

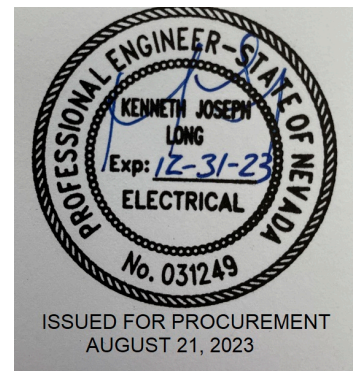
Specification No. 33 71 26.23/26

Combined Instrument Transformers

Southern Nevada Water Authority

69-12.47 kV Monthill Substation
Las Vegas, NV

Exhibit A



3010 W Charleston Blvd Suite 100
Las Vegas, NV 89102-1969

Project No. 3636S (181301299)



Revision Chart

Rev.	Reason for Change	Author	Review	Issue Date
A	Released for Client Review	KJL	CAL	01/13/2023
B	Comment Revisions	KJL	MR	05/03/2023
C	SNWA Comment Backcheck Revisions	KJL	LH	08/03/2023
D	Final Backcheck	KJL	MR	08/21/2023

Abbreviations and Acronyms

A	Amperes, measure of electrical current
AC	alternating current
ANSI	American National Standards Institute
ASTM	American Society for Testing and Materials
AWG	American Wire Gauge
BCT	Bushing Current Transformer
°C	Measurement of temperature, degrees Celsius
CIT	Combined Instrument Transformer
Contractor	The Construction Contractor responsible for installation
DAP	Delivered-at-Place, Destination
DC	Direct Current
DETC	De-Energized Tap-Changer
DOT	Department of Transportation
DWG	AutoCAD proprietary drawing format
DXF	Data Exchange File
FOB	Free on Board, Destination
HV	High-Voltage (in this text it refers specifically to the high-voltage winding, or series winding)
Hz	Hertz, measure of electrical frequency
IEEE	Institute of Electrical and Electronics Engineers
kV	kilovolts (1000's of Volts)
LV	Low-Voltage (in this text it refers specifically to the low-voltage winding, or common winding)
MCOV	Maximum Continuous Operating Voltage (with reference to a surge arrester's operating voltage)

Abbreviations and Acronyms – continued

MPT	Main Power Transformer (a step-down two-winding transformer serving the Project's distributed electrical load)
MR	Multi-Ratio, refers to CT secondary winding with taps
MSDS	Material Safety Data Sheets
MVA	Megavolt-Amperes, measure of electrical power, one-million volt-amperes
NA	Not Applicable
NEMA	National Electrical Manufacturers Association
NESC	National Electric Safety Code
OLTC	On-Load Tap-Changer
PD	Partial Discharge
PDF	Portable Document Format
pF	Picofarads, measure of electrical capacitance
ppm	parts per million
PSD	Project Specific Data Sheets (Appendix A)
Purchasing Authority	The originator of the purchase order
QA/QC	Quality Assurance/Quality Control
QSR	Quality Surveillance Representative
RFP	Request for proposal
rms	Root mean square, measure of electrical voltage
RV	Regulating Voltage (in this text it refers specifically to the high-voltage regulating winding, or tapped winding)
SR	Single-Ratio, refers to CT secondary winding without taps
SQL	Seismic Qualification Level

Abbreviations and Acronyms – continued

Stantec	Stantec Consulting Services Inc.
V	Volts, measure of electrical voltage or potential
VA	Volt-Amperes, measure of electrical power

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PART 1 - GENERAL

1.1 SUMMARY

- A. The specific application for the combined instrument transformer (CIT) is to provide revenue class metering voltage and current inputs, over an extended range of electrical power loading. The CIT will also provide a voltage source to the 69 kV transmission line protective relaying scheme and serve as a high-impedance path to ground for transmission line discharging current. The CIT is to be specifically rated, designed, manufactured, and tested for this application.
- B. The CIT is described as outdoor type, free standing, single-phase, oil insulated, with energized components supported by either a porcelain or polymer insulating column, with H₁ and H₂ line terminals, and secondary terminal box(es) for conduit entrance and secondary circuit connections.

