

INVITATION TO BID

The City of Rochester, New Hampshire, will accept sealed bids for Raw Water Pumps Rehabilitation Bids must be submitted in a sealed envelope plainly marked:

“Sealed Bid, RAW WATER PUMPS REHABILITATION

07-08

City of Rochester, New Hampshire

31 Wakefield St.

Rochester, NH 03867

Attn: Purchasing Agent

All bids must be received no later than August 17, 2006, at 2:30 PM. No late bids, telephone, faxed, or emailed bids will be accepted. The bid specifications, appendices and proposal forms may be obtained by visiting www.rochesternh.net, or emailing purchasing@rochesternh.net, or by contacting the Purchasing Agent at City Hall, 31 Wakefield Street, Rochester, NH 03867, (603) 335-7602. All bid questions must be submitted in writing (email preferred) to the Purchasing Agent. All bid proposals must be made on the bid proposal forms supplied, and the bid proposal forms must be fully completed when submitted.

SCOPE OF WORK**Part I****Raw Water Pump#3**

1. Travel to site
2. Tear down of Pump #3 (Peerlees Pump Model #8A16B) driven by 60hp motor
3. Perform inspection/diagnostic of existing pump conditions.
 - Check condition of the shaft
 - Couplings
 - Wear rings
 - Mechanical seal
 - Gaskets
 - Impeller
 - Bearings
 - Grease seals
 - Oil lubricator
 - Inspect all clearances
 - Operating temperature of motor
 - Review the sealing components for suitability of service and possible upgrading
4. Provide a detail report of existing conditions and make recommendations for repair as needed.
5. Provide installation and start-up:
 - Check alignment, vibration, and temperature. Adjust alignment as needed.
 - Check for leaks and proper operational status
 - Wire-to-water test and pump curve
7. Provide 2-year warranty for parts and labor

Part II**Raw Water Pump #2**

1. Travel to site
2. Tear down of Pump #2. (Peerlees Pump Model #8A16B) driven by 50hp motor
3. Perform inspection/diagnostic of existing pump conditions.
 - Check condition of the shaft
 - Couplings
 - Wear rings
 - Mechanical seal
 - Gaskets
 - Impeller

- Bearings
 - Grease seals
 - Oil lubricator
 - Inspect all clearances
 - Operating temperature of motor
 - Inspect all clearances
 - Review the sealing components for suitability of service and possible upgrading
4. Provide a detail report of existing conditions and make recommendations for repair as needed
5. Provide installation and start-up:
- Check alignment, vibration, and temperature. Adjust alignment as needed.
 - Check for leaks and proper operational status.
 - Wire-to-water test and pump curve
6. Provide 2 year warranty for parts and labor

Part III**Raw Water Pump #3****Furnish and install one Variable Frequency Drive (VFD)****Programming of SCADA computer to allow for remote control of VFD****Provide start-up and training**

- A. The drive shall be designed to meet the following specifications:
1. NFPA 70 - US National Electrical Code
 2. NEMA ICS 3.1 – Safety standards for Construction and Guide for Selection, Installation and Operation of Adjustable Speed Drive Systems.
 3. NEMA 250 - Enclosures for Electrical Equipment
 4. UL 508C - Underwriter's Laboratory
 5. CAN/CSA-C22 No. 14-M91. - Canadian Standards Association.
 6. IEC 146 - International Electrical Code.
- B. The drive shall conform to the following regulatory requirements:
1. NFPA 70
 2. IEC 146
 3. C-UL marking to provide an approved listing for both United States and Canadian users.
 4. Listed and classified by Underwriter's Laboratories (UL) as suitable for the purpose specified and indicated.

1.1 ENVIRONMENTAL REQUIREMENTS

- A. Confirm to specified service conditions during and after installation of products
- B. Maintain area free of dirt and dust during and after installation of products

1.2 PRE-MANUFACTURE SUBMITTALS

- A. Shop Drawings
 - 1. Elevation drawings showing dimensional information
 - 2. Structure Descriptions showing
 - a. Enclosure ratings
 - b. Fault ratings
 - c. Other information as required for approval
 - 3. Conduit locations
 - 4. Unit Descriptions including amperage ratings, frame sizes, trip settings, pilot devices, etc.
 - 5. Nameplate Information
 - 6. Schematic wiring diagrams
- B. Product Data
 - 1. Publications on variable frequency drive
 - 2. Data Sheets and Publications on all major components
 - a. Contactors
 - b. Circuit Breaker and Fuse information including time current characteristics
 - c. Control Power Transformers
 - d. Pilot devices
 - e. Relays
- C. Specification Response
 - 1. Detailed response to this specification showing where in the literature each requirement is satisfied.
 - 2. All clarifications and exceptions must be clearly identified.
- D. Testing and Test Reports
 - 1. Testing shall be per manufacturer's standard
 - 2. A copy of the test reports shall be provided as part of the Closeout documentation

1.3 CLOSEOUT SUBMITTALS

- A. Contractor shall provide certification that the variable frequency drive has been installed in accordance with the manufacturer's instructions.
- B. The contractor shall provide certification that the Contractor has properly adjusted any timing devices required in the starting circuitry.
- C. Final Drawings. The manufacturer shall provide final drawings reflecting the "As-Shipped" status of the motor control center. The contractor shall be responsible for making any changes to the "As-Shipped" drawings from the manufacturer to reflect any field modifications.
- D. Maintenance Data
 - 1. Variable frequency drive installation instructions and User Manual
 - 2. Installation / Operation instructions for major components such as circuit breakers, contactors, isolation transformers, etc.
 - 3. Drive Parameter Listing
 - 4. Field Service report from drive start-up service
 - 5. Variable Frequency spare parts listing and pricing
 - 6. Include name and phone number for a local distributor for the spare parts.

