



CITY OF CONCORD  
CONCORD, NORTH CAROLINA

FOR

**BID# 2213**

**CODDLE CREEK MEDIUM VOLTAGE MOTOR CONTROL EQUIPMENT**

FOR

WATER RESOURCES

ANNOUNCED DATE: THURSDAY, APRIL 18, 2013

DUE DATE: WEDNESDAY, MAY 1, 2013

TIME: 2:00 PM  
IN CONFERENCE ROOM C  
ALFRED M. BROWN OPERATIONS CENTER  
850 WARREN C. COLEMAN BOULEVARD  
P.O. BOX 308  
CONCORD, NC 28025

## REQUEST FOR BID

The City of Concord will receive sealed bids, on Wednesday, May 1, 2013 at 2:00 PM, in Conference Room C, Alfred M. Brown Operations Center, 850 Warren C. Coleman Boulevard, Concord, North Carolina 28025.

Said proposals will be publicly opened and read for:

**BID# 2213**  
**CODDLE CREEK MEDIUM VOLTAGE MOTOR CONTROL**  
**EQUIPMENT**

Copies of the specifications if not included in the bid can be Obtained by contacting the Purchasing Department, Alfred M. Brown Operations Center, 850 Warren C. Coleman Blvd., P.O. Box 308, Concord, N.C. 28025. Telephone (704) 920-5441, Fax (704) 785-8856.

NC General Statutes, including G.S. §143-129, and the city of Concord, NC General Specifications and Instructions to bidders will govern the RFB and award of the contract.

The City of Concord reserves the right to reject any or all bids.

Sid Talbert  
Purchasing Manager  
City of Concord, N.C.

In accordance with state law (G.S. 143.129), the award shall be made to the lowest responsible, responsive bidder, taking into consideration quality, performance, the time specified in the bid. Prices should be quoted for each line as well as a price for the total award.

Each bid must be submitted in a sealed envelope, so marked as to indicate its contents when being opened. **All bids should be marked BID #2213 CODDLE CREEK MEDIUM VOLTAGE MOTOR CONTROL EQUIPMENT**

An authorized official of the firm must sign the bid.

The vendor will be required to submit a written request for payment. Payment will depend on projected delivery date stated in the bid for items and certified acceptable by Christie Putnam – Water Resources Director, for City of Concord, P.O. Box 308, Concord, North Carolina 28025. Telephone (704) 920-5343. Questions concerning bid requirements or specifications should be directed to the Purchasing Manager, Alfred M. Brown Operations Center, 850 Warren C. Coleman Boulevard, P.O. Box 308, Concord, NC 28025. Any changes in specifications will be in writing in form of an addendum and furnished to all bidders. Verbal information obtained otherwise will not be considered in the awarding of bids. No changes to specifications will be permitted within (5) days to the bid opening.

Instructions for preparation and submission of a bid/proposal are contained in the attached packet. Please note that specific forms for submission may be required. Any changes to the conditions and specifications must be in the form of a written addendum to be valid; therefore, the Purchasing Department will issue a written addendum to document on all approved changes. Any bid submitted which does not acknowledge the receipt of an issued addendum will not be considered. Bidders should have no contact with elected officials or appointed officials except the Purchasing Manager during the bidding process. Any such contact will subject bidders to immediate disqualification. Questions regarding specifications should be directed to the Purchasing Manager. A bid proposal from your firm will be appreciated.

## Bid Proposal

City of Concord  
P.O. Box 308  
Concord, North Carolina

Gentlemen/Ladies:

The undersigned, as bidder, hereby declares the proposal is made without connection with any other person, company, or parties making a similar bid or proposal, and that it is in all respects fair and in good faith without collusion or fraud. The Bidder has carefully examined the annexed form of the specifications and instructions to the bidder and hereby declares that he will furnish the material called for in a manner prescribed in the specifications and instructions to bidders for the following prices listed.

