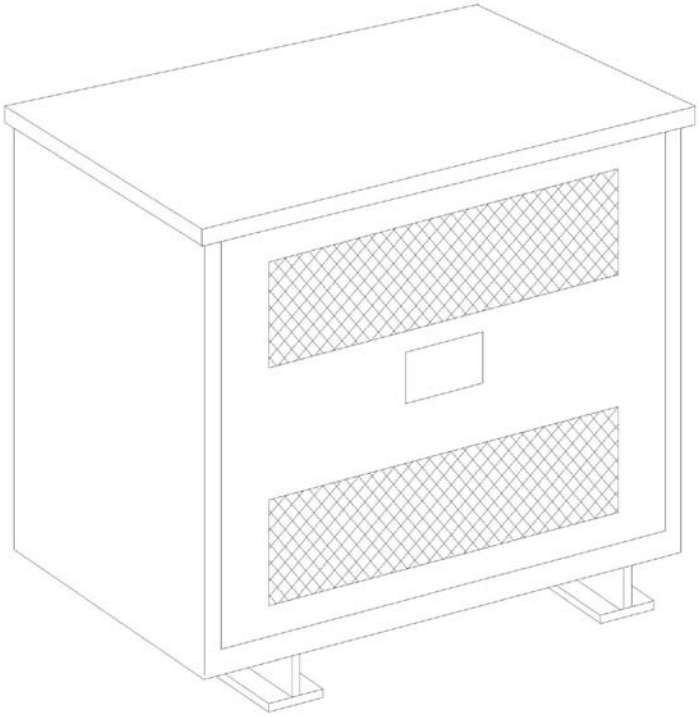
DRY TYPE INSTRUCTION
AND
MAINTENANCE MANUAL



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DRY TYPE TRANSFROMER INSTALLATION AND MAINTENANCE INSTRUCTIONS

UNLOADING AND HANDLING

The transformer must be handled with care to prevent damage to the enclosure or the core and coil assembly. The use of a fork lift with forks extended completely under the entire unit is recommended. The forks should extend out past the opposite side a small amount for full pickup coverage. The other method of lifting off of an open truck or a storage area that the unit may have been placed in, is to use the lifting eyes or openings provided.

Note: Always check the nameplate weight before attempting to lift the transformer.

When lifting the transformer be sure your equipment including cables can handle the load. Where steel cables or nylon straps are used, it is good practice to use spreader bars to keep the cable from damaging the enclosure of the transformer. Where conditions allow, it is always better to use convention slings or ropes.

Always have the transformer in the upright position when moving the unit. The transformer should never be slid across the ground or floor unless it is mounted on a skid or rollers are used. Damage could result to the enclosure in some cases when the enclosures are not designed for moving other than on a skid or rollers. When feasible, dollies with casters or a flat base can make the operation of moving the equipment much easier.

When transformers are handled outdoors during wet weather or other inclement conditions, be sure to keep the transformer covered with original plastic cover or a tarp of some kind. Most dry type transformers are of a NEMA 1 construction for indoor use and the weather can damage this type of unit.

Always store the transformer in a warm dry location with uniform temperature to prevent condensation. Use a plastic cover to keep out dust and contaminates during storage.

LOCATION

Atmosphere: Select a location that has the driest and cleanest air possible for installation of a NEMA 1 enclosed open ventilated transformer. Avoid exposure to splashing or dripping water or other liquids. If this is not possible, please provide proper protection of the transformer to avoid any problems due to contamination. NEMA 3R or outdoor design units require a rain shield or suitable housing for protection from the elements.

Temperature: Temperature in the installation area must be normal for the rated design. Transformers are designed to operate at a maximum ambient temperature of the cooling air at any time not to exceed 40 Degree C, and the average ambient temperature to be 30 Degree C over a 24 hour period. At higher or lower ambient temperatures loading can be adjusted to its maximum value by the following values

1. For each degree of C that the average ambient of 30 Degree C is exceeded the maximum load on the transformer must be reduced by 1% rating of the KVA.