1.4 DELIVERY, STORAGE AND HANDLING

- A. Contractor shall coordinate the shipping of equipment with the manufacturer.
- B. Contractor shall store the equipment in a clean and dry space.
- C. The contractor shall protect the units from dirt, water, construction debris and traffic.
- D. During storage the contractor shall connect internal space heaters (if specified) with temporary power.

1.5 FIELD MEASUREMENTS

- A. The Contractor shall verify all field measurements prior to the fabrication of the variable frequency drives.

1.6 SPARE MATERIALS

- A. Provide one (1) set of (3) of each size power fuse utilized

- B. Provide spares equal to 10 percent of the installed quantity for primary and secondary control power fuses
- C. Provide one (1) spare control relay for each unique relay utilized on the project
- D. (1) PCB Main Control Board for each unique PCB Main Control Board utilized on the project
- E. (1) Gate Drive Board for each unique Gate Drive Board utilized on the project.
- F. (1) Communication Adapter Boards for each unique Communication Adapter Board utilized on the project

1.7 WARRANTY

- A. The manufacturer shall provide their standard parts warranty for eighteen (18) months from the date of shipment or twelve (12) months from the date of being energized, whichever occurs first.
- B. The manufacturer shall confirm this warranty as part of the submittal.
- C. This warranty applies only to stand alone variable frequency drives.

PART 2 PRODUCTS

2.1 RATINGS

- A. The drive shall accept an input voltage of 480Vac, three phase plus or minus 10 percent
- B. For drives rated greater than five (5) horsepower, the displacement power factor shall range between 1.0 and 0.95, lagging, over the entire speed range.
- C. Efficiency: minimum of 97% at full load and speed.
- D. Environmental Ratings
 - 1. Storage ambient temperature range: -40 C to 70 C (-40 to 158 F).
 - 2. Operating ambient temperature range: 0 C to 40 C (0 to 109 F) without derating.
 - 3. The relative humidity range is 5% to 95% non-condensing.
 - 4. Operating elevation: up to 1000 Meters (3,300ft) without derating.

- E. Output power Ratings
1. The output voltage shall be adjustable from 0 to rated motor voltage.
 2. The output frequency range shall adjustable from 0 to 320Hz.
 3. The inverter section shall produce a pulse width modulated (PWM) waveform using latest generation IGBTs.
- F. Sizing
1. All loads are normal duty loads
 2. Loads shall be as shown on the drawings.

heavy duty shall provide 150 percent overload capability for up to one minute and 200 percent overload capability for up to three seconds.

- G. Definitions
1. The Drive Unit shall refer to the actual drive that will be mounted within the specified enclosure.
 2. The Drive System shall refer to the drive unit and all items specified under Drive System Options.

2.2 DRIVE UNIT DESIGN

- A. Hardware
1. Utilize diode or fully gated bridge on the input
 2. Utilize line reactor on all ratings.
 3. Utilize switching logic power supply operating from the DC bus.
 4. Incorporate phase to phase and phase to ground MOV protection.
 5. Utilize gold plated plug-in connections on printed circuit boards.
 6. Microprocessor based inverter logic shall be isolated from power circuits.
 7. Utilize latest generation IGBT inverter section.
 8. Inverter section shall not require commutation capacitors.
 9. Employ interface common for all horsepower ratings. Interface shall include a LCD digital display, programming keypad and operator key options.
 10. Main Control Board shall be common for all ratings.
 11. Control connection shall be common for all ratings.
 12. Common Node Capacitors available on all frames.
- B. Control Logic
1. Ability to operate a drive with motor disconnected

2. Provide a controlled shut down, when properly fused, with no component failure in the event of an output phase to phase or phase to ground short circuit. Provide annunciation of the fault condition.
3. Utilize an adjustable PWM carrier frequency within a range of 1-6kHz.
4. Provide either Selectable Sensorless Vector or V/Hz modes.
5. The drive shall be suitable for use on either normal duty or heavy duty loads. If specified for normal duty, the drive shall provide 110 percent overload capability for up to one minute and 150 percent overload capability for up to three seconds. If specified for heavy duty, the drive shall provide 150 percent overload capability for up to one minute and 200 percent overload capability for up to three seconds.
6. Provide multiple programmable stop modes including – Ramp, Coast, DC-Brake, Ramp-to Hold and S-Curve
7. Provide multiple acceleration and deceleration rates.
8. All adjustments shall be made with the door closed.
9. The drive shall have an adjustable output frequency up to 320Hz.

C. Power Conditioning

1. The drive shall be designed to operate on an AC line which may contain line notching and up to 10% harmonic distortion.
2. An input isolation transformer shall not be required for protection from normal line transients. If line conditions dictate the use of a transformer, the K factor shall be 4.0 or less.

2.3 DRIVE UNIT FEATURES

A. Control Mode

1. Selectable sensorless vector or V/Hz mode selectable through programming.
2. The sensorless vector mode shall use motor nameplate data plus motor operating data such as IR drop, nominal flux current and flux up time.
3. The volts per hertz mode shall be programmable for pre programmed fan curve, straight line or full custom patterns.

B. Current Limit

1. Programmable current limit from 0.1 amps to 150% of drive rated amps.
2. Current limit shall be active for all drive states: accelerating, constant speed and decelerating.
3. The drive shall employ PI regulation with an adjustable gain for smooth transition in and out of current limit.

