CITY OF AUSTIN – AUSTIN ENERGY

PURCHASE SPECIFICATION

FOR

Capacitor Bank, Distribution, Pre-Assembled

DATE	PREPARED BY	ISSUANCE/REVISION	DIRECTOR
10/18/2005	Steven Booher	Re-issue	David L. Wood
11/16/2005	Steven Booher	Revision	David L. Wood
1/11/2006	Steven Booher	Revision	
9/28/2009	Gary Haydon	Revision	Allen Small
4/17/2013	Brantley Gosey	Revision	Allen Small
5/9/2013	Brantley Gosey	Revision	Allen Small
6/28/13	Brantley Gosey	Revision	Allen Small
01/04/17	Brantley Gosey	Revision	

REASON FOR REVISION	AFFECTED PARAGRAPHS
Revised switch requirements	3.4
Deleted Capacitor Control	3
Revised Functional Requirements	3
Added Capacitor Requirements	3.8
Changed HV wire requirements, Updated part numbers, Changed wire length, Added control requirements	3.1, 3.5.7, 3.6.7, 3.7
Removed Remote Programmable Controller Section	3.7
Various Changes	3.2.3, 3.2.5, 3.4.1, 3.4.7
Added Remote Programmable Controller Section	3.9
Upon request, where to send tests reports; reference E-1806	3.2.7, 3.5, 3.7.1,

This specification, until rescinded, shall apply to each future purchase and contract for the commodity described herein. Retain for future reference.

CITY OF AUSTIN – AUSTIN ENERGY

PURCHASE SPECIFICATION

FOR

PRE-ASSEMBLED DISTRIBUTION CAPACITOR BANK

1.0 SCOPE AND CLASSIFICATION

1.1 SCOPE

1.1.1 The City of Austin (COA) through its Electric Utility Department DBA Austin Energy (AE) requires a qualified Vendor to provide preassembled capacitor banks. The qualified Vendor shall have at least five (5) years of experience in the manufacture of pre-assembled capacitor banks.

1.1.2 The capacitor bank shall be shunt connected, switched and pole-mounted.

1.1.3 The capacitor bank shall be shipped factory assembled, pre-wired and ready for installation.

1.2 CLASSIFICATION

1.2.1 The capacitor bank shall be externally fused, grounded-wye design, for use on a 12.47 kV, 3-phase, 60 Hz, solidly grounded neutral distribution system.

1.2.2 AE will purchase either 600 kVar or 1200 kVar pre-assembled switched capacitor banks in accordance with this specification and the attached design drawings.

2.0 APPLICABLE SPECIFICATIONS

The capacitor bank furnished shall be designed, fabricated, tested and delivered in accordance with the latest revision of all applicable ASTM, ANSI, IEEE, ICEA, NEMA and UL standards and to the requirements stated herein.

3.0 FUNCTIONAL REQUIREMENTS

3.1 Wire

3.1.1 All wire shall be stranded concentrically-lay soft uncoated copper in accordance with ASTM B-8. The wire shall be insulated for wildlife protection.

3.2 Capacitor Unit

3.2.1 The individual capacitor units shall be rated 200 kVar, 7200 volt, single phase, 15 kV, 60Hz, double bushing 95.0 kV BIL.

3.2.2 Line-to-Line System Voltage is 12.47 kV.

3.2.3 The Capacitor unit elements shall be all film type and not contain Kraft paper. The solid dielectric material shall consist of a minimum of 2 sheets of polypropylene film.

3.2.4 The Capacitor unit shall be equipped with an internal discharge resistor.

3.2.5 Capacitor units shall be equipped with two glazed wet process bushings. The bushing terminal stud shall be solid type design. All porcelain shall be ANSI No. 70 light gray finish.

3.2.6 Capacitor unit bushings shall be provided with a tin plated copper alloy clamp type parallel-groove terminals that accommodate copper or aluminum conductors from #8 solid through number #2 stranded AWG and shall come with appropriate wildlife protection installed.