Example: 300 KVA – 1% = 297 KVA

2. For each degree of C that the average ambient is less than 30 degree C the maximum load can be increased by .67% of the rated KVA.

Example: 300 KVA *.67% = 302 KVA

Ventilation: The location of the transformer must be in an area with good ventilation. For proper cooling of a dry type transformer it depends on circulation of clean are free from dust, dirt, or corrosive elements. Filtered air is preferably and may be mandatory in some cases of extreme air pollution. In any case it can help reduce the maintenance of the transformer.

1. Height of the vault and location opening can affect the transformer loading due to air flow or lack of air flow.
2. A distance of a minimum 1ft. should be provided on all sides of a dry type transformer as well as between adjacent units.
3. Wall mount transformers should have at least 6 inches of space beneath the transformer to provide adequate ventilation.

4. Free standing or floor mount transformers with bottom ventilation must be on the feet provided with clearance of minimum of 1 ft.1front to rear for access to proper air flow for bottom ventilation.

INSTALLATION

Dry type transformers can be mounted on various surfaces and with different methods of mounting. The transformer should be mounted in an upright position. This will permit the best effective ventilation

Be sure the surface to which the transformer is mounted is strong enough to handle the weight of the unit. Be sure to check the nameplate for the weight before installation.

In most cases it is best that the surface be flat and level, although this is not critical. If it is not flat and level, additional noise from vibrations may be heard.

Installation of a dry type transformer also involves another important consideration and that is the possible need to supply impulse protective devices such as arresters. Dry-types do not have the same impulse levels as their liquid filled counterpart. Where the units could be exposed to lightning strikes or heavy switching transients, proper protective equipment should be provided.

GROUNDING

The enclosure of the transformer and the core assembly should be permanently grounded in accordance with the latest National Electric Code requirements. Local requirements may vary so consult your electrical contractor for additional information.

TAP SETTINGS

To correct for high or low voltage on the secondary of the transformer, the units are normally equipped with taps at 2-2 ½% fcan & fcbn. This allows for a voltage change of up to 5% either way.

DRYING OF CORE & COIL ASSEMBLY

If the transformer has been stored outdoors or it has been subjected to an extended shut down under high humidity conditions, it may be required to dry the transformer out. You can check the unit by a megger for proper ratings based on the voltage to see if it is required. If readings are low, the transformer should be dried before applying rated voltage and loading the unit.

1. All free moisture should be blown or wiped from the coils, core and bus work. Heat can be applied by use of space heaters to help dry the surface moisture in the enclosure. The use of fans to blow the heated air up through the coils from bottom to top will help speed up the process. Care should be taken not to exceed the insulation temperature rating or damage could occur to the coils. It is important that the heated air pass through the ventilation ducts in the coil assembly.
2. Drying time will depend on the transformer size, voltage and amount of moisture present. The higher the parameters the longer it will take to dry the transformer.
3. A good gauge is to check the winding insulation resistance during the process with a “Megger” Insulation resistance will increase during the drying process and the heat should continue until it reaches a plateau. The resistance measurements should be taken in the same manner on all windings.

PRECUATIONS TO MINIMIZE SOUND LEVEL

There are a number of installation precautions and mounting techniques which if carefully noted and followed will help in the reduction of audible sound levels in energized transformers. Some of the more pertinent information and notes are below:

1. Proper location is the first consideration in an installation to keep within or below the prescribed decibel limit of the area.
2. Keep the transformer away from the area that the noise would be the least tolerated.
3. Avoid mounting the transformer in a room corner close to the ceiling. Three sided corners act a megaphone and amplify the sound level.
4. Avoid installing in corridors or corners in a stair well. The transformer sound can be reflected from the walls and be additive to the primary sounds of the transformer increasing the decibel level buildup.
5. Where it is feasible, experiment with the location of the transformer operation and positioning to see which area is the best location and orientation for decreased sound level.
6. Where necessary, the walls of the transformer room could be covered with a sound dampening material such as fiberglass, acoustical tile, kimsul and similar materials to reduce the

propagation of transformer noise to any adjacent areas. It should be noted however that such material has a major effect on the high harmonics of the transformer, but little effect on the normal hum associated with the unit. While special sound insulation materials are available for the 120 cps frequency range, their present cost may make them impractical for the application.