PRICE \_\_\_\_\_

DELIVERY DATE \_\_\_\_\_

COMPANY NAME \_\_\_\_\_

AUTHORIZED SIGNATURE \_\_\_\_\_

TYPE NAME AND TITLE \_\_\_\_\_

FEDERAL ID # \_\_\_\_\_

NC CONTRACTORS LICENSE # \_\_\_\_\_

TELEPHONE # \_\_\_\_\_

**Note:**

**This signature page must be signed for your bid to be valid.**

## MEDIUM-VOLTAGE MOTOR CONTROL EQUIPMENT

### PART 1 - GENERAL

#### 1.01 Scope of Work

##### Phase A

- Replacement of Main Fused Load Break Switch
- Replacement of Motor Controllers with RVSS Controllers for Pump 1, 3, and 5

Note: Future Phase B shall include the replacement of the Tie, Main, and Motor Controllers for pump 2 and 4.

#### 1.02 General

Equipment furnished and installed under this section shall be fabricated, assembled, erected, and placed in proper operating condition in full conformity with the specifications and recommendations of the equipment manufacturer, unless exceptions are noted by the specifications.

All equipment to be furnished shall be designed, constructed, and tested in accordance with UL 347 and NEMA ICS 3-1993.

#### 1.03 System Characteristics

The equipment will be connected to a 4,160 Volt, 60 Hz, 3 Phase, three wire, solidly grounded system.

The motor controller lineup shall have an interrupting rating of 350 MVA symmetrical at 4,000 Volts and a BIL rating of 60kV. The power bus shall be braced for 50 kA symmetrical or greater.

#### 1.04 Submittals

Complete assembly, foundation, and installation drawings, together with complete engineering data covering the materials used, parts, devices, and accessories forming a part of the motor controllers. Submittals shall include:

##### Motor Controller Lineup

Elevation, plan, and weight

Unit wiring diagrams showing devices, connections, and terminal designations

Interconnection diagrams

Control schematic diagrams

Fuse time-current characteristic curves

Motor protective relay time-current characteristic curves

#### 1.05 Special Tools and Spare Parts

All special tools and other devices normally furnished or required for installation, care, and maintenance of the controller equipment shall be furnished. The spare parts shall be stored as directed by the Owner. As a minimum the following spare parts shall be delivered with the medium voltage motor control lineup. If any of the spare parts are used during the installation process, they shall be replaced by the manufacturer at no cost to the Owner.

Provide spare parts - three (3) fuses of each size used (packed for long term storage).

#### 1.06 Warranty

Warranty period (full parts and labor) shall be 24 months from the date of substantial completion.

## Part 2 – PRODUCTS

### 2.01 Acceptable Manufactures

Each motor control lineup assembly shall be the product of a manufacturer of industrial motor starters and power switch equipment who has supplied such equipment, both individually and in integrated industrial control equipment assemblies, for at least 5 years.

The equipment shall be manufactured by Rockwell Automation/Allen-Bradley. Other manufactures shall be considered but they must submit detailed data sheets for review by the owner not less than 8 days before the bid.

### 2.02 Construction

The control lineup shall conform to the arrangement, on-line diagram, schematics, and requirements indicated on the drawings or specified herein. The control lineup shall be set up for bottom feed. Each incoming main load break switch shall be set up for bottom feed. Each RVSS shall be set up for bottom exit, and shall re-use the existing conduits.

The lineup shall be braced for seismic forces in accordance with the North Carolina Building Code.

If necessary, pad extensions shall be handled by the installer.

### 2.03 Sills and Anchors

The Contractor shall furnish and install steel channels, floor sills, and anchor bolts as required by the equipment manufacturer for proper installation.

### 2.04 Enclosures

Enclosure shall be NEMA Type 1 for indoor locations.

### 2.05 Wiring Labels

All internal wires shall be labeled at each termination. Terminals shall also have labels giving the terminal block and terminal number.

