SECTION 337753 - MEDIUM-VOLTAGE UTILITY RECLOSERS

Verify that Section titles referenced in this Section are correct for this Project's Specifications; Section titles may have changed.

1. GENERAL
	* + 1. RELATED DOCUMENTS
				1. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
			2. SUMMARY
				1. Section includes medium-voltage utility reclosers.
				2. Related Requirements:

Retain subparagraph below for requirements Contractor might expect to find in this Section but are specified in other Sections.

Section 337149.13 "Overhead Medium-Voltage Wiring" for structural capacity, mounting, protection and disconnecting means, bypass means, and connecting reclosers to overhead wiring.

* + - 1. DEFINITIONS

Retain terms that remain after this Section has been edited for a project.

* + - * 1. BIL: Basic impulse level, stated in kilovolts.
			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. Product Data: For each type of product.

Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.

Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.

* + - * 1. Design Data:

Time-Current Coordination Curves: Illustrate optimum coordination of protective devices involved in the Work of this Section.

* + - * 1. Source quality-control reports.

Retain "Field quality-control reports" paragraph below if Contractor is responsible for field quality-control testing and inspecting.

* + - * 1. Field quality-control reports.
			1. CLOSEOUT SUBMITTALS
				1. Operation and Maintenance Data: For reclosers to include in emergency, operation, and maintenance manuals.

In addition to items specified in Section 017716 "Contract Closeout," include the following:

Manufacturer's written instructions for testing and adjusting overcurrent protective devices.

Time-current curves, including selectable ranges for each type of overcurrent protective device.

Record as-left set points of adjustable devices.

* + - 1. MAINTENANCE MATERIAL SUBMITTALS
				1. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

Fuses: [**One**] <**Insert number**> for each type used, but no fewer than one.

* + - 1. QUALITY ASSURANCE

Retain "Testing Agency Qualifications" paragraph below if Contractor or manufacturer selects testing agency or if Contractor is required to provide services of a qualified testing agency in "Field Quality Control" Article.

Retain option in paragraph below only after verifying that this qualification is appropriate for work on medium-voltage overhead power systems.

* + - * 1. Testing Agency Qualifications: Accredited by NETA[**or an NRTL**].

Testing Agency's Field Supervisor: Certified by NETA[**or an NRTL**] to supervise on-site testing.

* + - 1. PROJECT CONDITIONS

Retain this article if interruption of existing service is required.

* + - * 1. Interruption of Existing Service: Do not interrupt service to facilities occupied by State or others unless permitted under the following conditions and then only after arranging to provide temporary service according to requirements indicated:

Notify Director’s Representative no fewer than [**two**] <**Insert number**> days in advance of proposed interruption of service.

Do not proceed with interruption of service without Director’s Representative’s written permission.

1. PRODUCTS

Manufacturers and products listed in SpecAgent and MasterWorks Paragraph Builder are neither recommended nor endorsed by the AIA or Deltek. Before inserting names, verify that manufacturers and products listed there comply with requirements retained or revised in descriptions and are both available and suitable for the intended applications.

* + - 1. PERFORMANCE REQUIREMENTS
				1. Automatic, outdoor, [**single**] [**and**] [**three**]-phase, [**oil**] [**air**]-insulated, [**oil**] [**vacuum**]-interrupter unit designed for pole-line application.
				2. Comply with IEEE C37.60.
				3. Service Conditions. Reclosers shall be suitable for operation under service conditions specified as usual service conditions in IEEE C37.60, except for the following:

Retain and revise subparagraphs below, and specify features required to provide satisfactory service. See "Service Conditions" and "Seismic Considerations" articles in the Evaluations for discussion and additional information.

Altitudes above 3300 feet.

Exposure to fumes, vapors, or dust.

Exposure to hot and humid climate or to excessive moisture, including steam, salt spray, and dripping water.

Exposure to seismic shock or to abnormal vibration, shock, or tilting.

Exposure to excessively high solar radiation.

* + - 1. RECLOSERS
				1. Manufacturers:

G & W Electric.

Siemens.

ABB Group.

Approved equivalent.

* + - * 1. Control: [**Hydraulic**] [**Electronic, solid state**].
				2. Operating Power for Contacts: Stored energy derived internally from source electrical line.
				3. Control Power: Internal rechargeable battery or other energy storage device.

Ratings in "Ratings" paragraph below are typical; other rating combinations are available from different manufacturers.

* + - * 1. Ratings: Equal to or greater than rated system voltage.

Note that reclosers rated for nominal 15-kV system should not be applied to single-phase taps from a 14.4/24.9-kV system.

For nominal 15-kV system:

Maximum Design Voltage: 15.5 kV.

Normal Operating Voltage: 14.4 kV.

BIL: [**110**] [**150**] kV.

Continuous Current Rating: [**560**] [**630**] [**800**] kV.

Interrupting Current Rating: [**12.5**] [**16**]-kA symmetrical.

For nominal 27-kV system:

Maximum Design Voltage: 27.0 kV.

Normal Operating Voltage: 24.9 kV.

BIL: 125 kV.