- C. Acceleration / Deceleration
 - 1. Accel/Decel settings shall provide separate adjustments to allow either setting to be adjusted from 0 seconds to 3600 seconds.
 - 2. A second set of remotely selectable Accel/Decel settings shall be accessible through digital inputs.
- D. Speed Regulation Modes
 - 1. Open Loop
 - 2. Slip Compensation with speed regulation from 0.1 to 0.5 percent.
 - 3. Process PI control
- E. Speed Profiles
 - 1. Programming capability shall allow the user to produce speed profiles with linear acceleration/deceleration or "S-Curve" profiles that provide changing accel/decel rates.
 - 2. S-Curve profiles shall be adjustable.
- F. Adjustments
 - 1. A digital interface shall be used for all set-up, operation and adjustment settings.
 - 2. All adjustments shall be stored in nonvolatile memory (EEPROM).
 - 3. No potentiometer adjustments shall be required.
 - 4. The drive shall provide EEPROM memory for factory default values.
- G. Process PI Control
 - 1. The drive shall incorporate an internal process PI regulator with proportional and integral gain adjustments as well as error inversion and output clamping functions.
 - 2. The feedback shall be configurable for normal or square root functions. If the feedback indicates that the process is moving away from the set point, the regulator shall adjust the drive output until the feedback equals the reference.
 - 3. Process control shall be capable of being enabled or disabled with a hardwire input. Transitioning in and out of process control shall be capable of being tuned for faster response by preloading the integrator.
 - 4. Protection shall be provided for a loss of feedback or reference signal.
- H. Fault Reset / Run
 - 1. The drive shall provide up to nine automatic fault reset and restarts following a fault condition before locking out and requiring manual restart.
 - 2. The automatic mode shall not be applicable to a ground fault, shorted output faults and other internal microprocessor faults.

3. The time between restarts shall be adjustable from 0.5 seconds to 30 seconds.
- I. Skip Frequencies
 1. Three adjustable set points that lock out continuous operation at frequencies which may produce mechanical resonance shall be provided.
 2. The set points shall have a bandwidth adjustable from 0Hz to 60Hz.
 - J. Run on Power Up
 1. A user programmable restart function shall be provided to automatically restart the equipment after restoration of power after an outage.
 - K. Inertial Ride Through
 1. The drive shall respond to a loss of AC input power by adjusting the output frequency to create a regenerative situation in the motor.
 2. The regenerated energy shall recapture the mechanical energy and convert it to electrical energy that shall power the drive logic during the power outage.
 3. The drive shall retain control of the motor during the power outage.
 4. The performance shall be based upon the amount of system inertia and the length of the outage.
 5. The amount of voltage drop required to trigger inertia ride through and the level at which regulation occurs shall be adjustable.
 6. Inertial Ride Through shall be capable of being enabled or disabled vial programming.
 - L. Fault Memory
 1. The last eight (8) fault codes with respective time shall be stored in a fault buffer.
 2. Information about the drive's condition at the time of the last fault such as operating frequency, output current, dc bus voltage and twenty-eight other status conditions shall be stored.
 3. A power up marker shall be provided at each power up time to aid in analyzing fault data.
 4. The last eight alarm codes shall be stored, without time stamp, for additional troubleshooting reference.
 - M. Overload Protection
 1. The drive shall provide internal Class 10 motor overload protection investigated by UL to comply with N.E.C. Article 430.
 2. Overload protection shall be speed sensitive and adjustable.
 3. A viewable parameter shall store the overload usage.

- N. Auto Economizer
1. An auto economizer feature shall be available to automatically reduce the output voltage when the drive is operating in an idle mode (drive output current less than programmed motor FLA). The voltage shall be reduced to minimize flux current in a lightly loaded motor thus reducing kW usage.
 2. When the load increases, the drive shall automatically return to normal operation.
- O. Terminal Blocks
1. Separate terminal blocks shall be provided for control and power wiring.
- P. Flying Start
1. The drive shall be capable of determining the speed and direction of a spinning motor and adjust its output to "pick-up" the motor at the rotating speed.
- Q. Ride Through
1. The control logic shall be capable of "riding through" a power outage of up to 2 seconds in duration.
- R. Inputs and Outputs
1. The standard Input / Output board shall consist of both analog and digital I/O.
 2. No jumpers or switches shall be required to configure inputs and outputs. All functions shall be fully programmable.
 3. The Input / Output board shall have the following analog inputs as standard.
 - a. Quantity one (1) differentially isolated plus or minus 10V (bi-polar) / 20mA, 9 bit plus sign, 10V common mode noise rejection
 - b. Quantity one (1) differentially isolated plus or minus 10V (bi-polar) / 20mA, 9 bit plus sign, 160V common mode noise rejection
 - c. Analog inputs shall be user programmable for a variety of uses including frequency command and process loop input. Analog inputs shall be user programmable for function scaling (including invert), offset, signal loss detect and square root.
 4. The Input / Output board shall have the following analog outputs as standard.
 - a. Quantity one (1) differentially isolated plus or minus 10V (bi-polar) / 20mA, 9 bit plus sign.

- b. The analog output shall be user programmable to be proportional to one of fourteen process parameters including output frequency, output current, encoder feedback, output power.
 - c. Programming shall be available to select either absolute or signed values of these parameters.
- 5. The Input / Output board shall have the following digital inputs as standard.
 - a. Quantity of six (6) digital inputs rated 115Vac
 - b. All inputs shall be individually programmable for functions from a list of thirty-one (31) that includes Start, Run, Stop, External Fault, Speed Select, Jog and Process PI functions.
- 6. The Input / Output board shall have the following digital outputs as standard.
 - a. Quantity of two (2) relay outputs, form C (1 N.O. – 1 N.C.)
 - b. Contact output ratings shall be 250Vac / 30Vdc (2.0 Amps maximum), resistive or inductive.
 - c. Relays shall be programmable to twenty-eight (28) different conditions including Fault, Alarm, At Speed, Drive Ready and PI Excess Error.
 - d. Timers shall be available for each output to control the amount of time, after the occurring event, that the output relay actually changes state.
- S. Reference Signals
 - 1. The drive shall be capable of using the following input reference signals
 - a. Analog inputs
 - b. Preset speeds
 - c. Remote potentiometer
 - d. Digital MOP
 - e. Human Interface
 - f. Communication module commands
- T. Loss of Reference
 - 1. The drive shall be capable of sensing the following reference loss conditions.
 - 2. In the event of loss of the reference signal, the drive shall be user programmable to the following:
 - a. Fault the drive
 - b. Alarm and maintain last reference
 - c. Alarm and go to preset speed
 - d. Alarm and go to minimum speed
 - e. Alarm and go to maximum speed

