SECTION 261221- REPLACE LOAD CENTER UNIT SUBSTATION TRANSFORMER

1. GENERAL
   * + 1. RELATED WORK SPECIFIED ELSEWHERE
          1. Disposal of PCB Liquid Filled Electrical Equipment: Section 028403.
2. REFERENCES

Change UL to FM if FM listing is used instead of UL.

* + - * 1. NEMA, UL, and ANSI/IEEE.
      1. DESCRIPTION

Two paragraphs below are examples. Modify to suit.

* + - * 1. Provide new transformer in the existing Westinghouse Electric Corp. MODUCOR Coordinated Liquid Power Center load center unit substation in basement of Bldg. No. 146.
        2. Refer to Section 028403 for nameplate data on existing transformer.
      1. SUBMITTALS
         1. Submittals for this section are subject to the re-evaluation fee identified in Article 4 of the General Conditions.
         2. Manufacturer’s installation instructions shall be provided along with product data.
         3. Submittals shall be provided in the order in which they are specified and tabbed (for combined submittals).
         4. Waiver of Submittals: The “Waiver of Certain Submittal Requirements” in Section 013300 does not apply to this Section.
         5. Submittal Packages: Submit the shop drawings, product data, shop drawings, and quality control submittals preliminary data specified below at the same time as a package.
         6. Shop Drawings:

Show installation details including primary and secondary bus connections to existing load center unit substation.

* + - * 1. Product Data:

Catalog sheets, specifications and installation instructions.

Change UL to FM if FM listing is used instead of UL.

For Less-Flammable Liquid-Insulated Transformers: Proof of UL listing, including details required for the installation to comply with the listing.

* + - * 1. Quality Control Submittals:

Preliminary Data: Submit certified report of the Company’s standard tests for the transformer. Test report format shall be NEMA “Transformer Test Report”.

Final Approval: After approval of preliminary data and after construction of transformer, make routine commercial ANSI/IEEE tests at the factory on the actual transformer and submit certified test reports. Test report format shall be NEMA “Transformer Test Report”.

* + - * 1. Contract Closeout Submittals:

Operation and Maintenance Data: Deliver 2 copies, covering the installed products, to the Director’s Representative.

1. PRODUCTS
   * + 1. TRANSFORMER

Also add manufacturer of the substation if not one of the below.

* + - * 1. ABB Power T & D Company Inc.’s Unit Substation Transformers, Cooper Power Systems’ Unit Substation Transformers, General Electric Co.’s Unit Substation Transformers, Niagara Transformer Corp.’s Unit Substation Transformers, or Square D Co.’s Liquid Filled Substation Transformers:

Physical size to fit into space now occupied by existing transformer.

Low Voltage Rating: \_\_\_\_\_\_\_\_ volts, 3 phase wye, 60 Hz, insulation class \_\_\_\_\_\_\_\_KV, \_\_\_\_\_\_\_\_KV BIL.

Fill in required data. See ANSI c57.l2.00 & c57.l2.l0 for data on insulation class and BIL voltage levels. Edit delta and wye connections to suit.

High Voltage Rating: \_\_\_\_\_\_\_\_ volts, 3 phase delta, 60 Hz, insulation class \_\_\_\_\_\_\_KV, \_\_\_\_\_\_\_KV BIL.

Use one of the two following subparagraphs and edit KVA to suit. If fans are required, modify first subparagraph to include fans and run circuits from the nearest available source.

KVA Rating: 1000/1120 future FA KVA, 65 degrees C. average winding temperature rise with provision for future addition of cooling fans. Future fan control to be from top liquid temperature thermometer.

KVA Rating: 500 KVA, 65 degrees C. average winding temperature rise.

UL & FM approach listing of less-flammable liquid-insulated transformers in different manners. If one method is preferred, specify only that method and design accordingly. Change UL to FM, and change parameters to meet FM requirements if FM listing is used instead of ul. See information at end of section, which highlights the differences.

There are several different types of less-flammable liquids on the market. If a specific type is desired, modify subparagraphs below and specify only the desired type (verify that all specified parameters meet the liquids’ listing requirements). See information at end of section, which lists the types available.

Less-Flammable Cooling Liquid: A type listed by UL. Transformer construction, electrical requirements, and physical installation shall be in accordance with the listing for the type of fluid being furnished, including:

Transformer tank capable of withstanding an internal pressure of 12 PSIG without rupture.