3.2.7 The dielectric fluid contained in the capacitor units shall be PCB free (less than 0.1ppm). The test method used for analysis of PCB content shall be EPA Method 608 latest revision. The contractor shall supply Austin Energy two copies of certified test reports, upon request, indicating that the dielectric fluid is PCB free. Upon request, copies of the certified test reports shall be sent to the Austin Energy Distribution Standards Supervisor.

3.2.8 Each capacitor unit shall be furnished with a heavy-duty stainless steel or aluminum nameplate in accordance with ANSI-C55.2. The name plate shall contain, but not limited to the following:

a. Manufacture name

b. Manufacture model

c. Manufacture serial number

d. Year of manufacture

e. Rated reactive power

f. Rated voltage, rms

g. Rated frequency

h. BIL

i. Statement as to whether insulating fluid is or is not flammable

j. NO-PCB

k. The actual tested production capacitance value

3.2.9 Capacitor tanks shall have type 304 stainless steel and be hermetically sealed by welding. Each tank shall be ANSI No. 70 gray in color. All parts requiring painting shall be guaranteed rust free for five (5) years.

3.2.10 Capacitor units shall have stainless steel mounting brackets left unpainted on the underside for positive grounding.

3.2.11 Each capacitor unit shall be supplied with a blue "NO-PCB" decal on the capacitor tank to provide quick and easy identification.

3.3 Capacitor Rack Mounting Frame

3.3.1 The pole mounted capacitor rack frame shall be provided to mount the capacitor units. The rack frame shall be made using lightweight, structural aluminum.

3.3.2 The capacitor rack frame shall include the following features:

a. Provision for grounding.

b. Lifting eyes, which provide for level lifting and are capable of supporting a completely equipped bank.

c. Riser wire shall be #4 AWG stranded concentrically-lay soft uncoated copper in accordance with ASTM B-8. The wire shall be covered with 110 mils of non-shielded black polyethylene in accordance with ICEA S-70-547. The riser wire length shall be a minimum of six feet.

d. Pole mounting bracket shall be supplied with a ground connector.

e. Pole mounting bracket shall be designed to mount the rack to a round wood pole.

f. Stainless steel hardware shall be utilized for mounting capacitor units and required accessories.

g. Capacitor rack shall have proper electrical clearances for 95 kV BIL, 7.2 kV phase to ground and 12.47 kV phase to phase.

h. Capacitor rack shall be sized to accommodate six 200 kVar capacitor units. The frame rack shall be provided with sway braces.

i. Capacitor rack shall be self-supporting, such that extra bracing is not required to keep the capacitor units from touching the ground during shipment and storage.

j. The capacitor rack shall have NEMA 3 cast aluminum or polymer weather resistant junction box to terminate all of the low voltage wiring. The junction box shall be mounted on the side of the capacitor rack in accordance with AE drawing titled 600 and 1200 kVar Switched.

3.4 Capacitor Switches

3.4.1 Capacitor switches shall be solid dielectric, single-phase vacuum, and have a solenoid driven operator. There shall be no porcelain used on the external portion of the switch. The switches shall be manufactured and tested in accordance with the latest revision of ANSI C37.66. Capacitor switches shall be rated as follows:

a.	Voltage Class	15kV
b.	Rated Impulse Withstand Voltage (BIL)	125kV
c.	Continuous Current Rating	200A

d.	Symmetrical Current Rating	6,000A
e.	Asymmetrical Current Rating	9,000A
f.	High Frequency Transient	12,000A
g.	Transient Inrush Frequency	6,000Hz
h.	Nominal Control Voltage	120Vac
i.	Operating Control Voltage Range	95-127 Vac
j.	Mechanical Operations-open/close without maintenance	25,000
k.	Operating Temperature Range	-40° to +65°C

3.4.2 Each vacuum switch shall include a five (5) pin weatherproof receptacle for connection to the junction box. Each switch shall be factory assembled and wired to the capacitor bank rack at the factory.