- f. Alarm and maintain last output frequency

- U. Metering

- 1. The following parameters shall be accessible through the Human Interface
 - a. Output Current in Amps
 - b. Output Voltage in Volts
 - c. Output Power in kW
 - d. Elapsed MWh
 - e. DC Bus Voltage
 - f. Output Frequency
 - g. Last eight (8) faults
 - h. Elapsed Run Time

- V. Faults

- 1. Fault information shall be accessible through the Human Interface
 - 2. At a minimum the following faults shall be displayed
 - a. Power Loss
 - b. Undervoltage
 - c. Overvoltage
 - d. Motor Overload
 - e. Heat Sink Over-temperature
 - f. Maximum Retries
 - g. Phase to Phase and Phase to Ground Faults

2.4 DRIVE SYSTEM OPTIONS

- A. Enclosure

- 1. NEMA 12 enclosure for indoor use to provide a degree of protection against dust, falling dirt and dripping non-corrosive liquids.
 - a. They shall be designed to meet drip, dust and rust resistance tests.
 - b. Free standing enclosures shall be provided with cooling mechanisms deemed appropriate for the environmental conditions.
 - 2. Paint: Manufacturer's standard
 - 3. Top entry and bottom exit for power cables
 - 4. Provide a 6.25" x 2" door mounted white lamacoid nameplate with black letters (message to be defined during submittal).
 - 5. UL Label for UL panel recognition

- B. Drive Input Fuses
 - 1. Provide drive input fuses to provide branch circuit protection for the drive.
 - 2. The drive input fuses shall be selected by the manufacturer and mounted in the fused disconnect.
 - 3. Mounting
 - a. If a fused disconnect is provided, the fuses shall be mounted in the disconnect.
 - b. If other than a fused disconnect is provided, the fuses shall be mounted in fuse blocks.
- C. Drive Input Fused Disconnect (Mutually Exclusive to Drive Input Circuit Breaker)
 - 1. Provide a door interlocked fused disconnect switch
 - 2. Operator Handles
 - a. Provide flange mounted operator handles for free standing units.
 - b. Provide through the door operating handles for wall mounted units
 - c. Handles shall be padlockable
 - 3. The drive system shall be rated for 65,000 amps. The rating shall be shown on the drive label.
- D. Drive Input Circuit Breaker (Mutually Exclusive to Drive Input Fused Disconnect)
 - 1. Provide a door interlocked motor circuit protector disconnect
 - 2. Operator Handles
 - a. Provide flange mounted operator handles for free standing units
 - b. Provide through the door operating handles for wall mounted units
 - c. Handles shall be padlockable
 - 3. The drive system shall be rated for 65,000 amps. The rating shall be shown on the drive label.
- E. Drive Input Line Reactor
 - A. Provide a drive input line reactor mounted within the drive system enclosure
 - B. The line reactor shall meet the following specifications:
 - 1. The construction shall be iron core with an impedance of (3) percent
 - 2. The winding shall be copper wound.
 - 3. The insulation shall be Class H with a 115 degree C rise.
 - 4. The unit shall be rated for system voltage and frequency

- F. Drive Input Contactor
 - 1. Provide an input contactor between the AC line and the drive.
 - 2. The contactor shall close on power up using drive circuitry.
- G. Drive Output Contactor (Standard with Bypass Options)
 - 1. Provide an output contactor between the drive output and the motor.
 - 2. The contactor shall close on power up and open after a drive fault or loss of power.
- H. Manual Bypass with Across the Line Starting
 - 1. Provide means to manually switch a single motor from drive control to bypass (across the line operation).
 - 2. Provide separate drive output and bypass contactors. The contactors shall be electrically interlocked.
 - 3. Provide a door-mounted Drive//Off/Bypass selector switch and pilots lights for indication of Drive and Bypass modes of operation.
 - 4. Provide a Class 10 overload for motor protection while operating in the bypass mode.
 - 5. Provide an output circuit breaker to provide an isolated bypass to allow for maintenance of the drive while in the bypass mode. Isolation provided solely by input and output contactors is not acceptable.
- I. Manual Bypass with Reduced Voltage Starting
 - 1. Provide means to manually switch a single motor from drive control to bypass (across the line) operation with soft start.
 - 2. Provide Allen-Bradley SMC Plus solid state motor controller with pump control option to provide soft start and smooth acceleration capability when first switching to bypass operation and smooth deceleration when stopping in bypass.
 - a. Microcomputer shall analyze the motor variables and generate control commands that control the motor to reduce the possibility of surges occurring in the system.
 - b. The starting time shall be adjustable from 2 to 30 seconds.
 - c. The stopping time shall be adjustable from 2 to 120 seconds.
 - 3. Provide separate contactors for drive output, SMC Plus output and total bypass. The total bypass contactor shall be utilized to bypass the SMC Plus once the motor is up to speed and shall be capable of starting and operating the motor if so wired in the field. The contactors shall be electrically interlocked.

