***** THIS STANDARD REPLACES FORMER TDMIS-1201 through 1212 *****

3700. GENERAL

This standard covers the details of installing and connecting underground single and three phase transformers. It also provides guidance on selection of dual voltage rated vs. single voltage rated transformers. Fusing details are covered in TDMIS-2700 – Protection, grounding details can be found in TDMIS-3800 – Underground Developments, and lightning protection is covered in this standard.

3701. CUSTOMER REQUIREMENTS

Customers having the potential to exceed 75 kVA of transformer capacity shall be required to supply space for electrical equipment on private property. This requires the customers, whose load may reasonably be expected to exceed 75 kVA at some point in the future, to provide a location for a pad-mounted transformer and pad-mounted switchgear. All secondary cable, connectors and connector fasteners shall be furnished, installed, owned and maintained by the customer. The transformer will be equipped with bushings that accept NEMA standard two-hole spade terminals mounted in the secondary cabinet.

3702. LOCATION

The physical location where transformers should be placed is discussed in TDMIS-3800 – Underground Developments. In general, transformers shall be placed as near as possible to the center of the load.

3703. SIZING AND LOADING

ANSI/IEEE Standards C57.91 and C57.92 – Guidelines for Loading Mineral Oil Immersed Transformers along with recent IEEE Papers were used to determine maximum kVA loading for single and three phase pad-mounted transformers.

ANSI/IEEE has established ambient temperatures of 95°F in summer and 32°F in winter. Using these temperatures, the transformer load shall not cause a hot spot winding

temperature to exceed 140°C. This gives a corresponding top oil temperature of approximately 110°F, which is safely below the flash point of mineral oil.

Based on these temperature limits and an 8-hour overload cycle with a pre-load of 100% of nameplate, a transformer can be safely loaded to 120% of nameplate in the summer and 140% of nameplate in the winter. Different preloads and overload durations may affect these overload percentages.

3704. SECONDARY CABLES

3704.1. Single-Phase Mini-Pads

No more than six sets of secondary conductors are permitted in a single phase mini pad. Maximum size secondary cable shall not exceed 500 MCM.

3704.2. Three-Phase Pad-Mounted Transformers

Three phase pad size and number of secondary cables shall be in accordance with The National Electrical Code and shall be approved by the appropriate authority having jurisdiction. Maximum number of secondary cables to be physically connected to a pad-mounted transformer is outlined below:

Number of Spade Holes	Max. Size and Number of Cables	
	Compression Type Connectors	Bolted or Set Screw Type Connectors
4	4 sets of 750 MCM	6 sets of 500 MCM
6	6 sets of 750 MCM	8 sets of 500 MCM 6 sets of 750 MCM
8	8 sets of 750 MCM	10 sets of 750 MCM
10	10 sets of 750 MCM	10 sets of 750 MCM

Table 3705-1: Max. Number of Secondary Cables by Number of Spade Holes

Secondary requirements greater than this shall necessitate a separate compartment, pull box, transclosure, or bus duct.

3705. SECONDARY CABLE CONENCTIONS

Secondary cable connections will be made with a cable to flat clamp or compression type connector, with a minimum of two holes in the flat pad and two clamping elements or two compressions per cable. See TDMIS-3800 for details of secondary cable terminations.

3706. GROUNDING AND BONDING

Standard grounding connections are shown in TDMIS-3800 – Underground Developments. Bonding of the conduits in the transformer primary and secondary compartments is required when the conduit is metallic. Neutral conductors in a grounded wye system are current carrying conductors and shall always be connected first and removed last during installation and removal. They shall always be connected to the transformer tank before the transformer is energized.

3707. FUSING

In general, loop feed pad-mounted transformers have internal fusing intended to protect the transformer from secondary faults.

All transformer installations shall also be protected on the primary side by fuses or interrupters per TDMIS-2700 – Protection.

3708. METERING

Meter installations for single customers supplied by three-phase pad-mounted transformers may be installed on the transformer.

3709. SURGE PROTECTION

Surge arresters are required at riser poles, transformer locations and at all open points. Elbow arrester, parking stand arrester, and bushing well arrester may come with braided ground lead.

3710. EASEMENTS

All DOP-owned equipment must be located within a permanent easement. Easements shall be in accordance with TDMIS-3800 – Underground Developments.

3711. PAD-MOUNTED TRANSFORMER FOUNDATION

Location shall be designated or approved by DOP. In general, transformers shall be located in accordance with TDMIS-3800 – Underground Developments.

3712. SUBWAY TRANSFORMERS

Every effort should be made to use pad-mounted transformers for new installations. Only if pad-mounted transformer locations cannot be obtained, subway transformers can be installed, provided they are installed in vaults and manholes. These transformers must be located to allow pulling the loadbreak elbows from outside the vault or above the manhole.

3713. MEASUREMENT AND PAYMENT

3713.1. Method of Measurement

The method of measurement shall be per each completed and operational transformer including transformer, accessories, grounding lugs, ground connections for shields and secondary bushing, bushing inserts, feed through bushing inserts, arresters, labor material, delivery and placement and attachment to transformer, equipment, tools supervision and miscellaneous required for a complete and operational module. This does not include any site preparation, ground grids, ground rods, and pads, which are included in TDMIS-3800 – Underground Developments.

3713.2. Basis of Payment

Items	Unit	Description
TDMIS-3700	each	___ kVA radial feed single-phase pad-mounted transformer (grounded wye)
TDMIS-3700	each	___ kVA radial feed single-phase pad-mounted transformer (delta)
TDMIS-3700	each	___ kVA loop feed single-phase pad-mounted transformer (grounded wye)
TDMIS-3700	each	___ kVA loop feed single-phase pad-mounted transformer (delta)
TDMIS-3700	each	___ kVA open loop feed single-phase pad-mounted transformer (grounded wye)
TDMIS-3700	each	___ kVA open loop feed single-phase pad-mounted transformer (delta)
TDMIS-3700	each	___ kVA radial feed single-phase subway transformer (grounded wye)
TDMIS-3700	each	___ kVA radial feed single-phase subway transformer (delta)
TDMIS-3700	each	___ kVA loop feed single-phase subway transformer (grounded wye)
TDMIS-3700	each	___ kVA loop feed single-phase subway transformer (delta)
TDMIS-3700	each	___ kVA radial feed three-phase pad-mounted transformer
TDMIS-3700	each	___ kVA loop feed three-phase pad-mounted transformer
TDMIS-3700	each	___ kVA radial feed three-phase subway transformer
TDMIS-3700	each	___ kVA loop feed three-phase subway transformer