## 2.06 Nameplates

Nameplates with unit description and designation of each control or indicating device shall be provided on hinged doors. Nameplates shall be black and white laminated phenolic material of suitable size, and shall be engraved with 1/2-inch high letters for section identity and 3/16-inch letters for other information. The engraving shall extend through the black exterior lamination to the white center.

Each control device and each control wire terminal block connection inside the units shall be identified with permanent nameplates or painted legends to match the identification on the manufacturer's wiring diagram.

The motor control lineup shall be provided with a nameplate identifying the manufacturer's name, address, and catalog number securely affixed to the equipment. The nameplate of the distributing agent only will not be acceptable.

## 2.07 Vertical Sections

The equipment furnished shall be of one-high type construction in which a single reduced voltage solid state motor controller requires a full-height section of the equipment.

One-high construction shall utilize the full height of the section. Standard two- high construction, with the top half of each section unused space, will not be considered as meeting this specification.

Equipment shall consist of a lineup of freestanding, metal-enclosed cubicles forming an integrally built group of medium-voltage control. All connections and servicing shall require access from the front only.

The individual sections shall be divided into high voltage and low voltage compartments, to ensure isolation of equipment for safety of personnel during servicing and maintenance or cable pulling, while adjacent sections of the group remain energized.

## 2.08 Busing

All buses shall be tin-plated copper. The main horizontal bus shall be located in an isolated bus compartment within or at the top of the enclosure and shall be rated at 1200 amperes as indicated on the drawings.

A copper ground bus shall be furnished through the lineup. A clamp type connector

shall be provided on each end of the ground bus for external connection of up to a 500 kcmil stranded copper grounding cable to the grounding system. A clamp type connector shall also be provided in each controller section for connection of stranded copper grounding cable run with incoming and outgoing phase wires, as indicated on the drawings.

#### 2.09 Motor Controller Units

Each controller unit shall consist of an externally operable isolation switch and magnetically operated vacuum contactors with current limiting fuses.

All controllers' components shall be rated to start a 600 horsepower motor.

#### 2.10 Main Disconnects

Each main disconnect shall include a gang-operated 600 amp rated load break fused switch. Load break switch and fuse units, instrument transformers, buses, and outgoing cable connections shall be provided in separate compartments formed by grounded steel barriers. Key interlocks shall be provided where indicated on the drawings to prohibit both main switches and the tie switch from being closed at the same time.

Installer to handle proper connection of the new Main Fused Load Break Switch to the existing Tie via cabling (new cabling to be supplied by installer). Since the North/West side line-up (Main Fused Load Break Switch, RVSS#1, RVSS#3 and RVSS#5) is bussed, this can be done by cabling between the main bus within RVSS #5 and the existing Tie, which are located "back-to-back"..

#### 2.11 Load Break Switches

Gang-operated load break fused switches shall comply with the performance requirements of UL 347.40. Switches shall be stationary, manually operated, three-pole, single-throw disconnecting type, with integral interrupter and stored-energy mechanism. Each switch shall have an external operating handle, with provisions for padlocking the switch in the "Off" position. Mechanical interlocks shall be provided to prevent the switch from being operated when the door is open and the door from being opened when the switch is closed.

Fuses shall be sized and furnished by the equipment manufacturer.

A viewing window shall be provided at each switch to display the condition and position of the switch blades.

#### 2.12 Isolation Switches

Each controller shall be isolated by a quick-make quick-break isolation switch with an externally mounted operating handle. Mechanical interlocks shall be provided to prevent operation of the isolation switch under load, opening of the high-voltage compartment door before the controller is isolated, and closing the contactor while the door is open.

#### 2.13 Solid-State Controllers

Controllers shall be reduced voltage solid-state motor starters designed and manufactured to conform to Part ICS 2.324 of the NEMA standards as a Class E1 controller. The horizontal bus work and the cabling bus from the main power cell shall be braced and tested in accordance with NEMA/EEMAC ICS 2.324 through ICS 2.325 and UL 347.