Transformer equipped with pressure relief devices having pressure relief capacity per the UL Classification Marking.

Integral primary fusing in accordance with the transformer manufacturer’s protection scheme, which limits I²T to the value required by the transformers’ UL Classification marking for the type of less flammable fluid being used.

High Voltage and Low Voltage Windings: Copper.

Use subparagraph below for delta primary.

Four or five-legged core/coil construction.

Use subparagraph below for wye primary and modify if required to match existing transformer.

Five-legged core/coil construction suitable for wye/wye connection.

High voltage neutral internally grounded and brought out to a ground pad or busing.

Secondary neutral ungrounded inside the transformer to prevent un-intentional grounding.

Primary and secondary neutrals not connected internally.

Two 2-l/2 percent FCAN and two 2-l/2 percent FCBN primary taps.

Externally operated tap changer for operation when the transformer is de-energized.

Verify impedance value for project requirements. Omit 2nd sentence in subparagraph below if not applicable.

6-l/2 percent impedance. Transformers shall have identical electrical characteristics suitable for parallel operation.

Copper busses, transitions, and accessories required to integrate transformer into existing load center unit substation.

1. EXECUTION
   * + 1. INSTALLATION

Modify paragraphs below to suit conditions

* + - * 1. Install new transformer in the existing load center unit substation.

Modify existing busses and enclosures as required to accommodate new transformer.

Connect transformer to match phase relationship of existing system.

* + - * 1. Maintain electrical service to the building by utilizing operating features of the double ended load center unit substation, summarized as follows:

The primary switches in the high voltage section serving transformer No. 1 will be opened.

Transformer No. 1’s main secondary circuit breaker in the low voltage section will be opened.

The secondary tie circuit breaker in the low voltage section will be closed.

Transformer No. 1 will be isolated.

Building will be supplied by transformer No. 2.

END OF SECTION 261221

The remainder of this section is for information only. Not to be included in project specifications.

1. Indicate on drawings the transformer KVA, primary and secondary voltage.

2. Indicate type of coil connections required.

3. Listing of Less Flammable Transformer Fluids and Less-Flammable Liquid-Insulated Transformers:

a. Factory Mutual Approved Transformer: Listing is based upon the use of a FM approved less-flammable liquid in a transformer tank that meets certain FM criteria.

1) Cylindrical tank must be capable of withstanding an internal pressure of 20 psi, rectangular tanks, 15 psi.

2) Pressure-relief devices must be provided.

3) Use of enhanced electrical protection. (Transformers are equipped with electrical protection for clearing of high and low current faults).

4) FM approved transformer fluid.

5) Spacing from adjacent combustibles must be provided, based on the fluid capacity of the transformer tank.

6) A liquid confinement area is intended to prevent the fluid from spreading beyond the vicinity of the transformer.

7) FM approved nameplate is required.

8) BIL testing at a minimum tilt of 1.5° from vertical.

9) Depending on transformer ratings; ground fault relay protection, pressure relief alarm contacts, rapid rise relay, oil level gage, liquid temperature indicator, pressure-vacuum gage.

10) Manufacturer’s quality assurance program.

11) As of July, 2000, only Cooper Power Systems has Factory Mutual Approved transformers.

12) For recommended electrical protection for each transformer (fusing, relaying) refer to Factory Mutual Property Loss Prevention Data Sheet 5-4/14-8.

13) Refer to Factory Mutual Approval Standard 3990 for details.

b. Factory Mutual Approved Less-Flammable transformer Fluids (transformer not FM approved):

1) FM approved transformer fluid.

2) Minimum separation distance per FM listing.

3) Fluid containment requirements as detailed in FM Loss Prevention Data 5-4/14-8 Section 2.4.3.

4) For recommended electrical protection for each transformer (fusing, relaying) refer to Factory Mutual Property Loss Prevention Data Sheet 5-4/14-8.

c. UL Listing is based on UL requirements that no tank rupture or noted fluid leakage occur during low-and high-current arcing fault tests.

1) Transformers be equipped with tanks capable of withstanding 12 psig minimum without rupture.

2) Transformers be equipped with pressure relief devices with minimum pressure relief capacity per the UL Classification Marking.