3.4.3 The switch shall require no routine maintenance.

3.4.4 The vacuum switch weight shall not exceed 28 pounds.

3.4.5 One vacuum switch shall be provided per phase.

3.4.6 The vacuum switch shall be mounted in accordance with Attachment I.

3.4.7 The switch shall be equipped with a manual hookstick operable disconnect handle.

3.4.8 Solenoid operated mechanism is required and motor operated switches will not be considered.

3.4.9 Capacitor vacuum switch supplied shall be ABB PS15 or Buyer approved equal.

3.5 Control Power Transformer (CPT)

3.5.1 A 1 kVA CPT shall be provided to operate the vacuum switches and capacitor control. The CPT shall have one (1) HV bushing and two (2) LV bushings with eyebolt connectors. The CPT shall be in accordance with Austin Energy Specification E-1806 latest revision.

3.5.2 The CPT shall have the rated secondary rated at 120 volts.

3.5.3 The CPT shall have an external tank-grounding lug.

3.5.4 CPT shall be rated for 65°C temperature rise.

3.5.5 The CPT shall be mounted on the capacitor rack prior to shipment from the factory in accordance with Attachment I.

3.5.6 The CPT shall be pre-wired to the junction box.

3.5.7 Each CPT shall include a 10 kV, 8.4 MCOV polymer housed arrester mounted on the transformer adjacent to the H1 bushing. The arrester supplied shall be Cooper URT1005-0A1A-1A1A or Ohio Brass 221609-7314 or Buyer approved equal.

3.6 Junction Box Requirements

3.6.1 The junction box supplied shall be NEMA 3 cast aluminum or polymer with hinged cover utilizing 2 wing nuts for securing the cover closed.

3.6.2 All cable entry bushings shall be aluminum liquid tight strain relief type.

3.6.3 The junction box shall be supplied with a seven (7) point terminal strip with the following designation:

a. Line "L"

b. Neutral "N"

c. Close "C"

d. Trip "T"

e. Neutral Sensor "N/S"

f. Spare

g. Spare

3.6.4 All junction box terminations shall use insulated ring tongue terminals. Only ratcheting type tools are acceptable for crimping the terminal onto the wire.

3.6.5 The junction box shall include control cables with a five (5)-pin plug to connect to the vacuum switches. The wire from the junction box to each of the vacuum switches shall be 3-conductor #14 cable. The termination and wire color code for the five (5) pin screw on plug, to the vacuum switch is as follows:

a. Pin A Not Used

b. Pin B Neutral (White)

c. Pin C Close (Red)

d. Pin D Trip (Green)

e. Pin E Not Used

3.6.6 The junction box shall include a control cable to connect to the control power transformer. The wire from the junction box to the control power transformer shall be a 2 conductor #10 stranded wire, with a bare #10 copper ground. The termination and wire color code is as follows:

a. Line (Black)

b. Neutral (White)

3.6.7 The vendor shall provide 35.0 ft of cable from the junction box to the capacitor controller. The cable shall be 7 wire, 12-gauge stranded. The wire colors shall be black, orange, green, red, blue, white and white with black stripe.

3.6.8 All control cable shall be 600 volt multi-conductor flame retardant. Control cable insulation shall be color coded, flame-retardant cross-linked polyethylene (XLPE). Cable assembly shall be wrapped with clear polyester tape. The control cable jacket shall be flame-retardant, abrasion, chemical, sunlight and weathering resistant polyvinyl chloride (PVC).

3.7 Drawings and Instruction Manuals

3.7.1 The following information should be provided with each size capacitor bank at time of bid:

a. One (1) set of drawings showing the capacitor bank layout, dimensions and component locations.

b. One (1) set of control wiring diagrams for the entire unit.

c. One (1) set of individual component instruction and operating manuals.

d. Approval drawings are required, two (2) weeks after receipt of order. Approval drawings shall be sent to the Austin Energy Distribution Standards Supervisor.

3.7.2 Austin Energy will provide and install the capacitor controller and meter base for the pre-assembled capacitor bank.