Each solid state controller shall be provided with a factory wired and tested Ethernet communication system capable of communicating Ethernet/IP. Ethernet capable devices shall be installed in each solid state controller and connected to the pumping station via a dedicated Cat-6 cable.

Control power for each Ethernet capable device shall be provided by individual unit control power transformer or power supply.

The SCRs shall be protected from voltage transients with a RC snubber network and be isolated from the control circuits via a fiber optic cable. The SCRs shall have a  $dv/dt$  rating of 2000V/micro second,  $di/dt$  rating of 200A per micro second and a PIV rating of 13,000V. Designs that use lower rated SCRs shall include an integral input line reactor for SCR protection.

#### 2.14 In-Line Contactor

The magnetic power contactor shall be vacuum break type, fixed-mounted style. The contactor shall electrically interlock with the main isolating switch providing the following safety features:

- a. Prevents the isolating switch from being opened or closed when the contactor is closed.
- b. Prevents opening the medium voltage door when the isolating switch is closed.

- c. Prevents closing the isolating switch when the medium voltage door of the controller is open.
- d. Removes the power to the control circuit when the isolating switch is open.

The vacuum contactor shall have the following ratings:

- 400A Continuous Current
- 0.5A Chop Current
- 2,500,000 Mechanical Operations
- 1,000,000 Electrical Operations
- 60kV BIL

#### 2.15 Bypass Contact

The bypass magnetic contactor shall be vacuum break type, fixed-mounted style. It shall be used to bypass the SCR power poles once the motor is up to full speed. When stop is commanded, the bypass contactor shall open to allow the SCR poles to operate once again just before shutdown.

#### 2.16 Controller Operating Features

The controller shall be provided with the following features:

- a. Adjustable ramp time (0 - 120 seconds)
- b. Adjustable initial current (50 - 400%)
- c. Adjustable maximum current (200 – 600%)
- d. Short SCR detection
- e. Software selectable relay output
- f. Event recorder
- g. Line frequency status
- h. LCD status display
- i. Full voltage start

#### 2.17 Motor and Controller Protection

The manufacturer of the reduced voltage solid-state motor starters furnished under this section shall be responsible for the coordination of the fused isolation switch, in-line contactor, SCRs, bypass contactor, current transformers, overload relays, surge limiters and current limiting fuses.

In selecting suitable components, the following requirements shall apply:

- a. Protection of the motor against sustained overloads and against locked rotor conditions by means of the overload relay.
- b. Protection of the fuses against sustained currents above their continuous ampere rating but below their melting value by means of an overload relay.
- c. Protection of the circuit by means of the contactor within the interrupting limits of the contactor and below the operating time of the fuses.
- d. Protection of the circuit, contactor, current transformers, and overload relays from the damaging effects of maximum fault currents by means of properly sized current limiting fuses.
- e. Protection of the motor against voltage surge by means of surge limiters.

#### 2.18 Current Transformers

Current transformers as needed for Motor Protection Relay and the Metering Package.

#### 2.19 Potential Transformers

Potential transformers as needed for Motor Protection Relay and the Metering Package.

#### 2.20 Control Power Transformers

Individual control power transformers shall be provided with each contactor and each motor starter. The transformer primary windings shall be fused and the secondary windings shall have one lead fused and the other grounded. Control power transformers which serve external device loads shall have extra capacity for motor space heaters and other associated equipment.

#### 2.21 Control Test Circuit

Test control power interlocking provisions shall allow testing of contactor or starter control operations from an external source of 120-volt control power with the high voltage disconnected and isolated.

## 2.22 Cable Connectors

Crimp-type terminal connectors for incoming and outgoing power cables shall be provided in each section. Connectors shall match the size of cables and the number of cables per phase as indicated on the drawings. Connectors to the ground bus shall be provided in each section for connecting the grounding cable in each power circuit.

