PART 1: GENERAL

1.01 Transformer

A. This section includes liquid filled, pad mounted distribution transformers with primary voltage of 12kV or 4.16kV (The University will determine primary voltage), with a kVA rating as required per project. This section does not include pole type distribution transformers mounted in an enclosure on a pad. The Professional Service Provider (PSP) shall coordinate the requirements of this section with the requirements of the related sections of this standard.

1.02 Metal Clad Switchgear

A. This section of the design standard includes basic requirements for the design of the metal clad switchgear used at the building service entrances. All breakers designed and specified shall use vacuum interrupting technology.

1.03 Service Entrance Equipment

A. This section of the design standard includes requirements for the service entrance equipment for facilities at the University of Texas at Austin.

PART 2: PRODUCTS

2.01 Transformer

A. General: Each transformer shall consist of an incoming high voltage termination section, transformer, and outgoing busway interconnection chamber. The transformers shall be new copper wound and designed with 55 degree Celsius (131 degree Fahrenheit) rating. Each section of the transformer shall have the following ratings:

1. kVA (as required)
2. Impedance: 5.75% or ANSI standard
3. H. Voltage: 12 kV Delta /4.16 kV delta
4. H. V. BIL: 95 kV /60kV
5. H.V. Taps: (2) 2 ½% FCAN and FCBN
6. L. Voltage: 480Y/277 grounded wye
7. L.V. BIL: 30 kV

B. Dielectric: Use FM approve, Envirotemp(FR3), BioTemp or owner approved equivalent with any other required accessories. PSP shall require containment to meet NFPA 70HB90 Section 450-23 without being located in a vault.

C. Protection: The 15 kV transformers shall be protected by phase-overcurrent relays with residually connected ground fault relays controlling a vacuum circuit breaker. A pressure relief device shall be used and the tank shall be rated for 12-

rated for 12-psi positive pressure and 5 psi negative pressure.

D. Outgoing Section: The outgoing section shall include all of the required bussing, bracing, and insulating materials required for the maximum fault current available at the secondary bushings of the transformer with an infinite source. The flexible copper connectors between the transformer secondary bushing and the fixed bus shall be provided. The bus bar extension or modification pieces that make up to the busway shall be electrolytically plated tin or silver. Each bus bar shall be insulated over its entire length with Class B (130 degree Celsius 268 Fahrenheit) rated insulating material. The temperature rise at any point in the busway shall not exceed 55 degrees C (131 degree Fahrenheit) rise above the ambient temperature when operating at rated load current.

F. Incoming Section: Terminate incoming cable with heat shrink technology.

G. Installation: Each transformer is to be placed on a housekeeping pad of suitable height to allow for the proper alignment of the 600 VAC busway connection to the 600 VAC Metal-Enclosed Switchgear.

H. Safety Design Issues

1. Provide signs stating “DANGER HIGH VOLTAGE” at any location where contact with live 15 KV parts is possible. Signs shall be located at the incoming air termination chambers.

2. Provide signs stating “DANGER 600 VOLTS” at any location where contact with live 600V parts is possible. Signs shall be located at the outgoing air termination chambers.

3. The signs shall use at least 1 ½” red lettering on a 3” white background.

2.02 Metal Clad Switchgear

A. Design the switchgear in accordance with the latest referenced specifications including NEMA, ANSI, and IEEE standards applicable to switchgear.

B. All switchgear parts shall be new and free from defects in material and workmanship.

C. The switchgear shall be rated 15,000 volts, metal clad, and shall operate on a 12,000-volt (4.16 kV if directed by The University) nominal, three phase, solidly grounded wye, 60 Hz system. The switchgear shall utilize vacuum breaker technology with a line-up including (2) incoming breakers used as load interrupter switches and (2) breakers used as transformer feeder circuits.

D. Enclosure: The switchgear assembly shall consist of individual vertical sections housing various combinations of circuit breakers and auxiliaries, bolted together to form a rigid metal-clad lineup. Each vertical section shall have the capability of stacking breakers two high and auxiliaries four high. Individual sections shall be completely insulated from top to bottom.

E. Main Bus: The main bus shall extend the entire length of the line-up and shall be rated not less than 1200 amp at 15 kV. The bus shall consist of rigidly supported silver-plated copper bars, braced to withstand not less than 50 kA symmetrical interrupting duty. The bus bars shall be of suitable design and cross sectional area to satisfactorily carry the rated current without exceeding the temperature rise as specified in the IEEE and NEMA standards.

F. Ground Bus: The ground bus shall be of high conductivity copper with a continuous rating of at least 600 amps and shall extend the entire length of the switchgear.

G. Circuit Breakers:

1. All circuit breakers shall be vacuum type and have the following ratings:

a.	Interrupting Rating:	50 kA
b.	Nominal Voltage:	12 kV (15 kV class)
c.	Continuous Current:	1200A or as required by design
d.	Rated interrupting time:	5 cycles
e.	Impulse Level:	95 kV
f.	Close Voltage:	230 VAC
g.	Trip Voltage:	AC powered capacitor trip

2. The vacuum breakers used as load interrupter switches shall operate on an open loop radial feed system. These breakers shall be used for switching purposes only and shall not require protective type sensing and circuitry.

H. Protective Relays:

1. Protective Relays shall be powered from the breakers' 120 VAC source.

I. Metering:

1. Metering shall be required on the main breaker for the building service transformers on the high voltage side. The design shall adhere to the following:

2. Metering circuits shall be designed such that they may be tested and calibrated without applying test currents and voltages to any other devices. Position KWH meters such that the display registers are eye-level. Must be Square D

Ion 8600.

2.03 Service Entrance Equipment

A. Unit Substation:
1. The double-ended unit substation shall include two transformers as required by this section each capable of carrying the entire load. Accessories shall include a de-energized tap changer externally operable with a padlockable handle, combination drain and filter valve with sampling device, manual gas pressure test connection, filling plug and filter press connection in cover, top liquid thermometer, magnetic liquid level gauge, pressure vacuum gauge, removable handhole in cover, and provisions for lifting and jacking.

B. The circuit breakers protecting each transformer shall be as required by this section.

PART 3: EXECUTION

3.01 Transformer

A. Show transformer on one-line diagram with kVA rating, primary and secondary voltage ratings and % impedance.

B. The PSP shall detail the designed location of the transformer(s) on enlarged room detail floorplans drawn to scale.

3.02 Metal Clad Switchgear

A. PSP shall provide single-line diagram showing switchgear with draw-out type breakers.

B. Floor plans details shall be provided with electric equipment room layouts including switchgear and other substation components drawn to scale.

C. Switchgear shall be placed on a 4” housekeeping pad.

D. Single line diagram shall clearly indicate dividing lines of points of acquisition and installation responsibility. The University typically provides the 12 kV cable. This should be clearly shown on the single line diagram.

END OF STANDARD