1.2 REFERENCES

- A. American Society for Testing and Materials – International
 - 1. ASTM-D3487-08 - Standard Specification for Mineral Insulating Oil Used in Electrical Apparatus
- B. Institute of Electrical and Electronics Engineers:
 - 1. IEEE C57.13 - Standard Requirements for Instrument Transformers
 - 2. IEEE C57.13.2 - Standard Conformance Test Procedure for Instrument Transformers
 - 3. IEEE C57.13.3 - Guide for the Grounding of Instrument Transformers Secondary Circuits and Cases
 - 4. IEEE C57.13.6 - Standard for High Accuracy Instrument Transformers
- C. National Fire Protection Agency Standards:
 - 1. NFPA 70 - National Electrical Code.
- D. National Electric Manufacturers Association:
 - 1. TR 1 - Transformer, Step Voltage Regulators and Reactors

1.3 SUBMITTALS

- A. Submit product data under provisions of Section 700 of the Contract Documents.
- B. Include an outline drawing showing support point dimensions for the base mounting, terminal pad height, terminal pad detail, grounding pad detail, creepage and strike distances, weight, center of gravity, oil volume, and access detail for the secondary terminal box.
- C. Additional information included in the outline drawing: housing color, maximum cantilever moment, basic impulse level (BIL), and maximum system voltage.
- D. Include a nameplate drawing showing as a minimum the manufacturer's type or model number, serial number, and year of manufacture; total weight, oil volume; insulation level including maximum system voltage, power frequency withstand voltage, basic switching level (if applicable), and basic impulse level; rated primary

voltage and current; secondary terminals, including their voltage and ratio, accuracy, and burden; and thermal rating.

- E. Include a schematic drawing and secondary terminal box terminal block arrangement drawing.
- F. Provide an Operations and Maintenance manual, including installation and commissioning instructions. The manual shall address any requirements for calibration or adjustments that may be required over the service life of the instrument.
- G. Submit a Test Plan and Procedures document for acceptance by the Owner which outlines the design and routine tests which are to be performed at the factory prior to shipment. Provide pertinent acceptance criteria as appropriate.
- H. Submit a certified copy of the factory acceptance test data that contains, as a minimum, testing criteria as specified in IEEE C57.13 and C57.13.2:
 - 1. Ratio and Phase angle measurements.
 - 2. High-Potential withstand test
 - 3. Notify Owner at least 6 weeks prior to tests as to when and where tests shall be performed.
 - 4. Owner will pay cost of observation.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Store and protect products under provisions of Section 800 of the Contract Documents.
- B. Provide indoor vs. outdoor storage and temperature limitations.
- C. Store in a location free from traffic hazards on a level concrete pad or foundation.
- D. Handle transformers using only lifting eyes and brackets provided for that purpose.
- E. Furnish suitable, safe means for off-loading transformer from transport at job Site.
 - 1. Housing wrapped and base bolted to pallet.
 - 2. Freight damage and consequential damages shall be Contractor's responsibility.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. GE Grid Solutions
- B. Hitachi Energy
- C. Ritz
- D. Trench Electric
- E. *Owner approved equal.*

2.2 EQUIPMENT

A. Combined Instrument Transformers:

1. The 350 kV BIL Combined Instrument Transformer (CIT) shall be a free standing, single-phase, high-accuracy, extended range, 60 Hertz, revenue metering class unit, and be suitable for operation at an elevation up to 3300 feet above sea level (IEEE correction factors shall apply for operation above 3300-feet). The CIT is to be capable of operating in an outdoor environment with an average ambient temperature within a 24 hour period up to plus 30°C. The maximum ambient air temperature shall be 40 deg. C, and the minimum shall be minus 30°C for "Usual" service conditions. Site specific elevation and temperatures are listed in Paragraph C of this section. Site specific conditions outside of the "Usual" temperature range, and/or elevations greater than 3300-feet, shall be dealt with as an "Unusual" service condition under the guidelines of IEEE C57.13.
2. The CIT's energized components are to be supported by either a porcelain or polymer insulating column and internally insulated with oil/paper. Provide a method for filling, sampling, and monitoring the level of the insulating medium. As a minimum, the insulating fluid level shall be monitored through a sight glass. Oil expansion is to be compensated by either a stainless steel expansion bellows, maintaining a constant pressure within the oil system, or provide a means of venting excess pressure, with visual indication of a venting operation occurrence.
3. Primary line terminals are to be aluminum or tin-plated copper flat pads with NEMA standard 4-hole drilling. The ground terminals shall either be an integral part of the base tank and be drilled and tapped for a 2-hole NEMA connection, or a drilled 2-hole pad.
4. External components made from mild steel with a painted finish are not allowed. All external components, including the base tank housing, bolted covers, flanges, handles, valves, and hardware will be marine grade or cast aluminum, galvanized steel, or stainless steel.
5. The insulating column finish shall be ANSI #70 light gray, or the Supplier's standard equivalent finish color. The base tank, expansion chamber, and any other compartment(s) may have a light gray finish, unless the component is galvanized or constructed of either aluminum or stainless steel, in which case the component is to be left in its natural finish.
6. The CIT will be mounted upright on a horizontal mounting plate. The supporting structure and its foundation will be supplied by others.
7. Provide lifting gussets with eyes to accommodate handling and installation.

