

SECTION 16460

TRANSFORMERS

Part 1 -Design Directives

Transformer arrangements that supply buildings at Dartmouth shall be selected based on the requirements stated below. Single and double transformer supplies are selected based on the function of the building and the requirements of the program that will occupy the building. In most cases a double-ended substation will only be required in science and research facilities and buildings where the function is deemed critical to the academic mission of the college. The Facilities Operations and Management department will determine the requirements for transformer arrangement at the beginning of each project.

Transformers shall be UL listed dry type, copper wound 300 KVA and above, aluminum or copper wound below 300KVA and equipped with a vacuum pressure impregnated (VPI) insulation system rated as follows:

Below 300 KVA: transformers shall be manufactured with a 220 degree C insulation system designed to operate at a temperature rise of 150 degrees C

300 KVA and above: transformers shall be manufactured with a 220 degree C insulation system designed to operate at a temperature rise of 80 degrees C.

Transformers shall be equipped with four full capacity taps on the HV winding rated 2 ½%, two above and two below, nominal voltage.

Transformers rated 300 KVA and above shall be equipped with a forced cooling package and three phase electronic temperature monitor

The designer shall request the loss ratio of the transformer be included as part of the submittal package to aid in the evaluation of the efficiency of a given transformer at the load applied.

Transformers rated 750 KVA through 1500 KVA connected to the 4.16 kV distribution system shall have primary fusing in accordance with the table below to ensure coordination with upstream overcurrent relay settings:

750 KVA	100 E max
1000 KVA	150E max
1500 KVA	200E max

No transformer connected to the 4.16 kV system shall be specified to be larger than 1500 KVA. Should the load require transformation greater than 1500 KVA a double-ended unit substation shall be specified.

Part 2 -Products

Since the nameplate on a transformer today does not accurately indicate the manufacturer of the unit the contractor shall be instructed to procure the transformers in the project from the same manufacturer that is supplying the switchboards and other major components of the system. The following submittal information must always be provided:

Provide transformer dimensional information to include length, depth and height of the overall enclosure and size of conduit entry spaces and recommended installation clearances. Close coupled switchboard and transformer combinations shall have coordination drawings for review by the owner.

Elevation and plan views showing all connections and internal bus layout

No-load losses and load losses for 25%, 50%, 75% and 100% of rated load.

Primary and secondary connections and ratings for current and voltage

Percent Impedance (guaranteed)

The submittal shall also state if the transformer offered meets NEMA Standard TP-1-1999. If the transformer does not meet NEMA TP-1-1999 an alternate price shall be included to provide a unit so rated.

Alternate pricing shall also be included for all transformers below 300KVA for 80 degree C rise construction.

Part 3 -Execution

Unit substations and pad mounted transformers shall be securely fastened to the housekeeping pad on which they are mounted.

Where transformers are directly coupled to the switchboard the line-up shall be provided with a high voltage cable enclosure for the primary connections to the transformer.

Connection of primary and secondary conductors to unit substations shall be made via under floor raceways whenever possible. If pits are employed under the primary connection enclosure the rules found in section 16425 (Switchboards) shall apply.

Conductors connected to free-standing transformers shall enter the enclosure below the bottom of the transformer windings or within the manufacturer's recommendations, whichever is lower.

Raceways enclosing transformer conductors shall be connected to transformer enclosures by means of flexible conduit. Raceways containing a grounding electrode conductor without phase conductors shall be nonmetallic.

Clear space around ventilation openings shall conform to manufacturer's specifications and NEC Article 450-9.