Continuous Current Rating: [**560**] [**630**] [**800**] kV.

Interrupting Current Rating: [**12.5**] [**16**]-kA symmetrical.

For nominal 38 kV system:

Maximum Design Voltage: 15.5 kV.

Normal Operating Voltage: 14.4 kV.

BIL: [**150**] [**170**] kV.

Continuous Current Rating: [**560**] [**630**] [**800**] kV.

Interrupting Current Rating: [**12.5**] [**16**]-kA symmetrical.

Retain one or both of "Minimum Tripping Time-Current Setting and Reclosure Interval" paragraphs below and coordinate with submittal articles and with Drawings. Retain first paragraph to require Contractor to select recloser control settings; first paragraph may place vital design decisions with Contractor without appropriate control and safeguards. Delete first paragraph if recloser control settings are selected and coordinated as part of the design and are adequately described in this Section or on Drawings. Delete both paragraphs if protective device coordination is specified in Section 260573.16 "Coordination Studies."

* + - * 1. Minimum Tripping Time-Current Setting and Reclosure Interval: Coordinated with upstream and downstream protective devices and selected according to IEEE 242. Prepare time-current coordination curves that illustrate optimum coordination of devices in Project.
				2. Minimum Tripping Time-Current Setting and Reclosure Interval: <**Insert values**>.

On single-phase circuit reclosers, delete three-phase trip and lockout in "Control" paragraph below.

* + - * 1. Control:

Sequence of Operation: Unit senses phase-to-[**ground**] [**phase**] overcurrent and trips open, controlled by adjustable time-current settings, then recloses after adjustable time interval. Capability for selecting zero, one, two, or three reclosing cycles[**on individual phases**], followed by lockout[**, including trip and lockout of nonfaulted phases,**] after last unsuccessful reclosure.

Field Set Operating Modes:

Three-phase trip, three-phase lockout.

Single-phase trip, three-phase lockout.

Single-phase trip, single-phase lockout.

<**Insert mode**>.

Retain "Current Metering Sensors" paragraph below if required for local or remote current reading or recording.

* + - * 1. Current Metering Sensors: Integral with bushings.

Retain "Ground-Fault Sensing" paragraph below for three-phase reclosers if ground-fault relaying is included in protection scheme.

* + - * 1. Ground-Fault Sensing: Solid-state control relay, connected to sense ground faults by measuring the residual component of the three-phase current.

Retain "Remote Metering and Monitoring Communication Module" paragraph below for remote monitoring and if communication network access is provided at recloser location.

* + - * 1. Remote Metering and Monitoring Communication Module: Provide analog-to-digital conversion of current, status sensing, and capability for network communications as part of facility electrical power monitoring and control installation.[**Comply with requirements in Section 260913 "Electrical Power Monitoring and Control."**]
				2. Construction:

Consisting of three individual single-phase circuit interrupters, [**each mounted in its own enclosure,**] [**mounted in a common enclosure,**]operated by a common control system.

With pole-mounting frame on overhead power lines.

Retain "Bushings" subparagraph below for contaminated locations. Areas prone to fog, especially when combined with a heavy concentration of industrial air pollutants, and coastal areas subjected to wind-borne salt spray are typical examples of locations that require increased creepage distance.

Bushings: Creepage distance shall exceed nominal value standard for unit rating by at least 75 percent.

Retain "Hardware, Tank(s), and Cover" subparagraph below for installations in corrosive environments.

Hardware, Tank(s) and Cover: Stainless steel, type 304 or 304L, with paint coating the exterior finish system complying with IEEE C57.12.28, including manufacturer's standard color finish coat.

Control Enclosure: NEMA 250, [**Type 4**] [**Type 4X**] [**Type 4SS**], with doors to access front and back of controls, provisions for locking doors, with at least two latches to secure each door. Enclosure comes with receptacle or disconnect to quickly disconnect recloser from controls.

* + - 1. PROTECTIVE DEVICES
				1. Comply with requirements for surge arresters, cutouts, switches, and fuses specified in Section 337149.13 "Overhead Medium-Voltage Wiring."
			2. SOURCE QUALITY CONTROL

Retain "Factory Tests" paragraph below for factory-assembled medium-voltage utility reclosers. Factory tests are an added cost option and may not be available from some manufacturers. Verify requirement with Director’s Representative.

* + - * 1. Factory Tests: Test and inspect assembled medium-voltage utility reclosers according to referenced standards. Verify the following:

Wiring conforms to connection diagrams.

Electrical Operation: Close and trip to test overcurrent response and automatic reclosing.

Full functionality of all manual controls on recloser.

Contact pole resistance on each phase. Resistance shall not exceed 150 microhms.

IEEE C37.60 specifies the following values for withstand test in "60-Hz Voltage Withstand" subparagraph below:

60-Hz Voltage Withstand: Comply with IEEE C37.60.

Wiring Insulation: Terminal block connections (with foil leads and microprocessor controller in place) shall pass an overvoltage test of 1500-V ac phase to ground.