B. Instrument Transformer Ratings, Provisions, and Accessories: Transformer shall be designed to industry standards, and include the following:

1. Power Frequency: 60 Hertz
2. Nominal Transmission System Voltage: 69 kV rms
3. Maximum Transmission System Voltage: 72.5 kV rms
4. Full Wave Lightning Impulse Withstand Voltage (BIL): 350 kV, peak
5. Primary Over Voltage Factor (continuous): 110% of Nominal Voltage
6. Primary Over Voltage Factor (30 seconds): 150% of Nominal Voltage
7. Primary Nominal Voltage (Phase-to-Ground): 40.25 kV
8. 60 Hertz Withstand Test Voltage (10 seconds Wet): 140 kV rms
9. Metering Accuracy Range: 90% to 110% of Nominal Voltage
10. Minimum Total Thermal Burden (90%-110% of Nominal Voltage): 2000 VA
11. Voltage Transformer - Winding 1 (Secondary):
 - a. Primary to Secondary (X) Ratio: 350

- b. Full-winding voltage (nominal): 115 Volts
 - c. Winding tap voltage (nominal): 69 Volts
 - d. Winding accuracy class: 0.3%
 - e. Winding burden (@60Hz): MWCY
- 12. Voltage Transformer - Winding 2 (Tertiary):
 - a. Primary to Tertiary (Y) Ratio: 350
 - b. Full-winding voltage (nominal): 115 Volts
 - c. Winding tap voltage (nominal): 69 Volts
 - d. Winding accuracy class: 0.6%
 - e. Winding burden (@60Hz): MWCY and Z
- 13. Voltage Transformer - Winding 3 (Tertiary):
 - a. Primary to Tertiary (Z) Ratio: 350
 - b. Full-winding voltage (nominal): 115 Volts
 - c. Winding tap voltage (nominal): 69 Volts
 - d. Winding accuracy class: 0.15%
 - e. Winding burden (@60Hz): MWCY and Z
- 14. Current Transformer - Winding 1 (Secondary):
 - a. Primary to Secondary (X) Ratio: 200:5 SR
 - b. Secondary current (nominal): 5 Amps
 - c. Winding accuracy class: 0.15%
 - d. Winding burden (@60Hz): B1.8
 - e. Accuracy range (minimum current): 1.0% of nominal
 - f. Accuracy range (maximum): 200.0% of nominal
- 15. Current Transformer - Winding 2 (Tertiary):
 - a. Primary to Tertiary (Y) Ratio: 200:5 SR
 - b. Secondary current (nominal): 5 Amps
 - c. Winding accuracy class: 0.15%
 - d. Winding burden (@60Hz): B0.9
 - e. Accuracy range (minimum current): 1.0% of nominal
 - f. Accuracy range (maximum): 200.0% of nominal
- 16. Minimum short-time (dynamic) mechanical current rating: 125 x nominal current rating
- 17. Continuous thermal current rating: 2.0 x nominal current rating

C. Physical Characteristics:

- 1. Insulating column material: Polymer with silicone rubber weathersheds
- 2. Insulating column minimum leakage distance: 69 inches
- 3. Insulating column minimum strike distance: 30 inches
- 4. Minimum terminal loading tension (service load): 400 pounds-force
- 5. Minimum cantilever moment at terminal pad top: 100,000 inch-pounds
- 6. Weathersheds color: light gray
- 7. Site elevation: Less than 3,000 feet
- 8. Site ambient temperature range: -40 degrees C to +48 degrees C, with a 24-hour maximum average of 37 degrees C.

D. Standard accessories:

- 1. None

E. Optional accessories:

- 1. None

F. Seismic Requirements (IEEE 693): Moderate acceleration

PART 3 - EXECUTION

3.1 QUANTITY REQUIRED

- A. Three (3) single-phase units

3.2 INSTALLATION

- A. Performed by others

3.3 FIELD QUALITY CONTROL

- A. Performed by others

END OF SECTION

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