4. Provide a door-mounted Drive/Off/Bypass selector switch and pilots lights for indication of Drive and Bypass modes of operation.
 5. Provide a Class 10 overload for motor protection while operating in the bypass mode.
 6. Provide an output circuit breaker to provide an isolated bypass to allow for maintenance of the drive while in the bypass mode. Isolation provided solely by input and output contactors is not acceptable.
- J. Class 20 Motor Thermal Overload Relay
1. Provide a Class 20 thermal overload relay.
 2. The relay shall utilize eutectic alloy heater elements.
 3. If a bypass option has been selected, then this overload is to be provided instead of the overload normally provided.
- K. Control Power Transformer
1. Provide a control power transformer mounted and wired inside of the drive system enclosure.
 2. The transformer shall be rated for drive power plus 250VA for customer use.
- L. Common Mode Choke
1. Provide a common mode choke at the drive output to help, in conjunction with the proper grounding techniques, reduce or eliminate interference with sensitive electronic equipment or communication devices installed in the same system.
- M. Harmonic Mitigation Techniques
1. None required
 2. Harmonic Trap Filter
 - a. Provide a harmonic trap filter mounted within the drive system enclosure.
 - b. Separately mounted units are not acceptable
 - c. The harmonic trap filter shall incorporate a 5% impedance input line reactor.
- N. Auxiliary Relays
1. Provide relays for Drive Alarm, Drive Fault and Drive Run.
 2. Provide (2) additional relays to be wired per custom requirements.
 3. The relays shall be Allen-Bradley 700HC24A1 relays (2 form C contacts, 2N.O. & 2N.C.). The relay contacts shall be rated for 115V AC/30V DC, 5.0 Amp resistive, 5.0 Amp inductive.
- O. Remote I/O Communication
1. Provide a Single Point Remote I/O interface board.

2. The board shall be configurable for 1/4, 1/2, 3/4, or full rack with a baud rate of 57.6, 115, or 230kbaud.
 3. The Remote I/O board shall be set up to monitor drive status and process parameters.
- P. Control Interface
1. The control terminals shall be rated for 115V AC.
 2. Inputs shall be optically isolated from the drive control logic.
 3. The control interface card shall provide input terminals for access to fixed drive functions that include start, stop, external fault, speed, and enable.
- Q. Enclosure Space Heater
1. Provide an enclosure space heater (180W fin strip type) to help prevent condensation inside the enclosure during periods of drive inactivity.
 2. The space heater shall be energized whenever the drive power is removed.
 3. Provide a white "Enclosure Space Heater On" pilot light mounted on the enclosure door.
 4. Power for the space heater shall be provided remote from the drive.
- R. Motor Heater Control
1. Provide drive control circuitry to interface with a remote 120VAC/360W power source to energize the motor heater whenever the motor is not running.
 2. The heater shall be interlocked with the drive run relay and shall be energized whenever the motor is not running.
 3. Provide a pilot light mounted on the drive system enclosure door for indication of Motor Heater On.
- S. Auto-Manual Selector Switch
1. Provide an Auto/Manual selector switch for Speed Reference
 2. The devices shall be Allen-Bradley Bulletin 800E pilot devices (22.5mm, NEMA Type 4/4X/13) mounted on the drive system enclosure door.
- T. Hand-Off-Auto Selector Switch
1. Provide a "Hand/Off/Auto" selector switch for start-stop control
 2. Provide pilot lights for indication of the "Hand" and "Auto" modes.
 3. The devices shall be Allen-Bradley Bulletin 800E pilot devices (22.5mm, NEMA Type 4/4X/13) mounted on the drive system enclosure door.
- U. Start-Stop Pushbuttons
1. Provide Start and Stop pushbuttons.

2. The devices shall be Allen-Bradley Bulletin 800E (22.5mm, NEMA Type 4/4X/13) pilot devices mounted on the drive system enclosure door.
- V. Pilot Lights
1. Provide pilot lights, mounted on the enclosure door, for indication of Control Power On, Run and Drive Fault.
 2. The devices shall be Allen-Bradley Bulletin 800E (22.5mm, NEMA Type 4/4X/13) pilot devices mounted on the drive system enclosure door.
- W. Speed Potentiometer
1. Provide a NEMA Type 1/4/12, single turn speed pot mounted on the drive system enclosure door.
- X. Motor Run Time Meter
1. Provide a digital, non-resettable, door-mounted elapsed time meter.
 2. The meter shall be electrically interlocked with the Drive Run relay and Bypass contactor (if required) to indicate actual motor operating hours.
- Y. Human Interface Module
1. Provide a door mounted Human Interface Module with integral display, operating keys and programming keys.
 2. The Human Interface shall be rated IP66 / UL Type 4X, 12.
 3. The display portion shall have the following features
 - a. The display shall be a seven (7) line by twenty-one (21) character backlit LCD display with graphics capability.
 - b. The display shall show drive operating conditions, adjustments and fault indications.
 - c. The display shall be configured to display in three distinct sections.
 - 1.) The first section shall be a status display for direction, status, fault / alarm conditions and Auto / Manual mode.
 - 2.) The second section shall display drive output frequency.
 - 3.) The third section shall be configurable as a display for either programming menus / information or as a two-line user display for two additional values utilizing scaled units.
 4. The Human Interface shall provide digital speed control.
 5. The keypad shall include programming keys, drive operating keys (Start, Stop, Direction, Jog and Speed Control), and numeric keys for direct entry.

- Z. RTD Protection Module
 - 1. Provide a door mounted RTD sensing module for over temperature and under temperature protection.
 - 2. Each unit shall monitor up to (8) motor mounted RTDs and shall have (3) output relays for alarm, trip and fault.
 - 3. Customer contacts shall be rated 5A-250V ac resistive.