## 2.23 Control Switches

Control, selector, and instrument transfer switches shall be of the multiple stages, rotary type. Number of contacts, position names, and action shall be as indicated on the drawings.

All pilot lights, pushbuttons, and selector switches shall be Allen Bradley 800T, 30.5 mm, non-metallic. Pilot lights shall be push to test, transformer type with LED bulbs.

## 2.24 Auxiliary Contacts

Auxiliary contacts for interlocking and control shall be furnished as indicated on the drawings. In addition, one spare N.O. isolated contact and one spare N.C. isolated contact shall be provided on each controller.

## 2.25 Metering Package

Each RVSS motor controller shall be equipped with a power monitor to meter voltage, current, frequency and power. It should calculate energy consumption, power factor and total harmonic distortion.

The power monitor shall have Ethernet communication capability.

The power monitor furnished shall be manufactured by Allen-Bradley and shall be Powermonitor 3000.

## 2.26 Solid-State Motor Protection Relay

Each motor shall be protected by a motor protection relay (MPR) as indicated on the drawings. The relay shall provide protection, metering, and monitoring functions. The relay shall be manufactured by General Electric and shall be GE Multilin Model 469 Motor Management Relay without exception.

The relay shall have Ethernet communication capability.

## 2.27 Control and Data Network Equipment

Furnish the labor and materials required to install the control and data onto the Control System Network.

- a. Provide and install from each RVSS controller a CAT. 6 cable to Pump Station PLC-6.
- b. Provide and install an Ethernet Switch, an Ethernet Media Converter, a fiber optic patch panel, and all necessary components to control panel PLC-6.
- c. Provide and install fiber optic cable from Pump Station PLC-6 to Main Building PLC-1.
- d. Provide and install an Ethernet Media Converter, a fiber optic patch panel, and all necessary components to Main Building PLC-1.
- e. SCADA computers to be modified as required to display the new status, control and power information.
- f. SCADA programming and modifications to be provided by Fortech, Inc. Charlotte, NC, 704-333-0621.

## 2.28 Wiring

All external connections to the equipment will enter at the bottom. Provide as much space as possible for conduits in unit floors and tops. All spare contacts shall be wired to terminals for external connections. In addition to spare contact terminals and spare terminals, terminals marked to match the manufacturer's drawing shall be provided for all connections wired through the controllers.

## 2.29 Shop Painting

All iron and steel surfaces, except machined surfaces and stainless steel, shall be shop painted with the manufacturer's standard coating. Finish color shall be ANSI 49. Field painting, other than touchup painting, will not be required. One quart of additional coating material and thinner shall be furnished to permit field touchup painting of damaged coatings.

## 2.30 Shop Tests

The complete control lineup shall be tested at the factory. All circuit, including power and control circuits, shall be tested in accordance with NEMA 2-324 and 325.

## PART 3 - EXECUTION

### 3.01 Installation

Equipment shall be installed in accordance with the Electrical Equipment Installation section and in accordance with the equipment manufacturer's recommendations.

### 3.02 Installation Check

An experienced and authorized factory direct personnel of the manufacturer shall visit the site of the Work and shall perform field services as specified in paragraph 3.03.

The authorized factory direct personnel shall furnish a written report certifying that the equipment has been properly installed.

### 3.03 Manufacturer's Field Services

Provide one (1) site visit of three days for equipment start-up and testing. These services shall be provided and included by the awarded solid-state starter manufacturer and be from factory-direct personnel. The use of agents, manufacturer's representative, associated integrators, or manufacturer's distributors for these requirements shall not be permitted.

### 3.04 Training of Owner's Personnel

After the system has been successfully field tested and checked out, provide one four-hour session for maintenance and operator training for up to 10 Owner's staff at the Owner's facility.

END OF SECTION