

## DRY TYPE TRANSFORMER INSTALLATION

SPC-TD150-90

### HANDLING

- Transformers must be handled with Care to prevent damage to enclosures and core-coil assemblies. Use of fork trucks, with forks extending under the entire unit adjacent to the mounting feet is recommended. Other methods of lifting the units off trucks or storage docks are to use the lifting eyes or openings provided. Always check the transformer weight on the nameplate and be sure lifting cables are of sufficient strength. Where steel cables and slings are necessary, it is good practice to use spreader bars to keep the cables from bending or damaging the steel enclosure. Where weight conditions permit, conventional ropes might be preferable.
- Always move a transformer in its upright (top end up) position. Units should never be slid laterally across the ground or floor unless they are mounted on a skid, and rollers are used to facilitate forward motion. When feasible, caster-equipped flat bases or dollies simplify the operation.
- When transformers are handled outdoors during wet or snowy weather, keep the unit covered with its original protective plastic cover.
- Store transformers in a warm, dry location with uniform temperature to prevent condensation. Use plastic cover to keep out dust.
- IMPORTANT - for making connections to aluminum bus bar use either AL-CU connectors or the proper joint compound with proper "BELLVILLE" washers.**
- Be sure that no tools or bits of metal hardware are dropped into the coils during handling and installation. Presence of any metal or foreign material in the coil assembly may cause insulation failure.

### LOCATION

- Atmosphere. Select a place that has the driest and cleanest air possible for installation of open-ventilated units. Avoid exposure to dripping or splashing water or other wet conditions. If this is not possible, provide proper protection of the units. Outdoor application requires a suitable housing or rain shields.
- Temperature in the installation area must be normal, or the transformer may have to be de-rated. Modern standard, ventilated, dry-type transformers are designed to provide rated KVA output at rated voltage when the maximum ambient temperature of the cooling air at any one time is 40°C, and the average ambient temperature of the cooling air over any 24-hour period does not exceed 30°C. At higher or lower ambient temperatures, transformer loading can be adjusted to its maximum value by the following relationship:
  - For each degree C that average ambient temperature exceeds 30°C, the maximum load on the transformer must be reduced by 1% of rated KVA.
  - For each degree C that average ambient temperature is less than 30°C, the maximum load on the transformer may be increased by 0.67% of rated KVA.

- Ventilation at the place of installation is another important requirement. For proper cooling, dry-type transformers depend upon circulation of clean air - free from dust, dirt or corrosive elements. Filtered air is preferable and may be mandatory in some cases of extreme air pollution. In any case, it can reduce maintenance.
- Height of vault, location of openings, and transformer loading affect the ventilation requirement.
- A distance of 1 foot should be provided on all sides of dry-type transformers as well as between adjacent units.
- Wall mounted units should have six inches of space beneath the transformer to provide adequate bottom ventilation.
- Freestanding, floor-mounted units with bottom ventilation must be set on the feet provided, with 1 foot clearance front and rear to provide air access for bottom ventilation.

### INSTALLATION

There are a number of different surfaces to which transformers can be mounted and a number of different methods of mounting the units:

- The transformer should be installed in an upright position. This permits most efficient ventilation.
- Be sure the surface to which the unit is to be mounted is sufficiently strong to support the weight.
- Installation of dry-type Transformers also involves another important consideration - the possible need to provide impulse protective devices. Dry-type units do not have the electrical impulse-strength of similarly rated liquid-filled transformers. Where they will be exposed to lightning strikes or heavy switching transients, proper protective equipment must be provided.
- Remove shipping braces and mounting bolts after field wiring and installation have been completed.

### TAPS AND INTERNAL WIRING

- Dry-type power transformers are frequently provided with primary taps to accommodate different levels of line voltage. Consult the transformer nameplate for tap options and connections.
- When connecting to taps, use the primary jumpers provided. If they are not provided, use insulated cable with a 90°C or greater temperature rating. Position all primary jumper leads away from coil, core and frame surfaces by a distance of one inch or more.
- If multiple leads are used, avoid bundling or cabling the leads. Always use leads of adequate current carrying capacity for the transformer rating.

### EXTERNAL CONNECTIONS

- Maintain all cables connected to terminals of transformers below their respective terminal levels. Any wire with insulation rated 75°C or higher may be used.