3.8 Capacitor Unit Testing Requirements

3.8.1 Each capacitor unit should be subjected to the following routine production tests as listed below:

a. Short-time overvoltage test

b. Capacitance test

c. Leak test

d. Discharge resistor test

e. Loss determination test

3.8.2 One copy of the production test shall be provided upon request to the Austin Energy Distribution Standards Supervisor.

3.8.3 The following design tests shall be preformed on the capacitor units as listed below:

a. Impulse Test

b. Thermal stability test

c. Radio influence test

d. Voltage decay test

e. Overvoltage Endurance Test, similar to IEC 60871 -25°C.

This design test shall include the application of 2.0 times AC voltage for 15 cycles and then reducing the voltage to 1.1 times rated voltage for 1.5 minutes without interruption, and then repeating the cycle again, without interruption, until the test unit has been subjected to 170 daily overvoltage cycles. This test shall continue until the test unit has been subjected to a total of 850 overvoltage cycles. At the start of each daily test period the dielectric temperature of the test unit(s) shall be -25°C.

3.8.4 Certified Design test reports verifying the above tests should be included in the bid for this item prior to final bid award. The Design tests shall be performed on capacitor units from a standard current production run. Failure to submit design test reports may be grounds for bid rejection.

3.9 Capacitor Controller

3.9.1 Mounting shall be six jaw ringed meter socket.

3.9.2 Enclosure shall be no larger than 10 in x 10 in x 7 in. NEMA 4X weather tight. Hinged with lockable hasp, exterior red neutral current fault light and surge protector pre-installed for an antenna. The surge protector shall be a Polyphaser IS-BOLN-C2 or buyer approved equal. The surge protector shall have a protective cap on the exterior male threads.

3.9.3 Contactor output shall be 30 A, 120/240VAC, 15 second on duration for motor and solenoid operated switches.

3.9.4 Surge and lighting protection shall be in accordance with ANSI C37.90.1 1989

3.9.5 Line Current Sensor input configurable for Lindsey or Fisher Pierce CT's via software.

3.9.6 Line Current Accuracy shall +/- 1%, +5 counts

3.9.7 Voltage accuracy +/- 0.5 VAC resolution

3.9.8 Temperature accuracy +/- 1 deg. F. resolution

3.9.9 Time accuracy Temperature compensated oscillator, +/- 0.001%

3.9.10 Clock backup shall power capacitor controller clock for 10 days

3.9.11 Liquid crystal display.

3.9.12 Data logging shall be 5000 records. 15 minute interval, approximately 45 days

3.9.13 Computer interface USB

3.9.14 Communications Interface Comm. 1: RS-232 serial interface for DNP 3.0 communication. Comm. 2: RS-232 serial interface for local or remote PC interface

3.9.15 Communications Power supply 12 VDC, 1 amp

3.9.16 Communication protocol DNP 3.0

3.9.17 Unit shall be designed to operate -22 deg. F to 185 deg. F. and at humidity 5-95%, non-condensing.

3.9.18 Settings Voltage: Voltage Close shall be 105-127/210-257 VAC; Max. Setting=Open Volts-3 VAC. Open: 108-103/213-260 VAC: Min. setting= close Volts +3 VAC, 5-minute time averaged voltage response. Setting in 0.1 volt increments.

3.9.19 Settings user interface shall be front panel user with visible access to all local control settings via rotary and rocker switches.

3.9.20 Amp Settings -Close shall be 10- 600

3.9.21 Amp Settings -Open shall be 5-300, no less than 5 amps less close amps.

3.9.22 KV AR settings -Close shall be -10 to -2000.

3.9.23 KVAR settings -Open. Shall be -280 to 1000. No less than 20 KVAR more than leading to Close KVAR.

3.9.24 Temperature settings Close: 0-120 deg. F; Open: 0-120 deg. F, no closer than *5* deg. F to close temperature.

3.9.25 Time delay settings shall be 3-600 seconds, 3 second increments.

3.9.26 Maximum operations per day Configurab1e from 2-24.

3.9.27 Manual trip momentary open or close, close and open operations delayed by selected time delay, 5-minute delay following open before re-close.

