SECTION 262200

SECONDARY DRY-TYPE TRANSFORMERS

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**NOTE TO SPECIFIER**

*Use this Specification Section for Mail Processing Facilities.*

***This is a Type 2 Specification with primarily editable text; therefore, most of the text can be edited, but there is some required text which is noted within the Section with a “Note to Specifier.” Do not revise these paragraphs without an approved Deviation from USPS Headquarters, Facilities Program Management, through the USPS Project Manager.***

*For Design/Build projects, do not delete the Notes to Specifier in this Section so that they may be available to Design/Build entity when preparing the Construction Documents.*

*For the Design/Build entity, this specification is intended as a guide for the Architect/Engineer preparing the Construction Documents.*

*The MPF specifications may also be used for Design/Bid/Build projects. In either case, it is the responsibility of the design professional to edit the Specifications Sections as appropriate for the project.*

*Text shown in brackets must be modified as needed for project specific requirements.* *See the “Using the USPS Guide Specifications” document in Folder C for more information.*

*The last date that USPS revised this standard specification section occurs in two places, at the end of this section and in the Table of Contents. If the date in this section matches the date in the Table of Contents, then you are using the latest version. Do not delete or revise the “last revised” date at the end of the section during the development of the Project Manual.*

*The footer in this section should be edited to replace the text, “USPS MPF SPECIFICATION” with the project name, and the blank date in the center should be replaced with the submission date, for interim design reviews, or the issue date of the completed Project Manual.*

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1. GENERAL
	1. SUMMARY
		1. Work Included: The work specified in this Section includes, but shall not be limited to, the following:
			1. Transformers shall be manufactured in compliance with D.O.E. 10 CFR 431.192, April 2013.
			2. Transformer shall be UL 1561 listed to feed a mix of equipment load profiles such as computers without derating or significant degradation of efficiency.
		2. Related Documents: The Contract Documents, as defined in Section 011000 - Summary of Work, apply to the Work of this Section. Additional requirements and information necessary to complete the Work of this Section may be found in other Documents.
		3. Related Sections:
			1. Section 260500 - Common Work Results for Electrical.
			2. Section 261414 - Infrared Viewing Panes (IR Windows).
	2. REFERENCES
		1. As specified in Section 260500 – Common Work Results for Electrical.
		2. Institute of Electrical and Electronics Engineers, Inc. (IEEE):
			1. IEEE 1100, “IEEE Recommended Practice for Powering and Grounding Electronic Equipment.”
			2. ANSI/IEEE C57.1110, " Recommended Practice for Establishing Transformer Capability When Feeding Nonsinusoidal Load Currents."
		3. International Code Council (ICC):
			1. ICC ES AC156, “Acceptance Criteria for Seismic Qualification by Shake Table Testing of Nonstructural Components and Systems.”
			2. ICC IBC, "International Building Code."
		4. International Organization for Standardization (ISO):
			1. ISO 9001, "Quality Management Systems Requirements."
			2. ISO 14001, “Environmental Management Systems Requirements with Guidance for Use.”
		5. National Electrical Manufacturers Association (NEMA):
			1. NEMA 250, "Enclosures for Electrical Equipment (1000 Volts Maximum)."
			2. NEMA ST 20, "Dry Type Transformers for General Applications."
			3. NEMA TP 1, "Standard for the Labeling of Distribution Transformer Efficiency.”
			4. NEMA TP 2, "Standard Test Method for Measuring the Energy Consumption of Distribution Transformers.”
		6. National Fire Protection Association (NFPA):
			1. NFPA 70, "National Electrical Code," hereinafter referred to as NEC.
			2. NFPA 5000, “Building Construction and Safety Code.”
		7. Underwriters Laboratories, Inc. (UL):
			1. UL 1561, "Standard for Dry Type General Purpose and Power Transformers."
			2. UL 250, “Enclosure for Electrical Equipment”.
		8. 2005 Energy Act PUBLIC LAW 109-58-AUG. 8, 2005. Comply with all Rules from Department of Energy:
			1. 10 CFR 429
			2. 10 CFR 431
	3. SUBMITTALS
		1. As specified in Section 260500 – Common Work Results for Electrical.
		2. Section 013300 - Submittal Procedures: Procedures for submittals.
			1. Product Data: Outline and support point dimensions of enclosures and accessories, unit weight, voltage, kVA, and impedance ratings and characteristics, tap configurations, insulation system type, and rated temperature rise.
			2. Manufacturer's Test Reports:
				1. Copy of ISO 9001 Certification of manufacturing operation.
				2. Copy of ISO 14001 Certification of manufacturing operation.
				3. Confirmation that transformers are UL 1561 listed with a K1 rating. Those requiring a k factor rating will be K13 rated.
				4. Construction details, including, but not limited to, enclosure dimensions, kVA rating, primary and secondary nominal voltages, voltage taps, approximate center of gravity, and unit weight.
				5. Basic performance characteristics, including, but not limited to, insulation class, temperature rise, core and coil materials, impedances and audible noise level, unit weight, and inrush value expressed in a multiplier of rated primary current RMS.
				6. Efficiency data shall be reported as described in the following sections. Reference temperatures shall be included when reporting efficiency.