PART 3 EXECUTION

3.1 MANUFACTURE'S FIELD SERVICES

- A. The service division of the variable frequency drive manufacturer shall perform all start-up services. The use of third party supplier start-up personnel is not allowed.
- B. At a minimum, the start-up service shall include:
 - 1. Pre-Power Check
 - a. Megger Motor Resistances: Phase to Phase and Phase to Ground
 - b. Verify system grounding per manufacturer's specifications
 - c. Verify power and signal grounds
 - d. Check connections
 - e. Check environment
 - 2. Drive Power-up and Commissioning
 - a. Measure Incoming Power Phase-to-Phase and Phase-to-Ground
 - b. Measure DC Bus Voltage
 - c. Measure AC Current Unloaded and Loaded
 - d. Measure Output Voltage Phase-to-Phase and Phase-to-Ground
 - e. Verify input reference signal
 - 3. Record all measurements
 - 4. Tune drive for system operation
 - 5. Provide Drive Parameter Listing

3.2 TRAINING

- A. Manufacturer to provide a quantity of one, four hour session of on-site instruction.
- B. A qualified service technician shall perform training.
- C. The instruction shall include the operational and maintenance requirements of the variable frequency drive.

- D. The basis of the training shall be the variable frequency drive, the engineered drawings and the user manual. At a minimum, the training shall:
1. Review of the engineered drawings identifying the components shown on the drawings.
 2. Review starting / stopping and speed control options for the controller.
 3. Review operation of the Human Interface for programming and monitoring of the variable frequency drive.
 4. Review the maintenance requirements of the variable frequency drive.
 5. Review safety concerns with operating the variable frequency drive.

RAW WATER PUMPS REHABILITATION SPECIFICATIONS

The City of Rochester is requesting bids to furnish and install on variable raw water pump and rehabilitation on another, the scope of work is located on pages 2 through 28 of this invitation to bid. This work will be completed within 60 working days after notification. A certificate of insurance will need to be supplied upon time of award.

Bid Item #1

Raw Water Pump#3

Price in Words

Price in numbers

Bid Item #2

Raw Water Pump #2

Price in Words

Price in numbers

Bid Item #3

Raw Water Pump #3**Furnish and install one Variable Frequency Drive (VFD)****Programming of SCADA computer to allow for remote control of VFD**

Provide start-up and training

Price in Words

Price in numbers

VENDOR NAME: _____

CONTACT PERSON: _____

SIGNATURE: _____

ADDRESS: _____

TELEPHONE# _____ FAX# _____ E-MAIL# _____

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INSTRUCTION TO BIDDERS

PREPARATION OF BID PROPOSAL

1. The Bidder shall submit her/his proposal upon the forms furnished by the City (attached). The bidder shall specify a unit price, both in words and figures if requested, for each pay item for which a quantity is given. All words and figures shall be in ink or typed.
2. If a unit price or lump sum bid already entered by the bidder on the proposal form is to be altered it should be crossed out with ink, the new unit price or lump sum bid entered above or below it, and initialed by the bidder, also with ink. In case of discrepancy between the prices written in words and those written in figures, the prices written in words shall govern.
3. The bidder's proposal must be signed with ink by the individual, by one or more members of the partnership, by one or more members or officers of each firm representing a joint venture; by one or more officers of a corporation, or by an agent of the contractor legally qualified and acceptable to the owner. If the proposal is made by an individual, his name and post office address must be shown, by a partnership the name and post office address of each partnership member must be shown; as a joint venture, the name and post office address of each must be shown; by a corporation, the name of the corporation and its business address must be shown, together with the name of the state in which it is incorporated, and the names, titles, and business addresses of the President, Secretary, and Treasurer.
4. All questions shall be submitted in writing to the Purchasing Agent. The Purchasing Agent will then forward both the question and the City's response to the question to all prospective bidders.

IRREGULAR PROPOSALS

Bid proposals will be considered irregular and may be rejected for any of the following reasons:

1. If the proposal is on a form other than that furnished by the Owner or if the form is altered or any thereof is detached.
2. If there are unauthorized additions, conditional or alternate bids, or irregularities of any kind which may tend to make the proposal incomplete, indefinite or ambiguous as to its meaning.
3. If the bidder adds any provisions reserving the right to accept or reject an award, or to enter into a contract pursuant to an award.
4. If the proposal does not contain a unit price for each pay item listed, except in the case of authorized alternate pay items.

DELIVERY OF BID PROPOSALS

When sent by mail, the sealed proposal shall be addressed to the owner at the address and in the care of the official in whose office the bids are to be received. All proposals shall be filed prior to the time and at the place specified in the invitation for bids. Proposals

received after the time for opening of the bids will be returned to the bidder, unopened. Faxed bid proposals are not acceptable.

WITHDRAWAL OF BID PROPOSALS

A bidder will be permitted to withdraw his proposal unopened after it has been deposited if such request is received in writing prior to the time specified for opening the proposals.

PUBLIC OPENING OF BID PROPOSALS

Proposals will be opened and read publicly at the time and place indicated in the invitation for bids. Bidders, their authorized agents, and other interested parties are invited to be present.

DISQUALIFICATION OF BIDDERS

Either of the following reason may be considered as being sufficient for the disqualification of a bidder and the rejection of his proposal of proposals:

1. Evidence of collusion among bidders.
2. Failure to supply complete information as requested by the bid specifications.

AWARD AND EXECUTION OF CONTRACT

CONSIDERATION OF PROPOSALS

1. Bids will be made public at the time of opening and may be reviewed only after they have been properly recorded. In case of discrepancy between the prices written in words and those written figures, the prices written in words shall govern. In case of a discrepancy between the total shown in the proposal and that obtained by adding the products of the quantities of items and unit bid prices, the latter shall govern.
2. The right is reserved to reject any or all proposals, to waive technicalities or to advertise for new proposals, if in the judgment of the City, the best interest of the City of Rochester will be promoted thereby.

