

**The City of Wilson
Wilson, North Carolina**

**Wilson Energy
Electrical Engineering**

Group Specification #103

**Single Phase Overhead
Conventional Transformers**

Rev.	Date	Description	By
0	10/15/1996	Initial Release	JHD
1	7/15/1997	Revision 1	JHD
2	12/9/2004	Revision 2	JHD
3	5/24/2005	Revision 3	JMM
4	6/17/2005	Revision 4	JMM
5	1/9/2007	<ul style="list-style-type: none"> • Update format—Add Revision Block—add date and revision information on each page • IV-E-4--Add Secondary Tank Ground Strap • VII—Liquidated damages homogenized • VII-A-3--Removed this section—redundant 	JMM
6	4/27/2010	<ul style="list-style-type: none"> • Updated A and B factors • Updated approved supplier information 	DRG

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**Specifications
for
Single Phase Overhead Conventional Transformers**

I. Scope.

This specification covers certain electrical, dimensional, and mechanical characteristics, and takes into consideration certain safety features of single-phase, 60-Hz, 65° C rise, mineral-oil-immersed, overhead-type distribution transformers, rated 500 kVA and smaller.

II. General.

- A. Except as otherwise specified herein, all construction, characteristics, requirements, tests, definitions, terminology, and voltage designations shall be in accordance with the latest edition of American National Standards Institute C57.12.20; Overhead-Type Distribution Transformers, 500 kVA and smaller.
- B. “Approved” as used in these specifications refers to approval by Wilson Energy Electrical Engineering.
- C. Prior to transformer construction, the transformer manufacturer must:
 - 1. Furnish mechanical and electrical data, along with dimensional outline drawings of all sizes and voltages included in this specification, for approval. The units may be supplied until such time as these specifications are changed.
 - 2. The minimum design information includes the following:
 - i. The volume of air and oil within the sealed tank.
 - ii. The primary and secondary fault current withstand capacity of the transformer.
 - iii. The impulse voltage of the transformer.
 - iv. The means by which the core and coil assembly is clamped and supported.
 - v. The type of insulating medium used throughout the transformer coil construction.
 - 3. Wilson Energy recognizes that manufacturers continuously improve their products through engineering review. Manufacturers are encouraged to discuss any opportunities for design improvements with Wilson Energy Electrical Engineering.

III. Ratings.

The City of Wilson operates grounded wye distribution feeders at 22,860/13,200 volts and 12,470/7,200 volts. Voltage ratings, kVA ratings, and insulation characteristics shall be in accordance with ANSI C57.20-latest edition in addition to the specifications below:

**Table I
Transformer Characteristics**

High Voltage	BIL	Low Voltage	BIL	kVA Range	High Voltage Taps
22,860/13,200	125	120/240	30	All Ranges	None
12,470/7,200	95	120/240	30	All Ranges	None
12,470/7,200	95	277/480	30	All Ranges	None

IV. All Transformers.

A. Impedance and Regulation.

The minimum percent impedance voltage, as measured on the rated voltage connection, and the maximum percent regulation, at rated load and 0.80 power factor, shall be as follows:

kVA Rating	Absolute Minimum Impedance	Absolute Maximum Regulation
All Transformers	2.50%	3.40%

B. Bushings and Terminals.

1. The two high voltage bushings may be porcelain or an equivalent epoxy compound and must provided with an approved wildlife protector cap.
2. Low voltage bushings may be porcelain or an equivalent epoxy compound.

C. Internal Protection.

An internal primary fuse link shall be provided which will isolate the transformer from the primary line.

D. Internal Lead Identification.

Internal secondary leads shall be identified with appropriate markings permanently embossed in the lead that corresponds with lead markings on the nameplate.

E. Accessories.

1. The transformer shall have no taps.

2. The transformer shall be equipped for two position mounting in accordance with the latest ANSI Standards. Note that 75 KVA transformers and above are exempt from this as a requirement.
3. The transformer shall be provided with one direct connect heavy duty MOV polymer lightning arrester rated at 10 kV with a Maximum Continuous Over Voltage (MCOV) Rating of 8.4 kV for applications on 12,470 volt system. Lightning arresters for application on a 22,860 volt system shall be rated at 18 kV with a MCOV Rating of 15.3 kV. The arrester will be equipped with a ground lead disconnecter. Approved suppliers are Ohio Brass, Joslyn, or Cooper Power.
4. The transformer shall be provided with a copper tank grounding strap.
5. An assembly shall be provided that is designed for pressure relief. Transformers will provide an externally operated pressure relief system.

