSIBLE REASONS FOR TRANSFORMER FAILURES AT SITE

1. Continuous over loading of transformer beyond rated capacity.
2. Improper tap position can cause excessive core loss and consequently excessive heating.
3. Outgoing cable faults if not cleared in specific time.
4. Improper contact of fuses/over capacity fuses.
5. Cable connection to LT bushing terminals loose.
6. Improper/loose earthing connection.
7. Unbalance load conditions.
8. Improper maintenance/checking of oil level in conservator/transformer and not topping up oil to required level.
9. Non checking of the condition of silicagel/not changing/reactivating the silicagel if silicagel has turned pink in colour.
10. Non checking oil level in bottom of breather/forming oil seal and not making up the oil level when required.
11. Not periodically checking the condition of gasket joints and tightening/replacing gaskets if needed.