3) Transformer primaries be protected with overcurrent protection options per the UL Classification Marking.

4) UL Listed less-flammable transformer fluid.

4. Types of Less-Flammable Transformer Fluids approved by FM & UL as of July, 2000:

a. Factory Mutual (Refer to Approval Guide 2000 - Electrical Equipment-Transformer Fluids):

1) BIOTEMP Less-Flammable Transformer Fluid; ABB Power T&D Co. Inc. 1021 Main Campus Dr. Raleigh NC 27606.

2) Envirotemp FR3 Natural Ester-Based Less-Flammable Transformer Insulating Fluid, and R-Temp Fluid; Cooper Power Systems, Fluids Products 1900 E North St. Waukesha WI 53188.

3) Alpha-1, and Beta Fluid; Dielectric Systems, Inc. 1320 Commerce St. Box 420 Tyler TX 75702.

4) Dow Corning 561 Silicone Transformer Fluid; Dow Corning Corp. Midland MI 48686.

5) MIDEL 7131; M&I Materials Ltd. Box 136 Manchester M60 1AN England.

6) Transformer Fluid L-305, and Y-7582 Silicone Transformer Fluid; Union Carbide Chemicals & Plastics Co. Inc. Specialty Chemicals Div 39 Old Ridgebury Rd. Danbury CT 06817.

b. UL: Refer to UL Gas and Oil Equipment Directory under Transformer Fluids (EOVK).

1) Envirotemp FR3 Natural Ester-Based Less-Flammable Transformer Insulating Fluid, and R-Temp Fluid; Cooper Power Systems, Fluid Products 1900 E. North St. Waukesha, WI 53188.

2) Dow Corning 561 Silicone Transformer Fluid; Dow Corning Corp. Midland MI, 48640.

5. Codes, Standards and References applicable to liquid-immersed unit substation transformers:

a. National Fire Protection Association (NFPA):

1) NFPA 70-Article 450-Transformers and Transformer Vaults, Article 490-Equipment Over 600 Volts, Nominal.

b. National Electrical Manufacturers Association (NEMA):

1) TR-1 1993, Transformers, Regulators and Reactors.

c. American National Standards Institute (ANSI):

1) C57.12.00 1993, General Requirements for Liquid-Immersed Distribution, Power, and Regulating Transformers. (Now listed under IEEE C57.12.00 12/00/99 4th draft).

2) C 57.12.10, Requirements for Transformers 230000 volts and below 833/958 through 8333/10417 kVA, Single Phase, and 750/862 through 60000/80000/100000 kVA, Three-Phase.

3) C57.12.28 1999, Pad-Mounted Equipment-Enclosure Integrity.

4) C57.12.29 1999, Pad-Mounted Equipment - Enclosure-Integrity for Coastal Environments.

5) C57.12.70 1993, Terminal Markings and Connections for Distribution and Power Transformers. (Also IEEE C57.12.70 draft 1996).

6) C57.12.80 1992, Terminology for Power and Distribution Transformers. (Also IEEE C57.12.80 draft 1996).

7) C57.12.90 1987, Test Code for Liquid-Immersed Distribution, Power, and Regulating Transformers and Guide for Short-Circuit Testing of Distribution and Power Transformers. (Now IEEE C57.12.90 1999).

8) C57.92 1992, Guide for Loading Mineral-Oil-Immersed Power Transformers Up to and Including 100 MVA with 55 degrees C or 65 degrees C Winding Rise.

9) C57.98 1986, Guide for Transformers Impulse Tests. (Also IEEE C57.98 Rev. 1993).

10) C57.105 1992, Guide for Application of Transformer Connections in Three-Phase Distribution Systems.

d. Factory Mutual:

1) Loss Prevention Data Sheet 5-4/14-8.

2) Approved Standard for Less or Nonflammable Liquid-Insulated Transformers - Class Number 3990.

3) Approval Standard - Less Flammable Transformer Fluids - Class Number 6933.

4) Approval Guide 2000 - Electrical Equipment - Transformer Fluids.

e. Underwriters Laboratories:

1) Gas and Oil Equipment Directory - Transformer Fluids (EOVK).

2) UL 340 Tests for Comparative Flammability of Liquids.

f. IEEE:

1) IEEE 979 1994, Substation Fire Protection Guide.

END OF INFORMATION 261221