1. EXECUTION
	* + 1. GENERAL INSTALLATION REQUIREMENTS
				1. Ground equipment according to Section 337149.13 "Overhead Medium-Voltage Wiring."
				2. Surge Arresters: Install on source and load sides of recloser. Connect both source and load arrester grounds to recloser ground, and continue connection to pole ground. Leads connecting to arresters shall be as short as feasible to limit stray inductance and to maximize arrester's effectiveness.
			2. FIELD QUALITY CONTROL

Retain one of first four paragraphs below. Retain "Testing Agency" paragraph below if Director’s Representative will hire an independent testing agency.

* + - * 1. Testing Agency: Director’s Representative will engage a qualified testing agency to perform tests and inspections.

Retain "Testing Agency" paragraph below to require Contractor to hire an independent testing agency.

* + - * 1. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

Retain "Manufacturer's Field Service" paragraph below to require a Company Service Advisor to perform tests and inspections.

* + - * 1. Manufacturer's Field Service: Engage a Company Service Advisor to test and inspect components, assemblies, and equipment installations, including connections.

Retain "Perform tests and inspections" paragraph below to require the Contractor to perform tests and inspection.

* + - * 1. Perform tests and inspections[**with the assistance of a Company Service Advisor**].

Tests in "Visual Inspection" paragraph below are excerpted from NETA Acceptance Testing Specification. Retain tests applicable to this installation. For new equipment, it may not be necessary to duplicate work at the factory.

* + - * 1. Visual Inspection:

Compare equipment nameplate data with Drawings and Specifications.

Inspect physical and mechanical condition, anchorage, alignment, and grounding.

Retain one of first three subparagraphs below.

Inspect bolted electrical connections for high resistance using a low-resistance ohmmeter.

Inspect bolted electrical connections for high resistance using calibrated torque-wrench method.

Inspect bolted electrical connections for high resistance by thermographic survey.

Retain subparagraph below for oil-filled reclosers.

Verify level of appropriate insulating liquid.

* + - * 1. Mechanical Inspection: Test mechanical operation and contact alignment of both the recloser and its operating mechanism.
				2. Electrical Inspection:

Perform resistance measurements through bolted connections with a low-resistance ohmmeter.

Perform insulation-resistance tests on each pole, phase-to-phase and phase-to-ground, with recloser closed and across each open pole for one minute.

Perform a contact/pole-resistance test.

Inspect targets and indicators.

Determine pickup and dropout of electromechanical targets.

Verify operation of all digital displays.

Set contrast for digital readouts.

Set relays according to coordination study or setting sheet supplied by Director’s Representative.

Retain first subparagraph below for previously used oil-filled reclosers that are not reconditioned.

Remove a sample of insulating liquid if applicable, according to ASTM D923. Sample shall be tested according to the referenced standard.

Dielectric Breakdown Voltage: ASTM D877.

Color: ASTM D1500.

Visual Condition: ASTM D1524.

* + - * 1. Operational Tests. Test settings and functions of all protective functions.

Verify and record control functions.

Verify that each relay contact performs its intended function in the control scheme, including breaker trip tests, close inhibit tests, 86 lockout tests, and alarm functions.

For microprocessor-based relays, verify all inputs, outputs, internal logic, and timing elements used in protection, metering, and control functions.

Timing Relay:

Determine time delay.

Verify operation of instantaneous contacts.

Instantaneous Overcurrent Relay:

Determine pickup.

Determine dropout.

Determine time delay.

Time Overcurrent:

Determine minimum pickup.

Determine time delays at two points on time-current curve.

Ground Detector Relay: Determine maximum impedance to ground causing relay pickup.

Reclosing Relay:

Determine time delay for each programmed reclosing interval.

Verify lockout for unsuccessful reclosing.

Determine reset time.

Determine close pulse duration.

Verify instantaneous overcurrent lockout.

Metering and Instrumentation Tests.

Verify accuracy of meters at all cardinal points.

Calibrate meters according to manufacturer's published data.

Verify all instrument multipliers.

Verify that current transformer and voltage transformer secondary circuits are intact.

Subparagraphs below are optional for vacuum reclosers.

Perform vacuum bottle integrity test (overpotential) across each vacuum bottle, with contacts in open position in strict accordance with manufacturer's published data.

Perform overpotential test on each pole-to-ground and pole-to-pole system, with recloser in closed position.

Perform insulation-resistance tests on all control wiring for ground. For units with solid-state components, follow manufacturer's written instructions. Otherwise, the applied potential shall be 500-V dc for cable rated 300 V and 1000-V dc for cable rated 600 V. Test for one minute.

Perform overall power-factor or dissipation-factor test.

Perform power-factor or dissipation-factor test on each bushing equipped with power-factor taps.

Test instrument transformers according to NETA Acceptance Testing Specification, "Inspection and Test Procedures, Instrument Transformers" Section.

* + - * 1. Prepare test and inspection reports.
			1. DEMONSTRATION
				1. [**Engage a Company Service Advisor to train**] [**Train**] Facility’s maintenance personnel to adjust, operate, and maintain reclosers.

END OF SECTION 337753