3.9.28 The Control shall have a red neutral current fault light on the exterior of the Control Enclosure. Neutral Amps trip shall be 3-100 amps, harmonic filtered, 5-minute time averaged response, manual reset, and 5-minute minimum tripped time.

3.9.29 The control shall have a split core neutral current sensor Fisher Pierce Part-number AT929-l-6 or buyer approved equal. The Neutral current sensor shall be packaged with the control.

3.9.30 The control shall have a PT ratio of 1-300.

3.9.31 The control shall have the following control modes:

- Time
- Voltage
- Temperature
- Current
- KVAR
- Time with voltage and temperature override

- Current with voltage override
- KVAR with voltage override

3.9.32 The controller shall be prewired and have mounting provisions to accept the UtiliNet Landis & GYR radio model number 26-1309.

3.9.33 The control shall have software features to design capacitor bank strategies from the office for future uploading to the control. Create and save different control schemes. View and analyze data downloading from capacitor controls. Examine control switching operations, power outages and system parameters. Graph stored voltage and temperature data. Zoom-in on areas of interest. Connect to a control for real time monitoring of the control parameters, such as voltage and temperature. Download stored programs to update a control scheme or download a control program from a control back to a computer. Set up the control for data logging. Program the control to store control and system parameter such as switching operations, voltage, and temperature.

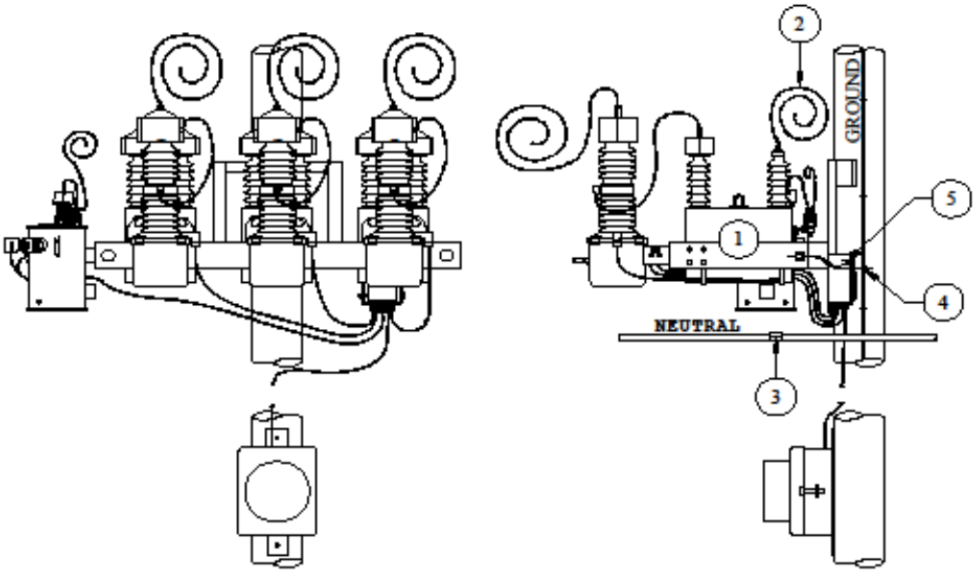
3.9.34 The Capacitor Controller supplied shall be a HD Electric 2600 Series Model Number VCC2616N058 or buyer approved equal.

ATTACHMENT I

1349-30	POLE APPARATUS	
Sheet 1 of 2	CAPACITOR BANKS	
11/01	CAPACITOR BANK - 1200 KVAR SWITCHED	Rev: 12/20/10

1349-30 CAPACITOR BANK - 1200 KVAR SWITCHED

FITALL FUSE LINK



NOTE:
METER BASE SHALL BE INSTALLED
7' ABOVE GROUND LEVEL.

1349-30-10 1/0 NEUTRAL
1349-30-20 4/0 NEUTRAL