No load and full load losses shall be calculated per NEMA ST 20 test methods.

Efficiency curves as follows:

Linear loads.

Data per the non linear load test program.

* + - * 1. Sound level ratings.
			1. Assurance/Control Submittals:
				1. Certificates: Manufacturer's certificate that Products meet or exceed specified requirements.
				2. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by Product testing agency. Include instructions for storage, handling, protection, examination, preparation, installation, and starting of Product.
		1. Section 017704 - Closeout Procedures and Training: Procedures for closeout submittals:
			1. Project Record Documents: Record actual locations of transformers.
			2. Maintenance Data: Include recommended maintenance procedures and intervals.
	1. QUALITY ASSURANCE
		1. As specified in Section 260500 – Common Work Results for Electrical.
		2. Regulatory Requirements: Comply with applicable requirements of the laws, codes, ordinances, and regulations of Federal, State, and local authorities having jurisdiction. Obtain necessary approvals from such authorities.
			1. Seismic Requirements:
				1. ICC IBC, NFPA 5000.
				2. Tri axial shake table test results conducted in accordance with the ICC ES AC156 test protocol 3 (Acceptance Criteria for Seismic Qualification Testing of Nonstructural Components).
			2. Comply with D.O.E. Guidelines established for manufacture, January 1, 2016 (10 CFR 431.192, April 2013.
		3. Compliance: Comply with applicable requirements of the following standards.
			1. CSA 802.2.
			2. CSA C22.2.
			3. ASHRAE 90.1.
		4. The manufacturer of this equipment shall have produced similar electrical equipment for a minimum period of 5 years.
	2. DELIVERY, STORAGE, AND HANDLING
		1. Section 016000 - Product Requirements: Transport, handle, store, and protect Products.
		2. Transformers shall be packaged for shipment using materials that shall have the least environmental impact.
			1. Transformer Wrapping: Transformers shall be protected by cardboard protective material; all plastic wraps shall not be accepted.
			2. Transformer Shipping Base: Transformers shall be shipped on a base that uses at least 50 percent less wood than traditional pallets. Comply with ISPM No. 15.
		3. Store in a warm, dry location with uniform temperature. Cover ventilation openings to keep out dust, water, and other foreign material.
		4. Handle transformers using lifting eyes and/or brackets provided for that purpose. Protect against unfavorable external environment such as rain and snow, during handling.
1. PRODUCTS

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**NOTE TO SPECIFIER**

Verify manufacturer information, Product numbers, and availability at time of Project Manual preparation for Project.