## MAINTENANCE

- Dry type transformers should be inspected periodically to assure satisfactory service. For clean dry locations this may be done at yearly intervals or longer. Where dust or fumes are present inspections should be at three to six month intervals.
- Inspection should be made for the general condition of the transformer, for loose connections, and for dirt especially accumulations on the coil or air ducts.
- If an accumulation of dirt is found on the coils or in the ducts, it should be removed promptly to avoid overheating. The windings may be cleaned with a vacuum cleaner, a blower, or with compressed air. Lead supports, terminal boards and other major insulating surfaces should be brushed or wiped with a dry cloth. Do not use liquid cleaners as they may harm the insulating materials.

## DRYING OF CORE-COIL ASSEMBLY

- If the transformer has been stored out of doors, or if it has been subjected to an extended shutdown under relatively high humidity conditions, it should be dried out before applying rated voltage and load.
- First all free moisture should be blown or wiped off the coils. Heat may be applied by use of space heaters in the transformer enclosure. The use of a fan to blow the heated air through the coils from bottom to top will speed up the drying process. Care should be taken not to exceed an air temperature of 2000 C. It is important that the heated air passes through the winding ventilation ducts.
- Drying time will depend on the transformer size, voltage, and amount of moisture present. The higher these three parameters are, the longer the drying time necessary. A good gauge is to check the winding insulation resistance during the drying process by use of a "megger". Insulation resistance will increase during the process, and the heat should be continued until resistance levels off and remains relatively constant for three to four hours. Insulation resistance measurements should be taken on all windings. and readings should always be taken in the same manner or procedure.

## PRECAUTIONS TO MINIMIZE SOUND LEVEL

There are a number of basic installation precautions and mounting techniques which, if carefully noted and followed, will minimize the audible sound level of energized transformers. Some of the more pertinent ones are noted below.

- Proper location is the first consideration in a low sound level installation. To keep within/below, prescribed decibel limits:
  1. Keep the transformer as far away as possible from the area in which its noise would be most objectionable.
  2. Avoid mounting the unit in a room corner up near the ceiling. Three sided corners act as megaphones and amplify the sound.
  3. Avoid installation in narrow halls and corridors or in corners of stairwells. The transformer sound reflected from the walls can become additive to the primary sound of the transformer and cause additional decibel buildup.
  4. Where feasible, experimental temporary operation and positioning of a free-standing transformer in a room or area will quickly indicate the best location and orientation of the unit.
  5. Where necessary, cover the walls of the transformer room with acoustical dampening material – fiber glass, acoustical tile, kimsul and similar absorbent materials – to reduce propagation of transformer noise from the room to any adjacent areas. It should be noted, however, that such material has a major effect on the high harmonics of transformer noise but little, if any, effect on the fundamental hum. While there are special sound insulating materials available for the 120 cps frequency range, their present form and cost make them impractical for the above application.

Transformer mounting methods play an important role in control and reduction of the audible sound coming from the unit. The prime objective is to "isolate" the noise – that is, prevent its mechanical transmission to the supporting structure and connected raceway system.

- This can be accomplished with one, or a combination of the following installation techniques:
  1. Use solid mounting when the transformer can be secured to a heavy, solid mass which cannot vibrate audibly, such as reinforced concrete - floor or wall.
  2. For installation on a structural frame, wall, ceiling or column. use the flexible mounting technique employing special vibration dampeners. There must be no solid metal contact between the transformer and supporting surface, otherwise the vibration of the pads would be "short-circuited". These external pads are furnished and installed by the electrical contractor.
  3. Use flexible connections between the raceway system and transformer enclosure to prevent transmission of noise vibrations from the enclosure to the raceway system, panels, and other mechanical parts. Flexible metal conduit and nonmetallic tubing are acceptable items for these relatively short "coupling" sections.
  4. Dry-type transformers are provided with vibration dampening pads between core and coil assembly mounting and the case. This mounting is tightly secured with bolts for mechanical strength when shipped. **After installation of the unit these mounting bolts must be removed for effective vibration dampening and minimizing of noise.**
  5. If used, lifting eyebolts may contribute to high sound level and should be removed after installation.
  6. Be sure all screws and bolts on covers and top are tight

## CONSULT FACTORY FOR SPECIAL CONDITION AND APPLICATIONS

### WARRANTY

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