AWARD OF CONTRACT

If a contract is to be awarded, the award will be made to the lowest responsible and qualified bidder whose proposal complies with all the requirements prescribed as soon as practical after the bid opening. No bid shall be withdrawn for a period of (60) sixty days subsequent to the opening of bids without the consent of the City of Rochester. The successful bidder will be notified, by the form mailed to the address on his proposal, that his bid has been accepted and that he has been awarded the contract.

CANCELLATION OF AWARD

The City reserves the right to cancel the award of any contract at any time before the execution of such contract by all parties without any liability against the City.**BID**

EVALUATION

In addition to the bid amount, additional factors will be considered as an integral part of the bid evaluation process, including, but not limited to:

1. the bidder's ability, capacity, and skill to perform within the specified time limits
2. the bidder's experience, reputation, efficiency, judgment, and integrity

3. the quality, availability and adaptability of the supplies and materials sold
4. bidder's last performance
5. sufficiency of bidder's financial resources to fulfill the contract
6. bidder's ability to provide future maintenance and/or services
7. Other applicable factors as the City determines necessary of appropriate (such as compatibility with existing equipment.)

CONDITIONS AT SITE

Bidders must visit the site and shall be responsible for having ascertained pertinent local conditions, such as: location, accessibility and general character of the site of the building. The character and extent of existing work within or adjacent to the site, and any other work being performed thereon at the time of the submission of his bid.

LAWS, PERMITS AND REGULATIONS

1. The Contractor shall obtain and pay for all licenses and permits as may be required of him by law, and shall pay for all fees and charges for connection to outside services, and use of property other than the site of the work for storage of materials or other purposes
2. The Contractor shall comply with all State and Local laws, ordinances, regulations and requirements applicable to work hereunder, including building code requirements. If the Contractor ascertains at any time that any requirement of this Contract is at variance with applicable laws, ordinances, regulations or building code requirements, he shall promptly notify the City of Rochester in writing.

CONTRACTOR'S AND SUBCONTRACTOR'S INSURANCE

1. The Contractor shall deliver at the time of execution of the Contract, certificates of all insurance required hereunder and shall be reviewed prior to approval by the City of Rochester. The certificates of insurance shall contain the description of the Project, and shall state that the companies issuing insurance will endeavor to mail to the City of Rochester ten (10) days notice of cancellation, alteration or material change of any listed policies. The Contractor shall keep in force the insurance required herein for the period of the Contract. At the request of the City of Rochester, the Contractor shall promptly make available a copy of any and all listed insurance policies. The requested insurance must be written by a Company licensed to do business in New Hampshire at the time the policy is issued.
2. The City of Rochester, NH shall be listed as additional insured on all the Certificates of Insurance.
 1. The Contractor shall require each Subcontractor employed on the Project to maintain the coverage listed below unless the Contractor's insurance covers activities of the Subcontractor on the Project.

2. No operations under this Contract shall commence until certificates of insurance attesting to the below listed requirements have been filed with and approved by the Department of Public Buildings & Grounds, and the Contract approved by the City Manager.
 - a. Workmen's Compensation Insurance
Limit of Liability - \$100,000.00 per accident
 - b. Commercial General Liability
Limits of Liability
Bodily Injury: \$1,000,000.00 per occurrence, \$1,000,000.00 aggregate
Property Damage: \$500,000.00 per occurrence, \$500,000.00 aggregate
Combined Single Limit, Bodily Injury and Property Damage:
\$1,500,000.00 per occurrence, \$1,500,000.00 aggregate
 - c. Automobile Liability
Limits of Liability - \$500,000.00 per accident
3. The Contractor shall indemnify, defend, and save harmless the City of Rochester and its agents and employees from and against any suit, action or claim of loss or expenses because of bodily injury. Including death at any time resulting there from, sustained by any person or persons or on account of damage to property, including loss of use thereof, whether caused by or contributed to by said City of Rochester, its agents, employees or others.

ACCIDENT PROTECTIONS

It is a condition of this Contract, and shall be made a condition of each subcontract entered into pursuant to the Contract. That a Contractor and any Subcontractors shall not require any laborer or mechanic employed in the performance of the Contract to work in surroundings or under working conditions which are unsanitary hazardous or dangerous to health or safety. As determined by construction safety and health standards of the Occupational Safety and Health Administration, United States Department of Labor, which standards include, by reference, the established Federal Safety and Health regulations for Construction. These standards and regulations comprise Part 1910 and Part 1926 respectively of Title 29 of the Code of Federal Regulations and are set forth in the Federal Register. In the event any revisions in the Code of Federal Regulations are published, such revisions will be deemed to supersede the appropriate Part 1910 and Part 1926, and be effective as of the date set forth in the revised regulation.

SUBCONTRACTS

1. Nothing contained in the Specifications or Drawings shall be construed as creating any contractual relationship between any Subcontractor and the City of Rochester. The Division or Sections of the Specifications are not intended to control the Contractor in dividing the work among Subcontractors or to limit the work performed by any trade.

2. The Contractor shall be as fully responsible to the City of Rochester for the acts and omissions of Subcontractors and of persons employed by him, as he is responsible for the acts and omissions of persons directly employed by him.

PROTECTION OF WORK AND PROPERTY

The Contractor shall, at all times, safely guard the City's property from injury or loss in connection with this Contract. He shall, at all times, safely guard and protect his own work and that of adjacent property from damage. All passageways, guard fences, lights and other facilities required for protection by State or Municipal laws, regulations and local conditions must be provided and maintained.