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* 1. MANUFACTURERS
		1. Subject to compliance with project requirements, manufacturers offering Products which may be incorporated in the Work include the following:
			1. Eaton Corporation, Cutler-Hammer Products, Pittsburgh, PA (800) 525-2000.
			2. General Electric Company (800) 626-2000.
			3. Siemens Energy & Automation, Inc., Alpharetta, GA (800) 964-4114.
			4. Square D Company, Palatine, IL (800) 392-8781.
		2. Basis of Design: Product specified shall be D.O.E. 10 CFR 431.192, April 2013 compliant transformers (“EX” Series) as manufactured by Square D Schneider Electric. Items specified are to establish a standard of quality for design, function, materials, and appearance. Equivalent products by other manufacturers are acceptable. The Architect/Engineer will be the sole judge of the basis of what is equivalent.
		3. Section 016000 - Product Requirements: Product options and substitutions. Substitutions: Permitted.
	2. TWO WINDING TRANSFORMERS
		1. The transformer shall be UL 1561 listed and labeled with a K1 rating (per UL 1561 35.2.1 and 34.2). Provide K13 rated transformers to serve mail processing equipment and other non-linear loads.
		2. Windings shall be continuous wound copper with brazed or welded terminations.
		3. Insulation and varnish systems shall be Nomex-based UL recognized 220 degrees C class utilizing an epoxy polyester impregnation.
		4. Maximum winding temperature rise for K1 rated units shall be 80 degrees C and K13 rated units shall be 130 degrees C rise.
		5. Terminals, including, but not limited to, those for changing taps, shall be readily accessible by removing a front coverplate.
		6. The transformers shall have a basic impulse level of 10 kV BIL.
		7. Voltage taps shall be as follows:
			1. Primary 480 volts.
				1. For transformers 15 kVA to 300 kVA, provide two 2-1/2 percent full capacity taps above and four 2-1/2 percent below nominal primary voltage.
				2. For transformers 500 kVA to 750 kVA, provide two 2-1/2 percent full capacity taps above and two 2-1/2 percent below nominal primary voltage.
		8. Impedance shall be the manufacturer’s standard.
		9. Three phase transformer efficiency shall be as stated below (tested at 35 percent of the nameplate rating, per D.O.E. 10 CFR 431.192:
			1. 15 kVA: 98.26 percent.
			2. 30 kVA: 98.58 percent.
			3. 45 kVA: 98.69 percent.
			4. 75 kVA: 98.97 percent.
			5. 112.5 kVA: 99.03 percent.
			6. 150 kVA: 99.04 percent.
			7. 225 kVA: 99.12 percent.
			8. 300 kVA: 99.20 percent.
		10. Sound Levels shall be as follows:
			1. 15 and 30 kVA: 39 dB.
			2. 45 and 75 kVA: 44 dB.
			3. 112.5 kVA: 47 dB.
			4. 150 to 225 kVA: 49 dB.
			5. 300 kVA: 54 dB.
		11. Transformers shall be designed for continuous operation at rated kVA, for 24 hours a day, 365 days a year operation, with normal life expectancy as defined in ANSI C57.96.
		12. Where required for K13 rating, the neutral bus shall be configured to accommodate 200 percent of the rated current.
		13. Ground core and coil assembly to enclosure by means of a visible flexible copper grounding strap in accordance with Article 250 of NFPA 70.
		14. Mounting: Suitable for wall, floor, or trapeze mounting, except transformers larger than 75 kVA, suitable for floor mounting.
	3. ENCLOSURE
		1. The enclosure construction shall be ventilated, NEMA 2 drip-proof, with lifting holes. All ventilation openings shall be protected against falling dirt. On outdoor units, provide weather shields over ventilated openings.
		2. Nameplate: Include transformer connection data and overload capacity based on rated allowable temperature rise.
	4. SOURCE QUALITY CONTROL
		1. Production test each transformer according to NEMA ST20.

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**NOTE TO SPECIFIER**

REQUIRED: Secondary, dry-type transformers “rated above 112.5 KVA” shall be equipped with IR viewing panes. Include paragraph 2.5 below for transformers rated above 112.5 KVA.

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* 1. INFRARED VIEWING PANES (IR WINDOWS)
		1. Typically, the high voltage and low voltage tap connections are located on the top side of a dry type transformer. A single, transparent, rectangular window (21 inch W x 6 inch H) shall be provided to view the high and low voltage connections on this side of the transformer. The neutral connections are typically made by bolted connections at the bottom of the transformer. A single, opaque, 2 inch dia. round window shall be provided at the bottom side of the transformer to view these bolted connections. Refer to specification section 261414.
		2. Acceptable installers:
			1. IR viewing panes shall be factory installed by the transformer manufacturer or field installed by a certified installer, as recommended by the IR viewing pane manufacturer.
			2. Installer shall be factory certified and trained by the IR viewing pane manufacturer.
1. EXECUTION
	1. EXAMINATION
		1. As specified in Section 260500 – Common Work Results for Electrical.
	2. PREPARATION
		1. Provide minimum 3 inch high concrete pad for floor mounted transformers.
	3. INSTALLATION
		1. Install transformers in accordance with NECA SI and manufacturer's published instructions, at locations and as indicated on Drawings.
			1. Use manufacturer approved mounting brackets for transformers supported from building structure.
			2. Securely anchor transformers to concrete pad for floor mounted transformers.
			3. Provide working clearances in conformance with NFPA 70 and manufacturer’s recommendations.
			4. Provide both primary and secondary protection using fuses or circuit breakers as indicated on Drawings.
		2. Set transformers plumb and level.
		3. Use minimum 2 foot length flexible conduit for connections to transformer case. Make conduit connections to side panel of enclosure.
		4. Mount transformers on vibration isolating pads suitable for isolating transformer noise from building structure.
		5. Provide grounding and bonding as specified in Section 260500.
		6. Furnish and install engraved plastic nameplates as specified in Section 260500.
		7. Furnish and install seismic restraints designed for type of mounting used.
	4. FIELD QUALITY CONTROL
		1. As specified in Section 260500 – Common Work Results for Electrical.
		2. Section 014000 - Quality Control: Field testing and inspection.
		3. Check for damage and tight connections prior to energizing transformer.
		4. Measure primary and secondary voltages and make appropriate tap adjustments.

END OF SECTION

USPS MPF Specification Last Revised: 10/1/2022