F. Oil.

Transformers shall be filled to the proper level with non-PCB transformer oil that is certified to be less than 2 PPM. Transformers shall be identified as non-PCB by permanently stamping non-PCB on the nameplate. Transformer oil must be in accordance with all specifications listed in ANSI/ASTM D3487-79.

G. Nameplate and Labeling.

1. A nameplate made of laser imprinted anodized aluminum shall be provided.
2. The serial number must be provided on the nameplate.
3. non-PCB status shall be indicated on the nameplate.
4. A separate label to indicate non-PCB dielectric fluid can be used; it can be external (preferred) or internal.
5. The following table defines the kVA rating and the primary and secondary voltage ratings by City of Wilson Item Number:

**Table III
Item Numbers by Transformer Type**

New Cat. Number	Item Number	kVA Rating	Voltage	
			Primary	Secondary
285-084-00006	26104109	50	7,200	120/240
285-084-00007	26104117	50	7,200	277/480
285-084-00008	26104208	75	7,200	120/240
285-084-00009	26104307	100	7,200	120/240
285-084-00010	26104356	100	7,200	277
285-084-00011	26104406	167	7,200	277
285-084-00012	26104455	167	7,200	120/240
285-084-00013	26104604	333	7,200	120/240
285-084-00014	26104703	333	7,200	277
285-084-00015	26104901	500	7,200	277
285-084-00016	26106401	167	13,200	277
285-084-00020	26108001	50	13,200	120/240
285-084-00021	26108100	75	13,200	120/240
285-084-00022	26108209	100	13,200	120/240
285-084-00023	26108258	100	13,200	277
285-084-00024	26108308	167	13,200	120/240
285-084-00025	26108506	250	13,200	120/240
285-084-00026	26108605	500	13,200	120/240
285-084-00027	26108704	833	7,200	277
285-084-00047	26100012	333	13,200	7,200
285-084-00048	26100103	500	13,200	2,400
285-084-00049	26100202	100	7,200	2,400
285-084-00057		50	13,200	277/480

V. Transformer Losses.

- A. Wilson Energy’s “A Factor” for all single phase overhead conventional transformers is \$7.80. The “B Factor” for all single phase overhead conventional transformers is \$2.10. (See Electricities of North Carolina Transformer Ownership Evaluation Formula, January 2010, NCEMPA values)
- B. All manufacturers shall provide quotations of guaranteed excitation losses and guaranteed load losses for all evaluated transformers for which a bid is submitted.
- C. Liquidated damages are discussed in section VII per Wilson Energy formulas.

VI. Manufacturer’s Test and Test Reports.

- A. All transformers shall receive tests in accordance with the methods prescribed in ANSI Standard C57.12.90.
- B. Certified Test Reports.

A certified test report shall be sent for each unit to the Purchasing Manager, City of Wilson, P.O. Box 10, Wilson, NC 27893. This report will include the following:

1. Actual measured excitation losses and exciting current at a temperature of 20° to 30°.
2. Actual measured load losses including all associated stray losses and test current

VIII. Workmanship, Transportation, and Warranty.

- A. In addition to inspections and tests on parts and products, the manufacturer shall have a finished product quality audit program to assure a well-designed, safe, and durable product.
- B. Any design modifications, or modifications affecting the installation and operation of a transformer, electrical or mechanical, made following an award of an order must be submitted to Wilson Energy Electrical Engineering for approval before any transformer so modified shall be shipped.

IX. Approved Suppliers.

- A. “Approved” as used in these specifications refers to approval by Wilson Energy, Electrical Engineering. Approved manufacturers are:
 - 1. ABB
 - 2. Cooper Power Systems
 - 3. General Electric
 - 4. Howard Industries
 - 5. Kuhlman
 - 6. Pauwells
 - 7. Central Moloney
 - 8. Ermco

Criteria for including another manufacturer on the “approved” list:

- Manufacturer must have a good reputation with respect to quality, delivery time, ability to meet specification; furnishing a client contact list will help Wilson Energy to make this determination.
- A manufacturer may be removed from the “approved” list for problems with quality, delivery time, and ability to meet specifications.
- If the manufacturer was once on the “approved” list but was removed for problems with quality, delivery time, and ability to meet specification; the manufacturer must demonstrate that it has corrected its deficiencies to the satisfaction of Wilson Energy. Wilson Energy reserves the right to allow a reasonable period of time from de-listing to re-listing (at least one year) to enable a manufacturer’s change/correction process to become mature before adding the manufacturer back to the “approved” list.