Transformer mounting methods can play an important role in the control and reduction of the audible sound coming from the unit. The main objective is to isolate the noise and prevent its mechanical transmission to the supporting enclosure, structure and bus connections. This can be accomplished with a single or combination of installation techniques:

1. Use solid mounting where the transformer can be heavy solid mass which cannot be vibrated audibly. Such would be a reinforced concrete floor or wall.
2. Installing on a structural frame, wall, ceiling or column a flexible mounting technique should be employed. Special vibration or isolation pads called “flexible mounts” or “vibration dampeners” should be used. There must be no solid metal contact between the transformer and the supporting surface, otherwise the vibration of the pads would be “short circuited” These pads can be furnished and installed by an electric contractor.
3. Use flexible connectors between the transformer bus and the raceway or system bus connections. This will help prevent the transmission of noise vibrations from the enclosure to the raceway system, panels and other mechanical components. Between the enclosure and the raceways, flexible metal conduit and nonmetallic tubing can be acceptable items for these relatively short connections.
4. Dry-type transformers are provided with vibration dampening pads between the core and coil assembly mounting and the case. This mounting is tightly secured with nuts and bolts for mechanical strength during shipping. After installation of the transformer, these should be loosened, for effective vibration dampening and minimizing of additional noise.
5. Lifting eyes may contribute to the noise and should be removed after installation.

MAINTENANCE

Like all equipment transformers do require occasional maintenance to assure proper operation. Inspection to the unit should be made on regular intervals to evaluate whether corrective measures should be taken.

1. Frequency of inspections depend on the area of installation. If the area is normally clean and dry then an annual inspection may be enough. In other locations if the area is contaminated with dust or chemical concerns a three to six month interval may be better. To start check within three months to see if the unit is not experiencing any problems
2. With the transformer de-energized (be sure to always check the main switch to make sure) access the inside of the transformer by removing the external panels and putting them aside. Inspect for dirt on the coil surfaces and at areas where the air flow could be restricted. If excessive dirt is found on the windings and insulators, actions should be taken to clean the unit immediately. Dirt can cause tracking and poor air circulation causing overheating. Clean the winding ducts by forcing air through them. Also carefully clean the top, sides and bottom end of the coils. The use of a vacuum cleaner is the preferred method of cleaning the coils in the first step of the process. This can be followed by clean dry air from a compressor to blow out the coils. The air should not be over 30 psi.
3. Check for loose connections which could cause heating and loose of power. Check condition of the tap changer, terminal board and general condition of the transformer.
4. Observations should be made for signs of overheating of the insulation and of voltage creepage over the insulation surface. This over heating or creepage would be evident by change in color of insulation in some areas, tracing or tracking with carbonization.
5. Enclosure condition should also be monitored. If signs of rust or corrosion is evident, corrective measures should be taken where necessary.
6. If the unit is to be shut down for a period of 12-24 hours, in humid environments it would be best to install small strip heaters for avoiding the effects of possible condensation I the enclosure and on the coils.

ENCLOSURE TYPES

NEMA 1-Enclouse constructed for indoor use and provides a degree of protection to personnel against contact and to equipment against falling dirt

NEMA 2- Enclosure constructed for indoor use and provides a degree of protection to personnel against contact and to equipment against falling dirt and to provide a limited degree against dripping and light splashing of liquids.

NEMA 3R- Enclosure constructed for either indoor or outdoor use and provides a degree of protection to personnel against contact and to equipment against falling dirt, rain, sleet, snow and will be undamaged by the external formation of ice on the enclosure.

NEMA 4X- Enclosure constructed for either indoor or outdoor use and provides a degree of protection to personnel against contact and to equipment against falling dirt, rain, sleet, snow windblown dust, splashing water, and hose directed water and corrosion and will be undamaged by the external formation of ice on the enclosure.

These are the common enclosure designs which are available for the transformers we build and sell.

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