USE OF PREMISES AND REMOVAL OF DEBRIS

The Contractor expressly undertakes at his own expense:

1. To take every precaution against injuries to persons or damage to property;
2. To comply with the regulations governing the operations of premises which are occupied and to perform his Contract in such a manner as not to interrupt or interfere with the operation of the Institution;
3. To perform any work necessary to be performed after working hours or on Sunday or legal holidays without additional expense to the City, but only when requested to do so by the City;
4. To store his apparatus, materials, supplies and equipment in such orderly fashion at the site of the work as will not unduly interfere with the progress of his work or the work of any other Contractors;
5. Daily to clean up and legally dispose of (away from the site), all refuse, rubbish, scrap materials and debris caused by his operation. Including milk cartons, paper cups and food wrappings left by his employees, to the end that at all times the site of the work shall present a neat, orderly and workmanlike appearance;
6. All work shall be executed in a workmanlike manner by experienced mechanics in accordance with the most modern mechanical practice and shall represent a neat appearance when completed.

MATERIALS AND WORKMANSHIP

Unless otherwise specified, all materials and equipment incorporated into the work under the Contract shall be new. All workmanship shall be first class and by persons qualified in their respective trades.

Where the use of optional materials or construction method is approved, the requirements for workmanship, fabrication and installation indicated for the prime material or construction method shall apply wherever applicable. Required and necessary modifications and adjustments resulting from the substitution or use of an optional material or construction method shall be made at no additional cost to the City.

STANDARDS

1. Materials specified by reference to the number, symbol or title of a specific standard, such as a Commercial Standard, a Federal Specification, Department's Standard

Specifications, a trade association standard or other similar standard. Shall comply with requirements in the latest revision thereof and any amendment or supplement thereto in effect on the date of advertisement, except as limited to type, class or grade or modified in such reference.

2. Reference in the Specifications to any article, device, product, material, fixture, form or type of construction by name, make or catalog number shall be interpreted as establishing a standard of quality and shall not be construed as limiting competition. In such cases the Contractor may, at his option, use any articles, device, product, material fixture, form or type of construction which, in the judgment of the City expressed in writing to all Bidders before opening of bids as an addendum, is an acceptable substitute to the specified.
3. Substitution During Bid Time: Whenever any particular brand or make of material or apparatus is called for in the Specifications, a Bidder's Proposal must be based upon such material or apparatus, or upon a brand or make which has been specifically approved as a substitution in an Addendum issued to all Bidders during the bidding time.
4. The intent is that the brand or make of material or apparatus which is called for herein establishes a standard of excellence which, in the opinion of the Consultant and Engineer, is necessary for this particular Project.
5. Substitution After Bid Opening: No substitutions will be considered after bids have been opened unless necessary due to strikes, lockouts, bankruptcy or discontinuance of manufacture, etceteras. In such cases, the Contractor shall apply to the City, in writing within ten (10) days of his realizing his inability to furnish the article specified, describing completely the substitution he desires to make.

EXTRAS

Except as otherwise herein provided, no charge for any extra work or material will be allowed unless the same has been ordered, in writing, by the Director of Public Works.

GUARANTEE OF WORK

1. Except as otherwise specified, all work shall be guaranteed by the Contractor against defects result in from the use of inferior materials, equipment or workmanship for one (1) year from the Date of Final Acceptance.
2. Make good any work or material, or the equipment and contents of said building or site disturbed in fulfilling any such guarantee.
3. In any case, wherein fulfilling the requirements of the Contract or of any guarantee, should the Contractor disturb any work guaranteed under another contract, the Contractor shall restore such disturbed work to a condition satisfactory to the Director of Public Works. And guarantee such restored work to the same extent as it was guaranteed under such other contracts.
4. If the Contractor, after notice, fails to proceed promptly to comply with the terms of the guarantee, the City of Rochester may have the defects corrected and the Contractor shall be liable for all expense incurred.

5. All special guarantees applicable to definite parts of the work that may be stipulated in the Specifications or other papers forming a part of the Contract shall be subject to the terms of this paragraph during the first year of the life of such special guarantee.

DEFAULT AND TERMINATION OF CONTRACT

If the Contractor:

1. Fails to begin work under Contract within the time specified in the notice to proceed; or
2. Fails to perform the work with sufficient workmen and equipment, or with sufficient materials to assume prompt completion of said work; or
3. Performs the work unsuitably or neglects or refuses to remove materials or to perform a new such work as may be rejected as unacceptable and unsuitable; or
4. Discontinues the prosecution of the work; or
5. Fails to resume work, which has been discontinued, within a reasonable time after notice to do so; or
6. Becomes insolvent or has declared bankruptcy, or commits any act of bankruptcy or insolvency; or
7. Makes an assignment for the benefit of creditors; or
8. For any other causes whatsoever, fails to carry on the work in an acceptable manner the City of Rochester will give notice, in writing, to the Contractor for such delay, neglect, and default.

If the Contractor does not proceed in accordance with the Notice, then the City of Rochester will have full power and authority without violating the Contract to take the prosecution of the work out of the hands of the Contractor. The City of Rochester may enter into an agreement for the completion of said Contract according to the terms and conditions thereof, or use such other methods as in his opinion will be required for the completion of said Contract in an acceptable manner.

All extra costs and charges incurred by the City of Rochester as a result of such delay, neglect or default, together with the cost of completing the work under the Contract will be deducted from any monies due or which may become due to said Contractor. If such expenses exceed the sum which would have been payable under the contract, then the Contractor shall be liable and shall pay to the City of Rochester the amount of such excess.

OBTAINING BID RESULTS

Bid results will be posted after 48 hours on the City of Rochester's web site: www.rochesternh.net or will be available by request via e-mail at the following address: purchasing@rochesternh.net